



Water Resources Division
Nunavut Regional Office
Iqaluit, NU X0A 0H0

November 2, 2009

Richard Dwyer
Licensing Administrator
Nunavut Water Board
PO Box 119
Gjoa Haven, NU X0A 1J0

**Re: 3BM-CAP0810 – Hamlet of Cape Dorset – Government of Nunavut,
Department of Community and Government Services - Submission of
Operations and Maintenance Plan and Thermistor Monitoring Results
for the 2007 Sewage Lagoon.**

Please be advised that Indian and Northern Affairs Canada (INAC) has reviewed the above noted submission from the Department of Community and Government Services, Government of Nunavut.

The Nunavut Water Board (NWB) distributed the Operation and Maintenance Manual for the Sewage Treatment System and Thermistor Monitoring Data for review and comment on October 8, 2009.

In conducting this review, I have referred to all documents on the Nunavut Water Board FTP site as it relates to 3BM-CAP0810. Attached is a Technical Review Memorandum for your consideration.

Please feel free to contact me should you have any questions or comments. I can be reached at (867) 975-4566 or by email at tanya.trenholm@inac.gc.ca.

Sincerely,

Original signed by

Tanya Trenholm
Pollution Policy Specialist



Technical Review Memorandum

To: Richard Dwyer, Licensing Administrator - Nunavut Water Board

From: Tanya Trenholm, Pollution Policy Specialist - Indian and Northern Affairs Canada – Water Resources Division

Re: **Hamlet of Cape Dorset – Government of Nunavut Community and Government Services – Submission of Operation and Maintenance Manual and Thermistor Monitoring Results for the 2007 Sewage Lagoon**

Existing Water Licence # 3BM-CAP0810

Background:

The Government of Nunavut, Community and Government Services (GN-CGS) submitted an Operation and Maintenance (O&M) Manual to the Nunavut Water Board (NWB) for approval on June 17, 2009. The NWB, in response to the GN-CGS submission, rejected the submission on the basis that the O&M manual met only one of 26 required items of the conformity assessment (Schedule 2 of the licence). The NWB requested (via letter correspondence, dated June 26, 2009) that the O&M Manual be revised to take into account the requirements of Schedule 2 of the licence and be resubmitted.

The NWB further informed the GN (via the June 26, 2009 letter) that a submission of an O&M Manual does not qualify the 2007 sewage lagoon (new lagoon) for commissioning. The NWB provided the GN with spreadsheets outlining a number of general licence conditions (in addition to the O&M Manual) that must be met prior to the Board's consideration to authorize the commissioning of the new lagoon.

On September 4, 2009, the GN resubmitted the following information:

- Appendix A: Revised O&M Manual
- Appendix B: Pages 8 and 9 of AMEC geothermal report, Oct. 13, 2005
- Appendix C: Recorded data from the four thermistors, Dec. 15, 2008 to May 15, 2009
- Appendix D: The Technical specification of Data Loggers
- Appendix E: Location map of the existing three cells lagoons with some photos
- Appendix F: Reponse to the letter of NWB (spread sheets) dated June 26, 2009



By way of the September 4, 2009 GN letter to the NWB, the GN requested that the NWB approve the commissioning of the new sewage disposal facility, as per Part H, Item 8 of the licence.

Comments and Recommendations:

Thermistor Monitoring Results:

Part H, Item 6 of the licence requires that the licensee install “three 20 to 25 metre deep thermistors in the crest of the west berm and at least one thermistor of that depth in the east berm.”

It is unclear if the thermistors are installed to the licensed depth of 20 – 25 metres. The thermistor data indicates that the thermistor beads extend to only a depth of -18.8 metres.

Part H, Item 7 of the licence states that the results of the thermistor monitoring program shall “include an Engineer’s Report, validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations”.

Water Resources notes that an Engineer’s Report validating the assumptions of the geothermal analysis has not been provided to the Nunavut Water Board.

The duration of the thermistor monitoring program is not adequate as the temperatures of the berm core are most critical when the depth of melting or warming of the ground and the berms will reach their maximums. This is from the time the ice leaves the surface of the lagoon (mid to late June) until the ground freezes to the depth of permafrost (late November). Results were only recorded for 6 months (December through May, and only April – May for data logger #2). In addition, due to a number of thermistor beads not functioning correctly, there were numerous gaps in the thermistor data provided. Specifically, temperatures are missing from ‘inside of the berm’ at a depth of -4.2 metres at logger #3 from December 15, 2008 – May 15, 2009, and logger #4 from April 15, 2009 – May 15, 2009. The GN has stated the dysfunctional beads would be fixed during the summer (of 2009).

It is important to note, that the Water Resources Officer (WRO), via July 24, 2009 and previously August 16, 2008 inspection reports indicated that there is obvious seepage through the berm walls of the new lagoon, specifically:

- Ground water entering and pooling within the new lagoon, in 3 places
- A flow exiting the berm from the East side and flowing into the lake adjacent to the new lagoon.
- Water is contained within the access hatch, at a depth that was covering the valve controls to the new lagoon for decant



Further, the Water Resources Officer noted (July 24, 2009 Inspection Report) that 'wires on the data loggers appear to have been ripped out'.

As such, INAC recommends the following:

- The GN should verify that the depth of the boreholes is that which is required by the licence (at least 20, to 25 m in depth).
- The GN must provide to the NWB an Engineer's Report validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations (Part H, item 7)
- Thermistor results should be provided to the NWB at least monthly for the excluded months (i.e. June through November) and again over the winter months to compensate for the missing data due to a number of the thermistor beads not functioning.
- The GN should provide verification that the thermistor beads were fixed.
- The GN should verify and provide appropriate evidence that the thermistors are still functioning and recording data at the described 8 hour intervals.

Operation and Maintenance Manual:

3.4.8 Geotechnical Reviews

The Manual states that a Dam Safety review is to be completed by a qualified geotechnical engineer and will be executed 3 years after commissioning and a frequency of 10 years after the first review. The report generated from the geotechnical review will be submitted as part of the annual report to the Nunavut Water Board.

However, Part F, Item 5, of the Licence states:

"An inspection of all engineered facilities related to the management of water and waste shall be carried out **annually in July**, by a Geotechnical Engineer in accordance with the Canadian Dam Association, Dam Safety Guidelines, November 2007, where applicable. This inspection shall include the access road alignment with respect to water resources and the diversion and passage of water through culverts. **The engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.**"

The 2008 and 2009 Inspection Reports for all engineered facilities related to the management of water and waste are outstanding.



In addition, during the August 16, 2008 inspection, the WRO noted further significant issues with structures related to waste disposal, including:

- The lagoon access road was washed out in places
- Water covered the access road at places where culverts had been installed
- Flooding of the lower borrow site / sand area as a result of water being channelled to that area by way of the installed culverts

As such, Water Resources recommends:

- The Manual should be revised to conform to the Water Licence, Part F, Item 5 (i.e. Annual inspections carried out in July and submission of the Geotechnical Engineer's report within 60 days of the inspection).
- The GN should submit the outstanding required inspection reports and accompanying cover letter to the NWB.

7.2 Off-site Resources (Spill Planning)

The contact information for the 'Indian and Northern Affairs Inspector', or The Department of Indian and Northern Affairs Canada, Manager of Field Operations should be changed to (867) 975-4295.

Appendix- F: Requirements Prior to Commissioning the 2007 Sewage Lagoon:

As noted above, the GN requested that the NWB consider the approval of the new lagoon for commissioning (September 4, 2009 letter).

A review of 'Appendix F 'Response to NWB Spreadsheets'' identifies a number of licence conditions, which must be provided to the Board for their consideration and approval prior to the commissioning of the 2007 sewage disposal facility, that are still outstanding. These include;

- As per Part H, Item 6 of the licence, the GN has not verified that the boreholes are drilled to the licensed depth of 20 – 25 meters, that the dysfunctional thermistor beads have been fixed, and that the thermistors are all functioning correctly.
- In accordance with Part H, Item 7, the GN must provide an Engineer's Report validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations (Part H, item 7)
- As per Part H, Item 12, the licensee shall install groundwater monitoring wells at the 2007 Sewage Disposal Facility, and obtain at least one monitoring season of data prior to the expiry of the License. This has not been completed yet.



- INAC Field Operations has not provided verification to the NWB that it is satisfied the assumptions of the geothermal analysis have been validated.

Summary and Conclusions:

The GN has requested that the 2007 sewage disposal facility be approved for commissioning, as per Part H, Item 8 of the Licence which states:

“The Licensee shall not commission the 2007 Sewage Disposal Facility until the requirements of Part H, Item 6 and 7 have been completed and approved”.

Throughout INAC Water Resources review of the Thermistor Monitoring Results and the O&M Manual and Appendices, a number of substantial deficiencies have been identified which prevent the conditions of Part H, Item 8 of the Licence from being satisfied at this time. Therefore, until such a time that the GN provides the appropriate information to the NWB, an approval to commission the 2007 sewage disposal facility should be withheld.

In addition, the existing Licence is set to expire March 1, 2010. It appears to be logistically unrealistic for the Licensee to fulfill the outstanding requirements in order to come into compliance with the licence by that time. For example;

- the licensee should collect the outstanding thermistor monitoring data as noted above (at a depth of -4.2 metres at logger #3 from December 15, 2008 – May 15, 2009, and logger #4 from April 15, 2009 – May 15, 2009),
- thermistor data should be collected from June – November,
- As per Part H, Item 12, groundwater monitoring wells must be installed at the 2007 Sewage Disposal Facility, and at least one monitoring season of data obtained prior to the expiry of the License.

Due to these circumstances, INAC highly recommends that the GN addresses the remaining outstanding compliance issues by submitting a ‘Plan for Compliance’ that clearly demonstrates the ways and means the Licensee will undertake to achieve full compliance with the conditions of the Licence, including firm timetables (as per Part B, Item 6 of the licence).

This review has been forwarded to the Field Operations Directorate for their consideration.

Please feel free to contact me at your convenience should you wish to further discuss any part of this submission to the Board. I can be reached at 867-975-4566 or via email, tanya.trenholm@inac.gc.ca.

Cc. Ian Rumbolt, Interim Manager, Water Resources Division – INAC;
Bernie MacIsaac, Director of Operations, INAC
Peter Kusugak – Manager, Field Operations Directorate - INAC
Andrew Keim – Water Resources Officer, Field Operations Directorate - INAC