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Feb. 16, 2007

Eva Schulz
UMA Engineering Ltd.
2540 Kensington Road NW
Calgary, Albert T2N 3S3

Subject: Water Licence Application for the Clean Up of the Former CAM-1, Jenny Lind Island DEW Line Site

Dear Ms. Schulz,

The **Nunavut Water Board** (NWB) requests further information pertaining to the Water Licence Application for the Clean Up of the Former CAM-1, Jenny Lind Island DEW Line Site as per ***Section 48 Item 2*** of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA).

The **NWB** would like to remind the Proponent that as per ***Section 57*** of the NWNSRTA, *the Board may not issue a license unless the applicants satisfies the Board that any waste produced by the appurtenant undertaking will be treated and disposed of in a manner that is appropriate for the maintenance of the water quality standards and effluent standards that the Board considers acceptable*. The Proponent's past performance will also be considered to ensure the completion of the appurtenant undertaking is adequate and such measures as may be required in mitigation of any adverse impacts are properly accounted for.

Sufficient detail and an avoidance of ambiguity and inconsistency should be followed in submitting response materials to the following comments, and the Proponent is encouraged to appropriately cross-reference any supporting documents by including title, section, and page number along with any details of how the referenced information should be considered to provide adequate context to the NWB:

<u>NIRB letter dated July 6, 2006</u>

1. In the letter to UMA on July 6, 2006, NIRB requested clarifications for eight issues, which are also the concerns of the NWB. The NWB requests that the Proponent provide the responses to the issues aforementioned from UMA to NIRB.

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Comments on the Application Form

2. (Section 10, p3) The Project Description is only a summary for the proposed construction, potential environmental impacts and proposed mitigation measures. Where can the NWB look into the technical details for certain facilities or activities? The NWB prefer to review a complete set of site-specific technical documents (e.g., sewage lagoon, site-specific water and waste management, site-specific spill contingency plan, site-specific monitoring programs).

Comments on the Questionnaire

3. (Section 10, p2) The camp will be located in an unknown location somewhere previously disturbed. It will cause uncertainty of preventive measures for impacts from sewage lagoon and fuel storage on water quality. What are the justifications for not determining the camp location?
4. (Section 13, p2) What are the results of 2006 pre-construction public consultation meetings in Kugluktuk, Cambridge Bay, Gjoa Haven, and Taloyoak? Are there any impacts on the cleanup project? The NWB requests that the Proponent provide related materials for review, which is a commitment in Sub-section 4.2.2 of Project Description.
5. (Section 29, p4) Will there be a laboratory on-site for testing sewage effluent quality, surface runoff, and soil and groundwater samples?
6. (Section 38, p6) The entire DLCU program is an abandonment and restoration program; however, for each cleanup project itself, there are certain site-specific activities of abandonment and restoration. The NWB requests that the Proponent provide site-specific (Jenny Lind Island) and project-specific (camp operation and cleanup operation) A&R plan.

Comments on the Project Description

7. (Section 1.2, p1) Is CAM-1A also included in the cleanup project?
8. (Appendix A Drawings) The drawings are draft. The NWB requests final drawings signed and stamped by qualified engineer. UMA stated in an e-mail dated Mar. 7, 2006 that two set of stamped drawings would be forwarded, but the NWB did not receive them yet.
9. (Sub-section 5.4.6 and 5.4.7, p21) The two sub-sections provide the sizing and siting information for contaminated soil disposal facilities. However, the facilities' capacities are not provided in the following (sub-)sections. The NWB request further detail into the facility capacity for the non-hazardous waste (NHW) landfill, the Tier II soil disposal facility and the landfarm being constructed.
10. (Section 5.5, p21-25) What are the design justifications for siting and sizing the proposed NHW landfill, Tier II soil facility and landfarm?
11. (Sub-section 5.5.2.1, p23) It is stated that "geothermal analysis was conducted to determine the time required for freeze-back and the long-term thermal regime of the facility". The NWB requests that the Proponent provide related

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study report to demonstrate the primary containment barrier (continuously frozen both the Tier II contaminated soil and the wet, silty gravel perimeter berms).

12. (Sub-section 5.5.3.1, p24) What is the placement thickness of Type B contaminated soil and Type B contaminated soils co-contaminated with Tier I contaminants?
13. (Sub- section 5.5.3.1, p24) It is stated that the contact water in the perimeter collection system will be treated if it does not meet the wastewater discharge criteria prior to the end of each operation season. The wastewater treatment is not further discussed. The NWB requests further detail into the possible contact water treatment.
14. (Section 5.7, p25) The NWB requests further detail into the possible water treatment for the ponded water in the landfill excavation area, and meltwater/groundwater/leachate collected at the low point of the excavation, including but not limited to the discharge criteria, possible treatment solutions, discharge points, and receiving water bodies.
15. (Section 5.7, p26) For the surface water quality monitoring, is it enough to only measure turbidity and total suspended solids? If not, what other parameters will be measured?
16. (Section 5.9, p33) The second strategy for those debris areas is to remove surface debris and where possible, partially buried/embedded debris. Will the partially buried/embedded debris be fully monitored to identify potentially hazardous materials? The NWB requests further clarity into the disposal operations for the partially buried/embedded debris.
17. (Section 5.10, p34) What is the unit used in Table 8?
18. (Sub-section 5.10.4, p35) The incineration practice of identified barrel contents and oil absorbent material is not clear. The Proponent is to provide further detail into it.
19. (Section 7.4, p44) The incineration of identified barrel contents, oil absorbent material will impact soil quality and water quality. The impacts do not seem to be identified. The Proponent is to clarify the impacts and related mitigation measures.
20. (Section 8.2, p48) Is the environment inspection staff the same person as the Contractor Coordinator? What is the structure of the environmental inspection/Quality Assurance team?
21. (Sub-section 8.3.5, p50) What is the estimation for the wastewater volume and the storage capacity in the existing site tanks? The Proponent is to demonstrate the feasibility of the temporary storage, and to clarify specific procedures for wastewater transfer, temporary storage and testing. In addition, the NWB requests further details into the wastewater treatment if any liquid effluent does not meet the criteria in Table 15 and if the sewage effluent does not meet the criteria in Table 16.
22. (Sub-section 8.3.6, p51) The existing landfills will be remediated. How will “all residual kitchen wastes and other non-hazardous wastes” be disposed of in

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them. The NWB requests clarity into it.

23. (Section 9.5, p65) In addition to the substances listed in the section, what other materials may be possibly spilled at the CAM-1 site?
24. (Section 10, p79) What are the monitoring programs for the abandoned landfarm and sewage lagoon, and those sites of demolished facilities in the phase of post-construction?
25. (Section 10, p79) Will surface water runoff from each facility be monitored? If so, where? If not, why not?
26. (Section 10, p79) What are the sampling procedures and protocols, including QA/QC, which will be employed to monitor surface water and groundwater?
27. (Sub-section 10.5.3, p77) For the post-construction monitoring program of the excavated landfill sites, there is inconsistency between Table 19 and Table 23. The NWB requests clarity into it.
28. (Section 12, p80) The Information Sources will provide further technical details into some concerns of the NWB, such as the EBA's and ESG's site investigation reports, UMA's clean up study (volume 13), preliminary design report and specifications. The Proponent is to provide these reports if possible.

Comments on the Drawings

29. The drawings are draft. The NWB requests that the Proponent provide the final drawings signed and stamped by qualified engineer(s).
30. A lot of abbreviations are used in the drawings, such as USAF, APRON, BPOL, WLDA and EPAD. The Proponent is to provide a list for these abbreviations and related full terms.
31. (Drawing #104, 105) Water bodies in these two drawings might be contaminated by the existing landfills and site debris. Were the water samples taken and tested? If not, why not? If contaminated, what kind of mitigation measures will be taken?
32. (Drawing #108, 109) The beach area will be impacted by the site debris, breach landfills such as East Landing Landfill, and breach POL site. Are those planned mitigation measures enough to eliminate the hazards? All the suspected locations in the beach area seem to be totally excavated in order for that. Are there monitoring programs for the locations (debris areas and landfills) in the beach area? If not, why not?

Comments on the facilities' containment functions

Overall, the documents reviewed by NWB with respect to the containment functions of the facilities were general in nature. Much of the discussion of engineering design, operations, and maintenance was an overview or a detailed summary of what is proposed to be completed. Additional detail pertaining to engineering analysis and findings, design methods, operating characteristics, maintenance details, and QA/QC for construction, and QA/QC for soil and water analysis would assist the NWB in determining whether the proposed activities and functions of the facility will protect

fresh waters and contain wastes to protect fresh waters. The review provided in this letter provides direction on where additional detail is needed.

33. What are the site baseline hydrologic, hydrogeologic, geotechnical, thermal, and permafrost characteristics about the location of each facility (non-hazardous waste, Tier II soil, and landfarm)?
34. What are the details regarding the volume balance conducted to size each facility (non-hazardous waste, Tier II soil, and landfarm) including, but not limited to, soil properties and assumptions were used in the calculations?
35. What is the hydraulic capacity of the sump in the landfarm? At what frequency will the landfarm sump be monitored for water quality? What operations are in place to manage the landfarm sump from overfilling? How will waters removed from the landfarm sump be managed?
36. What are the details, soil properties, climatic conditions, assumptions, and limitation of the thermal analysis completed to promote permafrost aggradation into each waste containment facility?
37. What are the long-term final cover maintenance and operation plans for the Tier II soil and non-hazardous waste facilities?
38. What are the details of the quality control and quality assurance program for the construction of each facility (non-hazardous waste, Tier II soil, and landfarm) with consideration given, but not limited to, methods of measurement for all critical geotechnical properties, frequency of measurement, method of placement, acceptable geosynthetic material proprieties, acceptable geotechnical characteristics, and acceptable placement climatic conditions for all soils (e.g., Type 1, Type 2, Type 4, and Type 5 granular fill) and geosynthetics (e.g., geotextile and geomembrane)?
39. How will liner integrity be ensured during placement and after construction for the Tier II soil and landfarm facility?
40. Will the quality control and quality assurance program be overseen by an appropriately qualified geotechnical engineer registered in Nunavut?
41. Details pertaining to settlement of facility (non-hazardous waste, Tier II soil, and landfarm) components were not provided. Is settlement a concern for integrity of these structures? If so, what are the details pertaining to the method, analysis, assumptions, geotechnical properties, and limitations in assessing settlement of each facility? If not, why not?
42. Details pertaining to the stability of facility (non-hazardous waste, Tier II soil, and landfarm) components were not provided. If global, slope, or internal stability is not a concern for facility integrity, discussion is requested into why these geotechnical considerations are not important. If global, slope, or internal stability are important for facility integrity, what are the details pertaining to the method, analysis, assumptions, geotechnical properties of soils and geosynthetics, and limitations in assessing global stability, slope stability, and internal geosynthetic-geosynthetic and soil-geosynthetic stability that may be applicable for each facility?

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43. What are the details of analysis associated with ensuring adequate anchoring of geosynthetic products within any key trenches or burial by cover material?
44. What are the details, applied loadings, and analysis for selection of any soil and geosynthetic material properties as protection layer(s) for the geomembrane against damage and puncture?
45. For facilities where permafrost aggradation is relied upon to contain waste and leachate, what contingency plans are in place, and what will trigger implementation of contingency plan, if temperatures do not decrease to expected levels?
46. The non-hazardous waste landfill facility is not lined on the base or sides or capped with an impermeable liner. Water that comes into contact with non-hazardous waste may be elevated in inorganic contents. There is no sump to collect waters that come into contact with non-hazardous waste. No groundwater monitoring points are proposed about the non-hazardous waste landfill. How will waters that come into contact with non-hazardous waste be managed?
47. Drawing #114 shows soil berm in Section D to be constructed of Type 2 soil; however, associated Detail #1 shows soil berm to be constructed of Type 4 soil. Clarification is requested to address this inconsistency.
48. With respect to the proposed landfarm facility, the Board requests additional detail to address each of the following:
    a. What is the minimum cover above the geomembrane at the crest of the berm?
    b. Will the ditch that conveys water to the sump within the landfill be open and not covered with soils? If so, what practices are in place to ensure that the ditch will remain open to convey waters? If not, how will waters be conveyed to the sump?
    c. Why is a liner not specified to be included in the berm on the one side of the landfarm?
    d. The depth of the key trench is a minimum of 1.0 m. No liner is placed at the base of the landfarm facility. Additional detail and discussion is requested into how this design configuration will contain all waters within the facility such that seeps under the berm foundation will not occur.
    e. General details of operation were provided, however, specifics of operation are requested that may include, but not limited to: method and frequency of application of nutrients, water, and tilling; type and concentration of nutrients; measurement and frequency of nutrients and water content of the soils.
49. What are the details of thermistor strings to be installed at site and location of temperature measurements with depth?

In closing the **NWB** requests a detailed response to the bulleted items in this letter. The **NWB** would like to remind the Proponent that **Section 70 Item 1** of the

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NWNSRTA allows the Board to install license conditions that it considers appropriate, including conditions relating to the quantity, concentration and types of waste that may be deposited and the manner of depositing waste, and the studies to be undertaken, works to be constructed, plans, including contingency plans, to be submitted, and monitoring programs to be undertaken.

If you require assistance regarding facilities' containment functions please feel free to contact Dr. Jamie Van Gulck, P.Eng. at (519) 577-4129 or vangulck@vgqconsulting.com. Please do not hesitate to contact the undersigned with any other questions or comments with regards to the foregoing at (867) 360-6338ext.27 or tech4@nunavutwaterboard.org.

Sincerely,

Original signed by:

Zhong Liu (M.Sc., MBA, M.A.Sc.)
Technical Advisor

cc. Philip Warren, DCC
Phyllis Beaulieu, NWB