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Government of Nunavut
Request for Proposals

RFP # 2017-63

Feasibility Study Rankin Inlet Water Infrastructure-Treatment
Rankin Inlet Nunavut

ISSUE DATE – November 10, 2017

CLOSING DATE – December 01, 2017

Statement of Purpose

The Department of Community and Government Services (CGS), within the Government of Nunavut (GN), wants to conduct a feasibility study determining the best course of action to replace aging water infrastructure in the Hamlet of Rankin Inlet. The facilities being considered for replacement are the Williamson Lake Pump House (WLPH) and the Nipissar Lake Pump House (NLPH).

Background

The majority of Rankin Inlet is serviced by a piped water distribution system. The piped system was installed in the 1970's and distributes water through 5 distribution loops of buried piping. The water distribution and treatment facility is located at Williamson Lake (center of community). Water is pumped through a 2 km pipeline from Nipissar Lake (water source) to the WLPH. The water is then chlorinated and stored in a storage tank. Prior to 2016, the storage tank was used to store raw water. After the storage tank it is distributed to the community. The entire system is a closed loop system and water continuously flows to prevent freezing of the pipes.

The system is over 40 years old and is showing its age. The design of the system does not meet current codes and standards nor does it meet the current and future water needs of the Hamlet. The condition of most system components are past their service life and are at risk of critical failure. The pump house for the distribution network is undersized and is failing to provide adequate water delivery service to the end users. There are many health and safety risks that must be addressed in the near future. The following sections highlight some of these major concerns.

Distribution Network Expansions and Upgrades

The original system consisted of only three service loops (Town Loop 1, Town Loop 2 and Town Supply in Figure 1). To service the growing community the following upgrades and expansions have been completed:

- Area 5 loop was added in the late 1980s
- Nuvuk loop construction in the 1990s
- Nuvuk loop expanded in the mid-2000s
- Area 1 was upgraded in 2006; all the access vaults, building services and piping were replaced
- Area 5 expansion is currently underway to service a future subdivision
- A trades school, health center, commercial buildings, 33-plex apartment building and other large facilities have been added to the network

The WLPH is the heart of the system and has not been upgraded to complement the addition of the extended loops and buildings. The higher distribution demand has put a lot of strain on this facility and it is failing to meet its requirements. For example, Area 1 and Area 5 distribution networks are constantly plagued with low water pressure. This results in the Area 1 return line's fire flow valve frequently opening to allow the return line to become a supply line to supplement the water main's flow. Typically this should only occur for fire-fighting purposes. Area 5 was designed with a small diameter return line and no fire valve. Therefore when there are low flows in the water main of Area 5, the return line cannot supplement the water main. These residents experience the inconvenience of constant low pressures and additionally do not have adequate fire protection services. There is currently a study underway to determine the condition and future needs of the Rankin Inlet Utilidor System.

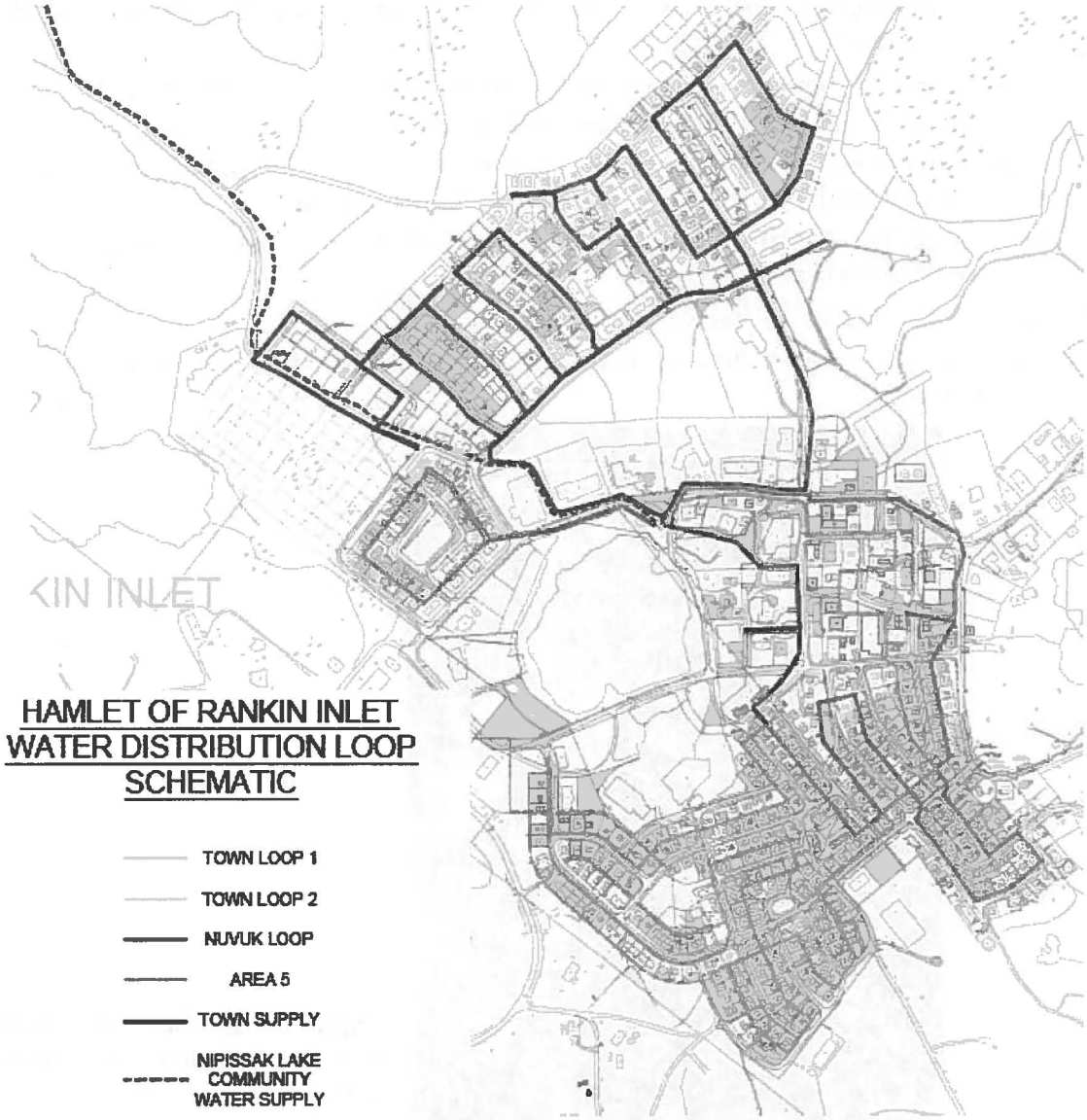

Figure 1: Piped water distribution network in Rankin Inlet

Williamson Lake Pump House Condition

The Williamson Lake Pump House has reached the end of its service life. It was constructed in the 1970s and some operating components are over 40 years old. The operators have identified concerns of significant deterioration of the system. Some of the major concerns are:

- Corrosion of piping in the WLPH
- Tuberculation (build-up of corrosion products) within the pipes. This build-up restricts flows which increases pumping costs and reduces the water pressure in the distribution system
- Wet wells (storage tanks underneath the WLPH) are showing signs of significant deterioration (Figure 2):
    - Water pipes that feed into the wet well have significant corrosion and leaks
    - Floor drain of WLPH leaks back into wet well
    - Up to one inch of corrosion in some areas of the wet well - a ladder has completely detached due to corrosion
    - Liners were installed in the wet wells to prevent water intrusion into the system
    - Sump pumps were installed behind the liners to remove ground water
- Valves in the plant do not function properly resulting in areas not able to be isolated when required for maintenance or other operations (e.g. wet wells cannot be isolated)
- The concrete housing for the supply pumps to the distribution network is deteriorating -concrete is brittle and is at risk of complete failure
- The roof of the WLPH has integrity issues
- There is a leak near the WLPH which has resulted in ice build-up in the area, which could be due to leaks in the wet well

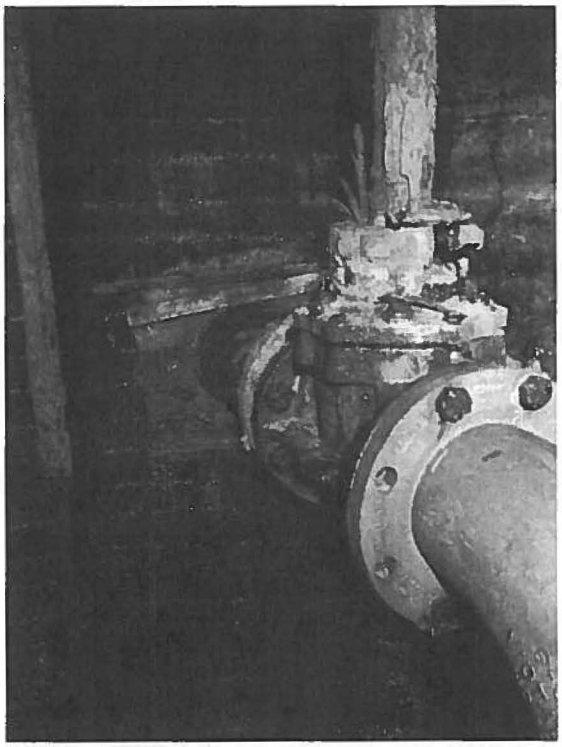

Figure 2: Significant corrosion and deterioration of components in wet wells

Nipissar Lake Pump House Condition

Nipissar Lake Pump House was also constructed in the 1970s and is in need of an overhaul. Some of the concerns are:

- The building envelope of the NLPH is not weather tight and snow accumulates inside the building
- Intake line does not reach the deepest part of the lake
- The intake pumps are nearing capacity and may not be able to accommodate hamlet's growth

Health and Safety Concerns

In addition to deteriorating condition of system components, there are many health and safety concerns for the residents as well as operators.

1. Health and Safety Concerns for Residents:
    - Inadequate ventilation system resulting in the fluoridation system being taken offline
    - Area 5 has low pressure and inadequate fire protection
    - Inadequate chlorine residual in distribution system which resulted in the boil water advisory in April 2015 (prior to converting the storage tank to store chlorinated water)
    - The wet well lids are required to remain closed due to safety concern of the chlorine air concentration above the water level in the wells. This prevents adequate monitoring of the wet wells
2. Health and Safety Concerns for Operators:
    - The electrical system does not meet code due to its age and design. Most notably, it is not grounded which is a major safety concern
    - Asbestos has been found in the WLPH
    - Concerns that the chlorine ventilation is insufficient

Inadequacies of the System

There are a number of system components which are inadequate, undersized or absent. The lack of these components hinders day to day operations of water delivery, poses a health and safety risk to end users and operators and results in the system falling short of meeting applicable regulations, codes and guidelines. For example:

1. The water storage tank was originally designed to meet a one week water supply demand. Currently, it has less than a two day supply. If there were problems with the upstream pump house (NLPH) and transmission line it does not allow a lot of time for repair before the town runs out of water.
2. The computer system is outdated and is required to be replaced; however, the lack of LAN signal at the NLPH restricts this system from replacement.
3. No gas monitoring in the plant which is required when using chemicals such as chlorine and fluoride.
4. The plant and mechanical/electrical design drawings have not been updated when any plant changes were made. This makes it difficult to conduct maintenance work and determine issues.
5. Area 5's return line has a faulty design and does not allow for additional flow to supplement required water and pressure for firefighting purposes.
6. When the storage tank needs to be taken offline for maintenance, adequate disinfection cannot be achieved in the distribution system prior to first users.

Treatment System

Water treatment at the WLPH consists of chlorine gas disinfection prior to the water entering the distribution system. The system lacks sufficient infrastructure to adequately meet the Nunavut Public Health - Consolidation of Public Water Supply Regulations.

In April of 2015, a two-week long precautionary boil water advisory was issued requiring residents to boil water prior to consumption. This was in response to drinking water samples containing lower than acceptable free chlorine residuals. This raised questions regarding the chlorine disinfection process. The Nunavut Public Health Act - Public Water Supply Regulations states *"there shall be a minimum total chlorine contact period of 20 minutes in the pipeline and reservoirs, before the first consumption by any person of the treated water"*. A study in 2015 identified that there are a number of service connections on some of the distribution loops that do not meet the 20 minute chlorine contact time. Temporary provisions were put in place in 2016 to correct this shortfall by converting the raw water storage tank to a treated water storage tank. To provide a long term solution to address the issue, new treated water storage infrastructure is necessary and/or a second disinfection method required.

Scope of Work

Project Requirements

WLPH and NLPH need to be replaced with facilities that can provide the hamlet of Rankin Inlet with water reliably, safely and sustainably. The project is divided into 3 phases that fall under the consultant's Scope of Work.

Phase 1A: Schematic Alternatives
The consultant shall determine the best option for replacing the WLPH and NLPH. The options of replacing the facilities at the existing sites, combining both into one facility at the NLPH site and at least one other option must be considered. While determining the best site(s), the consultant is to take into consideration the latest revision of Rankin Inlet's Community Plan.

The consultant must develop a strategy for comparing the different options in coordination with the GN.

Phase 1B: Geotechnical Site Assessment
If alternate sites (different from current sites) are proposed by the consultant, and approved by the GN, the consultant will be required to conduct geotechnical site assessments and provide a report.

Phase 2: Treatment Train
The consultant shall determine the components required in the treatment train, based on water analysis results, and provide a Process Flow Diagram (PFD) and other documentation, issued for design. The consultant shall consider applicable drinking water regulations (Nunavut PHA Public Water Supply Regulations, Canadian Drinking Water Quality Guidelines, etc.) during this phase.
The consultant shall size the train according to the water requirements of the community in the year 2038.

Phase 3: Impact on Existing Infrastructure
If the execution of the agreed upon solution affects the delivery of water in Rankin Inlet, the consultant must provide a plan for ensuring safe drinking water is delivered to the hamlet until the new facilities are commissioned. Any monetary impact must also be included in the cost estimates.
As well, the consultant shall determine if any additional water infrastructure is required including, but not limited to, piping, booster station(s), etc. A cost estimate must also be included.

Cost Estimates

The consultant shall provide a Class D estimate for replacing the water facilities under the different options. The consultant shall also provide operational costs for the options proposed.
Any monetary impact to the delivery of water services due to the execution of the proposed options must also be included as a separate line item(s).

Schedule
Adherence to the following schedule will be expected unless otherwise agreed to:

Task	Completed By
Proposal	December 1st, 2017
Outline of Site Visit	January 12th, 2018
Site Visit	January 26th, 2018
Draft Report	February 16th, 2018
Final Report	March 9th, 2018
Issued for Use Report	March 16th, 2018

Program Manager and Contract Authority

Contract resulting from this RFP will be managed by the Senior Municipal Planning Officer. A name, title and contact information will be provided upon contract award(s).

Recommendations	• Replace Nipisar Pump House (short-term: 1-2 years) • Identify and develop alternative water source to keep pace with community growth (medium-term)

6.7.2 Waste Water and Sewage Disposal

Table 25. Waste Water and Sewage Disposal

Asset	Acquired (Year)	Projected Useful Life (Year)	Years of Remaining Life	Issues
Ford F700 Sewage Truck	1998	2005	(-5)	• Use exceeds capacity
Sterling Acterra Sewage Truck (Municipal)	2009	2016	6	• Use exceeds capacity
Sewage Treatment Plant (GN)				• Use exceeds capacity; • Potential for environmental contamination if treatment facility is not enhanced
Wastewater Treatment (GN)				• Use exceeds capacity
Utilidor System				• Use exceeds capacity
Sewage Screener (GN)	1998	2028	18	• Use exceeds capacity
Drainage (GN)	2001	2031	21	• Use exceeds capacity
Infrastructure Priorities and Planned Investments	• No priorities were identified by Council for NCIAC in 2008. For more details, refer to Volume 2, Section 5.24 • CGS has committed 1,044k (GN Main) from 2009-12 for Nunavut Trade School Water and Sewer Mains.			
Recommendations	• Sewage Treatment plant (medium-term) • Utilidor replacement and expansion as community grows (long-term)			

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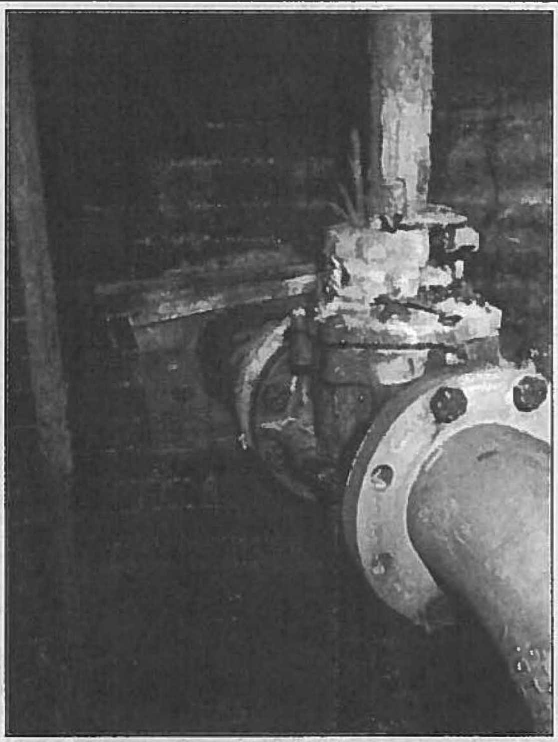
NUNATSIAQ NEWS

NEWS: Nunavut November 14, 2017 - 9:15 am

Rankin Inlet's rickety water infrastructure raises worries

"The design of the system does not meet current codes and standards, nor does it meet the current and future water needs of the hamlet"

JOHN THOMPSON



A corroding pipe is seen inside the bowels of the Williamson Lake Pump House. (GOVERNMENT OF NUNAVUT PHOTO)

The shoddy shape of Rankin Inlet's water treatment and distribution system poses "many health and safety risks that must be addressed in the near future," warns a Government of Nunavut report.

That's from a request for proposals issued Nov. 10 by the territorial government, which is seeking ideas for how best to replace the aging water treatment and distribution infrastructure that supports the Kivalliq community of about 2,850 people.

Risks identified by the report include:

• Rankin Inlet's water storage tank was originally designed to hold one week's worth of water when it was built in the 1970s. But, due to the community's growth, it's now only able to hold a two-day supply. If a problem were to occur with the upstream pump house or pipeline, the report warns "it does not allow a lot of time for repair before the town runs out of water."

• In 2015, Rankin Inlet faced a precautionary boil-water advisory for two weeks, after tests showed drinking water wasn't being adequately treated with chlorine. As a stop-gap solution, the raw water storage tank was converted into a treated water storage tank, but the report says that's no substitute for a properly built system for treating water, possibly including a second stage of disinfection.

• Due to a faulty design, one of the community's water distribution lines suffers from water pressure that's so low, it may not be able to support firefighting.

• There's no gas monitoring at the water treatment plant, as required when working with chemicals like chlorine and fluoride. Inadequate ventilation has resulted in the fluoridation system being taken offline.

• Electrical wiring isn't up to code. "Most notably, it is not grounded, which is a major safety concern."

• Asbestos has been found inside one pump house.

Rankin Inlet's water treatment system "is over 40 years old and is showing its age," the report states. "The design of the system does not meet current codes and standards, nor does it meet the

current and future water needs of the Hamlet."

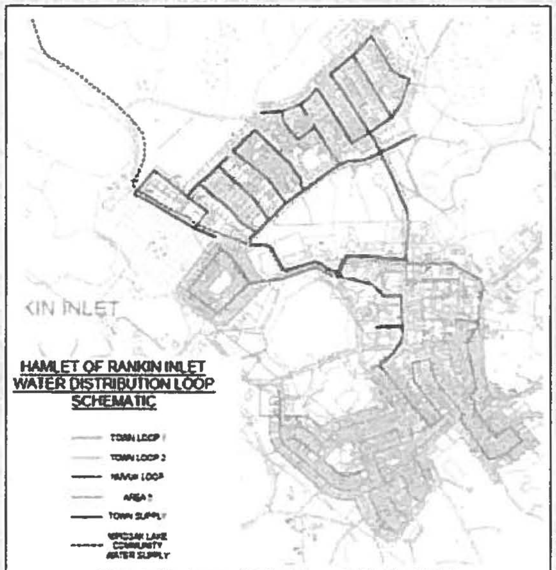


Figure 1: Piped water distribution network in Rankin Inlet

This map shows the path taken by Rankin Inlet's potable water. It's first pumped from Nipissar Lake along a two-kilometre pipeline to the Williamson Lake Pump House in the centre of town. From there it is chlorinated, stored and then fed into five loops of buried pipe. (GOVERNMENT OF NUNAVUT PHOTO)

Chief among the report's structural concerns is the state of the Williamson Lake Pump House, which it calls "the heart of the system." Built in the 1970s, the pump house "has reached the end of its serviceable life," the report states. Problems include:

- The building's pipes are corroded and, in some cases, partially plugged by build-up.
- Storage tanks beneath the pump house have in some cases "up to one inch of corrosion," and a ladder has "completely detached" as a result.
- Valves in the plant don't work properly, so some areas can't be shut off for maintenance.
- The concrete housing for the supply pumps is "brittle and is at risk of complete failure."
- The roof has "integrity issues."

Rankin Inlet's drinking water is pumped from Nipissar Lake along a two-kilometre pipeline to the Williamson Lake Pump House, in the centre of the community, where it is chlorinated and stored. From there, water is fed into five loops of buried pipe. Water in the loops continuously flows to prevent it from freezing.

The Williamson Lake Pump House now struggles to support the community, and neighbourhoods fed by two distribution lines are "constantly plagued with low water pressure."

To cope, the community has taken to opening the return line's fire flow valve along one loop. "Typically this should only occur for firefighting purposes," the report states.

The other line that suffers from low water pressure doesn't have a fire valve, so residents served by this pipe are stuck with low water pressure "and additionally do not have adequate fire protection services."

The Nipissar Lake Pump House, also built in the 1970s, needs an overhaul. The building is "not weather tight," and snow accumulates inside. As well, its intake line doesn't reach the deepest part of the lake, and its intake pumps are near capacity and may not be able to support the community's further growth.

Consultants hired by the territory would develop plans to replace both pump houses and devise a new plan to treat the community's water.

The resulting report, which would include cost estimates for this work, would need to be finalized by March 2018, according to the RFP. Interested parties must get their bids in by Dec. 10.

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