

Executive Summary of the Utilidor System (Water and Sewage Treatment Facilities) of the Municipality of Resolute Bay

The Hamlet of Resolute Bay is located on Cornwallis Island at N74°42' and W94°52'. Resolute Bay has a reported population of almost 290. The Hamlet is made up of two development areas; the airport area and the town site. The needs of the airport area are currently met using a truck service delivery system. The town site area was developed with piped water distribution and sewage collection networks. The utilidor system in Resolute Bay includes a pump station at Char Lake, intake pipes, water treatment plant (WTP) at Signal Hill, water distribution and sewer lines, fire hydrants, access vaults and a macerator unit. The entire system is undergoing renovation: in 2016 the buried utilities were replaced; and a new pump station and WTP are scheduled for construction in 2020; and a wastewater treatment plant (WWTP) is planned for 2024.

The Utilidor system of the Municipality of Resolute Bay is being operated under the Type B water licence #3BM-RUT1520 and Community Government Services of the Government of Nunavut (GN-CGS) is the Licensee. This licence was expired on ----- . To satisfy the recent guidelines of the NWB, this licence falls under the category of Type A. The renewal application was submitted by GN-CGS for 20 yrs. Term. In support of the 20-year licence renewal application and information requests, a number of documents have been prepared and submitted following the comments received from a number of stakeholders at the July 2020 water licence technical sessions which included Crown Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), the Nunavut Water Board (NWB), the Government of Nunavut – Community and Government Services (GN-GCS), and the Municipality of Resolute Bay.

Quantity of water requested and verification of consumption. Annual water extraction from Char Lake has been calculated from 2020 to 2047. Total extracted water accounts for use within the community, the airport, and bleedwater. Annual consumption for 2020 is calculated at 160,502 m³ up to 236,137 m³ in 2047 with population increases, per capita consumptions increases and increased bleedwater usage. Char Lake's replenishment capacity is sufficient up to about 2040 to supply water for the community. EXP has prepared flow meter specifications and are currently arranging delivery and subsequent installation in October 2020. The goal is to collect at least a week of flow data prior to the NWB hearing on October 27, 2020 to verify consumption.

Char Lake Pumphouse: CIRNAC recommends that both an Environmental Management Plan and Decommissioning & Remediation Plan be submitted. Both of these plans have been submitted to address any issues related to plan for the old Char Lake Pumphouse that will be replaced. The Environment Management Plan (EMP) assists with implementing measures to protect the environment and minimize environmental impacts during construction at both the Char Lake Pumphouse and Signal Hill WTP sites. The EMP outlines requirements and procedures to minimize surface water and fish habitat impacts by controlling erosion and drainage with sedimentation control. Pollution controls and procedures are also implemented to reduce dust and particulate matter. It also spells out procedures for management of hazardous materials during decommissioning. Spill response procedures are also outlined for spills on land, snow and water. And finally, it describes in detail the reporting requirements of any spill that may occur. Additional details are provided in the decommissioning and remediation plan and the spill contingency plan discussed later in this executive summary. The decommissioning plan assists with implementing specific work procedures and measures to protect human health and minimize environmental impacts during decommissioning of the Char Lake Pumphouse. Due to the proximity of the pumphouse to Char Lake, control measures must be implemented to prevent movement of

contaminants into the water caused by disturbing the soils and structure dismantling. The above-ground fuel tank must be safely removed, cleaned and washing using a vacuum truck, and the metal must be disposed at the community metal land field. Hazardous materials such as lead-based paints, mercury-containing florescent light tubes and PCB-containing light fixture ballasts must be securely removed and disposed to recycling facilities.

Wastewater Treatment Plant (WWTP): A number of technical issues and concerns regarding the current and future wastewater treatment have been raised by stakeholders. As such, EXP have prepared and submitted a health and safety plan for the existing macerator building, a technical memo addressing recommended fecal coliform limits, a technical memo addressing ammonia for the new WWTP and a technical memo that reviews the 2012 and 2020 WWTP designs.

The calculated Fecal Coliform values were determined based on linear regression of data collected from 2016 to 2020, which included 18 results. For flows greater than 600 Lcd and TSS of 80 mg/L, the calculated Fecal Coliform value was determined to be 157,929 cfu/100mL. For flows between 150 Lcd and 600 Lcd and TSS of 80 mg/L, the calculated Fecal Coliform value was determined to be 183,167 cfu/100mL.

The current trends in wastewater regulations indicate that effluent ammonia is likely to become a parameter of concern throughout Nunavut (and specifically the Hamlet of Resolute Bay) in the future. There are currently no regulations currently in place in Nunavut or the Hamlet of Resolute Bay that would require biological nitrification to meet an effluent ammonia discharge objective. However, it is anticipated that there will be future regulatory changes for the far north that could include new guidance on ammonia. With the uncertainty of the future regulatory changes, the Hamlet of Resolute Bay will be well served by installing a biological-mechanical treatment system in accordance with EXP's updated pre-design report (2020). The proposed process technology could be designed for ammonia removal to meet the current WSER performance standards in effect throughout Canada.

There were a number of key design factors that remained very similar or unchanged between the 2012 and 2020 designs completed by EXP. The most significant difference was the process technology with the intent to better balance the treatment performance requirements with the economic challenges. This will result in a more cost competitive system that is still capable of providing a high-quality effluent.

O&M Manual for the Utilidor System: The O&M manual was located and submitted. The manual includes operation and maintenance information for major utilidor water and wastewater equipment components such as access vaults, watermains, sewer mains, and hydrants.

Char Lake New Pump House Design and Construction: The scope for the new pump house and remediation of the site of the new facility involves the following activities: site works including access and a power line; provision of a new building including electrical and mechanical systems; provision of new intakes into Char Lake; a new transmission watermain interconnecting the pump house with the water treatment plant; and remediation of petroleum contamination of the existing site and management of the contaminated soil. The design flow rate from the water source to the new pump station at Char Lake is 720 L/m. The site selected is approximately 60 m east of the existing facility and meets the required criteria. A significant amount of work has been completed during the 2020 construction season at the Char Lake site that includes installation of silt fencing around the work site, excavation for the new pump house, concrete pours for foundations and pads, a new pumphouse building was constructed, boiler, glycol pipes and pumps were installed, bedding materials imported, and gravel bedding material was placed in Char Lake (with a turbidity curtain in place to prevent

particulate matter from entering the raw water supply) for the new intakes to be placed during the 2021 construction season.

Signal Hill Existing Water Treatment Plant (WTP) Rehabilitation Design and Construction: The upgrade to the WTP on Signal Hill examines the requirements for water treatment as outlined by the Canadian Drinking Water Guidelines. This includes the upgrade of disinfection equipment and the inclusion of filtration equipment. Capital costs as well as operational needs for a 30-year operating life were considered. The recommended water treatment process includes multiple filtration steps and disinfection with Calcium Hypochlorite. The filtration will provide for the suitable protection for microorganism removal and any small amounts of TSS that may get picked up by the Char Lake pumps. The chlorine addition will protect against viruses and microorganisms from the water source and provide protection for any cross contamination that may occur in the distribution system. The first stage filters are to be a duplex backwashable media filter. A media filter typically removes particles down to a 7 to 10 micron size which is suitable for larger turbidity particles and Giardia Cysts. The secondary proposed filters will be disposable polymer-based filters that will filter down to nominal 1 micron size which is suitable from further removal of smaller particles and Cryptosporidium. The disinfection method to be employed will be Calcium Hypochlorite. This will be delivered to site in a dry format and prepared for a 24-hour period in a mix tank. The upgraded water treatment plant will be in the same building but will incorporate filtration equipment, new disinfection equipment, new circulation pumps, washroom facilities, storage area, laboratory area and maintenance area. The unused reservoir tank will be removed, and the building will be expanded in an easterly direction. A significant amount of work has been completed during the 2020 construction season at the Signal Hill site that includes site grading, concrete demolition work, building addition work including concrete, walls, roof and cladding, and obsolete equipment and materials were removed.

Quality Assurance/Quality Control (QA/QC): The QA/QC program is used to maintain standards in the monitoring programs for the wastewater treatment and disposal, water supply and treatment, and solid waste disposal described in the respective O&M manuals. The program describes QA and QC processes and procedures applied during field activities to accurately reflect the attributes of the water, wastewater, and leachate being tested. Field QC addresses cross contamination as a common source of error in sampling procedures, sample handling, and storage and shipping. Field QC samples may include field blanks labelled as such to trace sources of artificially introduced contamination, or blind duplicates not labelled as such to ensure analytical precision. Laboratory QC is applied by laboratories after the samples have been received from the field to enable the laboratory produce accurate and reproducible results on an ongoing basis. The samples are collected in laboratory-supplied bottles and jars and analyzed at a laboratory certified by the Canadian Association for Laboratory Accreditation (CALA). All analytical reports are to include QA/QC reports. This Hamlet has been using the services of the accredited lab in Ottawa named Caduceon Environmental Laboratories.

Spill Contingency Plan (SCP): The SCP is used to address the proper responses to the anticipated types of spills that may occur during the routine operation and maintenance activities of the Hamlet's facilities associated with wastewater treatment and disposal, water supply and treatment, and solid waste disposal. The SCP presents potential contaminants and spill scenarios, existing preventative measures, and response organization. The SCP action plan includes potential impacts from and procedures for containing chemical spills such as sodium hypochlorite used to treat the water, and petroleum spills such as diesel fuel used to power equipment. The SCP provides contact information in case of spill, spill kit locations and spill reporting procedures. The SCP also includes the standard spill kit requirements.