Application for Modification - Supporting Documentation

Water Licence NWB3PON9904

1 SUMMARY

This application for a modification to Water Licence NWB3PON9904 is made under Part D.6 and Part E: Conditions Applying to Modifications.

This application is to:

1. Immediately dispose untreated sewage to the new area known locally as "Qeetenujah" (phonetic spelling) to protect the north berm's structural integrity at the old lagoon while a new lagoon is constructed.

2. Build a new lined lagoon and dispose wastewater to a new area; and

3. Convert the old sewage lagoon into a lined sludge farm.

The Pond Inlet sewage lagoon berms have become structurally unstable as a result of water leaking through the berms. If water continues to leak through the berms there is a possibility of a collapse.

It has been determined that the most cost-effective solution to resolve this problem is the construction of a new lagoon with a clay liner in an adjacent area. Commissioning of this new lagoon is planned for the summer of 2002.

To protect the current structure, and in preparation for commissioning, it is requested that a new location be approved for the disposal of raw sewage. The area requested is a gully area known locally as "Qeetenujah" (phonetic spelling).

Following commissioning of the new lagoon, its annual discharge will be to the same area.

Following is supporting documentation to substantiate this application.

2 BACKGROUND

Commissioned in 1996, the lagoon is located about 1.6 kilometres south-east of the Hamlet. It is an irregularly shaped 6 sided earthen fill structure. It has 47,000m^2 surface area and a working depth of approximately 2 metres. The working volume is estimated at 220 m^3.

Seepage from the northeast corner of the lagoon in April 2001 had been witnessed by an Environment Canada Inspector who issued a direction to contain the seepage.

3 SITE INSPECTION AND OBSERVATIONS

On July 23, 2001 Ron Kent, P. Eng. and Kelly Henderson, B. Tech. (Env.) from Ferguson Simek Clark arrived in Pond Inlet to review the seepage problem at the sewage lagoon. They were joined by:

- Nelson Pisco, P. Eng. A/Regional
- Jacques Paquin, Project Engineer
- David Parker, Senior Municipal Planning Engineer.

They were met at the site were two employees of the Hamlet:

- Joanasie Niqitarvik
- David Qamaniq

A trench had been cut in the area down slope of the lagoon to a collection area. Liquid seeping from the northeast corner was directed to an excavated collection area about mid-point along the berm. From this area water was pumped back into the lagoon

Liquid was noted flowing at a significant rate from numerous locations along the base of the entire berm. Shown on photo 1, the berm was wet in numerous locations approximately half way up the outside face.

On July 23, 2001 longitudinal cracking indicative of slope failure was noted in several areas in the northeast corner both in the inside and outside faces of the berm. On July 24, 2001, longitudinal cracking in the northeast corner had widened and new cracks were noted, as shown on photo 2. Longitudinal cracking had also appeared on the inside surface of the northwest corner.

Joanasie advised that the first spring following the lagoon's commissioning, seepage was noted in the northeast corner. Each year seepage worsened and more and more of the berm began to seep.

4 LAGOON CONSTRUCTION

The original lagoon design was with 3:1 side slopes and an 8 metre top. The berm was to be built over soil which had been scarified to a depth of 150mm to 200mm.

The site is a glacial rubble field with 300mm+ rocks layered over each other. David Parker advised that he had been the Project Officer during the construction. The rubble field made it impossible to scarify the soil as per the design. Instead, the berm was constructed directly over the rubble.

5 ALTERNATIVES TO STOP THE SEEPAGE

Alternatives available include:

1. A clay cut-off dyke installed in the existing berm;
2. A clay layer on the interior face;
3. Bentonite pellets placed in the interior face;
4. An HDPE liner for the entire lagoon;
5. An HDPE liner on the interior face of the berm;
6. A Bentomat ST liner for the entire lagoon;
7. A Bentomat ST liner on the interior face of the berm; and
8. A new lagoon.

5.1 Discussion of Alternatives

There are insufficient clay resources to consider the first two alternatives; Bentonite pellets may have some effect on the seep through the base of the berm, however, they will not affect water that pipes through the upper portions.

An HDPE liner or Bentomat ST on the interior face of the berm would involve the risk that either the water will find its way under the liner, or it will find another route from the lagoon through and under berms which have not been lined.

A Bentomat ST liner in the present lagoon appears to be the least expensive alternative. Although a superior product for this application as it is more robust and self-healing, there is a significant risk in undertaking this alternative. Clearing the sludge from the present lagoon is a dirty job. Local forces may be unwilling to undertake this project, or allow their equipment to be used. Additional costs will be incurred planning for and mobilizing forces and equipment from the South.

When cleared of sludge, ballast will have to be added to the lagoon to hold the liner in place. This will decrease the available volume of the lagoon by a minimum of 300mm. Therefore, an additional project will have to be undertaken to raise the berms providing additional storage to meet the 20 year requirement.

In an effort to commission a new lagoon as soon as possible, if lining the lagoon is chosen, an unlined sludge farm will have to be constructed immediately. There will be regulatory concern over an unlined sludge farm. This concern may delay or preclude approval. Building a lined sludge farm may cause a significant delay in the project.

Therefore the most cost effective alternative is a new lagoon lined with Bentomat ST.

Bentomat ST is bentonite clay layer sandwiched between layers of fabric and a reinforcing geotextile for additional strength. The layers are overlapped approximately 300mm and "welded" together with bentonite clay pellets. The product is very strong and if punctured, self healing. Following installation the material is weighted with 300mm+ of granular material.

6 PROJECT CONCEPT

6.1 Immediately Discharge Raw Sewage to "Qeetenujah"

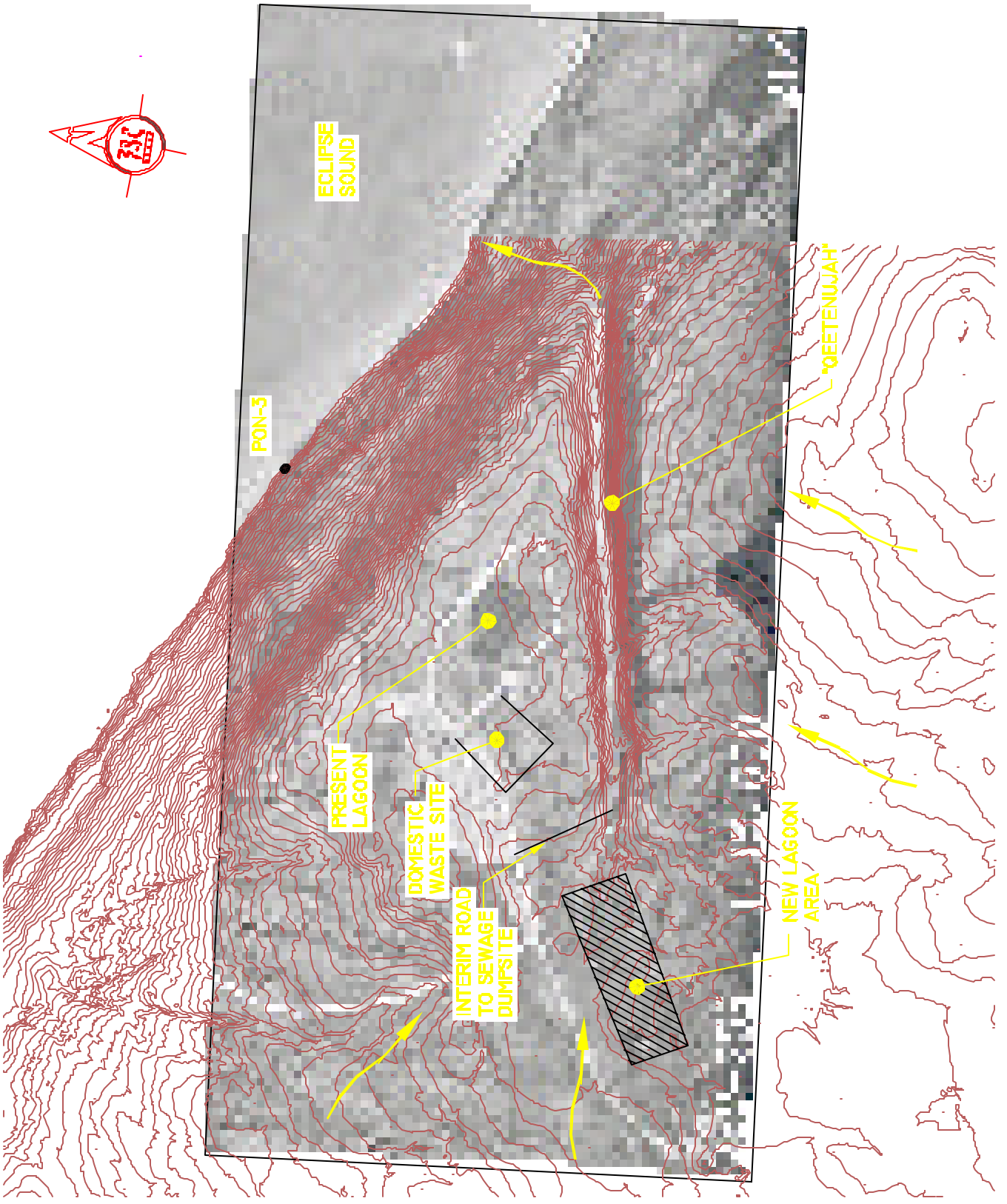
"Qeetenujah" is a gully located to the south-east of the present sewage lagoon, shown on the following figure which combines an air photo with topographical mapping. People are reported to use this as a skidoo trail to access a hunting area east of Pond Inlet. However, not everyone uses it, nor do they us it all the time, nor is it the only way to get to the hunting area.

As shown, "Qeetenujah" discharges to Eclipse Sound. This site is approximately half a kilometer to the east of the current SNP station PON-3. The area is similar to the area at PON-3. The currents in the Sound run from west to east.

Photos 3 through 5 show "Qeetenujah". It drains a small area and has become a natural sink for organic material and nutrients as shown by the increased amount of vegetation. When this site was inspected, the odour of rotting vegetation was noticeable in several areas. Such odours indicate that the organisms that would treat sewage in this area are already present.

It is noted that "Qeetenujah" is already receiving water flowing from the current waste management area approved by the Hamlet Council.

This proposal would be to discharge raw sewage from the pumpout trucks beginning immediately upon approval, until commissioning of a new lagoon in the fall of 2002. A



FSC GROUP

FSC JOB NO. 2001-0580

JOB TITLE
POND INLET
SEWAGE LAGOON

POND INLET, NWT

DRAWING TITLE
OVERALL SITE

DESIGNED BY	SCALE 1:10000
DRAWN BY RJW	DATE Aug. 3/01
FILE NAME site.dwg	JOB NUMBER
SHEET 1 of 1	DRAWING NO S1

road, turn around and temporary truck dumping station would be constructed immediately upon approval. This area is shown approximately on the figure.

The area chosen to discharge raw sewage is shown on the air photo. It has a steep slope and many fractured rocks to capture sewage solids. It is immediately above a wide area vegetated with cotton grass shown on photo 6.

The community plans to begin a public education program. It will advise people against discarding non-biodegradable materials in the pump-out sewage. This program should reduce the amount of litter in "Qeetenujah".

"Qeetenujah" appears to be a natural wetland area. Such areas are well known in the arctic to provide sewage treatment. However, the efficiency of such a system, or its operational parameters have not been studied at such a latitude. Therefore, while it is hoped and expected that additional treatment of wastewater will take place, it is not our intention to rely on this system.

6.2 Build a New Lagoon

A new lagoon sized for the 2020 population would be constructed in a area upstream of "Qeetenujah". Effluent from the lagoon will be discharged to "Qeetenujah" annually. This portion of the project is still in the planning stage, so figures are approximate at this time.

The lagoon would be designed to hold approximately 90,000 m^3 of sewage at a working depth of 1.5 metres with a 1.0 metre minimum freeboard. The estimate dimensions at this time are 170 metres by 340 metres, with 3:1 sideslopes.

The lagoon would be lined with Bentomat ST material. Sufficient quantity of this product has been ordered for this year's sealift and should arrive in the community in late August 2001.

Plans are early at this time, a site survey is still required, and a design or construction methodology has not be developed. Once completed, these will be forwarded for approval.

6.3 Convert the Present Lagoon into a Sludge Farm

At present, and until approval of this application, raw sewage continues to be discharged to the present sewage lagoon. The lagoon has been decanted by pumping to relieve the head on the berms which continues to exacerbate the structural instability. Effluent was pumped in layers over the adjacent land with the hoses moved hourly.

Once sewage is being discharged to "Qeetenujah", the lagoon and its contents will be allowed to dry. A further decant may be required to accomplish this. Once dried sufficiently, the sludge will be moved within the existing structure to begin the

conversion to a lined sludge farm. At the end the facility may be smaller than it is currently.

Bentomat ST liner will be used in the conversion. This liner may necessitate an annual decent to remove water as part of the sludge farming operations.

Plans are early at this time, and a design or construction methodology has not be developed. Once completed, these will be forwarded for approval.

6.4 Monitoring

Water monitoring stations will be established in conjunction with the Inspector to determine the discharge quality from "Qeetenujah". The discharge point at Eclipse Sound is virtually unreachable except by boat once the ice in the Sound allows access, as shown by photo 7. Monitoring will take place during periods of flow.

After commissioning the new lagoon, new monitoring stations will have to be designated in the SNP.

Over the life of the licence, there may be opportunity to more fully describe the treatment afford by "Qeetenujah", and to perhaps vary the annual decant to make the best use of the available treatment potential.

6.5 Revised O&M Manual

Once the facilities are designed and approved, the O&M manual will be updated and submitted for approval.

6.6 Signs

Upon commissioning, new signs will be erected to identify facilities and SNP stations.

7 PHOTOS

Photo 1 Liquid seeping from the north berm.

Photo 2 Longitudinal cracking along lagoon.

Photo 3 Upper area of “Qeetenujah.”

Photo 4 Middle area of “Qeetenujah.”

Photo 5 Lower area of “Qeetenujah.”

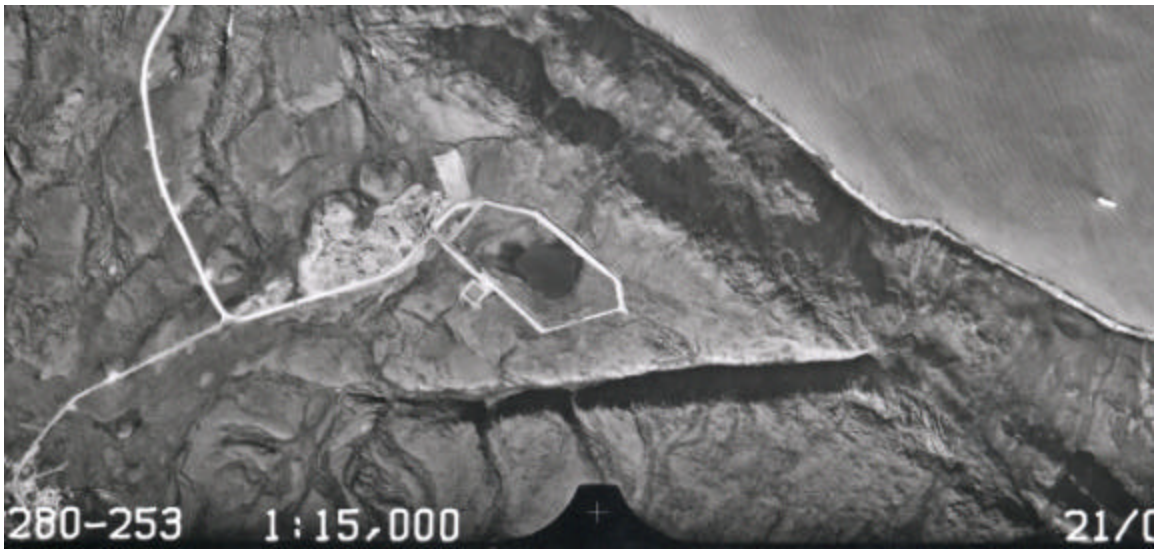


Photo 6 Aerial photo of the Pond Inlet sewage lagoon.

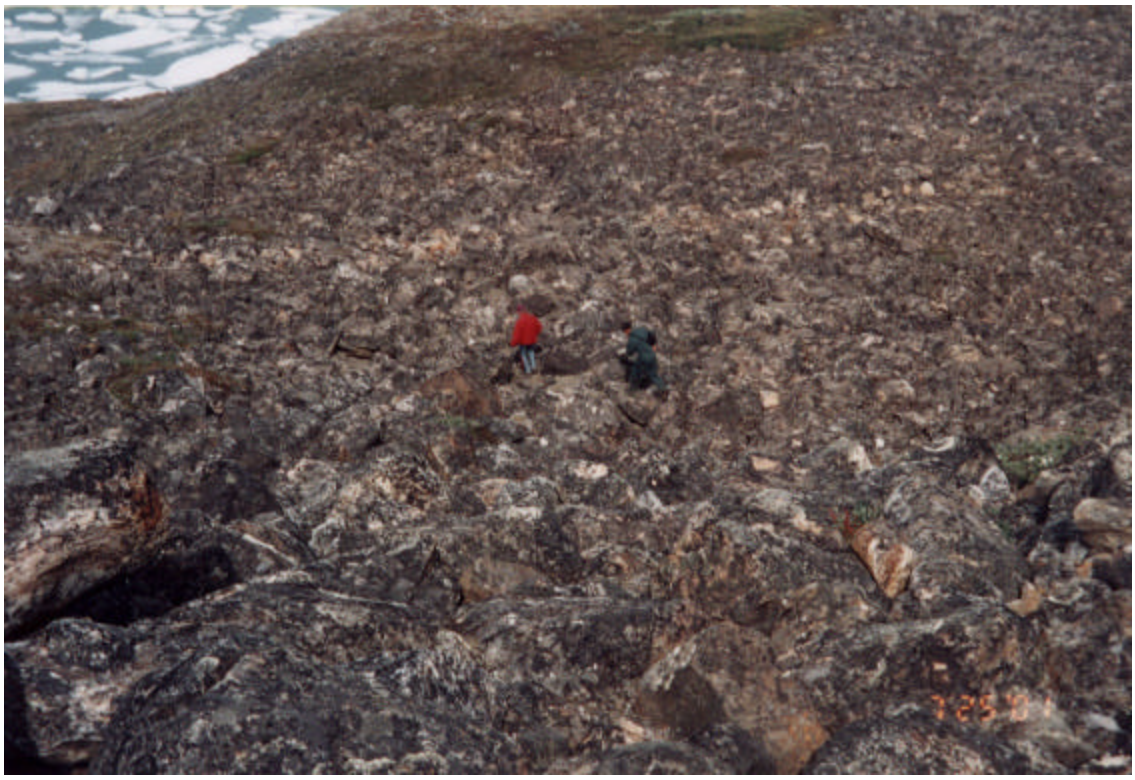


Photo 7 Dave Parker and Joanasie Naqitarvik trying to access Eclipse Sound from the land.