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CITY OF IQALUIT
DAM SAFETY INSPECTION
LAKE GERALDINE DAM
IQALUIT, NUNAVUT

PRODUCED FOR:

CITY OF IQALUIT

PRODUCED BY:

CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED

CONCENTRIC REFERENCE NUMBER:

12-4394

DATE:

JULY 11, 2012

Lake Geraldine Dam
Iqaluit, Nunavut
Dam Safety Inspection

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1. EXECUTIVE SUMMARY

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

The site inspection was conducted on June 27, 2012, by Allan Murray, P.Eng., of Concentric. It is recommended that the next DSI be conducted prior to October 2013.

OBSERVATIONS:

With the exception of the following items, no significant changes in condition of the concrete dam structure and retention berms were observed since the previous DSI, which was conducted in 2011.

- Repair areas (injection repairs conducted in 2011) show minor seepage only.
- Upwelling along the south concrete wing wall appears similar to that observed in 2009.
- Additional minor leakage was observed at two (2) construction joint locations.
- Water was noted at the North berm access ramp where previously observed in 2010; this appeared to be primarily melt water at the time of the inspection. A separate monitoring program is ongoing.

Representative existing conditions have been documented by photographs in Appendix A.

The required documentation under the Canadian Dam Safety Guidelines was updated by Concentric in 2011. An Emergency Preparedness Plan has reportedly been completed by others.

RECOMMENDATIONS:

1. Complete repairs to the North berm prior to October 2012 – this work is currently in design phase and is slated to commence in September 2012.
2. Continue to monitor for signs of leakage at the North berm access ramp area and at two construction joints on the south wing wall structure.
3. Complete the next DSI prior to October 2013.
4. The LG Dam requires an updated DSR by June 2014 at the latest.

2. INTRODUCTION

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

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

The site visit was conducted on June 27, 2012.

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 Lake Geraldine Dam requires a DSR every seven (7) years. The last DSR was conducted in late 2006 by Concentric. A revised DSR is therefore required by late 2013 or early 2014.

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 Lake Geraldine Dam. 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.
- 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.

This report has been prepared for the sole use of The City of Iqaluit.

5. SUMMARY OF PREVIOUS DSI's

The original DSR was conducted in 2001. In 2005, a major alteration to the dam was designed, and implemented over a two (2) year period. The major alteration triggered the requirement for a revised DSR. The DSR was prepared by Concentric in late 2006.

The most recent DSI was completed by Concentric in 2011.

This DSI should be read in conjunction with the current DSR, which contains the historical record, the bulk of which is not repeated here.

A summary of observed conditions and recommendations from the 2011 DSI (with updated information added as appropriate) is as follows:

- The concrete portions of the dam structure are in general unchanged from that observed for the 2009 DSI.
- The north berm structure has experienced considerable scour and loss of granular fill due to wave action from wind events; the severity has increased over the last 2 years as the reservoir level has begun to approach maximum.
- A grouting program was completed in August 2011; based in part on the results of an underwater survey commissioned in 2010. The grouting program had been slated for 2010 but was deferred one year to accommodate budgetary constraints. The grouting program appears to have been, in general, effective.
- Upwelling along the south concrete wing wall appears unchanged from the 2009 DSI.
- The (previous) leakage sites on both sides of the vehicle access ramp to the North berm exhibit little or no leakage.

The required documentation (discussed previously) under the Canadian Dam Safety Guidelines, was updated in 2011.

The Emergency Preparedness Plan has not yet been completed; however, we have been advised by the City that this task is ongoing by others.

- A repair of the damage to the North berm is required in 2012. An engineered tender package should be prepared which should include provisions for long term stability of the berm.
- Continue to monitor the leakage sites on each side of the access ramp to the North berm.
- Once the Emergency Preparedness Plan is complete, it should be integrated with the dam record documentation and Permanent Record File.
- Complete the next DSI prior to October 2012.

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 Lake Geraldine Dam requires a DSR every seven (7) years. The current DSR for the Lake Geraldine Dam was conducted in 2006; therefore, the Lake Geraldine Dam is due for an updated DSR in 2013. 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 Lake Geraldine Dam was accessed on foot.

With the exception of the following items, no significant changes in condition of the concrete dam structure and retention berms were observed since the previous DSI.

- Previous repair areas that received polyurethane injection conducted in 2011, show minor seepage only.
- Upwelling along the south concrete wing wall (the concrete structure south of the spillway) appears similar to that observed in 2009.
- Additional minor leakage was observed at two (2) construction joint locations. These construction joints are located along the south concrete wing wall.
- Water was noted at the North berm access ramp where previously observed in 2010; this appeared to be primarily melt water at the time of the inspection. A separate monitoring program is ongoing and further comments (under separate cover) will be provided by Concentric.

Representative existing conditions have been documented by photographs in Appendix A.

The required documentation under the Canadian Dam Safety Guidelines was updated by Concentric in 2011.

The Emergency Preparedness Plan has reportedly been completed; the City has had this document prepared by others.

8. RECOMMENDATIONS

The following actions are recommended:

1. Complete repairs to the North berm prior to October 2012 – this work is currently in design phase (design and implementation by Concentric) and is slated to commence in September 2012.

2. Continue to monitor for signs of leakage at the North berm access ramp area. This monitoring program is being coordinated by Concentric and is ongoing under separate contract with the City.

3. Monitor construction joint leakage and re-assess at the next DSI.

4. Complete the next DSI prior to October 2013.

5. The LG Dam requires an updated DSR by June 2014 at the latest.

We would be pleased to discuss this report with you. Should there be any questions, please contact the undersigned.

Yours truly,

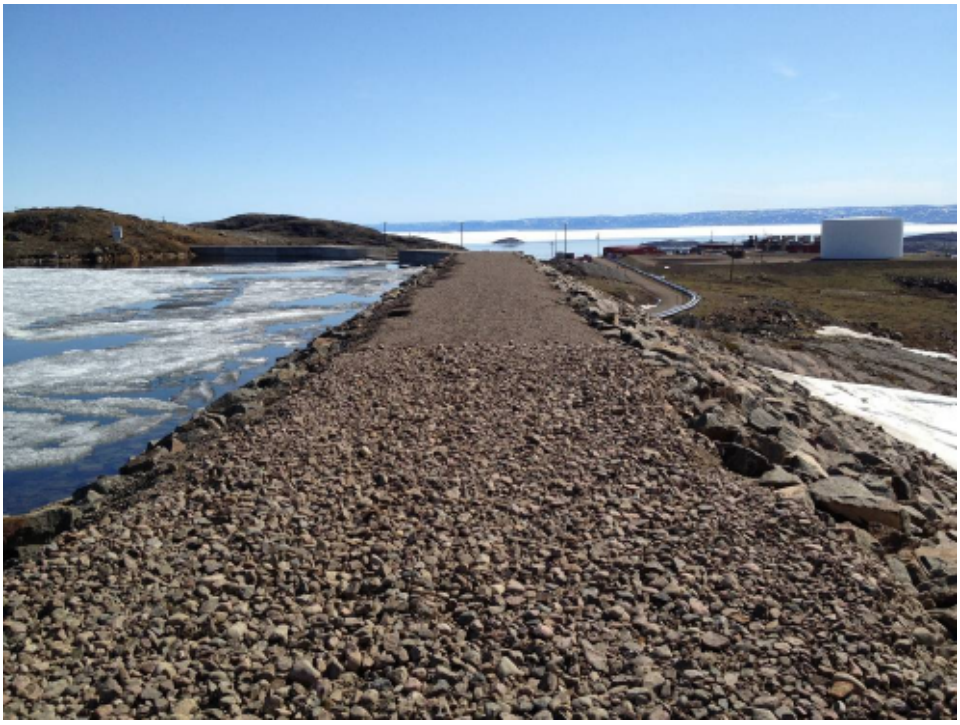
Concentric Associates International Incorporated

Allan Murray, P.Eng.,
President

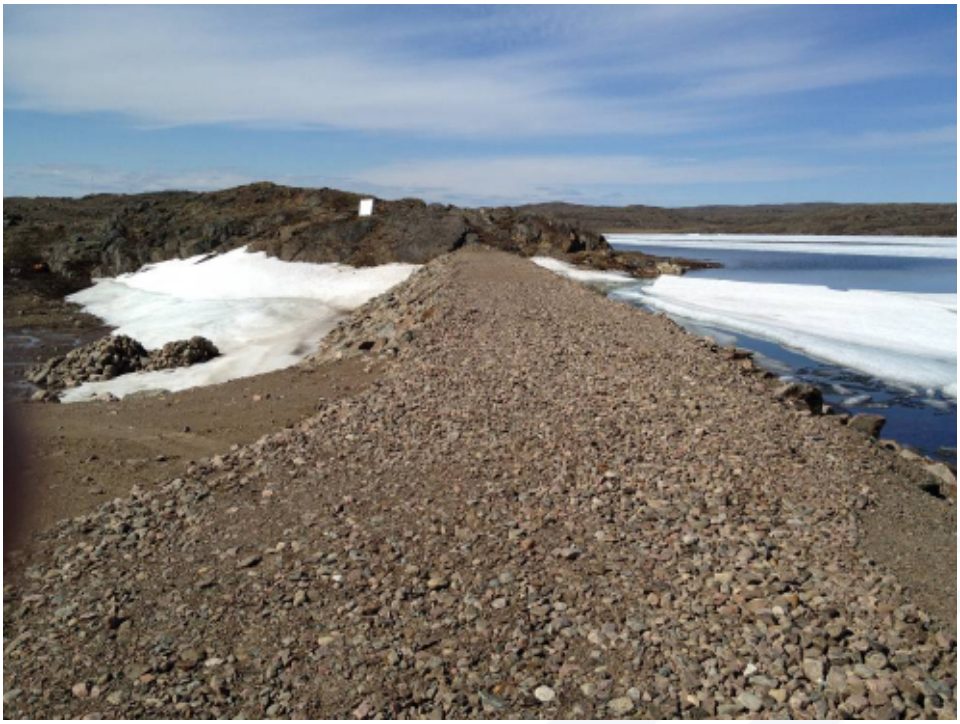
Paul Matergio, CET
Vice President

APPENDIX A

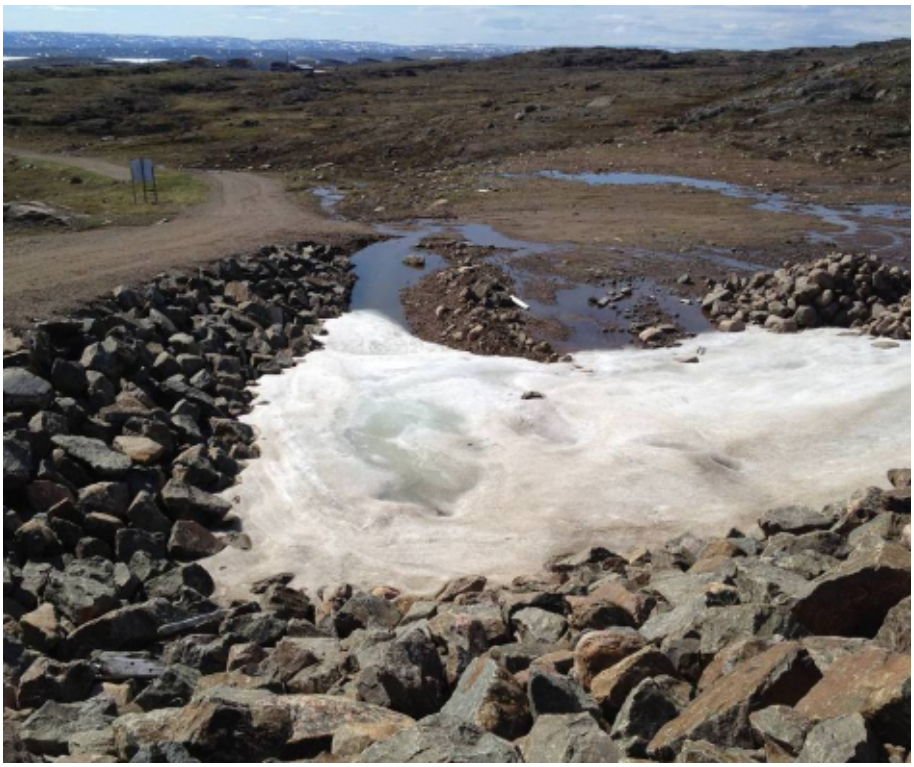
Photographs



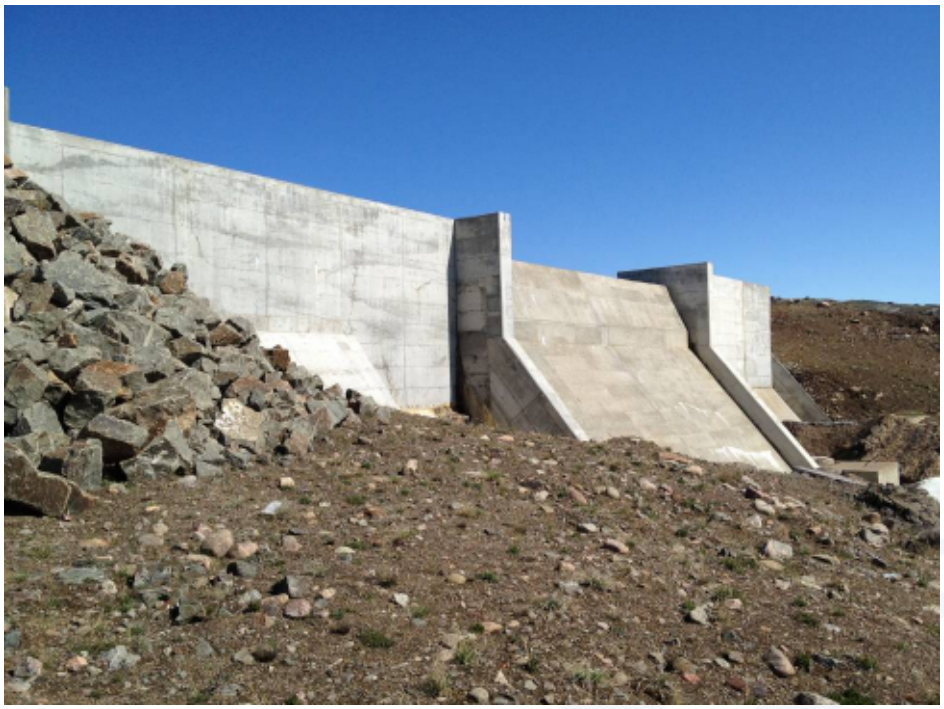
Photograph 1
Overview of north berm looking south.



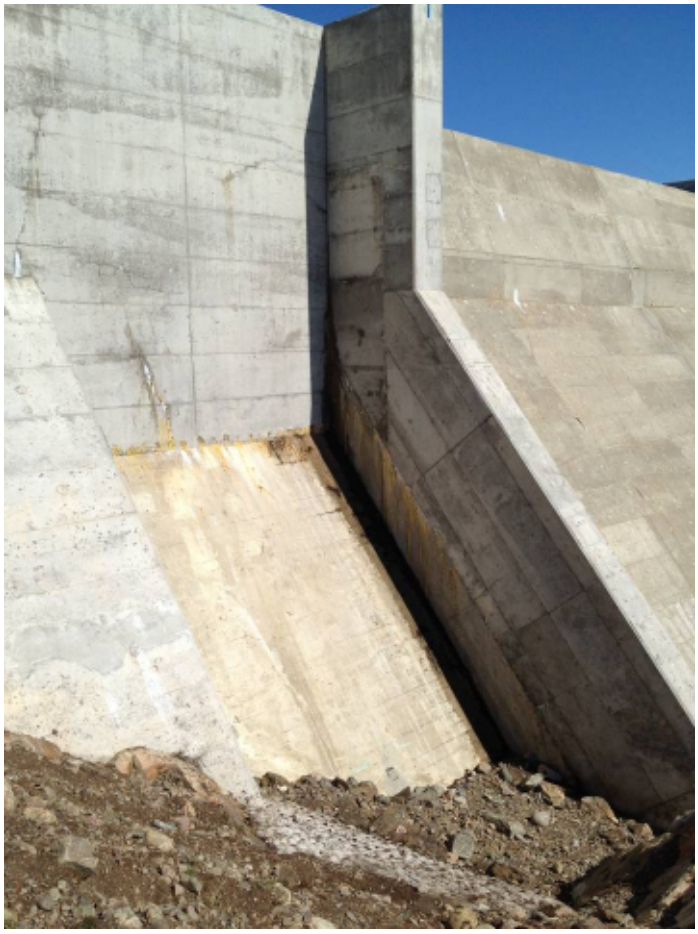
Photograph 2
Overview of north berm looking north.



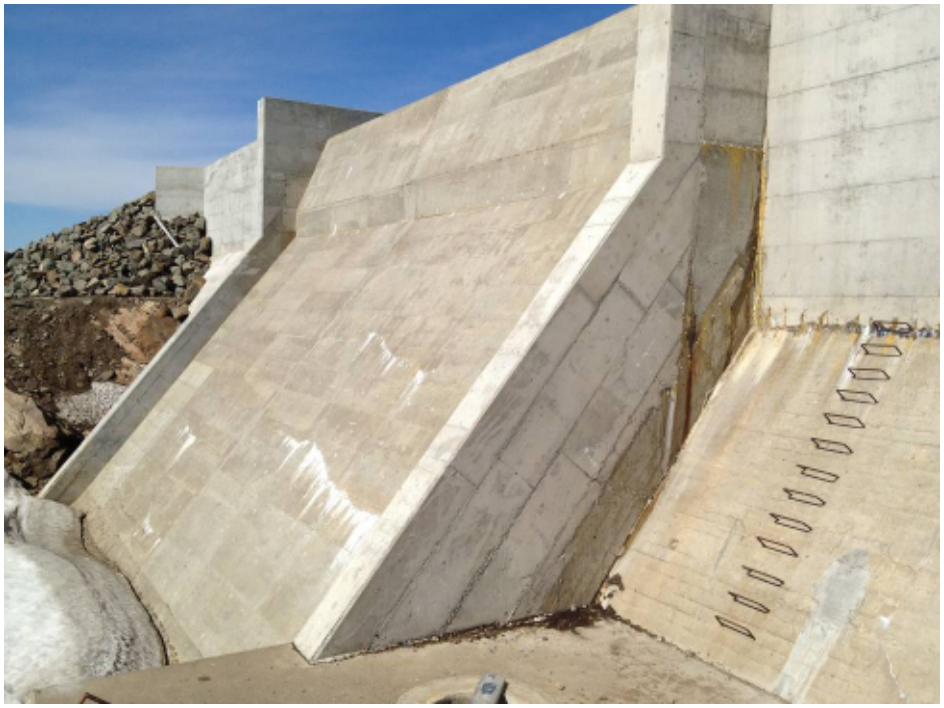
Photograph 3
Meltwater and potential minor leakage at north side of access road / north berm.



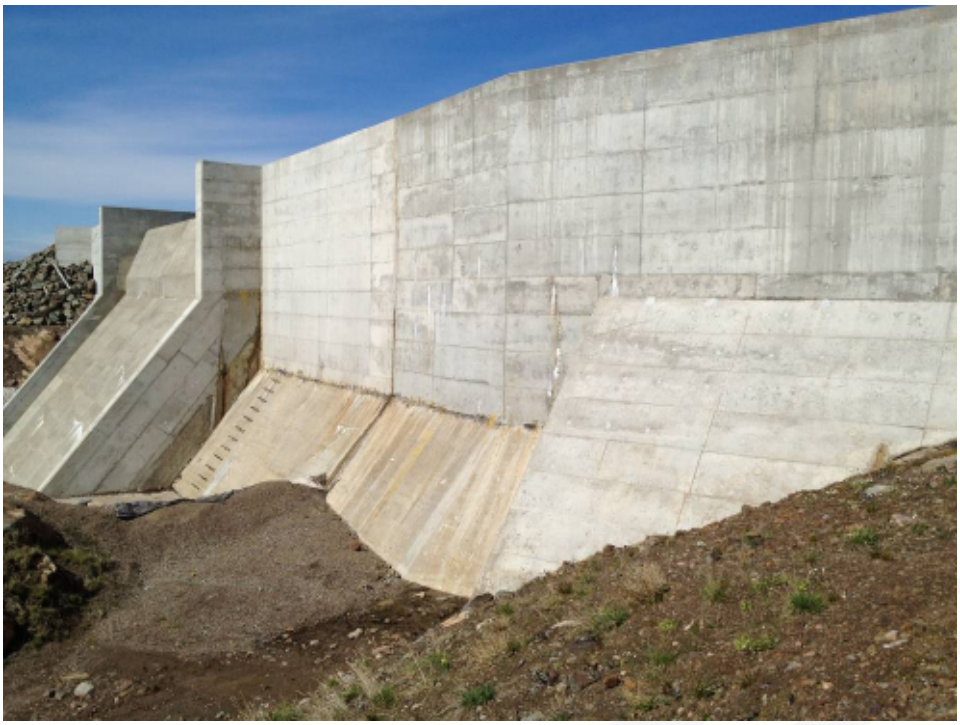
Photograph 4
Overview of concrete structures from the northwest.



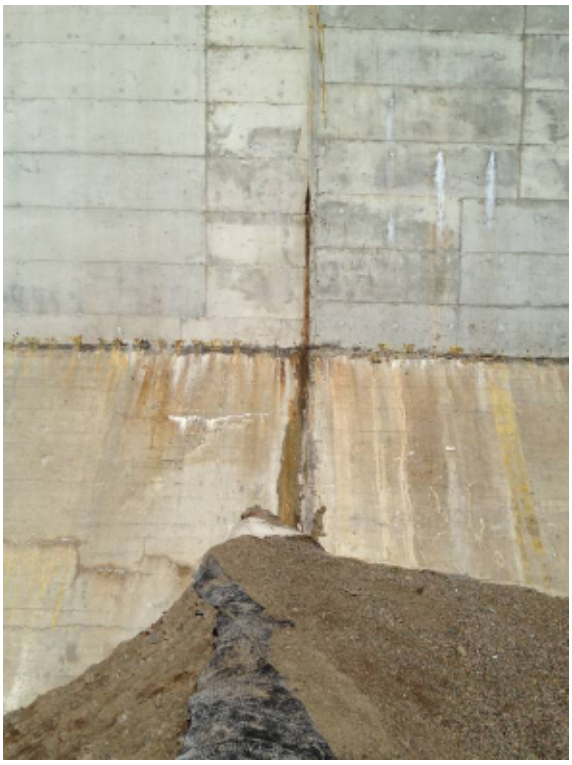
Photograph 5
Minor leakage at north transition of spillway at previous injection repair.



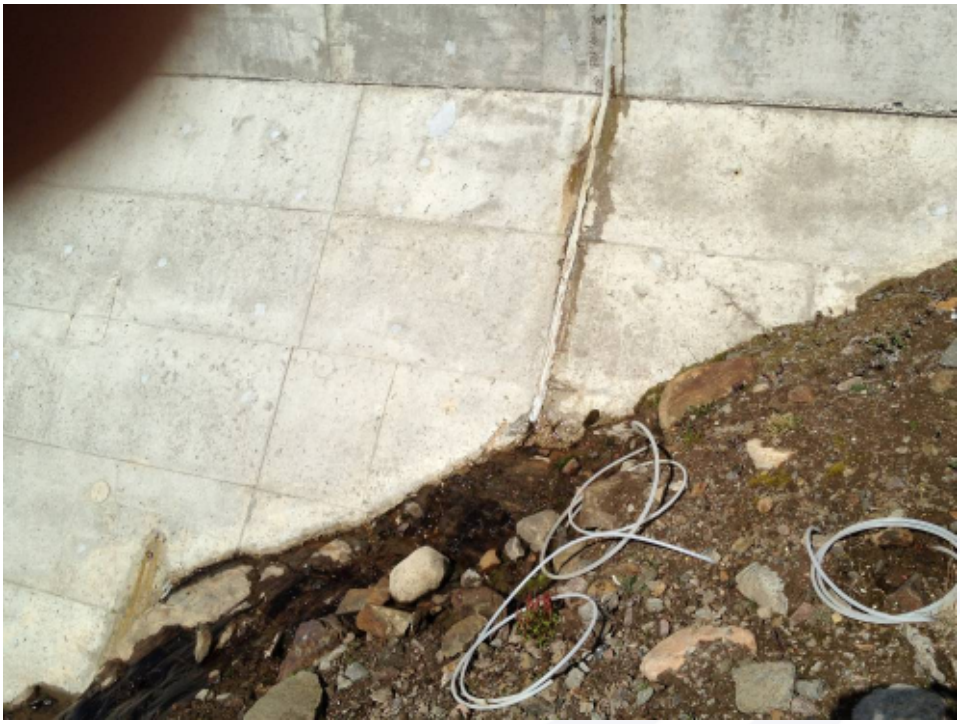
Photograph 6
Overview of spillway from the southwest. Note minor leakage at previous injection repair.



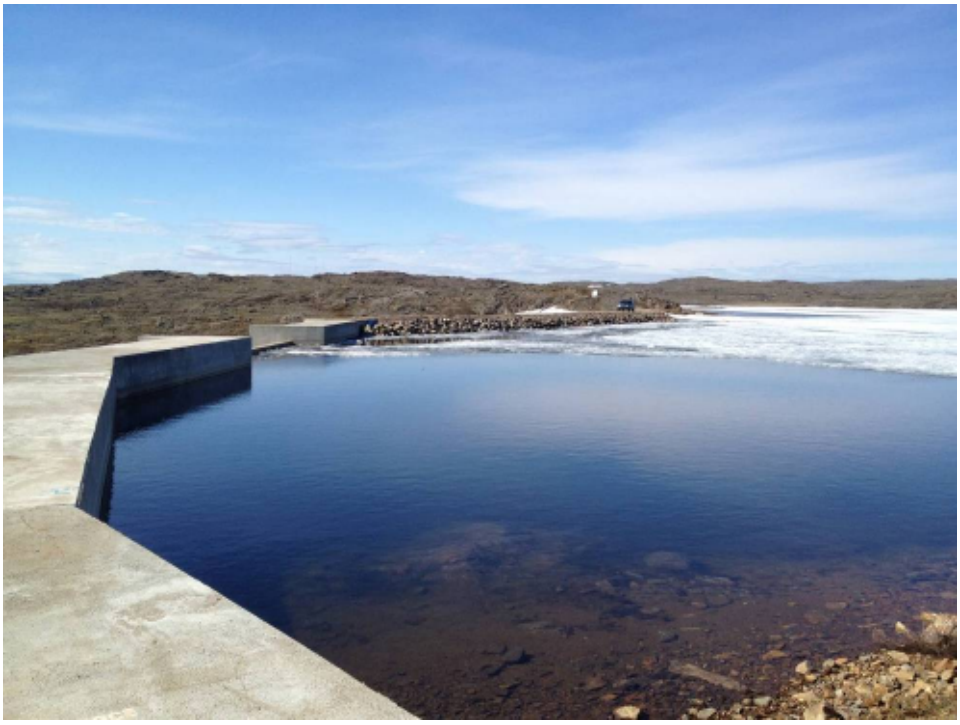
Photograph 7
Overview of south concrete structures from the southwest.



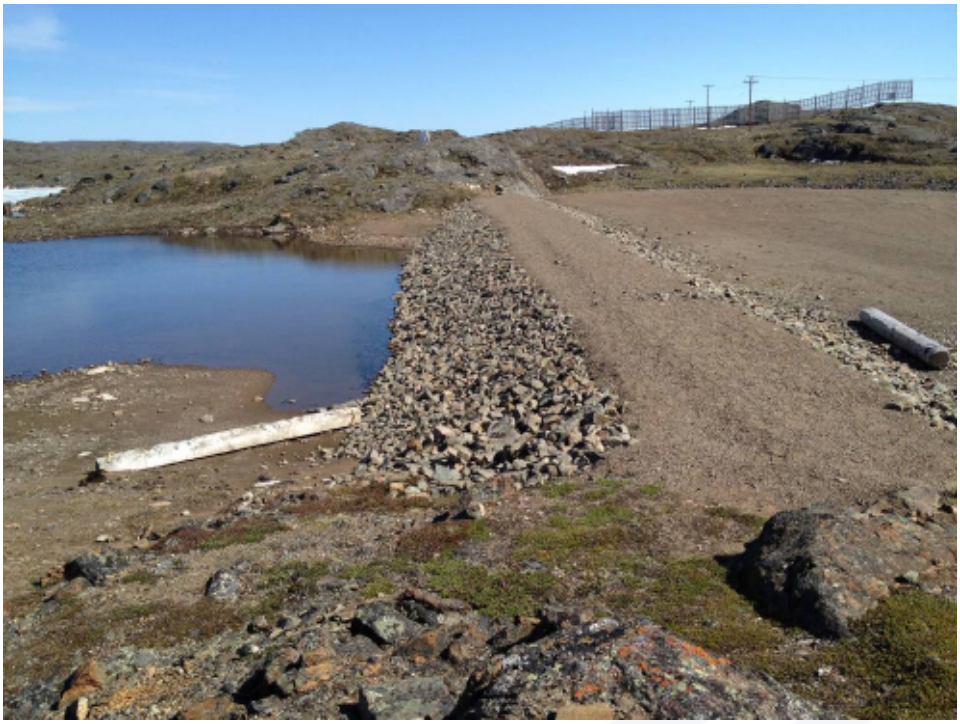
Photograph 8
South structure control joint showing minor leak at previous injection repair.



Photograph 9
Minor leak at another control joint on south structure.



Photograph 10
Overview of upstream face.



Photograph 11
Overview of south berm.