BEAVERLODGE PROJECT

Cameco

Beaverlodge Project Annual Report

Year 26
January 1, 2011 to June 30, 2012

Prepared for:
Canadian Nuclear Safety Commission
Compliance Report for Licence: WFOL-W5-2120.0/2012
&
Saskatchewan Ministry of Environment
Compliance Report: Beaverlodge Surface Lease

Prepared and Submitted by:
Cameco Corporation

September 2012

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1.0 INTRODUCTION

This report is submitted in compliance with Canadian Nuclear Safety Commission (CNSC) Waste Facility Operating Licence WFOL-W5-2120.0/2012 issued to Cameco Corporation (Cameco) for the decommissioned Beaverlodge mine and mill site.

The report is also submitted in compliance with the Saskatchewan Beaverlodge Surface Lease Agreement dated December 24, 2006.

The report describes observations on the decommissioned Beaverlodge site covering the period between January 1, 2011 and June 30, 2012. In the 2008 Annual Report Cameco provided data based on a calendar year (January 2008 to December 2008). In November 2009 the CNSC granted Cameco a licence expiring on November 30, 2012. In that licence the CNSC Commission requested that Cameco and the CNSC staff provide an annual update of activities at a meeting during the fourth quarter of each year.

To facilitate the preparation of the documentation required for this update meeting, it was agreed the Annual Report would include information on environmental conditions, site activities and project status for an 18-month period (January through June of the following year). Cameco will continue providing an 18-month summary report until the expiry of the current CNSC licence. Following 2012 it is anticipated that subsequent annual reports will return to a 12-month summary, with the intention that the summary be based on a calendar year.

Results of environmental monitoring programs conducted for Beaverlodge during this period are provided in the report and, where applicable, historical environmental data has been included and discussed as part of the overall assessment of the decommissioned properties. The status of current projects and activities conducted as of the end of June 2012 are provided, along with an overview of anticipated activities planned for the latter half of 2012.

2.0 GENERAL INFORMATION

2.1 Organizational Information

2.1.1 CNSC Licence/Provincial Surface Lease

The CNSC Waste Facility Operating Licence WFOL-W5-2120.0/2012 and the Province of Saskatchewan - Beaverlodge Surface Lease, December 24, 2006 are issued to:

CAMECO CORPORATION
2121 - 11th Street West
Saskatoon, Saskatchewan
S7M 1J3
(306) 956-6200 (Phone)
(306) 956-6201 (FAX)

2.1.2 Officers and Directors

The officers and board of directors of Cameco as at June 30, 2012 are as follows:

Officers

President and Chief Executive Officer	T.S. Gitzel
Senior Vice-President and Chief Operating Officer	R.A. Steane
Senior Vice-President and Chief Commercial Officer	K.A. Seitz
Senior Vice-President and Chief Corporate Officer	A. Wong
Senior Vice-President and Chief Financial Officer	G.E. Isaac
Senior Vice-President, Chief Legal Officer, and Corporate Secretary	G.M.S. Chad

Board of Directors

T. S. Gitzel	A.N. McMillan
V.J. Zaleschuk	J.F. Colvin
D.R. Camus	J.R. Curtiss
J.H. Clappison	D.H.F. Deranger
N.E. Hopkins	J.K. Gowans
O. Hushovd	I. Bruce
A.A McLellan	

2.2 CNSC Licence

On February 18, 2009 a public hearing was held in Ottawa, Ontario for the renewal of the waste management licence for the decommissioned Beaverlodge mining and milling facility. The Commission decided to adjourn the hearing until November 2009 so that a plan was made available for consideration which would provide details and milestones on the long-term activities for the proposed three-year licence period.

At the February 2009 hearing the Commission granted exemption from further CNSC licensing of five minor former Eldorado Beaverlodge properties. This action allowed the properties to be released by Saskatchewan Ministry of Environment (SMOE) from further decommissioning and reclamation and to be transferred to the province of Saskatchewan's Institutional Control (IC) program. The Saskatchewan Ministry of Energy and Resources (SkMER) is now the responsible authority for the administration of the five properties in the IC Program as described in the provincial *Reclaimed Industrial Sites Act*.

Following the November 2009 hearing, the Commission granted Cameco a Waste Facility Operating Licence for the former Beaverlodge mine and mill site. The renewed licence WFOL-W5-2120.0/2012 is valid from December 1, 2009 to November 30, 2012.

2.3 Provincial Surface Lease

The current provincial surface lease for the decommissioned Beaverlodge properties was issued to Cameco on December 24, 2006 with an expiry date of December 24, 2026.

2.4 Background Information

The decommissioned Beaverlodge mine/mill properties are located north of Lake Athabasca, northeast of Beaverlodge Lake, in the northwest corner of Saskatchewan at approximately N59° 33'15" and W108° 27'15" (Figure 2.4.1).

Uranium-bearing minerals were first discovered in the Beaverlodge area in 1934. Since there was little demand for uranium at that time, further prospecting and development in the region was delayed for almost ten years until 1944 when Eldorado Mining and Refining Ltd., a crown corporation owned by the Government of Canada, commenced detailed exploration in the area of Fishhook Bay on the north shore of Lake Athabasca. Between 1944 and 1948 Eldorado Mining and Refining Ltd. continued to explore the area around Beaverlodge Lake discovering the Martin Lake and Ace Zones in 1946. In 1947 a prospecting incline was developed to explore the Ace orebody and the Dubyna claims were staked.

Exploration and initial development of a number of separate orebodies continued until 1951 when Eldorado Mining and Refining Ltd. developed the Fay shaft and headframe. The following year the foundations were laid for a 450 tonnes per day (t/day) carbonate-leach mill which started production in 1953. Mill production expanded to 680 t/day in 1954 and increased to 1800 t/day in 1956. A small acid-leach circuit was added in 1957 to handle a small amount of ore containing sulphides. Non-sulphide ore was sent directly to the carbonate circuit, while the sulphide concentrate was treated in the small acid-leach circuit.

During mining the primary focus was on an underground area north and east of Beaverlodge Lake where the Ace, Fay and Verna shafts were located. Production from these areas continued until 1982. Over the entire 30-year production period (1952-1982) the majority of the ore used to feed the mill came from these areas; however a number of satellite mines, primarily in the

Ace Creek watershed were also developed and operated for shorter periods of time. During the mill operating period, approximately 60% of the tailings were placed into small waterbodies within the Fulton Creek watershed with the remainder being deposited underground.

During the early years of operation, uranium mining and milling activities conducted at the Beaverlodge site were undertaken using what were considered acceptable practices at the time. However, these practices did not have the same level of rigor for the protection of the environment as is currently expected. Although the Atomic Energy Control Board (AECB) licensed the Beaverlodge activities, environmental protection legislation and regulation did not exist either federally or provincially and therefore was not a consideration during the early operating period. It was not until the mid-1970s, some 22 years after operations began, that effluent treatment processes were initiated at the Beaverlodge site in response to discussions with provincial and federal regulatory authorities.

At the request of the AECB, a conceptual decommissioning plan was submitted in June 1981. On December 3, 1981 Eldorado Nuclear Limited (formerly Eldorado Mining and Refining Ltd.) announced that its operation at Beaverlodge would be shutdown.

Mining operations at the Beaverlodge site ceased on June 25, 1982 and the mill discontinued processing ores in mid-August 1982. At that time Eldorado Resources Limited (formerly Eldorado Nuclear Limited) initiated site decommissioning. The decommissioning and reclamation work was completed in 1985. Transition-phase monitoring was initiated at that time and continues today.

On February 22, 1988 the Government of Canada and the Province of Saskatchewan publicly announced their intention to establish an integrated uranium company as the initial step in privatizing their respective uranium investments.

On October 5, 1988 Cameco Corporation, a Canadian Mining and Energy Corporation, was created from the merger of the assets of the Saskatchewan Mining Development Corporation and Eldorado Resources Ltd. Following the merger, management (monitoring and maintenance) of the decommissioned Beaverlodge properties became the responsibility of Cameco, while the Government of Canada, through Canada Eldor Inc. (CEI) retained responsibility for the financial liabilities associated with the properties.

In 1990 the corporate name was changed to simply Cameco Corporation (Cameco) with shares of Cameco being traded on both the Toronto and New York stock exchanges.

The management of the Beaverlodge monitoring program and any special projects associated with the properties is the responsibility of the Reclamation Co-ordinator, SHEQ - Compliance and Licensing, Cameco.

2.5 Confounding Factors

While Beaverlodge Lake is the receiving environment for water from the decommissioned Beaverlodge properties, it is also the receiving environment for contaminants discharged from at least nine other non-Eldorado abandoned uranium mine sites and one former uranium mill tailings area (Lorado Uranium Mining Ltd. mill site) within the Beaverlodge Lake watershed. These abandoned sites are managed by Saskatchewan Research Council (SRC) and are currently in the process of being decommissioned.

Previous experience has shown that the abandoned sites are likely contributing some level of contamination (heavy metals and radionuclides) to the watershed and ultimately to Beaverlodge Lake and Martin Lake, particularly during spring runoff and periods of heavy precipitation.

3.0 DECOMMISSIONED AND RECLAIMED AREAS ACTIVITIES

The performance of the decommissioned and reclaimed area of the Beaverlodge site is assessed by routinely scheduled sampling/analysis as well as routine inspections conducted by Cameco personnel and the Joint Regulatory Group (JRG). In addition, special monitoring/investigation projects are completed to assess the performance of specific components of the decommissioned areas. The following section outlines related activities around the Beaverlodge properties during the reporting period.

3.1 Joint Regulatory Group

The JRG is comprised of representatives of various federal and provincial regulatory agencies including

- Canadian Nuclear Safety Commission (CNSC)
- The Department of Fisheries and Oceans Canada (DFO)
- Environment Canada (EC) and
- Saskatchewan Ministry of Environment (SMOE).

Five meetings were held with the JRG during the 2011-2012 reporting period, with the primary purpose of the meetings to discuss the Beaverlodge workplan and to allow for comment on activities and submissions.

3.1.1 Special Meetings with JRG

May 5, 2011: Quantitative Site Model (QSM) Update

This meeting was conducted at the CNSC Offices in Ottawa, Ontario. This meetings purpose was to review the progress of the Beaverlodge Quantitative Site Model and discuss any issues that have developed around the action plans necessary for the CNSC and SMOE to support the methodology of model before the CNSC Commission update meeting in November 2011. The loading calculations from Beaverlodge Lake were addressed, as well as the summary of the Lakeview model and how it applies to Beaverlodge.

3.2 Regulatory Inspections

The performance of the decommissioned and reclaimed areas at Beaverlodge, described in this section, is determined by routine and non-routine visual inspections conducted by regulatory agencies and Cameco. Inspections are held in order to ensure that conditions on the properties do not impact the health and safety of people or protection of the environment and ensure the requirements of the licence are being met.

3.2.1 2011 Inspection

Representatives from the CNSC, the SMOE, DFO, EC, CanEldor, and Cameco performed a Type-II joint inspection of the Beaverlodge properties from June 6 to June 10, 2011.

The main objective of the inspection was to follow up on action items and recommendations from the previous inspection and to observe other areas of potential interest with respect to further source controls. The inspection of a sand flow occurrence at the Fookes Delta was also included in the inspection. This was deemed to be a one-time occurrence that would not threaten the functionality of the ditch.

Several recommendations from previous inspections were noted as complete in the 2011 inspection. These included the rehabilitation of the Dorrclone and Fay shaft area, the sealing of the Hab mine area boreholes, and the removal of unused equipment and debris in the Fay shaft area and from the water stations TL-7 and AC-8.

3.2.2 2012 Inspection

On June 5, 2012 to June 7, 2012, representatives from Cameco, the CNSC, and SMOE completed a Type-II compliance inspection of the Beaverlodge properties.

The focus of the trip was to provide a general overview of the properties and the remaining issues that may prevent the property from transferring to IC.

Following the inspection, the CNSC and SMOE provided Cameco with four recommendations:

1. *Cameco should monitor and investigate the clay boils on the Marie Tailings Delta as their existence may impede the properties designation to Institutional Control.*
    - Although there was no gamma signature from this area, the presence of clay material piping through the waste rock cover on the tailings indicates there may be areas of increased hydraulic pressure within the tailings delta and Marie Reservoir.
2. *Cameco should inspect the track etch cup sampling and re-evaluate how they are held in place.*
3. *Cameco should evaluate the source of the elevated gamma signature between seeps 2 and 3 at the base of the Fay Waste rock Pile.*
4. *Cameco should review access to sample stations and make reasonable efforts to ensure access to sampling stations is available and adhered to by staff.*

A formal response to these recommendations outlining actions taken and plans to address outstanding items will be provided to the JRG prior to October 31, 2012.

3.3 Geotechnical Inspection

In 2011 the frequency of the third-party inspections of the Fookes Delta and outlet structures at Marie and Fookes reservoirs was adjusted from every three years to every five years. To accommodate the change in frequency of third-party inspections, an inspection of the delta and outlet structures is completed annually by Cameco personnel during the JRG visit using a checklist developed by Cameco and SRK Consulting. The Geotechnical Inspection Checklist requires the assessment of the condition of the Fookes and Marie outlet structures and Fookes Delta. In addition, the checklist requires photographically documenting each area. Should any changes to the deltas or to the outlet structures be observed, then a third-party inspection would be called in regardless of the regular schedule.

Water was flowing in both the Marie and the Fookes outlet structures during the 2012 inspection. The integrity of both of the outlet structures was maintained. There was no evidence of erosion and no concerns were noted. Grout-intruded rip-rap remained in place at both structures and is performing as designed. Photographic evidence was collected at both structures.

The Fookes delta was inspected for any evidence of tailings boils, tailings exposure, erosion of the cover, or any sand wash into the lake. No tailings boils were found and the settling features observed in 2011 were much less prominent. Vehicular traffic had gained access to the delta by driving over a berm put in place to eliminate traffic. Although vehicles had accessed the delta they did not appear to have compromised the integrity of the sand cover. The berm will be repaired and made impassable to vehicular traffic prior to October 31, 2012.

The geotechnical inspection took place during the June 2012 JRG inspection with the results and photographic record included in Appendix C.

3.4 Community Engagement and Consultation

3.4.1 Public Meetings

Two public meetings were held during the 2011-2012 reporting period with the intent of providing an overview to the residents of Uranium City regarding the completed activities, an update on the current condition of the Beaverlodge properties, as well as the outlook for future planned activities.

June 6, 2011: Public Meeting (Uranium City, Saskatchewan)

The 2011 Public Meeting was held at Ben McIntyre School in Uranium City. Attendees included Uranium City residents, and representatives from the AWG, EQC, Cameco, SMOE, CNSC, DFO, EC, CEI, CanNorth and the northern Saskatchewan Population Health Unit. The purpose was to discuss the 2010 and 2011 Beaverlodge related activities and also provide an update on the Country Food Study.

Cameco presented on the history of the Beaverlodge properties and its management plan. The 2010 activities presented were the Minewater Aquatic Investigation, the Macrophyte Study, the Ace Bay Contamination Delineation Study, the Geotechnical Assessment, the White Sucker Spawning Study and the Ace Lake Hydrology Study.

Water quality data was presented graphically for the Fulton Creek outlet (Station TL-9) and the outlet of Ace Creek (Station AC-14). The parameters discussed included radium (^{226}Ra), uranium (U), total dissolved solids (TDS), and selenium (Se). The applicable Close-Out Objectives (COO) and Saskatchewan Surface Water Quality Objectives (SSWQO) were provided along with the water quality graphs.

An overview of the activities to be conducted in 2011 was presented. These included Year 2 of the Country Foods Study, the continued development of the QSM, and the planned permanent sealing of the boreholes inspected in 2010. Additional 2011 activities include an Ace Lake hydrology follow-up study, the characterization of Pistol Lake and Beatrice Lake, the assessment of waste rock and of tailings spills, and an investigation of the boreholes located on the Dubyna property.

CanNorth followed with a presentation summarizing the results of the Year 1 Country Foods Study. Year 2 of the Country Foods Study was discussed with plans to include the analysis of country food items harvested from the Beaverlodge properties and surrounding areas. CanNorth requested assistance from the Uranium City locals in providing samples and locations for the collection of country food items to be studied.

At the end of the presentation, in follow-up to the discussion from the previous public meeting Cameco representatives called on the attendees for their input on how to improve communications between Cameco and the Uranium City residents and a sign-in sheet was circulated.

June 4, 2012: Public Meeting (Uranium City, Saskatchewan)

The 2012 public meeting was hosted by Cameco at the Ben McIntyre School in Uranium City, Saskatchewan. The attendees of the meeting included residents from Uranium City, a member of the AWG and EQC, members of the Mamawetan Churchill River Regional Health Authority, staff from SENES Consultants, CanNorth, and Cameco, and a regulatory representative from the CNSC and SMOE.

The purpose of this meeting was to engage the public in the ongoing activities at the Beaverlodge site, distribute information, and to address any concerns or interests that were raised by the participating parties. Three presentations were delivered during the public meeting.

Representatives from Cameco presented the Beaverlodge Management Plan and discussed the progress regarding the QSM and the remedial options workshop. It was also clarified which areas were not included under the Beaverlodge Management Plan. These areas are Gunnar, Laredo, and other abandoned sites managed by the SRC. The review helped to clarify exactly which areas are under Cameco responsibility. The Beaverlodge relicensing hearing, which is scheduled to occur in October 2012, was discussed and the residents were informed that there is a ten-year renewal being requested. Activities scheduled to occur in 2012 include plugging of flowing boreholes at Lower Ace and Dubyna, as well as gathering flow rate information at the various watersheds in the region.

CanNorth presented the results of the Country Foods Study Year 2, which was developed based on information gathered during the Country Foods Study Year 1, in which the residents of Uranium City were interviewed to determine the species of vegetation and animals most commonly consumed.

The focus of the Year 2 study was to determine if locally harvested country foods were safe to consume. CanNorth informed the attendees that the short-term outlook for the study was to see what the health risks could be to the residents consuming the country foods and the long-term outlook was to create a comprehensive database. The vegetation and animal samples were collected over a two-year period. The areas sampled included the Beaverlodge properties, Camsell Portage, and around Uranium City. Maps of the sampling locations were also provided at the meeting. This provided the attendees with a visual aid to see exactly what areas had been sampled for the study. After the tissue sample results were returned, SENES conducted a risk assessment to determine the level of risk locals faced by consuming locally harvested country foods. The conclusion found that the country foods do not present health risks to Uranium City residents.

The last presentation was made by Dr. Irving of the Mamawetan Churchill River Regional Health Authority. He discussed the findings from the Northern Saskatchewan Health Indicators Report. The study was prepared by the Population Health Unit for Northern Saskatchewan and provides statistics and relevant information regarding the health and well-being of people in Uranium City and northern Saskatchewan. There was also time for attendees to ask Dr. Irvine questions.

3.4.2 Environmental Quality Committee Meetings

The Northern Saskatchewan Environmental Quality Committee (NSEQC) is made up of representatives from designated northern municipal and First Nation communities. The NSEQC is broken into three sub-committees, with the Athabasca Environment Quality Committee (AEQC) representing the Uranium City area. The NSEQC enables northerners to learn about uranium mining activities and to see first-hand the environmental protection measures being employed, and the socio-economic benefits being gained. Activities involving the NSEQC are outlined below.

September 27, 2011: AEQC Meeting (Uranium City, Saskatchewan)

This meeting was held on September 27, 2011. There were five attendees from the Athabasca Environmental Quality Committee (AEQC), eight community members, and representatives from SMOE, the CNSC, and the Northern Mines Monitoring Secretariat. It took place in Uranium City, Saskatchewan at the Ben McIntyre School. The purpose of the meeting was the annual AEQC site visit and was open to the residents of Uranium City to participate. The discussion by Cameco and the AEQC focused on what Cameco had completed in 2011 and where the project was advancing to in 2012.

The next AEQC meeting will be held in September 2012.

3.4.3 Workshops

April 3/4, 2012: Remedial Options Workshop (Saskatoon, Saskatchewan)

On April 3 and 4, 2012 Cameco hosted a workshop in Saskatoon to review potential remedial options available for the Beaverlodge properties. In attendance at the workshop were ten community members from Uranium City, six members from the NSEQC, representatives from the Northern Mines Monitoring Secretariat, CNSC, Environment Canada, Natural Resources Canada, DFO, SMOE, Mamawetan Churchill River Regional Health Authority, SRC, CanNorth, Canada Eldor Inc., and Cameco. Prior to the workshop Cameco had contracted SENES to develop the QSM which will be discussed in section 3.7.

The objective of the workshop was to gather clear and documented feedback from a cross-section of stakeholders regarding remediation options for the Beaverlodge properties. The gathered information will be used by Cameco to prepare a final remediation plan that will be submitted for acceptance to the regulatory agencies (SRK Consulting, 2012).

3.5 CNSC Meetings

3.5.1 CNSC Update and Commision Public Meeting

This meeting was held on December 15, 2011. At the meeting Cameco and CNSC staff provided the Commission members with and update regarding the implementation of the Beaverlodge Management Plan.

The Beaverlodge Management Plan consists of a five-step process which includes

- assess information
- assess risk
- assess options
- implement options and monitor, and
- apply for release to IC program.

This plan was developed in part with the JRG and reviewed with local stakeholders. The assessment of information involves the submission of study reports in 2011, while the assessing of residual site risk involves the complete site model in 2011. The assessment of potential remedial options was conducted during the remedial options workshop held in 2012. The implementation of reasonable remedial options involves determining the next steps with the JRG, and looking at options feasibility in 2013. Once site conditions are stable and/or improving and risks have been managed to an acceptable level, individual properties will be transferred to the Institutional Control program for long-term stewardship by the Province of Saskatchewan.

3.6 2011-12 Activities

3.6.1 Implementation of Revised Water Sampling Program

Cameco received approval from the CNSC and SMOE to implement a revised water sampling program in March 2011. The water sampling program was revised to reflect more recent trends and streamline analysis. The previous Beaverlodge surface water sampling program had been designed for the initial stages of post-decommissioning monitoring and thus was not reflective of the historical data and established water quality trends.

The change to the program resulted in numerous additional stations to fill information gaps and in response to stakeholder concerns about downstream water quality. In addition, sampling frequencies at many stations were revised to be more reflective of the historical data.

3.6.2 Follow-up to 2011 Inspection Report

Clean-up of Ace Uplands:

As identified in the regulatory inspection Cameco was requested to clean-up and dispose of large debris present in the Ace Uplands area. Cameco hired a local contractor to complete this task. As of July 15, 2011 this task was completed. The area was inspected during the 2012 JRG inspection with no additional work identified.

Removal of Nesting Boxes:

The removal of nesting boxes was requested because there was no further research being conducted with these devices. The boxes if needed could be easily re-installed. The removal of the boxes was completed in October 2011.

Clean-up of Ace Shaft:

Clean-up of the large debris that was found in the area of Ace Shaft was required after the 2011 inspection. A local contractor was hired to complete this work and the debris was removed from the area and taken to the Bolger Pit waste disposal area. This activity was completed before July 15, 2011. A follow-up inspection would be conducted during the 2012 JRG inspection.

3.6.3 Beaverlodge Borehole Decommissioning

MDH Engineered Solutions Corp. was contracted by Cameco to decommission boreholes located on the Beaverlodge property. There were 14 boreholes that needed to be filled with grout to 30m deep. These boreholes were flowing due to groundwater that had flooded the underground mining areas. The water would then reach the surface through the open boreholes. This decommissioning occurred from September 9 to 19, 2011. There were three boreholes that could not be adequately filled at the time and a seep that was located near one of the boreholes. Cameco and MDH discussed further action that would need to be taken to completely decommission these flowing boreholes and seep.

3.6.4 V-Notch Weir Structures

V-Notch weir structures were installed or replaced at three locations in 2011. V-Notch weirs are important as they allow direct measurement of surface water flow along a channel. When a V-Notch weir is combined with a datalogger measuring surface water elevation, continuous discharge measurements can be calculated.

A V-notch weir and datalogger have been installed at station AC-6A (Verna Lake outflow). Due to low flow and poor bank control conditions of the channel between Verna Lake and Ace

Lake, and the areas potential for back-flooding conditions, the V-Notch weir was installed on the inlet to a culvert (Golder, 2012).

A V-notch weir and datalogger have been installed at station TL-6 (Minewater Reservoir outlet). The V-notch was installed in a blasted trench, which drains water from the reservoir towards the tailings management area. The flow from this area is typically seasonal in nature and this equipment will provide accurate flow measurements from this area.

Over time the V-notch weir installed at station TL-7 had deteriorated and was not allowing for accurate flow measurements to be calculated. A new steel plate with a V-notch cut out was engineered and attached to the dam structure located at TL-7. The new V-Notch combined with the seasonal datalogger in place will provide accurate flow measurements during the open water season.

3.7 Studies

The following section provides a summary of the studies that were completed and provided to the regulatory agencies during the reporting period.

January 2011: Results of Packed Borehole and Seep Monitoring near the Former Eldorado Mill

In 2010 Golder monitored the results of packing boreholes and seeps. This was in the area located near the waste rock pile at the mill. It was reported that there was not any evidence of new seeps or boreholes that had begun to flow due to the temporary packing of boreholes in the area. It was concluded that the temporary packing had reduced contaminant loadings to the surrounding environment. Long-term monitoring was recommended, after the removal of the temporary packers and the installation of permanent seals on those boreholes.

February 2011: CanNorth Country Foods Study Year 1

The CanNorth Country Food Study was initiated in May 2010 as a two-year study with a primary objective of determining whether there were any potential human health risks from the consumption of country foods gathered in the area by Uranium City residents.

The focus of the Year 1 study was to gather information regarding the type, location, and the quantity of country foods the residents of Uranium City typically gather and consume. During the survey 115 residents of Uranium City were interviewed, representing approximately 91% of the year-round and seasonal community. The residents voluntarily provided a number of samples of wildlife and berries for analysis. The samples represent a good cross-section of the types of foods consumed by locals and a variety of sampling locations.

The country foods commonly harvested include moose, rabbit, spruce grouse, blueberries, raspberries, and Labrador tea although beaver, lynx, muskrat, porcupine, and bear were also reported to be consumed. Fish was primarily obtained from Lake Athabasca with lake trout, lake whitefish, and northern pike being the most commonly consumed. Hunting areas are normally accessed by roads and corridors such as the Bushell and Eldorado roads as well as power lines in the area, although some hunters may travel longer distances by water in the fall to hunt moose.

Year 1 of the CanNorth Country Food Study was completed in 2010 with the final report submitted to the regulators on Feb 22, 2011.

February 2011: Ace Bay 2010 White Sucker Spawning, Health, and Chemistry Study

In the spring of 2010 CanNorth was contracted to perform a white sucker spawning study in the vicinity of the Beaverlodge site. The main objective of this study was to document the age-class structure, sex-ratio and general condition of the spawning population of white sucker within Ace Creek of Beaverlodge Lake and compare them to reference areas. The concentrations of metals and radionuclides in lake trout and white sucker tissue were also investigated to assist in assessing the condition of the white sucker spawning populations.

The final report was submitted in February 2011.

February 2011: Site-Wide Borehole Assessment

In May of 2010 SRK Consulting (Canada) Inc. completed a flowing borehole investigation on the former Eldorado Beaverlodge properties. The intent of the investigation was to identify and record the location and condition of each borehole that exhibits the potential for artesian conditions in which groundwater associated with flooded underground workings could report to the surface.

As part of the investigation, a review of historical provincial exploration drill records was performed and field confirmation was conducted at each of the former Eldorado Beaverlodge properties for the presence/absence of exploration drill holes. Drill holes were characterized in terms of location, condition, and presence/absence of surface discharges. At the conclusion of this investigation there were 71 boreholes assessed. In addition, an identification system was developed with each borehole labeled in the field. The final report was submitted in February 2011.

February 2011: Ace Lake Watershed Hydrologic Assessment

In support of the approved management framework and to better understand the potential residual risk associated with the decommissioned properties upstream of Ace Lake, Golder Associates Ltd. was contracted to collect streamflow and water quality data from all known sources of surface flow into and out of Ace Lake.

The assessment found that the majority of the contaminant load to Ace Lake is through the upper Ace Creek watershed, which contains the former Dubyna mine site. Other less significant load contributions were measured from the Hab sub-watershed and Verna sub-watershed. The assessment showed that Ace Lake acts as a flow through system rather than as a sink or source of contaminants of concern such as uranium. Flow monitoring results showed that 2010 was an exceptionally dry year in northern Saskatchewan, which may have influenced flow regimes in the region.

Results from the assessment supported establishing a hydrometric monitoring station (AC-14). The final report was submitted to the regulators on February 14, 2011.

February 2011: Beaverlodge 2009 Aquatic Macrophyte Sampling Program

The purpose of this study was to complete a thorough assessment of research found on the aquatic macrophyte species in the Beaverlodge area. A comparison between aquatic macrophyte species in reference areas to those in areas of exposures was conducted. The information will be used in evaluating site specific transfer factors. This information could then be used to evaluate the potential risks that could come to wildlife species that would consume the aquatic macrophyte species.

April 2011: Ace Bay Sediment Characterization Report

The study was completed to identify the difference between the spatial and temporal concentrations of Se, U, and ^{226}Ra in Ace Bay sediments.

Spatially it was determined that elevated levels of Se, U, and ^{226}Raextend beyond Ace Bay into Beaverlodge Lake. Temporally, when comparing sediment horizon depth there was evidence of recovery in the upper horizons (CanNorth, 2011).

The other objective of this report was to assess the presence of PCBs in sediment along the shoreline of Ace Bay adjacent to the Fay Waste Rock Pile. Uranium City residents had raised concerns about the disposal of transformers during mining operation s into an industrial landfill located in the waste rock pile and were concerned that Ace Bay may be contaminated with PCBs. Sampling results showed no evidence of PCB contamination in Ace Bay.

November 2011: Beaverlodge Quantitative Site Model – Part A: Source Characterization and Dispersion Analysis

Senes Consultants completed a two part assessment with Part A being submitted in November 2011. The focus of Part A was to give background on the history of the Beaverlodge area, the water and sediment quality and chemistry, and the load data. This information all factored into the source model used in to predict how the environment would naturally recover.

January 2012: 2011 Ace Lake Water Balance

This was similar to the study that was conducted in 2010 monitoring the inflow and outflows of Ace Lake and the corresponding water chemistry.

January 2012: Results of Packed Borehole and Seep Monitoring near the Former Beaverlodge Eldorado Mine

The purpose of this report was to develop a mitigation plan that focused on the control of the outflow from six boreholes that were draining into Beaverlodge Lake. In 2009 there were temporary packers installed in the boreholes that flowed. Through monitoring in 2010 and

2011, it was found that the plugging of the boreholes did not result in additional boreholes flowing. In September 2011 the temporary packers were replaced by permanent filling of the boreholes. (Golder, 2012).

February 2012: Beaverlodge Quantitative Site Model – Part B: Pathways Assessment

This report was a continuation of Part A that was presented in November 2011. Part B focused on taking the information from Part A and assessing it using a pathway assessment model. This model was then used to assess the potential ecological and human health risks. In addition the model can be used to predict the expected benefits of implementing potential remedial options. The report in its entirety, the Beaverlodge Quantitative Site Model, was revised based on regulatory and stakeholder feedback and submitted on June 18, 2012.

March 2012: Costing Study – Potential Remedial Options

The purpose of this study was to evaluate and assess a cost estimate for remedial options at Beaverlodge. The focus was on the remediation efforts that could reduce the effects of the decommissioned mine on the surrounding environment. The cost estimate will be used to complete an as-low-as-reasonably-achievable (ALARA) analysis in the future.

As part of this submission SRK Consulting (Canada) Inc. performed an assessment of potential options for the diversions of surface flows at several former Eldorado properties in the Beaverlodge area. Field surveys were conducted from May 26 to June 4, 2010, and included ground-truthing of several possible diversion options.

June 2012: 2011 Beaverlodge Deep Basin Sediment Sampling

CanNorth conducted this study during September 15 to October 1, 2011. The focus of the study was to collect samples on water and sediment quality from Ace, Dubyna, Pistol, and Verna lakes. The intended purpose of this investigation is to present the methods and the raw data results of the sampling program. (CanNorth, 2012).

June 2012: 2011 Beaverlodge Aquatic Investigations in Beatrice and Pistol Lakes

The characterization of the water quality, sediment quality, benthic invertebrate community, and the fish community was the focus of this study. It was specific to Beatrice and Pistol lakes. The focus was on Pistol Lake because waste rock was placed into it during the mine's operation. Beatrice Lake is upstream from the Hab Mine and was not affected by the mining activities at Eldorado. (CanNorth, 2012).

June 2012: Uranium City Country Foods Study Year 2

The Country Foods Study Year 2 main objective was to collect information regarding country foods so that the Uranium City residents would know if it was safe to consume harvested country foods. The collection and analysis of a variety of country foods was completed. The Year 2 study was based upon the information gathered in Year 1, in terms of what types and how much of certain types of country foods the residents were consuming. The information from the lab analysis of the collected plant and animal specimens was then used to conduct a human health risk evaluation for the Beaverlodge area. The final conclusion of the study was that the consumption of country foods does not pose health risks to the residents of Uranium City. This report was submitted in June 2012.

3.8 Bolger Pit Waste Disposal

In February 2010 Cameco received approval from SMOE and the CNSC to use the Bolger Pit as a disposal location for loose debris encountered during inspection activities on the Beaverlodge sites. The Bolger Pit was selected as the disposal location as it was used by Eldorado Resources as a disposal area for similar materials during decommissioning.

A trench was excavated with dimensions of approximately 26 m long x 15 m wide x 1.5 m deep to dispose of any additional materials encountered during the clean-up of remaining debris on the Beaverlodge properties. A lockable gate at the entrance to the Bolger Pit was installed to control access to the area.

During the summer of 2011 during clean-up activities at Ace Upland and Ace Shaft areas an additional 30 m^3 of material was placed into the trench. The material placed in the trench consisted mainly of wood and wire collected from the remnants of the Ace Uplands tailings line, along with concrete pillars and hoist rope from the Ace Shaft area. No additional material was placed into Bolger Pit during the first six months of 2012.

4.0 ENVIRONMENTAL MONITORING PROGRAMS

Cameco retains a local contractor (Urdel Ltd.) to conduct the required water quality and radon sampling throughout the year. Employees from Urdel Ltd., while collecting samples, also perform cursory inspections and report any unusual conditions to Cameco.

4.1 Close-Out Objectives and Requirements

In 1982 Eldorado Nuclear Limited submitted a document which described their approach to decommissioning and reclamation of the Beaverlodge site (ENL June 1982). This document included proposed COOs. The AECB then issued close out requirements and objectives specific to the close-out of the Beaverlodge operation (AECB, 1982).

Table 4.1.1 provides a summary of the water quality COOs as originally established by the AECB in 1982 (AECB 1982). In the interest of completeness, the table also provides a summary of the most recent *Saskatchewan Surface Water Quality Objectives for the Protection of Aquatic Life* and *General Surface Water Quality Objectives* (Saskatchewan Environment, 2006), the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME, 2006), the *Saskatchewan Municipal Drinking Water Quality Objectives* (2002) and the *Guidelines for Canadian Drinking Water Quality* (Health Canada, 2007).

As indicated in Section 2.3.3 of Volume 5, *Plan for the Close-Out of the Beaverlodge Site*, (ERL 1983b) it is predicted that at Station TL-7, radium-226 (^{226}Ra) and total dissolved solids (TDS) will not meet the COOs at any point in the foreseeable future and uranium (U) concentrations are expected to meet the COOs only in the long term (i.e. >200 years). The estimated operational loadings are summarized in Table 4.1.2.

4.2 Transition-Phase Monitoring

Over the history of the transition-phase monitoring, the results of four separate monitoring programs have been evaluated to assess the performance of the closed-out site. These are water quality, ambient radon, air quality, and gamma radiation surveys.

As of 2011-2012 only two environmental monitoring programs continue

1. Water quality, and
2. Ambient radon.

The air quality monitoring program for dust fall and high volume sampling was discontinued following the third year of the transition-phase monitoring as sampling results met the established close-out objectives. The original gamma radiation surveys were completed in the first year of the transition phase (1985/86) and are now only conducted in specific areas in support of applications to release specific properties from decommissioning and reclamation.

The following sections summarize results for the water and ambient radon monitoring programs.

4.3 Water Quality Monitoring Program

This section discusses the summary results for water quality parameters of interest at 17 sampling stations from July 1982 to June 2012, where data is available. A revised water sampling program was approved by the CNSC and SMOE for implementation in 2011.

This section focuses on the four main parameters of concern: U, ^{226}Ra, TDS, and Se.

At Beaverlodge, selenium (Se) monitoring began at selected water stations in 1996. Prior to 1996 Se was not identified as a contaminant of concern at Beaverlodge. The SSWQO includes Se as well as U; there are no guidelines under the current SSWQO for ^{226}Ra or TDS. Where applicable, comparisons are also made with the original water quality modeling predictions made in 1983 (SENES 1983) and the revised predictions made in 2003 (SENES 2003).

Water samples were unable to be collected in 2011 for stations AC-6A, TL-3, TL-4, TL-6, and TL-9 due to a lack of flow. Water began to flow at these stations in 2012 following freshet. Sampling was discontinued in 2011 for AN-4 as per the revised water sampling program approved by the CNSC and SMOE. The scheduled sampling of AN-3 in 2010 and 2011 was unable to be completed due to a lack of water flow. The next upcoming scheduled sampling is in September 2012, thus there is no data for AN-3 available for the January 2011 to June 2012 reporting period.

The two watersheds affected by the historical mining activities are Ace Creek and Fulton Creek. Figure 4.3 provides an overview of the various stations at which water quality is monitored. Within the Ace Creek watershed the routine sampling stations (from upstream to downstream) include:

- **AN-5** - Pistol Creek below the decommissioned Hab mine site.
- **DB-6** - Dubyna Creek downstream of the decommissioned Dubyna mine site and before the creek enters Ace Creek upstream of Ace Lake.
- **AC-6A**- Verna Lake discharge to Ace Lake.
- **AC-8** - Ace Lake outlet to Ace Creek.
- **AC-14** - Ace Creek at the discharge into Beaverlodge Lake.

In May of 2010, Cameco began monitoring water quality at the Verna Lake discharge to Ace Lake. This station has been labelled as AC-6A, and is now part of the approved environmental monitoring program.

The Fulton Creek watershed contains the bulk of the decommissioned tailings deposited during operations. Within the Fulton Creek watershed the permanent, routinely sampled stations (from upstream to downstream) include:

- **AN-3** - Fulton Lake (represents un-impacted or background condition).
- **TL-3** - Discharge of Fookes Reservoir.
- **TL-4** - Discharge of Marie Reservoir.
- **TL-6** - Discharge of Minewater Reservoir (which flows into Meadow Fen).

- **TL-7** - Discharge of Meadow Fen upstream of Greer Lake.
- **TL-9** - Fulton Creek below the discharge of Greer Lake and before it enters Beaverlodge Lake.

Additional permanent sampling stations located downstream of the Beaverlodge site include:

- **BL-3** - Located in Fulton Bay, Beaverlodge Lake immediately opposite the Fulton Creek discharge.
- **BL-4** - Located in a central location within Beaverlodge Lake.
- **BL-5** – Outlet of Beaverlodge Lake.
- **ML-1** – Outlet of Martin Lake.
- **CS-1** – Crackingstone River at Bridge.
- **CS-2** – Crackingstone Bay in Lake Athabasca.

As part of the revised water sampling program, stations BL-5, ML-1, CS-1, and CS-2 were added while sampling of station AN-4, located in Martin Lake, was discontinued as a component of the environmental monitoring program moving forward.

Figures 4.3.1 to 4.3.3 are graphical representations of the historical annual average concentrations of U, ^{226}Ra, Se and TDS at each station. In the interest of completeness, where data collected during the final six years of operation (1977-1982) was available, it has also been included in the graphs.

Sections 4.3.1 to 4.3.2 cover the water quality results and trends at each of the water quality stations within each watershed. Trends are noted through visual interpretation of the graphs and include trends in the short term (less than 5 years) and in the long term-trends (10 to 30 years). For the purposes of this report, no statistical methods were applied in the discussion surrounding trends at each station.

Table 4.2.1 compares the mean concentrations over the 18 month period from January 2011 through June 2012 to the COOs. Operational and model predictions for the stations AC-14, TL-7, and BL-4 are presented in Table 4.3-1. Table 4.3-2 summarizes whether each station has met the COO in the current reporting year.

Total environmental loadings of U, ^{226}Ra, TDS, and Se to Beaverlodge Lake in 2011-2012 have been calculated and are reported in Tables 4.4.1 and 4.4.2. Loadings calculations and comparisons with the U, ^{226}Ra, and TDS revised predicted loadings at the shutdown of the facility are presented in Table 4.4.3 and summarized in Section 4.4.2.

Comparisons for Se loadings with the estimated operational loadings and predicted shutdown loadings are not possible, since Se was not monitored until after decommissioning.

The regional hydrology required to calculate the loadings is discussed in Section 4.4.2.

The detailed water quality results for the current reporting period, January 2011 to June 2012, are provided in Appendix A.

4.3.1 Ace Creek Watershed

AN-5

Station AN-5 is located in Pistol Creek downstream of the decommissioned Hab satellite mine (Figure 4.3). It is one of the four stations identified in the Eldorado decommissioning documents (Eldorado 1982) at which COOs are applied. During the 2011-12 reporting period, concentrations of U and TDS met their respective COOs while ^{226}Ra did not. The annual averages can be seen in Table 4.3.1-1.

Uranium values have shown seasonal fluctuation which affects the annual average resulting in the COO for U being met since 2009. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning.

The long-term trend for ^{226}Ra has shown considerable fluctuation, with values increasing slightly post decommissioning. In 2011 the average ^{226}Ra values decreased from 1.142 Bq/L in 2010 to 0.958 Bq/L. Further decrease has been seen in 2012 with an average concentration of 0.615 Bq/L.

As with U values, TDS concentrations exhibit seasonal fluctuation that affect the annual average; however, the long-term trend has remained relatively consistent and below the COO following decommissioning. This trend has continued for 2011 and 2012.

Selenium values at AN-5 have followed the short-term trend, continuing to meet the SSWQO of 0.001 mg/L since 2001.

All parameters, except for ^{226}Ra, are meeting the COOs for the current reporting period (Table 4.2.1). A historical summary of U, ^{226}Ra, TDS and Se concentrations at AN-5 are presented in Figures 4.3.1-1 to 4.3.1-4.

DB-6

Station DB-6 is located in Dubyna Creek, downstream of Dubyna Lake and the decommissioned Dubyna satellite mine, before the creek enters Ace Creek, upstream of Ace Lake (Figure 4.3). It is one of the four stations identified in the Eldorado decommissioning document (Eldorado, 1982) at which COOs are applied.

All parameters were at or below the established COOs during the 2011-12 reporting period at this station.

Uranium concentrations at DB-6 are currently below the COO for the first portion of 2012 and have shown a steadily decreasing trend in the long term, with U levels meeting the COO in five of the last seven years. The average for the first six months of 2012 is 0.214 mg/L. Efforts have been made in 2011 and 2012 to plug three flowing boreholes identified in Dubyna Lake. With these boreholes now plugged it is anticipated that U concentrations in Dubyna Lake should continue to decrease.

The long-term trend for ^{226}Ra and TDS at DB-6 has been consistent, with annual averages for ^{226}Ra and TDS meeting the COOs since 1981 and 1983 respectively. Concentrations of these parameters recorded during the 2011-2012 reporting period are consistent with the long-term trend.

The short-term trend for Se at DB-6 has remained consistent, meeting the SSWQO since 2002.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station DB-6 are presented in Figures 4.3.1-5 to 4.3.1-8. The annual averages for 2007 to 2010 compared to this current reporting period can be seen in Table 4.3.1-2.

AC-6A

AC-6A is located at the discharge of Verna Lake to Ace Lake (Figure 4.3). Water quality monitoring at this station began in May 2010; however, due to low flow only the May 2010 sample was able to be collected. The station was dry in 2011 and no water samples were able to be collected or analysed. There is no data available prior to 2009 or for 2011. A water sample was collected in 2012 showing results consistent with results seen in 2010. This can be seen presented in Table 4.3.1-4 or detailed results per sample date in Appendix A.

As station AC-6A was added to the water sampling program in 2010, there is not enough data to assess trends. The data is presented graphically in Figures 4.3.1-9 to 4.3.1-12.

AC-8

Station AC-8 is located at the discharge of Ace Lake into Ace Creek. Ace Lake is the receiving environment for waters discharged from DB-6, AN-5 and AC-6A (Figure 4.3). Annual averages for 2007 to 2010, as well with the averages from the current reporting period, can be found in Table 4.3.1-3. Long-term trends for concentrations of U and TDS have remained relatively stable at this station since 1982. The long term-trend for ^{226}Ra has shown a decrease in the annual concentrations at this station.

Selenium only recently became a part of the routine monitoring program at AC-8, in August of 2009. As a result, there are not enough data points to confidently discuss trends with respect to the long term; however, Se concentrations are below the SSWQO.

A historical summary of U, ^{226}Ra, TDS, and Se annual average concentrations for station AC-8 are presented in Figures 4.3.1-13 to 4.3.1-16.

AC-14

AC-14 is located in Ace Creek at the discharge into Beaverlodge Lake (Figure 4.3). It is one of the four stations identified in the Eldorado decommissioning document (Eldorado 1982) at which COOs are applied. The long-term trend for annual average concentrations of U and TDS measured at this station have been consistent with concentrations below the COOs since the decommissioning of the Beaverlodge mine/mill complex. Concentrations of ^{226}Ra remained above the COOs until 1990-91, however; the long-term trend has shown concentrations near or below the objective since 1991.

During the 2011-2012 reporting period, U, ^{226}Ra, and TDS were below the COOs, while Se was below the SSWQO. Annual average concentrations from 2007 to 2010, with the averages for 2011 and the first six months of 2012 can be found in Table 4.3.1-5.

Modeling conducted for Eldorado Nuclear Ltd. during the original decommissioning established estimated concentrations for three parameters (SENES 1983). During the 2011-2012 monitoring period the annual average U, ^{226}Ra and TDS concentrations at AC-14 were all less than the COOs.

Uranium concentrations remained steady for the 2011-2012 reporting year as compared to previous years. The ^{226}Ra had increased to 0.072 Bq/L for 2011, but has dropped to 0.042 Bq/L for the first half of 2012. TDS remained under the COO and Se is still under the SSWQO at a consistent concentration of 0.0002 mg/L since 2008.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station AC-14 are presented in Figures 4.3.1-17 to 4.3.1-20.

4.3.2 Fulton Creek Watershed

AN-3

AN-3 is located at the outflow of Fulton Lake prior to Fookes Reservoir and was not impacted by mining activities in the area (Figure 4.3). Water quality at this station is typical of background water quality in the region. Since 1986, sampling has been on an annual basis. Due to low flows in the region, samples were not able to be collected in 2010 or 2011. There is no data yet for 2012, as the sampling is not scheduled until September.

As expected with a reference location, the long-term trend for concentrations of U, TDS, Se and ^{226}Ra recorded at AN-3 have remained relatively stable and below the SSWQO. Selenium concentrations at AN-3 have been at or below detectable laboratory limits since routine analysis began in 2000.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station AN-3 are presented in Figures 4.3.2-1 to 4.3.2-4. The annual average values are also presented in Table 4.3.2-1 for the years of 2007 to 2009.

TL-3

TL-3 is located at the discharge of Fookes Reservoir and is the first sampling location in the recovering tailings management system area (Figure 4.3). Water had not been flowing at TL-3 since May 2010, until freshet in the spring of 2012.

Overall, the long-term trend for mean concentrations of U, TDS, and Se has shown a decrease since 1990. The long-term trend for ^{226}Ra has remained relatively consistent post-decommissioning.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-3 are presented in Figures 4.3.2-5 to 4.3.2-8. The annual averages from, 2007 to 2010, and the average for the current reporting period can be found in Table 4.3.2-2.

TL-4

TL-4 is located within Fulton Creek drainage downstream of TL-3 and at the discharge of Marie Reservoir (Figure 4.3). Water had not been flowing at TL-4 since October 2010, thus there is no data available for the latter part of 2010 and for all of 2011. Water began flowing in the spring of 2012.

Annual concentrations of U and TDS at TL-4 have shown a considerable decrease over the long term, while Se and ^{226}Ra have remained relatively consistent.

The 2010 annual average concentrations for U, ^{226}Ra, TDS, and Se are slightly elevated in comparison to 2009 levels; however, concentrations are consistent with the observed short-term trend. The average for the first half of 2012 shows a slight decrease for U, TDS, and Se. The comparison of these numbers can be seen in Table 4.3.2-3.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-4 are presented in Figures 4.3.2-9 to 4.3.2-12.

TL-6

TL-6 is located at the discharge of Minewater Reservoir which was used for tailings deposition in 1953 and settling of treated mine water during the last 10 years of Beaverlodge mill operations (Figure 4.3). This water station generally exhibits ephemeral flows. As a result, only one sample was collected in 2010, with no water collected in 2011. Samples have been collected in 2012. The long-term trend for U and TDS at TL-6 showed a sharp decrease in concentrations post-decommissioning. The long-term trend for annual concentrations of ^{226}Ra has shown considerable fluctuation over the past fifteen years ranging from 1.3 Bq/L in 1996 to 5.6 Bq/L in 2010. In the 2012 average thus far ^{226}Ra is measured at 4.5Bq/L. During the same time period, concentrations of sulphate have been decreasing while barium has demonstrated a trend similar to that observed in ^{226}Ra. Cameco has hypothesized that this is a result of dissolution of the barium-radium-sulphate precipitate that was generated during the active treatment of minewater with barium chloride during operations. The annual average concentrations for 2008 to 2010 and the current reporting period can be found in Table 4.3.2-4.

Monitoring of Se at TL-6 was initiated in 1996, with concentrations fluctuating until 2004. As with U and TDS, the short-term trend for Se concentrations has stabilized in recent years.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-6 are presented in Figures 4.3.2-13 to 4.3.2-16.

TL-7

TL-7 is located at the discharge of Meadow Fen (Figure 4.3). It is one of the four stations identified in the Eldorado decommissioning document (Eldorado 1982) at which COOs are applied. During the 2011-2012 reporting period, none of the parameters met the numerical COOs established for this station, although recent U results have been approaching the COO.

The original predictions made in SENES 1983 indicated that U concentrations were expected to meet the COOs in the long term (more than 200 years), while TDS and ^{226}Ra were not expected to meet COOs at any point in the foreseeable future.

As observed with stations TL-3, TL-4 and TL-6 mean annual U concentrations have shown a decreasing long-term trend since 1990. The 2011 average concentration for U was 0.197 mg/L, which is below the COO; however the first six months of 2012 has seen a return to more historical concentrations at 0.282 mg/L. The annual averages for 2007 to 2010, and the current reporting period can be found in Table 4.3.2-5.

While the annual average for ^{226}Ra has been increasing overall since 1984, the 2011 value was the lowest ^{226}Ra concentration since 2000. The short-term trend for ^{226}Ra has shown fluctuations in concentration; however, the 2011 value is lower than recorded in the previous several years and this is similar with the 2012 average thus far.

The long-term trend for TDS at TL-7 has been stable over the last 10 years. TDS was above the COO of 250 mg/L in 2010 and 2011, but in 2012 is below the objective. Selenium concentrations at TL-7 have been stable with minor fluctuations. A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-7 are presented in Figures 4.3.2-17 to 4.3.2-20.

TL-9

TL-9 is located downstream of Greer Lake immediately before the water enters Beaverlodge Lake. Sampling at this station began in 1981 and continued until 1985 at which time it was discontinued. Sampling resumed in 1990 in order to re-assess the water quality entering Beaverlodge Lake. There had not been any water flowing at TL-9 since May 2010, and it just began to flow again in 2012. Average concentrations for TL- for 2007 to 2010, compared to 2012, can be found in Table 4.3.2-6.

The long-term trend for U at TL-9 has shown a decrease in concentrations following decommissioning. Concentrations in the short term have been stable, with a decrease in U from 0.48 mg/L and 0.37mg/L, from 2010 to 2012.

Radium concentrations have seen an overall increasing trend since 1990 and displayed some fluctuation throughout the past twenty years.

Concentrations of TDS have shown a decreasing trend in the long term. Annual average TDS concentration has been consistent in the short term, with a slight increase observed in 2010.

The 2012 average followed the decreasing trend recording at 243mg/L as compared to the 2010 average of 308 mg/L.

Routine monitoring of Se at TL-9 was not conducted until 1996 at which time it was identified as a contaminant of concern. As with U and TDS, Se had shown a decreasing trend over the long term. The Se value for 2012 has increased from the 2010 average of 0.0048mg/L to 0.0087 mg/L. These values are both above the SSWQO.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-9 are presented in Figures 4.3.2-21 to 4.3.2-24.

4.3.3 Other Transition Phase Monitoring Stations

BL-3

BL-3 is located in Beaverlodge Lake, approximately 100 m from the Fulton Creek discharge (TL-9) (Figure 4.3). Sampling at this station was originally carried out during the operational mining and milling phase in order to monitor the near-field impacts of operations on Beaverlodge Lake.

Post-decommissioning collection of samples at this location commenced during the 1998-99 reporting period, and has continued since that time. Sampling frequency increased from semi-annual to quarterly in 2004-05 in order to better assess the conditions in Beaverlodge Lake.

The long-term trend for annual average concentrations of U, TDS and Se at BL-3 has remained relatively consistent from 1998 to June 2012. Concentrations of ^{226}Ra have trended downward over the past seven years, from a value of 0.1 Bq/L in 2003 to the most recent value of 0.02 Bq/L.

Concentrations of Se are typically around 0.003 mg/L and are elevated above the SSWQO.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station BL-3 are presented in Figures 4.3.3-1 to 4.3.3-4. Table 4.3.3-1 displays a comparison between the 2007-2010 average concentrations and the current reporting period averages.

BL-4

Station BL-4 is located in the approximate center of the north end of Beaverlodge Lake (Figure 4.3). The sampling frequency was increased from semi-annual to quarterly in 2004-05 in order to better reflect any potential changes or trends. Following approval of the revised water sampling program, semi-annual sampling was resumed in 2011 at BL-4.

The long-term trend for U and ^{226}Ra at BL-4 has shown an overall decreasing trend, while TDS has been relatively consistent. Se concentrations have fluctuated over the long term; however, the recent short-term trend has remained stable. All of the measured parameters and their average concentrations at BL-4 for 2007 to 2010, and the current period can be found in Table 4.3.3-2.

Historical sampling results are presented in Figures 4.3.3-5 to 4.3.3-8.

BL-5

Station BL-5 is located at the Beaverlodge Lake outlet (Figure 4.3). It was implemented in the revised water sampling program in January 2011 in order to provide a point of reference to compare upstream Beaverlodge Lake water quality and downstream Martin Lake water quality. As a result, there is only data for 2011 and the first portion of 2012. Previous reporting period averages were not available for BL-5, so the average concentration for 2011 and 2012 are listed in Table 4.3.3-3.

Both U and Se exceed the SSWQO at BL-5. Discussion of trends is not yet appropriate since the only data available is for 2011 and the first half of 2012. The data is presented graphically in Figures 4.3.3-9 to 4.3.3-12.

ML-1

Station ML-1 is located at the outlet of Martin Lake. Sampling of this station began in 2011, thus there is no data available prior to this.

For the 2011 reporting period, both U and Se were above the SSWQO. Discussion of trends is not yet appropriate since the only data available is for 2011 and the first half of 2012. A table comparing the average concentrations for all measured parameters between 2011 and 2012 can be found on Table 4.3.3-4.

The data is presented graphically in Figures 4.3.3-13 to 4.3.3-16.

CS-1

Station CS-1 is located at the outlet of Martin Lake near the bridge in Crackingstone River (Figure 4.3). Its purpose is to monitor water quality downstream from Uranium City. This station was implemented as part of the water sampling program in January 2011 with the first sampling scheduled in September 2011. Due to the reporting period of this report being from January 2011 to June 2012, there is only one set of data for CS-1.

The U concentration was measured at 0.047 mg/L, while the ^{226}Ra activity was measured to be 0.005 Bq/L. The figures for CS-1 can be found in the figures section under Figure 4.3.3-17 to 4.3.3-20. Selenium was measured to be 0.0003mg/L, while TDS was 135 mg/L.

CS-2

Station CS-2 is located at the inlet of Crackingstone Bay in Lake Athabasca (Figure 4.3). As with station CS-1, station CS-2 is newly implemented and therefore the only data thus far is from 2011. The U concentration average for 2011 was 0.0003 mg/L which is below the SSWQO for U of 0.015mg/L. The average ^{226}Ra activity in 2011 was 0.005 Bq/L. In addition the Se concentration was below the SSWQO value, measured to be 0.0001 mg/L. The measured parameters and their average concentrations can be seen in Table 4.3.3-6. Figures 4.3.3-21 to 4.3.3-24 also presents the U, Se, ^{226}Ra, and TDS trends.

4.4 Air Quality

Section 4.5 presents a summary of the results of historic and on-going radon monitoring at ten separate locations in and around the mill site, various satellite areas and at Uranium City.

4.4.1 Ambient Radon Monitoring

As part of the transitional phase ongoing monitoring program, radon levels have been monitored on and around the Beaverlodge mine and mill site and at other locations in the region since 1985. The sampling regime uses Terrace, track-etch type radon gas monitors (Tech/Ops Landauer Inc. Glenwood, Illinois). Monitors are collected and replaced semi-annually from ten stations established throughout the area.

The ten radon monitoring stations are illustrated in Figure 4.4.1 and are located in the following areas:

- Airport Beacon
- Eldorado Town Site
- Northwest of the Airport
- Ace Creek
- Fay Waste Rock Pile
- Fookes Delta
- Marie Lake Delta
- Donaldson Lake
- Fredette Lake
- Uranium City.

Track-etch cups were set out at ten stations in the Beaverlodge area from January 2011 and collected in July 2011 to track radon for that time period. The track-etch cups were then set out again from July 2011 to January 2012. Table 4.5.1 presents a summary of the radon monitoring conducted at the ten sites for the 2011-2012 monitoring period and compares it to the previous four years data. Although the entire suite of stations monitored in 1982 is not applicable for comparison to the current monitoring results, applicable stations have been included in the summary.

4.5 Hydrology

4.5.1 Introduction

MacLaren Plansearch initially estimated the stream flows for various locations within the Ace Creek and Fulton Creek drainage basins in 1983 (MacLaren Plansearch 1983) as part of the Eldorado Resources Ltd. decommissioning documentation. During the 1996-97 reporting period revisions were made to both the Ace Creek and Fulton Creek stream flow estimates using 10 years of actual flow.

A review of post closure monitoring was conducted using data from 1983 to 1996, and confirmed the 1983 estimates were low. A re-assessment of the hydrology in the Beaverlodge area was subsequently conducted as part of the *Current Period Environmental Assessment* (Connor Pacific 1999).

In summary, the original (1983) streamflow for the predicted shut down and reclamation scenarios (SENES 1983) were:

- 150 L/s at AC-14
- 7.5 L/s at TL-7

The revised (TAEM 1997) streamflow predictions were:

- 426 L/s at AC-14
- 16 L/s at TL-7

Table 4.1.2 summarizes the original (1983) loading calculations and compares them to the revised loadings, which were derived using the revised (1997) streamflow data.

4.5.2 Hydrological Data and Loading Calculations

McElhanney Consulting Service Ltd. was retained by Cameco to complete an assessment of the stage and flow data for stream flow monitoring stations at Fulton Creek (TL-7) and Ace Creek (AC-8) for the period January 1, 2011 to June 30, 2012. The report can be found in Appendix C.

At AC-8, spring runoff waters were measured at the highest recording value for the past seven years. According to the McElhanney report, TL-7 appears to be recovering from a drought period, which will result in the storage areas connected to this system recharging.

As seen in Table 4.4.2, there was an increase in loading concentration from the measurements in 2011 compared to the first six months of 2012. At AC-14 the U loadings for all of 2011 were 2.25×10^2 mg/L and for the first six months the measured loadings were 3.25×10^2 mg/L. The stream flow is responsible for this increase within the first six months of 2012. The May stream-flow discharge at AC-14 was 2565 L/s as compared to the May discharge in 2011 of 299 L/s. The increased flows seen during freshet in May 2012 were due to the higher than normal snowpack observed in the Uranium City area. Increased flow was also noted at TL-7 but not to the same degree. The monthly loadings for TL-7 can be found in Table 4.4.1.

The two tables present a summary of the monthly loading calculations for U, ^{226}Ra and TDS at TL-7 and AC-14, respectively, as well as the annual loading calculations for Se.

Using the monthly water quality monitoring data for AC-14 and TL-7 along with the corresponding stream flow data for Ace Creek and Fulton Creek the total loading of U, ^{226}Ra, Se and TDS can be calculated. The total loading from the former Eldorado properties to

Beaverlodge Lake can then be calculated by adding both Ace Creek and Fulton Creek loadings, for each parameter.

Tables 4.4.1 and 4.4.2 present a summary of the monthly loading calculations for U, ^{226}Ra and TDS at TL-7 and AC-14, respectively, as well as the annual loading calculations for Se.

As detailed previously, revised estimates were completed in 1997 using site-specific flow information. Table 4.4.3 provides a comparison of the 2011-2012 loadings at each of the two stations and the site total, to the revised loadings predicted for various reclamation scenarios.

Loadings Summary

Table 4.4.3 provides a summary of the total 2011 and January-to-June 2012 loadings to Beaverlodge Lake, as well as those of AC-14 and TL-7. Figures 4.4.1 to 4.4.3 present the revised total loadings to Beaverlodge Lake during operations for comparison. The loading requirement identified at decommissioning states "*annual radioactive and non-radioactive contaminant loadings to the environment would not be greater after close-out than those which occurred during operations" (Eldorado 1983).* A review of this data shows the loading requirement for of U, ^{226}Ra and TDS to Beaverlodge Lake was met during the 2011 monitoring period

4.6 Five-Year Inspection of the Marie Reservoir Outlet structure and the Fookes Delta and Outlet Structure

The next third-party inspection of Marie Reservoir outlet structure and the Fookes Delta and outlet structure will occur in 2016.

Annual inspections of the Marie and Fookes Reservoir outlet structures and Fookes Delta are completed by Cameco during the JRG inspection and the results are provided in Appendix C of this document.

5.0 2012 – 2013 OUTLOOK

As this report was prepared in June 2012, this section describes those tasks proposed for the remainder of the year. A detailed list of studies and activities conducted from January 1, 2011 to June 30, 2012 are presented in Section 3.0.

5.1 Regular Scheduled Monitoring

Representatives of Cameco continue to complete the established monitoring program associated with the various properties for:

- Water
- Radon in air
- Hydrology

5.2 Planned Public and AEQC Meetings

An AEQC meeting is scheduled for Uranium City in September 2012. This meeting will be used to share information regarding the Beaverlodge site with the AEQC and Uranium City residents.

Each year in the first week of June Cameco hosts a public meeting in Uranium City to review the results of any activities completed since the previous meeting and to review the plans for the upcoming year, including any activities or planned studies that are to be completed.

5.3 Planned Regulatory Inspections

The JRG conducts an annual inspection of the Beaverlodge properties in conjunction with the annual Uranium City public meeting. The regulatory inspection involves travelling to the Beaverlodge properties and checking that conditions remain in a safe and stable condition. In addition there is follow-up to activities stemming from previous inspection recommendation to confirm that the activity was completed to the satisfaction of the regulatory agencies.

As discussed in Section 4.6 annual inspections of the Marie and Fookes Reservoir outlet structures and Fookes Delta are completed by Cameco during the JRG inspection and the results are provided in a report format as Appendix C of this document.

5.4 2013 Work Plan

Cameco is preparing a path forward workplan which will describe the site activities required to address residual human health and ecological risk while demonstrating conditions on the properties are stable and/or improving. The workplan, once developed, will be vetted through the JRG and reviewed with local and regional stakeholders. Ultimately, the Beaverlodge properties are being managed for acceptance into the provincial IC program, and future works undertaken will support the management framework established to move towards this goal.

The following is a list of activities planned for 2013.

Beaverlodge - Status of Environment (SOE) Report

Preparation of the SOE will be completed in 2013. The SOE is a summary report describing the results of all monitoring and special studies completed over a five-year period. For this SOE all data and studies completed from 2008 through 2012 will be included.

Release of 12 Zone and Martin Lake Adits

Cameco intends to submit documentation to support transferring Eagle 12 Zone and the Martin Lake adits to the provincial IC program.

Site Wide Gamma Monitoring

Cameco intends to complete a site-wide gamma scanning program to quantify residual site specific gamma levels. The results of this monitoring will be used to determine if additional site specific remediation is warranted. In addition, a detailed gamma survey of site specific areas will be required prior to transferring properties to the IC program.

Ace Creek Watershed Hydrologic Monitoring

This program will continue the monitoring that has been carried out since 2010 to improve the understanding of the flows originating in the various sub-watersheds feeding Ace Creek. This information is used to update the pathways model predictions for the Ace Creek area.

Borehole Monitoring

Flowing boreholes identified near the Fay Waste Rock Pile and along Dubyna Lake shoreline were permanently sealed in 2011 and 2012. This follow-up monitoring program is to check that these boreholes remain sealed and that no additional flows are observed.

In order to provide additional confidence that boreholes in the area do not begin flowing, all boreholes identified during the Site Wide Borehole Assessment conducted in 2010 will be filled with grout.

Shaft Cover Assessment

At each of the sites associated with the Beaverlodge properties, all vertical raises (ventilation and mine shafts) will need to be located and assessed for structural stability. Eventually each vertical opening will require the implementation of an engineered plan and proper documentation prior to the site being eligible for transfer to the IC program.

6.0 REFERENCES

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TABLES

TABLES

Table 4.1.1
Summary of Applicable Water Quality Objectives

Parameter	Units	Close Out Objectives[1]	SSWQO For the Protection of Aquatic Life[2]	Canadian Water Quality Guidelines for the Protection of Aquatic Life[3]	Saskatchewan Municipal Drinking Water Quality Objectives[4]	Guidelines for Canadian Drinking Water Quality[5]
Ammonia, Total	mg/L	-	-	1.37 at pH 8.0:10°C 2.20 at pH 6.5:10°C	-	-
Arsenic	mg/L	0.01	0.005	0.005	0.025	0.01
Barium	mg/L	-		-	1	1
Cadmium	mg/L	-	0.017 at [$CaCO_3$]=0-48.5 µg/L 0.032 at [$CaCO_3$]=48.5-97 µg/L 0.058 at [$CaCO_3$]= 97-194 µg/L 0.10 at [CaCo3] >194 µg/L	$10^{\{.86[\log(hardness)]-3.2\}}$	0.005	0.005
Chromium	mg/L	-	0.001 (Cr VI)	Cr(III) 0.0089 Cr(VI) 0.001	0.05	0.05
Copper	mg/L	0.02	0.002 at [$CaCO_3$]=0-120 mg/L 0.003 at [$CaCO_3$]=120-180 mg/L 0.004 at [$CaCO_3$] >180 mg/L	0.002 at [$CaCO_3$]=0-120 mg/L 0.003 at [$CaCO_3$]=120-180 mg/L 0.004 at [$CaCO_3$] >180 mg/L	1	1
Iron	mg/L	0.3	0.3	0.3	0.3	0.3
Lead	mg/L	0.05	0.001 at [$CaCO_3$]=0-60 mg/L 0.002 at [$CaCO_3$]=60-120 mg/L 0.004 at [$CaCO_3$]=120-180 mg/L 0.007 at [$CaCO_3$] >180 mg/L	0.001 at [$CaCO_3$]=0-60 mg/L 0.002 at [$CaCO_3$]=60-120 mg/L 0.004 at [$CaCO_3$]=120-180 mg/L 0.007 at [$CaCO_3$] >180 mg/L	0.01	0.01
Mercury	mg/L	-	0.000026	0.000026	0.001	0.001
Nickel	mg/L	-	0.025 at [$CaCO_3$]=0-60 mg/L 0.065 at [$CaCO_3$]=60-120 mg/L 0.110 at [$CaCO_3$]=120-180 mg/L 0.150 at [$CaCO_3$] >180 mg/L	0.025 at [$CaCO_3$]=0-60 mg/L 0.065 at [$CaCO_3$]=60-120 mg/L 0.110 at [$CaCO_3$]=120-180 mg/L 0.150 at [$CaCO_3$] >180 mg/L	-	-
pH	-	6.5 – 9.5	-	6.5 – 9.0	6.5 – 9.0	6.5 – 8.5
Radium 226	Bq/L	0.11	-	-	-	-
Selenium	mg/L	-	0.001	0.001	0.01	0.01
Silver	mg/L	-	0.0001	0.0001	-	-
TDS	mg/L	250	-	-	1500	500
TSS	mg/L	BkGd + 10	-	-	-	-
Uranium	mg/L	0.25	0.015	-	0.02 (Amended 2002)	0.02
Zinc	mg/L	0.05	0.03	0.03	5	5

1 Close Out Objectives, Atomic Energy Control Board, 1982
2 Saskatchewan Surface Water Quality Objectives for the Protection of Aquatic Life, Interim Edition, 2006.
3 Canadian Water Quality Guidelines for the Protection of Aquatic Life, CCME, 2006
4 Saskatchewan Drinking Water Quality Standards and Objectives EPB207/2002, 2002.
5 Guidelines for Canadian Drinking Water Quality, Health Canada, 2007.

Table 4.1.2
Predicted Loadings to Beaverlodge Lake During Operation

Parameter	Total Loadings	
	1983 Estimate	Revised Estimate (1998)
Uranium (kg/year)	12,000	16,000
Total Dissolved Solids (kg/year)	5,000,000	6,240,000
^{226}Radium (Bq/year)	1.74×10^{8}	27.3×10^{8}

Table 4.2.1
January 2011 – June 2012 Average versus Close-Out Objectives

Parameter	Unit	AC-14	AN-5	DB-6	TL-7	TL-9[1*]	Close-Out Objective
Arsenic	*(µg/L)*	0.2	0.4	0.1	1.3	1.6	**10**
Barium	*(mg/L)*	0.026	0.137	0.050	0.282	0.605	**1**
Copper	*(mg/L)*	0.001	0.001	0.001	0.001	0.002	**0.02**
Iron	*(mg/L)*	0.068	0.26	0.013	0.145	0.027	**0.3**
Nickel	*(mg/L)*	0.00021	0.00052	0.00020	0.00068	0.00045	**0.05**
Lead	*(mg/L)*	0.0005	0.0002	0.0001	0.0004	0.0011	**0.025**
Radium 226	*(Bq/L)*	0.061	0.843	0.033	0.744	2.750	**0.11**
TDS	*(mg/L)*	86.94	175.17	163.88	285.56	243.00	**250**
TSS	*(mg/L)*	1.235	3.667	1.125	1.222	1.000	**Background + 10**
Uranium	*(µg/L)*	34.7	151.3	238.1	225.3	370.0	**250**
Zinc	*(mg/L)*	0.002	0.002	0.001	0.001	0.002	**0.05**

1-Close-out Objectives were not specified for TL-9, however it is included as it is located at the discharge of the decommissioned tailings management area, immediately before the water enters Beaverlodge Lake.

*- This average is from January 2012 to June 2012 only, due to there being no water at TL-9 in 2011.

Table 4.3 – 1
Operational and Predicted Water Quality Values

Scenario	Ace Creek (AC14)			Meadow Lake (TL7)			Beaverlodge Lake (BL4)		
	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)
Operation Phase	0.65	0.22	174	4.06	0.44	1793	0.2	0.11	150
Predicted at Shutdown	0.035	0.06	129	3.16	0.53	1130	0.2	0.11	150
Minimum Reclamation (Long Term Predicted*)	0.035	0.06	129	0.1	0.38	389	0.03	0.06	128
Maximum Reclamation (Long Term Predicted*)	0.03	0.06	125	0.1	0.27	414	0.03	0.06	127

* Long term indicates a 200 year time period.

Table 4.3 – 2
Transition Phase Monitoring – Year 26 (January 2011-June 2012)

	AC14	***AN5***	***DB6***	***TL-7***	***AC14***	***TL-7***	***BL4***
	Close Out Objective Concentration				***Model Long Term* Concentration Predicted at Shutdown v. Actual Results***		
Parameter	Met	Met	Met	Met	Met	Met	Met
Arsenic	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Barium	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Copper	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Iron	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Nickel	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Lead	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Radium-226	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**Y**
TDS	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**
TSS	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**
Uranium	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**
Zinc	**Y**	**Y**	**Y**	**Y**	**-**	**-**	**-**

Y – Yes **N** – No

* Long term indicates a 200 year time period.

Table 4.3.1 – 1 AN-5 Summary Statistics and Comparison to Historical Results
Hab Site - upstream of confluence of Hab and Pistol creeks

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	281	287	195	313	260	4	249	2
pH-L (pH Unit)	7.82	7.77	7.66	7.60	7.51	4	7.67	2
TSS (mg/L)	1.167	5.833	2.000	2.167	4.750	4	1.500	2
Major Ions								
Alk-T (mg/L)	121.7	135.2	88.2	145.3	115.3	4	112.5	2
Ca (mg/L)	39.7	40.8	27.0	43.0	35.8	4	35.5	2
Cl (mg/L)	1.38	1.37	0.74	1.68	1.25	4	1.40	2
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.0	4	1.0	2
Hardness (mg/L)	136	142	95	150	125	4	122	2
HCO3 (mg/L)	150.2	164.7	107.8	177.7	140.5	4	137.5	2
K (mg/L)	1.4	1.9	1.4	2.0	1.7	4	1.6	2
Mg (mg/L)	9.5	9.7	6.7	10.3	8.7	4	8.0	2
Na (mg/L)	5.3	5.2	3.2	6.0	4.8	4	4.5	2
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	4	1.0	2
SO4 (mg/L)	25.5	18.3	14.5	18.2	17.8	4	17.0	2
Sum of Ions (mg/L)	193	242	161	259	211	4	205	2
TDS (mg/L)	190.33	185.33	136.60	204.33	183.75	4	158.00	2
Metals								
As (µg/L)	0.3	0.5	0.3	0.5	0.4	4	0.3	2
Ba (mg/L)	0.167	0.167	0.115	0.178	0.148	4	0.116	2
Cu (mg/L)	0.001	0.002	0.001	0.001	0.001	4	0.002	2
Fe (mg/L)	0.219	0.447	0.180	0.557	0.287	4	0.185	2
Mo (mg/L)	-	-	-	0.003	0.003	4	0.004	2
Ni (mg/L)	0.00100	0.00100	0.00055	0.00052	0.00047	4	0.00060	2
Pb (mg/L)	0.0020	0.0020	0.0001	0.0003	0.0001	4	0.0003	2
Se (mg/L)	0.0002	0.0001	0.0002	0.0001	0.0001	4	0.0001	2
Zn (mg/L)	0.005	0.005	0.001	0.003	0.002	4	0.002	2
Nutrients								
NH3-N (mg/L)	-	-	-	0.06	0.08	1	-	0
NO3 (mg/L)	-	-	-	0.04	0.05	4	-	0
P-(TP) (mg/L)	-	-	-	0.03	0.01	1	-	0
Radionuclides								
Pb210 (Bq/L)	0.13	0.11	0.03	0.06	0.02	1	-	0
Po210 (Bq/L)	0.050	0.053	0.020	0.035	0.009	1	-	0
Ra226 (Bq/L)	0.695	1.015	0.762	1.142	0.958	4	0.615	2
U (µg/L)	277.0	294.5	109.0	184.8	140.5	4	173.0	2
Organics								
C-(org) (mg/L)	-	-	-	12.000	11.000	1	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-Parameter was not analyzed.

Table 4.3.1 – 2 DB-6 Summary Statistics and Comparison to Historical Results
Dubyna Lake discharge at culvert

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	225	224	218	232	240	5	237	3
pH-L (pH Unit)	7.95	7.96	7.85	7.80	7.76	5	7.72	3
TSS (mg/L)	1.200	1.000	1.000	1.000	1.000	5	1.333	3
Major Ions								
Alk-T (mg/L)	85.3	84.3	85.5	87.0	90.4	5	91.0	3
Ca (mg/L)	35.2	35.5	34.8	37.0	38.2	5	37.3	3
Cl (mg/L)	0.80	0.65	0.65	0.66	0.74	5	0.73	3
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.0	5	1.0	3
Hardness (mg/L)	111	112	109	116	120	5	116	3
HCO3 (mg/L)	104.0	102.8	104.3	106.2	110.2	5	111.0	3
K (mg/L)	0.6	0.8	1.0	1.0	0.9	5	0.9	3
Mg (mg/L)	5.7	5.7	5.3	5.8	6.0	5	5.6	3
Na (mg/L)	2.2	2.3	2.1	2.2	2.2	5	2.1	3
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	5	1.0	3
SO4 (mg/L)	28.2	27.8	25.5	28.4	28.8	5	27.3	3
Sum of Ions (mg/L)	174	175	174	181	187	5	185	3
TDS (mg/L)	153.40	153.25	150.33	157.60	167.00	5	158.67	3
Metals								
As (µg/L)	0.1	0.1	0.1	0.1	0.1	5	0.1	3
Ba (mg/L)	0.047	0.046	0.047	0.047	0.051	5	0.049	3
Cu (mg/L)	0.001	0.002	0.001	0.001	0.001	5	0.001	3
Fe (mg/L)	0.016	0.021	0.020	0.015	0.012	5	0.015	3
Mo (mg/L)				0.002	0.002	5	0.002	3
Ni (mg/L)	0.00100	0.00100	0.00023	0.00018	0.00020	5	0.00020	3
Pb (mg/L)	0.0020	0.0020	0.0001	0.0001	0.0001	5	0.0001	3
Se (mg/L)	0.0002	0.0001	0.0002	0.0001	0.0001	5	0.0001	3
Zn (mg/L)	0.005	0.005	0.001	0.002	0.001	5	0.001	3
Nutrients								
NH3-N (mg/L)	-	-	-	0.05	0.05	1	0.02	1
NO3 (mg/L)	-	-	-	0.16	0.33	5	0.58	1
P-(TP) (mg/L)	-	-	-	0.02	0.01	1	0.01	1
Radionuclides								
Pb210 (Bq/L)	0.05	0.04	0.02	0.02	0.02	1	0.02	1
Po210 (Bq/L)	0.015	0.013	0.013	0.007	0.006	1	0.010	1
Ra226 (Bq/L)	0.040	0.037	0.035	0.030	0.033	4	0.033	3
U (µg/L)	307.4	280.0	215.5	247.6	252.4	5	214.3	3
Organics								
C-(org) (mg/L)	-	-	-	8.700	9.100	1	9.300	1

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-Parameter was not analyzed.

Table 4.3.1 – 3 AC-8 Summary Statistics and Comparison to Historical Results
Ace Lake discharge at weir

Physical Properties	Previous Period Average				Current Reporting Period			
	2007	2008	2009	2010	**2011**	Count	2012*	Count
Cond-L (µS/cm)	108	108	109	114	122	2	126	1
pH-L (pH Unit)	7.83	7.87	7.69	7.69	7.47	2	7.53	1
TSS (mg/L)	1.750	1.000	1.400	1.000	1.000	2	1.000	1
Major Ions								
Alk-T (mg/L)	47.8	46.5	50.4	49.8	52.0	2	55.0	1
Ca (mg/L)	15.5	15.5	15.6	16.0	17.5	2	17.0	1
Cl (mg/L)	0.93	1.00	0.92	1.02	1.30	2	1.20	1
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.0	2	1.0	1
Hardness (mg/L)	51	51	52	53	58	2	56	1
HCO3 (mg/L)	58.3	56.5	61.4	60.5	63.5	2	67.0	1
K (mg/L)	0.6	0.6	0.6	0.8	0.7	2	0.9	1
Mg (mg/L)	3.0	3.1	3.1	3.2	3.4	2	3.2	1
Na (mg/L)	1.4	1.5	1.5	1.6	1.5	2	1.7	1
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	2	1.0	1
SO4 (mg/L)	6.3	6.8	6.5	6.6	7.0	2	7.1	1
Sum of Ions (mg/L)	86	85	90	90	95	2	98	1
TDS (mg/L)	80.00	63.50	73.00	77.00	81.50	2	80.00	1
Metals								
As (µg/L)	-	-	0.1	0.2	0.2	2	0.1	1
Ba (mg/L)	-	-	0.022	0.039	0.025	2	0.024	1
Cu (mg/L)	-	-	0.001	0.001	0.000	2	0.000	1
Fe (mg/L)	-	-	0.027	0.287	0.027	2	0.046	1
Mo (mg/L)	-	-	0.001	0.001	0.001	2	0.001	1
Ni (mg/L)	-	-	0.00015	0.00015	0.00015	2	0.00010	1
Pb (mg/L)	-	-	0.0001	0.0002	0.0001	2	0.0001	1
Se (mg/L)	-	-	0.0001	0.0001	0.0002	2	0.0001	1
Zn (mg/L)	-	-	0.001	0.001	0.001	2	0.001	1
Nutrients								
NH3-N (mg/L)	-	-	-	0.06	0.07	1	-	0
NO3 (mg/L)	-	-	0.04	0.08	0.09	2	-	0
P-(TP) (mg/L)	-	-	-	0.01	0.01	1	-	0
Radionuclides								
Pb210 (Bq/L)	-	-	0.02	0.02	0.02	1	-	0
Po210 (Bq/L)	-	-	0.005	0.007	0.005	1	-	0
Ra226 (Bq/L)	0.014	0.014	0.014	0.015	0.015	2	0.010	1
U (µg/L)	16.0	18.3	14.6	15.3	16.5	2	14.0	1
Organics								
C-(org) (mg/L)	-	-	-	7.550	6.000	1	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
- Parameter was not analyzed.

Table 4.3.1 – 4 AC-6A Summary Statistics and Comparison to Historical Results *Verna Lake discharge to Ace Lake*

Physical Properties	Previous Period Average	Current Reporting Period	
	2010	2012*	Count
Cond-L (µS/cm)	298	298	1
pH-L (pH Unit)	7.77	7.58	1
TSS (mg/L)	1.000	1.000	1
Major Ions			
Alk-T (mg/L)	97.0	98.0	1
Ca (mg/L)	43.0	45.0	1
Cl (mg/L)	0.40	0.40	1
CO3 (mg/L)	1.0	1.0	1
Hardness (mg/L)	143	152	1
HCO3 (mg/L)	118.0	120.0	1
K (mg/L)	0.9	1.1	1
Mg (mg/L)	8.8	9.6	1
Na (mg/L)	2.4	2.5	1
OH (mg/L)	1.0	1.0	1
SO4 (mg/L)	51.0	58.0	1
Sum of Ions (mg/L)	225	237	1
TDS (mg/L)	199.00	203.00	1
Metals			
As (µg/L)	0.2	0.2	1
Ba (mg/L)	0.022	0.023	1
Cu (mg/L)	0.001	0.001	1
Fe (mg/L)	0.021	0.040	1
Mo (mg/L)	0.001	0.001	1
Ni (mg/L)	0.00010	0.00010	1
Pb (mg/L)	0.0001	0.0001	1
Se (mg/L)	0.0001	0.0002	1
Zn (mg/L)	0.001	0.001	1
Nutrients			
NH3-N (mg/L)	-	-	0
NO3 (mg/L)	0.04	-	0
P-(TP) (mg/L)	-	-	0
Radionuclides			
Pb210 (Bq/L)	-	-	0
Po210 (Bq/L)	-	-	0
Ra226 (Bq/L)	0.100	0.130	1
U (µg/L)	263.0	186.0	1
Organics			
C-(org) (mg/L)	-	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
- Parameter was not analyzed.

Table 4.3.1 – 5 AC-14 Summary Statistics and Comparison to Historical Results
Ace Creek discharge to Beaverlodge Lake

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	124	116	115	121	132	11	132	6
pH-L (pH Unit)	7.91	7.86	7.79	7.72	7.74	11	7.79	6
TSS (mg/L)	1.462	1.083	1.385	2.917	1.273	11	1.167	6
Major Ions								
Alk-T (mg/L)	51.5	49.5	52.4	49.1	53.2	11	53.5	6
Ca (mg/L)	17.0	16.2	16.5	16.8	18.0	11	18.3	6
Cl (mg/L)	1.69	1.38	1.17	1.47	2.00	11	2.00	6
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.3	11	1.0	6
Hardness (mg/L)	56	53	55	55	59	11	60	6
HCO3 (mg/L)	62.8	60.4	63.8	59.8	64.2	11	65.3	6
K (mg/L)	0.6	0.7	0.7	0.7	0.8	11	0.8	6
Mg (mg/L)	3.3	3.2	3.2	3.3	3.5	11	3.6	6
Na (mg/L)	2.6	1.9	1.8	2.1	2.3	11	2.3	6
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	11	1.0	6
SO4 (mg/L)	9.6	7.8	7.5	8.8	9.1	11	9.6	6
Sum of Ions (mg/L)	97	92	95	93	100	11	102	6
TDS (mg/L)	84.15	71.58	78.08	82.25	86.82	11	87.17	6
Metals								
As (µg/L)	0.1	0.2	0.2	0.2	0.2	11	0.1	6
Ba (mg/L)	0.024	0.025	0.025	0.024	0.026	11	0.025	6
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	11	0.001	6
Fe (mg/L)	0.089	0.099	0.068	0.085	0.074	11	0.058	6
Mo (mg/L)			0.001	0.001	0.001	11	0.001	6
Ni (mg/L)	0.00100	0.00100	0.00033	0.00017	0.00024	11	0.00015	6
Pb (mg/L)	0.0020	0.0020	0.0006	0.0008	0.0005	11	0.0003	6
Se (mg/L)	0.0003	0.0002	0.0002	0.0002	0.0002	11	0.0002	6
Zn (mg/L)	0.005	0.005	0.002	0.001	0.002	11	0.001	6
Nutrients								
NH3-N (mg/L)	-	-	-	0.08	0.05	4	0.05	2
NO3 (mg/L)	-	-	0.04	0.14	0.13	11	0.13	2
P-(TP) (mg/L)	-	-	-	0.01	0.01	4	0.01	2
Radionuclides								
Pb210 (Bq/L)	0.02	0.02	0.02	0.03	0.02	4	0.02	2
Po210 (Bq/L)	0.016	0.014	0.011	0.010	0.008	4	0.007	2
Ra226 (Bq/L)	0.057	0.048	0.034	0.046	0.072	11	0.042	6
U (µg/L)	41.1	27.6	23.8	32.1	33.2	11	37.5	2
Organics								
C-(org) (mg/L)	-	-	-	7.500	7.400	4	8.750	2

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
- Parameter was not analyzed.

Table 4.3.2 – 1 AN-3 Summary Statistics and Comparison to Historical Results
Fulton Lake discharge

Physical Properties	Previous Period Averages		
	2007	2008	2009
Cond-L (µS/cm)	139	137	136
pH-L (pH Unit)	8.02	7.88	7.88
TSS (mg/L)	2.000	2.000	1.000
Major Ions			
Alk-T (mg/L)	70.0	67.0	69.0
Ca (mg/L)	20.0	21.0	20.0
Cl (mg/L)	0.70	0.70	0.60
CO3 (mg/L)	1.0	1.0	1.0
Hardness (mg/L)	68	70	68
HCO3 (mg/L)	85.0	82.0	84.0
K (mg/L)	0.8	0.7	0.8
Mg (mg/L)	4.5	4.4	4.5
Na (mg/L)	1.8	1.8	1.8
OH (mg/L)	1.0	1.0	1.0
SO4 (mg/L)	4.3	4.6	4.3
Sum of Ions (mg/L)	117	115	116
TDS (mg/L)	84.00	94.00	89.00
Metals			
As (µg/L)	0.1	0.1	0.1
Ba (mg/L)			
Cu (mg/L)	0.001	0.001	0.001
Fe (mg/L)	0.023	0.029	0.013
Mo (mg/L)	-	-	-
Ni (mg/L)	0.00100	0.00100	0.00010
Pb (mg/L)	0.0020	0.0020	0.0001
Se (mg/L)	0.0001	0.0001	0.0001
Zn (mg/L)	0.005	0.005	0.001
Nutrients			
NH3-N (mg/L)	-	-	-
NO3 (mg/L)	-	-	-
P-(TP) (mg/L)	-	-	-
Pb210 (Bq/L)	0.02	0.02	0.02
Po210 (Bq/L)	0.005	0.005	0.006
Ra226 (Bq/L)	0.005	0.005	0.005
U (µg/L)	1.5	2.0	1.6
Organics			
C-(org) (mg/L)	-	-	-

-No water available for collection in 2010 or 2011
-Parameter was not analyzed.

Table 4.3.2 – 2 TL-3 Summary Statistics and Comparison to Historical Results
Fookes Reservoir discharge

	Previous Period Averages				Current Reporting Period	
Physical Properties	**2007**	**2008**	**2009**	**2010**	**2012***	**Count**
Cond-L (µS/cm)	363	366	349	334	348	1
pH-L (pH Unit)	8.29	8.21	8.18	8.08	8.16	1
TSS (mg/L)	1.917	1.167	1.417	1.000	1.000	1
Major Ions						
Alk-T (mg/L)	135.6	140.7	135.1	129.0	134.0	1
Ca (mg/L)	25.8	28.0	26.2	27.0	26.0	1
Cl (mg/L)	4.25	4.17	4.17	3.64	5.00	1
CO3 (mg/L)	2.5	1.0	1.0	1.0	1.0	1
Hardness (mg/L)	85	91	86	89	86	1
HCO3 (mg/L)	162.3	171.6	164.9	157.6	163.0	1
K (mg/L)	1.3	1.3	1.4	1.2	1.3	1
Mg (mg/L)	5.0	5.2	5.0	5.2	5.2	1
Na (mg/L)	46.4	44.2	42.6	36.6	42.0	1
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	1
SO4 (mg/L)	46.2	44.9	44.2	38.2	42.0	1
Sum of Ions (mg/L)	290	299	289	270	284	1
TDS (mg/L)	226.33	228.33	220.25	210.60	216.00	1
Metals						
As (µg/L)	-	-	1.1	0.9	1.0	1
Ba (mg/L)	0.035	0.035	0.036	0.034	0.034	1
Cu (mg/L)	-	-	0.001	0.001	0.001	1
Fe (mg/L)	-	-	0.008	0.006	0.009	1
Mo (mg/L)	-	-	0.019	0.015	0.017	1
Ni (mg/L)	-	-	0.00040	0.00028	0.00020	1
Pb (mg/L)	-	-	0.0006	0.0004	0.0004	1
Se (mg/L)	0.0041	0.0049	0.0043	0.0037	0.0042	1
Zn (mg/L)	-	-	0.001	0.001	0.001	1
Nutrients						
NH3-N (mg/L)	-	-	-	-	-	0
NO3 (mg/L)	-	-	0.04	0.10	-	0
P-(TP) (mg/L)	-	-	-	0.03	-	0
Radionuclides						
Pb210 (Bq/L)	-	-	-	0.07	-	0
Po210 (Bq/L)	-	-	-	0.040	-	0
Ra226 (Bq/L)	1.107	1.122	1.198	1.070	1.400	1
U (µg/L)	408.8	423.3	393.9	341.8	377.0	1
Organics	-	-				
C-(org) (mg/L)	-	-		9.500	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-No water available for collection in 2011
-Parameter was not analyzed.

Table 4.3.2 – 3 TL-4 Summary Statistics and Comparison to Historical Results
Marie Reservoir Outflow

	Previous Period Averages				Current Reporting Period	
Physical Properties	**2007**	**2008**	**2009**	**2010**	**2012***	**Count**
Cond-L (µS/cm)	360	358	341	445	**321**	1
pH-L (pH Unit)	8.28	8.14	8.13	7.79	**7.90**	1
TSS (mg/L)	1.667	2.083	1.273	2.000	**1.000**	1
Major Ions						
Alk-T (mg/L)	136.8	140.3	136.8	146.6	**133.0**	1
Ca (mg/L)	22.7	23.8	22.0	38.6	**18.0**	1
Cl (mg/L)	4.42	4.35	4.18	4.70	**4.00**	1
CO3 (mg/L)	2.1	1.1	1.0	1.0	**1.0**	1
Hardness (mg/L)	77	81	77	124	**67**	1
HCO3 (mg/L)	164.7	170.3	165.1	178.8	**162.0**	1
K (mg/L)	1.3	1.4	1.5	1.5	**1.5**	1
Mg (mg/L)	5.1	5.3	5.2	6.6	**5.4**	1
Na (mg/L)	49.3	47.5	45.2	47.0	**47.0**	1
OH (mg/L)	1.0	1.0	1.0	1.0	**1.0**	1
SO4 (mg/L)	43.9	40.8	39.7	78.1	**33.0**	1
Sum of Ions (mg/L)	289	294	286	355	**271**	1
TDS (mg/L)	228.67	225.67	227.27	289.63	**213.00**	1
Metals						
As (µg/L)	-	-	1.7	1.6	**2.2**	1
Ba (mg/L)	0.055	0.083	0.066	0.108	**0.076**	1
Cu (mg/L)	-	-	0.001	0.001	**0.001**	1
Fe (mg/L)	-	-	0.028	0.311	**0.210**	1
Mo (mg/L)	-	-	0.014	0.011	**0.010**	1
Ni (mg/L)	-	-	0.00060	0.00126	**0.00060**	1
Pb (mg/L)	-	-	0.0008	0.0004	**0.0004**	1
Se (mg/L)	0.0060	0.0038	0.0025	0.0031	**0.0022**	1
Zn (mg/L)	-	-	0.001	0.003	**0.001**	1
Nutrients						
NH3-N (mg/L)	-	-	-	0.05	-	0
NO3 (mg/L)	-	-	0.04	0.05	-	0
P-(TP) (mg/L)	-	-	-	0.02	-	0
Radionuclides						
Pb210 (Bq/L)	-	-	-	0.23	-	0
Po210 (Bq/L)	-	-	-	0.055	-	0
Ra226 (Bq/L)	1.332	1.433	1.582	1.650	**1.600**	1
U (µg/L)	382.4	324.3	344.5	419.8	**244.0**	1
Organics						
C-(org) (mg/L)	-	-	-	8.800	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-No water available for collection in 2011
-Parameter was not analyzed.

Table 4.3.2 – 4 TL-6 Summary Statistics and Comparison to Historical Results
Minewater Lake discharge

Physical Properties	Previous Period Averages			Current Reporting Period	
	2008	2009	2010	2012*	Count
Cond-L (µS/cm)	794	765	791	861	1
pH-L (pH Unit)	8.07	7.94	7.94	7.83	1
TSS (mg/L)	3.000	5.000	2.000	2.000	1
Major Ions					
Alk-T (mg/L)	312.0	289.5	306.0	294.0	1
Ca (mg/L)	54.0	47.0	46.0	47.0	1
Cl (mg/L)	54.00	56.00	54.00	62.00	1
CO3 (mg/L)	1.0	1.0	1.0	1.0	1
Hardness (mg/L)	184	165	160	166	1
HCO3 (mg/L)	381.0	353.0	373.0	359.0	1
K (mg/L)	2.6	2.8	3.1	3.9	1
Mg (mg/L)	12.0	11.6	11.0	12.0	1
Na (mg/L)	112.0	110.5	118.0	125.0	1
OH (mg/L)	1.0	1.0	1.0	1.0	1
SO4 (mg/L)	48.0	43.5	41.0	73.0	1
Sum of Ions (mg/L)	664	625	646	682	1
TDS (mg/L)	516.00	526.00	529.00	566.00	1
Metals					
As (µg/L)	-	-	1.2	1.7	1
Ba (mg/L)	1.110	1.140	1.160	1.090	1
Cu (mg/L)	-	-	0.000	0.001	1
Fe (mg/L)	-	-	0.710	0.970	1
Mo (mg/L)	-	-	0.002	0.003	1
Ni (mg/L)	-	-	0.00030	0.00060	1
Pb (mg/L)	-	-	0.0001	0.0008	1
Se (mg/L)	0.0022	0.0023	0.0022	0.0054	1
Zn (mg/L)	-	-	0.001	0.001	1
Nutrients					
NH3-N (mg/L)	-	-	-	0.08	1
NO3 (mg/L)	-	-	0.04	0.04	1
P-(TP) (mg/L)	-	-	-	0.01	1
Radionuclides					
Pb210 (Bq/L)	-	-	-	0.09	1
Po210 (Bq/L)	-	-	-	0.060	1
Ra226 (Bq/L)	6.200	5.550	5.600	5.600	1
U (µg/L)	273.0	210.0	248.0	396.0	1
Organics					
C-(org) (mg/L)	-	-	-	36.000	1

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-No water available for collection in 2011

-Parameter was not analyzed.

Table 4.3.2 – 5 TL-7 Summary Statistics and Comparison to Historical Results

Meadow Lake discharge at weir

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	383	402	352	454	475	6	375	3
pH-L (pH Unit)	8.13	8.17	8.00	7.87	7.99	6	7.81	3
TSS (mg/L)	1.538	1.750	1.364	1.333	1.333	6	1.000	3
Major Ions								
Alk-T (mg/L)	146.4	153.4	140.1	150.4	148.3	6	121.7	3
Ca (mg/L)	25.2	29.3	23.5	36.9	41.8	6	29.7	3
Cl (mg/L)	7.68	6.33	5.80	7.40	10.55	6	15.43	3
CO3 (mg/L)	1.5	1.3	1.0	1.0	1.0	6	1.0	3
Hardness (mg/L)	86	98	81	123	140	6	102	3
HCO3 (mg/L)	177.2	186.5	170.9	183.4	180.8	6	148.7	3
K (mg/L)	1.4	1.4	1.5	1.5	2.4	6	1.8	3
Mg (mg/L)	5.7	6.0	5.5	7.6	8.7	6	6.9	3
Na (mg/L)	51.7	50.4	45.5	50.0	47.2	6	39.7	3
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	6	1.0	3
SO4 (mg/L)	43.6	47.9	39.2	74.7	86.3	6	48.7	3
Sum of Ions (mg/L)	311	328	292	362	378	6	291	3
TDS (mg/L)	241.08	249.58	222.00	297.11	309.50	6	237.67	3
Metals								
As (µg/L)	1.7	1.4	1.5	1.4	1.1	6	1.7	3
Ba (mg/L)	0.176	0.356	0.162	0.353	0.352	6	0.143	3
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	6	0.001	3
Fe (mg/L)	0.157	0.064	0.055	0.177	0.092	6	0.250	3
Mo (mg/L)			0.013	0.011	0.008	6	0.011	3
Ni (mg/L)	0.00100	0.00100	0.00064	0.00063	0.00062	6	0.00080	3
Pb (mg/L)	0.0020	0.0020	0.0007	0.0004	0.0002	6	0.0007	3
Se (mg/L)	0.0046	0.0038	0.0024	0.0053	0.0055	6	0.0047	3
Zn (mg/L)	0.005	0.005	0.001	0.002	0.001	6	0.002	3
Nutrients								
NH3-N (mg/L)	-	-	-	0.03	0.21	2	0.04	1
NO3 (mg/L)	-	-	0.04	0.06	0.28	6	0.04	1
P-(TP) (mg/L)	-	-	-	0.02	0.01	2	0.01	1
Radionuclides								
Pb210 (Bq/L)	0.07	0.05	0.06	0.07	0.02	2	0.07	1
Po210 (Bq/L)	0.045	0.037	0.043	0.020	0.015	2	0.100	1
Ra226 (Bq/L)	1.261	1.719	1.273	1.621	0.857	6	0.520	3
U (µg/L)	360.4	313.8	327.5	274.9	196.8	6	282.3	3
Organics								
C-(org) (mg/L)	-	-	-	9.667	11.000	2	13.000	1

*2012 - Only sampling from January 1, 2012 to June 30, 2012.

Table 4.3.2 – 6 TL-9 Summary Statistics and Comparison to Historical Results
Greer Lake discharge at Beaverlodge Lake

Physical Properties	Previous Period Averages				Current Reporting Period	
	2007	2008	2009	2010	2012*	Count
Cond-L (µS/cm)	356	372	348	464	369	2
pH-L (pH Unit)	8.26	8.16	8.11	8.04	8.00	2
TSS (mg/L)	2.167	1.600	1.375	1.250	1.000	2
Major Ions						
Alk-T (mg/L)	136.7	143.6	139.0	186.5	145.0	2
Ca (mg/L)	22.0	25.1	22.6	32.5	24.5	2
Cl (mg/L)	6.86	6.70	6.63	9.25	9.00	2
CO3 (mg/L)	1.7	1.0	1.0	1.0	1.0	2
Hardness (mg/L)	80	88	82	122	91	2
HCO3 (mg/L)	165.6	175.1	169.5	227.5	176.5	2
K (mg/L)	1.3	1.4	1.5	2.3	1.6	2
Mg (mg/L)	6.4	6.3	6.3	9.8	7.3	2
Na (mg/L)	47.7	46.2	43.4	57.3	44.5	2
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	2
SO4 (mg/L)	40.0	41.6	36.8	46.0	38.5	2
Sum of Ions (mg/L)	287	303	287	385	302	2
TDS (mg/L)	225.67	212.00	220.63	308.00	243.00	2
Metals						
As (µg/L)	1.9	1.9	1.7	1.1	1.6	2
Ba (mg/L)	0.703	0.597	0.824	0.563	0.605	2
Cu (mg/L)	0.001	0.003	0.001	0.001	0.002	2
Fe (mg/L)	0.061	0.140	0.047	0.020	0.027	2
Mo (mg/L)	-	-	-	0.011	0.014	2
Ni (mg/L)	0.00100	0.00100	0.00057	0.00047	0.00045	2
Pb (mg/L)	0.0020	0.0020	0.0012	0.0003	0.0011	2
Se (mg/L)	0.0047	0.0036	0.0032	0.0048	0.0087	2
Zn (mg/L)	0.005	0.005	0.002	0.001	0.002	2
Nutrients						
NH3-N (mg/L)	-	-	-	-	0.04	1
NO3 (mg/L)	-	-	-	0.13	0.35	1
P-(TP) (mg/L)	-	-	-	0.03	0.01	1
Radionuclides						
Pb210 (Bq/L)	0.09	0.13	0.07	0.06	0.04	1
Po210 (Bq/L)	0.068	0.042	0.040	0.020	0.080	1
Ra226 (Bq/L)	1.858	1.860	2.075	0.980	2.750	2
U (µg/L)	316.9	311.9	296.4	483.8	370.0	2
Organics						
C-(org) (mg/L)	-	-	-	14.000	14.000	1

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-No water available for collection in 2011
-Parameter was not analyzed.

Table 4.3.3 – 1 BL-3 Summary Statistics and Comparison to Historical Results
Beaverlodge Lake - 100m out from TL-9

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	259	254	253	252	250	3	242	2
pH-L (pH Unit)	8.12	8.08	7.97	7.98	7.79	3	7.84	2
TSS (mg/L)	1.000	1.000	1.000	1.000	1.000	3	1.000	2
Major Ions								
Alk-T (mg/L)	71.8	72.8	74.3	72.7	70.7	3	71.5	2
Ca (mg/L)	21.8	21.5	22.5	22.0	21.8	4	22.0	2
Cl (mg/L)	14.25	14.50	14.25	13.67	13.50	4	13.00	2
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.0	4	1.0	2
Hardness (mg/L)	77	75	79	77	77	4	78	2
HCO3 (mg/L)	87.8	88.8	90.5	89.0	86.0	3	87.0	2
K (mg/L)	1.1	1.2	1.2	1.2	1.1	4	1.3	2
Mg (mg/L)	5.4	5.3	5.5	5.5	5.4	4	5.5	2
Na (mg/L)	21.3	20.8	20.5	20.0	19.8	4	19.0	2
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	4	1.0	2
SO4 (mg/L)	34.0	32.0	34.3	33.7	33.0	4	32.5	2
Sum of Ions (mg/L)	186	184	189	185	178	4	181	2
TDS (mg/L)	146.50	149.50	151.25	150.33	151.33	3	140.00	2
Metals								
As (µg/L)	0.3	0.3	0.3	0.5	0.3	4	0.3	2
Ba (mg/L)		0.035		0.039	0.035	4	0.035	2
Cu (mg/L)	0.002	0.004	0.001	0.002	0.003	4	0.001	2
Fe (mg/L)	0.007	0.048	0.010	0.007	0.008	4	0.003	2
Mo (mg/L)				0.004	0.004	4	0.004	2
Ni (mg/L)	0.00550	0.00575	0.00178	0.00330	0.00347	4	0.00100	2
Pb (mg/L)	0.0020	0.0020	0.0006	0.0002	0.0003	4	0.0001	2
Se (mg/L)	0.0029	0.0030	0.0031	0.0029	0.0028	4	0.0027	2
Zn (mg/L)	0.005	0.005	0.004	0.005	0.006	4	0.001	2
Nutrients								
NH3-N (mg/L)	-	-	-	0.22	0.21	1	-	0
NO3 (mg/L)	-	-	-	0.04	0.06	3	-	0
P-(TP) (mg/L)	-	-	-	0.01	0.01	1	-	0
Radionuclides								
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	0.02	1	-	0
Po210 (Bq/L)	0.005	0.005	0.005	0.004	0.005	1	-	0
Ra226 (Bq/L)	0.033	0.052	0.052	0.048	0.023	4	0.020	2
U (µg/L)	146.0	146.5	152.0	145.3	140.5	4	135.5	2
Organics								
C-(org) (mg/L)	-	-	-	3.550	3.800	1	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-Parameter was not analyzed.

Table 4.3.3 – 2 BL-4 Summary Statistics and Comparison to Historical Results
Beaverlodge Lake - middle - composite of top, middle, bottom

Physical Properties	Previous Period Averages				Current Reporting Period			
	2007	2008	2009	2010	2011	Count	2012*	Count
Cond-L (µS/cm)	249	249	244	246	246	2	254	1
pH-L (pH Unit)	8.09	8.06	7.98	7.94	7.70	2	7.87	1
TSS (mg/L)	1.250	1.000	1.000	1.000	1.000	2	1.000	1
<u>Major Ions</u>								
Alk-T (mg/L)	69.8	68.8	71.0	69.5	67.5	2	71.0	1
Ca (mg/L)	21.0	21.0	21.3	21.3	21.5	2	22.0	1
Cl (mg/L)	13.50	14.00	13.50	14.00	14.00	2	15.00	1
CO3 (mg/L)	1.0	1.0	1.0	1.0	1.0	2	1.0	1
Hardness (mg/L)	74	73	75	75	76	2	77	1
HCO3 (mg/L)	85.0	84.0	86.5	85.0	82.0	2	87.0	1
K (mg/L)	1.1	1.1	1.2	1.2	1.1	2	1.3	1
Mg (mg/L)	5.2	5.2	5.3	5.3	5.3	2	5.4	1
Na (mg/L)	20.5	20.0	19.5	19.5	19.5	2	21.0	1
OH (mg/L)	1.0	1.0	1.0	1.0	1.0	2	1.0	1
SO4 (mg/L)	32.8	32.0	32.8	33.0	32.5	2	35.0	1
Sum of Ions (mg/L)	179	177	180	179	176	2	187	1
TDS (mg/L)	138.75	143.00	142.00	147.00	143.00	2	146.00	1
<u>Metals</u>								
As (µg/L)	0.2	0.3	0.3	0.3	0.3	2	0.3	1
Ba (mg/L)		0.034		0.035	0.034	2	0.034	1
Cu (mg/L)	0.002	0.002	0.002	0.001	0.001	2	0.003	1
Fe (mg/L)	0.006	0.006	0.014	0.043	0.003	2	0.006	1
Mo (mg/L)				0.004	0.004	2	0.004	1
Ni (mg/L)	0.00225	0.00250	0.00235	0.00173	0.00220	2	0.00300	1
Pb (mg/L)	0.0020	0.0020	0.0006	0.0002	0.0001	2	0.0002	1
Se (mg/L)	0.0029	0.0030	0.0030	0.0028	0.0028	2	0.0028	1
Zn (mg/L)	0.005	0.005	0.006	0.005	0.002	2	0.006	1
<u>Nutrients</u>								
NH3-N (mg/L)	-	-	-	0.06	0.08	2	0.06	1
NO3 (mg/L)	-	-	-	0.05	0.42	2	0.04	1
P-(TP) (mg/L)	-	-	-	0.01	0.01	2	0.01	1
<u>Radionuclides</u>								
Pb210 (Bq/L)	0.02	0.02	0.02	0.03	0.03	2	0.02	1
Po210 (Bq/L)	0.005	0.005	0.005	0.005	0.005	2	0.005	1
Ra226 (Bq/L)	0.033	0.025	0.025	0.035	0.025	2	0.030	1
U (µg/L)	142.0	140.5	143.8	143.8	142.0	2	145.0	1
<u>Organics</u>								
C-(org) (mg/L)	-	-	-	3.300	3.400	2	3.700	1

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-Parameter was not analyzed.

Table 4.3.3 – 3 BL-5 Summary Statistics and Comparison to Historical Results
Beaverlodge Lake Outlet

Physical Properties	Current Reporting Period			
	2011	Count	2012*	Count
Cond-L (µS/cm)	227	3	246	2
pH-L (pH Unit)	7.65	3	7.91	2
TSS (mg/L)	2.333	3	1.000	2
Major Ions				
Alk-T (mg/L)	66.7	3	69.5	2
Ca (mg/L)	21.0	3	21.5	2
Cl (mg/L)	11.47	3	14.00	2
CO3 (mg/L)	1.0	3	1.0	2
Hardness (mg/L)	73	3	76	2
HCO3 (mg/L)	81.3	3	84.5	2
K (mg/L)	1.1	3	1.3	2
Mg (mg/L)	5.0	3	5.4	2
Na (mg/L)	16.0	3	20.0	2
OH (mg/L)	1.0	3	1.0	2
SO4 (mg/L)	27.0	3	34.0	2
Sum of Ions (mg/L)	163	3	181	2
TDS (mg/L)	135.33	3	140.00	2
Metals				
As (µg/L)	0.3	4	0.3	2
Ba (mg/L)	0.038	4	0.033	2
Cu (mg/L)	0.001	4	0.000	2
Fe (mg/L)	0.008	4	0.001	2
Mo (mg/L)	0.003	4	0.004	2
Ni (mg/L)	0.00020	4	0.00015	2
Pb (mg/L)	0.0001	4	0.0001	2
Se (mg/L)	0.0023	4	0.0027	2
Zn (mg/L)	0.001	4	0.001	2
Nutrients				
NH3-N (mg/L)	0.06	1	-	0
NO3 (mg/L)	1.07	3	-	0
P-(TP) (mg/L)	0.01	1	-	0
Radionuclides				
Pb210 (Bq/L)	0.02	1	-	0
Po210 (Bq/L)	0.005	1	-	0
Ra226 (Bq/L)	0.021	4	0.035	2
U (µg/L)	143.3	3	138.0	2
Organics				
C-(org) (mg/L)	2.900	1	-	0

*2012 - Only sampling from January 1, 2012 to June 30, 2012.
-Parameter was not analyzed.

Table 4.3.3 – 4 ML-1 Summary Statistics and Comparison to Historical Results
Martin Lake outlet (North basin)

Physical Properties	Current Reporting Period			
	2011	Count	2012*	Count
Cond-L (µS/cm)	213	4	179	2
pH-L (pH Unit)	7.78	4	7.65	2
TSS (mg/L)	1.000	4	1.000	2
Major Ions				
Alk-T (mg/L)	68.3	4	62.0	2
Ca (mg/L)	20.5	4	19.5	2
Cl (mg/L)	10.30	4	6.65	2
CO3 (mg/L)	1.0	4	1.0	2
Hardness (mg/L)	71	4	67	2
HCO3 (mg/L)	83.5	4	75.5	2
K (mg/L)	1.1	4	1.1	2
Mg (mg/L)	4.8	4	4.4	2
Na (mg/L)	14.5	4	10.5	2
OH (mg/L)	1.0	4	1.0	2
SO4 (mg/L)	23.3	4	17.0	2
Sum of Ions (mg/L)	158	4	135	2
TDS (mg/L)	129.75	4	108.00	2
Metals				
As (µg/L)	0.2	4	0.2	2
Ba (mg/L)	0.042	4	0.041	2
Cu (mg/L)	0.000	4	0.000	2
Fe (mg/L)	0.006	4	0.012	2
Mo (mg/L)	0.003	4	0.002	2
Ni (mg/L)	0.00013	4	0.00010	2
Pb (mg/L)	0.0001	4	0.0001	2
Se (mg/L)	0.0016	4	0.0009	2
Zn (mg/L)	0.001	4	0.001	2
Nutrients				
NH3-N (mg/L)	0.07	4	0.04	2
NO3 (mg/L)	0.20	4	0.09	2
P-(TP) (mg/L)	0.01	4	0.01	2
Radionuclides				
Pb210 (Bq/L)	0.02	4	0.02	2
Po210 (Bq/L)	0.005	4	0.005	2
Ra226 (Bq/L)	0.009	4	0.007	2
U (µg/L)	69.3	4	54.5	2
Organics				
C-(org) (mg/L)	4.775	4	6.950	2

*2012 - Only sampling from January 1, 2012 to June 30, 2012.

Table 4.3.3 – 5 CS-1 Summary Statistics and Comparison to Historical Results
Crackingstone River at bridge

Physical Properties	Current Reporting Period	
	2011	Count
Cond-L (µS/cm)	211	1
pH-L (pH Unit)	7.78	1
TSS (mg/L)	1.000	1
Major Ions		
Alk-T (mg/L)	85.0	1
Ca (mg/L)	28.0	1
Cl (mg/L)	7.80	1
CO3 (mg/L)	1.0	1
Hardness (mg/L)	96	1
HCO3 (mg/L)	104.0	1
K (mg/L)	1.2	1
Mg (mg/L)	6.3	1
Na (mg/L)	6.4	1
OH (mg/L)	1.0	1
SO4 (mg/L)	11.0	1
Sum of Ions (mg/L)	165	1
TDS (mg/L)	135.00	1
Metals		
As (µg/L)	0.2	1
Ba (mg/L)	0.056	1
Cu (mg/L)	0.000	1
Fe (mg/L)	0.100	1
Mo (mg/L)	0.003	1
Ni (mg/L)	0.00030	1
Pb (mg/L)	0.0001	1
Se (mg/L)	0.0003	1
Zn (mg/L)	0.001	1
Nutrients		
NH3-N (mg/L)	0.08	1
NO3 (mg/L)	0.04	1
P-(TP) (mg/L)	0.01	1
Radionuclides		
Pb210 (Bq/L)	0.02	1
Po210 (Bq/L)	0.005	1
Ra226 (Bq/L)	0.005	1
U (µg/L)	47.0	1
Organics		
C-(org) (mg/L)	11.000	1

Note: This station was implemented in 2011 and only has had one sample set thus far.

Table 4.3.3 – 6 CS-2 Summary Statistics and Comparison to Historical Results
Crackingstone Bay in Lake Athabasca

Physical Properties	Current Reporting Period	
	2011	Count
Cond-L (µS/cm)	68	1
pH-L (pH Unit)	7.45	1
TSS (mg/L)	1.000	1
Major Ions		
Alk-T (mg/L)	28.0	1
Ca (mg/L)	7.1	1
Cl (mg/L)	2.00	1
CO3 (mg/L)	1.0	1
Hardness (mg/L)	27	1
HCO3 (mg/L)	34.0	1
K (mg/L)	0.5	1
Mg (mg/L)	2.2	1
Na (mg/L)	2.4	1
OH (mg/L)	1.0	1
SO4 (mg/L)	3.5	1
Sum of Ions (mg/L)	52	1
TDS (mg/L)	220.00	1
Metals		
As (µg/L)	0.3	1
Ba (mg/L)	0.011	1
Cu (mg/L)	0.001	1
Fe (mg/L)	0.013	1
Mo (mg/L)	0.000	1
Ni (mg/L)	0.00040	1
Pb (mg/L)	0.0001	1
Se (mg/L)	0.0001	1
Zn (mg/L)	0.001	1
Nutrients		
NH3-N (mg/L)	0.06	1
NO3 (mg/L)	0.04	1
P-(TP) (mg/L)	0.02	1
Radionuclides		
Pb210 (Bq/L)	0.02	1
Po210 (Bq/L)	0.005	1
Ra226 (Bq/L)	0.005	1
U (µg/L)	0.3	1
Organics		
C-(org) (mg/L)	2.800	1

Note: This station was implemented in 2011 and only has had one sample set thus far.

Table 4.4.1
January 2011 - June 2012 Monthly Loading Calculations at TL-7

Month	Days in Month	Average Flows (L/s)	Uranium (mg/L)	U Loadings (Kg)	^{226}Ra (Bq/L)	^{226}Ra Loadings (Bq) x 10^7	TDS (mg/L)	TDS Loadings (Kg) x 10^4	Se (mg/L)	Se Loadings (Kg)	Comments
2011											
January	31	0.2	-	-	-	-	-	-	-	-	No Water
February	28	0	-	-	-	-	-	-	-	-	No Water
March	31	0	-	-	-	-	-	-	-	-	No Water
April	30	0	-	-	-	-	-	-	-	-	No Flow
May	31	0.3	0.338	0.2716	0.88	0.0707	318	0.0256	0.0058	0.0047	
June	30	0.2	0.23	0.1192	1.4	0.0726	346	0.0179	0.0047	0.0024	
July	31	0.3	-	-	-	-	-	-	-	-	No Water
August	31	0.4	0.069	0.0739	1.00	0.1071	350	0.0375	0.0029	0.0031	
September	30	0.3	0.126	0.0980	0.74	0.0575	327	0.0254	0.0041	0.0032	
October	31	0.2	0.22	0.1178	0.64	0.0343	342	0.0183	0.01	0.0054	
November	30	0.0	-	-	-	-	-	-	-	-	No Water
December	31	0.0	-	-	-	-	-	-	-	-	No Water
2011		0.2	0.197	0.68	0.86	0.34	310	0.12	0.0055	0.02	
2012											
January	31	0.0	-	-	-	-	-	-	-	-	No Water
February	29	0.0	-	-	-	-	-	-	-	-	No Water
March	31	0.0	-	-	-	-	-	-	-	-	No Water
April	30	0.0	-	-	-	-	-	-	-	-	No Flow
May	31	4.0	0.417	4.47	0.45	0.48	301	0.32	0.0051	0.0546	
June	30	9.0	0.216	5.04	0.890	2.08	228	0.53	0.0029	0.0677	
Jan to Jun 2012		2.2	0.282	9.51	0.52	2.56	238	0.85	0.0047	0.12	
Jan 2011-Jun 2012 Annual Average	-	0.83	0.225	-	0.74	-	286	-	0.0052	-	-
Total Jan 2011 to June 2012 Loadings				10.19		2.90		0.98		0.14	

Table 4.4.2
January 2011- June 2012 Monthly Loading Calculations at AC-14

Month	Days in Month	Average Flows (L/s)	Uranium (mg/L)	U Loadings (Kg)	^{226}Ra (Bq/L)	^{226}Ra Loadings (Bq) x 10^7	TDS (mg/L)	TDS Loadings (kg) x 10^4	Se (mg/L)	Se Loadings (Kg)**
2011										
January	31	173	0.019	8.80	0.06	2.780	94	4.3556	0.0001	0.0463
February	28	140	0.02	6.77	0.08	2.710	84	2.8450	0.0001	0.0339
March	31	113	0.027	8.17	0.05	1.513	85	2.5726	0.0001	0.0303
April	30	92	0.072	17.17	0.08	1.908	99	2.3608	0.0005	0.1192
May	31	299	0.032	25.63	0.07	5.606	75	6.0063	0.0001	0.0801
June	30	319	0.026	21.50	0.07	5.788	87	7.1936	0.0001	0.0827
July	31	207	0.023	12.75	0.09	4.990	84	4.6572	0.0001	0.0554
August	31	240	0.044	28.28	0.09	5.785	84	5.3997	0.0004	0.2571
September	30	358	0.034	31.55	0.05	4.640	87	8.0730	0.0002	0.1856
October	31	250	0.039	26.11	0.1	6.696	88	5.8925	0.0003	0.2009
November*	30	224	0.034	19.74	0.075	4.355	88	5.1094	0.0002	0.1161
December	31	241	0.029	18.72	0.05	3.227	88	5.6804	0.0001	0.0645
2011		221.333	0.033	225.20	0.07	49.997	87	60.146	0.0002	1.27
2012										
January	31	224	0.025	15.00	0.04	2.400	89	5.3397	0.0001	0.0600
February	29	191	0.023	11.01	0.03	1.436	96	4.5943	0.0001	0.0479
March	31	186	0.027	13.45	0.03	1.495	90	4.4836	0.0001	0.0498
April	30	215	0.101	56.29	0.06	3.344	96	5.3499	0.0005	0.2786
May	31	2565	0.023	158.01	0.03	20.610	84	57.7088	0.0001	0.6870
June	30	1056	0.026	71.17	0.06	16.423	68	18.6126	0.0001	0.2737
Jan to June 2012		740	0.038	324.92	0.04	45.707	87	96.089	0.0002	1.40
Jan 2011-June 2012 Annual Average		394.06	0.035		0.06		87		0.0002	
Total Jan 2011 to Jun 2012 Loadings				550.12		95.70		156.23		2.67

* - The average concentration listed for November 2011 is the mean of October and December 2011, due to unsafe sampling conditions in November.

** - Where selenium concentrations were below the detection limit for a given month (0.0001mg/L), the detection limit value was used as a proxy for the actual concentration to calculate the monthly loadings. This calculation method will likely result in an overestimation of the selenium loadings.

Table 4.4.3
Comparison of Predicted Loadings to Actual January 2011- June 2012 Loadings

Scenario	Parameter	AC14			TL7			Site Total Loadings
		Average Flows (L/s)	Average Concentration	Loadings	Average Flows (L/s)	Average Concentration	Loadings	
Predicted Loadings								
During Operations	U (mg/L)	215	0.65	4.41E+03	89.4	4.1	1.16E+04	1.60E+04
	Ra226 (Bq/L)	215	0.22	1.49E+09	89.4	0.44	1.24E+09	2.73E+09
	TDS (mg/L)	215	174	1.18E+06	89.4	1793	5.06E+06	6.23E+06
At Shutdown (Predicted)	U (mg/L)	426	0.035	4.70E+02	16	3.16	1.59E+03	2.06E+03
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.53	2.67E+08	1.07E+09
	TDS (mg/L)	426	129	1.73E+06	16	1130	5.70E+05	2.30E+06
Minimum Reclamation (Long Term Predicted)	U (mg/L)	426	0.035	4.70E+02	16	0.1	5.05E+01	5.21E+02
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.38	1.92E+08	9.98E+08
	TDS (mg/L)	426	129	1.73E+06	16	389	1.96E+05	1.93E+06
Max. Reclamation (Long Term Predicted)	U (mg/L)	426	0.03	4.03E+02	16	0.1	5.05E+01	4.53E+02
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.27	1.36E+08	9.42E+08
	TDS (mg/L)	426	125	1.68E+06	16	414	2.09E+05	1.89E+06
Actual Loadings (2011*)	U (mg/L)	221.3	0.033	2.25E+02	0.2	0.197	6.81E-01	2.26E+02
	Ra226 (Bq/L)	221.3	0.07	5.00E+08	0.2	0.86	3.42E+06	5.03E+08
	TDS (mg/L)	221.3	87	6.01E+05	0.2	310	8.54E+03	6.10E+05
Actual Loadings (January-June 2012*)	U (mg/L)	740	0.038	3.25E+02	0.83	0.225	1.02E+01	3.35E+02
	Ra226 (Bq/L)	740	0.04	4.57E+08	0.83	0.74	2.90E+07	4.86E+08
	TDS (mg/L)	740	87	9.61E+05	0.83	286	0.1360	9.61E+05

**Note: Loading values in this table were calculated using monthly flow volumes, not the annual averages that are presented in this table.*
Units:
U [=] mg/L, Ra226 [=] Bq/L, TDS [=] mg/L
Loadings U [=] Kg/month, Loadings Ra226 [=] Bq/month, Loadings TDS [=] Kg/month

Table 4.5.1
Radon Track Etch Cup Summary

	Annual Average pCi/L						
Location	1982	2006	2007	2008	2009	2010	2011
Airport Beacon	1.4	0.4	0.3	0.5	0.5	0.3	0.2
Eldorado Townsite	3.7	0.7	0.4	0.7	0.7	0.5	0.4
Northwest of Airport	2.4	0.4	0.2	0.3	0.4	0.3	0.2
Ace Creek	10.7	6.3	4.9	6.7	5.3	5.4	7.0
Fay Waste Rock	5.1	1.4	1.1	1.2	1.2	0.9	1.1
Fookes Delta	5.1	3.1	1.8	3.0	2.9	2.0	1.9*
Marie Lake	5.1	2.5	2.5	2.7	2.5	5.8	3.6
Donaldson Lake	5.1	0.3	0.2	0.7	0.6	0.2	0.2
Fredette Lake	5.1	0.4	0.2	0.3	0.8	1.2	0.2
Uranium City	5.1	0.2	0.2	0.3	1.2	0.3	0.2

Note: Values presented are an average of two 6 month samples collected through the calendar year.
* Radon detector was damaged by wildlife. Only one sample was collected from Fookes Delta in 2011 (January – June)

FIGURES

FIGURES

Figure 2.4.1
Beaverlodge Location Map

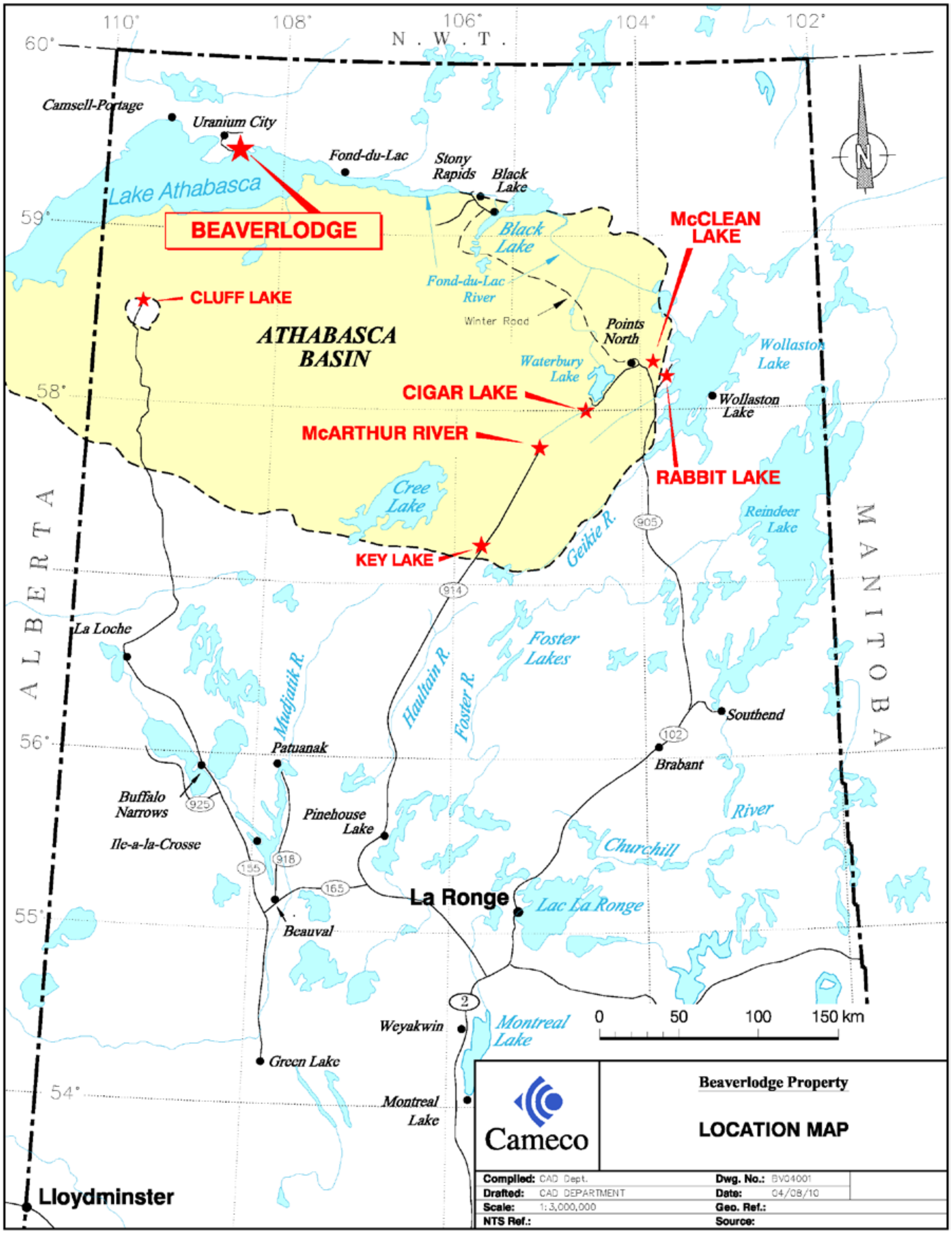


Figure 4.3
Aquatic Sampling Station Locations

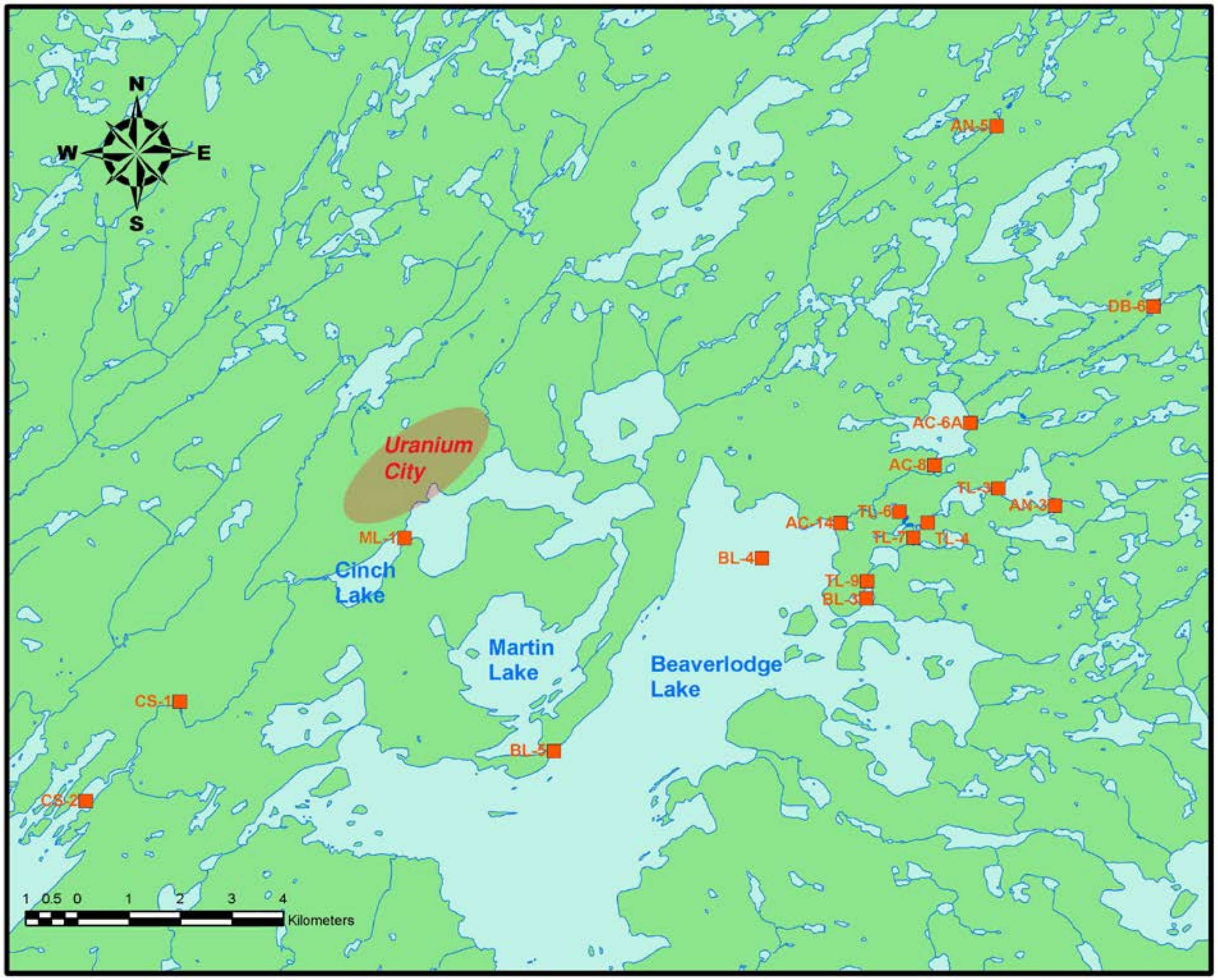


Figure 4.3.1-1 AN-5 - Pistol Creek below Hab Site

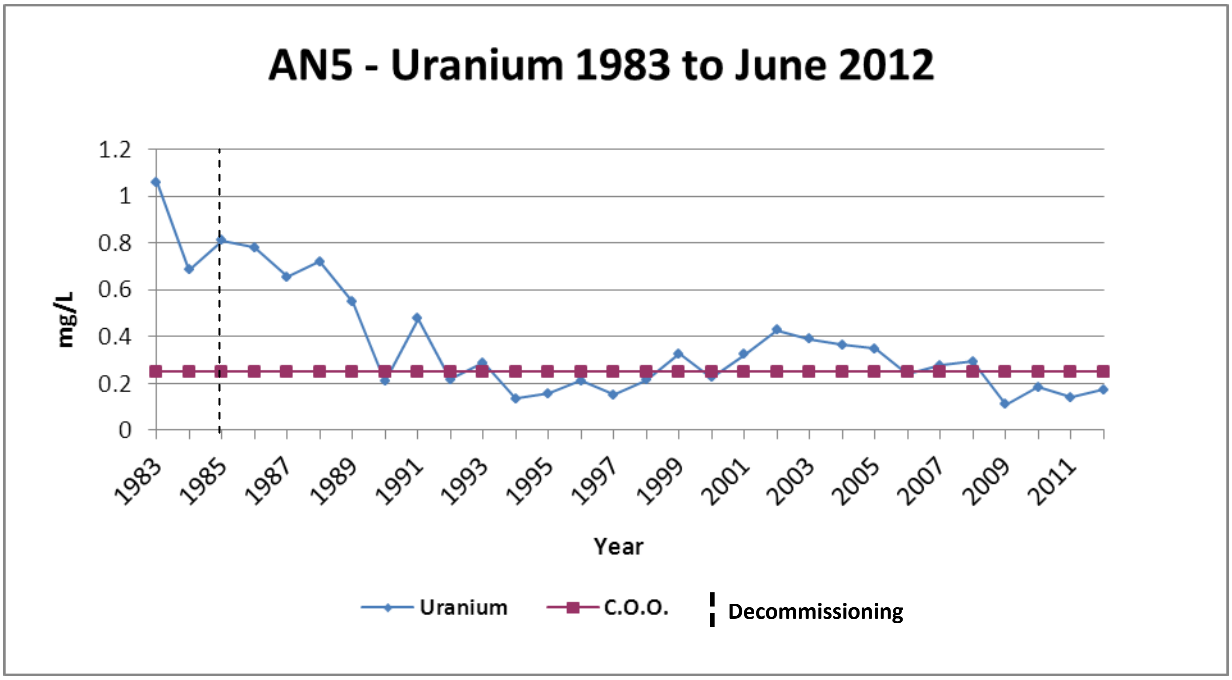


Figure 4.3.1-2 AN-5 - Pistol Creek below Hab Site

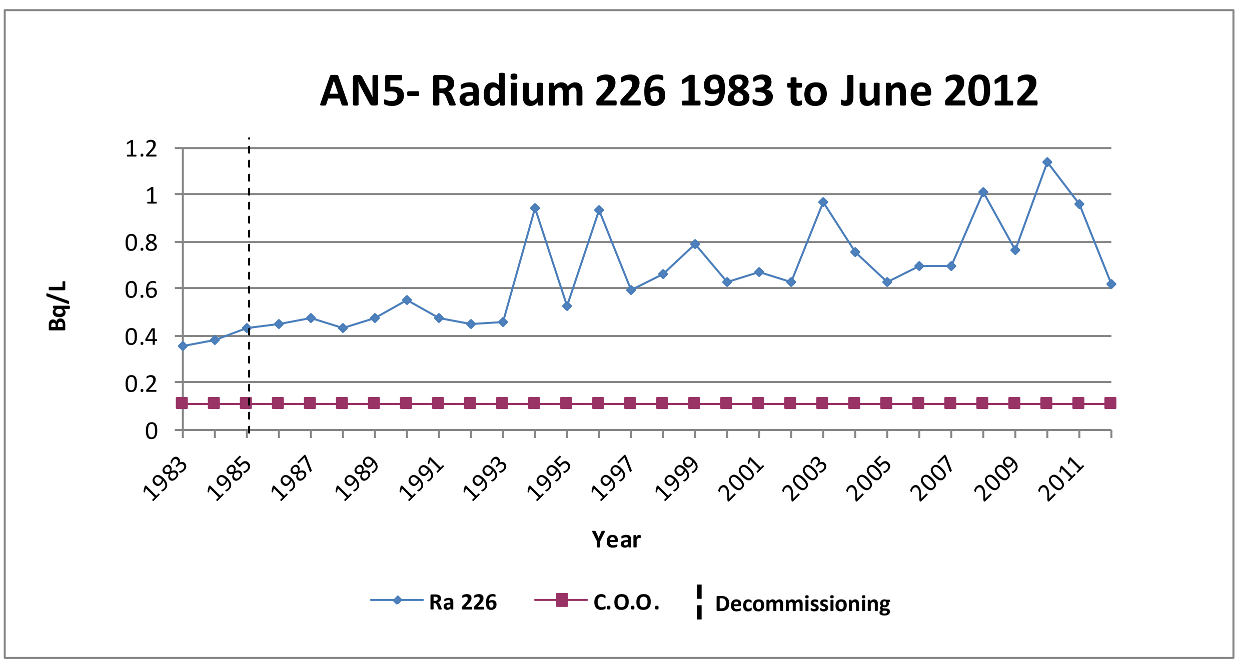


Figure 4.3.1-3 AN-5 - Pistol Creek below Hab Site

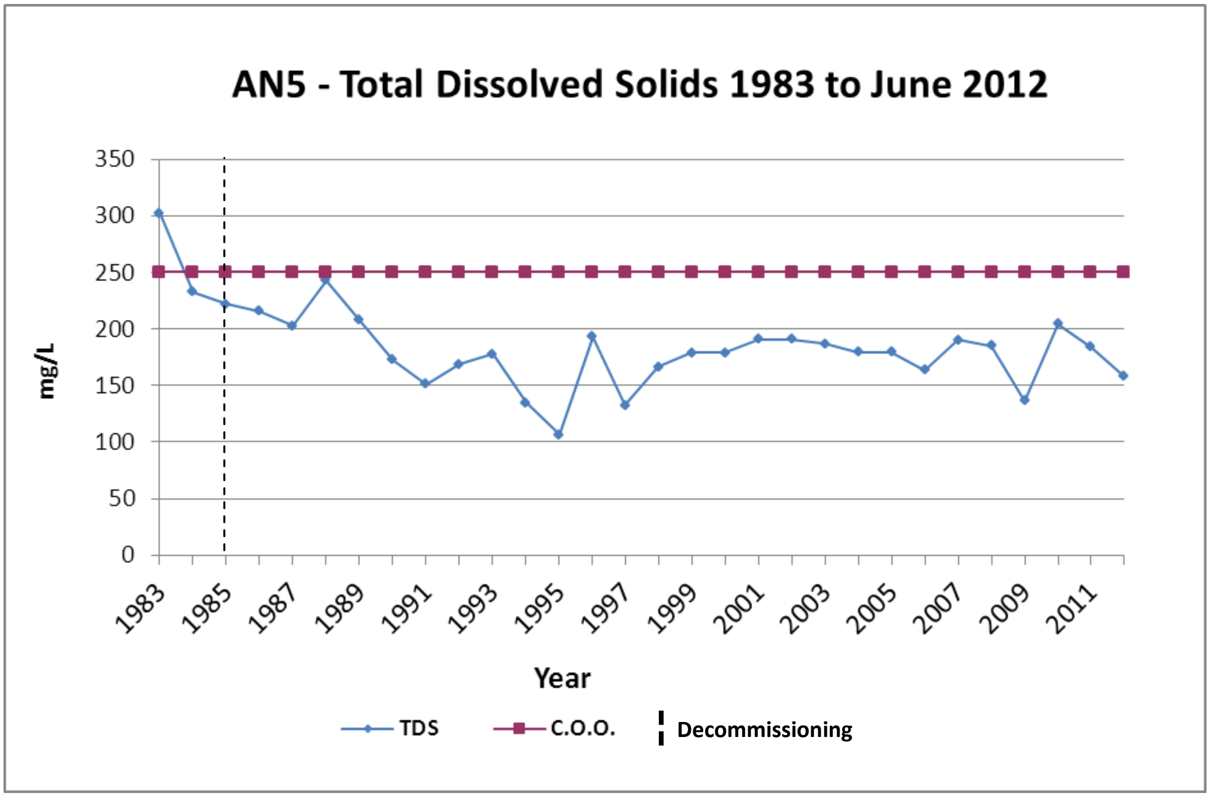


Figure 4.3.1-4 AN-5 - Pistol Creek below Hab Site

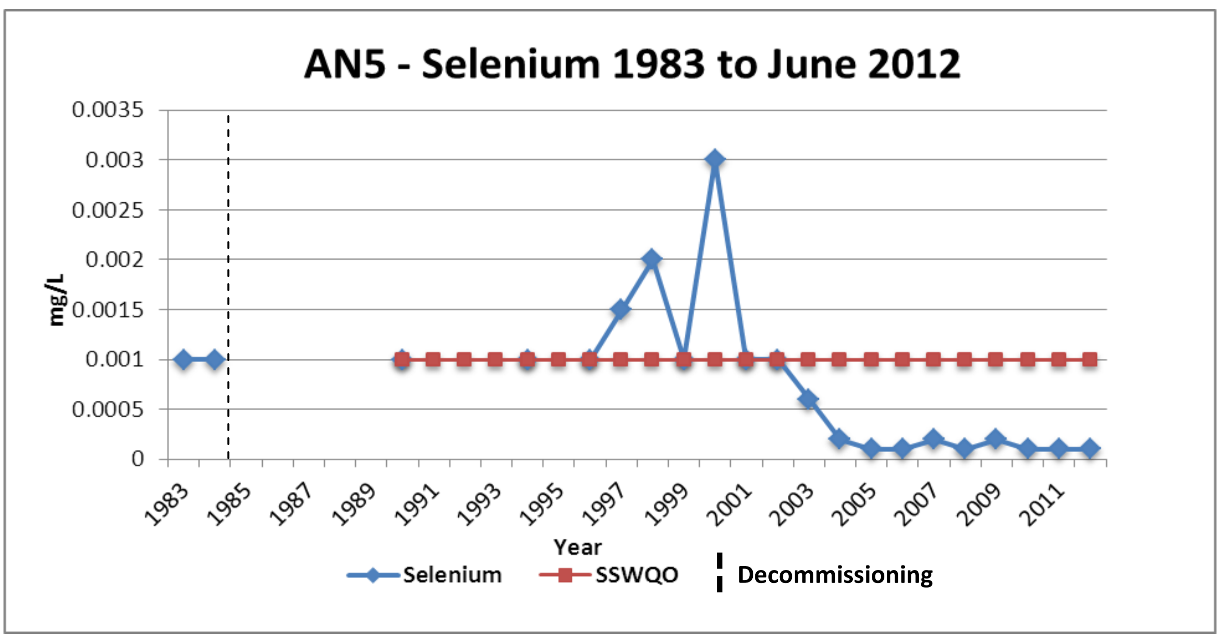


Figure 4.3.1-5 DB-6 - Dubyna Creek

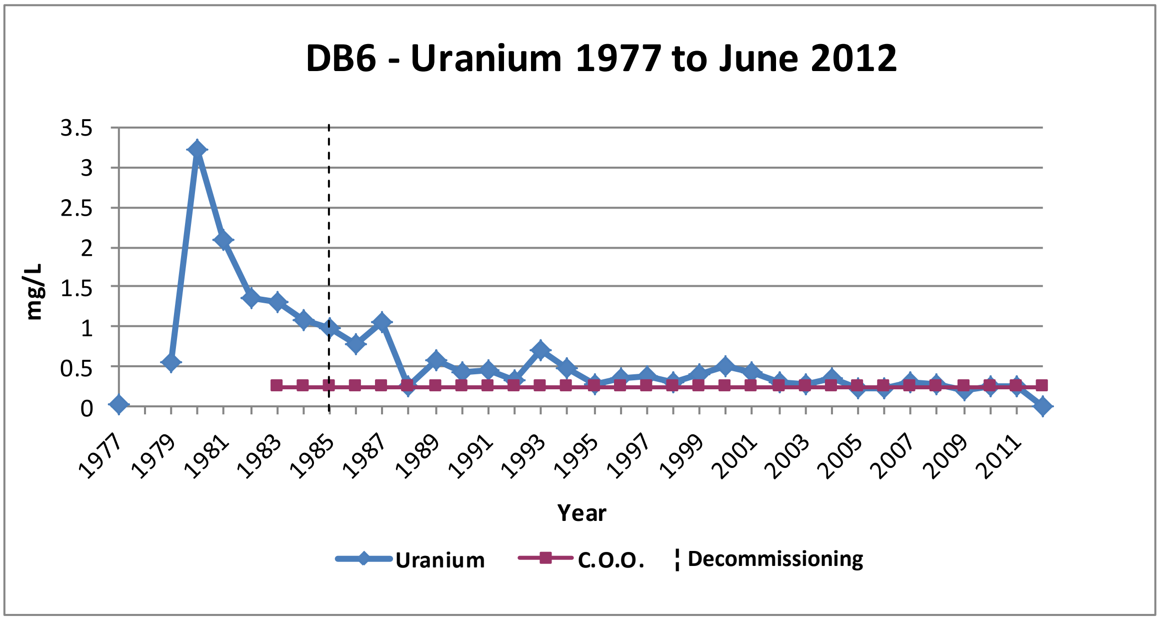


Figure 4.3.1-6 DB-6 - Dubyna Creek

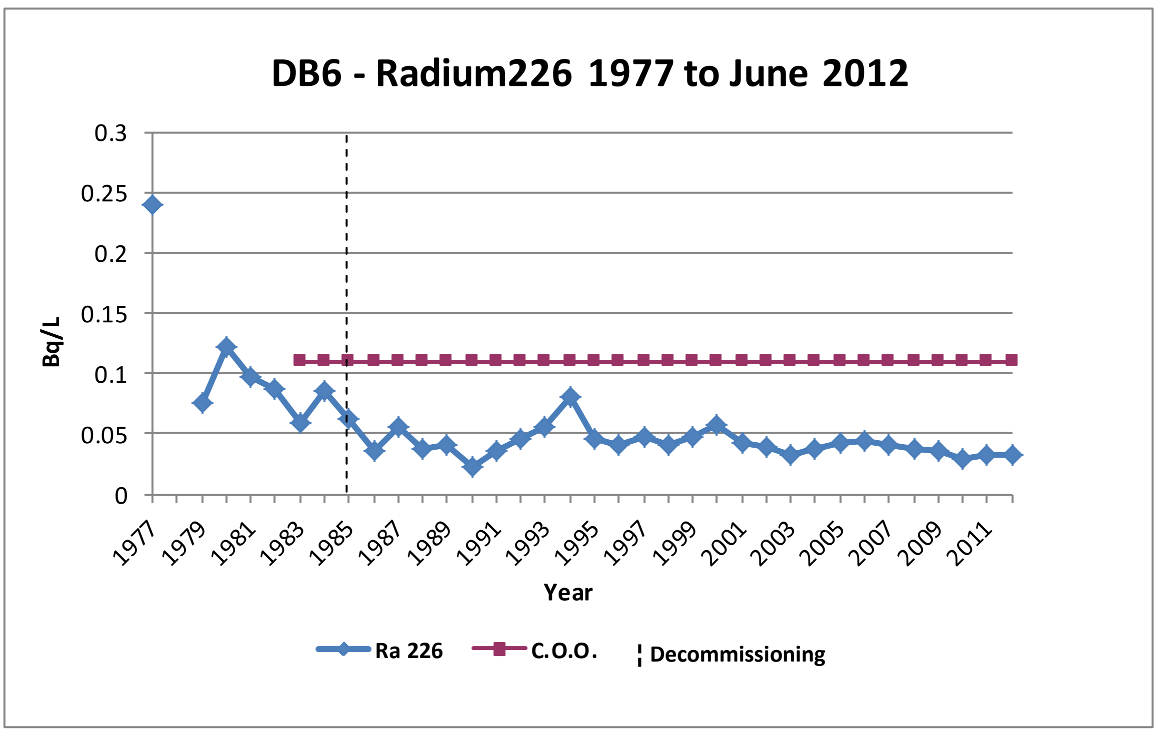


Figure 4.3.1-7 DB-6 - Dubyna Creek

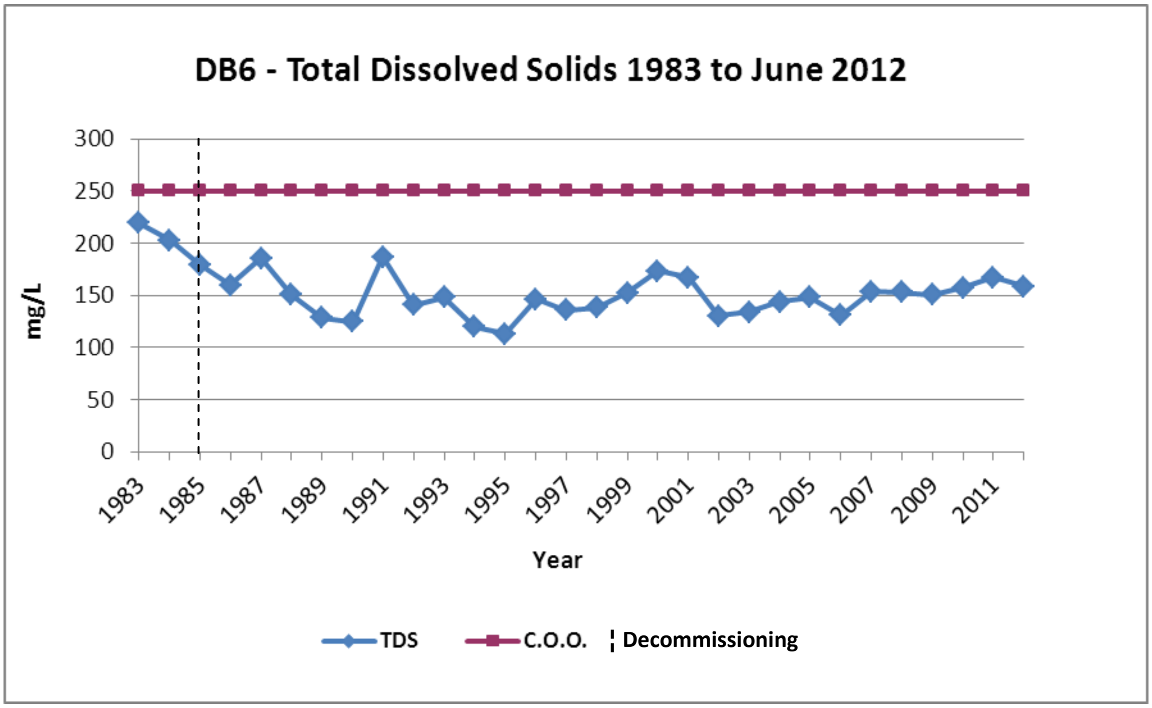


Figure 4.3.1-8 DB-6 - Dubyna Creek

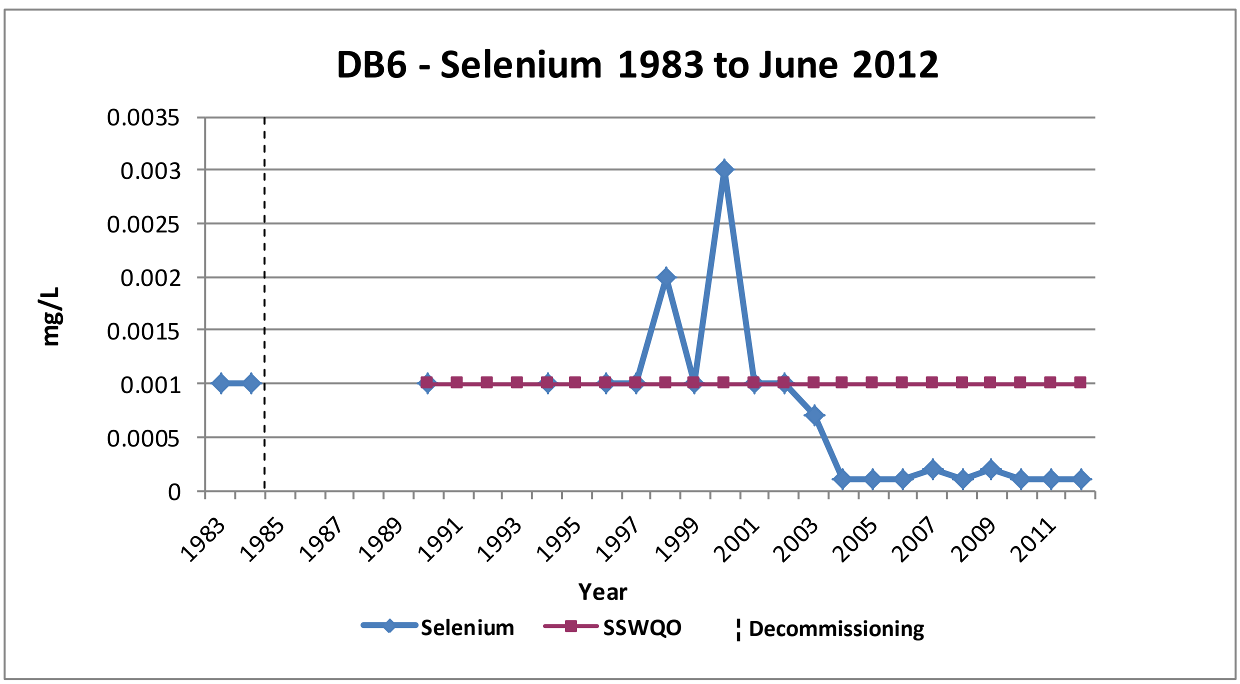


Figure 4.3.1-9 AC-6A- Verna Lake Discharge to Ace Lake

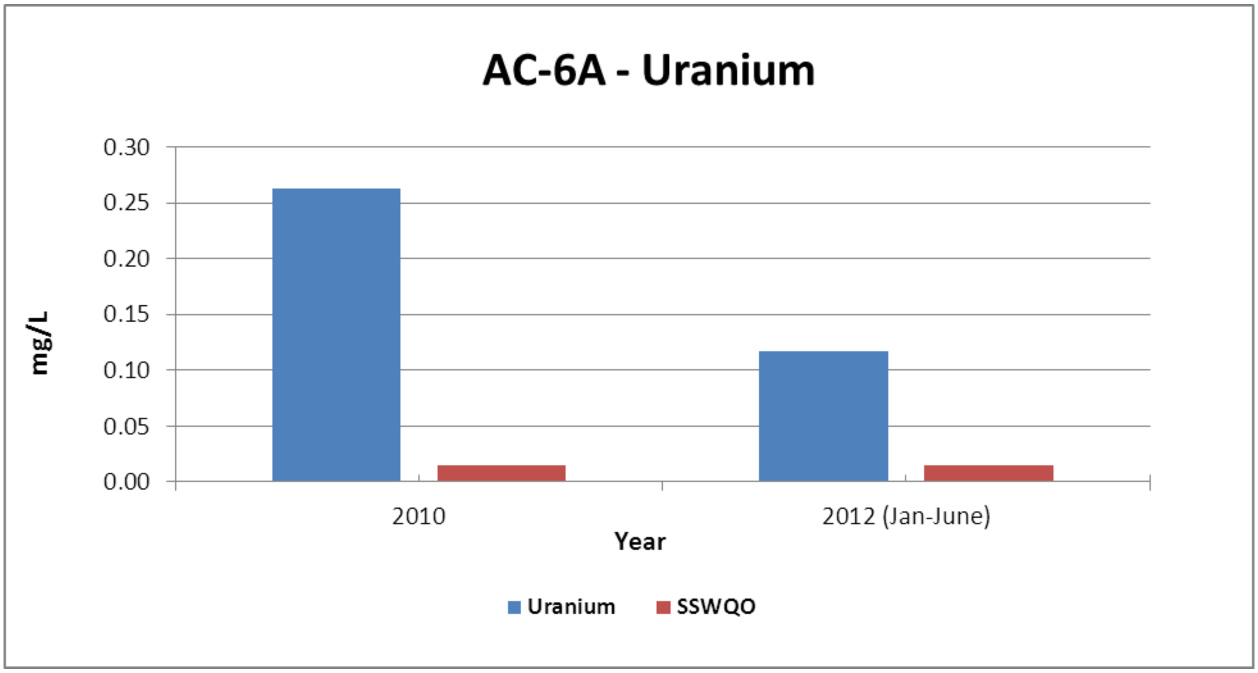


Figure 4.3.1-10 AC-6A- Verna Lake Discharge to Ace Lake

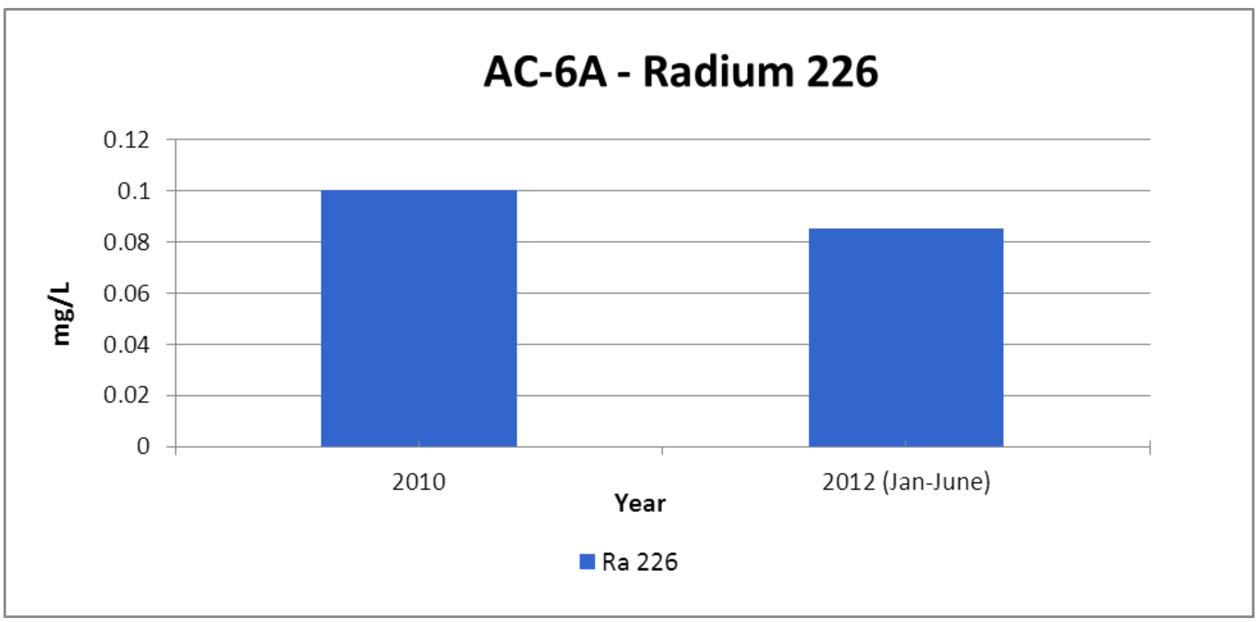


Figure 4.3.1-11 AC-6A- Verna Lake Discharge to Ace Lake

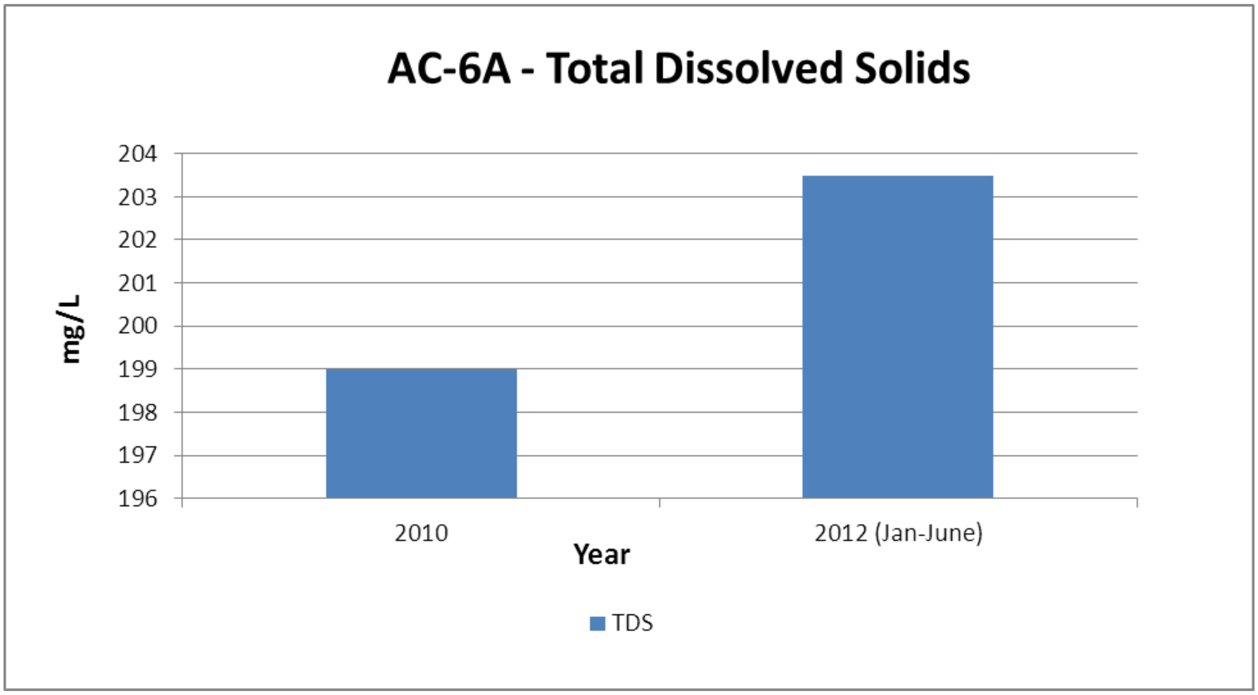


Figure 4.3.1-12 AC-6A- Verna Lake Discharge to Ace Lake

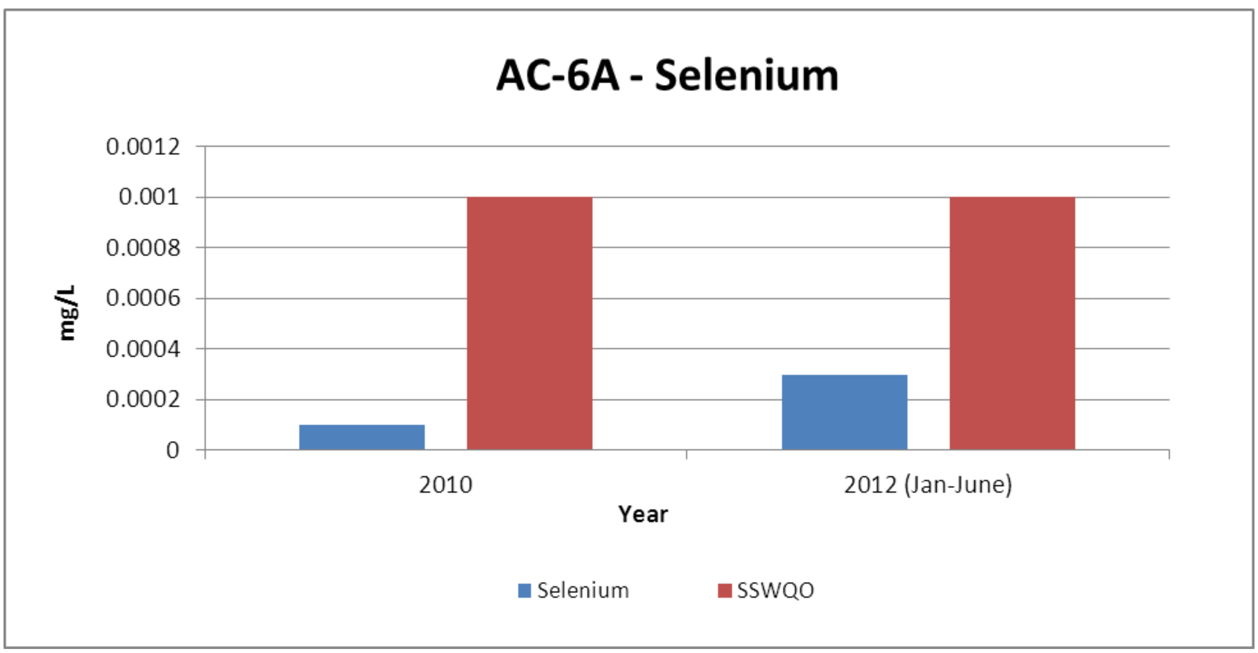


Figure 4.3.1-13 AC-8 - Ace Lake Outlet to Ace Creek

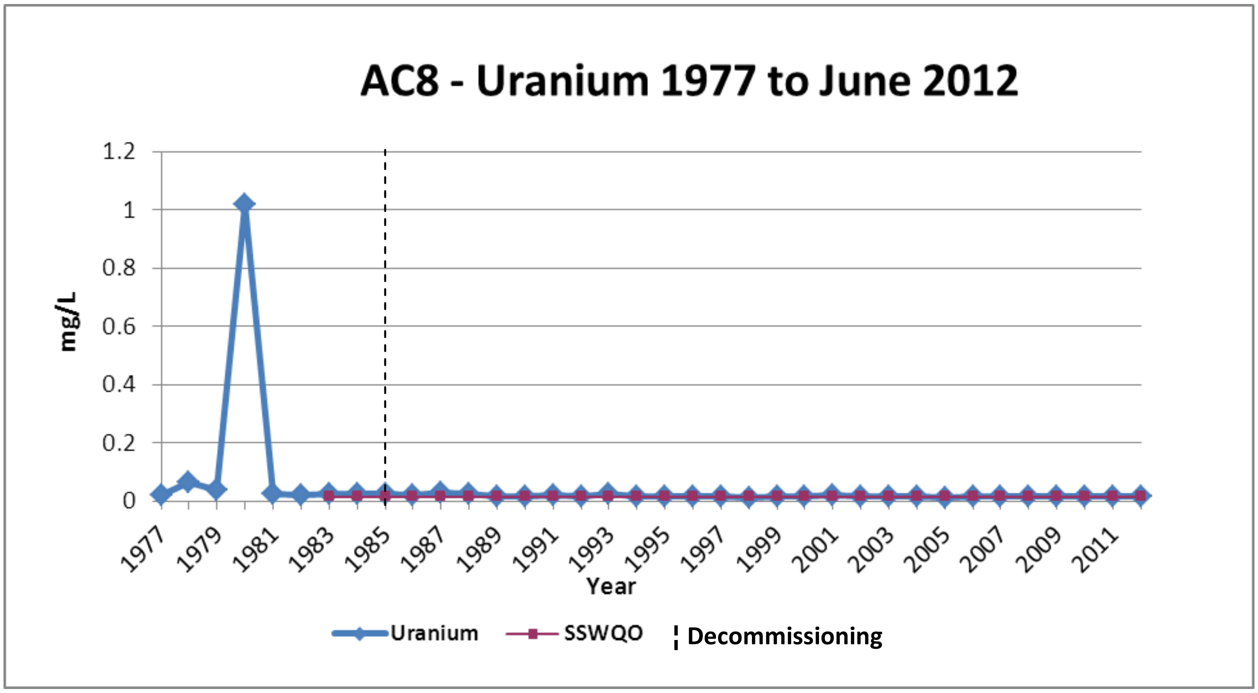


Figure 4.3.1-14 AC-8 - Ace Lake Outlet to Ace Creek

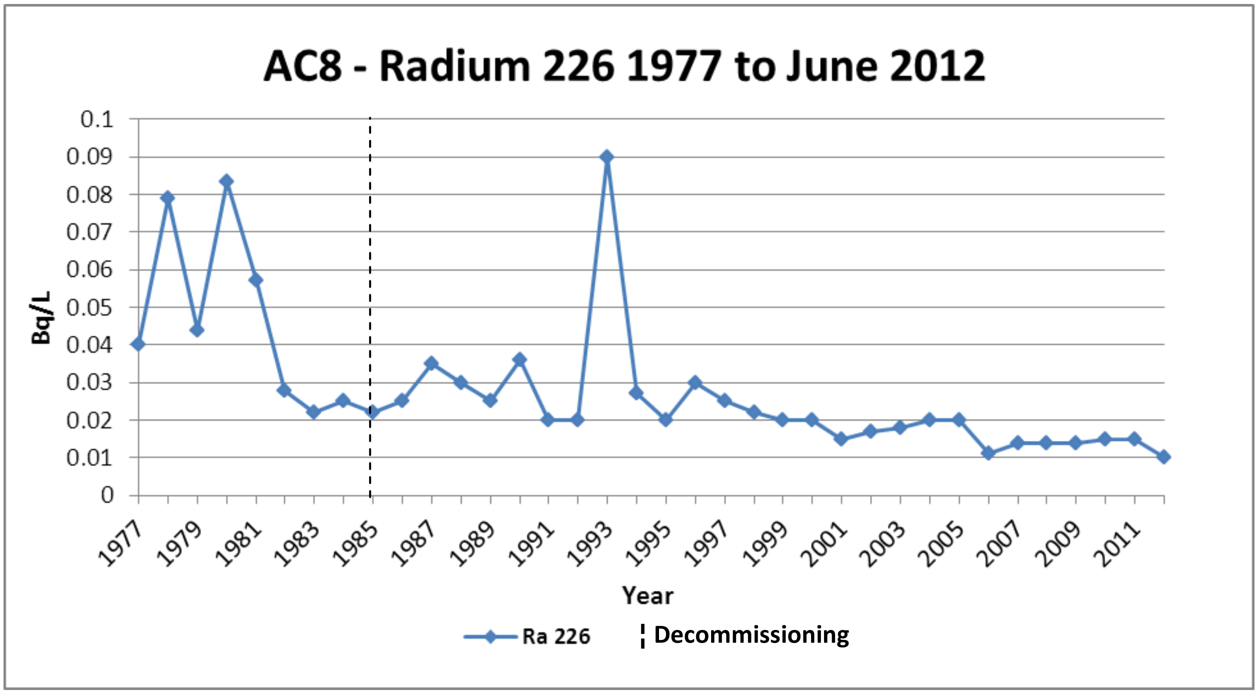


Figure 4.3.1-15 AC-8 - Ace Lake Outlet to Ace Creek

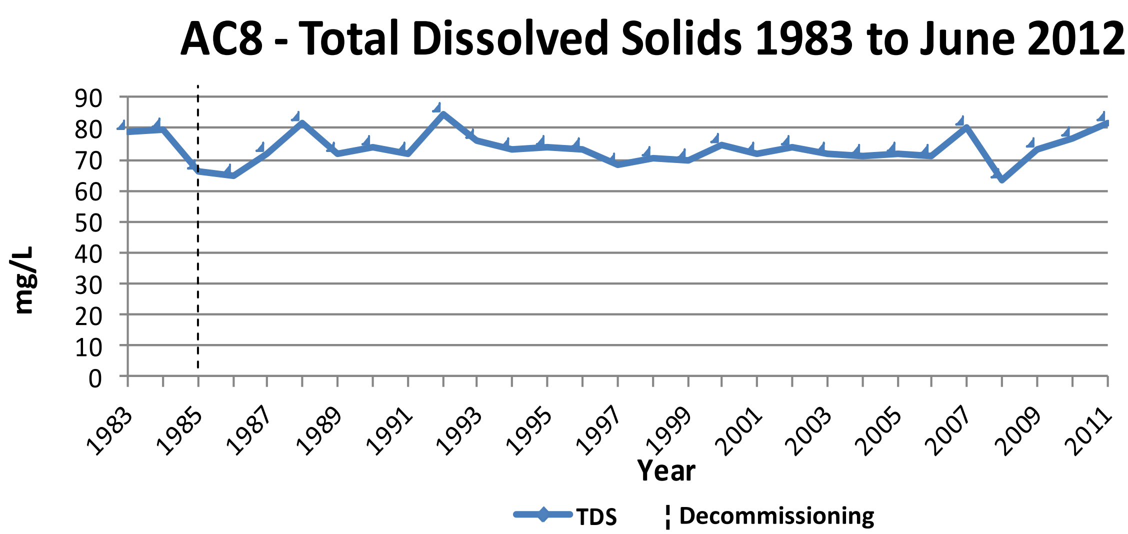


Figure 4.3.1-16 AC-8 - Ace Lake Outlet to Ace Creek

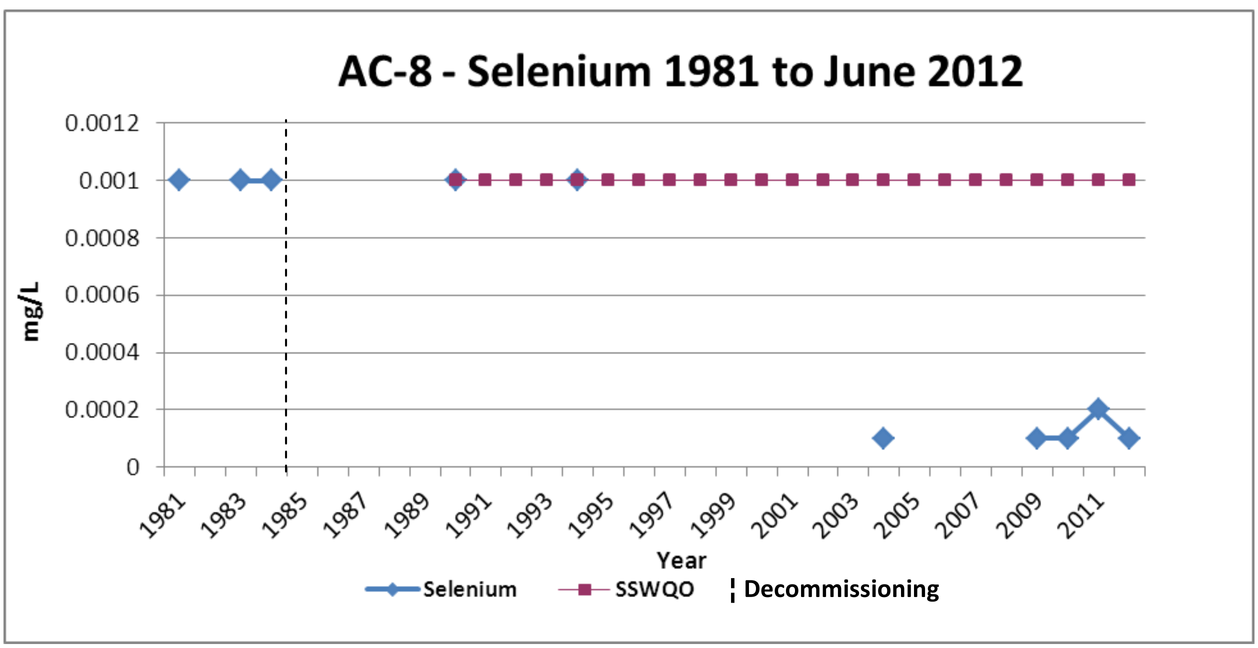


Figure 4.3.1-17 AC-14 - Ace Creek

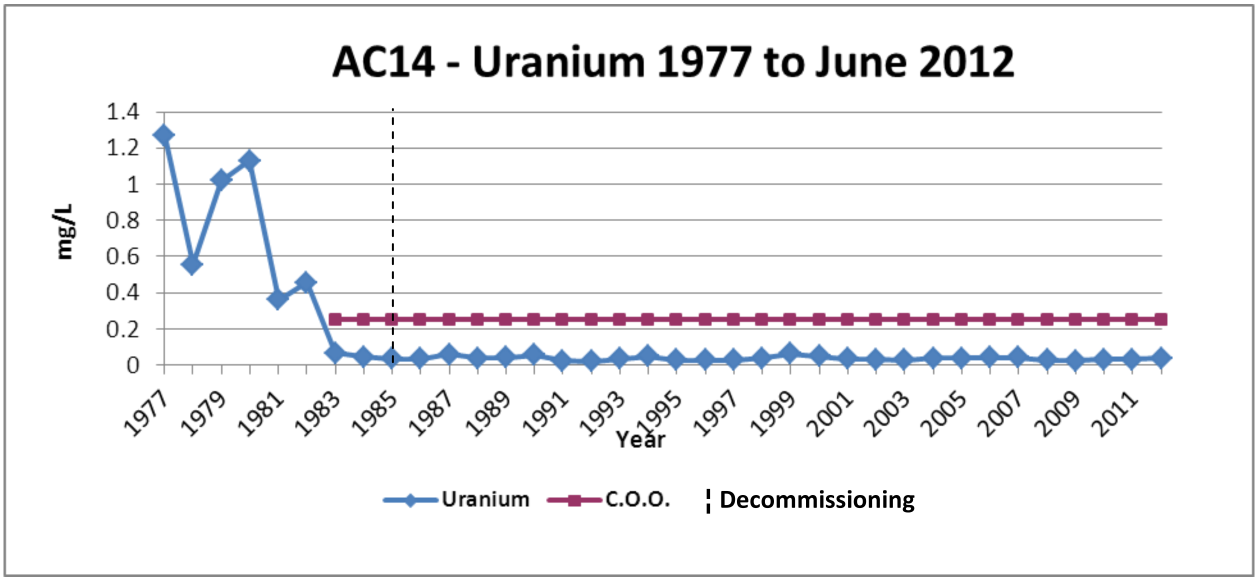


Figure 4.3.1-18 AC-14 - Ace Creek

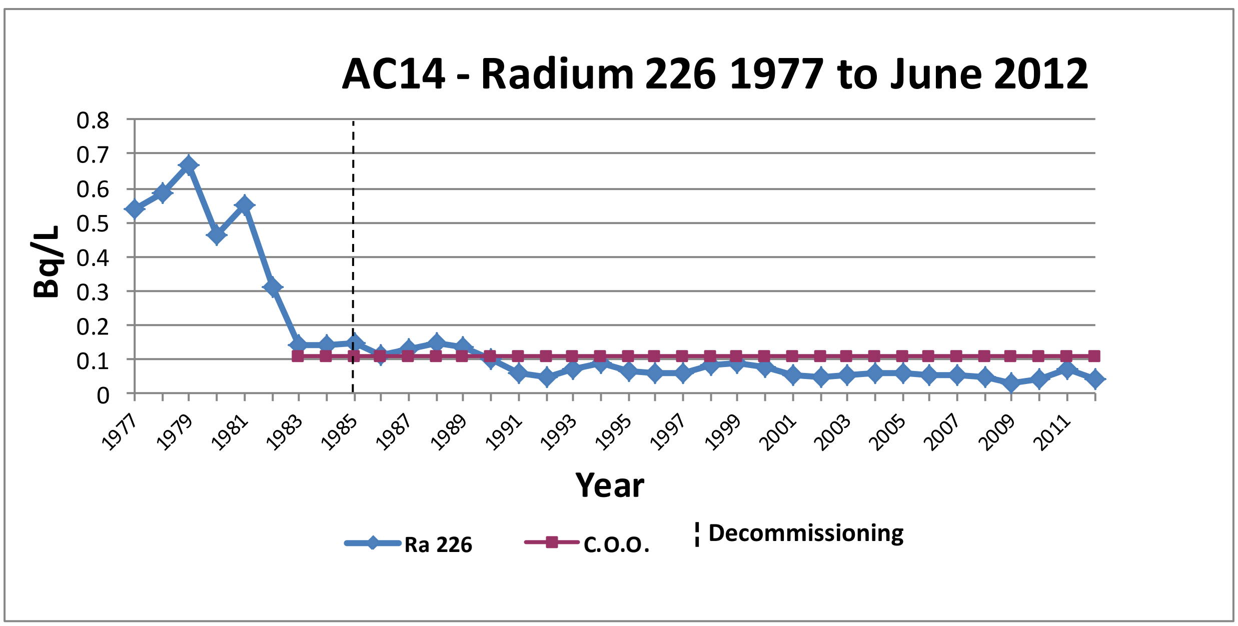


Figure 4.3.1-19 AC-14 - Ace Creek

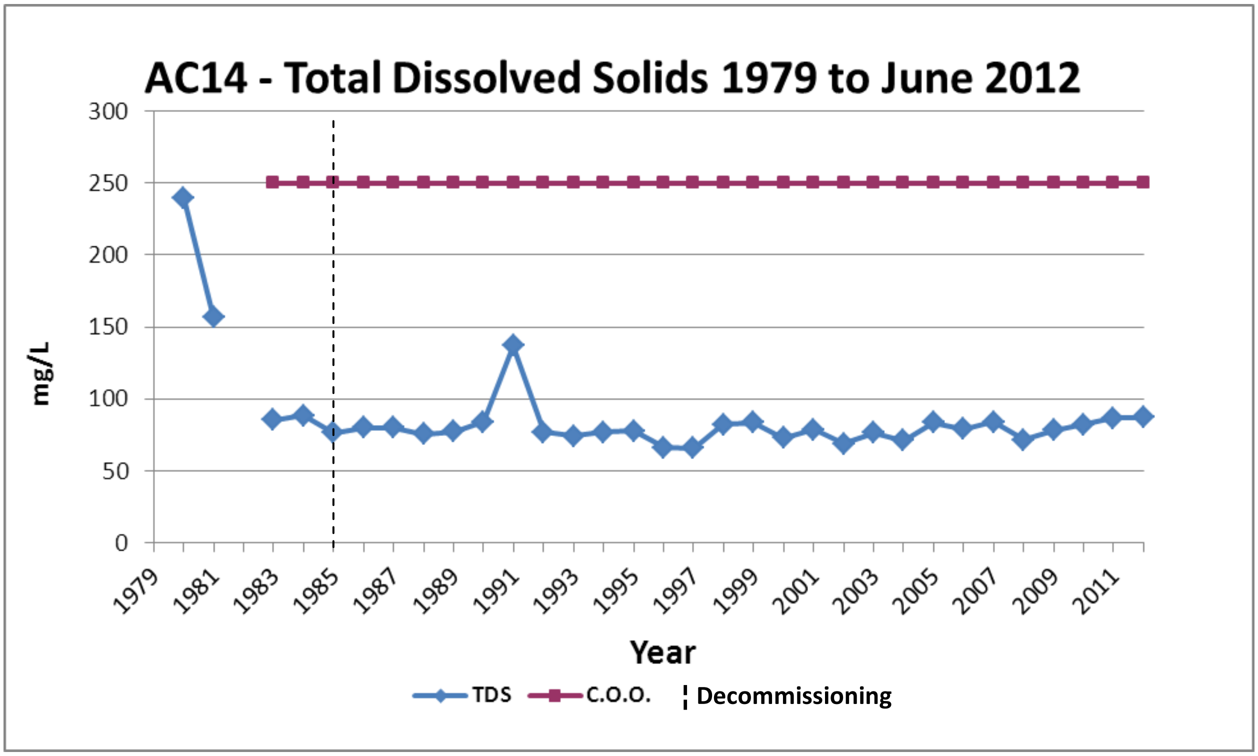


Figure 4.3.1-20 AC-14 - Ace Creek

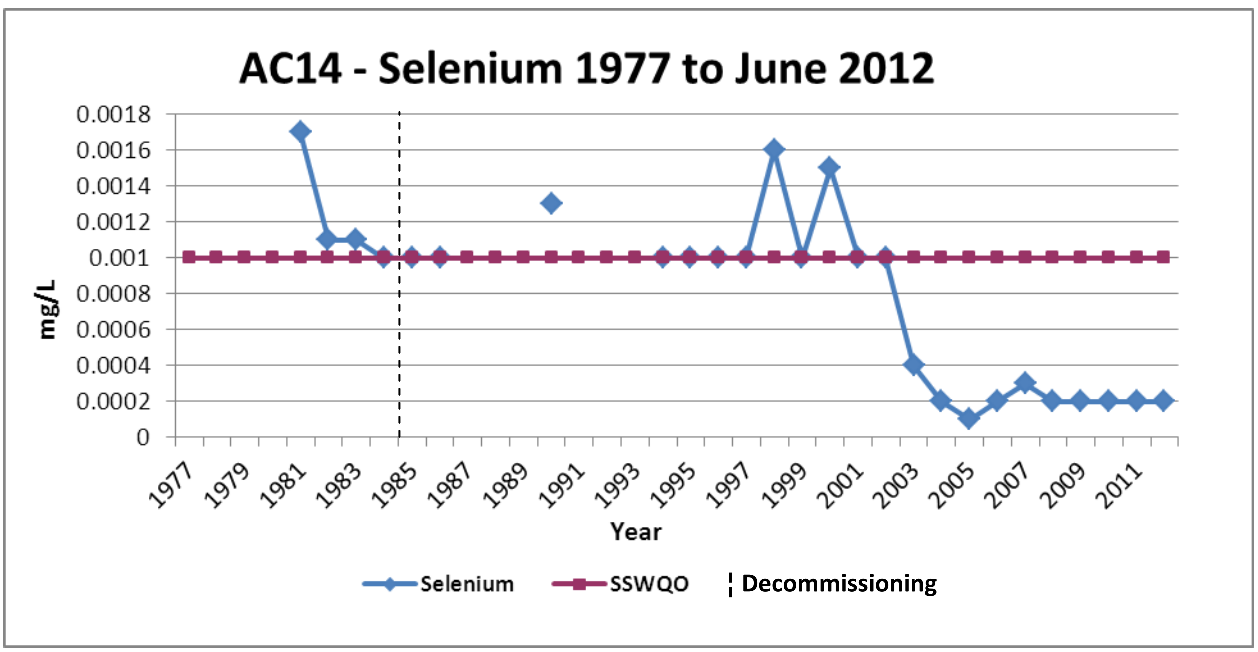
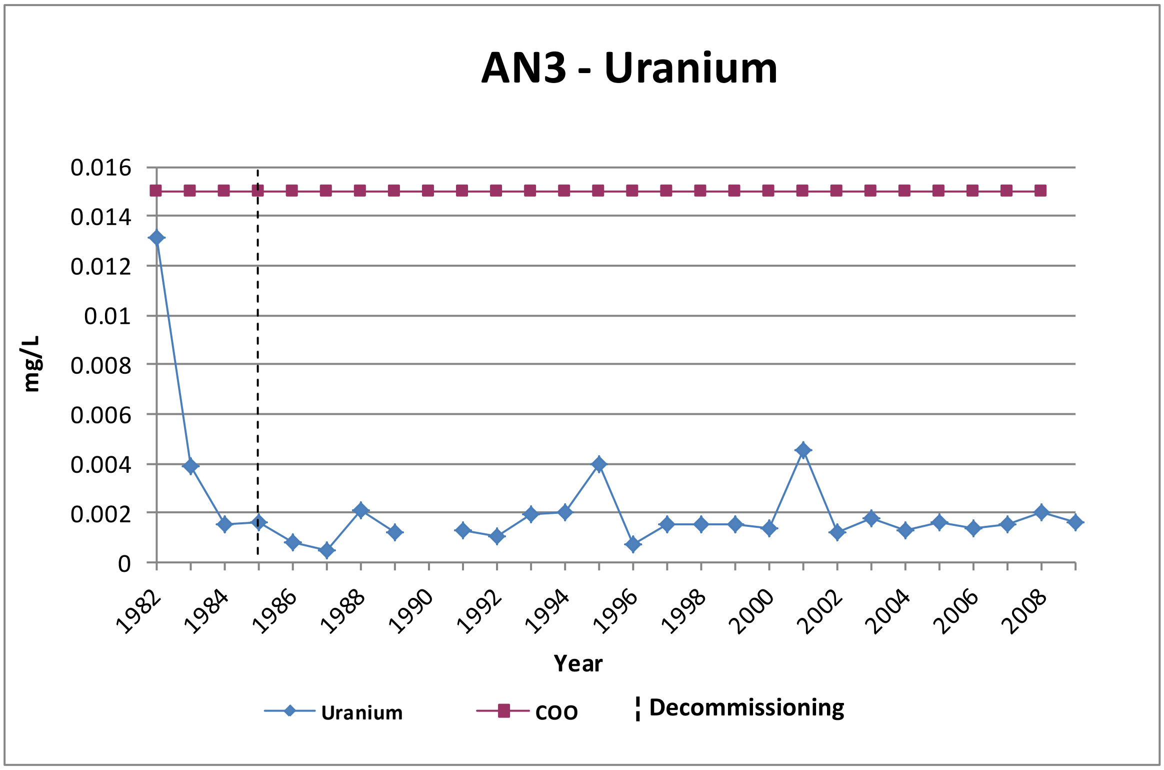
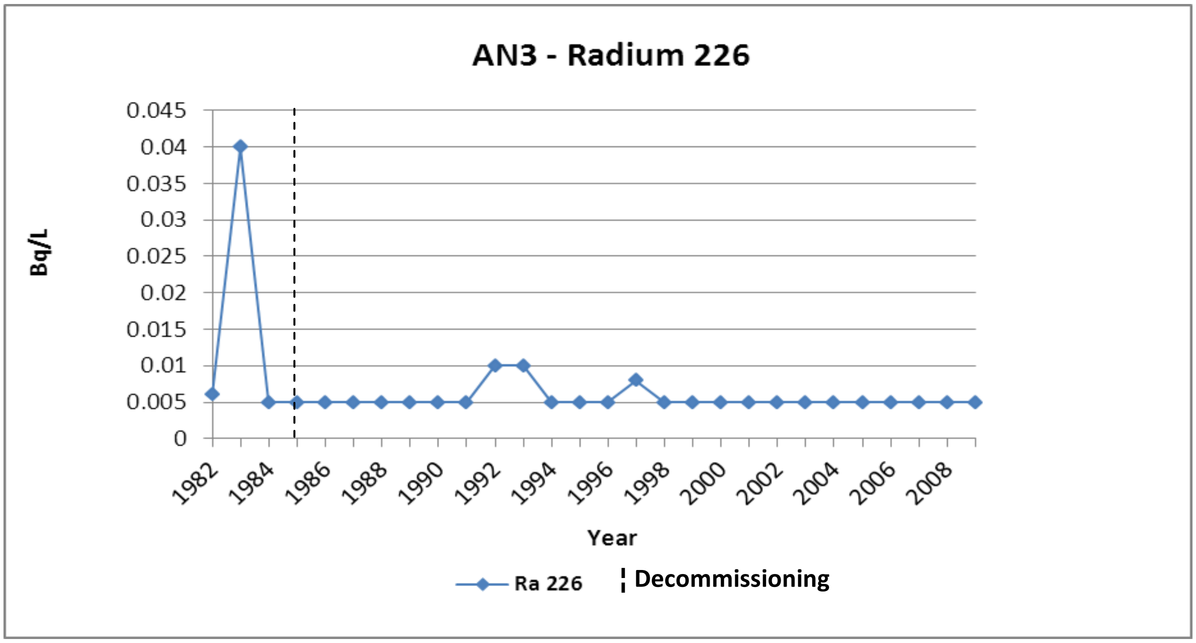


Figure 4.3.2-1 AN-3 - Fulton Lake (upstream of TL Stations)



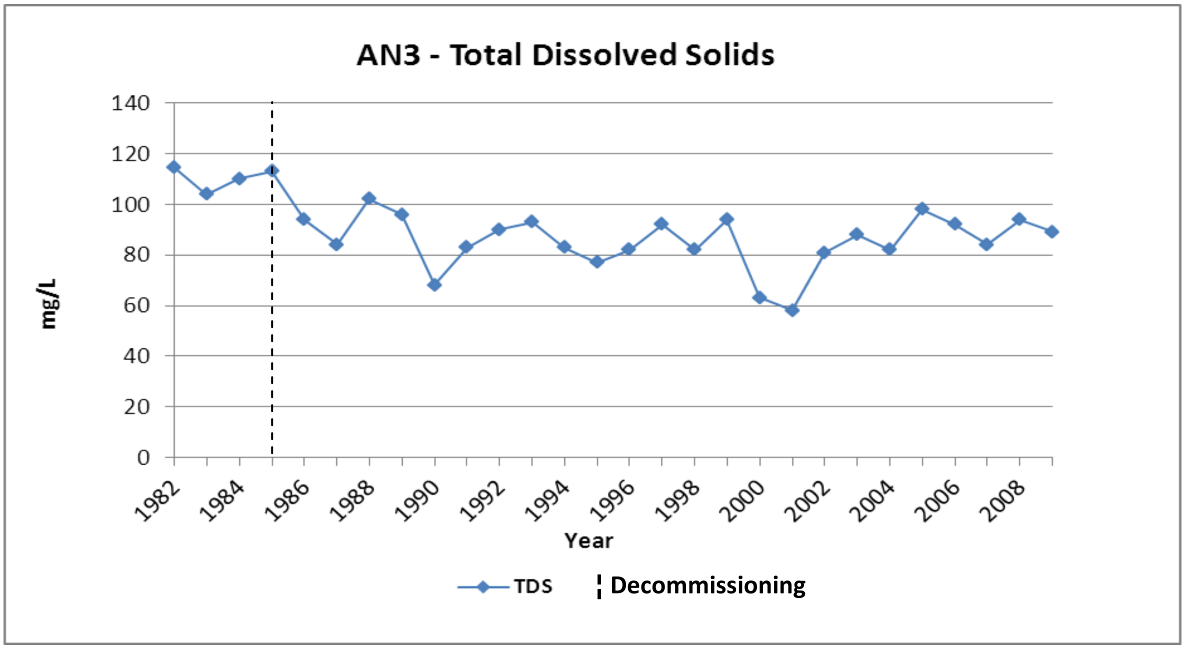
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*
***Sampling is scheduled for September 2012*

Figure 4.3.2-2 AN-3 - Fulton Lake (upstream of TL Stations)



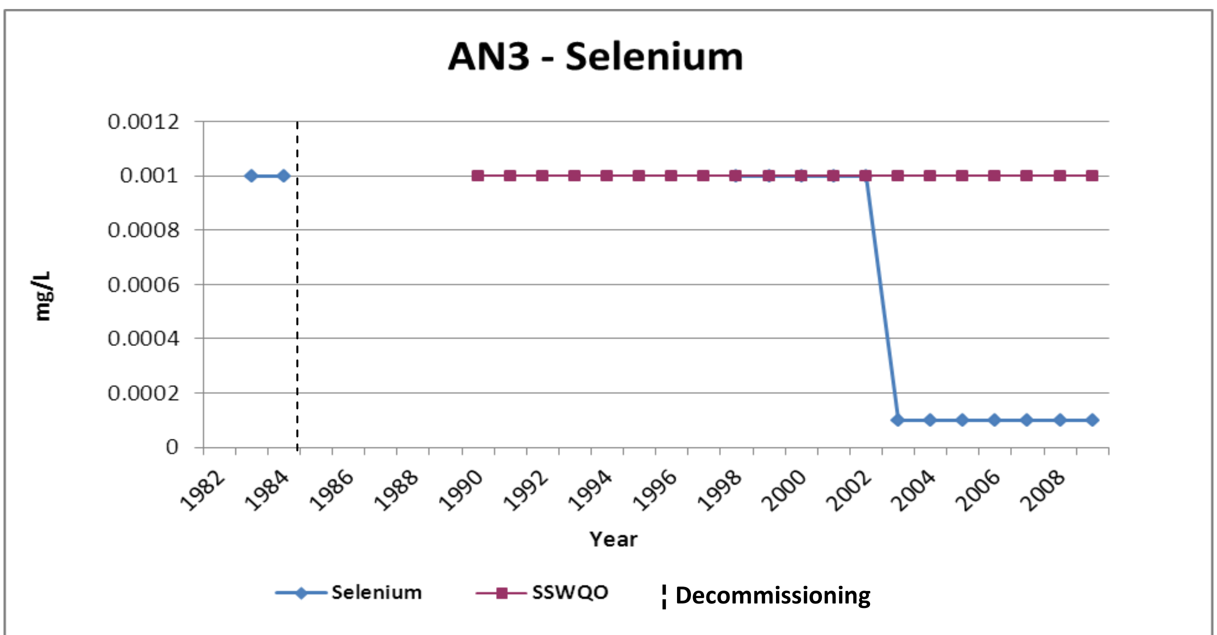
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*
***Sampling is scheduled for September 2012*

Figure 4.3.2-3 AN-3 - Fulton Lake (upstream of TL Stations)



**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*
***Sampling is scheduled for September 2012*

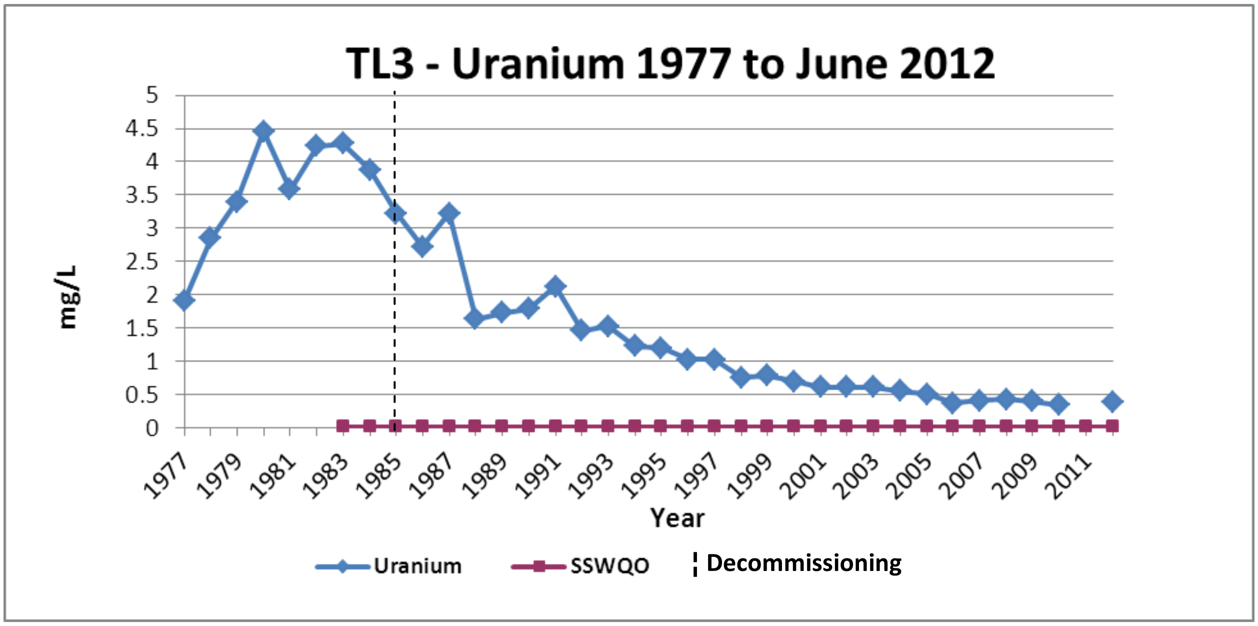
Figure 4.3.2-4 AN-3 - Fulton Lake (upstream of TL Stations)



Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003

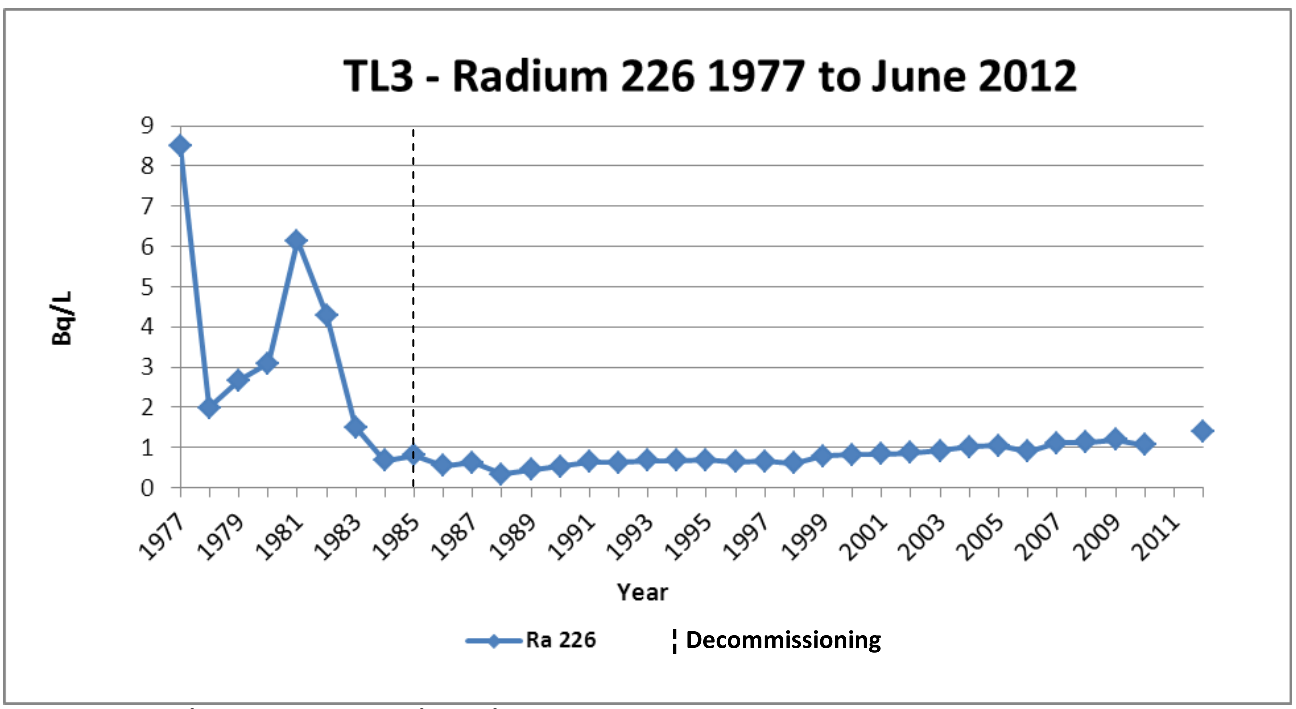
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*
***Sampling is scheduled for September 2012*

Figure 4.3.2-5 TL-3 - Fookes Reservoir Discharge



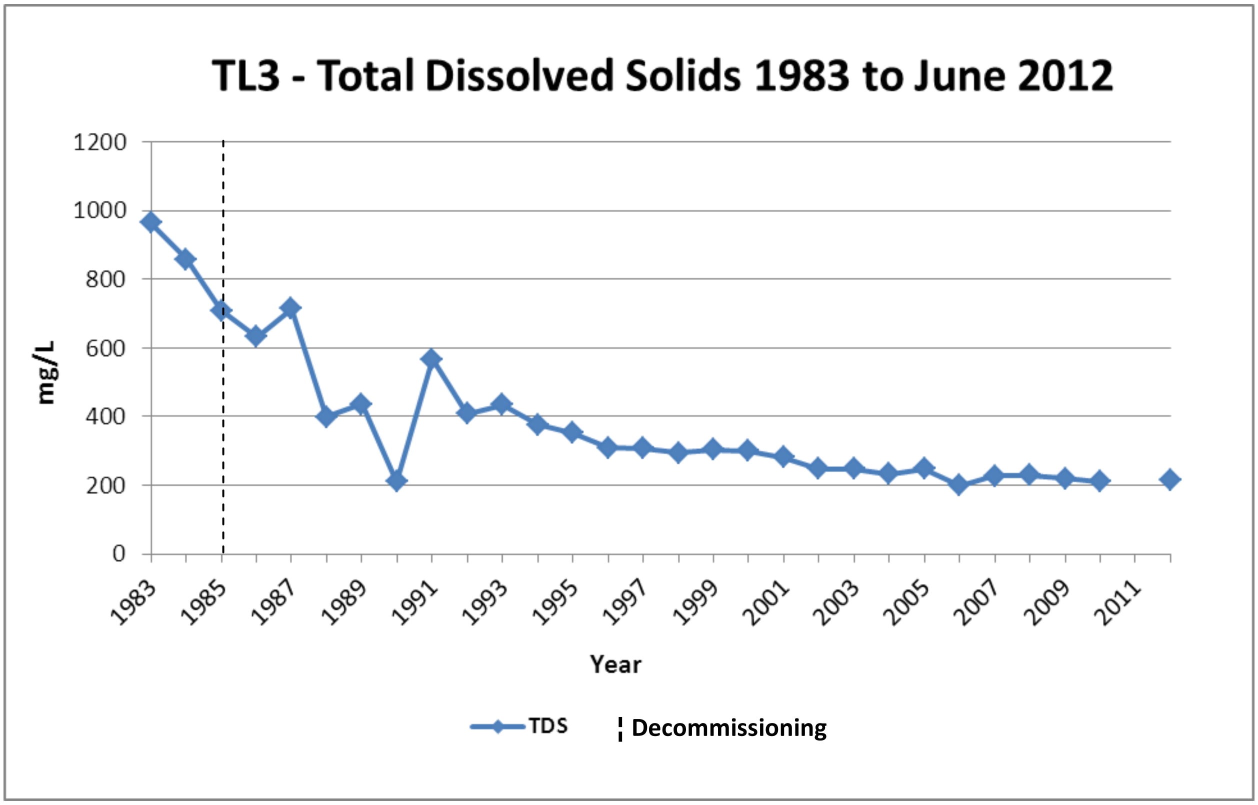
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-6 TL-3 - Fookes Reservoir Discharge



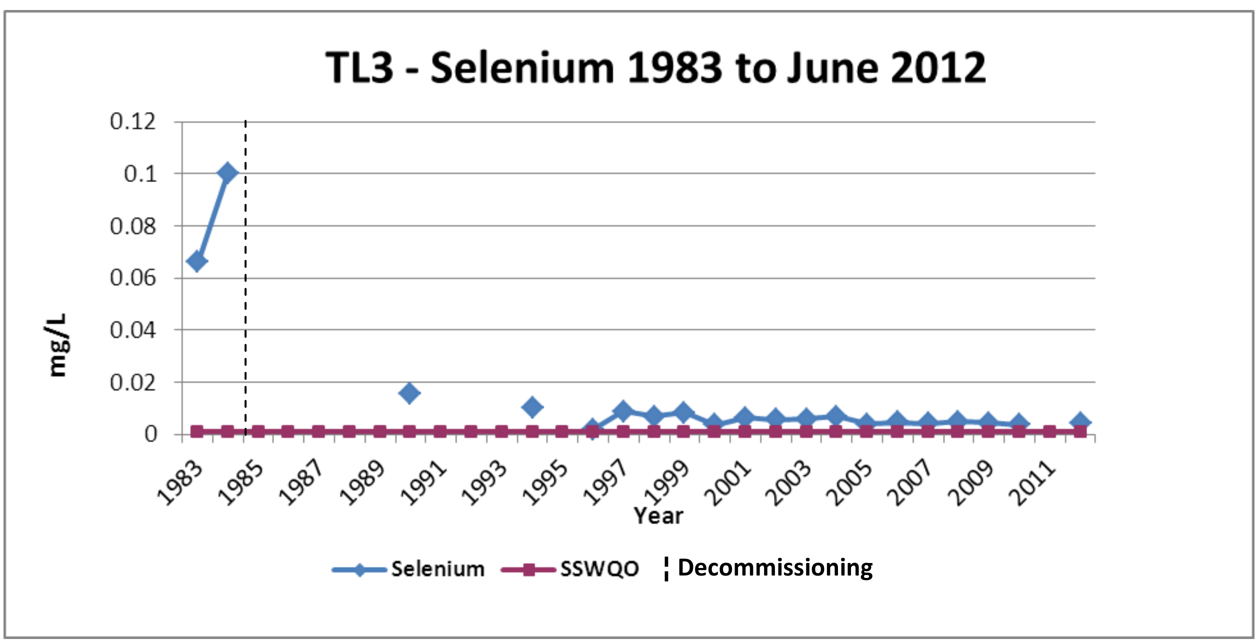
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-7 TL-3 - Fookes Reservoir Discharge



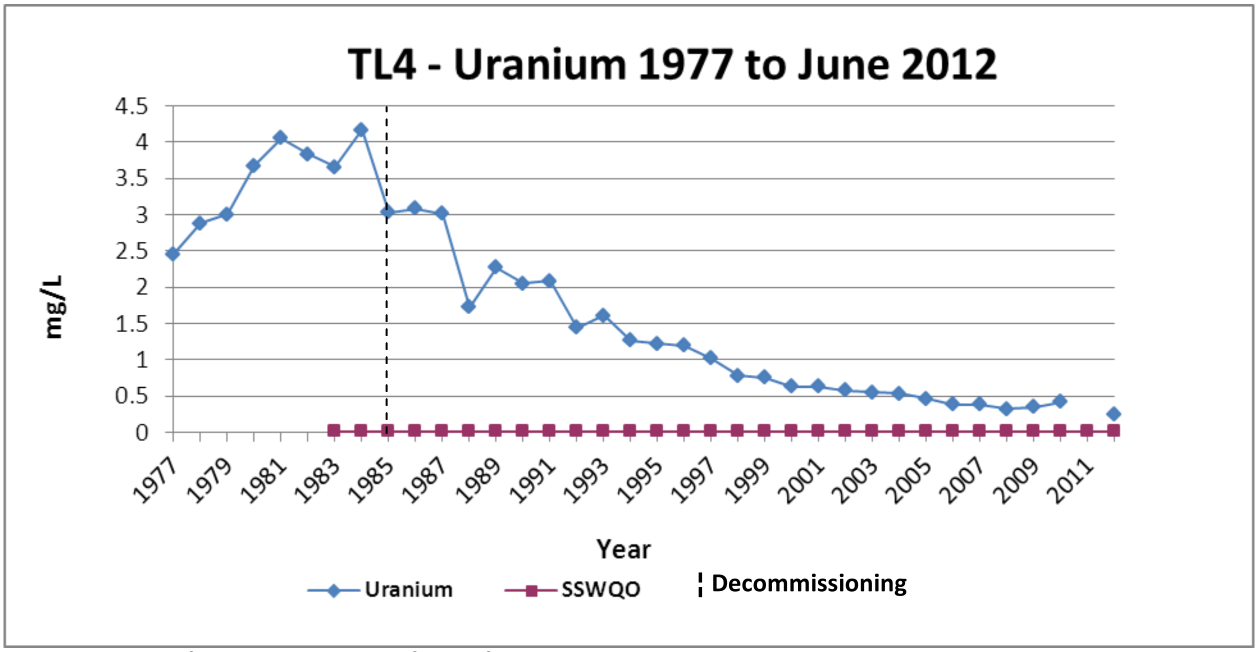
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-8 TL-3 - Fookes Reservoir Discharge



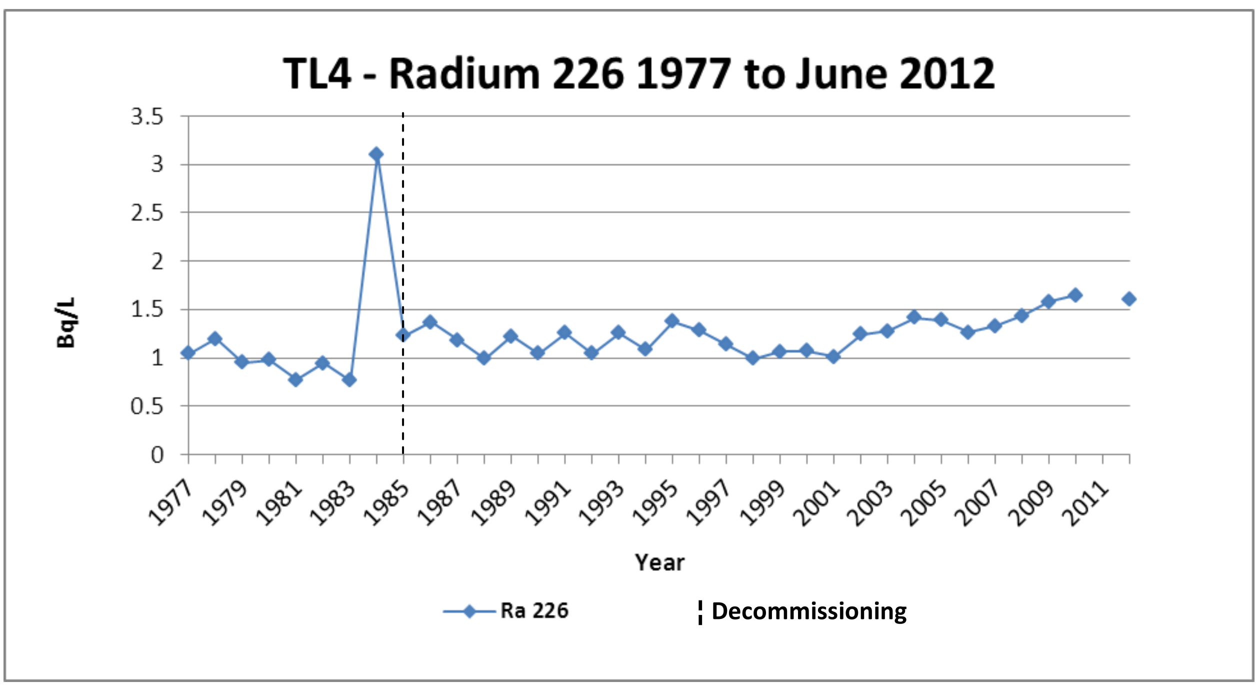
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-9 TL-4 - Marie Reservoir Discharge



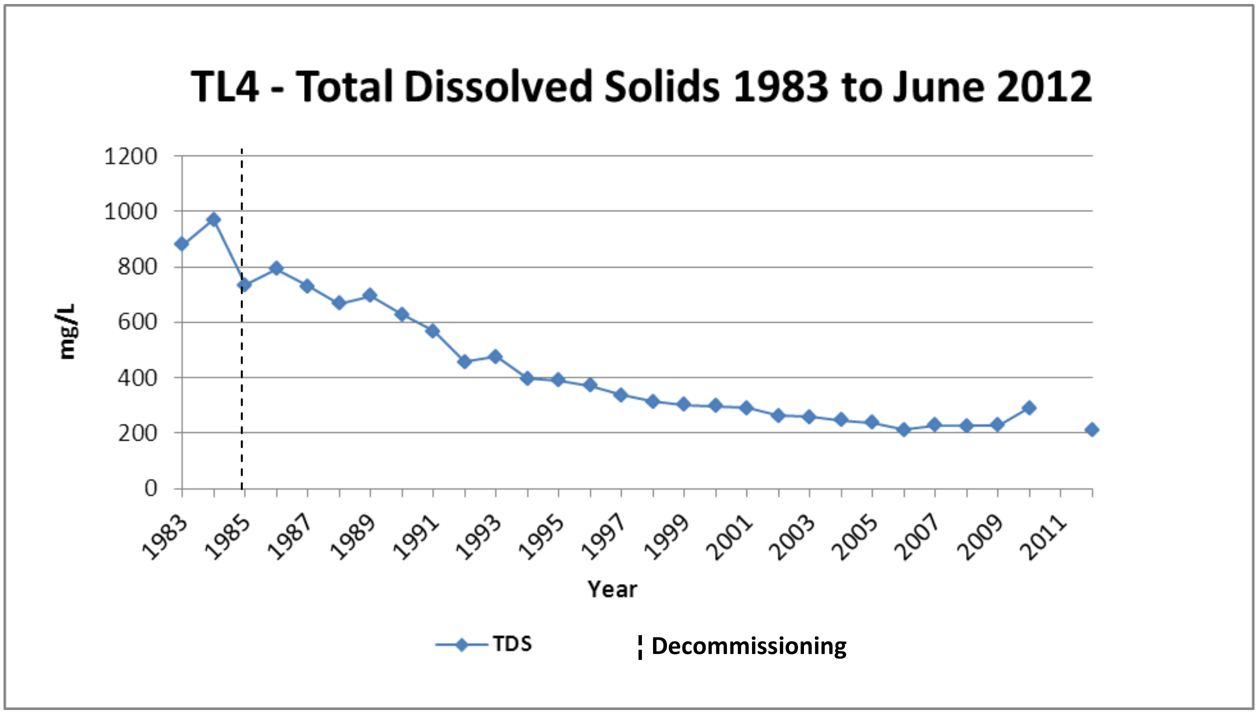
**No data available for2011 due to a lack of water flow*

Figure 4.3.2-10 TL-4 - Marie Reservoir Discharge



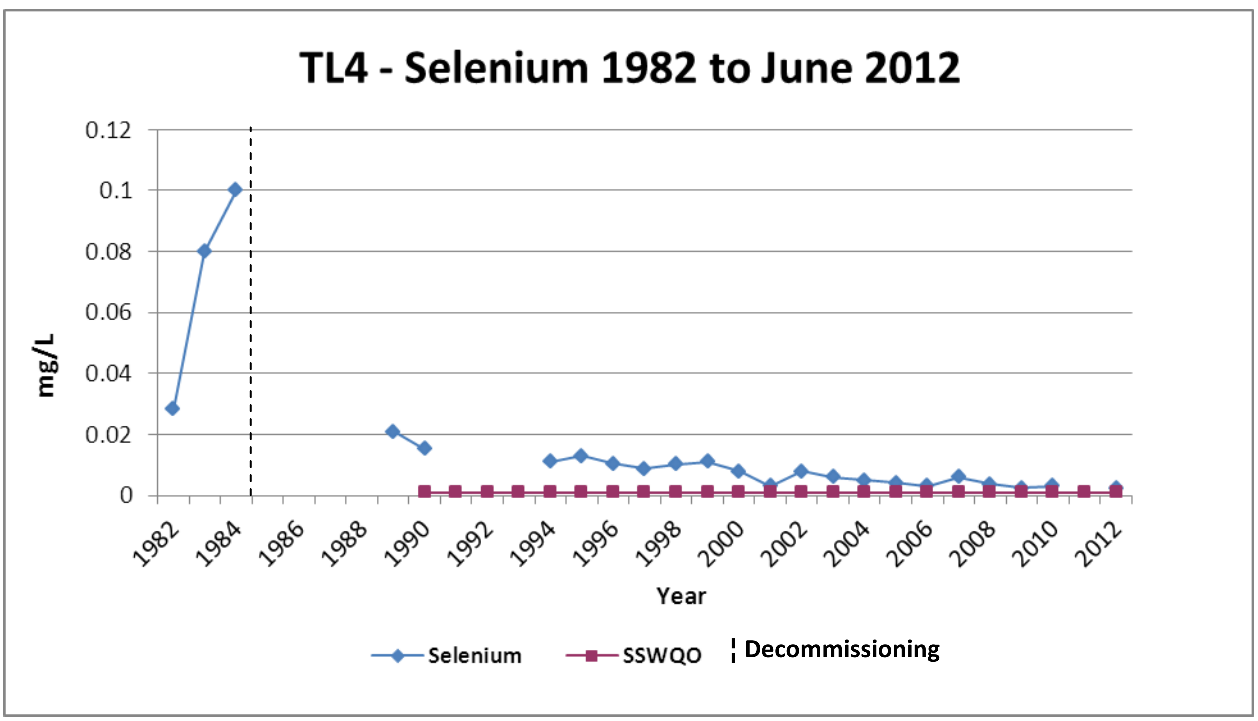
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-11 TL-4 - Marie Reservoir Discharge



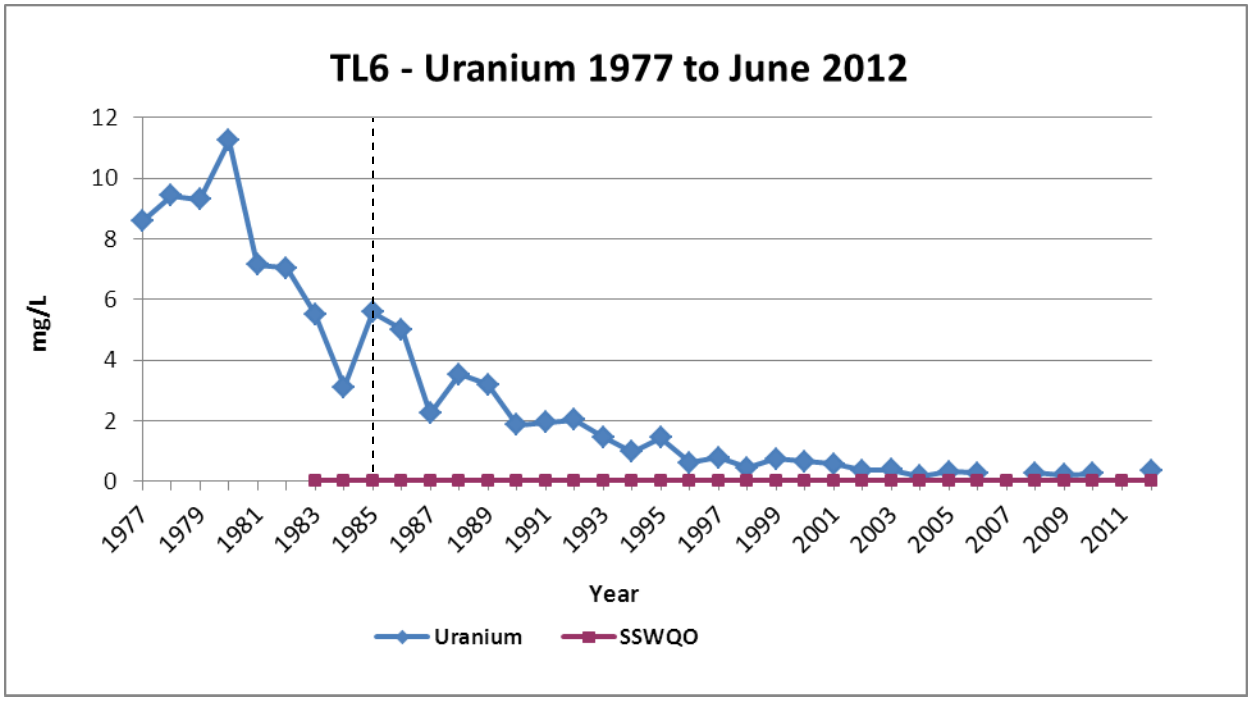
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-12 TL-4 - Marie Reservoir Discharge



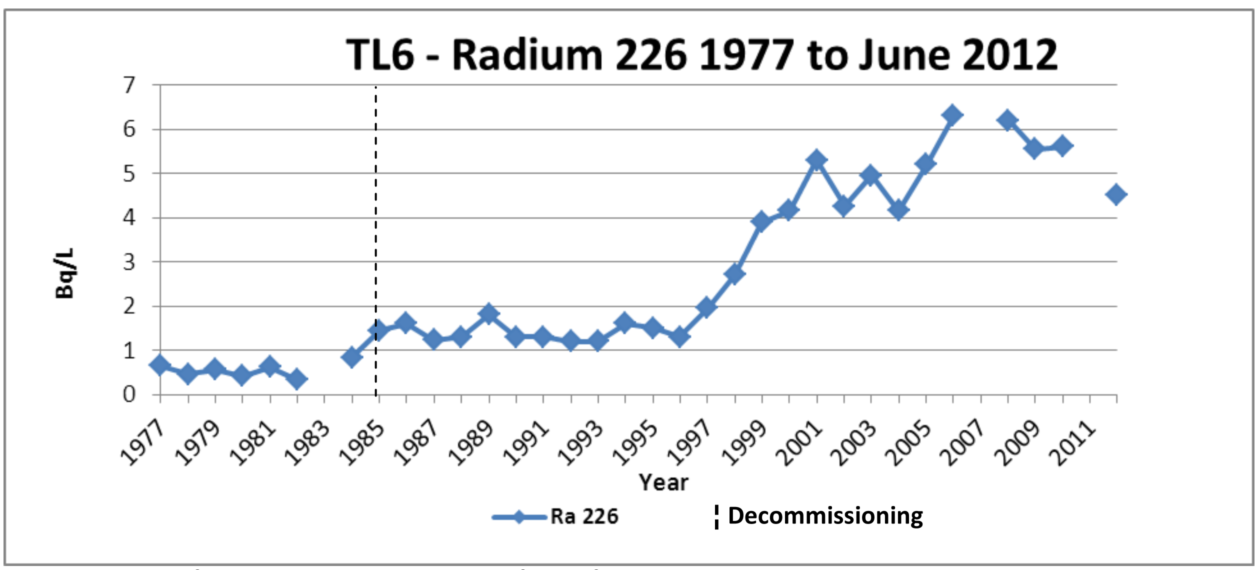
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-13 TL-6 - Minewater Reservoir Discharge



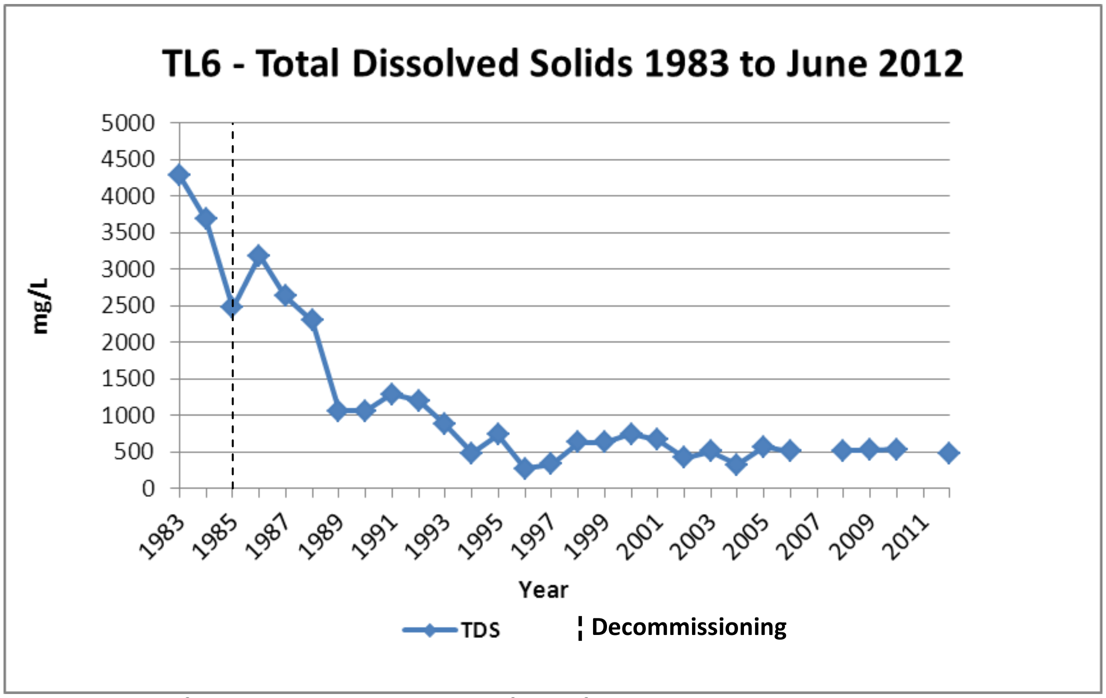
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-14 TL-6 - Minewater Reservoir Discharge



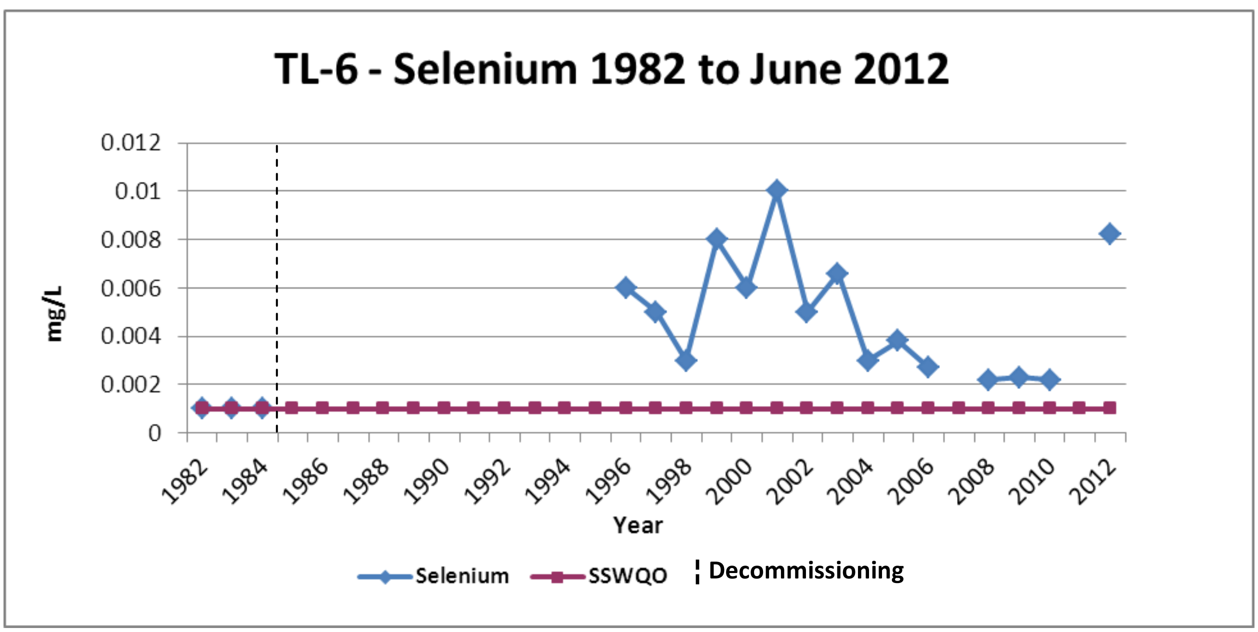
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-15 TL-6 - Minewater Reservoir Discharge



**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-16 TL-6 - Minewater Reservoir Discharge



**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-17 TL-7 - Meadow Lake Discharge

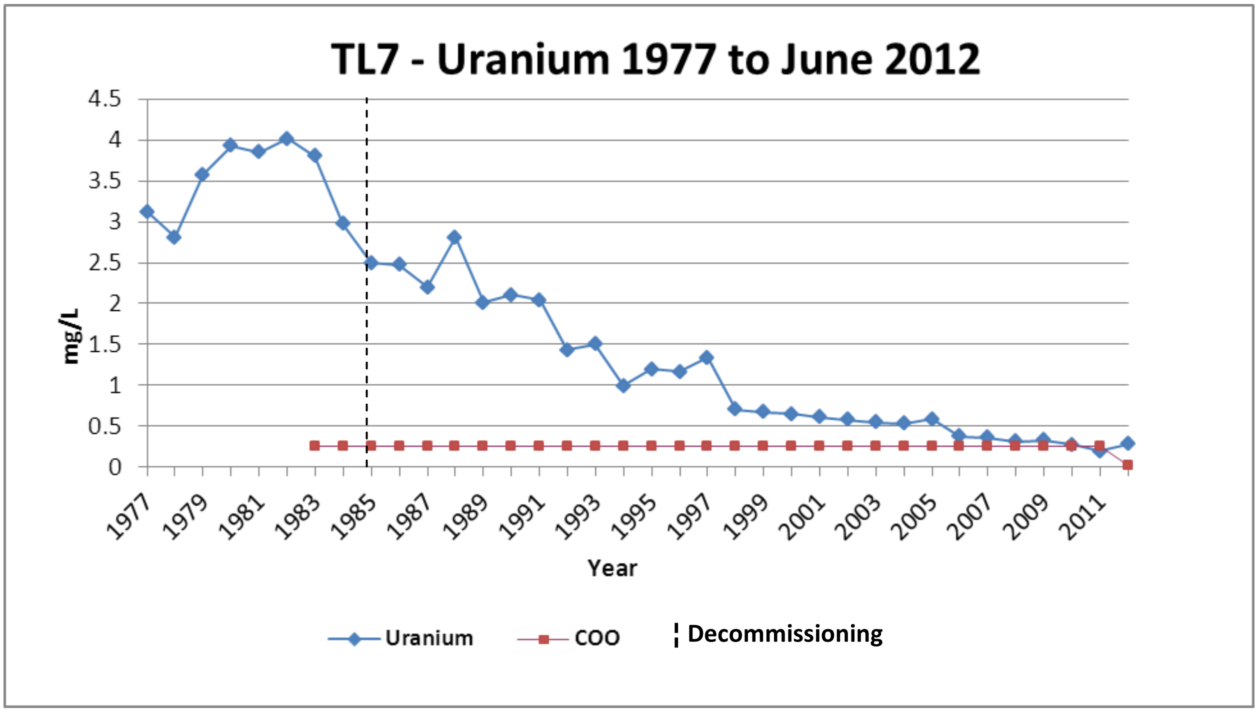


Figure 4.3.2-18 TL-7 - Meadow Lake Discharge

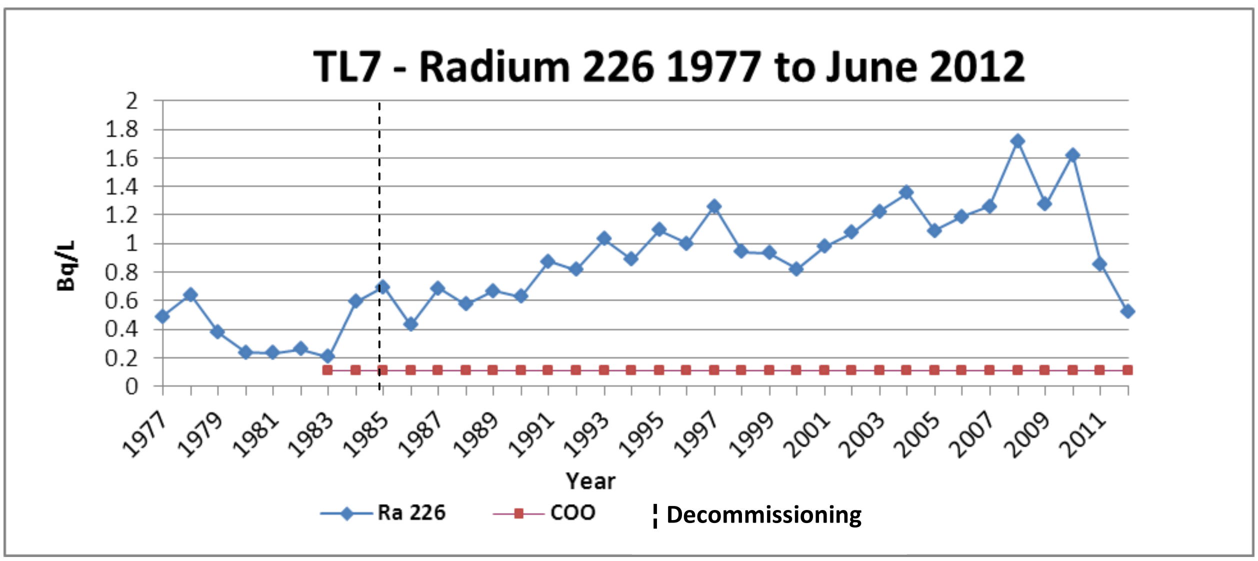


Figure 4.3.2-19 TL-7 - Meadow Lake Discharge

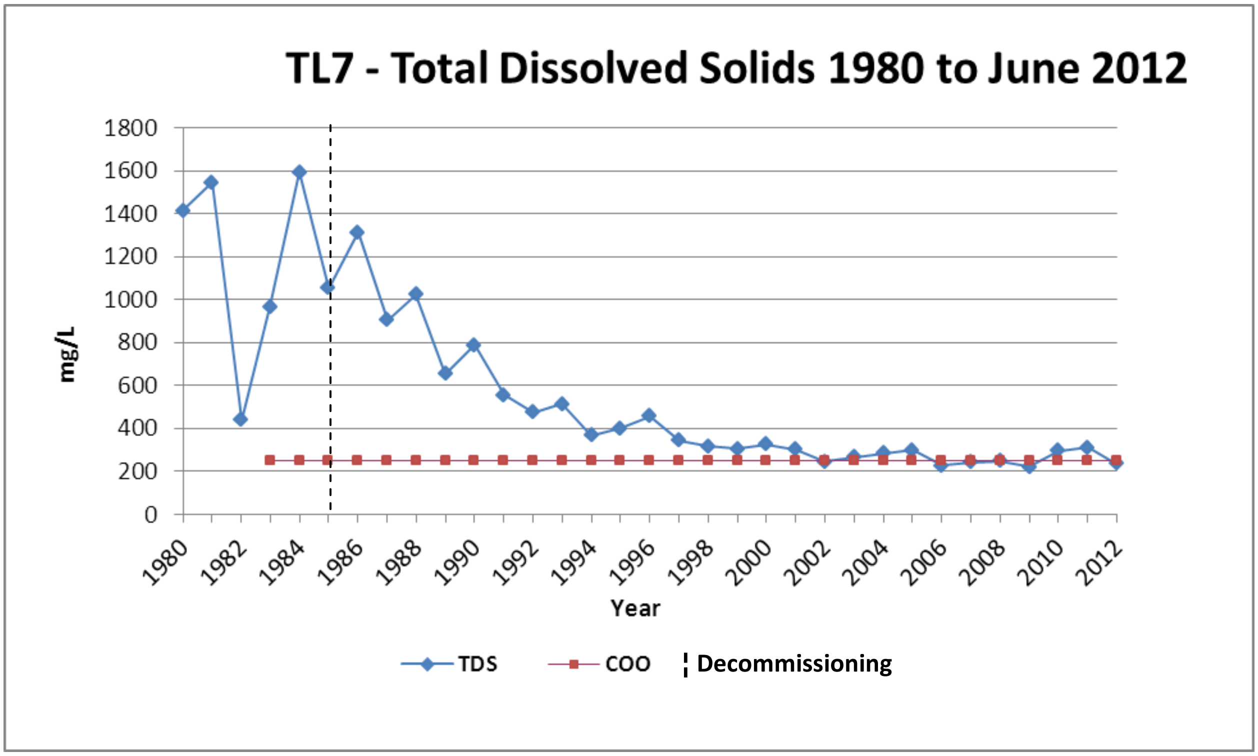


Figure 4.3.2-20 TL-7 - Meadow Lake Discharge

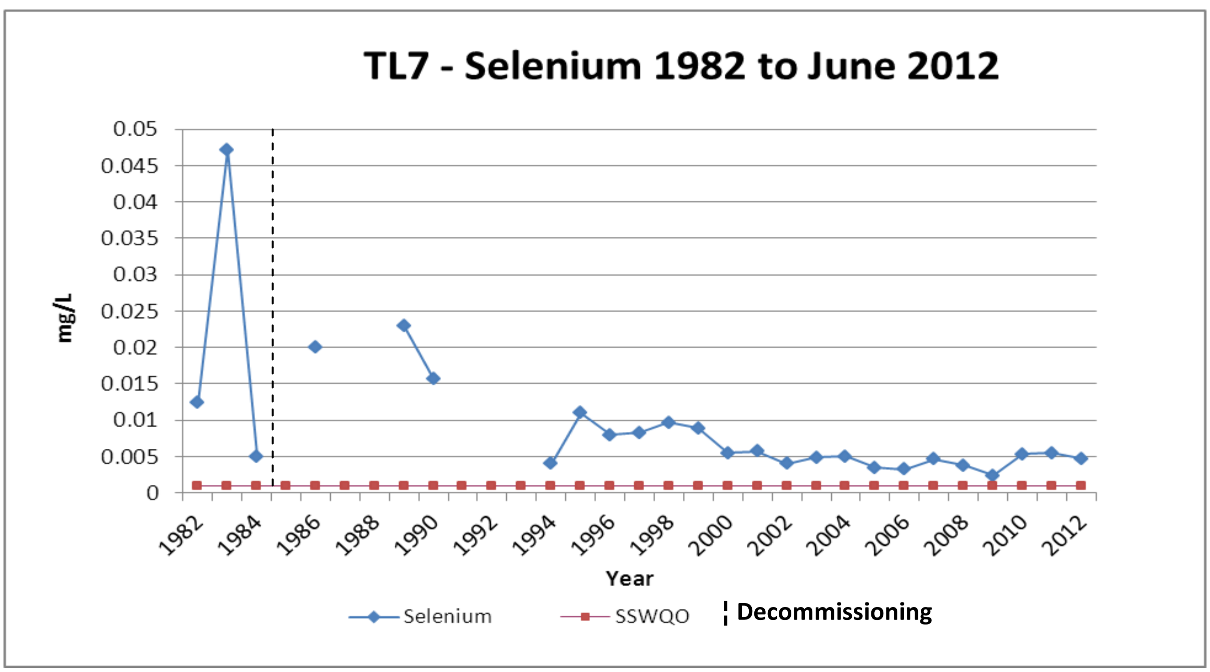
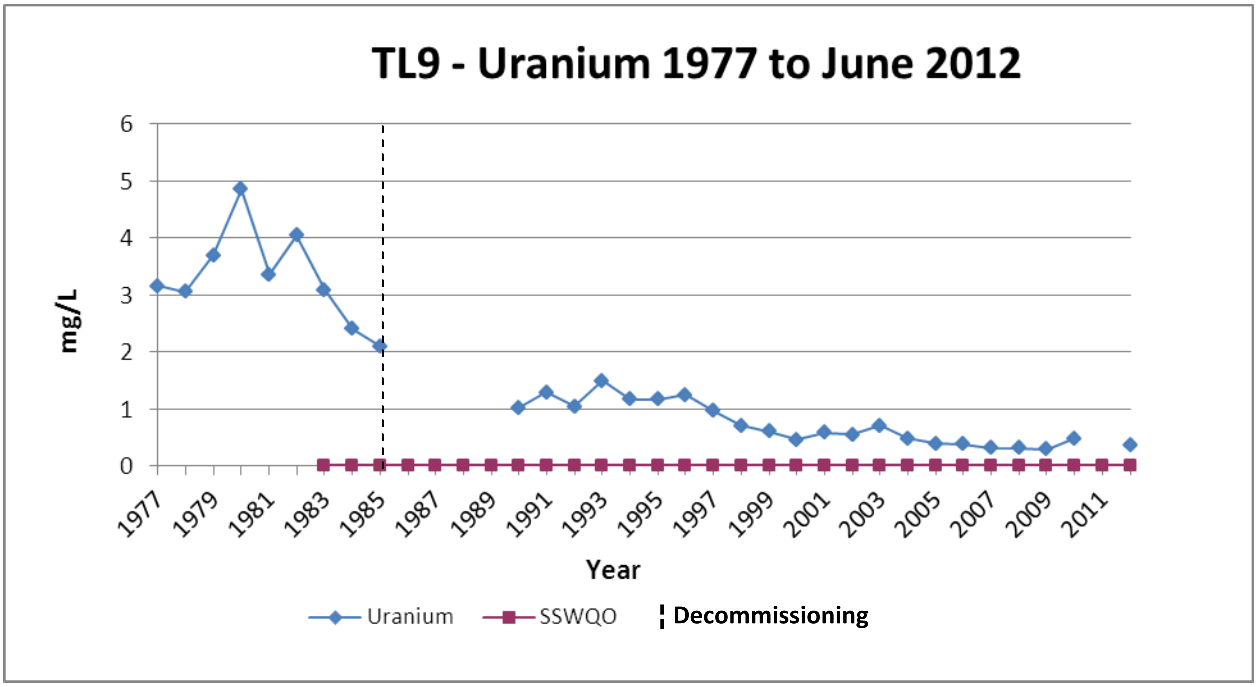
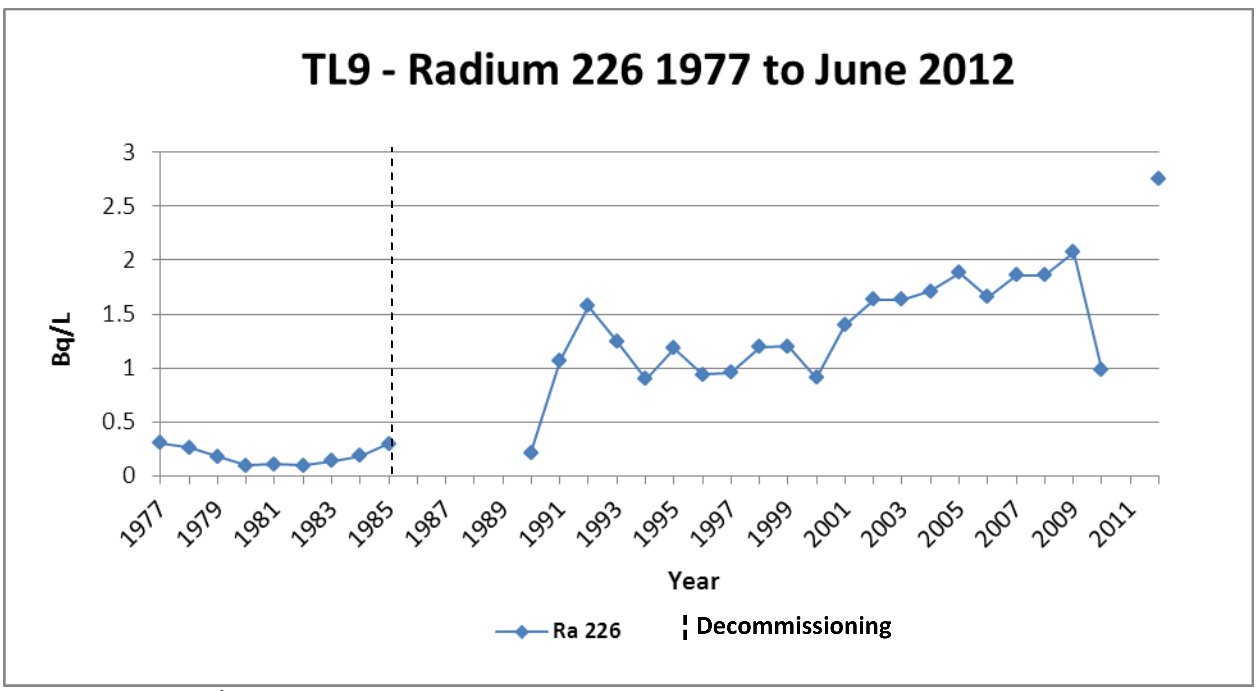


Figure 4.3.2-21 TL-9 - Fulton Creek Below Greer Lake



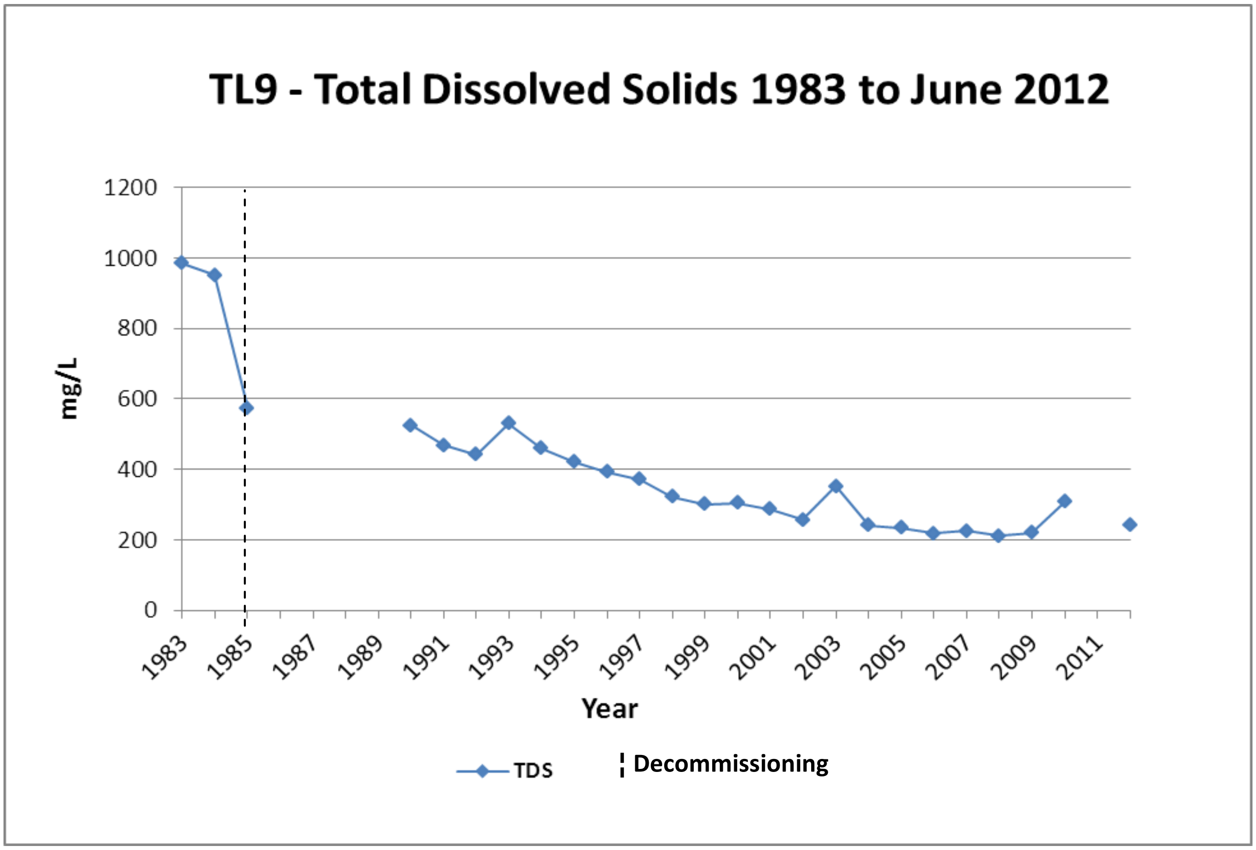
**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-22 TL-9 - Fulton Creek Below Greer Lake



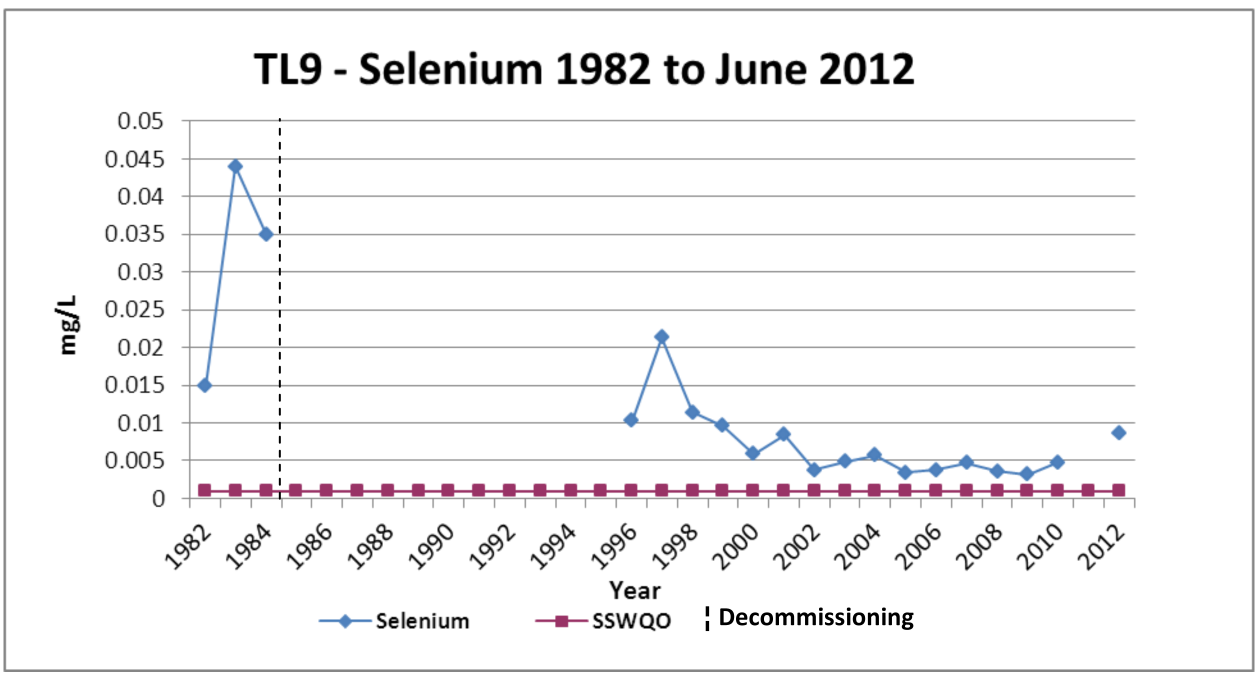
**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-23 TL-9 - Fulton Creek Below Greer Lake



**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-24 TL-9 - Fulton Creek Below Greer Lake



**There was not water flow at TL-9 in 2011.*

Figure 4.3.3-1 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

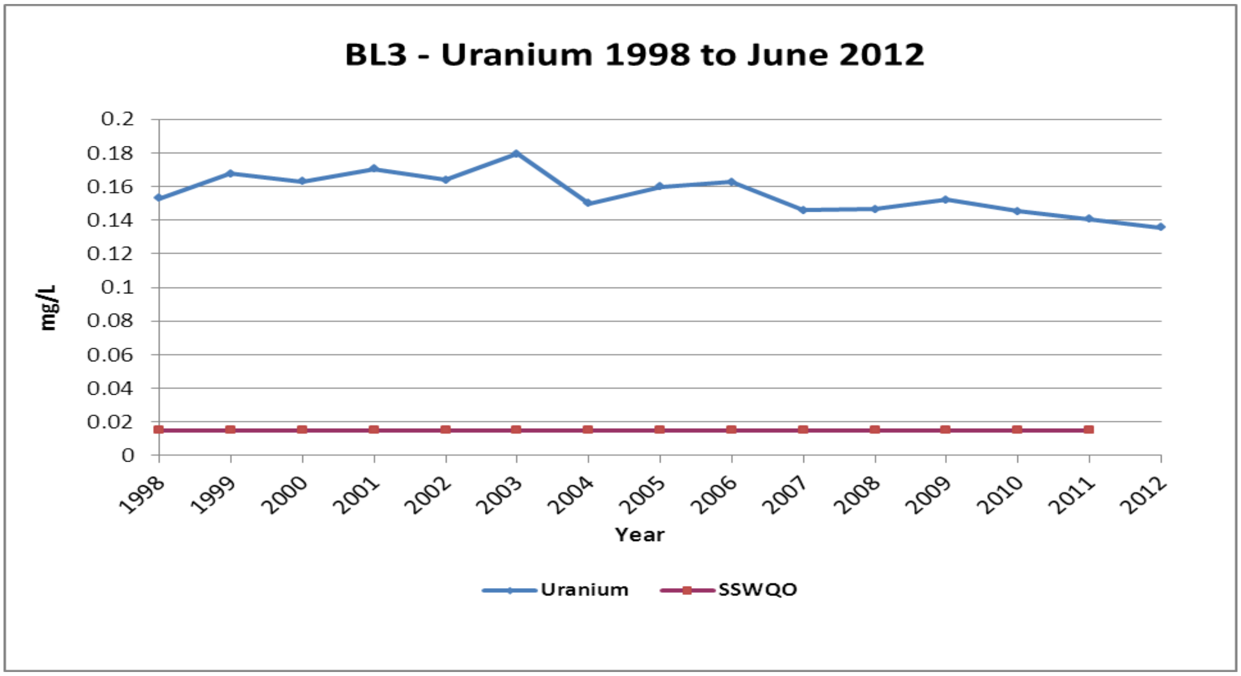


Figure 4.3.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

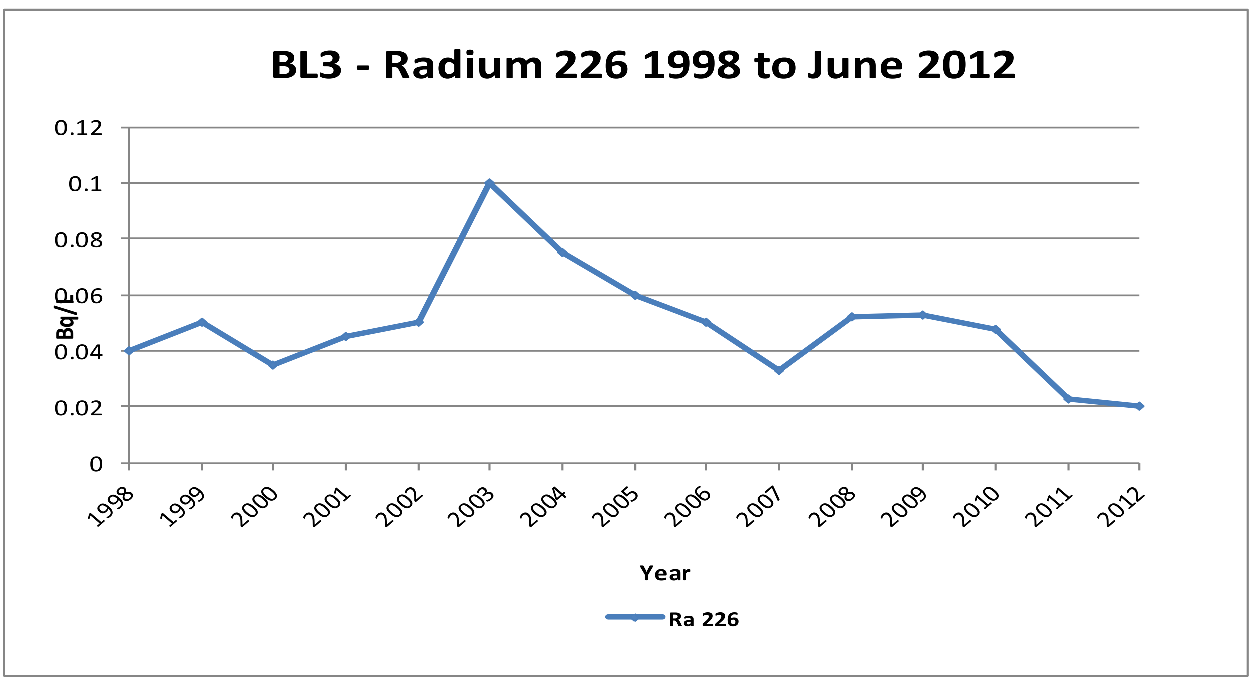


Figure 4.3.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

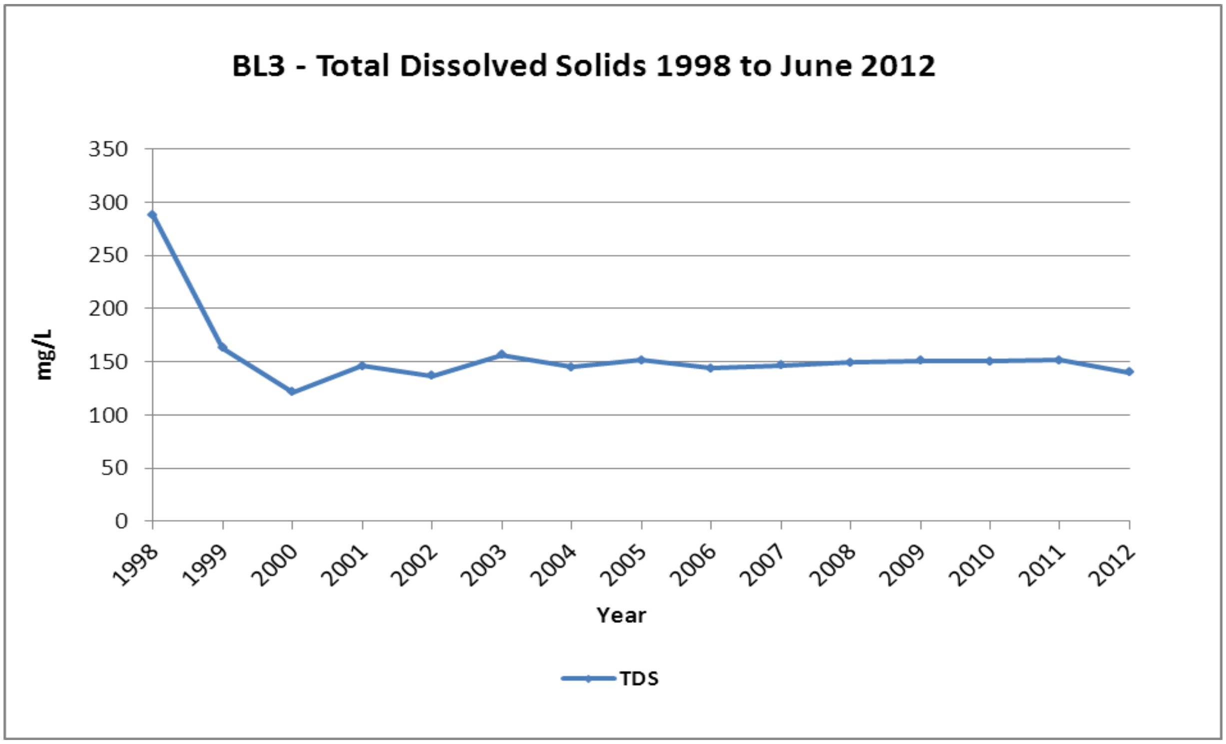
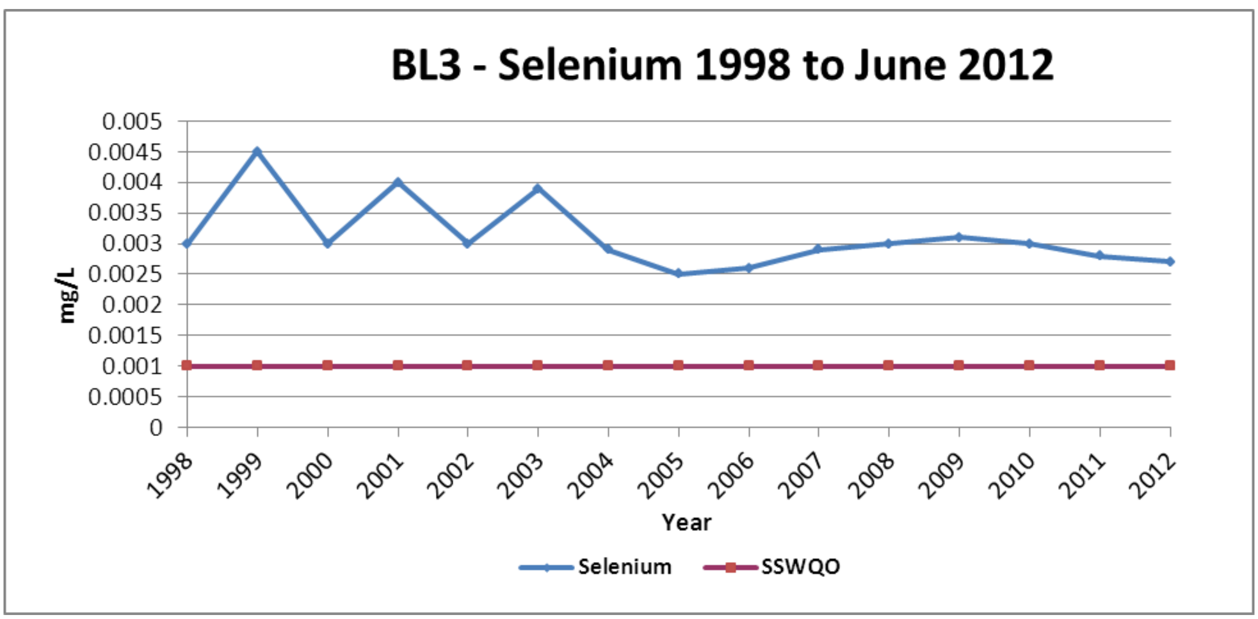


Figure 4.3.3-4 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



Note: Method detection limit changed from 0.001mg/L to 0.0001mg/L in 2003.

Figure 4.3.3-5 BL-4 - Beaverlodge Lake Centre

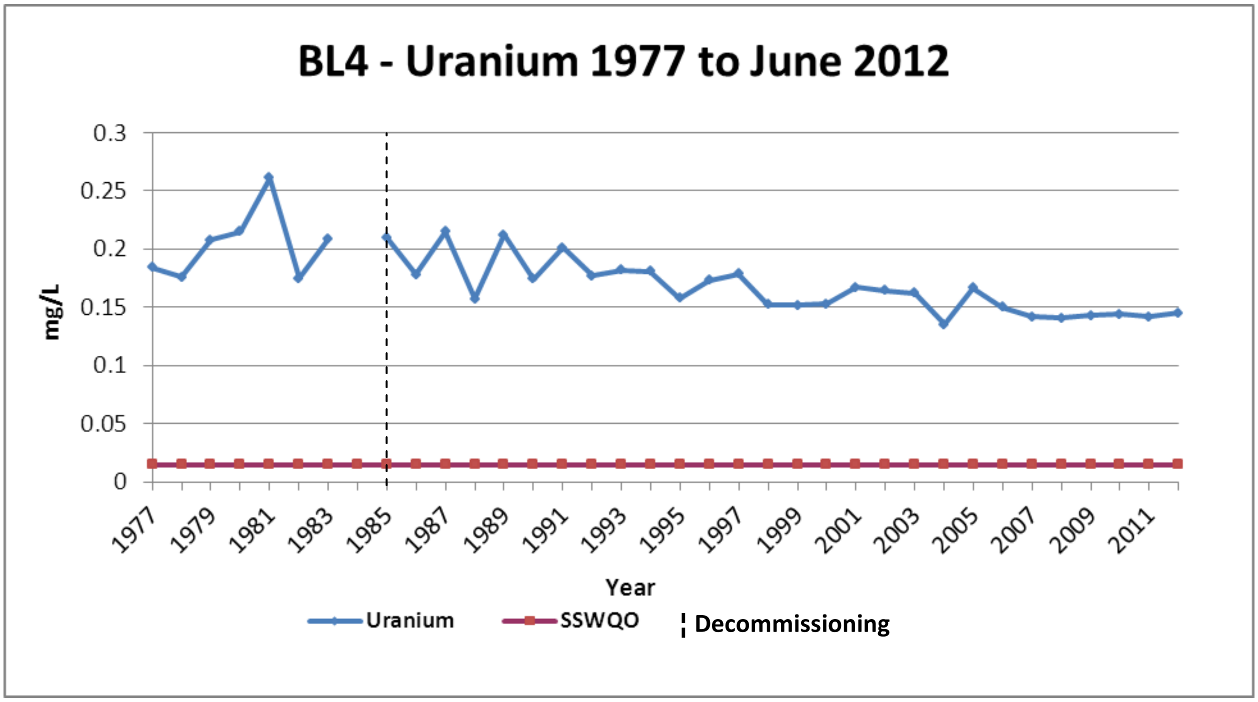


Figure 4.3.3-6 BL-4 - Beaverlodge Lake Centre

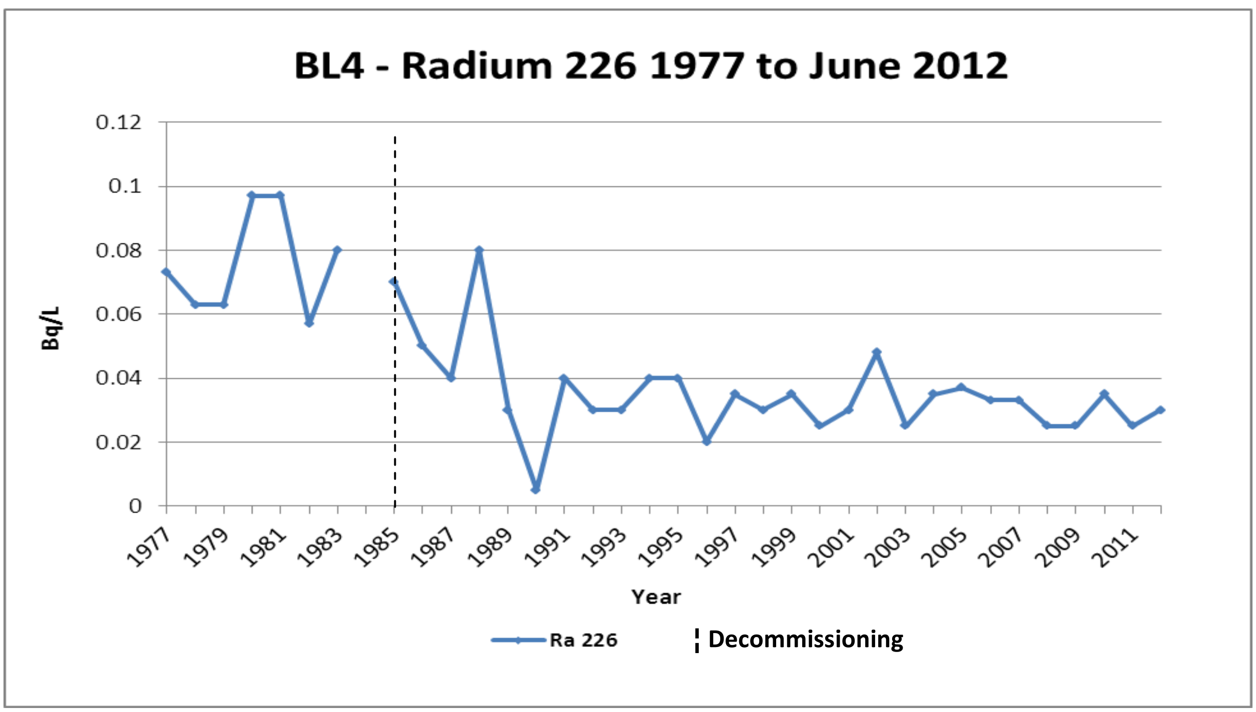


Figure 4.3.3-7 BL-4 - Beaverlodge Lake Centre

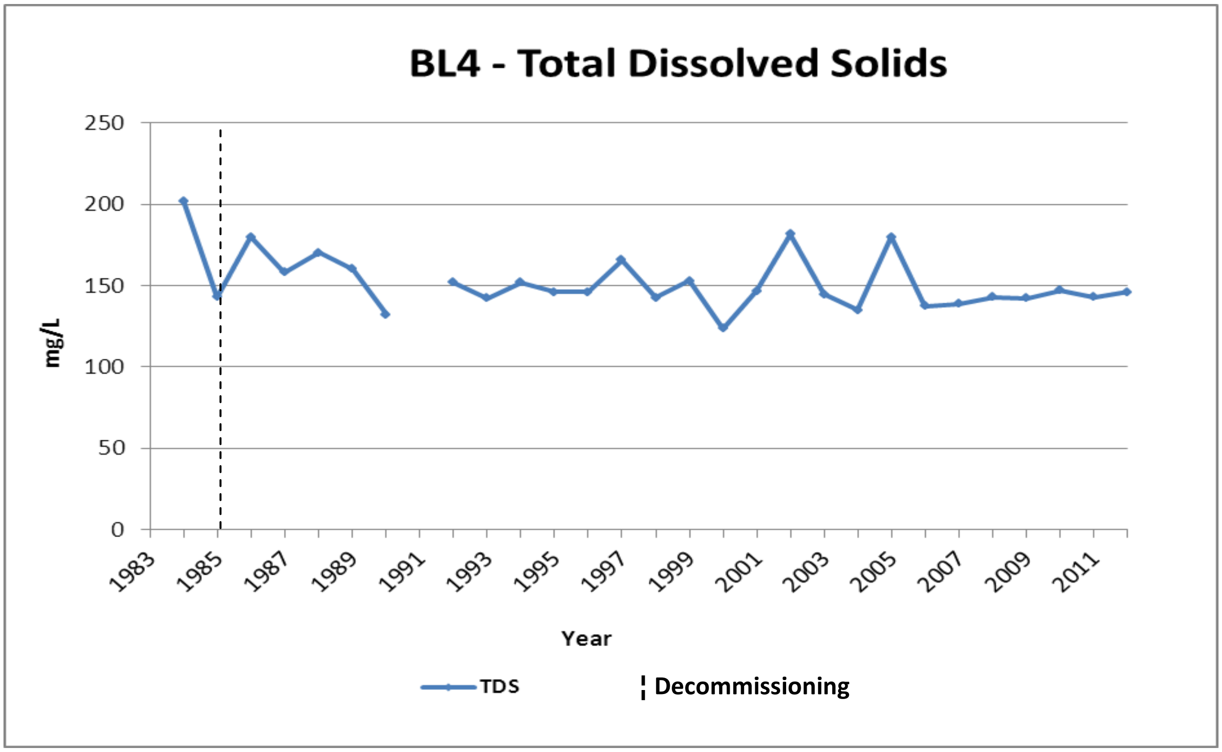
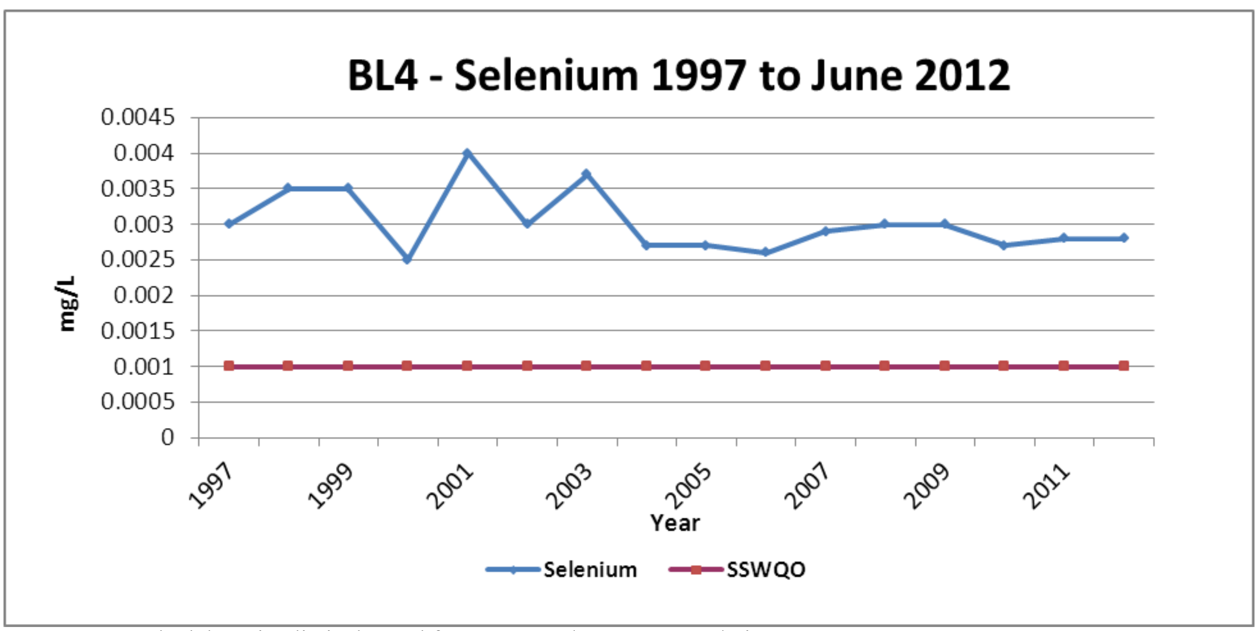
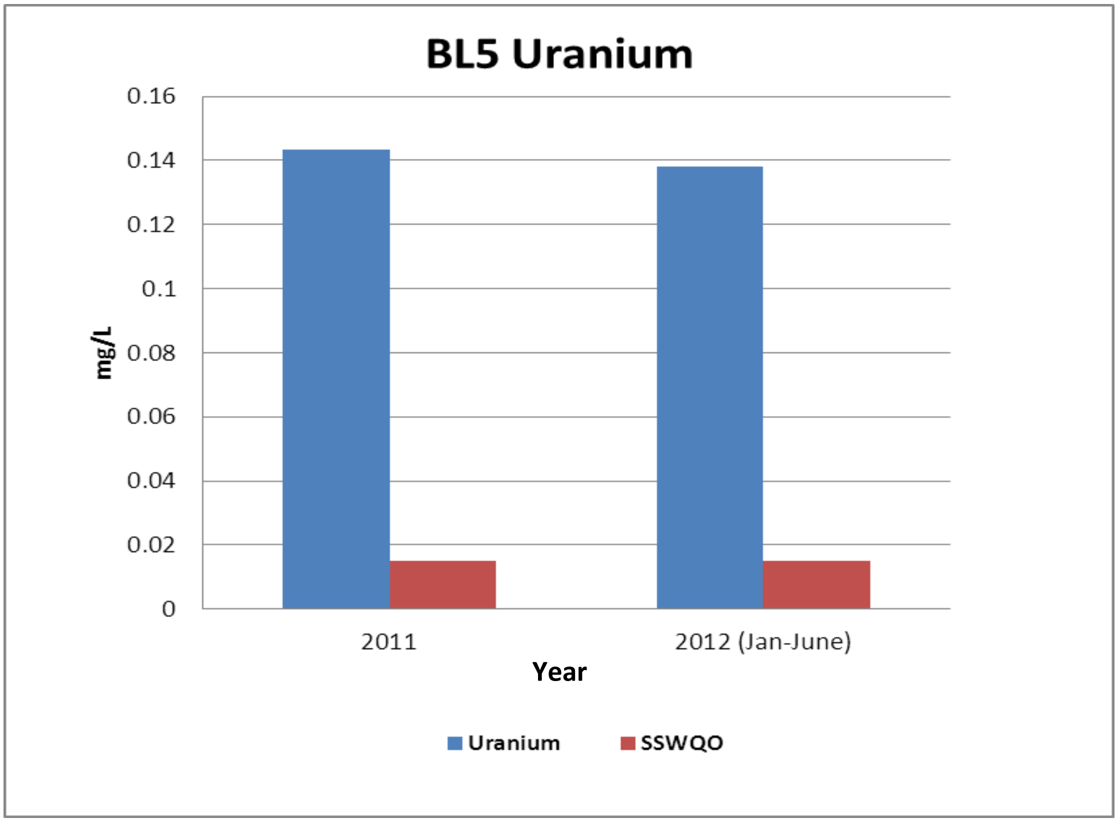


Figure 4.3.3-8 BL-4 - Beaverlodge Lake Centre



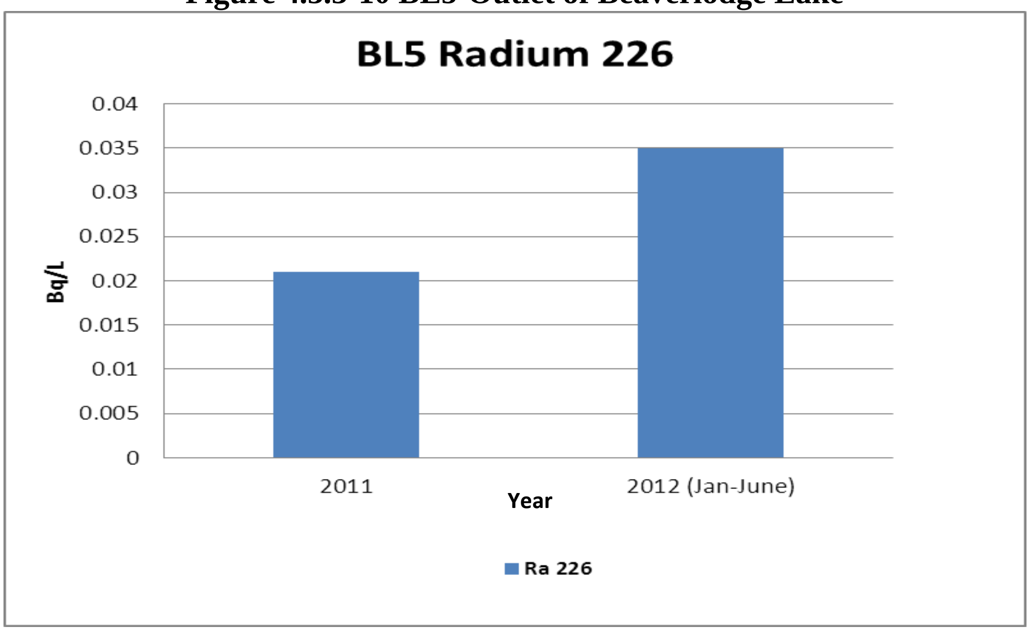
Note: Method detection limit changed from 0.001mg/L to 0.0001mg/L in 2003.

Figure 4.3.3-9 BL5-Outlet of Beaverlodge Lake



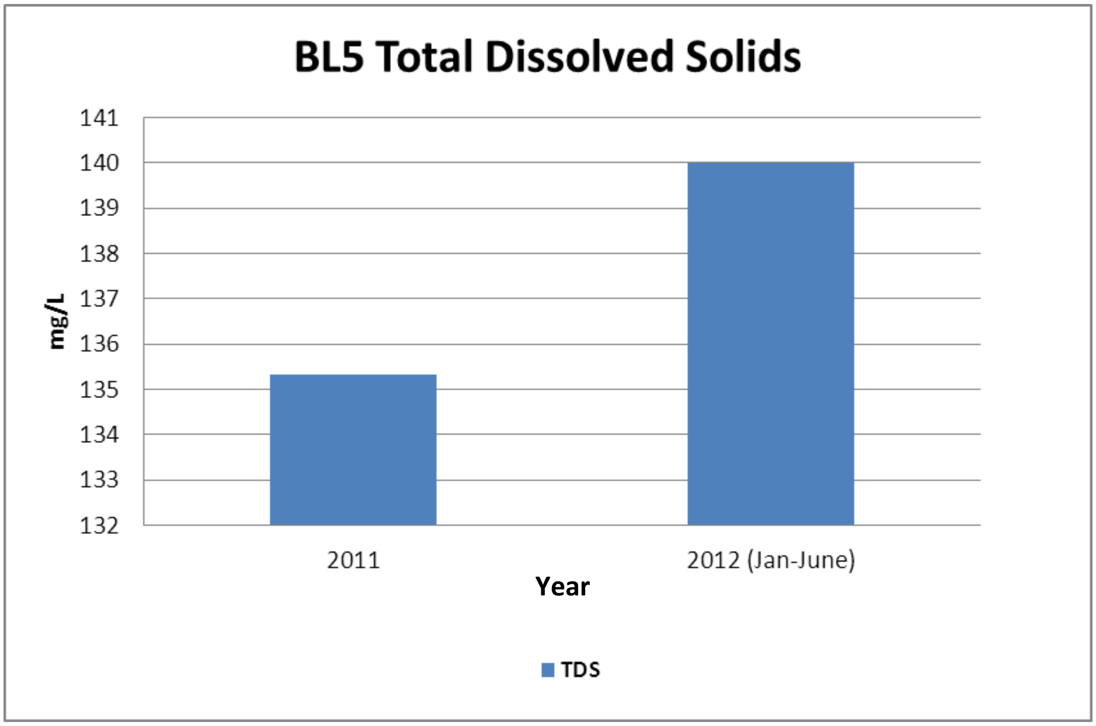
** Station implemented in water sampling program in 2011*

Figure 4.3.3-10 BL5-Outlet of Beaverlodge Lake



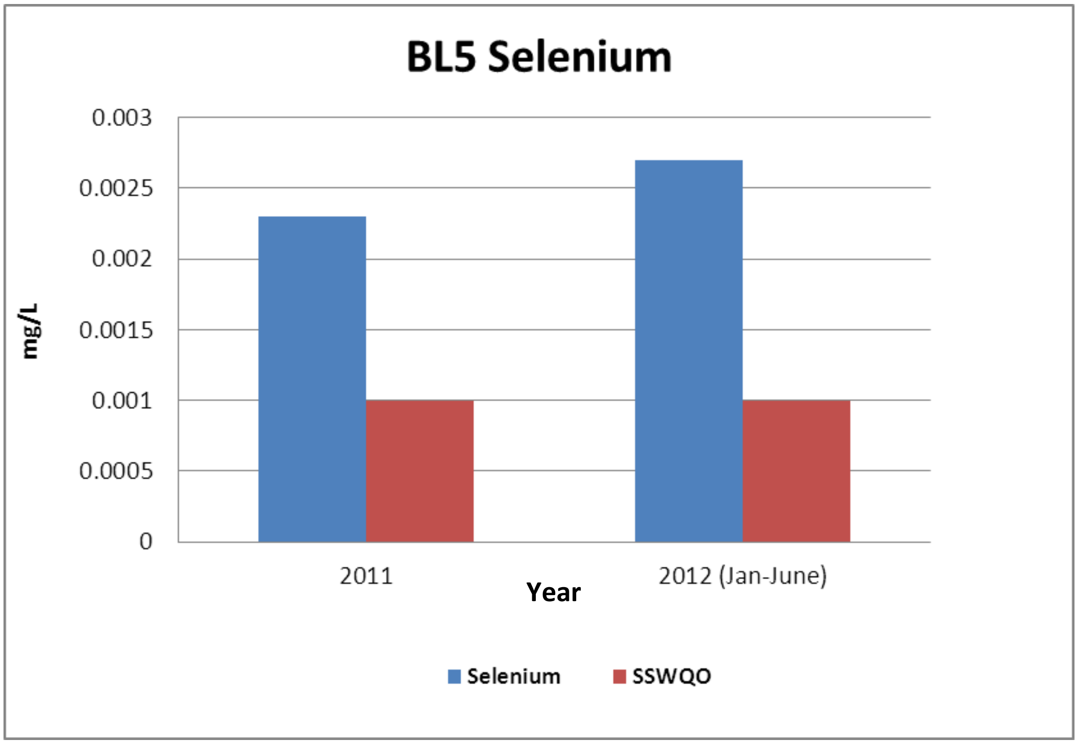
** Station implemented in water sampling program in 2011*

Figure 4.3.3-11 BL5-Outlet of Beaverlodge Lake



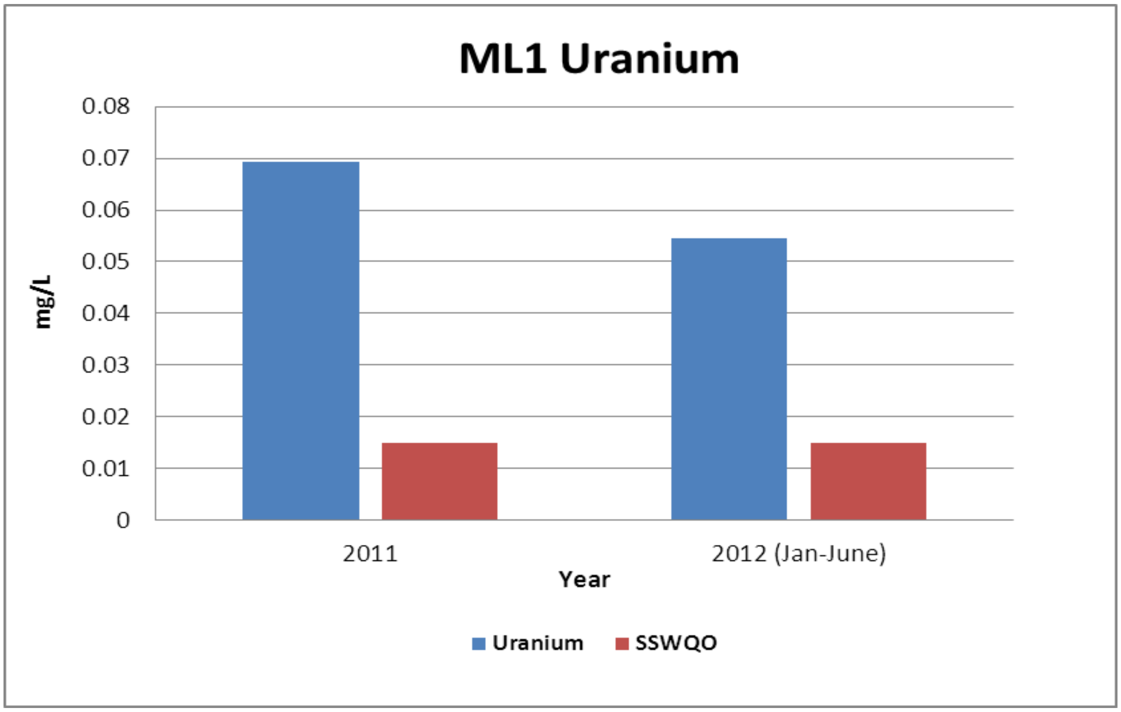
** Station implemented in water sampling program in 2011*

Figure 4.3.3-12 BL5-Outlet of Beaverlodge Lake



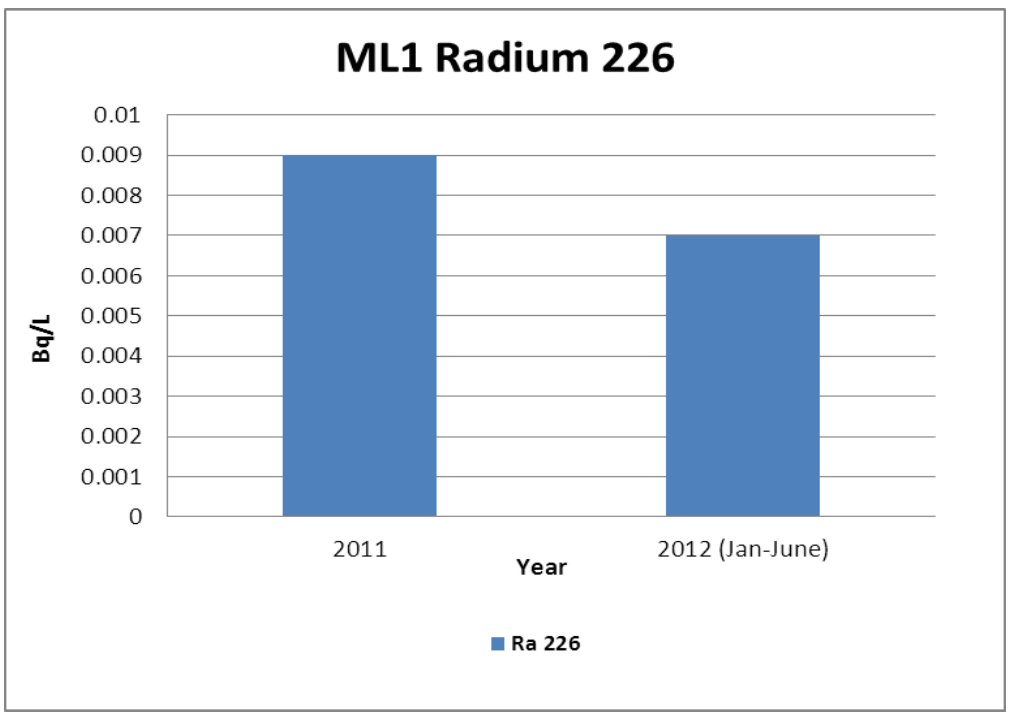
** Station implemented in water sampling program in 2011*

Figure 4.3.3-13 ML1-Outlet of Martin Lake



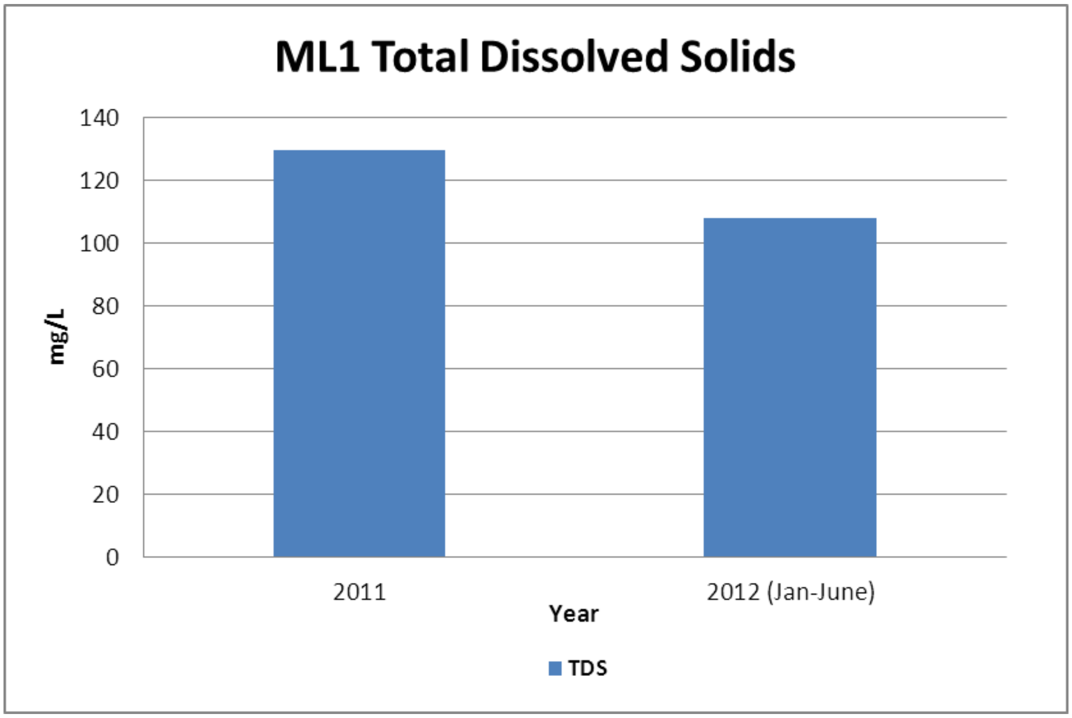
**Station implemented in water sampling program in 2011*

Figure 4.3.3-14 ML1-Outlet of Martin Lake



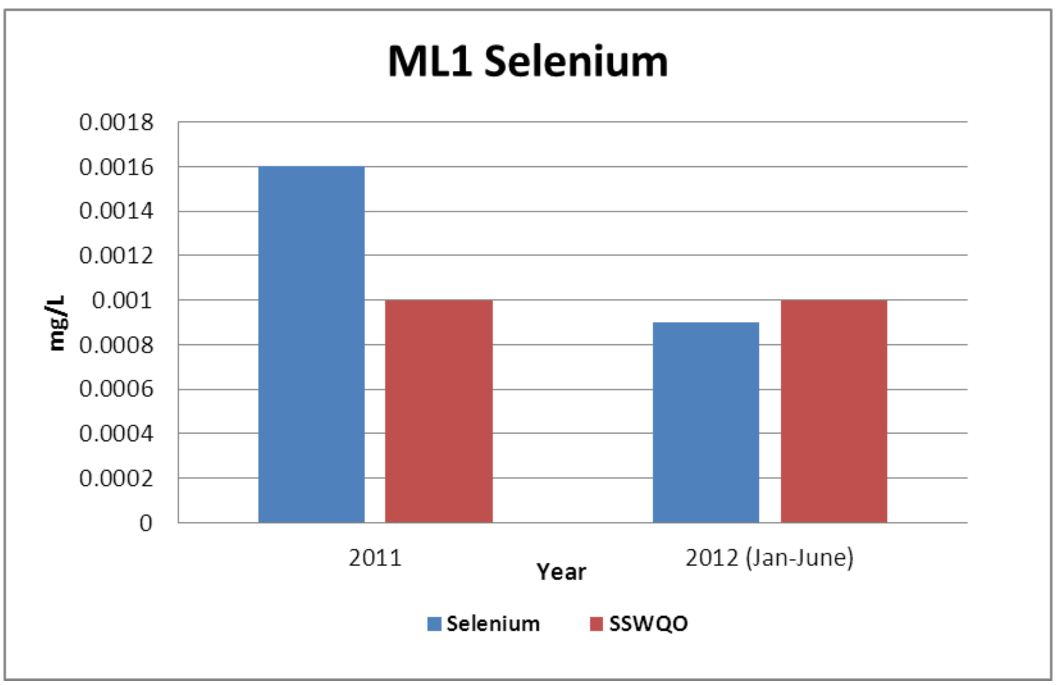
**Station implemented in water sampling program in 2011*

Figure 4.3.3-15 ML1-Outlet of Martin Lake



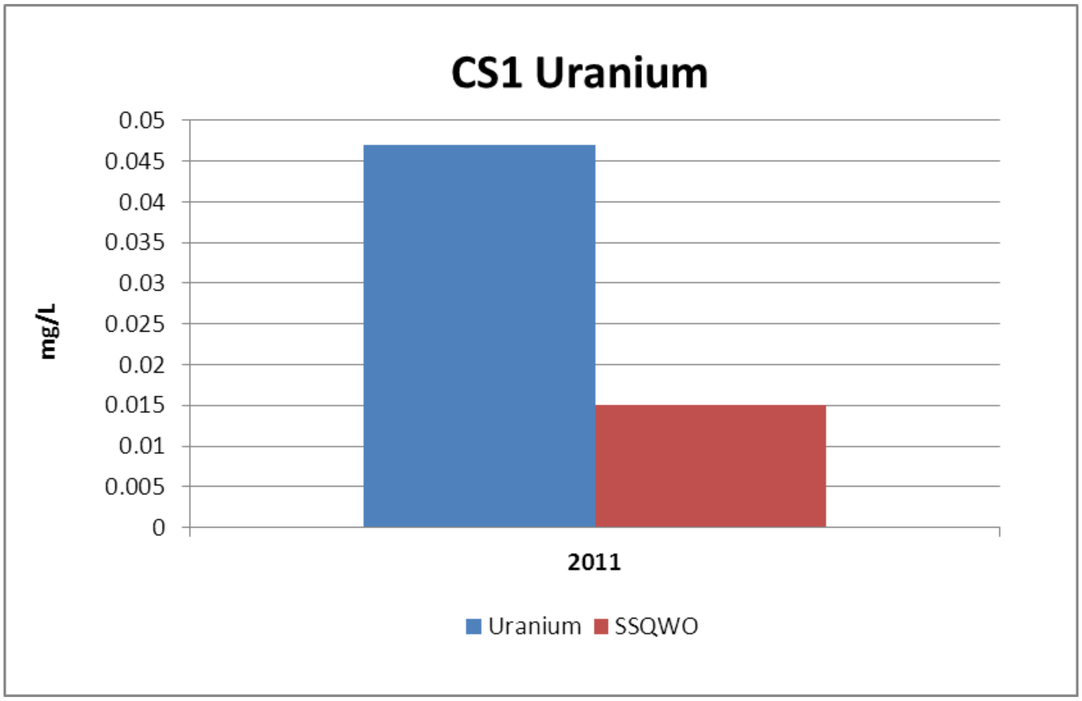
**Station implemented in water sampling program in 2011*

Figure 4.3.3-16 ML1-Outlet of Martin Lake



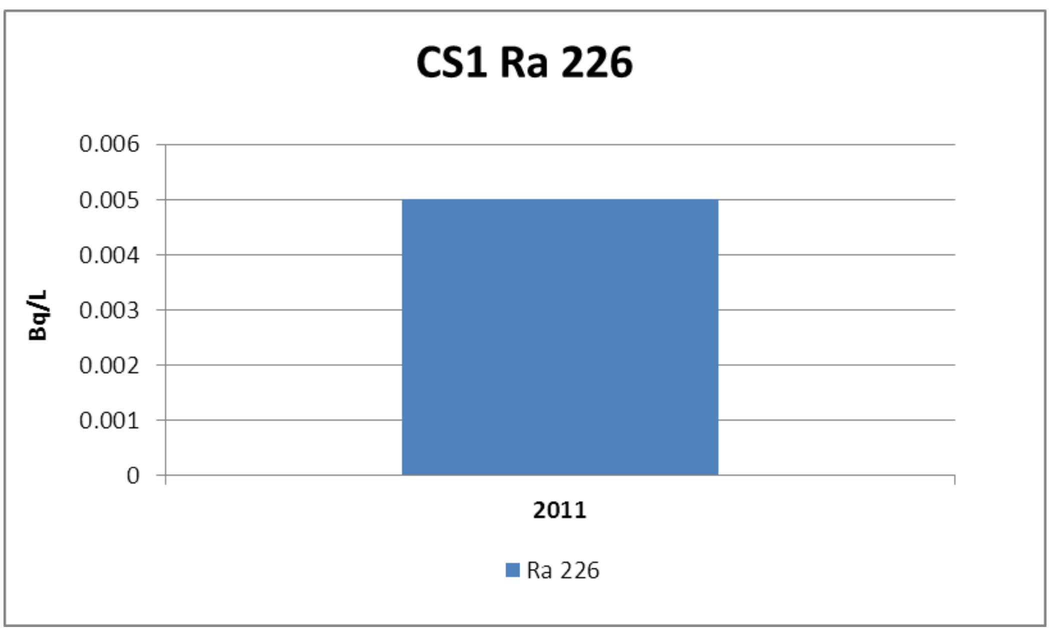
**Station implemented in water sampling program in 2011*

Figure 4.3.3-17 CS1-Crackingstone River at Bridge



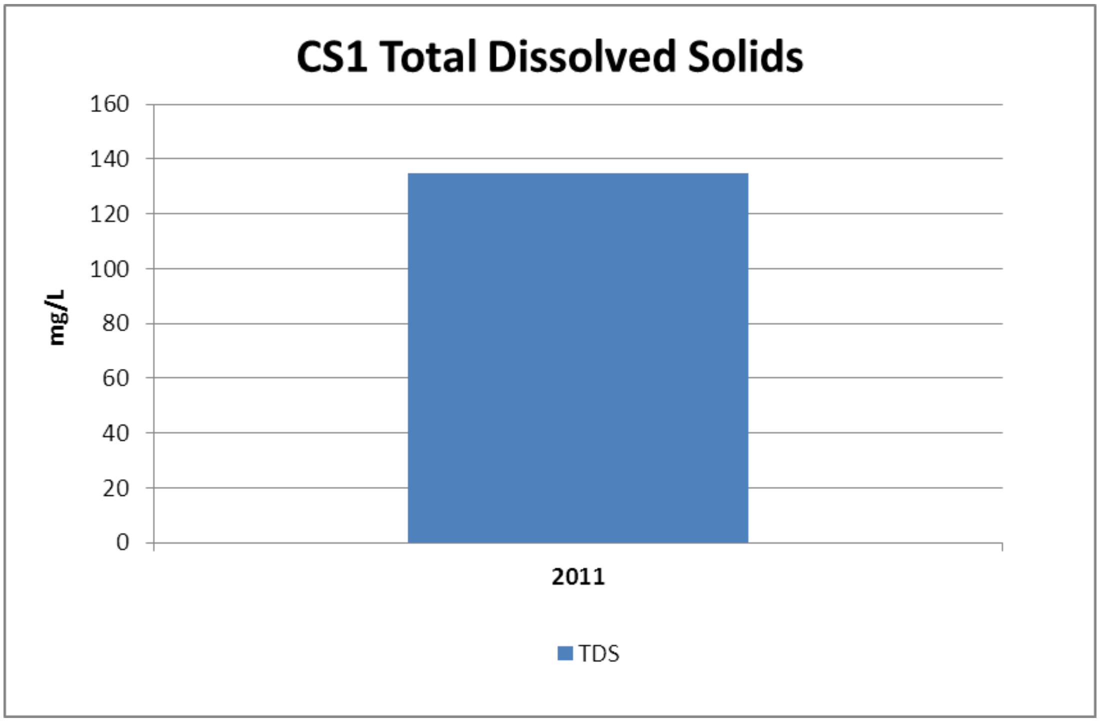
**Station implemented in water sampling program in 2011*

Figure 4.3.3-18 CS1-Crackingstone River at Bridge



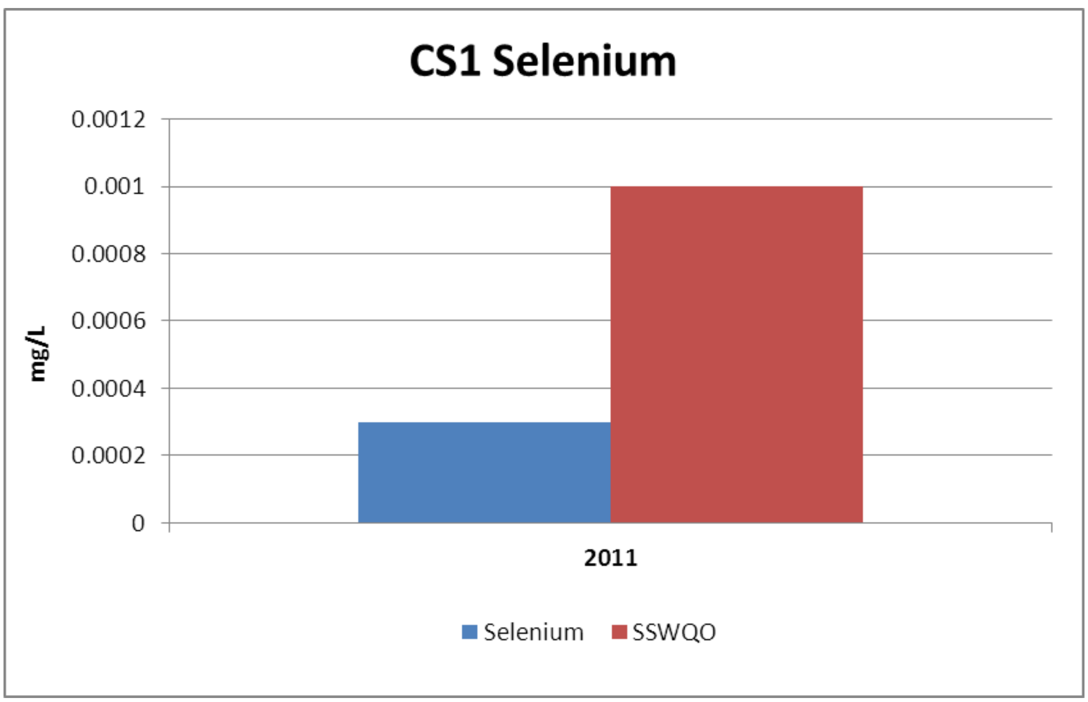
**Station implemented in water sampling program in 2011*

Figure 4.3.3-19 CS1-Crackingstone River at Bridge



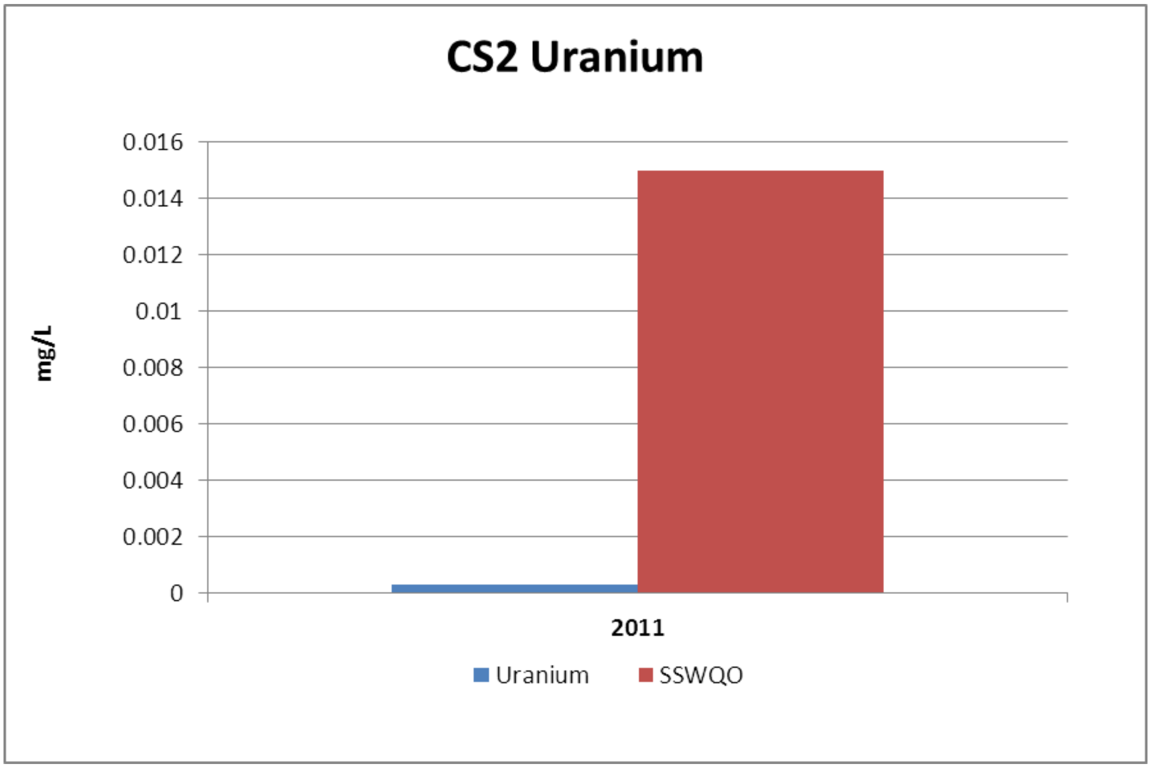
**Station implemented in water sampling program in 2011*

Figure 4.3.3-20 CS1-Crackingstone River at Bridge



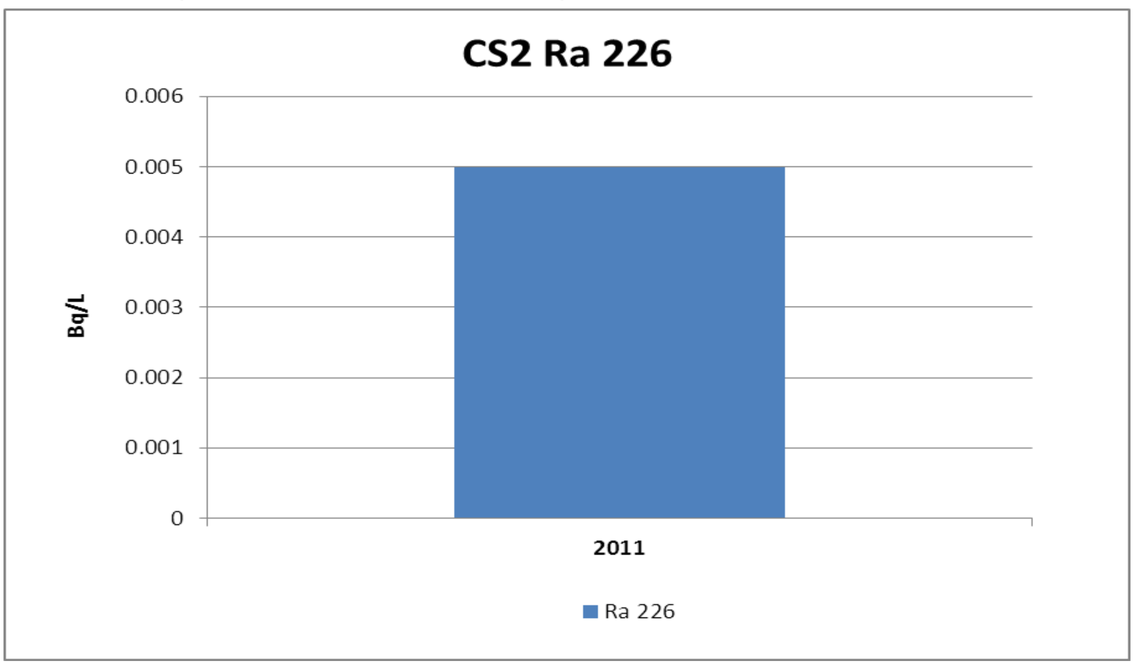
**Station implemented in water sampling program in 2011*

Figure 4.3.3-21 CS2-Crackingstone Bay in Lake Athabasca



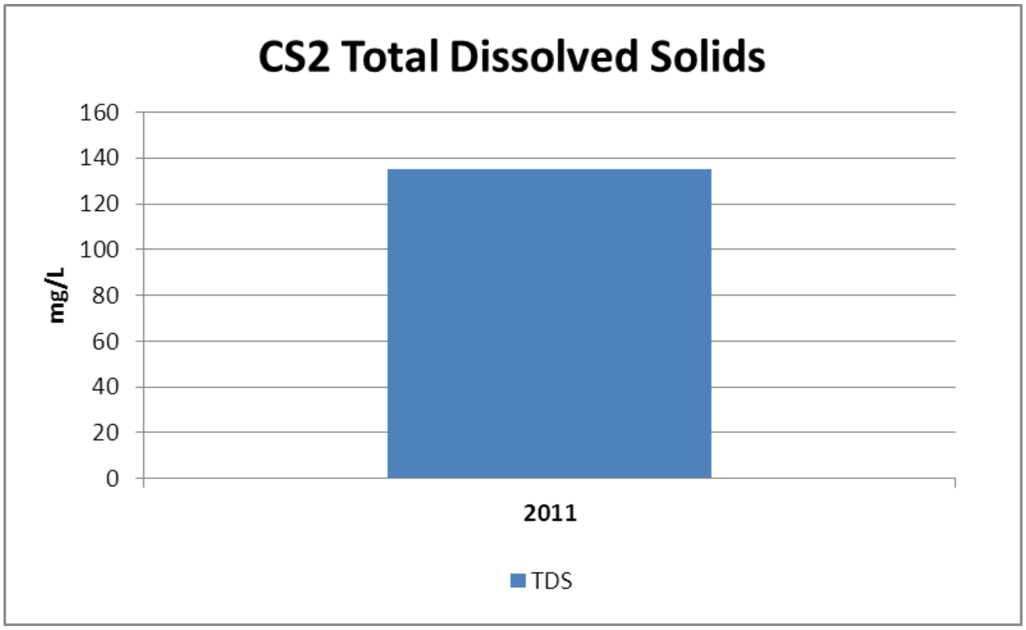
**Station implemented in water sampling program in 2011*

Figure 4.3.3-22 CS2-Crackingstone Bay in Lake Athabasca



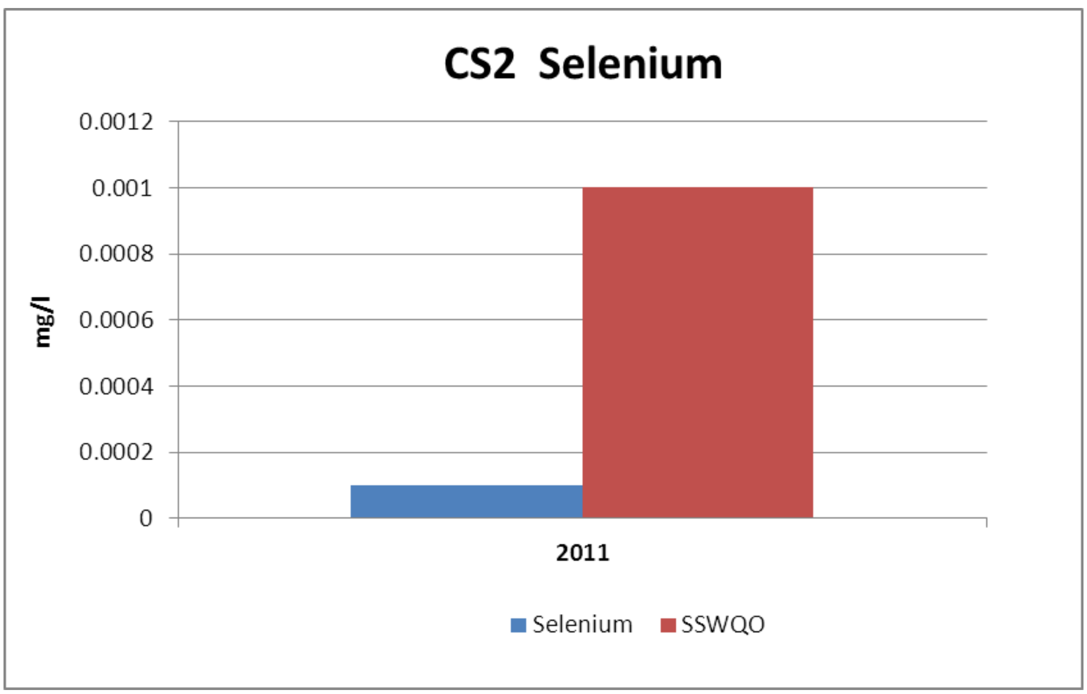
**Station implemented in water sampling program in 2011*

Figure 4.3.3-23 CS2-Crackingstone Bay in Lake Athabasca



**Station implemented in water sampling program in 2011*

Figure 4.3.3-24 CS2-Crackingstone Bay in Lake Athabasca



**Station implemented in water sampling program in 2011*

Figure 4.4.1 - Air Sampling Locations

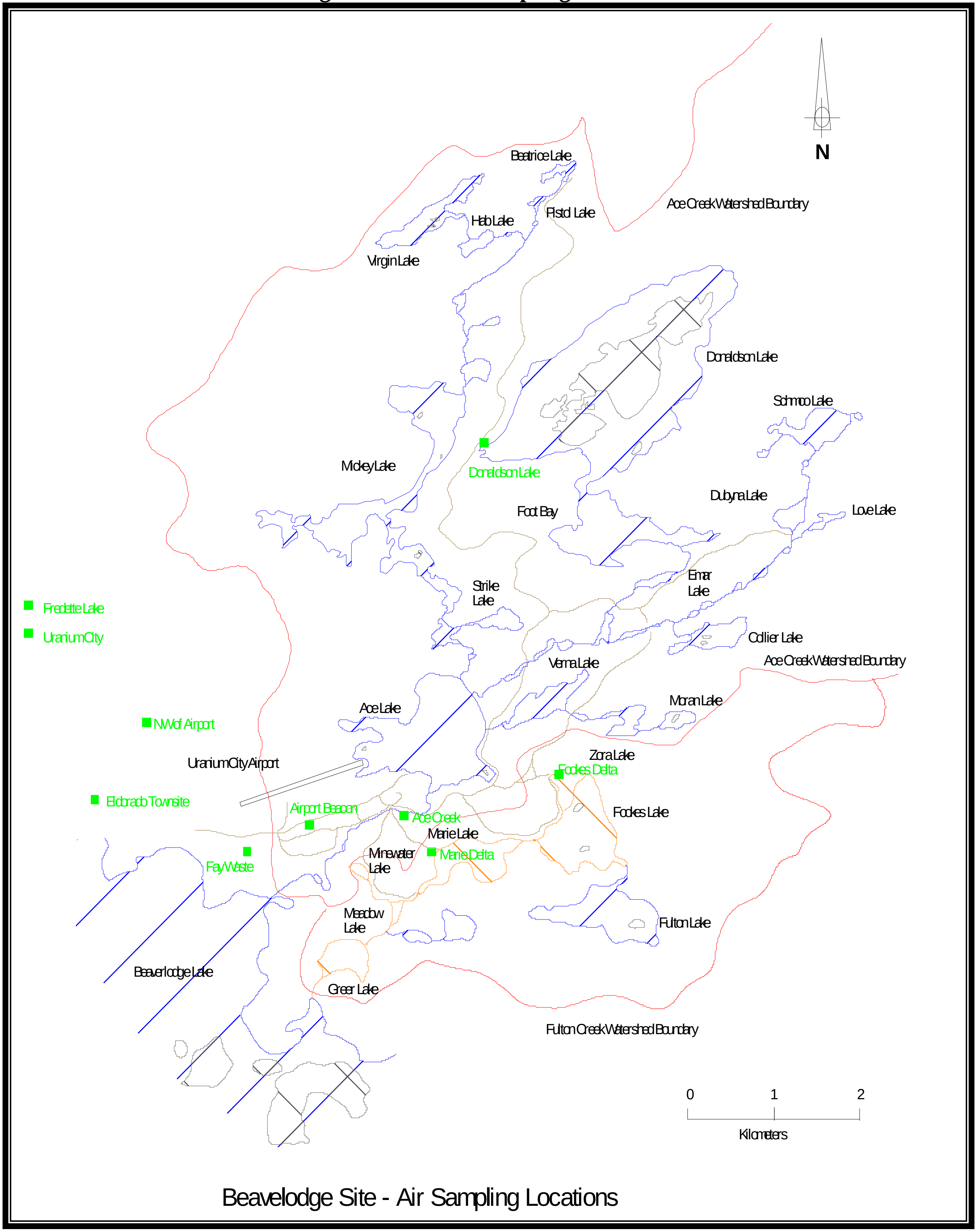
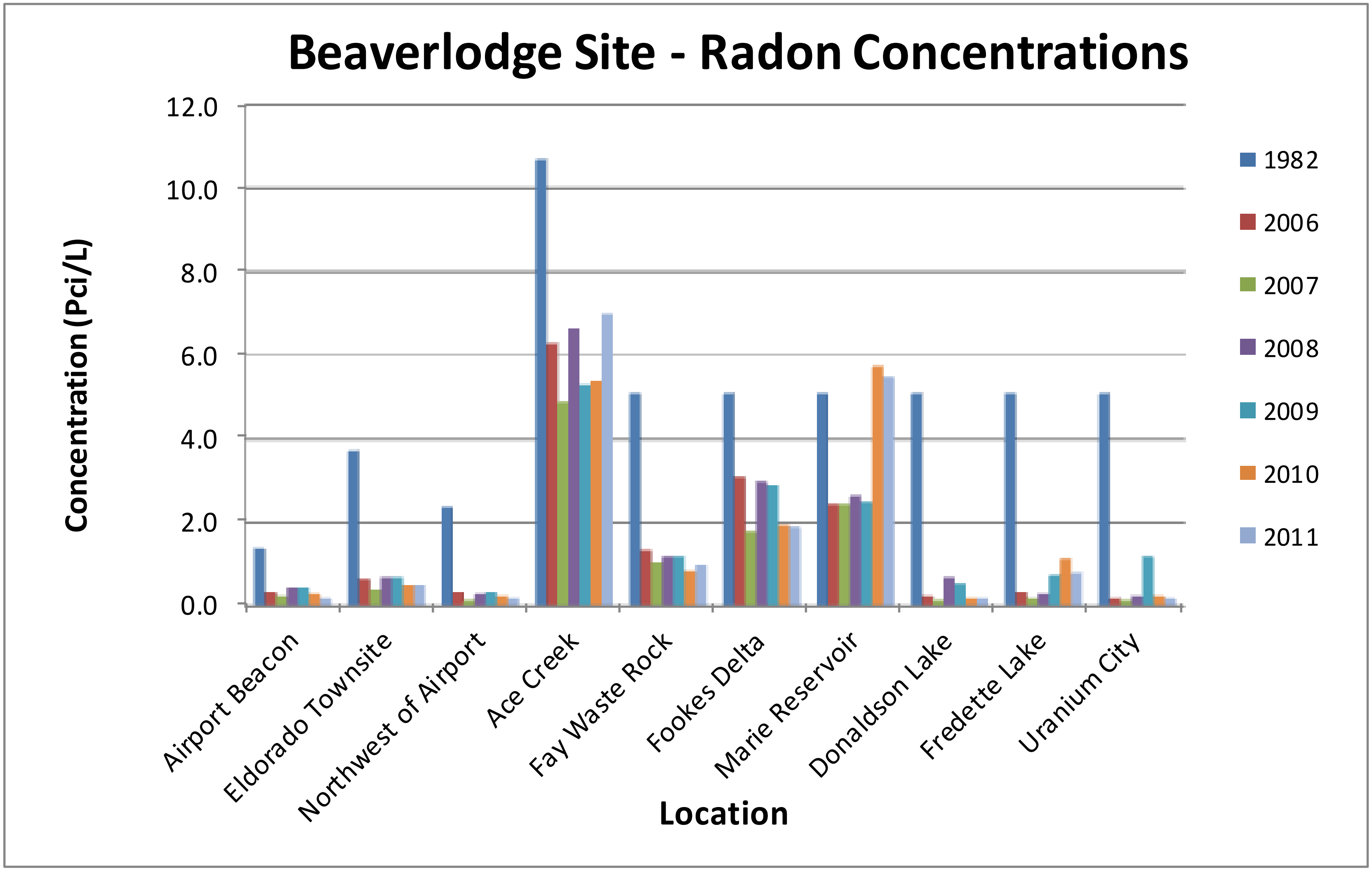


Figure 4.4.2
Radon Summary (2007 – 2011 versus 1982)



APPENDIX A

APPENDIX A

Station: AC-14

Parameters	2011-01-31	2011-02-28	2011-03-30	2011-04-30	2011-05-15	2011-06-23	2011-07-31	2011-08-24	2011-09-30	2011-10-21	2011-12-15	2012-01-31	2012-02-29	2012-04-03	2012-04-27	2012-05-25	2012-06-29
Alk-T (mg/L)	54.0	53.0	54.0	60.0	48.0	51.0	50.0	52.0	54.0	53.0	56.0	56.0	57.0	54.0	57.0	48.0	49.0
As (µg/L)	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.2
Ba (mg/L)	0.026	0.026	0.025	0.027	0.025	0.028	0.028	0.027	0.025	0.025	0.026	0.026	0.026	0.025	0.026	0.022	0.023
C-(org) (mg/L)			8.200			7.800			6.200		7.400			8.000			9.500
Ca (mg/L)	18.0	18.0	18.0	20.0	17.0	17.0	17.0	18.0	18.0	18.0	19.0	18.0	19.0	19.0	21.0	16.0	17.0
Cl (mg/L)	1.20	2.00	1.50	3.70	1.30	2.00	1.70	3.40	1.70	1.90	1.60	1.40	3.00	2.20	3.20	1.10	1.10
CO3 (mg/L)	<1.0	<1.0	<1.0	4.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	129	126	128	192	115	122	122	134	126	128	133	134	134	134	157	113	118
Cu (mg/L)	0.001	0.005	0.001	0.002	0.001	0.000	0.000	0.002	0.000	0.001	0.001	0.001	<0.000	0.000	0.000	0.001	0.001
Fe (mg/L)	0.040	0.052	0.027	0.069	0.046	0.120	0.180	0.110	0.047	0.078	0.045	0.045	0.035	0.041	0.071	0.056	0.100
Hardness (mg/L)	59	60	59	66	56	56	56	60	59	60	62	60	62	62	69	53	56
HCO3 (mg/L)	66.0	65.0	66.0	66.0	58.0	62.0	61.0	63.0	66.0	65.0	68.0	68.0	70.0	66.0	70.0	58.0	60.0
K (mg/L)	0.9	0.9	0.7	0.9	0.7	0.8	0.8	0.9	0.7	0.7	0.6	0.9	0.9	0.9	0.7	0.7	0.8
Mg (mg/L)	3.5	3.6	3.5	3.8	3.2	3.3	3.2	3.6	3.5	3.6	3.6	3.6	3.7	3.7	4.0	3.1	3.4
Mo (mg/L)	0.001	0.001	0.002	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Na (mg/L)	1.8	1.9	1.7	3.5	1.9	2.0	2.0	4.0	2.0	2.1	1.9	1.9	2.2	2.6	3.7	1.6	2.0
NH3-N (mg/L)			0.06			0.03			0.06		0.05			<0.04			0.06
Ni (mg/L)	0.00020	0.00040	0.00020	0.00030	0.00020	0.00020	0.00020	0.00040	0.00010	0.00020	0.00020	0.00020	0.00010	0.00010	0.00020	0.00020	0.00010
NO3 (mg/L)	0.09	0.18	0.20	<0.04	<0.04	0.71	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.22	0.22	0.26	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01			<0.01			<0.01		<0.01			<0.01			<0.01
Pb (mg/L)	0.0004	0.0014	0.0002	0.0008	0.0004	0.0003	0.0007	0.0006	0.0002	0.0006	0.0004	0.0003	0.0002	0.0002	0.0005	0.0005	0.0002
Pb210 (Bq/L)			<0.02			<0.02			<0.02		<0.02			<0.02			<0.02
pH-L (pH Unit)	7.67	7.46	7.75	8.54	7.70	7.77	7.77	7.64	7.46	7.67	7.72	7.79	7.66	7.78	7.96	7.72	7.80
Po210 (Bq/L)			0.010			0.008			0.008		<0.005			<0.005			0.010
Ra226 (Bq/L)	0.060	0.080	0.050	0.080	0.070	0.070	0.090	0.090	0.050	0.100	0.050	0.040	0.030	0.030	0.060	0.030	0.060
Se (mg/L)	<0.0001	0.0001	<0.0001	0.0005	<0.0001	<0.0001	<0.0001	0.0004	0.0002	0.0003	0.0001	0.0001	<0.0001	0.0001	0.0005	0.0001	0.0001
SO4 (mg/L)	8.0	7.7	7.4	15.0	8.0	7.6	7.4	11.0	9.2	9.5	8.8	7.9	8.4	9.7	16.0	7.4	8.1
Sum of Ions (mg/L)	99	99	99	117	90	95	93	104	101	101	104	102	107	104	119	88	92
TDS (mg/L)	94.00	84.00	85.00	99.00	75.00	87.00	84.00	84.00	87.00	88.00	88.00	89.00	96.00	90.00	96.00	84.00	68.00
TSS (mg/L)	<1.000	1.000	2.000	<1.000	2.000	1.000	<1.000	2.000	<1.000	<1.000	<1.000	2.000	<1.000	1.000	<1.000	1.000	<1.000
U (µg/L)	19.0	20.0	27.0	72.0	32.0	26.0	23.0	44.0	34.0	39.0	29.0	25.0	23.0	27.0	101.0	23.0	26.0
Zn (mg/L)	<0.001	0.006	<0.001	0.004	0.001	<0.001	<0.001	0.009	<0.001	<0.001	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Station: AC-6A

Parameters	2012-06-29
Alk-T (mg/L)	98.0
As (µg/L)	0.2
Ba (mg/L)	0.023
Ca (mg/L)	45.0
Cl (mg/L)	0.40
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	298
Cu (mg/L)	0.001
Fe (mg/L)	0.040
Hardness (mg/L)	152
HCO3 (mg/L)	120.0
K (mg/L)	1.1
Mg (mg/L)	9.6
Mo (mg/L)	0.001
Na (mg/L)	2.5
Ni (mg/L)	<0.00010
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
Pb (mg/L)	<0.0001
pH-L (pH Unit)	7.58
Ra226 (Bq/L)	0.130
Se (mg/L)	0.0002
SO4 (mg/L)	58.0
Sum of Ions (mg/L)	237
TDS (mg/L)	203.00
TSS (mg/L)	<1.000
U (µg/L)	186.0
Zn (mg/L)	<0.001

Station: AC-8

Parameters	2011-03-30	2011-09-30	2012-04-03
Alk-T (mg/L)	54.0	50.0	55.0
As (µg/L)	0.2	0.1	0.1
Ba (mg/L)	0.025	0.024	0.024
C-(org) (mg/L)		6.000	
Ca (mg/L)	18.0	17.0	17.0
Cl (mg/L)	1.30	1.30	1.20
CO3 (mg/L)	<1.0	<1.0	<1.0
Cond-L (µS/cm)	126	117	126
Cu (mg/L)	0.001	0.000	0.000
Fe (mg/L)	0.036	0.018	0.046
Hardness (mg/L)	59	56	56
HCO3 (mg/L)	66.0	61.0	67.0
K (mg/L)	0.7	0.7	0.9
Mg (mg/L)	3.5	3.3	3.2
Mo (mg/L)	0.001	0.001	0.001
Na (mg/L)	1.5	1.5	1.7
NH3-N (mg/L)		0.07	
Ni (mg/L)	0.00010	0.00020	0.00010
NO3 (mg/L)	0.13	<0.04	0.22
OH (mg/L)	<1.0	<1.0	<1.0
P-(TP) (mg/L)		<0.01	
Pb (mg/L)	<0.0001	<0.0001	<0.0001
Pb210 (Bq/L)		<0.02	
pH-L (pH Unit)	7.60	7.35	7.53
Po210 (Bq/L)		<0.005	
Ra226 (Bq/L)	0.010	0.020	0.010
Se (mg/L)	0.0002	<0.0001	<0.0001
SO4 (mg/L)	6.9	7.0	7.1
Sum of Ions (mg/L)	98	92	98
TDS (mg/L)	81.00	82.00	80.00
TSS (mg/L)	<1.000	<1.000	<1.000
U (µg/L)	15.0	18.0	14.0
Zn (mg/L)	<0.001	<0.001	<0.001

Station: AN-5

Parameters	2011-05-15	2011-07-31	2011-09-30	2011-12-04	2012-01-31	2012-05-25
Alk-T (mg/L)	105.0	121.0	106.0	129.0	145.0	80.0
As (µg/L)	0.3	0.6	0.3	0.4	0.3	0.3
Ba (mg/L)	0.130	0.190	0.130	0.140	0.140	0.091
C-(org) (mg/L)			11.000			
Ca (mg/L)	33.0	35.0	34.0	41.0	45.0	26.0
Cl (mg/L)	0.80	1.00	1.20	2.00	2.00	0.80
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	235	254	247	305	313	184
Cu (mg/L)	0.001	0.000	0.001	0.001	0.001	0.004
Fe (mg/L)	0.140	0.520	0.140	0.350	0.200	0.170
Hardness (mg/L)	115	123	120	141	153	90
HCO3 (mg/L)	128.0	148.0	129.0	157.0	177.0	98.0
K (mg/L)	1.5	1.6	1.5	2.2	2.0	1.2
Mg (mg/L)	8.0	8.6	8.5	9.5	10.0	6.0
Mo (mg/L)	0.004	0.002	0.003	0.004	0.004	0.005
Na (mg/L)	4.5	4.9	4.4	5.2	5.5	3.4
NH3-N (mg/L)			0.08			
Ni (mg/L)	0.00050	0.00040	0.00040	0.00060	0.00050	0.00070
NO3 (mg/L)	<0.04	<0.04	<0.04	0.09	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01			
Pb (mg/L)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0004
Pb210 (Bq/L)			<0.02			
pH-L (pH Unit)	7.54	7.53	7.27	7.69	7.75	7.58
Po210 (Bq/L)			0.009			
Ra226 (Bq/L)	0.580	1.500	0.650	1.100	0.680	0.550
Se (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
SO4 (mg/L)	17.0	11.0	21.0	22.0	19.0	15.0
Sum of Ions (mg/L)	193	210	200	239	260	150
TDS (mg/L)	171.00	196.00	172.00	196.00	202.00	114.00
TSS (mg/L)	<1.000	6.000	1.000	11.000	2.000	1.000
U (µg/L)	162.0	41.0	89.0	270.0	265.0	81.0
Zn (mg/L)	0.003	<0.001	0.001	0.002	0.001	0.004

Station: BL-3

Parameters	2011-03-30	2011-06-23	2011-09-30	2011-12-15	2012-04-03	2012-06-29
Alk-T (mg/L)	74.0		66.0	72.0	77.0	66.0
As (µg/L)	0.3	0.2	0.3	0.3	0.3	0.3
Ba (mg/L)	0.037	0.035	0.034	0.035	0.035	0.034
C-(org) (mg/L)			3.800			
Ca (mg/L)	23.0	21.0	21.0	22.0	23.0	21.0
Cl (mg/L)	14.00	12.00	14.00	14.00	13.00	13.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	257		242	252	248	236
Cu (mg/L)	0.002	0.001	0.001	0.007	0.001	0.001
Fe (mg/L)	0.005	0.005	0.006	0.014	0.004	0.003
Hardness (mg/L)	80	74	74	78	80	75
HCO3 (mg/L)	90.0		80.0	88.0	94.0	80.0
K (mg/L)	1.1	1.1	1.0	1.2	1.3	1.2
Mg (mg/L)	5.5	5.2	5.4	5.6	5.5	5.5
Mo (mg/L)	0.003	0.004	0.004	0.004	0.004	0.004
Na (mg/L)	20.0	19.0	19.0	21.0	19.0	19.0
NH3-N (mg/L)			0.21			
Ni (mg/L)	0.00160	0.00120	0.00170	0.00940	0.00100	0.00100
NO3 (mg/L)	<0.04		0.09	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01			
Pb (mg/L)	<0.0001	0.0002	0.0001	0.0007	<0.0001	<0.0001
Pb210 (Bq/L)			<0.02			
pH-L (pH Unit)	7.90		7.58	7.88	7.84	7.84
Po210 (Bq/L)			<0.005			
Ra226 (Bq/L)	0.030	0.020	0.020	0.020	0.030	0.010
Se (mg/L)	0.0028	0.0027	0.0028	0.0028	0.0026	0.0027
SO4 (mg/L)	34.0	32.0	32.0	34.0	33.0	32.0
Sum of Ions (mg/L)	188	163	173	186	189	172
TDS (mg/L)	155.00		156.00	143.00	145.00	135.00
TSS (mg/L)	<1.000		<1.000	<1.000	<1.000	<1.000
U (µg/L)	134.0	143.0	140.0	145.0	136.0	135.0
Zn (mg/L)	0.005	0.002	0.001	0.016	0.002	0.001

Station: BL-4

Parameters	2011-03-30	2011-09-30	2012-04-03
Alk-T (mg/L)	69.0	66.0	71.0
As (µg/L)	0.3	0.3	0.3
Ba (mg/L)	0.034	0.034	0.034
C-(org) (mg/L)	3.600	3.200	3.700
Ca (mg/L)	22.0	21.0	22.0
Cl (mg/L)	14.00	14.00	15.00
CO3 (mg/L)	<1.0	<1.0	<1.0
Cond-L (µS/cm)	249	242	254
Cu (mg/L)	0.001	0.001	0.003
Fe (mg/L)	0.002	0.004	0.006
Hardness (mg/L)	77	74	77
HCO3 (mg/L)	84.0	80.0	87.0
K (mg/L)	1.1	1.1	1.3
Mg (mg/L)	5.3	5.3	5.4
Mo (mg/L)	0.005	0.004	0.004
Na (mg/L)	20.0	19.0	21.0
NH3-N (mg/L)	0.08	0.09	0.06
Ni (mg/L)	0.00140	0.00300	0.00300
NO3 (mg/L)	<0.04	0.80	<0.04
OH (mg/L)	<1.0	<1.0	<1.0
P-(TP) (mg/L)	<0.01	<0.01	<0.01
Pb (mg/L)	<0.0001	<0.0001	0.0002
Pb210 (Bq/L)	0.03	<0.02	<0.02
pH-L (pH Unit)	7.88	7.52	7.87
Po210 (Bq/L)	<0.005	<0.005	<0.005
Ra226 (Bq/L)	0.030	0.020	0.030
Se (mg/L)	0.0028	0.0028	0.0028
SO4 (mg/L)	32.0	33.0	35.0
Sum of Ions (mg/L)	178	174	187
TDS (mg/L)	142.00	144.00	146.00
TSS (mg/L)	<1.000	<1.000	<1.000
U (µg/L)	144.0	140.0	145.0
Zn (mg/L)	0.001	0.003	0.006

Station: BL-5

Parameters	2011-03-30	2011-06-23	2011-09-30	2011-12-15	2012-04-03	2012-06-29
Alk-T (mg/L)	68.0	65.0	67.0		73.0	66.0
As (µg/L)	0.2	0.2	0.3	0.3	0.3	0.2
Ba (mg/L)	0.046	0.035	0.034	0.037	0.035	0.031
C-(org) (mg/L)			2.900			
Ca (mg/L)	21.0	21.0	21.0		22.0	21.0
Cl (mg/L)	7.40	13.00	14.00		14.00	14.00
CO3 (mg/L)	<1.0	<1.0	<1.0		<1.0	<1.0
Cond-L (µS/cm)	196	242	244		256	236
Cu (mg/L)	0.002	0.000	0.000	0.001	0.000	0.000
Fe (mg/L)	0.011	0.013	0.005	0.004	0.001	0.001
Hardness (mg/L)	71	74	74		78	74
HCO3 (mg/L)	83.0	79.0	82.0		89.0	80.0
K (mg/L)	1.1	1.1	1.1		1.3	1.2
Mg (mg/L)	4.6	5.2	5.3		5.6	5.2
Mo (mg/L)	0.002	0.004	0.004	0.004	0.004	0.004
Na (mg/L)	10.0	19.0	19.0		21.0	19.0
NH3-N (mg/L)			0.06			
Ni (mg/L)	0.00010	0.00020	0.00020	0.00030	0.00020	<0.00010
NO3 (mg/L)	0.26	2.90	<0.04		<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0		<1.0	<1.0
P-(TP) (mg/L)			<0.01			
Pb (mg/L)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Pb210 (Bq/L)			<0.02			
pH-L (pH Unit)	7.69	7.72	7.55		7.95	7.87
Po210 (Bq/L)			<0.005			
Ra226 (Bq/L)	<0.005	0.040	0.020	0.020	0.030	0.040
Se (mg/L)	0.0009	0.0027	0.0028	0.0030	0.0028	0.0027
SO4 (mg/L)	17.0	31.0	33.0		36.0	32.0
Sum of Ions (mg/L)	144	169	175		189	172
TDS (mg/L)	111.00	144.00	151.00		147.00	133.00
TSS (mg/L)	2.000	4.000	<1.000		<1.000	<1.000
U (µg/L)		138.0	142.0	150.0	146.0	130.0
Zn (mg/L)	0.001	<0.001	0.001	0.002	<0.001	<0.001

Station: CS-1

Parameters	2011-09-30
Alk-T (mg/L)	85.0
As (µg/L)	0.2
Ba (mg/L)	0.056
C-(org) (mg/L)	11.000
Ca (mg/L)	28.0
Cl (mg/L)	7.80
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	211
Cu (mg/L)	0.000
Fe (mg/L)	0.100
Hardness (mg/L)	96
HCO3 (mg/L)	104.0
K (mg/L)	1.2
Mg (mg/L)	6.3
Mo (mg/L)	0.003
Na (mg/L)	6.4
NH3-N (mg/L)	0.08
Ni (mg/L)	0.00030
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	<0.01
Pb (mg/L)	<0.0001
Pb210 (Bq/L)	<0.02
pH-L (pH Unit)	7.78
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	0.0003
SO4 (mg/L)	11.0
Sum of Ions (mg/L)	165
TDS (mg/L)	135.00
TSS (mg/L)	<1.000
U (µg/L)	47.0
Zn (mg/L)	0.001

Station: CS-2

Parameters	2011-10-22
Alk-T (mg/L)	28.0
As (µg/L)	0.3
Ba (mg/L)	0.011
C-(org) (mg/L)	2.800
Ca (mg/L)	7.1
Cl (mg/L)	2.00
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	68
Cu (mg/L)	0.001
Fe (mg/L)	0.013
Hardness (mg/L)	27
HCO3 (mg/L)	34.0
K (mg/L)	0.5
Mg (mg/L)	2.2
Mo (mg/L)	0.000
Na (mg/L)	2.4
NH3-N (mg/L)	0.06
Ni (mg/L)	0.00040
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	0.02
Pb (mg/L)	<0.0001
Pb210 (Bq/L)	<0.02
pH-L (pH Unit)	7.45
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	<0.0001
SO4 (mg/L)	3.5
Sum of Ions (mg/L)	52
TDS (mg/L)	220.00
TSS (mg/L)	<1.000
U (µg/L)	0.3
Zn (mg/L)	0.001

Station: DB-6

Parameters	2011-05-15	2011-07-31	2011-09-30	2011-12-04	2011-12-15	2012-01-31	2012-04-03	2012-05-25
Alk-T (mg/L)	79.0	86.0	89.0	99.0	99.0	98.0	96.0	79.0
As (µg/L)	0.2	0.1	0.1	0.2	0.1	0.1	0.1	<0.1
Ba (mg/L)	0.045	0.050	0.049	0.054	0.055	0.056	0.050	0.041
C-(org) (mg/L)			9.100				9.300	
Ca (mg/L)	33.0	37.0	38.0	42.0	41.0	39.0	40.0	33.0
Cl (mg/L)	0.60	0.70	0.80	0.80	0.80	0.80	0.70	0.70
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	208	233	239	267	255	257	245	208
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Fe (mg/L)	0.007	0.017	0.010	0.013	0.011	0.010	0.022	0.014
Hardness (mg/L)	104	116	119	131	129	122	124	103
HCO3 (mg/L)	96.0	105.0	108.0	121.0	121.0	120.0	117.0	96.0
K (mg/L)	0.8	0.9	0.8	1.0	0.9	0.9	1.0	0.8
Mg (mg/L)	5.2	5.8	6.0	6.4	6.5	6.0	5.9	5.0
Mo (mg/L)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Na (mg/L)	1.9	2.1	2.1	2.3	2.5	2.3	2.3	1.8
NH3-N (mg/L)			0.05				0.02	
Ni (mg/L)	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
NO3 (mg/L)	<0.04	0.04	0.04	0.13	1.40	<0.04	0.58	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01				<0.01	
Pb (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Pb210 (Bq/L)			<0.02				<0.02	
pH-L (pH Unit)	7.77	7.89	7.61	7.80	7.73	7.86	7.51	7.80
Po210 (Bq/L)			0.006				0.010	
Ra226 (Bq/L)	0.030	0.020	0.040		0.040	0.040	0.040	0.020
Se (mg/L)	<0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001
SO4 (mg/L)	26.0	29.0	28.0	30.0	31.0	29.0	29.0	24.0
Sum of Ions (mg/L)	164	180	184	204	205	198	196	161
TDS (mg/L)	143.00	145.00	164.00	213.00	170.00	176.00	165.00	135.00
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000	2.000	<1.000	<1.000
U (µg/L)	239.0	266.0	261.0	244.0	252.0	261.0	196.0	186.0
Zn (mg/L)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002

Station: ML-1

Parameters	2011-03-30	2011-06-23	2011-09-30	2011-12-15	2012-04-03	2012-06-29
Alk-T (mg/L)	75.0	63.0	63.0	72.0	64.0	60.0
As (µg/L)	0.3	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.037	0.042	0.042	0.047	0.042	0.040
C-(org) (mg/L)	3.400	5.000	4.800	5.900	8.000	5.900
Ca (mg/L)	23.0	19.0	19.0	21.0	20.0	19.0
Cl (mg/L)	16.00	8.20	8.30	8.70	6.90	6.40
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	270	187	189	207	180	178
Cu (mg/L)	0.000	0.000	0.000	0.001	0.001	0.000
Fe (mg/L)	0.001	0.011	0.008	0.005	0.015	0.008
Hardness (mg/L)	81	65	65	72	68	65
HCO3 (mg/L)	92.0	77.0	77.0	88.0	78.0	73.0
K (mg/L)	1.1	1.1	0.9	1.1	1.2	1.0
Mg (mg/L)	5.7	4.3	4.4	4.9	4.5	4.3
Mo (mg/L)	0.005	0.002	0.002	0.002	0.002	0.002
Na (mg/L)	21.0	12.0	12.0	13.0	10.0	11.0
NH3-N (mg/L)	0.03	0.11	0.09	0.06	0.03	0.04
Ni (mg/L)	0.00020	0.00010	0.00010	0.00010	<0.00010	<0.00010
NO3 (mg/L)	<0.04	0.66	<0.04	<0.04	0.04	0.13
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pb210 (Bq/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
pH-L (pH Unit)	7.93	8.01	7.55	7.62	7.40	7.90
Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ra226 (Bq/L)	0.020	<0.005	<0.005	<0.005	<0.005	0.008
Se (mg/L)	0.0031	0.0011	0.0012	0.0011	0.0007	0.0010
SO4 (mg/L)	36.0	18.0	19.0	20.0	16.0	18.0
Sum of Ions (mg/L)	195	140	141	157	137	133
TDS (mg/L)	161.00	119.00	117.00	122.00	113.00	103.00
TSS (mg/L)	<1.000	1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	58.0	72.0	73.0	74.0	47.0	62.0
Zn (mg/L)	<0.001	<0.001	<0.001	0.002	<0.001	<0.001

Station: TL-3

Parameters	2012-06-29
Alk-T (mg/L)	134
As (µg/L)	1.0
Ba (mg/L)	0.034
C-(org) (mg/L)	
Ca (mg/L)	26.0
Cl (mg/L)	5.00
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	348
Cu (mg/L)	0.001
Fe (mg/L)	0.009
Hardness (mg/L)	86
HCO3 (mg/L)	163.0
K (mg/L)	1.3
Mg (mg/L)	5.2
Mo (mg/L)	0.017
Na (mg/L)	42.0
NH3-N (mg/L)	
Ni (mg/L)	0.00020
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	
Pb (mg/L)	0.0004
Pb210 (Bq/L)	
pH-L (pH Unit)	8.16
Po210 (Bq/L)	
Ra226 (Bq/L)	1.400
Se (mg/L)	0.0042
SO4 (mg/L)	42.0
Sum of Ions (mg/L)	284
TDS (mg/L)	216.00
TSS (mg/L)	<1.000
U (µg/L)	377.0
Zn (mg/L)	<0.001

Station: TL-4

Parameters	2012-06-29
Alk-T (mg/L)	133.0
As (µg/L)	2.2
Ba (mg/L)	0.076
C-(org) (mg/L)	
Ca (mg/L)	18.0
Cl (mg/L)	4.00
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	321
Cu (mg/L)	0.001
Fe (mg/L)	0.210
Hardness (mg/L)	67
HCO3 (mg/L)	162.0
K (mg/L)	1.5
Mg (mg/L)	5.4
Mo (mg/L)	0.010
Na (mg/L)	47.0
NH3-N (mg/L)	
Ni (mg/L)	0.00060
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	
Pb (mg/L)	0.0004
Pb210 (Bq/L)	
pH-L (pH Unit)	7.90
Po210 (Bq/L)	
Ra226 (Bq/L)	1.600
Se (mg/L)	0.0022
SO4 (mg/L)	33.0
Sum of Ions (mg/L)	271
TDS (mg/L)	213.00
TSS (mg/L)	<1.000
U (µg/L)	244.0
Zn (mg/L)	<0.001

Station: TL-6

Parameters	2012-05-25
Alk-T (mg/L)	294.0
As (µg/L)	1.7
Ba (mg/L)	1.090
C-(org) (mg/L)	36.000
Ca (mg/L)	47.0
Cl (mg/L)	62.00
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	861
Cu (mg/L)	0.001
Fe (mg/L)	0.970
Hardness (mg/L)	166
HCO3 (mg/L)	359.0
K (mg/L)	3.9
Mg (mg/L)	12.0
Mo (mg/L)	0.003
Na (mg/L)	125.0
NH3-N (mg/L)	0.08
Ni (mg/L)	0.00060
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	0.01
Pb (mg/L)	0.0008
Pb210 (Bq/L)	0.09
pH-L (pH Unit)	7.83
Po210 (Bq/L)	0.060
Ra226 (Bq/L)	5.600
Se (mg/L)	0.0054
SO4 (mg/L)	73.0
Sum of Ions (mg/L)	682
TDS (mg/L)	566.00
TSS (mg/L)	2.000
U (µg/L)	396.0
Zn (mg/L)	0.001

Station: TL-7

Parameters	2011-04-30	2011-05-15	2011-06-23	2011-08-24	2011-09-30	2011-10-21	2012-04-27	2012-05-25	2012-06-29
Alk-T (mg/L)	105.0	150.0	185.0	151.0	148.0	151.0	96.0	130.0	139.0
As (µg/L)	2.0	1.0	1.2	0.9	0.7	0.9	1.5	1.1	2.4
Ba (mg/L)	0.130	0.380	0.560	0.490	0.370	0.180	0.100	0.150	0.180
C-(org) (mg/L)			12.000		10.000				13.000
Ca (mg/L)	25.0	43.0	45.0	45.0	44.0	49.0	30.0	37.0	22.0
Cl (mg/L)	4.30	11.00	10.00	12.00	13.00	13.00	4.30	35.00	7.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	275	477	521	538	511	529	290	488	347
Cu (mg/L)	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.002	0.001
Fe (mg/L)	0.230	0.110	0.120	0.037	0.027	0.028	0.310	0.150	0.290
Hardness (mg/L)	84	146	150	151	146	161	100	128	78
HCO3 (mg/L)	128.0	183.0	226.0	184.0	180.0	184.0	117.0	159.0	170.0
K (mg/L)	6.0	1.9	1.9	1.7	1.7	1.4	2.2	1.9	1.4
Mg (mg/L)	5.3	9.4	9.3	9.5	8.9	9.5	6.2	8.8	5.7
Mo (mg/L)	0.006	0.012	0.009	0.004	0.007	0.010	0.006	0.014	0.012
Na (mg/L)	23.0	45.0	58.0	56.0	51.0	50.0	20.0	51.0	48.0
NH3-N (mg/L)			<0.01		0.40				0.04
Ni (mg/L)	0.00060	0.00060	0.00070	0.00070	0.00060	0.00050	0.00040	0.00110	0.00090
NO3 (mg/L)	<0.04	<0.04	0.66	0.84	<0.04	<0.04	0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			0.01		<0.01				<0.01
Pb (mg/L)	0.0004	0.0004	0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0008	0.0009
Pb210 (Bq/L)			<0.02		<0.02				0.07
pH-L (pH Unit)	8.09	7.88	8.13	8.22	7.71	7.92	7.92	7.84	7.66
Po210 (Bq/L)			0.020		0.010				0.100
Ra226 (Bq/L)	0.480	0.880	1.400	1.000	0.740	0.640	0.220	0.450	0.890
Se (mg/L)	0.0054	0.0058	0.0047	0.0029	0.0041	0.0100	0.0060	0.0051	0.0029
SO4 (mg/L)	36.0	84.0	90.0	110.0	98.0	100.0	43.0	67.0	36.0
Sum of Ions (mg/L)	228	377	440	418	397	407	223	360	290
TDS (mg/L)	174.00	318.00	346.00	350.00	327.00	342.00	184.00	301.00	228.00
TSS (mg/L)	<1.000	<1.000	3.000	1.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	198.0	338.0	230.0	69.0	126.0	220.0	214.0	417.0	216.0
Zn (mg/L)	0.002	0.001	0.001	<0.001	<0.001	<0.001	0.002	0.001	0.003

Station: TL-9

Parameters	2012-05-25	2012-06-29
Alk-T (mg/L)	142.0	148.0
As (µg/L)	1.5	1.7
Ba (mg/L)	0.240	0.970
C-(org) (mg/L)		14.000
Ca (mg/L)	26.0	23.0
Cl (mg/L)	9.00	9.00
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	373	364
Cu (mg/L)	0.002	0.001
Fe (mg/L)	0.019	0.035
Hardness (mg/L)	96	86
HCO3 (mg/L)	173.0	180.0
K (mg/L)	1.6	1.7
Mg (mg/L)	7.6	7.1
Mo (mg/L)	0.016	0.013
Na (mg/L)	44.0	45.0
NH3-N (mg/L)		0.04
Ni (mg/L)	0.00050	0.00040
NO3 (mg/L)	<0.04	0.35
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)		<0.01
Pb (mg/L)	0.0012	0.0010
Pb210 (Bq/L)		0.04
pH-L (pH Unit)	8.03	7.98
Po210 (Bq/L)		0.080
Ra226 (Bq/L)	2.800	2.700
Se (mg/L)	0.0130	0.0045
SO4 (mg/L)	43.0	34.0
Sum of Ions (mg/L)	304	300
TDS (mg/L)	243.00	243.00
TSS (mg/L)	<1.000	<1.000
U (µg/L)	497.0	243.0
Zn (mg/L)	0.002	0.001

Station: AN-3

	2011-09-30
Alk-T (mg/L)	
As (µg/L)	
Ba (mg/L)	
C-(org) (mg/L)	
Ca (mg/L)	
Cl (mg/L)	
CO3 (mg/L)	
Cond-L (µS/cm)	
Cu (mg/L)	
Fe (mg/L)	
Hardness (mg/L)	
HCO3 (mg/L)	
K (mg/L)	
Mg (mg/L)	
Mo (mg/L)	
Na (mg/L)	
NH3-N (mg/L)	
Ni (mg/L)	
NO3 (mg/L)	
OH (mg/L)	
P-(TP) (mg/L)	
Pb (mg/L)	
Pb210 (Bq/L)	
pH-L (pH Unit)	
Po210 (Bq/L)	
Ra226 (Bq/L)	
Se (mg/L)	
SO4 (mg/L)	
Sum of Ions (mg/L)	
TDS (mg/L)	
TSS (mg/L)	
U (µg/L)	
Zn (mg/L)	

APPENDIX B

APPENDIX B

Report to

2011/12 Streamflow Assessment near Beaverlodge Mine

Cameco

Project No. 2711-13003-0
Cameco Corporation | Michael Webster | (306) 956-6200
July 31, 2012

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McElhanney

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As a world leading uranium producer, Cameco Corporation (Cameco) provides approximately 16% of the world's production from its mines in Canada and the US. Cameco's goal is to be the supplier, partner, investment and employer of choice in the nuclear industry and is committed to providing a safe, healthy and rewarding workplace, a clean environment, supportive communities and outstanding financial performance. Cameco was formed in 1988 as a merger of the Saskatchewan Mining Development Corporation and Eldorado Nuclear Limited, both crown corporations of the Saskatchewan and Canadian governments, respectively. (Cameco, 2012a)

1 INTRODUCTION

Development of uranium mines in the area of Beaverlodge Lake, Saskatchewan near Uranium City began in the 1950s. At that time, operations were owned by Eldorado Mining and Refining Ltd., a crown corporation owned by the Government of Canada. The milling and local mine sites were closed in 1982 and decommissioning and reclamation works were completed in 1985. The project transferred into a monitoring and maintenance phase following decommission and reclamation. The site is currently managed by Cameco on behalf of the Government of Canada. (SRK Consulting, 2009)

Post-closure monitoring activities have continued since the decommissioning of the site and include routine sampling and/or measurement of local parameters including water quality and flow. Cameco has retained McElhanney Consulting Services Ltd. (MCSL) for the reporting of 2011/12 streamflow data for Ace Creek at Station AC-8 and Fulton Creek at Station TL-7. This report summarizes the data collected in 2011 and 2012 for each station and provides climatic data for the communities of Uranium City and Stony Rapids, Saskatchewan.

2 CLIMATIC CONDITIONS

Environment Canada operates meteorological stations at Uranium City and at Stony Rapids, Saskatchewan. Meteorological data from these sites provide an indication of climatic conditions through the hydrological monitoring period. The station near Uranium City is automated and has been subject to problems in the past resulting in data gaps. Stony Rapids station in the past few years has become somewhat less reliable as well, but both have sufficient record to provide an indication of the recent climate at the Beaverlodge area. Table 1 provides mean and annual total precipitation (rain and snow) totals for Uranium City and Stony Rapids as well as the number of recorded days of data with respect to the number of possible days of record (Environment Canada 2012). Normal annual totals for precipitation are provided as presented by Golder Associates Ltd. (2011).

As indicated in Table 1, annual precipitation totals appear to be below normal for both Uranium City and Stony Rapids; however, there are gaps in the data available which makes both records incomplete. In particular, missing data should be taken into consideration for Uranium City in 2012 where approximately 51% of the data is unavailable including all of February and March, while Stony Rapids 2011 data is missing approximately 9% of the data mostly in January and February. In 2011, both stations show above average precipitation for the months of July and August with below average totals for the remainder of the year. April 2012 total precipitation for Stony Rapids is approximately average while Uranium City is well below average but missing 15 days out of 30; both stations for are below normal values for the year up to the end of June.

Residents of Uranium City indicated during the spring field program that there was more snow than usual during the winter of 2011/2012. This may indicate that data was missed during important periods at the Uranium City station which does not fully describe the snowpack for the winter. The data reported in Table 1 is a summary of the daily reported data from Environment Canada and was not subjected to in-filling or extrapolation to complete the record.

Table 1. Precipitation Data

Year	Month	Uranium City				Stony Rapids			
		Precipitation (mm)	Normal Precipitation (mm)[(a)]	Percent of Normal	Recorded Days of Data	Precipitation (mm)	Normal Precipitation (mm)[(b)]	Percent of Normal	Recorded Days of Data
2011	January	7.6	19.3	39.4	31/31	2.4*	18.1	13.3	17/31
	February	4.3	15.5	27.7	28/28	1.9*	13.3	14.3	22/28
	March	3.6*	17.8	20.2	30/31	2.6*	18.2	14.3	26/31
	April	1.4	16.9	8.3	30/30	0.0*	18	0.0	28/30
	May	2.1*	17.5	12.0	30/31	2.8*	26.3	10.6	30/31
	June	5.6	31.3	17.9	30/30	11.6	44.4	26.1	30/30
	July	47.9	47.1	101.7	31/31	72.5	56.3	128.8	31/31
	August	74.4*	42.4	175.5	29/31	118.4	63.9	185.3	31/31
	September	9.1	33.7	27.0	30/30	17.3	48.4	35.7	30/30
	October	13.0*	29.1	44.7	30/31	15.8*	30.1	52.5	30/31
	November	18	28	64.3	30/30	7.0*	27.6	25.4	29/30
	December	17.7	23.6	75.0	31/31	7.5*	18.7	40.1	27/31
	Total	204.7*	322.2	63.5	360/365	259.8*	383.3	67.8	331/365
2012	January	6.6*	19.3	34.2	29/31	2.3*	18.1	12.7	26/31
	February	0.0*	15.5	0.0	0/29	0.0*	13.3	0.0	28/29
	March	0.0*	17.8	0.0	0/31	8.7*	18.2	47.8	29/31
	April	4.9*	16.9	29.0	15/30	18.5	18	102.8	30/30
	May	4.7*	17.5	26.9	24/31	7.5*	26.3	28.5	30/31
	June	30.8*	31.3	98.4	21/30	28.0*	44.4	63.1	29/30
	Total	47.0*	118.3	39.7	89/182	65.0*	138.3	47.0	172/182

Notes: (a) Uranium City Normals, Golder (2011); (b) Stony Rapids Normals, Golder (2011); * indicates incomplete data set.

3 STREAMFLOW MONITORING

Streamflow monitoring at Ace Creek (AC-8) and Fulton Creek (TL-7) is maintained as a part of the site monitoring program. The station known as AC-8 is located at the outlet of Ace Lake where the outlet configuration is a rectangular concrete weir. The drainage area reporting to Ace Lake is approximately 152 km². Manual measurements of discharge have been ongoing since 2005 and the station is outfitted with a staff gauge and data logger. The rating curve used to estimate discharge from the stage data is presented in Figure 1. Data used to create the stage-discharge rating curve has been collected since 2005 and is presented in Table 2.

Figure 1:Stage-Discharge Rating Curve at AC-8

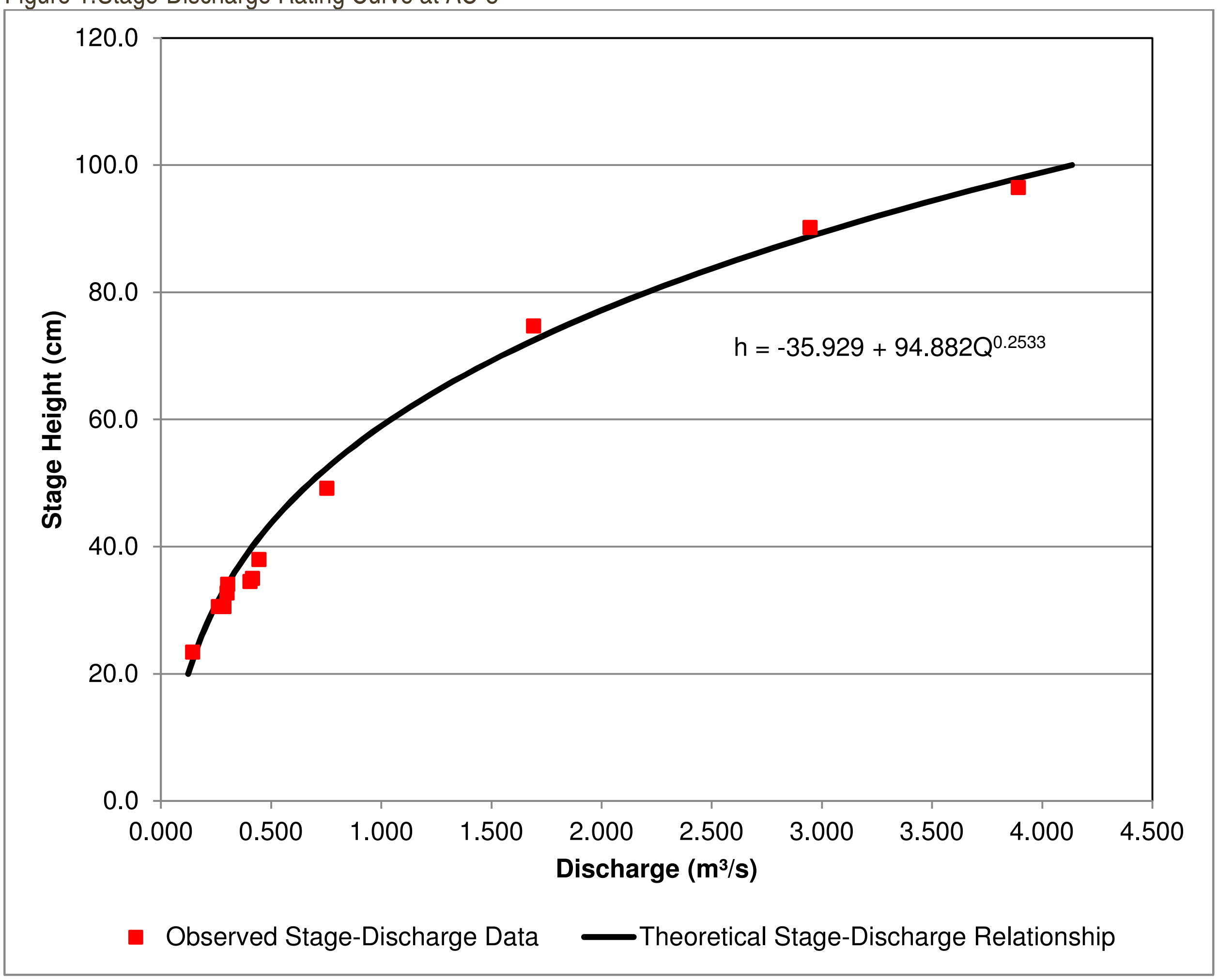


Table 2. Stage and Discharge Measurement Summary at AC-8

Date	Time	Staff Gauge (cm)	Discharge (m^3/s)
16-Aug-05	Not Recorded	35.0	0.415
24-Jan-06	Not Recorded	34.5	0.404
24-May-06	Not Recorded	74.7	1.691
30-Apr-10	Not Recorded	49.2	0.753
1-Jul-10	Not Recorded	30.6	0.286
11-Sep-10	10:15	23.4	0.144
16-May-11	15:30	34.1	0.303
22-May-11	8:11	38.0	0.444
28-Aug-11	10:30	30.6	0.261
3-Oct-11	Not Recorded	32.7	0.301
8-May-12	15:09	90.2	2.947
10-May-12	8:57	96.5	3.891

At TL-7, a large v-notch weir controls discharge and is also monitored with a staff gauge and data logger. The catchment area contributing to TL-7 is approximately 14 km^2. A rating curve for this station has not been developed so discharge is calculated using the standard equation for a 90° v-notch weir shown below as Equation [1] (Smith, 1995). The datalogger for this station is only installed during the open water season to limit potential damage which may occur when ice forms upstream of the weir structure. Two volumetric discharge measurements were performed at TL-7 and those measurements, along with measured stage heights, are provided in Table 3 (Golder, 2012).

$$[1] \qquad Q = 1.37 \cdot h^{2.5}$$

Table 3. Discharge Measurement Summary at TL-7

Date	Time	Stage Height (cm)	Discharge (L/s)
21-May-11 (a)	15:40	5.4	1.16
3-Oct-11 (a)	14:30	3.0	0.20
7-May-12	16:30	9.6	Not Recorded
9-May-12	19:30	9.0	Not Recorded

(a) Golder, 2012.

3.1 ACE CREEK – STATION AC-8 RESULTS

The datalogger installed at AC-8 remained intact and without detrimental malfunction for the course of the monitoring period (Jan 1, 2011 to June 30, 2012). The addition of two high discharge measurements at the site in May of 2012 is of added benefit to the curve for estimation of discharge during periods of high stage. The stage-discharge rating curve equation used to estimate discharge at AC-8 is presented in Figure 1. The daily average discharges for the monitoring period and historical mean monthly flows are presented in Tables 4 and 5, respectively, for AC-8. Monthly mean flows prior to the monitoring period are taken from Golder (2011). The hydrograph for the monitoring period is presented as Figure 2 and is a graphical representation of the data provided in Table 4. In general terms, discharge during May of 2012 is high relative to historical values.

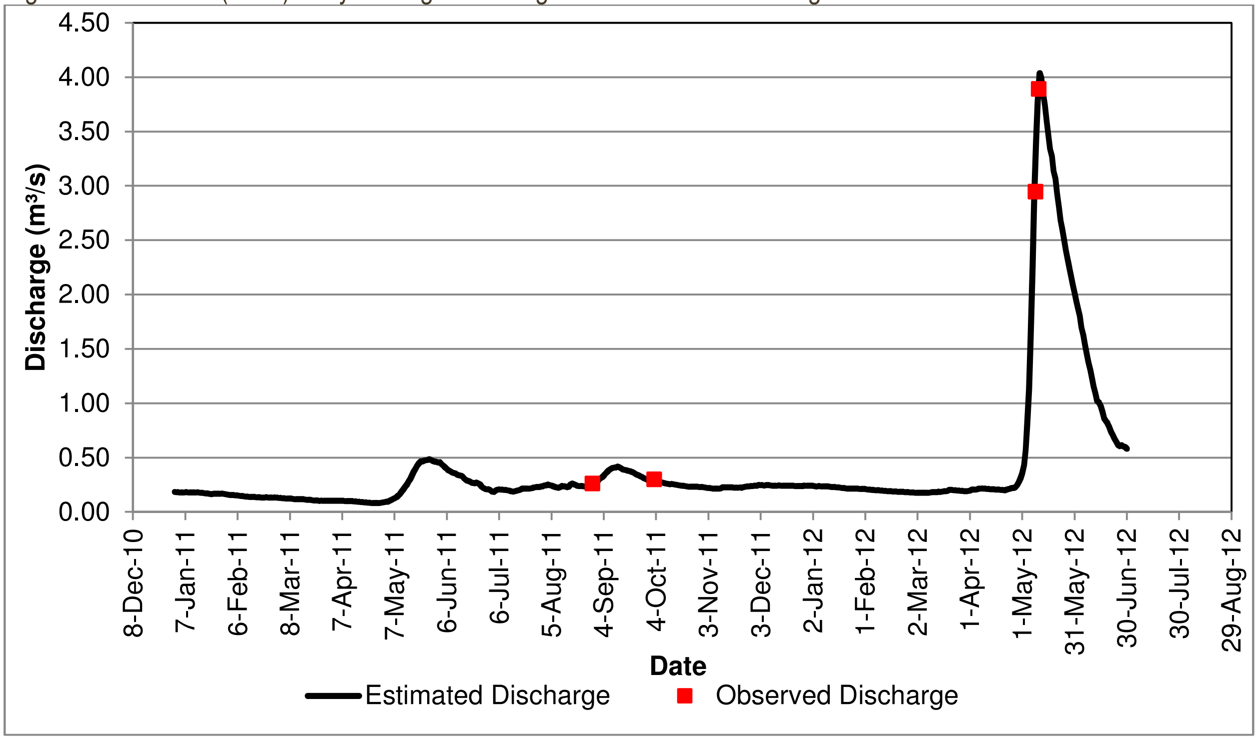
Table 4. Daily Average Discharge (m³/s) for Ace Creek (AC-8) from January 1, 2011 to June 30, 2012

Day	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
1	0.183	0.158	0.130	0.101	0.088	0.455	0.197	0.242	0.297	0.279	0.225	0.239	0.239	0.209	0.175	0.195	0.355	1.941
2	0.182	0.155	0.129	0.101	0.091	0.456	0.186	0.243	0.308	0.271	0.221	0.247	0.239	0.208	0.174	0.205	0.432	1.877
3	0.180	0.155	0.127	0.102	0.093	0.440	0.183	0.251	0.320	0.269	0.220	0.246	0.236	0.206	0.174	0.204	0.571	1.802
4	0.178	0.154	0.126	0.102	0.101	0.425	0.196	0.245	0.335	0.276	0.219	0.245	0.235	0.204	0.176	0.204	0.795	1.696
5	0.178	0.152	0.125	0.101	0.107	0.411	0.205	0.241	0.352	0.278	0.215	0.244	0.237	0.203	0.175	0.206	1.127	1.627
6	0.179	0.151	0.123	0.101	0.115	0.395	0.206	0.238	0.369	0.274	0.213	0.244	0.236	0.202	0.175	0.212	1.613	1.542
7	0.180	0.148	0.122	0.100	0.124	0.380	0.205	0.231	0.383	0.273	0.212	0.245	0.235	0.200	0.176	0.214	2.247	1.449
8	0.180	0.145	0.122	0.100	0.134	0.372	0.204	0.224	0.397	0.269	0.212	0.244	0.235	0.199	0.176	0.215	2.879	1.377
9	0.179	0.144	0.121	0.098	0.147	0.364	0.202	0.223	0.406	0.264	0.212	0.242	0.235	0.198	0.178	0.214	3.416	1.305
10	0.179	0.142	0.119	0.098	0.162	0.358	0.202	0.227	0.407	0.261	0.216	0.241	0.234	0.197	0.180	0.212	3.778	1.233
11	0.178	0.140	0.117	0.099	0.184	0.353	0.198	0.239	0.408	0.258	0.224	0.240	0.233	0.195	0.179	0.211	4.038	1.155
12	0.179	0.139	0.116	0.097	0.206	0.342	0.195	0.233	0.416	0.255	0.224	0.239	0.231	0.192	0.181	0.211	3.990	1.087
13	0.179	0.137	0.116	0.097	0.227	0.337	0.190	0.233	0.410	0.256	0.225	0.242	0.229	0.191	0.181	0.208	3.862	1.019
14	0.180	0.137	0.115	0.096	0.251	0.334	0.187	0.228	0.400	0.254	0.225	0.241	0.228	0.190	0.186	0.206	3.743	1.007
15	0.177	0.136	0.116	0.094	0.277	0.325	0.189	0.230	0.391	0.252	0.225	0.240	0.228	0.189	0.184	0.206	3.608	0.977
16	0.176	0.136	0.115	0.092	0.299	0.307	0.196	0.252	0.386	0.249	0.224	0.239	0.226	0.188	0.188	0.206	3.460	0.920
17	0.174	0.135	0.113	0.091	0.336	0.292	0.198	0.259	0.384	0.245	0.223	0.239	0.224	0.188	0.188	0.204	3.341	0.861
18	0.172	0.134	0.111	0.089	0.370	0.288	0.205	0.253	0.379	0.243	0.222	0.239	0.221	0.186	0.190	0.203	3.273	0.834
19	0.170	0.133	0.110	0.088	0.398	0.281	0.213	0.245	0.375	0.240	0.221	0.240	0.219	0.185	0.192	0.202	3.137	0.812
20	0.168	0.131	0.109	0.086	0.425	0.271	0.214	0.241	0.368	0.239	0.221	0.240	0.218	0.185	0.201	0.200	3.065	0.786
21	0.165	0.132	0.107	0.085	0.449	0.266	0.214	0.237	0.359	0.237	0.224	0.241	0.215	0.184	0.202	0.200	2.931	0.733
22	0.163	0.134	0.105	0.084	0.463	0.264	0.213	0.237	0.352	0.233	0.221	0.239	0.214	0.183	0.201	0.203	2.801	0.706
23	0.165	0.133	0.104	0.083	0.462	0.269	0.213	0.235	0.343	0.231	0.229	0.238	0.213	0.182	0.199	0.209	2.679	0.674
24	0.166	0.132	0.104	0.081	0.473	0.260	0.215	0.233	0.336	0.231	0.229	0.236	0.213	0.181	0.198	0.214	2.607	0.645
25	0.167	0.131	0.102	0.080	0.475	0.253	0.219	0.237	0.329	0.229	0.232	0.238	0.214	0.180	0.196	0.219	2.504	0.614
26	0.166	0.132	0.103	0.080	0.479	0.232	0.223	0.237	0.318	0.230	0.234	0.238	0.214	0.180	0.194	0.220	2.412	0.605
27	0.167	0.133	0.101	0.080	0.483	0.219	0.227	0.236	0.311	0.231	0.238	0.237	0.213	0.178	0.193	0.225	2.325	0.614
28	0.169	0.132	0.100	0.082	0.474	0.210	0.226	0.234	0.304	0.230	0.238	0.241	0.212	0.177	0.191	0.246	2.249	0.603
29	0.167		0.100	0.084	0.470	0.207	0.228	0.232	0.297	0.228	0.239	0.240	0.211	0.176	0.190	0.273	2.165	0.598
30	0.164		0.100	0.087	0.461	0.206	0.233	0.257	0.289	0.228	0.238	0.239	0.210		0.188	0.309	2.093	0.580
31	0.161		0.101		0.460		0.234	0.271		0.229		0.239	0.210		0.193		2.013	
Mean	0.173	0.140	0.113	0.092	0.299	0.319	0.207	0.240	0.358	0.250	0.224	0.241	0.224	0.191	0.186	0.215	2.565	1.056

Table 5. Historical Monthly and Annual Mean Discharges (m^3/s) for Ace Creek (AC-8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	0.151	0.150	0.149	0.221	0.204	0.156	0.145	0.145	0.145	0.163	0.151	0.146	0.161
1981	0.146	0.145	0.145	0.169	0.392	0.178	0.182	0.192	0.194	0.190	0.198	0.188	0.193
1982	0.169	0.167	0.176	0.196	0.577	0.459	0.279	0.185	0.146	0.157	0.154	0.162	0.236
1983	0.177	0.164	0.151	0.223	0.750	0.574	0.414	0.334	0.251	0.226	0.206	0.194	0.305
1984	0.189	0.192	0.208	0.413	0.501	0.723	0.789	0.564	0.399	0.571	0.790	0.725	0.505
1985	0.471	0.378	0.335	0.395	2.768	1.366	0.551	0.332	0.256	0.215	0.174	0.169	0.618
1986	0.181	0.186	0.185	0.218	0.462	0.541	0.608	0.544	0.343	0.233	0.201	0.193	0.325
1987	0.191	0.208	0.221	0.219	1.988	0.685	0.260	0.116	0.102	0.103	0.135	0.138	0.364
1988	0.154	0.114	0.108	0.100	0.361	0.817	1.120	0.819	0.254	0.181	0.202	0.191	0.368
1989	0.178	0.176	0.156	0.160	1.912	1.427	0.361	0.166	0.115	0.120	0.154	0.172	0.425
1990	0.197	0.183	0.169	0.108	0.556	0.764	0.317	0.175	0.145	0.151	0.250	0.333	0.279
1991	0.262	0.219	0.207	0.436	2.038	1.962	0.788	0.395	0.393	0.431	0.464	0.398	0.666
1992	0.319	0.254	0.215	0.247	2.634	1.386	0.663	0.489	0.408	1.223	0.985	0.508	0.778
1993	0.302	0.221	0.183	0.190	0.862	0.513	0.356	1.006	0.594	0.314	0.382	0.400	0.444
1994	0.277	0.225	0.205	0.186	3.014	1.459	0.339	0.117	0.097	0.105	0.130	0.131	0.524
1995	0.113	0.106	0.104	0.129	1.698	1.401	0.900	0.493	1.002	0.511	0.378	0.325	0.597
1996	0.252	0.190	0.155	0.146	0.272	0.524	1.408	0.499	0.341	0.286	0.293	0.262	0.386
1997	0.229	0.202	0.167	0.171	0.593	0.970	1.251	1.897	4.109	3.439	1.629	0.617	1.273
1998	0.369	0.291	0.246	0.279	1.236	0.410	0.614	0.404	0.260	0.208	0.208	0.199	0.394
1999	0.169	0.160	0.165	0.156	0.467	0.608	0.408	0.216	0.203	0.161	0.153	0.166	0.253
2000	0.166	0.136	0.129	0.136	0.307	0.305	0.267	0.274	0.674	0.824	1.211	0.744	0.431
2001	0.365	0.298	0.236	0.203	1.176	0.763	0.457	0.360	0.355	0.597	0.457	0.365	0.469
2002	0.350	0.220	0.176	0.189	1.304	2.353	0.516	2.216	1.102	0.688	0.561	0.437	0.843
2003	0.288	0.246	0.201	0.179	2.240	2.284	0.668	0.522	0.458	0.422	0.410	0.345	0.689
2004	0.253	0.250	0.301	0.214	0.206	1.996	0.455	0.219	0.169	0.170	0.176	0.166	0.381
2005	0.143	0.164	0.150	0.191	1.158	1.077	0.549	0.443	0.456	0.464	0.728	0.579	0.509
2006	0.433	0.321	0.229	0.397	2.280	0.978	0.365	0.240	0.226	0.228	0.220	0.200	0.510
2007	0.199	0.171	0.156	0.175	0.734	0.573	0.370	0.321	0.477	0.483	0.874	0.635	0.431
2008	0.463	0.343	0.294	0.252	1.110	1.125	0.361	0.318	0.265	0.509	0.735	0.495	0.523
2009	0.242	0.180	0.124	0.175	1.066	0.852	1.478	0.681	0.454	0.432	0.431	0.414	0.544
2010	0.341	0.280	0.217	0.309	0.744	0.430	0.238	0.105	0.167	0.199	0.178	0.181	0.282
2011	0.173	0.140	0.113	0.092	0.299	0.319	0.207	0.240	0.358	0.250	0.224	0.241	0.221
2012	0.224	0.191	0.186	0.215	2.565	1.056							
Mean	0.247	0.208	0.187	0.215	1.166	0.940	0.553	0.470	0.466	0.445	0.420	0.326	0.466

Figure 2:Ace Creek (AC-8) Daily Average Discharge and Observed Discharge



3.2 FULTON CREEK – STATION TL-7 RESULTS

Though Fulton Creek through TL-7 is known to flow through the winter in most years, it is common practice to remove the datalogger at the end of each open water season prior to freeze up. This prevents damage to the datalogger as a result of glaciation through the v-notch weir. In 2011, the datalogger was installed in May and removed in October while the logger was installed in May of 2012 and remains there to date. To estimate the magnitude of discharges through TL-7 during the winter months a correlation has been developed (Golder 2011) with AC-8 allowing for winter discharge at TL-7 to be calculated. The equations to correlate AC-8 to TL-7 are as follows:

[2] $Q_{TL-7} = 0.034Q_{AC-8} - 0.0086$; for Q_{AC-8} <0.396 m³/s; and,

[3] $Q_{TL-7} = 0.0076Q_{AC-8}$; for Q_{AC-8} >= 0.396 m³/s.

As indicated, Equation [2] is to be used when flows at AC-8 are lower than 0.396 m³/s. As such, it is possible for this equation to predict flows at TL-7 that have a negative magnitude. In those instances, the minimum value estimated for the flow record is zero. Tables 6 and 7 present the daily average discharges and the monthly and annual historic means at TL-7 for the monitoring period. Figure 3 presents the daily average hydrograph for the monitoring period including observed discharge. The current monitoring period indicates that discharge is quite low when compared to monthly mean values in Table 7. If this trend persists for several years, while AC-8 experiences higher discharges, it may warrant an investigation into the local drainage system contributing to TL-7; however, recent observations indicate that the Fulton Creek drainage may be recovering from a period of drought (Cameco, 2012b).

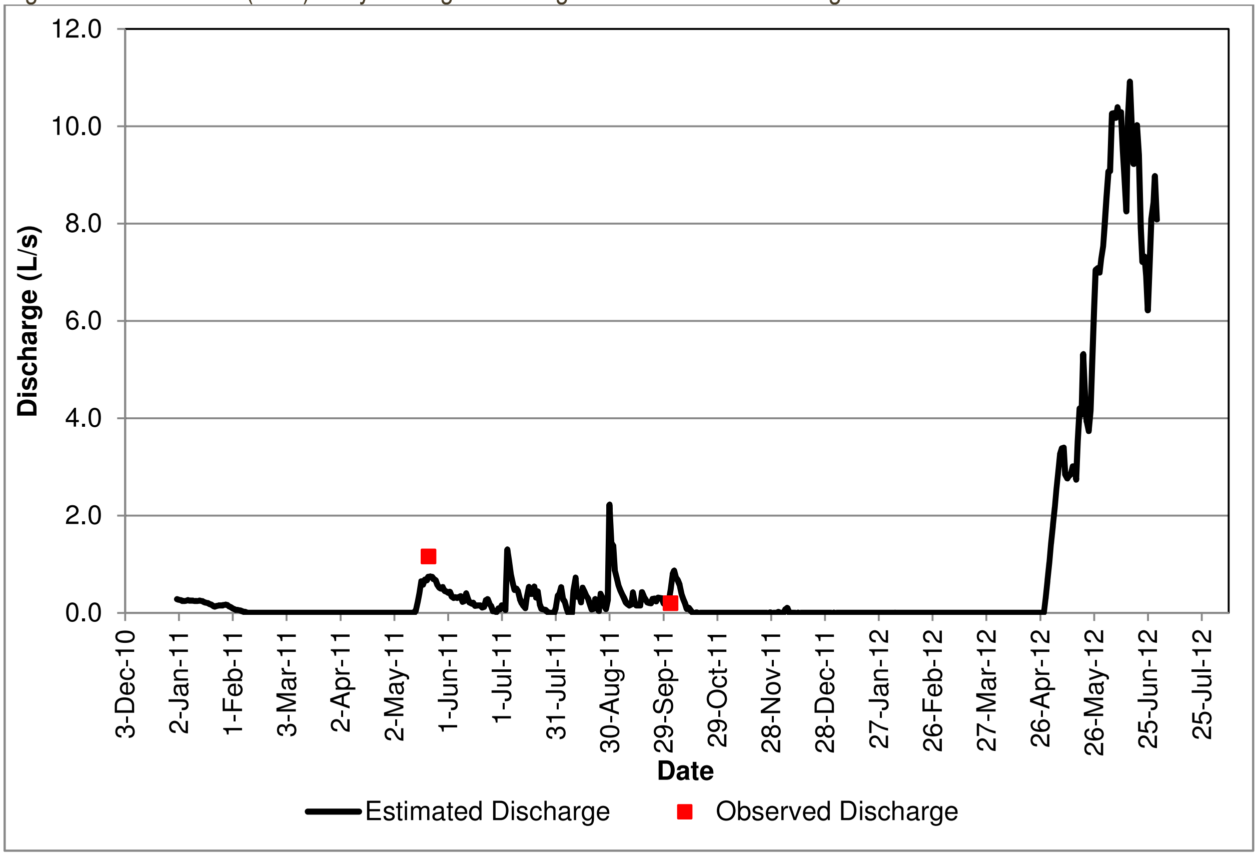
Table 6. Daily Average Discharge (L/s) for Fulton Creek (TL-7) from January 1, 2011 to June 30, 2012

Day	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
1	0.28	0.09	0.00	0.00	0.00	0.41	0.15	0.35	1.38	0.23	0.00	0.00	0.00	0.00	0.00	0.00	1.04	7.95
2	0.27	0.07	0.00	0.00	0.00	0.43	0.15	0.38	0.86	0.24	0.00	0.02	0.01	0.00	0.00	0.00	1.42	8.55
3	0.26	0.06	0.00	0.00	0.00	0.33	0.06	0.52	0.70	0.48	0.00	0.00	0.00	0.00	0.00	0.00	1.79	9.07
4	0.24	0.06	0.00	0.00	0.00	0.31	1.30	0.27	0.56	0.79	0.00	0.00	0.00	0.00	0.00	0.00	2.17	9.08
5	0.24	0.05	0.00	0.00	0.00	0.32	1.08	0.23	0.46	0.86	0.00	0.00	0.00	0.00	0.00	0.00	2.55	10.27
6	0.25	0.04	0.00	0.00	0.00	0.31	0.79	0.08	0.38	0.72	0.00	0.08	0.00	0.00	0.00	0.00	2.92	10.27
7	0.26	0.02	0.00	0.00	0.00	0.32	0.60	0.00	0.30	0.67	0.00	0.10	0.00	0.00	0.00	0.00	3.26	10.17
8	0.25	0.02	0.00	0.00	0.00	0.34	0.47	0.00	0.22	0.57	0.00	0.00	0.00	0.00	0.00	0.00	3.38	10.39
9	0.25	0.00	0.00	0.00	0.00	0.23	0.50	0.00	0.18	0.38	0.00	0.00	0.00	0.00	0.00	0.00	3.40	10.22
10	0.25	0.00	0.00	0.00	0.00	0.24	0.44	0.46	0.15	0.29	0.00	0.00	0.00	0.00	0.00	0.00	2.83	10.29
11	0.24	0.00	0.00	0.00	0.00	0.40	0.29	0.72	0.17	0.19	0.00	0.00	0.00	0.00	0.00	0.00	2.76	9.49
12	0.24	0.00	0.00	0.00	0.00	0.28	0.20	0.33	0.42	0.09	0.00	0.00	0.00	0.00	0.00	0.00	2.81	8.96
13	0.25	0.00	0.00	0.00	0.00	0.21	0.14	0.36	0.22	0.11	0.00	0.00	0.00	0.00	0.00	0.00	2.85	8.25
14	0.25	0.00	0.00	0.00	0.05	0.19	0.09	0.22	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00	3.01	10.18
15	0.24	0.00	0.00	0.00	0.23	0.21	0.34	0.52	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.01	10.92
16	0.22	0.00	0.00	0.00	0.40	0.14	0.53	0.44	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.73	9.96
17	0.21	0.00	0.00	0.00	0.65	0.15	0.39	0.35	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.52	9.23
18	0.20	0.00	0.00	0.00	0.58	0.15	0.39	0.29	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	9.73
19	0.18	0.00	0.00	0.00	0.68	0.15	0.54	0.17	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.08	10.02
20	0.17	0.00	0.00	0.00	0.67	0.11	0.32	0.07	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.32	9.41
21	0.14	0.00	0.00	0.00	0.74	0.12	0.44	0.08	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.45	7.91
22	0.13	0.00	0.00	0.00	0.75	0.26	0.17	0.28	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	7.21
23	0.14	0.00	0.00	0.00	0.74	0.28	0.08	0.12	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.74	7.32
24	0.15	0.00	0.00	0.00	0.69	0.18	0.07	0.04	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16	6.92
25	0.15	0.00	0.00	0.00	0.67	0.14	0.07	0.39	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.11	6.22
26	0.15	0.00	0.00	0.00	0.58	0.03	0.03	0.32	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22	7.23
27	0.16	0.00	0.00	0.00	0.52	0.03	0.00	0.14	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.05	8.10
28	0.17	0.00	0.00	0.00	0.50	0.02	0.00	0.07	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.01	7.09	8.44
29	0.16		0.00	0.00	0.53	0.09	0.00	0.27	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.29	6.99	8.98
30	0.13		0.00	0.00	0.45	0.07	0.00	2.23	0.21	0.00	0.00	0.00	0.00		0.00	0.66	7.29	8.09
31	0.11		0.00		0.44		0.10	1.43		0.00		0.00	0.00		0.00		7.53	
Mean	0.20	0.01	0.00	0.00	0.32	0.22	0.31	0.36	0.34	0.18	0.00	0.01	0.00	0.00	0.00	0.03	3.95	8.96

Table 7. Historical Monthly and Annual Mean Discharges (L/s) for Fulton Creek (TL-7)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	3.7	3.7	3.6	6.1	5.4	3.8	3.5	3.5	3.5	4.1	3.7	3.5	4.0
1981	3.5	3.5	3.5	4.4	12.4	4.6	4.7	5.0	5.1	4.9	5.2	4.9	5.1
1982	4.3	4.2	4.5	5.1	20.1	15.1	8.0	4.8	3.5	3.9	3.8	4.1	6.8
1983	4.5	4.1	3.7	6.4	27.9	20.0	13.2	10.1	7.0	6.1	5.5	5.1	9.5
1984	4.9	5.0	5.5	13.5	16.8	26.7	29.7	19.5	12.6	20.3	29.7	26.7	17.6
1985	15.6	11.7	10.1	12.7	145.2	59.8	19.0	10.0	7.2	5.8	4.4	4.3	25.5
1986	4.6	4.8	4.8	5.9	15.1	18.7	21.6	17.4	8.9	6.4	5.3	5.0	9.9
1987	5.0	5.5	6.0	5.9	82.8	24.9	10.1	0.4	0.1	0.0	3.2	3.3	12.3
1988	3.9	2.6	2.4	2.2	18.0	33.6	37.6	24.2	9.5	4.7	5.3	5.0	12.4
1989	4.5	4.5	3.8	4.0	98.9	64.6	11.3	4.2	2.6	2.8	3.8	4.3	17.4
1990	5.2	4.7	4.4	2.4	20.1	28.8	9.5	4.5	3.5	3.7	7.0	10.0	8.7
1991	7.4	5.9	5.5	14.4	99.3	94.2	29.9	12.5	12.4	13.9	15.2	12.5	26.9
1992	9.5	7.1	5.8	6.9	113.3	39.6	32.4	16.7	22.7	73.0	70.8	18.9	34.7
1993	8.9	6.0	4.7	5.0	33.9	17.5	10.9	41.3	21.0	9.3	11.9	12.6	15.3
1994	8.0	6.1	5.4	4.8	211.5	53.0	6.9	3.2	2.3	3.0	3.1	3.1	25.9
1995	2.6	2.4	2.3	3.0	82.2	67.2	68.7	62.1	40.7	17.1	11.7	9.7	30.8
1996	7.1	4.9	3.8	3.5	16.0	16.8	35.0	29.2	10.3	8.3	8.5	7.4	12.6
1997	6.3	5.3	4.2	4.3	20.7	38.5	53.0	89.6	237.3	189.7	74.0	21.8	62.1
1998	11.4	8.4	6.8	8.0	52.2	13.0	21.6	12.9	7.4	5.6	5.6	5.3	13.2
1999	4.3	4.0	4.1	3.8	15.7	21.4	13.0	5.8	5.4	4.0	3.8	4.2	7.5
2000	4.2	3.3	3.0	3.2	9.1	9.0	7.6	8.2	8.9	48.0	96.2	8.9	17.5
2001	6.7	5.6	5.3	6.2	81.7	44.3	9.3	11.0	4.1	1.6	14.9	11.2	16.8
2002	10.7	6.0	4.5	4.9	55.9	24.4	12.1	63.2	44.6	5.6	19.3	14.1	22.1
2003	8.3	6.8	5.3	4.6	110.5	113.2	51.8	29.6	24.7	24.7	13.0	10.4	33.6
2004	7.1	7.0	8.8	5.7	5.5	45.6	7.6	2.6	1.8	1.3	4.5	4.2	8.5
2005	3.5	4.1	3.7	5.0	48.1	43.8	18.4	13.9	14.4	14.7	26.3	19.6	18.0
2006	13.4	9.0	5.7	13.3	115.4	45.9	12.4	7.3	6.2	6.2	6.0	5.3	20.5
2007	5.2	4.5	4.1	5.1	36.4	21.2	5.2	1.7	3.0	18.7	38.0	22.6	13.8
2008	15.2	10.4	8.6	7.1	48.9	47.4	11.2	9.5	7.5	17.3	27.2	16.6	18.9
2009	2.9	2.2	1.5	2.1	27.7	20.4	42.2	14.6	6.9	6.1	6.1	5.5	11.5
2010	4.1	3.4	2.6	4.6	16.7	6.6	0.2	0.1	0.2	0.4	0.2	0.3	3.3
2011	0.2	0.0	0.0	0.0	0.3	0.2	0.3	0.4	0.3	0.2	0.0	0.0	0.2
2012	0.0	0.0	0.0	0.0	4.0	9.0							
Mean	6.3	5.1	4.5	5.6	50.5	33.1	19.3	16.8	17.1	16.6	16.7	9.1	17.0

Figure 3:Fulton Creek (TL-7) Daily Average Discharge and Observed Discharge



4 SUMMARY

This assessment provides discharges and precipitation records for the monitoring period of January 1, 2011 to June 30, 2012 for AC-8 and TL-7. Precipitation records from Uranium City and Stony Rapids, SK and local knowledge indicate that the north has experienced below normal annual total precipitation in the past few years though local knowledge also indicate that snowfall through the winter of 2011/2012 was higher than normal. This observation is contrary to the climate data record but the climate record is a relatively incomplete dataset. Spring runoff waters from AC-8 were measured to be among the highest flows since 2005 and TL-7 appears to be recovering from a period of drought where storage areas in the system are likely recharging.

For future assessment purposes it may improve the accuracy of the stations to perform the following work items;

- Continue to update the rating curve at AC-8;
- Updating of the Ace Creek to Fulton Creek relationship based on newly measured data; and,
- Assess any additional ideas to verify winter flows in Fulton Creek such as modeling or correlations.

5 CLOSURE

MCSL appreciates the opportunity to work with Cameco on this project. If there are any questions regarding this assessment please do not hesitate to contact the undersigned.

McElhanney Consulting Services Ltd.

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APPENDIX C

APPENDIX C

TABLE OF CONTENTS

1.0 INTRODUCTION

In June 2012 Cameco along with representatives of the Canadian Nuclear Safety Commission (CNSC) and the Saskatchewan Ministry of Environment (SMOE) conducted an annual inspection of the cover at the Fookes tailings delta and the two outlet spillways at Fookes and Marie reservoirs.

Previously the geotechnical inspection was completed on a three-year schedule by a qualified engineer. Past inspections of these areas were conducted by SRK Consulting in September 1998, September 2001, June 2004, August 2007 and May 2010 (*SRK, 2010),* with all reports being submitted to the regulatory agencies.

Following the May 2010 inspection SRK Consulting recommended the frequency of formal inspections by a qualified engineer to be reduced from three years to five years. In addition SRK Consulting recommended that Cameco and/or the JRG conduct annual inspections of the area to ensure structures were behaving as expected. SRK Consulting and Cameco collaborated in the development of an inspection checklist and the checklist was reviewed and accepted by the CNSC and SMOE.

In 2011 Cameco initiated internal annual inspections of these areas using a criterion based checklist prepared by a qualified engineer. The 2012 inspection of the Fookes tailings delta and the outlet structures at Marie and Fookes reservoirs represent the second year of internal inspections.

With respect to the outlet spillway structures the specific elements evaluated during this inspection included the following:

- The condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place
- The condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event.

With respect to the Fookes delta, the specific elements that evaluated during this inspection included the following:

- The potential presence of new tailings boils or tailings exposures due to frost action, etc.
- Significant erosion of the cover, including the diversion ditches in the northern part of the cover and the cover limit along its contact with Fookes Reservoir
- The condition of the water bars along the access road at the northwest corner of the site, as well as the two associated diversion ditches and the tailings cover immediately adjacent to this access road.

This report summarizes the observations and recommendations made during the June 5, 2012 inspection of these areas.

2.0 OUTLET STRUCTURE INSPECTIONS (FOOKES & MARIE RESERVOIR)

Both spillway structures consist of a rip-rap lined open channel (with trapezoidal cross-section) discharging into a rip-rap lined stilling basin. The rip-rap lining in both the spillway channels and the stilling basins was intruded with grout for added erosion protection; however the rip-rap in the spillway was designed to be stable in the absence of grout intrusion. The spillways are capable of passing a 500-year flood event with a depth of 0.3 m (680 L/sec) and 0.35 m (760 L/sec) at the entrances of the Fookes and Marie reservoir outlet spillways, respectively. In the event of embankment overtopping, the coarse rip-rap will resist erosion of the upper surfaces and downslope embankments.

It should be noted that cracking and displacement of the grout-intruded rip-rap was anticipated in the original design and does not affect the performance of the outlet spillway. The grout that was intruded into the rip-rap is meant to serve purely as a binding agent to increase the effective block size of the rip-rap, allowing it to more effectively resist erosion. It has been acknowledged by SRK that additional cracking and grout degradation will occur with time. (*SRK 2010*)

2.1 General Observations

During the 2011 inspection it was noted that water was not flowing in the Fookes or Marie outlet structures and significant recharge had to occur before flow would begin. Flow measurements and observations through the summer of 2011 showed that water did not flow through these structures during the summer of 2011. Uranium City saw an increased snow pack, compared to previous years, through the winter if 2011/2012 which resulted in hydraulic recharge of the areas and flow through these outlet structures resumed.

2.2 Inspection Checklist

- Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place.
- Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event.
- Document conditions with photographs

2.3 Marie Reservoir Outlet Structure Checklist

2.3.1 Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place

Photos 1 to 3, taken during the June 5, 2012 inspection, provide photographic record of the condition of the Marie Reservoir spillway channel.

Previously SRK Consulting identified that the grout-intruded rip-rap is relatively intact except near the spillway entrance where one large block and several smaller ones on the right side of the spillway (looking downstream from Marie Reservoir) continue to displace due to ice-jacking.

The photographic record supports the observations made by SRK Consulting and the spillway continues to perform as designed.

Photo 1 – Marie Reservoir Spillway looking upstream

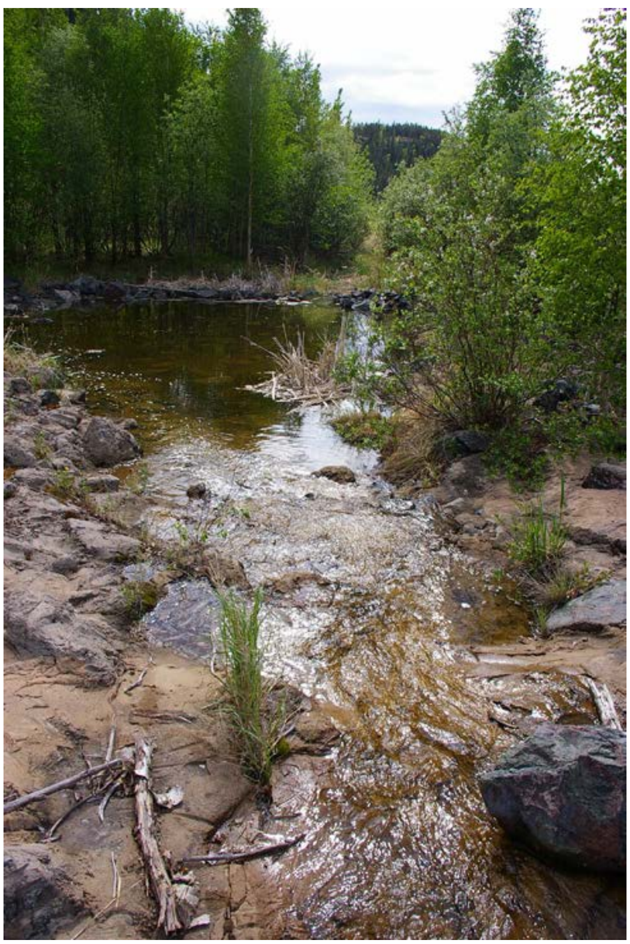

Photo 2 – Marie Reservoir Spillway (water flowing into stilling basin)

Photo 3 – Ice-jacked block on north side of Marie Spillway

2.3.2 Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event

Given the extremely low water levels experienced in 2011 and the water levels observed during the June 5, 2012 inspection there was no evidence that overtopping of the rip-rap occurred since the June 2011 inspection.

2.4 Fookes Reservoir Outlet Structure Checklist

2.4.1 Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place

Photos 4 and 5, taken during the June 5, 2012 inspection, provide photographic record of the condition of the Fookes Reservoir spillway channel.

Previously SRK Consulting identified that the grout-intruded rip-rap along the length of the Fookes Reservoir outlet spillway show signs of cracking. In addition, there has been some ice-jacking, with the most significant displacements located near the upper part of the spillway, i.e., on the sides of the spillway, within 5 to 6 m of the spillway entrance.

The photographic record shows there has been no change in the condition of the spillway from previous inspections and the spillway continues to perform as designed.

Photo 4 – Fookes Reservoir Spillway looking upstream

Photo 5 – Fookes Reservoir Spillway looking downstream towards the stilling basin

2.4.2 Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event

Given the extremely low water levels experienced in 2011 and the water levels observed during the June 5, 2012 inspection there was no evidence that overtopping of the rip-rap occurred since the June 2011 inspection.

Of note, when photos taken during the 2011 inspection are compared to the 2012 inspection photos, the debris in the channel of the spillway is in exactly the same position, indicating this area has been subjected to very low flows since the previous inspection.

3.0 TAILINGS DELTA

3.1 General Observations

After a period of drought which saw water levels in Fookes Reservoir drop in 2011, water levels in returned to a normal level this spring following freshet. Generally the cover was in good condition showing no areas of excessive erosion. Past vehicular traffic was evident on the delta with access gained by driving over a three-foot berm on the east side of the delta. This berm will be repaired and reinforced to prevent traffic from accessing the delta. Although vegetation on the delta remains sparse over much of the area it is well established within 50 m of the Fookes Reservoir shoreline, and the engineered drainage structures. Photos 6 and 7 show the vegetation growth on the cover.

Photo 6 – Vegetation on the Fookes delta (looking NW)

Photo 7 – Vegetation on the Fookes delta (looking SW)

3.2 Inspection Checklist

- Check for evidence of new tailing boils or tailings exposure due to frost action
- Check for evidence of significant erosion of the cover material
    - Trench along the northeast edge of the delta (sand flows, erosion of waste rock, slumping, etc.) – maintain photographic and GPS record (identify areas of concern on map).
    - Cover limit along its contact with Fookes Reservoir – maintain photographic and GPS record (identify areas of concern on map) where sand from the delta cover extends into the reservoir.
- Ensure erosion-protection devices are performing as expected on former north access road
    - Waterbars (chevrons)
    - Diversion ditches
    - Erosion of cover adjacent to the former access road
- Ensure earthen berms are in place to limit access to the delta

3.2.1 Check for evidence of new tailing boils or tailings exposure due to frost action

No new tailings boils were noted on the cover.

3.2.2 Check for evidence of significant erosion of the cover material

In general the sand cover was in good condition and showed no signs of excessive erosion. As mentioned previously Fookes Reservoir water levels returned to normal in 2012. Photo 8 shows the shoreline where the water level meets the sand cover. A small amount of erosion of the sand cover can be seen due to wave action, which is to be expected. It is not anticipated that this small amount of erosion will affect the performance of the sand cover. As vegetation continues to encroach on the shoreline it will provide additional armoring and increase the stability of the cover.

Photo 8 – Fookes Reservoir shoreline

Small fractures in the sand cover noted during the 2011 inspection were not prevalent in 2012, supporting the theory that they were caused by a low regional water table, which has rebounded in 2012.

A drainage trench is located along the east side of the Fookes delta to channel surface water runoff during heavy precipitation events and spring freshet. It was noted in previous inspections that sand has flowed along the base of the drainage trench that has a rock-fill base. This sand flow is not expected to threaten the functionality of the ditch in the medium term. In the longer term, as vegetation continues to establish itself, the risk to ditch functionality will diminish further. There were no new sand flows identified in the drainage trench during the 2012 inspection. Photo 9 shows the vegetation growth in and around the drainage trench.

Photo 9 – Vegetation growth near drainage trench on the Fookes delta

3.2.3 Ensure erosion protection devices are performing as expected on former north access road

As part of the design and installation of the covers in 2005 and 2007, the area considered most vulnerable to erosion was in the area on and below the access ramp at the northwest corner of the tailings delta (*SRK 2010*). The general condition of the ramp is very good. Access to this ramp is closed off by a windrow of material at the top of the ramp. The water bars (chevrons) are performing as expected and show little sign of erosion (Photo 10). In addition to the chevrons, run-out structures were installed to carry away excessive water during extreme run-off events. These run-out structures are also in good shape and have seen no additional eroded material beyond that observed during previous inspections (Photo 11).

Photo 10 – Chevrons in place on north access point to the Fookes delta

Photo 11 – Run-out structure along north access road

3.2.4 Ensure earthen berms are in place to limit access to the delta

During the 2011 inspection it was noted that vehicles were accessing the Fookes delta via the west access road from Marie Reservoir. Following the 2011 inspection an additional earthen berm was placed on the west access road to prevent vehicles from entering the Fookes delta area. This berm was inspected during the 2012 inspection and found to be in good condition with no evidence that vehicles are by-passing the berm.

At the north access point the potential exists for truck to by-pass the earthen berm; however the road access is filled with chevrons, as discussed previously, making access at this point difficult. There was no evidence of fresh vehicle tracks in this area.

During the 2012 inspection it was discovered that the east access berm had been compromised and vehicles had gained access to the delta from this point (photo 12). Although vehicles had accessed the delta they did not appear to have compromised the integrity of the sand cover.

Photo 12 – East berm showing tire tracks driving over control point

Following the inspection Cameco hired a local contractor to place repair and improve the berm along the east access point to prevent further access. This work will be completed in prior to September 15, 2012 and will be inspected during the 2013 annual JRG inspection.

4.0 REFERENCES

SRK Consulting (2010). Beaverlodge Project: Inspection of Fookes Delta and Outlet Structures at Fookes Reservoir and Marie Reservoir. Report prepared for Cameco Corporation, September, 2010.