

**City of Iqaluit Sewage Lagoon  
Iqaluit, Nunavut  
Dam Safety Inspection**

*August 31, 2006  
REPORT*



**Produced For:**  
THE CITY OF IQALUIT, NUNAVUT

**Produced By:**  
CONCENTRIC ASSOCIATES INTERNATIONAL  
INCORPORATED

**Concentric Project Reference Number:**  
06-1405



**City of Iqaluit Sewage Lagoon  
Iqaluit, Nunavut  
Dam Safety Inspection**

---

**CONTENTS**

	<b>Page</b>
1. EXECUTIVE SUMMARY.....	1
2. INTRODUCTION.....	2
3. BACKGROUND .....	3
4. SCOPE OF SERVICES .....	4
5. SUMMARY OF PREVIOUS DSI'S .....	5
6. COMMENTARY ON DAM SAFETY GUIDELINES .....	7
7. OBSERVATIONS .....	8
8. RECOMMENDATIONS .....	9

APPENDIX A - Photographs



## **1. EXECUTIVE SUMMARY**

Concentric Associates International Inc., (Concentric) was retained by the City of Iqaluit, to undertake a Dam Safety Inspection (DSI) of the City of Iqaluit sewage lagoon. The scope of work for the assignment has been undertaken in accordance with Concentric's proposal 06-1405.

The site inspection and reporting were conducted on August 17 and 24, 2006, by Allan Murray, P.Eng., of Concentric.

It is recommended that the next DSI be conducted prior to October 2007.

### **OBSERVATIONS:**

No significant changes in condition were observed since the previous DSI, with the following exceptions:

- The sewage lagoon is currently inactive, as all sewage is being processed at the sewage treatment plant.
- The sewage lagoon has been drawn down to a near empty level as a result of its inactive status
- As a result of the draw down, considerable sludge accumulation is now visible, which has likely reduced the lagoon capacity
- The west berm repairs recommended in previous DSI's have been completed.

### **RECOMMENDATIONS:**

1. Preparation of the required Operation & Safety Manual, Logbook, and Permanent File, remains incomplete, however, the City has authorized this work to proceed this year.
2. Undertake the next DSI prior to October 2007.
3. The capacity of the sewage lagoon should be confirmed and sludge removal undertaken if required.
4. It is understood that the intent of the City of Iqaluit is to retain the sewage lagoon as a back-up facility only. Given this occasional use the facility in its current configuration (pending the capacity check recommended in Item 3, above) should be adequate for the intended purpose. However, this does not mean preventative maintenance can be overlooked. Localized failures and/or seeps are to be expected. The City of Iqaluit should remain aware that the lagoon operates on old technology – it is essentially a “leaky dam”, and its use may be prohibited at any time in the future.



## 2. INTRODUCTION

Concentric Associates International Inc., (Concentric) was retained by the City of Iqaluit, to undertake a Dam Safety Inspection (DSI) of the City of Iqaluit sewage lagoon located in Iqaluit, Nunavut.

This assignment and the scope of work described herein has been undertaken in accordance with Concentric's proposal 06-1405.

The site visit and reporting were conducted on August 17 and 24, 2006.

Allan Murray, P.Eng., of Concentric, met with the following personnel at the City of Iqaluit:

- Geoff Baker, Director of Engineering, City of Iqaluit

This report summarizes our terms of reference for the assignment, observations, conclusions and recommended action.



### **3. BACKGROUND**

The Canadian Dam Safety Guidelines (DSG) requires that all structures exceeding prescribed height and volume minimums be subject to Dam Safety Reviews (DSR's) and Dam Safety Inspections (DSI's) at regular intervals.

A DSR is a comprehensive, formal review process that involves completion of checklist items in accordance with the Dam Safety Guidelines. The DSR forms a baseline of dam history, condition, repair requirements, and extensive documentation of monitoring, operating, safety and emergency procedures.

The sewage lagoon requires a DSR every ten (10) years. The DSR for the sewage lagoon was conducted in 2001.

It is required in the DSG document that in the interval between DSR's, a Dam Safety Inspection be performed on an annual basis. The DSI is a much less comprehensive review, comprising a visual inspection only to identify any changes in condition, or any observed concerns.

A detailed historical perspective may be referenced in the DSR on file with the City of Iqaluit.



#### **4. SCOPE OF SERVICES**

Our directive has been to undertake a Dam Safety Inspection (DSI) in accordance with the DSG, for the sewage lagoon. The inspection consisted of an on-site visual assessment, notation of any significant changes in condition since the last available DSI, preparation of a written report in a format compatible with the DSR, and a photographic record.

The following is a summary of the scope of work for this assignment. The DSI report is the primary deliverable, and has been prepared in accordance with the DSG document.

- ❑ Review available record documentation, to be provided by the City
- ❑ Review, in particular, reports and/or repairs/upgrades conducted since the 2001 DSR
- ❑ Interview and/or solicit input from maintenance personnel and City Administration regarding operating performance, concerns, incidents, repairs, and any notable concerns
- ❑ Conduct a visual on-site assessment of the sewage lagoon
- ❑ Prepare a photographic record documenting general and representative conditions
- ❑ Identify, characterize, and risk-assess any actual or potential concerns
- ❑ Prepare a written report summarizing our observations, items of concern, and recommendations
- ❑ Indicate any recommended repairs
- ❑ Prioritize action items
- ❑ Submit final documents in electronic format and hard copy

#### **Limitations**

The DSI is based on visual assessment; no invasive inspection/assessment was done.



## 5. SUMMARY OF PREVIOUS DSI'S

The following is a summary of observations and recommendations made from the previous DSI's:

### January 7, 2003 (2002) DSI

A DSI was conducted by Trow Consulting Engineers (Report MA15882A, dated January 7, 2003) in October 2002. The DSI was termed "...an interim step prior to the implementation of remedial measures..." recommended in the 2001 DSR.

The DSI noted no significant changes since the 2001 DSR, but highlighted the seepage concerns of the east berm and the threat of overtopping in the spring.

The DSI reiterated the recommendations of the 2001 DSR, as follows:

- There is inadequate information concerning the as-built conditions of the berms
- The berms are not considered safe in their current condition and are non-compliant with the design and performance standards of the DSG.
- Remedial measures include three (3) options - an impermeable liner; buttressing the berms; and building a new lagoon.

Not stated in the 2002 DSI, but recommended in the 2001 DSR, were the following additional requirements, which are believed to be still outstanding:

- Complete the remaining outstanding non-compliance requirements of Section Nos. 3 and 4 of the DSG, as follows:
  - Permanent file
  - Operation, Maintenance and Surveillance Manual
  - Logbook
  - Emergency Preparedness Plan

### 2003 DSI

Based on our discussions with the City of Iqaluit Engineering Department, there is no 2003 DSI on file. However, a geotechnical investigation was conducted by Trow Associates Inc. (Report OTGE00016794A, dated October 8, 2003) in 2003.

The scope of the geotechnical investigation was to undertake a topographic survey of the lagoon and conduct a slope stability analysis of the berms. A separate hydrologic report is referenced, but was not provided to us. It would appear that the geotechnical investigation was attempting to address some of the as-built issues discussed in the 2002 DSI.



## City of Iqaluit Sewage Lagoon Dam Safety Inspection

---

Salient points from the geotechnical investigation include:

- Adequate (satisfying the Dan Safety Guidelines) factors of safety exist for steady state seepage and rapid drawdown scenarios
- The berm slopes should remain stable provided they are protected against overtopping and adequate erosion protection is installed on downstream faces
- Catastrophic failure is unlikely with the above provisos, however, localized failures or seeps are expected until such time as the lagoon is lined with an impervious material, or rebuilt

### 2004 DSI

A 2004 DSI was commissioned, however, it was not authorized by the City of Iqaluit until February 2005. The DSI was conducted by Concentric.

Much of the site was snow covered at the time of the 2004 DSI so the report was limited in nature and basically reiterated previous concerns and items that remained outstanding.

### 2005 DSI

A 2005 DSI was not conducted.





## 6. COMMENTARY ON DAM SAFETY GUIDELINES

The Canadian Dam Association publication, Dam Safety Guidelines (DSG), governs the nature and frequency of inspection and review activities for structures which fall under its umbrella criteria.

The DSG applies to those structures that are at least 2.5 meters in height, and which have at least 30,000 cubic meters of storage capacity.

The DSG document is far reaching in terms of applicability and requirements for conformance. This is understandable as the type and complexity of structures that fall under the jurisdiction of the document varies considerably, from relatively small and simple embankments or dikes to massive and complex dams associated with hydroelectric generating facilities, irrigation, flood control, etc.

The DSG requires that all structures exceeding the height and volume minimums described above be classified according to their “consequence category”, that is, the consequence of dam failure in terms of life safety, and socio-economic impact. The category assigned may range from very low to very high. The consequence category dictates the requirement and frequency of Dam Safety Reviews.

A Dam Safety Review (DSR) is a comprehensive, formal review process, conducted at regular intervals, that involves completion of checklist items in accordance with the Dam Safety Guidelines. The DSR forms a baseline of dam history, condition, repair requirements, and extensive documentation of monitoring, operating, safety and emergency procedures.

The frequency of DSR's varies depending on consequence category. For structures where significant life safety and/or socio-economic consequence exist, the DSR is usually conducted every five (5) to ten (10) years. The sewage lagoon requires a DSR every ten (10) years. The initial DSR for the sewage lagoon was conducted in 2001; therefore, the sewage lagoon is due for an updated DSR in 2011. If significant alterations (not including repairs that do not change the height or volume of the structure) to the structure take place before this date, an updated DSR would be required.

It is required in the DSG document that in the interval between DSR's, a Dam Safety Inspection (DSI) would be performed on an annual basis. The DSI is a much less comprehensive review, comprising a visual inspection to identify any changes in condition, or any observed concerns. The results of the DSI are incorporated into the DSR documentation. A DSI may trigger repairs, or changes in standard operating procedures.



## 7. OBSERVATIONS

The sewage lagoon was accessed on foot. Based on our visual assessment we have the following comments:

- The lagoon is currently not in use. All sewage is being processed at the sewage treatment plant. The City of Iqaluit intends to use the lagoon as a back up facility only.
- As a result of inactivity, (loss of inflow) the lagoon has been gradually drawn down by the outflow to a near empty state.
- The repairs to the west berm that were recommended in previous DSI's and other reports have been completed.
- Seepage was not observed downstream of any berms.
- Minimal flow was observed at the outflow.
- Considerable sludge build up was noted now that the lagoon has been drawn down

Overall, the condition of the structure has not changed significantly since the previous DSI, with the above noted exceptions



## **8. RECOMMENDATIONS**

The following actions are recommended:

1. Preparation of the required Operation & Safety Manual, Logbook, and Permanent File, remains incomplete, however, the City has authorized this work to proceed this year.
2. Undertake the next DSI prior to October 2007.
3. The capacity of the sewage lagoon should be confirmed and sludge removal undertaken if required.
4. It is understood that the intent of the City of Iqaluit is to retain the sewage lagoon as a back-up facility only. Given this occasional use the facility in its current configuration (pending the capacity check recommended in Item 3, above) should be adequate for the intended purpose. However, this does not mean preventative maintenance can be overlooked. Localized failures and/or seeps are to be expected. The City of Iqaluit should remain aware that the lagoon operates on old technology – it is essentially a “leaky dam”, and its use may be prohibited at any time in the future.



## City of Iqaluit Sewage Lagoon Dam Safety Inspection

---

We would be pleased to discuss this report with you.

Should there be any questions, please contact the undersigned.

Yours truly,

**Concentric Associates International Incorporated**

Allan D. Murray, P.Eng.,  
Project Manager



## APPENDIX A

### Photographs