Hamlet of Taloyoak, Nunavut

Sewage Treatment Facility

Operation and Maintenance (O&M) Plan

Prepared by

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1.0 Introduction

Taloyoak sewage facility was developed in early 1980's with a series of natural lakes apart by a natural berm in between, and a raised outlet from the secondary cell to a wide area wetland. This O&M manual presents the operation and maintenance procedures associated with sewage and wastewater treatment and management. The proper operation and maintenance of lagoon facility is an important component of its sewage waste management system. It is recognized that inappropriate operation and maintenance of a sewage lagoon can cause a source of public health hazards and adverse environmental impacts.

The community has a population of approximately 900 (2006), with an approximate 1.5 % projected growth rate. Community infrastructure includes:

- A water treatment plant, which draws water from the Canso Lake, treat it through filters & chlorine and transport it to the community through truck fill to holding tanks in each building
- A sewage lagoon which receives trucked sewage from holding tanks in each building, hold raw sewage for approximately 360 days and discharge into wetland for natural remediation.
- A Solid waste facility which includes a bulky metals disposal area, hazardous waste oil battery and other materials storage areas within the waste site.

This O&M manual covers information and requirements in managing municipal sewage waste:

- Location of the community
- Basic geographical information such as precipitation, permafrost, hydrological information
- Location of sewage lagoon, solid waste facility and other related infrastructure
- Population and projected growth trend – current uses and future demand
- Water distribution, frequency of distribution and quantity return to water body
- Sewage waste collection and quantity of daily/weekly/monthly production
- Sewage generation and composition projections and types
- Sewage treatment and disposal system, remediation, and clearance
- History of facility development, time of operation, change and modification
- Location of wetland and trend of wetland condition during summer, winter, and fall
- Discharge method and duration-continuous or intermittent
- Drainage swale- around the outside perimeter of the lagoon
- Operators name and contact numbers of associates and assistance
- Sampling procedure, frequency of sampling, sample storage, transportation, and QA/QC
- SNP and station locations with GPS locator- temporary, fix or amendment
- Site records of sewage collection, effluent discharge and maintenance undertaken
- Safety procedure of operator, facilities, aquatic life, and public
- Method of controlling access to site and adequate signs
- Sludge management and treatment if any
- Spill – contingency plan for spills and reporting procedure

1.1 Objective of facility O & M manual:

The purpose of O&M manual is to assist community staff doing proper operation and maintenance of their sewage waste disposal facilities. This document is prepared for the review of Nunavut Water Board (NWB) for client (community) uses in practicing the Water Licence of Hamlet of Taloyoak. The O&M manual include descriptions:

- How facilities are operated and maintained
- How often the activities are performed and who is responsible for the compliance
- Location of facilities and proximity to receiving water body
- Frequency of inspection of berms, drainage, and dams
- Removal of floating materials from sewage disposal facilities
- Controlling effluent discharge quality
- Runoff and drainage control within and around the facility
- Treatment of effluent and drainage if any
- Prevention of windblown debris
- Method and frequency of site maintenance including berm, fence, gate, access way etc.

The following general requirements to minimize public health hazards and environmental impacts are addressed in this manual with the due diligence and operating principles that follows the core importance:

- to minimize environmental nuisances that can interfere with human & aquatic life
- to minimize the possibility of polluting surface water with retention, discharge, and treatment
- to minimize occurrence of public health impacts through reduction of disease-causing organisms.

The purpose is to implementation of “Best Management Practices” for planning and corrective action for good housekeeping, maintenance, inspection, record keeping, security, employee training, incident reporting, emergency responding, risk identification, situation assessment and corrective action.

1.2 Location of the Community and sewage lagoon facility:

Hamlet of Taloyoak is located on the Boothia Peninsula within the Kitikmeot region of Nunavut at a geographical location 69^0 32’ 0’’ N and 93^0 32’ 0” W, within a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds.

The lagoon system is located approximately 3.2 km from the community, about 35,700 m3 capacity. The primary cell receives raw sewage from truck discharge in the primary cell and stay there for the winter. Upon spring freshet, effluent and water flows over a semi-submerged berm into the secondary cell, from where it naturally overflows onto wetland. The meandering wetland about 900 m, enriched with seasonal vegetation, helps the effluent remediation process tremendously before the final ending into Stanner Harbour.

1.3 Geographical and Climate information

The Hamlet of Taloyoak is situated in a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds, with seasonal vegetation (Canadian Arctic Profiles – Indigenous Culture, 2006). The surficial geology immediately surrounding the community is classified as a till veneer, with till deposits being patchy and generally less than 1m.

The bedrock geology of the Taloyoak area comprises sedimentary rocks (carbonates, shale's and sandstones). Bedrock is generally exposed at sporadic locations close to sea level, where exposed, the bedrock comprises layers of dolomite and shale, and is jointed and frost shattered. The reported ground temperature below 3 m depth averages about -10^0 C. The thickness of active layer varies from 0.3 m in poorly drained areas to over 2 m in well drained areas. Excess ice contents of up to 10% have been reported in the subsurface soils.

The climate can be characterized by long cold winters and short cool summers. The average total annual precipitation is 13 cm, with about 85 cm of snowfall and 7 cm of rainfall. The July mean high is 12.3°C and mean low is 4.6°C. The January mean high is -25°C and mean low is -36°C. The prevalent wind direction is to the northwest at an annual average wind speed of 22 km/h

2.0 Facility Operational Policy

The manual demonstrates to the Water Board that the community is capable of operating and managing their waste sites. The policy covers basic and technical requirements including safety, site control, emergency response, litter & odor control, record keeping and employee training (but not limited) of the main policies for the operation and maintaining the sewage facility in compliance to the standard and in accordance to northern communities.

2.1 Sewage collection and transportation

The Hamlet of Taloyoak provides trucked sewage pickup service for residents, business centres and institutions of the community and transports it to the lagoon. Sewage lagoon receives raw sewage from truck chute through discharge flume, retains them within the primary cell of where it stays for sufficient retention time before a move to the secondary cell when melts in summer and fall. Sewage collection, transportation and disposal operation carries by hamlet operators using hamlets sewage trucks - two on service and one as backup standby, to a distance about 3.2 km from the away of town. Sewage is collected daily normal working hours 8:00 am to 5:00 pm with exceptional extended hours on weekdays and weekend by vacuum trucks from all household tank at a rate of 2 days interval and on daily basis from institution, office, and commercial builds. Additional trips also maintain as per needed and request.

The lagoon is designed to receive municipal sewage only as outlined in the water licence and termed as sewage and sanitary wastes-both grey water and black water. The discharge of other type of liquid wastes is prohibited unless it can be demonstrated that the waste quality does not have deleterious impact on the Sewage Treatment Facility.

The policy is to operate the lagoon in adherence to the Environmental Guidelines for Industrial Waste Discharge in Nunavut (Government of Nunavut, 2002) provides a Decision Flow Chart for managing an industrial waste discharge. It also includes schedules of comparative criteria for evaluating the liquid waste.

Liquid wastes meeting the criteria are acceptable for discharge into the sewage lagoon facility. Liquid wastes that do not meet the criteria must be pre-treated until they do or be stored in the Hazardous waste storage area for future disposal at a licensed facility located outside of the community. Operation policies were developed to provide specific details related to the Operation and Maintenance of the facility with the intent of keeping the requirements of the Water License. Policies, presented in of this manual, cover a wide range of topics, personnel involved with the operation of the facility are fully conversant with these Policies.

2.2 Discharge Method

Sewage collected from household tank by vacuum truck and then discharge into the main cell lagoon for round the year. In the winter, this discharged sewage forms an ice pack in the lagoon and stays full

winter which melts and flows over the submerged berm to the secondary cell during summer and fall. The summer discharge naturally settles down the sludge portion (about 10% of the total) at the bottom and flows out remaining watery portion (almost 90 %) over the berm to the secondary cell and finally line up with the previously meted water through the open outlet from secondary cell to wetland while temperatures are above freezing point. Effluents from secondary cell pass through a shallow and narrow open area to wetland where maximum remediation takes place naturally to sewage runoff before completing the travel to the ocean. The hamlet of Taloyoak maintains a Log sheet to identify and taking necessary steps for sewage facility maintenance. A fulltime employed Forman with other operator are making this effort while facility in operation. The long chute helps raw sewage bringing down into the main cell and in summer it brings almost near the bottom at discharge point. Hence, less chances of mixing raw sewage with very top portion of retained sewage.

The primary settling cell helps in treating raw sewage through settling the solid portion at the bottom and retains for sufficient time, while comparatively liquid watery portion receives sunlight & Oxygen as needed BOD level for remediation. Melted sewage water also helps in transmitting heat & Oxygen to the under layer colloidal and solid portion before getting out of the cell. Seasonal vegetation on sides of the lagoon also helps in remediation process by reducing contamination level. The lagoon is capable maintaining sufficient freeboard and no overflow on sides or up front, the primary cell is large enough to hold sewage accumulation from October through May. The secondary cell migrates along 900 m tundra wetland pathway to the ocean.

2.3 Normal Operations

Taloyoak sewage lagoon is intended for domestic municipal wastewater and sewage only. Be aware of the regular sewage truck operators and look for signs at the truck discharge and in general, that wastes other than municipal sanitary sewage is being discharged into the sewage lagoon system. For any spills, refer to the Spill Contingency Plan. Litter should be collected on a weekly basis during summer and fall. General public accesses to the lagoon area are discouraged. Possible contamination or infection from pathogenic organisms exists with every contact with the sanitary sewage. This area should not be used for recreational activities

2.3.1 Operation from Freeze-up to Break-up

Specific operation of the lagoon during this time is for winter. Changeover to winter operation occurs when effluent in the lagoon begins to freeze- starting from November normally until April. Sewage is collected using the sewage vacuum truck and discharged into the lagoon via the discharge flume.

Any sewage spilled onto the truck turn around or standing point must be cleaned up immediately to prevent the accumulation of ice. Any accumulation of ice on the discharge flume also be cleared away to keep the flume clean and free of blockages.

2.3.2 Operation from Break-up to Freeze-up

Operation of the lagoon during the time of summer, changeover to summer operations occurs when stored effluent in the lagoon has thawed. Sewage collected and discharged into the lagoon for winter operations. Natural discharge happens during this time from secondary cell to wetland. Effluent will be discharged to wetland over the raised crest from secondary cell. During the start of discharge, hamlet must inform CGS and/or CIRNAC inspector effluent sampling program. Residual sewage will be stored in the lagoon during the winter along with new discharged sewage from the community.

During the summer and fall operations, implementation of monitoring program begins and hamlet's responsibility to ensure the program is carried on time in each summer and fall in compliance with the requirement of the standard practice and with the requirement of the renewal Licence.

2.4 Resource and Personnel

The Hamlet Forman and operators are responsible for overall operation of raw sewage collection, transportation, and disposal to treatment facility as well as general operation and maintenance of vehicles and facilities. One person is employed to operate each sewage truck and another person in connecting house tank outlet to the hose at the vacuum truck for each team operation, daily 8:00 am to 5:00 P M and 5 days a week. The Hamlet is operating such two trucks with two full time drivers and one truck as backup in case of failure of regular one. Regular 5 days a week service with overtime operation during Saturday and Sunday in the case of emergency. In absence of a regular employee, a casual hiring from local people encouraged with appropriate training. To assist in such filling and to create sufficient local employee, the hamlet keeps a plan and budget in creating more jobs for the local operators – coop students are also encouraged. Thus, more trained personnel become resource for the community through the operation of sewage waste facility. Also, local people can take part in the facility operation.

Contact person for any information and action as below:

Operators Name	Title	contact number
Ashoona Irriquit	Forman	867-561-5112
Jams Ashevak	Operator	867-561-5112
Janice Anderson	CAO	867-561-2302

3.0 Effluent Guidelines

As set out in the original Licence, effluent discharged from the lagoon & wetland must be monitored during the period of natural treatment process. The lagoon is the main storage & primary treatment facility for sewage. Once discharged out to wetland, secondary treatment occurs through biological process in presence of sunlight and Oxygen where effluent is exposed to warmer temperature and air. The wetland makes the changes in contamination and polishing effluent by removing some organic and inorganic materials. The Hamlet of Taloyoak sewage effluent quality levels to be measured at TAL-4 (final discharge point of effluent before merging to ocean). Wastewater effluent quality parameters at the final discharge point can be seen in the Table:

Parameters	Maximum concentration of any Grab sample
Fecal Coliforms	1×10^6 CFU/dl
BOD_5	120 mg/L
Total suspended Solids (TSS)	180 mg/L
Oil and grease	No visible seen
p^H	Between 6 and 9

3.1 Effluent Monitoring

Monitoring points are located at the outlet point of discharge from the secondary cell lagoon to the wetland (TAL -2) and at selected locations down-stream on wetland before mixing with solid waste effluent point (TAL-4) prior to entering the ocean. The lagoon is sized to contain the annual volume of sewage for about a year. The wetland treatment system is designed to natural flow channel which gradually become a more biologically rich area to provide natural attenuation processes as the discharge volume increases year by year.

Sewage effluent parameters

Parameter	
Alkalinity	Sodium (Na)
Conductivity	Sulphate (S04)
P^H	Aluminium (Al)
Total Suspended Solid (TSS)	Arsenic (As)
Ammonia as N2	Cadmium (Cd)
Biochemical Oxygen Demand (BOD)	Chromium (Cr)
Carbonaceous Oxygen Demand (CBOD)	Cobalt (Co)
Nitrate as N2 (NO3)	Copper (Cu)
Nitrite as N2 (NO2)	Iron (Fe)
Calcium (Ca)	Lead (Pb)
Chloride (Cl)	Manganese (Mn)
Hardness (Total)	Nickel (Ni)
Magnesium (Mg)	Zinc (Zn)
Potassium (k)	Mercury (Hg)

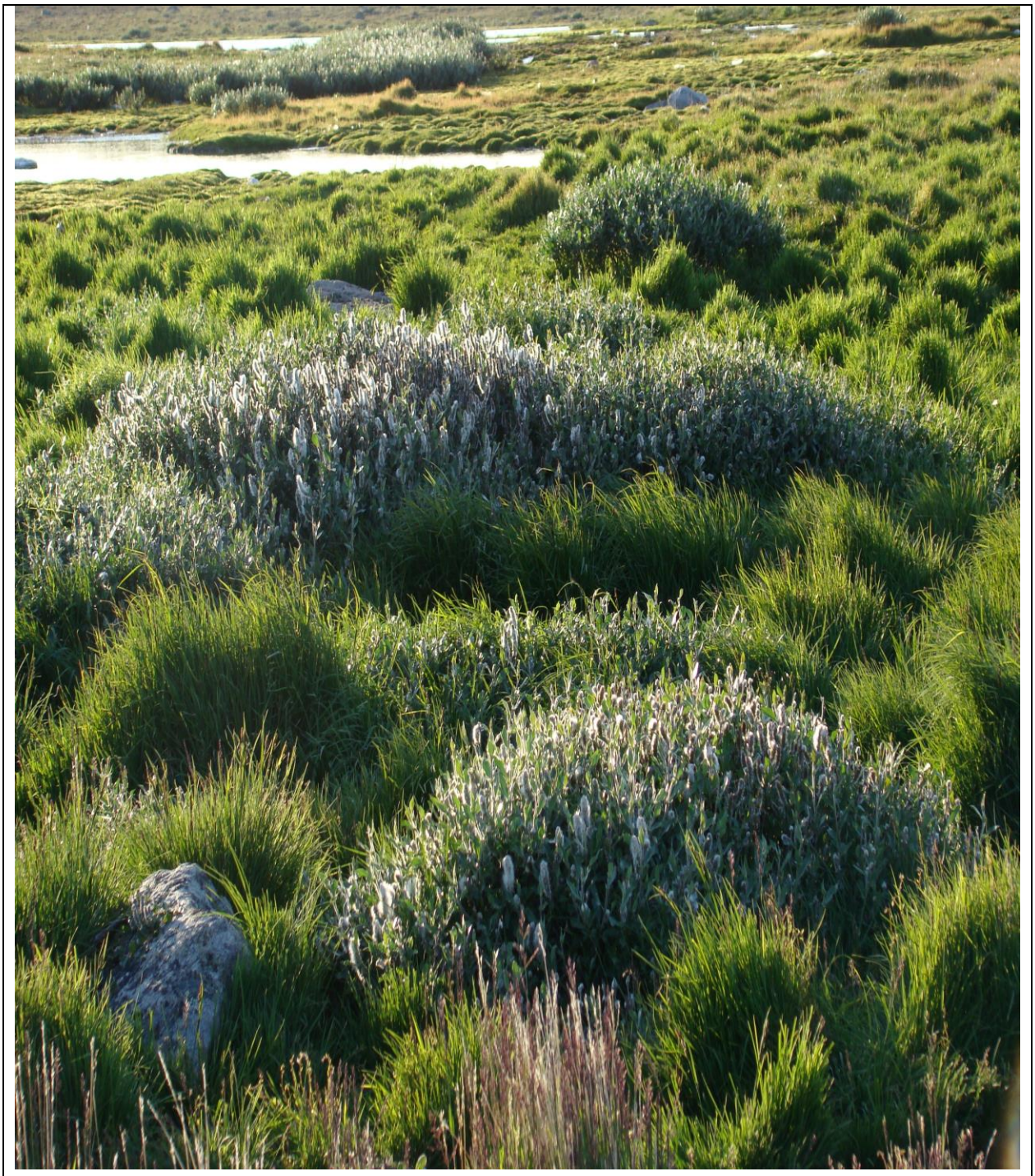
Additional analytical parameters, which could become a requirement of the NWB water license or be requested by an Inspector as defined in the Nunavut Waters and Nunavut Surface Rights Tribunal Act. Other parameters can be added as needed.

3.2 Monitoring stations:

Taloyoak sewage lagoon facility is about 3.2 km away from the community and to the other side of water body. The wetland connects the sewage lagoon in one end and the Ocean on the other end. Monitoring stations are marked with GPS locator on each station point on wetland for grab samples collection best representing the effluent status at that point. These monitoring stations are marked with signage for operation and inspection purposes, visible for inspector and operators. Additional station points can be selected based on requirement and issues on existing location. It is the responsibility of the Hamlet to maintain these station points and signage at all the time. Records to be maintained of these station points and sample results and update with Annual Report to NWB.

Table: Monitoring Stations of sewage and solid waste sample collection points:

Sampling Station	GPS Location		Description	Comments
	Latitude	Longitude		
TAL-1	N 69^0 32′ 39 ″	W 93^0 32′ 05″	Raw Water supply at Water Lake	Volume of water collected from lake
TAL-2	N 69^0 32′ 38 ″	W 93^0 35′ 39″	Sewage outfall entry to wetland	Outside the lagoon , onto wetland
TAL-3	N 69^0 32′ 26 ″	W 93^0 35′ 22″	Solid waste discharge run-off	Outside the fenced area on wetland
TAL-4	N 69^0 32′ 22 ″	W 93^0 35′ 25″	Effluent Final discharge point before meeting ocean	Combined effluent at the end of wetland
TAL-5	N 69^0 32′ 23 ″	W 93^0 34′ 34″	Hazardous storage cell retention water	New station. Sample collect only when decanting requires



Taloyoak Sewage Treatment Facility: Natural Wetland (seasonal vegetation)

3.3 Record Keeping

Record keeping is mandatory to have information updated of the status of the lagoon system at a specific time and for keeping track of operation or occurrences. Keeping records of facility operation and monitoring are important for the hamlet and regulatory organization in practicing regulations. Records must be in detail to facilitate evaluation of operation and to track the development of problems. Records also provide list and sequence of completed and list of obligation. Lagoon management must establish and maintain an operating record and prepare annual reports.

Copies of such record shall be kept at the Hamlet office for review and reference. Records shall be contained with information such as:

- Number of trips makes per day and approximate volume of sewage discharged
- Information of any monitoring for the day of a plan for next day(s)
- Results of monitoring program
- Any maintenance carried, required or in plan for the day or later the date

3.4 Site Management:

The normal operational check of the sewage lagoon system involves observation of daily truck load numbers and quantity of sewage disposal as well as any spills or unwanted / abnormal situations. Observations should also be made of the lagoon surface, noting if there is material floating and what the material may be. An entry should be made every day on the Daily Inspection Record to either indicate that the operation is normal or that something abnormal was observed and corrective step to be taken.

The log shall be maintained with the operator, with a copy to the MSM daily/weekly for recording and reporting purposes.

3.4.1 Inspection of Sewage Lagoon System and Components

Daily: A brief check of the lagoon shall be done daily when raw sewage discharge into the lagoon. Site and weather conditions shall be noted, as well as any activities carried out that day.

Weekly: During snow-free period in summer and fall, integrity of main components (discharge chute, flute tie and support, pad) of the sewage lagoon system should be inspected. A report shall be filed, noting the date and any issues identified. The truck discharge point and surrounding area should be examined weekly for signs of cracking, sliding or other operational issues.

The truck discharge system consists of discharge chute laid on a slope for conveying sewage from the truck discharge into the primary cell. The chute is anchored at the top and bottom of the slope. A pressure treated timber wheel stop and steel bumper posts are provided to control the position of the

trucks during discharge. The timber wheel stop and steel bumper posts should be inspected regularly for any signs of damage or instability.
During open water periods, the water level in the lagoon should be observed and recorded.

Sewage Colour

The variations in the colour of sewage during open water periods can be an important indicator of a sewage lagoon system performance. The following list provides frequently observed sewage colours and associated performance indicators:

- **Dark Green** – Good. High pH and high dissolved oxygen (DO).
- **Dull Green to Yellow** – Not very good. P^H dropping, DO dropping and blue-green algae are coming to establish.
- **Grey to Black** – Very bad. Lagoon anaerobic.
- **Tan to Brown** – Okay if caused by a type of algae bloom. Not good if due to silt or bank erosion.
- **Red or Pink** – Indicates presence of sulphur bacteria (anaerobic conditions) or presence of red algae

Lagoon colour shall be noted during the weekly inspections. If the lagoon colour indicates poor performance (dull green to yellow, grey to black and red or pink) the Hamlet shall consult with the NWB to determine appropriate remedial actions. Sewage of this colour is not ready for decanting

4.0 Administrative Structure

Hamlet administrative decision runs by council member's motion and decision. Council members select and appoint Mayor, Deputy Mayor using direct vote. Hamlets council members with the help of Executive members appoint the CAO. The Chief Administration Officer (CAO) has overall responsibility on Departments including the Municipal Services or Public Works Manager which is responsible for management and operation of the sewage lagoon facility. Duties of the CAO in relation to the sewage lagoon include:

- Review Municipal Plan and projects in conjunction to improvements to the lagoon.
- Review maintenance, administrative & management cost and allocate annual budget
- Confirm personnel training, operator hiring and emergency casual staff with proper training
- Monitor overall operations to confirm it in accordance with this O&M manual and Water License
- Obtain and review operating and monitoring records
- Review emergency response plans and confirm exercises occur on a regular basis
- Coordinate with CIRNAC for sampling, monitoring and annual inspection of the facility
- Liaise with the NWB
- Review and submit reports to the NWB, as required by the Water License
- Respond to public inquiries
- Address any complaints

4.1 Municipal Services Manager (MSM)

The MSM is responsible for management of the sewage lagoon and reports to the CAO. A local contractor is also available and in contract for any interim help or emergency response. Duties of the MSM in relation to the sewage lagoon include the following:

- Plan for operators and improvement of the facility operation
- Conduct sewage lagoon inspections as required
- Ensure sampling and monitoring occurs as required in the Water Licence and standards.
- Prepare annual operation and maintenance budgets
- Manage maintenance activities with standard lagoon system and in this manual
- Organize training of personnel on Environmental awareness and facility operation
- Prepare emergency response plans and schedule regular exercises
- Update the Safety Plan for the facility and environment
- Prepare reports required by the Water License
- Prepare and maintain an operational record of the facility
- Ensure current and accurate facility signage, warning and contact information for facility users
- Conduct Safety Orientation for visitors and Contractors

4.2 Lagoon operation

The Lagoon Operator reports to the MSM/CAO is responsible for overseeing vehicular traffic, day-to-day operations of the lagoon and monitoring lagoon in all weather. Duties of the Lagoon Operator include:

- Carry out winter and summer maintenance of roads, sewage disposal area, and ditches of lagoon with inspections of infrastructure as required in the Water Licence
- Maintain equipment and keep records of sewage disposal and annual quantities of disposal
- Coordinate overall operations to ensure lagoon site is operated according to the O&M manual
- Co-ordinate and collect grab samples from Monitoring Stations and any instructed point.
- Complete or arrange for packing, labelling and transportation to the laboratory for testing
- Take corrective action for issues of non-compliance and instruction by CIRNAC/NWB
- Respond to corrective action to swage collection, transportation, disposal and lagoon operation for any spills, leakage, failure or unauthorized uses of the facility
- Administer the Site Safety Plan and Spill Contingency Plan, Litter control
- Surface water management and assist with third party water sampling
- Emergency response and spill control as per Spill Contingency Plan
- Record keeping for sewage, vehicle, equipment, and reporting to Municipal Services Manager

A complete and current list of personnel responsible for operation and maintenance of the lagoon sites along with emergency and regulatory contact information must be maintained

4.3 Wetland Treatment Area

The wetland treatment area is an integral part of the sewage treatment facility. It consists a meandering stream pathway that reaches across the tundra, approximately 900 m between the lagoon and ocean. Monitoring of the existing wetland downstream has shown the wetland has been providing adequate treatment that NWB license requirements were being met before discharging into the ocean. Continuous monitoring will allow ample warning if maintenance efforts such as diverting some of the flow into adjacent drainage systems is required.

5.0 Maintenance

Maintenance includes access road, discharge chute, vehicle turn around pad, splash pad, flow wire, protection berm, signage, wetland, and sampling station points. Maintenance of the access road should follow winter and summer maintenance with snow clearing in the winter and surface grading debris free in the summer.

The following maintenance procedures will be undertaken by the hamlet staff to ensure wastewater treatment infrastructure operates efficiently:

- The roadway and truck move around shall be maintained by snow clearing in the winter and surface grading in the summer with any defects repaired as necessary
- Lagoon containment shall be inspected periodically during the summer and fall.
- Wetland drainage channels shall be inspected during summer and repaired as necessary
- Facility identity and warning signage which identifies Sewage Treatment Facility shall be inspected monthly and repaired or replaces, as necessary.
- The discharge flume shall be inspected for displacement or damage monthly and as necessary.
- Any airborne litter shall be removed from sewage lagoon periodically and dump at dump site.

5.1 Odour Problems and Weed & Insect Control

Under normal operating conditions, the sewage lagoon system will not cause any serious odour problems. However, at times, severe odours may occur subject to sewage quality and various environmental factors. The sewage lagoon is located a significant distance from the community. Therefore, odour is not normally considered to be a problem.

The periods of concern for odour are:

- During the period following ice break-up and thereafter
- During an extensive period of cloud cover, where the absence of sunlight would lead to reduced algae activity and reduced oxygen production, and
- The presence of extensive floating sludge mats

The operator of the sewage lagoon system has limited control over these conditions. The problem will normally be of short duration during and after the ice breaking. For other periods in summer & fall, the situation should improve once the cloud cover breaks. For situation of floating scum and algae mats, there is a need to be broken up and screened for removal and drying on the sludge drying pad, for eventual disposal in the landfill

5.2 Lagoon Vegetation

Seasonal surface weeds can develop in sewage lagoons during summer and fall. The primary concern with surface weeds is that they may obstruct sunlight going close near to lagoon waste which mostly needed for sewage treatment. Also, those weeds attract insects and breed there. In addition, when floating plants die, they began to decompose and deplete oxygen, which is needed by the bacteria for sewage treatment

Surface weeds may be controlled by the hamlet operator or with expert hiring as follows:

- Skimming – this is often difficult and must be done numerous times, and
- Use of herbicides – Approval from Nunavut Water Board is required for their use.

The removed weeds should be buried, where possible, to prevent odour and insect problems

5.3 Insect Control

Flies and mosquitoes create the most common insect problems on the open area sewage lagoon. Most mosquitoes breed in sheltered, calm water containing vegetation and floating materials to waste which the female can attach eggs. The egg clusters are fragile and easily damaged by turbulent action caused by wind and currents. Improper weed control and the accumulation of a scum layer will make insect problems worse

6.0 Sludge Management

The lagoon was originally built with natural discharge of effluent will clean up almost all sewage waste during the following year of accumulation within the primary cell, and very least 5-10% sludge as residue on lagoon bottom. With long time uses, there has possibility of developing sludge blanket on the bottom of the lagoon and will reduce the capacity for raw sewage. Currently, no bathymetry survey data are available to assess sludge quantity in the lagoon. To keep the lagoon capacity in holding the designed quantity, sludge removal can be suggested for every 5-10 years of operation of the lagoon. The general monitoring procedures for sludge management are as follows:

- Sludge measurement – sludge measurements will be taken with a “sludge judge” which is Approximately a 2-cm clear tube, pushed into the sludge and withdrawn and measure the sludge marking. Sampling will take place at the discharge pipe concrete retaining wall.
- Water levels – water levels will be measured from a fixed point on the discharge
- Lagoon discharge samples will be collected from the monitoring point form the discharge

Raw sewage samples will be collected from the base of the input flume, after several consecutive loads have been dumped to obtain a representative sample of several loads. Sample will be collected using a pole with bottle clamp. All other samples will be collected from designated surface water sampling stations.

7.0 Health and Safety

Health and safety of workers and the public are first priorities while operating the sewage treatment facility. The requirements of the Nunavut Safety Act must be followed at all time. All actions and operations must be undertaken with safety as the priority. The Lagoon Operator(s) must make sure that all aspects of municipal sanitary sewage management are conducted safely. Site safety at the lagoon is coordinated through the lagoon operator. All operations are to be always conducted with safety as a priority and in accordance with the Safe Work Policy. Possible contamination or infection from pathogenic microorganisms exists with every contact with the sanitary sewage. General public access to the lagoon area should be discouraged. Possible contamination or infection from pathogenic organisms exists with every contact with the sanitary sewage. This area should not be used for recreational activities. Equipment and any other structures should be kept clean. This reduces safety hazards and protects equipment.

Use of proper hand gloves, safety boots, safety vest, jacket, pants, safety eyewear and any primary safety tools are mandatory during sewage collection and disposal and lagoon operation. After work, before eating, and at other convenient times, the Lagoon Operator(s) should wash their hands thoroughly. Caution should be used when working with sanitary sewage. If an operator is splashed accidentally with sewage, the area should be promptly washed with plenty of water. All cuts and skin abrasions should be treated immediately to prevent any infection.

Operators and personnel should remain attentive and aware of any potential health and safety hazards, such as tripping hazard like debris or ice. When possible, hazards should be removed. Care should especially be taken when obtaining samples, gloves (nitrile - not latex) must be worn. All employees shall:

- Receive the appropriate safety training
- Wear the appropriate personal safety equipment
- Not endanger themselves or others at any time
- Report unsafe practices
- Notify other employees or site users when they are acting in an unsafe man

7.1 Lagoon Emergencies, Accidents and Near Misses

All accidents, injuries, or near misses should be reported to the lagoon operator, municipal services manager and the appropriate safety official of the Hamlet of Taloyoak. For all accidents, injuries, or near misses, the operator or 1st witness of the scene needs to:

- Investigate the incident immediately
- Find out the cause
- Make a complete accident report
- Take immediate measures to correct the cause and prevent it reoccurring
- Have a safety meeting with employees as soon as possible after the incident

During any lagoon emergency, the press will likely become aware and cover the story. The MSM or CAO will be the only spokespersons for the Hamlet.

7.2 Accidents:

All accidents at the lagoon shall be investigated and an Accident Report Form for the incident shall be completed. Traffic accidents occurring at the site shall be reported to the RCMP if applicable. Complete the form providing as many facts as possible, provide only the facts and include the following information as required on the form:

- Who was involved?
- Which vehicles were involved?
- What were the personal injuries, if any?
- What property was damaged?
- Which agencies or individuals responded to the accident?
- Date, time, weather conditions, witnesses, and other pertinent information

7.3 Medical Emergencies

All injuries should be considered important and should be reported as a safety incident to the Lagoon Operator. Possible contamination or infection from pathogenic microorganisms exists with every contact with the sanitary sewage.

First Aid should be applied in a manner that is appropriate to the nature of the injury. If the injury requires medical assistance, the individual should be taken to a medical emergency centre.

A medical doctor should be consulted for all injuries that could result in infection because of working with sanitary sewage. This includes injuries such as cuts and scrapes, or skin punctures.

If the person injured on-site is a customer or visitor, Lagoon Operator's employees shall provide any assistance necessary and appropriate First Aid.

8.0 Training to operator and supervisor

Staff training is an important aspect of the operation of a sewage treatment facility. Staff must be adequately trained to follow this O&M plan and operate the facility. GN CGS has arranged several sessions with the help of MTO and consultant to training the operator and program covering 'Training for Trainer' to create more trained people within the community. Hamlet has more responsibility in creating appropriate trained operator to hire a trained operator in the operation of the lagoon. This O&M Plan is dependent on sufficient site-specific training to allow staff to operate the facility and helping the hamlet for proactive awareness of Environmental Regulation.

8.1 Emergency Response

The lagoon emergency response plan sets out appropriate procedures to address foreseeable emergencies. In the event of an emergency, guidance and site emergency response can be obtained from the sources shown in the Table. The key elements of this plan are:

- What is the nature and severity of the emergency?
- What is to be done?
- Who does it?

Table: Emergency Contact Information

Emergency Contacts	Contact	Location	Telephone	Fax
CIRNAC	Water/Wastewater Resources Manager	Iqaluit	(867) 975-4550	(867) 979-6445
Hamlet of Taloyoak	CAO	Taloyoak	867-561-2302	
CGS-GN	Regional Engineer	Cambridge Bay	867-983-4156	867-983-4123
Environment Canada	Inspector	Iqaluit	(867) 975-4644	(867) 975-4594
Fire Department		Cambridge Bay	(867) 983-4016	(867) 983-4003
RCMP				
Health Center				

8.2 Emergency Plan Updates

Municipal Services of the Hamlet shall review the emergency plan annually and, following an emergency incident, ensure that:

- Emergency response procedures for the lagoon are effective and updated as necessary
- Appropriate individuals are appointed to manage emergency situations
- Regular safety and emergency meetings are held with lagoon employees

9.0 wastewater Study and Research of Treatment process

A GN project for Taloyoak Sewage Lagoon and Wastewater Feasibility Study has been done. Design of a new cell and the lagoon system is in progress by the consultant. Once funding confirmed, a construction contact will go out to retain a proponent for the new lagoon system development which is expecting to be taking place during FY 2021-22. Once completed and transfer to operation, a new O&M manual will come to replace this O&M manual and sewage wastewater management program.