



Demande de la CNER faisant l'objet d'un examen préalable #126460

Arctic Water Solutions: Harnessing Native Northern Plants for Nature-Based Wastewater Treatment in Canada's Arctic

Type de demande : New

Type de projet: Scientific Research

Date de la demande : Thursday, July 30, 2026

Period of operation: from 2027-04-01 to 2028-03-01

Promoteur du projet: Wenxi Liao
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DÉTAILS

Description non technique de la proposition de projet

Anglais: Who: University of Guelph. Project lead: Dr. Wenxi Liao, co-lead: Dr. David McCarthy, co-PIs: Dr. Shadman Khan, Dr. Marc Habash, Dr. Jacqueline Goordial. Why: Northern communities across Canada's Arctic rely heavily on simple sewage lagoons that have limited wastewater treatment capacity. Conventional wastewater treatment plants are often impractical in these regions due to extreme cold conditions. Nature-based biofilters have demonstrated effective removal of nutrients, pathogens, and emerging contaminants in cold regions. However, more research is needed to adapt these systems using local plant species and suitable filter materials so that they are environmentally compatible, culturally appropriate, and resilient to Canada's Arctic conditions. What: This project will develop and optimize low-cost, scalable, and climate-adapted biofilters for wastewater treatment in Canada's Arctic, while protecting native plant species and enhancing ecosystem services. The project is important for Northern communities because it offers an effective, affordable, and locally relevant wastewater treatment solution that is informed by local knowledge and community input. Approximately six pilot-scale biofilter systems near the triplex at CHARS to evaluate wastewater treatment performance and plant health under Arctic conditions from 2027 to early 2028. Wastewater will be pumped from the triplex sewage holding tank into a temporary storage tank and then to the biofilters for treatment. Treated effluent will drain from each biofilter into a separate collection container. After effluent samples have been collected, the remaining treated effluent will be pumped back into the sewage holding tank in the triplex. Therefore, no wastewater or treated wastewater will be discharge to the ground in the experiment. Wastewater treatment assessments will be conducted only when the graduate students are present at CHARS. During these periods, the students will closely supervise the biofilters to ensure safe operation and promptly address any issues. Wastewater will not be introduced into the biofilters when the students are not on site. During unattended periods, the biofilters will be irrigated with tap water, as needed, to support plant survival and growth. Native Arctic plant species, such as mastodon flower and Arctic willow, will be collected locally under the appropriate permit and transplanted into the biofilters. Fewer than 20 plants in total will be collected. The biofilters will be instrumented with environmental and water quality sensors, including soil moisture, turbidity, pH, and electrical conductivity sensors, to continuously monitor system performance. Sensors and biofilters will be monitored graduate students and CHARS staff. The project will involve a collaborative research team, CHARS staff, and local community partners. All biofilters and sensors will be removed at the end of the project in early 2028. Personnel and research materials will be transported using existing commercial airline services and CHARS facilities. No vehicles will be required to support on-site research activities. Where: The field demonstration is proposed to take place at CHARS in Cambridge Bay, Nunavut. When: The field deployment and monitoring of biofilters is planned between March 2027 to March 2028. The biofilters and equipment will be disassembled around June 2028.

Français: N/A

Inuktitut: N/A

Inuinnaqtun: University of Guelph. Dr. Wenxi Liao, Dr. David McCarthy, Dr. Shadman Khan, Dr. Marc Habash, Dr. Jacqueline Goordial. Ukiuqtaqtumi nunallaat Kanatami tamaat ihariagiplugu atuqpagait anaqnut kuvviit ikittut kuvvikunik imaqmik halummaqhitilgit. Nutaatqiyat kuvvikunik imaqmik halummaqhitit amihuiqtuqhutik ihuaqutaunngittut hapkunani aviktuqhimayunit qaayuqnaqpallaamut. Maniraqmiutanik halummaqhitit ihiriitkutut ilittuqhitiavaktuq ahivaiyunik niqittianik, halumailrunik, nuivalliyullu halumailruit qaayuqnaqtumi aviktuqhimayuni. Kihimi, qauyihaihimmaqtughat ihuaqhaiyaamik havauhiqnik atuqhutik nunallaarmiut nauttianginnik ihuaqtuniklu ihiriitkutanik taimaa avatinut naammagiamik, ilitqihinut ihuaqtughat, hakugiktughallu Kanatam Ukiuqtaqtuanit qaayuqnaqtumi. Una havaaghaq hanayauhimayuq ihuaqhailutiklu akikittunik, qauyiharnaqtunik, hilaullu-nakuuhihimayunik ihiriitkutut kuvvikunik imaqmik halummaqhitinik Kanatam Ukiuqtaqtuanit, munariplugit nauttiat ihuaqhivaalliriamiklu uumayunut ikayuutighat. Havaaghat aghuurnaqtut Ukiuqtaqtumi nunallaanut tuniqhihimakkamik ihuaqtunik, akikittunik, nunallaarmiunullu ihuaqtunik kuvvikunik imaqmik halummaqhitighaq naunaiyaqhimayut nunallaarmiut qauhimayatuqainit nunallaarmiullu uqauhiinit. Hivulliqni havaanginnit 2026-mi, hanayaghaliuqniaqtugut ihuaqhailugulu ihiriitkutaq atuqhugit maniraqmiutat Ukiuqtaqtumiu nauttiangit ihuaqtumiklu ihiriitkutaqmik

qauyihavingmi nauttivingnilu qauyihaiplutik talvani Ilihaqpaalliqvianit Guelph. Nakuutqiyaunahugiyauyuq ihiriitkutaq uuktuqtauniaqtuq ilihaiyut havakvianit hanianiluuniit CHARS-kut Iqaluktuuttiaqmi munaqtaulutiklu Ukiuqtaqtumi hilautainit 2027-mit 2028-mut. Maniraqmi ilittuqhitillugit, nunallaarmit kuvvikuit imait uuktuqtauniaqtut ihiriitkutanut, halummaqtauhimayuqlu imaq katitauniaqtuq qauyihariamik qanurininganiit. Ilanga halummaqhimayuq kitullu tikkuaqtauhimayut halummaqhivingnit qimilruktaghat aullaqtitauniat Ilihaqpaalliqvianut Guelph-mi qauyihaqvingnit ihivriuqtauyaamik. Amiakkuit imaq utiqtitauinat kuvvinianit halummaqhivingnut angiqtauhimayumulluuniit nunallaarnit kuvviqmut, malighugit nunallaarmiut maliktaghait. Qanuriningania munaqtauniaqtuqlu ihivriuqhitillutik. Havaaghanut ilauniat qauyihaiyut havaktiit, CHARS-kut havaktiit, nunallaarmiullu havaqatigiit. Mikiyuinnait qauyihautauyut ihiriitkutut ingilrutait munaqtillu ingilrutait iliuraqtauniaqtut. Ihiriitkutut ingilrutillu ahivaqtauniaqtut iniqvianit qauyihaiyut atulihaaqqat 2028. Aullaarutait agyaqtaqtullu hunaqutinik ingilraviquaqniat tingmitjanut havakvighaqaqlutiklu. Maniraqmi iliaqtittiyughat naahuriyauyuq talani Kanatam Ukiuqtaqtumi Qauyihaqvianit (CHARS) Iqaluktuuttiaqmi, Nunavunmi. Iqaluktuuttiaq qanitqiyauyuq nunallaq talvunga maniraqmi havaaghainut. Maniraqmi aullaqtittiyut munaqtiuyullu ihiriitkutanik parnaiyaqhimayuq aulayaamik qakugukiaq Qiqailruq 2027-mit Qiqailruq 2028-mut. Ihiriitkutut ingilrutiillu ituptiqtaunahuat haniani Qitiqqautijug 2028.

Personnel

Personnel on site: 4

Days on site: 90

Total Person days: 360

Operations Phase: from 2027-04-01 to 2027-07-01

Operations Phase: from 2027-04-01 to 2028-03-01

Closure Phase: from 2028-03-01 to 2028-06-01

Post-Closure Phase: from to

Activités

Emplacement	Type d'activité	Statut des terres	Historique du site	Site à valeur archéologique ou paléontologique	Proximité des collectivités les plus proches et de toute zone protégée
Cambridge Bay	Researching	Crown	We plan to work near Canadian High Arctic Research Station (CHARS)	N/A	Approximately 1.5 km between CHARS and Hamlet of Cambridge Bay

Engagement de la collectivité et avantages pour la région

Collectivité	Nom	Organisme	Date de la prise de contact
Cambridge Bay	We are currently working with staff at CHARS. We visited Cambridge Bay in July this year to discuss the project plan with local community members and staff at CHARS. Many members supported this project. The project application is associated with the field work planned for 2027-2028.	CHARS	2026-07-14

Autorisations

Indiquez les zones dans lesquelles le projet est situé:

Kitikmeot

Autorisations

Organisme de régulation	Description des autorisations	État actuel	Date de l'émission/de la demande	Date d'échéance
Office des eaux du Nunavut	We have contacted NWB and they have confirmed that we do not need to apply for a permit/licence with NWB for this project.	Not Yet Applied		
Gouvernement du Nunavut, ministère de l'Environnement	We also plan to apply for a permit/licence with Government of Nunavut - Department of Environment after our first visit to Cambridge Bay.	Not Yet Applied		
Institut de recherche du Nunavut	We are in the process of preparing the permit application. The fieldwork associated with this project is planned for 2027. We visited Cambridge Bay and engaged with local community members in July 2026 and will incorporate their feedback into our application. We plan to submit the permit application by September 2026.	Not Yet Applied		

Project transportation types

Transportation Type	Utilisation proposée	Length of Use
Air	Materials will be transported using airlift	

Project accomodation types

Autre,

Utilisation de matériel

Équipement à utiliser (y compris les perceuses, les pompes, les aéronefs, les véhicules, etc.)

Type d'équipement	Quantité	Taille – Dimensions	Utilisation proposée
Biofilter	6	100 cm high and 60 cm in diameter, with an estimated total volume of approximately 210 L	We propose to install approximately six pilot-scale biofilter systems near the triplex at CHARS to evaluate wastewater treatment performance and plant health under Arctic conditions. Each biofilter will contain native Arctic plants and layered biofilter media composed of sand, gravel, and/or biochar.

Décrivez l'utilisation du carburant et des marchandises dangereuses

Décrivez l'utilisation de carburant :	Type de carburant	Nombre de conteneurs	Capacité du conteneur	Quantité totale	Unités	Utilisation proposée
No	hazardous	0	0	0	Kg	All the samples will be shipped to the laboratory at the University of Guelph for analysis. No hazardous material and chemicals will be used in the field.
No	fuel	0	0	0	Kg	No fuel will be used for this project.

Consommation d'eau

Quantité quotidienne (m3)	Méthodes de récupération de l'eau proposées	Emplacement de récupération de l'eau proposé
0	The proposed project will not take water from the region. We have consulted the permit manager at the Nunavut Water Board, who confirmed that the proposed project does not require a licence from them.	N/A

Déchets

Gestion des déchets

Activités du projet	Type des déchets	Quantité prévue	Méthode d'élimination	Procédures de traitement supplémentaires
Researching	Other, wastewater	Small volume	No disposal is needed. Wastewater will be pumped from the triplex sewage holding tank into a temporary storage tank and then to the biofilters for treatment. Treated effluent will drain from each biofilter into a separate collection container. After effluent samples have been collected, the remaining treated effluent will be pumped back into the sewage holding tank in the triplex. Therefore, no wastewater or treated wastewater will be discharge to the ground in the experiment. Wastewater treatment assessments will be conducted only when the graduate students are present at CHARS. During these periods, the students will closely supervise the biofilters to ensure safe operation and promptly address any issues. Wastewater will not be introduced into the biofilters when the students are not on site. During unattended periods, the biofilters will be irrigated with tap water, as needed, to support plant survival and growth.	N/A

Répercussions environnementales :

This project is funded through Polar Knowledge Canada (POLAR). As described in the project summary, the proposed research aims to evaluate the wastewater treatment performance of vegetated biofilter systems. Wastewater will be pumped from the triplex sewage holding tank into a temporary storage tank and then to the biofilters for treatment. Treated effluent will drain from each biofilter into a separate collection container. After effluent samples have been collected, the remaining treated effluent will be pumped back into the sewage holding tank in the triplex. Therefore, no wastewater or treated wastewater will be discharge to the ground in the experiment. The proposed work is expected to pose minimal environmental

risk. Wastewater treatment assessments will be conducted only when the graduate students are present at CHARS. During these periods, the students will closely supervise the biofilters to ensure safe operation and promptly address any issues. Wastewater will not be introduced into the biofilters when the students are not on site. During unattended periods, the biofilters will be irrigated with tap water, as needed, to support plant survival and growth. These measures will minimize environmental impacts while ensuring safe and responsible handling of wastewater throughout the project. We consulted the Nunavut Water Board and were informed that no permits or licences are required from the NWB for the proposed project.

Additional Information

SECTION A1: Project Info

SECTION A2: Allweather Road

SECTION A3: Winter Road

SECTION B1: Project Info

SECTION B2: Exploration Activity

SECTION B3: Geosciences

SECTION B4: Drilling

SECTION B5: Stripping

SECTION B6: Underground Activity

SECTION B7: Waste Rock

SECTION B8: Stockpiles

SECTION B9: Mine Development

SECTION B10: Geology

SECTION B11: Mine

SECTION B12: Mill

SECTION C1: Pits

SECTION D1: Facility

SECTION D2: Facility Construction

SECTION D3: Facility Operation

SECTION D4: Vessel Use

SECTION E1: Offshore Survey

SECTION E2: Nearshore Survey

SECTION E3: Vessel Use

SECTION F1: Site Cleanup

SECTION G1: Well Authorization

SECTION G2: Onland Exploration

SECTION G3: Offshore Exploration

SECTION G4: Rig

SECTION H1: Vessel Use

SECTION H2: Disposal At Sea

SECTION I1: Municipal Development

Description de l'environnement existant : Environnement physique

Description de l'environnement existant : Environnement biologique

Description de l'environnement existant : Environnement socio-économique

Miscellaneous Project Information

Identification des répercussions et mesures d'atténuation proposées

The proposed work is expected to pose minimal environmental risk. Wastewater samples will be handled, stored, and transported using appropriate containment and biosafety procedures to minimize the risk of spills, releases, or exposure. Only the volume of wastewater necessary for experimental application and analysis will be used. Any excess treated or untreated wastewater will be returned to the originating wastewater treatment facility or other approved local disposal locations in accordance with local guidelines and operational requirements. These measures will minimize environmental impacts while ensuring safe and responsible handling of wastewater throughout the project. We consulted the Nunavut Water Board and were informed that no permits or licences are required from the NWB for the proposed project.

Répercussions cumulatives

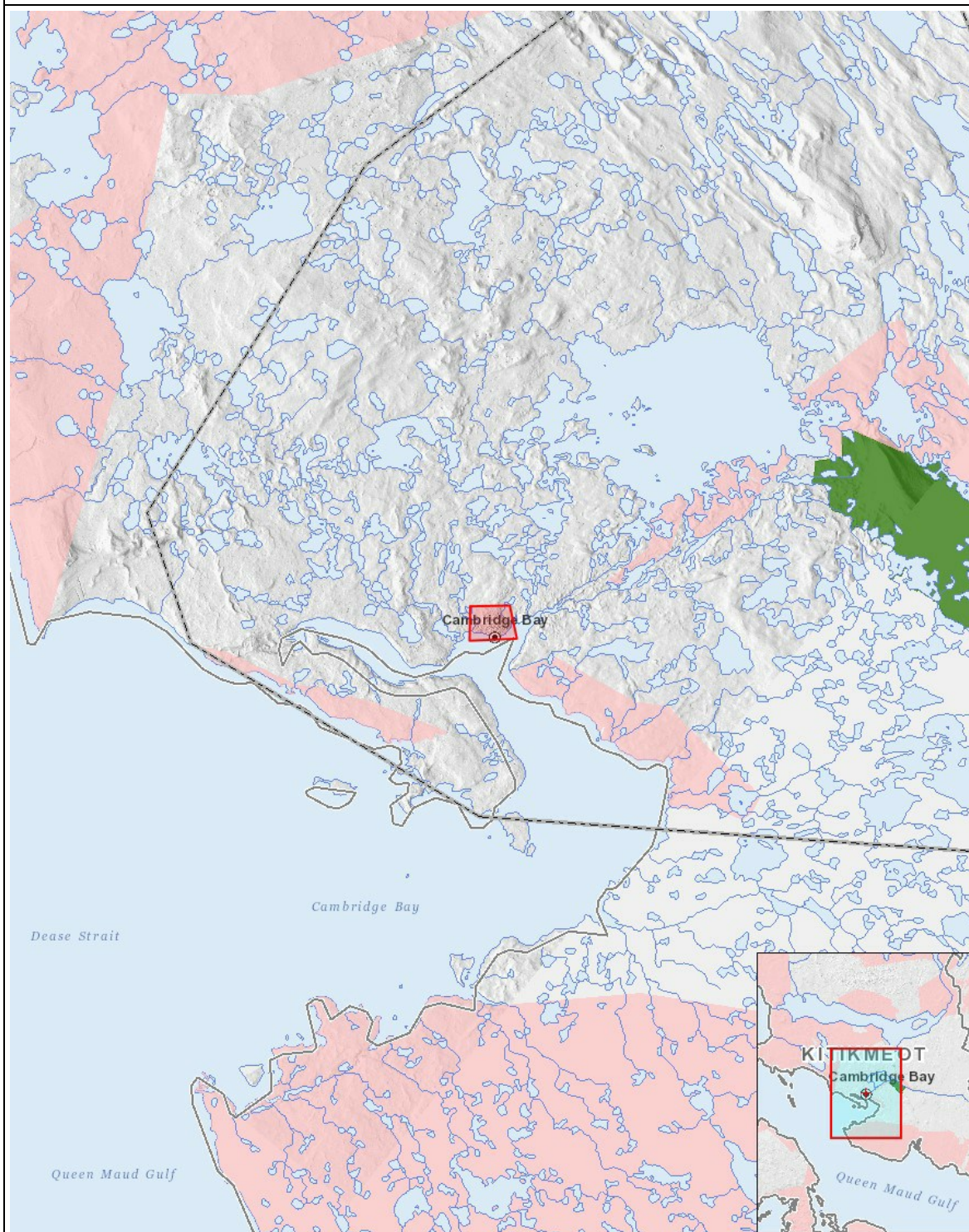
Impacts

Identification des répercussions environnementales

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(P = Positive, N = Négative et non gérable, M = Négative et gérable, U = Inconnue)

Site du projet



Liste des géométries de projet

1	polygon	Cambridge Bay
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