
From: Kathleen Graham [kgraham@mvlwb.com]
Sent: June-14-11 3:11 PM
To: permits@mvlwb.com
Subject: FW: Fort Smith land fill waste site
Attachments: R2MVLAWB Response.doc; fin rpt-peregrine soil removal-ce04012-dec10-rbg.pdf; NTCLBldgRem.pdf; LLRWMO-508760-REPT-17002 Rev 0.pdf; E-DOCS-#3440738-v2-Memo_-_Regulatory_Disposition_of_Exempted_Mounds_Sites.pdf

From: Jean Soucy [mailto:jsoucy@fortsmith.ca]
Sent: Tuesday, June 14, 2011 3:03 PM
To: Kathleen Graham
Cc: michel.lanteigne@aecom.com
Subject: FW: Fort Smith land fill waste site

I finally received a response from AMEC representing AECL on the low level radioactive waste . I hope it's not too late to include these documents for tomorrows Tech session for discussion.

Regards

Jean Soucy
A/Director of Municipal Services
Town of Fort Smith
867-872-8412
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From: Geddes, Brian [mailto:brian.geddes@amec.com]
Sent: June-14-11 2:30 PM
To: Jean Soucy
Cc: Zelmer, Robert; Owen, Michael; Wenzel, Chris; DeJong; Brown, Julie; 'Roy, Micheline'
Subject: RE: Fort Smith land fill waste site

Jean

The first attached is a summary description of the storage cell at the Fort Smith landfill that is intended to respond to the MVLAWB's questions on the physical characteristics of the cell. This summary has been extracted from the more detailed information that appears in the second and third attachments (the 2010 Peregrine Street Remediation Report and a report completed describing the initial phase of cell development in 1998, respectively). If you think the board will require more or less detail than provided in the summary, perhaps we can discuss their specific requirements and response timelines.

With respect to monitoring, we are not aware of any formal reporting relationship that has been established between the LLRWMO and the Town. We have been able to find a letter dated 1998 May 08 from Bob Scott of the Town of Fort Smith requesting the assistance of the LLRWMO in the removal and disposal of the NTCL building. A follow up fax transmittal from Barry McCallum (LLRWMO) to Helen Griffith (NRCan) describes the issue and the need to support the Town's effort. The LLRWMO inspects the cell annually and reports on the condition of the cell in its publically available annual reports. Similarly, while the Canadian Nuclear Safety Commission (CNSC) has elected to exempt the Fort Smith cell from any licensing requirement under the Nuclear Safety and Control Act (largely because it has concluded that an exemption would not pose an unreasonable risk to the environment or to public health and safety; see last two attachments), it does

inspect the cell when in the area. We should discuss the nature and scope of any changes to these monitoring protocols that might be required in response to the MVLAWB's review of your renewal application.

We note that the Board has also suggested that a formal relationship and agreement between the Town and the LLRWMO clarifying roles and responsibilities be established. Again, we would suggest that a discussion be arranged to review this requirement and the likely timelines for its development. We have reviewed the file history of cell development and have not been able to locate any written agreement struck when the cell was originally constructed (we are assuming that because the Town was the project proponent in 1998 that there may not have been a requirement for an agreement with the LLRWMO). Please let us know if you have located any correspondence that adds to our understanding of history on this point.

Finally, the Board refers to an "AECL evaluation/report" and requests that it be submitted. We are not aware of this document and cannot locate the Proponent's reference that the Board refers to in the renewal application materials that we have. Perhaps you could let us know if you are aware of the document that the Board is referencing here.

We hope that the summary description attached assists with your immediate correspondence with the Board. However, there are a number of points relating to their inquiries that would likely benefit from a discussion; let me know what your availability might be and I can arrange with Bob and others as appropriate.

Regards
Brian

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From: Jean Soucy [mailto:jsoucy@fortsmith.ca]
Sent: Friday, June 10, 2011 10:04 AM
To: Geddes, Brian; Zelmer, Robert
Subject: Fort Smith land fill waste site

Hi Robert & Brian,

As you know the Town of Fort Smith is in the process of renewing its water licence. One of the questions from the MVLAWB with regards to Hazardous Waste Management is to provide a detailed description on burial site, design, construction, volume and so on. (see attachment below).

The dead line for this is identified for June 10 today, however I have asked for an extension until June 14th. Please provide us with all previous reporting you have on our landfill low level radioactive site.

31	GNWT-ENR	TOPIC4:Hazardous Waste Management	<p>Comment 2 – Uranium Burial Site</p> <p>ENR understands that there is a uranium burial site located at the landfill that was established in 1998 by Atomic Energy of Canada Ltd. (AECL). However, other than the brief description in the Background Report, there is no specific information provided on the burial site such as details on: design and construction; volume and characteristics of soil or materials buried; and a monitoring program. Furthermore, ENR understands that AECL manages the site but is unaware of any formal relationship or agreement</p>	<p>1. Provide details on the design and construction of the site, volume and characteristics of the soil and materials buried, including laboratory analyses, and the monitoring program. In the case no monitoring program for the uranium burial site exists, one should be established.2. Establish a formal relationship and agreement between the Town of Fort Smith and AECL to clarify responsibility for the management of the uranium burial site including ongoing operations and maintenance, monitoring, etc.</p>	<p>an evaluation by AECL can provide this information and designed criteria.</p>	<p>The Proponent should clarify what AECL evaluation/report is being referred to. If this is available, the Proponent should submit it to the Board by June 10</p>
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I thank you in advance.

Regards

Jean Soucy
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Summary of Uranium-Contaminated Soil Remediation Activities in Fort Smith, NWT

The Fort Smith Landfill Cell (FSLC) has been developed over the course of three remedial programs conducted in the Town of Fort Smith in 1998, 2001 and 2010.

1998

The cell located at the Fort Smith landfill was originally developed in the fall of 1998 to facilitate the removal and disposal of a uranium ore-contaminated building (the former NTCL warehouse) by the Town of Fort Smith. The Town was responsible for the overall management of this initial demolition project and the identification of a disposition site (i.e. the FSLC) for the associated materials. The LLRWMO was retained by the Town to provide the technical expertise and support staff required for the safe removal and containment of the low-level radioactive waste (LLRW) materials identified in parts of the building structure (i.e., the wooden floor boards)

The initial program during 1998 included the following:

- Excavating a containment cell and lining with an impermeable barrier at an area of the Fort Smith landfill site selected by the municipality;
- Demolishing the former NTCL warehouse and hauling LLRW materials to the FSLC for storage;
- Restoring the work area and covering the materials at the FSLC with an impervious liner, placing at least 0.5m of borrowed soil over the liner and regrading the area to drain.

The FSLC is located inside the interior dump fence-line in an area proximate to the south side of the active landfill. The area is flat and located on native sand material. The dimensions of the containment cell when first constructed measured approximately 10 m x 10 m x 2 m deep. The floor of the excavated cell was lined with a woven fabric tarpaulin to demarcate received wastes from native soil. Once the approximately 100 m³ of uranium-contaminated building materials and soil were placed within the cell they were covered (top and sides) with a woven fabric tarpaulin and then covered with a 0.5 metre layer of soil generated during excavation of the cell. Construction fencing was erected to delineate the limits of the containment cell and “Do Not Dig” and contact information signs installed on all four sides.

2001

In September 2001, uranium- contaminated soils were removed from three private properties and ditches adjacent to Peregrine Street in Fort Smith. Radiation levels at each location were above that of the local background, but were lower than that which would result in an incremental dose of 1 mSv/a (the regulatory limit for the general public under CNSC regulations). Technical staff, representing the LLRWMO, assisted by a local contractor, identified, segregated and moved some 125 m³ of soils from the properties to the FSLC. Residual gamma radiation levels at the base of completed excavations were at background. Eighteen truckloads of uranium- contaminated soil were hauled to a newly excavated cell adjacent to the existing FSLC at the municipal landfill. An area approximately the size of the original storage cell (10 m x 10 m x 2 m deep) was excavated and lined with a polyethelene

liner. Once the uranium-contaminated soil was placed within the cell the soil was covered with a polyethelene tarpaulin and a 30 cm layer of clean sand. Additional construction fencing was erected to accommodate the expanded cell footprint. Gamma radiation levels at the surface of the cover materials were indistinguishable from normal background.

Although the Peregrine Street ditches were addressed during this work, uranium- contaminated soils remained in-situ under portions of the road bed.

2010

The September 2010 program was undertaken to address the materials in the road bed described above that could not be removed in 2001. Conditions encountered during 2010 were consistent with expectations based on the previous work, although the volumes of contaminated soil were somewhat lower than originally estimated.

Nine truckloads were loaded and measured for total activity calculations. None of the loads met the definition of dangerous materials, under Transportation of Dangerous Goods regulations. Many loads were near background because they contained mostly overburden.

Approximately 60 m³ of soil were removed to the FSLC at the local landfill. The expanded storage cell measured approximately 5 m x 15m x 2 m deep and was lined with a 30 mil high density polyethylene (HDPE) liner. Once the uranium-contaminated soil was placed within the cell the soil was covered with HDPE and a 30-90 cm layer of clean sand. Additional construction fencing was erected to accommodate the expanded cell footprint.

Summary

The temporary storage cell located at the Fort Smith Landfill is comprised of three separately constructed cells within an L-shaped footprint measuring approximately 22 metres in length and 15 metres along its widest side (south end). All materials, lumber and soil, are contained within woven fabric and/or HDPE material. The entire storage cell is covered with clean sand material varying in thickness between 30 and 90 cm. Construction fencing strengthened by wire and supported by t-rails and larger metal posts encompasses the whole of the storage cell. "Do Not Dig" signs and contact information signs are installed on all four sides.

1.0 INTRODUCTION

1.1 Purpose

This document provides the results of radioactivity monitoring carried out in September and October, 1998 during the removal and disposal of a uranium-contaminated building by the Town of Fort Smith. As part of an agreement between the Town of Fort Smith and the Low-Level Radioactive Waste Management Office (LLRWMO) of Atomic Energy of Canada Limited (AECL) to provide technical expertise and support for the safe removal and containment of historic radioactive materials in the Town, a radiation protection support plan [1] was produced by the LLRWMO.

The project was managed by the Town of Fort Smith. The safe removal of uranium-contaminated waste materials was conducted with the assistance of a Radiation Specialist under contract to the Low-Level Radioactive Waste Management Office in accordance with the radiation support plan.

1.2 Background

An approximately 10 m x 14 m building had been moved to the site from a landing at Fort Fitzgerald, Alberta. The building was located on an otherwise empty field belonging to the Town of Fort Smith, NWT, at the north end of Breynat Street on the east side, overlooking the Slave River. This former NTCL storage shed was one of the identified sites along the historic water transportation route that was used to transport uranium ore from the 1930s until 1960 from the North-west Territories to the rail-head at Fort McMurray. The building had been identified in earlier surveys by the LLRWMO and SENES Consultants during preliminary studies of the transportation route [2]. The ore was transported overland from Fort Smith to Fort Fitzgerald around the Slave River rapids. In the spring of 1998, the building was set on fire. A Hazardous Waste Specialist from the Environmental Protection Services Office of the North-west Territories conducted radiological surveys and collected soil samples for analysis to assure that uranium contamination had not been spread beyond the building or that the firefighters' equipment had not become contaminated. The Fire Marshall declared the building unsafe and ordered its demolition.

In 1994, the LLRWMO conducted a radioactivity survey in the building consisting of a gamma radiation scan, a surface contamination survey of all parts of the superstructure and wipe sampling to determine if the uranium contamination was readily dispersible. The survey showed that gamma radiation levels at one metre above the floor were difficult to differentiate from natural background radioactivity at $0.09 \mu\text{Sv/h}$ ($15 \mu\text{R/h}$) while some localized contact readings on the floor reached levels of $0.3 \mu\text{Sv/h}$ ($50 \mu\text{R/h}$). Outside the building, soils exhibited normal background gamma radiation levels of $0.04 \mu\text{Sv/h}$ ($6 \mu\text{R/h}$).

A contamination survey showed that uranium ore had been ground into the wooden floor boards, into the cracks between the floor boards, onto the tops of the floor joists and onto the crawl space soils beneath the building. The contamination was found to be spotty and discontinuous, however most of the individual floor boards had been impacted to some extent. No contamination was

found on the walls or roof structure at levels above the normal background of the instrumentation. Wipes of dust collected on surfaces of the walls and the roof structure showed no indication of the presence of uranium contamination. Wipes of the floors showed only barely detectable contamination, indicating that the material had been ground into the wood and would not be removed by simple cleaning methods. No radiological contamination was found on the exterior of the building.

In 1994, it was proposed that the floors and joists be covered with new plywood and the building be moved in its entirety to the nuisance grounds where it could have been used for the interim storage of hazardous materials such as batteries, paints, etc. This work did not go ahead because a tar paper-like material covering the outside of the building is suspected of containing mildly friable asbestos.

2.1 PURPOSE, SCOPE AND CRITERIA

2.2 Purpose

This document describes the work conducted in order to safely demolish and remove from site a former NTCL storage shed containing a uranium-contaminated floor, floor joists and a small amount of contaminated soil beneath.

This document addresses the radiological aspects of the work and does not comprehensively consider details of the demolition work or issues around asbestos contamination on the exterior of the building. No radiological decontamination work would take place until the building was free from asbestos contamination or those components had been removed. The LLRWMO provided, through a contractor, radiation protection services to persons who would be removing the asbestos or those components containing asbestos.

2.3 Description of Work

2.2.1 Asbestos Abatement

The LLRWMO through a contractor, provided advice, monitoring, and other support with respect to radiation protection in conjunction with asbestos abatement activities.

The asbestos abatement work was beyond the scope of the work provided by the LLRWMO.

2.2.2 Uranium Decontamination

The LLRWMO, through a contractor, provided:

1. a comprehensive re-survey of the building to verify that the superstructure portions of the building were free from uranium contamination;

- ii. radiation protection services in conjunction with the demolition work; and
- iii. post-remedial characterization survey of the area to ensure that the remaining ground surface is free from uranium contamination, as governed by the criteria described in Section 2.3.

The demolition work was beyond the scope of the work provided by the LLRWMO but highlights have been included here to avoid oversight.

- i. removing the building superstructure (roof and walls) with radiation protection provided and hauling these materials to the Nuisance Grounds for disposal in an area designated for the disposal of asbestos wastes;
- ii. excavating and placing an impermeable "Fabrene" liner at an area of the nuisance grounds selected by the municipality;
- iii. peeling off the floor boards and joists with a backhoe and loading the contaminated lumber and contaminated soils beneath the floor into a haul vehicle and transport to the interim storage cell;
- iv. removing the uncontaminated building support structures and hauling these materials to the Nuisance Grounds for conventional disposal;
- v. restoring the work area; and,
- vi. covering the materials at the interim storage cell with an impervious liner, placing at least 0.5 m of borrowed soil over the liner and regrading the area level.

The work, as it actually took place is described in following sections.

2.4 Criteria

The criteria against which the post-remedial characterization results would be compared are described in Table I, although levels were reduced to as low as reasonably achievable (ALARA), social and economic factors being taken into account.

Table I : Criteria

Source of Radioactivity	Criterion	Comments
All Sources	1.0mSv per year increment to background (ground radiation)	AECB proposed maximum permissible dose to a member of the general public.
Gamma Radiation	0.6uSv/h (100 µR/h) at 1 m from the unrestored ground surface	Federal-Provincial Task Force on Radioactivity (1977) guidelines used to trigger milligramme measures in Pon Hope
Total Beta Emitters	5 Bq/cm ² averaged over 100 cm ²	AECB limits
Total Alpha Emitters	0.5Bq/cm ² averaged over 100cm ²	AECD levels

The contaminated materials in and under the building did not meet the definition of "radioactive material" (ie. more than 74 kBq/Kg) for the purposes of transport regulations. As well, the materials were of such low activity that they did not require licencing under Atomic Energy Control Board (AECB) regulations (ie. natural uranium is less than 500 ppm). In fact, the building and site did not fail any of the criteria in Table I. The purpose of the post-remedial characterization is to verify that this remains the case after all work was complete.

3.0 RESPONSIBILITIES

3.1 Town of Fort Smith

The Town of Fort Smith was responsible for the overall management of this demolition project, including the procurement of Contractors and Sub-contractors as required for the demolition, and transport and containment of wastes generated by the demolition of the shed. The Town of Fort Smith characterized the siding materials and selected qualified contractors to remove asbestos contaminated materials in accordance with the regulations. The Town of Fort Smith selected the location of the asbestos disposal area and the interim containment area for uranium contaminated materials. The Town was to place the locations on the Land Record in order to avoid improper future use.

Project Manager (Gilles Lafferty)

This position reports to the Town of Fort Smith. He was responsible for the budget, schedule, external approvals, administration of contracts and purchase orders required to conduct the demolition project.

Contractors (Heron's Trucking and C & R Construction)

The Contractors report to the Project Manager

The Contractors were retained by the Town of Fort Smith to conduct civil works. The contractors were responsible for providing all supervision, labour, equipment and materials for removal of the building and radiologically contaminated building materials. The work included: site preparation; construction of interim storage cell; excavation, loading, and transportation of radiologically-contaminated waste; decontamination and disposal of construction debris and non-contaminated materials; backfilling; restoration; and site cleanup. The Contractors had primary responsibility for completing all on-site activities associated with normal construction occupational health and safety.

The contractors were responsible for ensuring the work was carried out in accordance with governmental codes and regulations.

3.2 LLRWMO

The Low-Level Radioactive Waste Management Office contracted, at no cost to the Town, technical expertise and support staff to assist in the safe removal and containment of historic radioactive materials contained in the building. The LLRWMO provided all necessary instrumentation to carry out radiological monitoring of the building, workers and the local environment.

LLRWMO Manager (S. McCalum)

The LLRWMO Manager was responsible for providing the radiological scope of the project. He was responsible for the budget, schedule, internal (AECL) and external approvals, administration of contracts and purchase orders required to conduct the radiological technical support elements of the project.

LLRWMO Radiation Protection Program Manager (C. C/emell)

This position advises the LLRWMO Manager.

The Radiation Protection Program Manager was responsible for ensuring that AECL's Radiation Protection Requirements were met.

LLRWMO Site Environmental Officer (P. De)

This position advises the LLRWMO Project Manager.

The Site Environmental Officer was responsible for ensuring that AECL's Environmental Protection Program requirements were met.

Radiation Specialist (J. De Jong. Contractor to the LLRWMO)

This position reports to the LLRWMO Manager.



Report, General

REMOVAL OF THE MOUNDS EXEMPTION FROM LICENSING

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT OFFICE

LLRWMO-508760-REPT-17002

Revision 1

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2014/03/18

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Report, General

Removal of the Mounds
Exemption from Licensing

Low-Level Radioactive Waste Management Office

**LLRWMO-508760-REPT-17002
Revision 1**

2014 March

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Revision History / Liste de révisions

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0d2	2009/03/12	Internal reviewer comments incorporated.	M. Gardiner	M. Owen/G. Case	
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1	2014/03/18	Revised. This document was not entered into the TRAK system when originally prepared. This revision 1 revises the Security Identifier to AELC – OFFICIAL USE ONLY and revises front page to correct number 508760 Issued as “Approved for Use”.	S. Pickering	M. Owen	M.J. Gardiner

TABLE OF CONTENTS

SECTION	PAGE
1. INTRODUCTION	1-1
2. INTERIM STORAGE SITES MANAGED BY THE CROWN	2-1
2.1 Passmore Mound, Scarborough, Ontario	2-2
2.1.1 Background	2-2
2.1.2 Remediation Activities	2-2
2.1.3 Property Ownership	2-2
2.1.4 Timeline	2-3
2.1.5 Inventory of Materials	2-3
2.1.6 Current Ongoing Activities	2-3
2.1.7 Future Site Plans	2-3
2.1.8 Conclusions	2-3
2.1.9 Recommendation	2-3
2.2 Beacon Hill Landfill Mound, Fort McMurray, Alberta	2-4
2.2.1 Background	2-4
2.2.2 Remediation Activities	2-4
2.2.3 Property Ownership	2-4
2.2.4 Timeline	2-5
2.2.5 Inventory of Materials	2-5
2.2.6 Current Ongoing Activities	2-5
2.2.7 Conclusions	2-5
2.2.8 Recommendation	2-5
2.3 Fort Smith Landfill Cell, Fort Smith, NWT	2-6
2.3.1 Background	2-6
2.3.2 Remediation Activities	2-6
2.3.3 Property Ownership	2-6
2.3.4 Timeline	2-7
2.3.5 Inventory of Materials	2-7
2.3.6 Current Ongoing Activities	2-7
2.3.7 Conclusions	2-7
2.3.8 Recommendation	2-7
3. INTERIM STORAGE SITES MANAGED BY THE PROPERTY OWNERS	3-1
3.1 1400 Lakeshore Road East Cell, Mississauga, Ontario	3-1
3.1.1 Background	3-1
3.1.2 Remediation Activities	3-1
3.1.3 Property Ownership	3-2
3.1.4 Timeline	3-2
3.1.5 Inventory of Materials	3-2

TABLE OF CONTENTS

SECTION	PAGE
3.1.6	Current Ongoing Activities..... 3-2
3.1.7	Conclusions..... 3-2
3.2	Erskine Avenue Containment Cell, Peterborough, Ontario 3-3
3.2.1	Background..... 3-3
3.2.2	Remediation Activities 3-3
3.2.3	Property Ownership..... 3-4
3.2.4	Timeline..... 3-4
3.2.5	Inventory of Materials 3-4
3.2.6	Current Ongoing Activities..... 3-4
3.2.7	Conclusions..... 3-4
4.	SUMMARY..... 4-1

1. INTRODUCTION

The Low-Level Radioactive Waste Management Office (LLRWMO) was established in 1982 to carry out the responsibilities of the federal government for the management of low-level radioactive waste (LLRW) in Canada. The Office is operated by Atomic Energy of Canada Limited (AECL) through a cost-recovery agreement with Natural Resources Canada (NRCan), the federal department that provides the funding and establishes national policy for LLRW management.

Historic waste is low-level radioactive waste that was managed in the past in a manner no longer considered acceptable, but for which the owner cannot reasonably be held responsible and for which the federal government has accepted the responsibility for its long-term management.

Historic waste generally consists of process residues and contaminated materials mixed with soil. Nearly all of the historic waste date back to the 1930s, when radium was refined for medical applications at a refinery in Port Hope, Ontario. This waste, a total volume of about 1.5 million cubic metres, represents about 70% of the total low-level radioactive waste inventory in Canada by volume. Most of the waste is safely stored at interim storage facilities located at or near the waste sites.

For historic waste, the LLRWMO performs cleanup remedial work, and constructs and operates interim storage facilities until long-term management facilities are available.

The interim storage facilities created by the LLRWMO exist at locations across Canada. The majority of these contain wastes associated with the transportation of raw uranium ore materials to the refinery in Port Hope (Ontario), the refinery process itself or the use of the refined product.

This document summarizes the activities and resulting waste inventories currently stored at three interim storage sites operated by the LLRWMO and two operated by the property owners. Information is provided for all five sites, but recommendations relate only for three sites managed by the LLRWMO. It is assumed that the Canadian Nuclear Safety Commission (CNSC) will deal directly with the other two property owners.

Four of the five sites were developed at a time when the *Atomic Energy Control Act* and Regulations were in place, and were therefore under the regulatory oversight of the Atomic Energy Control Board. During this time the sites did not contain licensable material. Subsequently, the *Nuclear Safety and Control Act* (NSCA) came into place and under the NSCA, the inventories of these sites were considered licensable. Assessment of the sites resulted in their being exempted from licensing while the Nuclear Safety and Radiation Devices Regulations were being reviewed. The fifth site (in Peterborough), established under the NSCA was also exempted from licensing, as the nature of the inventory was similar to that of the other four sites.

The revision of the Nuclear Safety and Radiation Devices Regulations has returned the five sites to a condition where they are no longer licensable, however the LLRWMO is requesting that the

CNSC continue to maintain an awareness of the sites for continuity in support of public confidence.

This document also serves to request that the CNSC concur with the LLRWMO's understanding that based on the unconditional release criteria for the radionuclide inventories at these sites, licensing of the temporary storage sites is not required.

The maintenance of the federal government's liability for these sites would be benefited from the association of a knowledgeable regulator of record, particularly in light of radioactivity, health and safety and environmental aspects associated with the management of historic LLRW. The introduction at this time of a regulator (new provincial, territorial or other) not familiar with the nature of the wastes may not result in the same level of attention provided by the CNSC, potentially resulting in previously unseen stakeholder concern.

The two types of storage sites under consideration are those that are managed by the Crown, and those that are managed by the property owners.

Site	Location	Type of Containment	Volume (m ³)	Contaminant	Ave. Activity Concentration (Bq/g)
Interim Storage Sites Managed by the Crown					
Passmore Avenue Mound	Scarborough, Ontario	Above-ground Mound	9,000	Radium-226	0.082
Beacon Hill Landfill Mound	Fort McMurray, Alberta	Above-ground Mound	43,300	Uranium Ore	0.06
Fort Smith Landfill Cell	Fort Smith, NWT	Below-Ground Cell	126 (soils) 100 (wood)	Uranium Ore	0.2
Interim Storage Sites Managed by the Property Owners					
1400 Lakeshore Road East	Mississauga, Ontario	Below-Ground Cell	1,912	Radium-226	0.52
839 Erskine Avenue	Peterborough, Ontario	Below-Ground Cell	270	Uranium Ore	0.46

2. INTERIM STORAGE SITES MANAGED BY THE CROWN

The LLRWMO is currently managing wastes at sites under exemption in Scarborough (ON), Fort McMurray (AB) and Fort Smith (NWT). The exemption from licensing expires on 2009 December 31.

Given their history, the LLRWMO requests that the CNSC maintain an ongoing awareness of these sites.

2.1 Passmore Mound, Scarborough, Ontario

2.1.1 Background

The Passmore Interim Storage Site (Passmore Site) was developed as part of the Malvern Remedial Project (MRP) for the interim storage of soil mildly contaminated with radioactivity, until a long-term disposal facility is available. The Passmore Site is maintained and monitored by the Low-Level radioactive Waste Management Office of Atomic Energy of Canada Limited.

2.1.2 Remediation Activities

The main elements of the project were to complete the cleanup of soils at McClure Crescent and McLevin Avenue. The objective of the Malvern Remedial Project was to sort the soil removing all material with licensable concentrations of radium and to store the remaining mildly contaminated soil at the sorting site until a permanent disposal site is available in Ontario. Licensable materials were transferred to storage at the LLRWMO's storage buildings in Waste Management Area D at AECL's Chalk River Laboratories. The remaining materials were consolidated in an aboveground engineered storage mound and have been under LLRWMO maintenance and monitoring ever since. An extended radiological survey of the Malvern community did not identify any further areas of radium contamination.

2.1.3 Property Ownership

The Passmore Site land is owned by the Ontario Realty Corporation. The historic low-level radioactive waste (radium-226 contaminated soils) in the Passmore Mound is the responsibility of the federal government.

A Memorandum of Understanding between the federal government and ORC results in the provision of maintenance and monitoring services of the Passmore Mound being completed by the LLRWMO.

The MRP was a joint undertaking by the federal and Ontario governments. It was implemented for the cleanup of residential, commercial, municipal and undeveloped properties in the Malvern area of Scarborough, Ontario, which had historic contamination of soils with radium. With the assistance of citizens of the community, a proposal was developed to excavate the soil, segregate the licensable contamination for removal from Scarborough through transport to storage at the LLRWMO warehouse at Chalk River Laboratories of AECL, and place the residual mildly contaminated soils in an engineered storage mound at the Passmore Site.

The MRP resulted in the removal of radium-contaminated soils from more than 60 properties. The contamination originated from the radium refining/processing industry at the time of the Second World War, and was discovered in Malvern at properties on McClure Crescent in 1980 and McLevin Avenue in 1990. The MRP was announced in 1992 March.

2.1.4 Timeline

- Discovery of McClure Crescent material in 1980
- Discovery of McLevin Avenue material in 1990
- Remediation Project announced in 1992
- Remediation Project started in 1994
- Remediation Project completed in 1996
- LLRMWO maintenance and monitoring since facility closure in 1996.

2.1.5 Inventory of Materials

- Approximately 9,000 m³ of radium-226 contaminated soil in the Passmore Mound
- Total activity estimated at 11 MBq radium-226
- Estimated activity concentration is 0.082 Bq/g radium-226.

2.1.6 Current Ongoing Activities

- Environmental Monitoring Program
 - Gamma radiation survey, quarterly
 - Radon, quarterly
 - Groundwater, twice a year
 - Mound leak detection system (water), quarterly
- Quarterly site inspections
- Quarterly monitoring results posted on site signs
- Annual reporting to ORC and other stakeholders.

2.1.7 Future Site Plans

The federal government maintains the long-term responsibility for these wastes and for identifying a long-term waste management solution.

2.1.8 Conclusions

On review of the activity concentrations of historic LLRW in this site, we believe it is below regulatory concern as per Schedule 1 and 2 of the CNSC's Nuclear Substances and Radiation Devices Regulations, in that the Passmore Mound activity concentration for radium-226 does not exceed its unconditional clearance level of 1 Bq/g.

2.1.9 Recommendation

That the CNSC concur with our conclusion that no licence is required for the ongoing storage activities for the material in the Passmore Mound.

Should it be confirmed that no CNSC licence is required, the LLRWMO will continue to maintain and monitor the Passmore Mound until such a time as a federal government long-term waste management option is implemented. During this time we recommend that CNSC staff continue to maintain and ongoing awareness of the site in order to help maintain the confidence level of property owners and local residents that the site is safely and appropriately managed.

2.2 Beacon Hill Landfill Mound, Fort McMurray, Alberta

2.2.1 Background

Fort McMurray, Alberta, is the southernmost point in the Northern Transportation Route (NTR), the historical pathway of the transport of uranium ores from the Port Radium Mine on the eastern shores of Great Bear Lake to the rail line that took the raw materials to the Eldorado refinery in Port Hope, Ontario. The transfer between barges, often involving on-land transport around rapids or for temporary storage, along the NTR resulted in the loss of some material during handling, as did the transfer from barge to rail in Fort McMurray, Alberta. Some of these sites have been remediated, but the remaining ones are managed by the LLRWMO.

Fort McMurray remediation activities resulted in the transfer of uranium ore-contaminated soils from six sites in Fort McMurray to a secure, long-term management facility (LTMF) constructed at the Fort McMurray Beacon Hill municipal landfill site.

The LTMF is a separate cell designed and built only for the storage of uranium ore-contaminated soils collected during the Fort McMurray uranium ore-contaminated soil remediation activities.

2.2.2 Remediation Activities

Following the initial radiological surveys of the many potential sites in Fort McMurray, a working group consisting of the LLRWMO, the Fort McMurray and District Health Unit, the City of Fort McMurray and Improvement District 18 was established to direct the cleanup project. A cleanup of contaminated soils from the Northern Transportation Company Limited (NTCL) Lower Town site began in the fall of 1992. Remediation of the last uranium ore-contaminated site in Fort McMurray, the CN Rail site in Waterways, was completed in the fall of 2002.

The licensable material was separated at the remediation sites and was packaged and shipped to the LLRWMO's storage buildings at AECL's Chalk River Laboratories in Ontario. The remaining uranium ore-contaminated soils were placed in the LTMF at the Fort McMurray municipal landfill site forming the Beacon Hill Landfill Mound.

2.2.3 Property Ownership

The Fort McMurray landfill site is owned and operated by the Regional Municipality of Wood Buffalo and is licensed by the Province of Alberta. The historic low-level radioactive waste (uranium ore-contaminated soils) in the Fort McMurray LTMF is the responsibility of the federal government.

The LTMF is managed, maintained and monitored by the LLRWMO under an agreement made with the City of Fort McMurray (now part of the Regional Municipality of Wood Buffalo) in 1993.

2.2.4 Timeline

- Discovery of material in 1992
- Remediation Project started in 1992
- Remediation Project completed in 2002
- LLRMWO maintenance and monitoring since facility closure in 2002.

2.2.5 Inventory of Materials

- Approximately 43,300 m³ of uranium ore-contaminated soil in the Beacon Hill LTMF
- Total activity is estimated at 13 GBq uranium-238, in equilibrium with progeny
- Activity concentration is estimated at 0.06 Bq/g uranium-238.

2.2.6 Current Ongoing Activities

- Environmental Monitoring Program
 - Gamma radiation survey, yearly
 - Radon, twice-yearly
 - Water, yearly.
- Annual site inspections
- Annual reporting to Regional Municipality of Wood Buffalo and other stakeholders
- Slope stability testing every five years.

2.2.7 Conclusions

On review of the activity concentrations of historic LLRW in this mound, we believe this site is below regulatory concern as per Schedule 1 and 2 of the CNSC's Nuclear Substances and Radiation Devices Regulations, in that the Beacon Hill LTMF activity concentration for uranium-238 does not exceed its unconditional clearance level of 1 Bq/g.

2.2.8 Recommendation

That the CNSC concur with our conclusion that no licence is required for the ongoing storage activities for the material in the Beacon Hill LTMF.

Should it be confirmed that no CNSC licence is required, the LLRWMO will continue to maintain and monitor the Beacon Hill landfill site LTMF until such a time as a federal government long-term waste management option is implemented. During this time we recommend that CNSC staff continue to maintain an ongoing awareness of the site in order to help maintain the confidence level of property owners and local residents that the site is safely and appropriately managed.

2.3 Fort Smith Landfill Cell, Fort Smith, NWT

2.3.1 Background

Fort Smith is a community on the Slave River at the Alberta - Northwest Territories border. It is also the location of a former portage on the Slave River used during the transportation of uranium ore along the Northern Transportation Route (NTR) from the Port Radium mine site to the railhead at Fort McMurray. Fort Smith is the final portage on the NTR before arriving at Fort McMurray.

The on-land transfer between barges around the Slave River rapids resulted in the contamination of a small volume of soils during handling and the flooring of a warehouse building during longer-term storage.

Remediation of the contaminated sites required a local temporary storage site. The remains of the former warehouse building and the contaminated soils from the soil excavations are stored in a designated area at the local landfill site. The material is stored in a shallow depression, lined on bottom and top with tarpaulin, referred to as the Fort Smith landfill site cell. A 30 cm cover of sand protects the liner and cover tarps. The site is fenced and signs posted to identify the materials.

2.3.2 Remediation Activities

Uranium ore-contaminated soils in the Fort Smith area were identified during the COSMOS 954 Satellite recovery operation conducted in 1978/79. In addition to approximately 1,100 radioactive particles associated from fallout from the satellite, additional above-background levels of radioactivity associated with the uranium ore-contaminated soils were identified.

Remedial works in Fort Smith between 1998 and 2001 resulted in the transfer of approximately 126 m³ of uranium ore-contaminated soils to the landfill site (then referred to as the Nuisance Grounds). In 1998, a containment cell was created in the Fort Smith Landfill to store local area contaminated materials. In 1998, an old NTCL warehouse was demolished and approximately 100 m³ of uranium ore-contaminated flooring was placed in the cell. In 2001, approximately 126 m³ of uranium ore-contaminated soils were added to the cell. No additions have taken place since.

2.3.3 Property Ownership

The Fort Smith landfill site is owned and operated by the Municipal Corporation of the Town of Fort Smith and is licensed by the Northwest Territories. The historic low-level radioactive waste (uranium ore-contaminated soils) in the Fort Smith landfill site cell is the responsibility of the federal government.

The landfill site cell is managed, maintained and monitored by the LLRWMO as part of its responsibilities in the Fort Smith area.

2.3.4 Timeline

- Discovery of uranium ore material in 1978 during Cosmos 954 satellite recovery operation
- Documentation of waste sites in Fort Smith area in 1992 as part of NTR investigations
- Remediation Projects for soil cleanup took place between 1998 and 2001
- Remediation Project for contaminated warehouse flooring took place in 1998
- LLRWMO maintenance and monitoring since in 2001.

2.3.5 Inventory of Materials

- Approximately 126 m³ of uranium ore-contaminated soil in the landfill site cell
- Approximately 100 m³ of uranium ore-contaminated warehouse flooring included in the landfill site cell
- Activity is estimated at 54 MBq uranium-238, in equilibrium with progeny
- Activity concentration is estimated at 0.2 Bq/g uranium-238, mostly from soils.

2.3.6 Current Ongoing Activities

- Environmental Monitoring Program
 - Gamma radiation survey, yearly
- Annual site inspections.

2.3.7 Conclusions

The Fort Smith Landfill site contains a purpose-built temporary storage cell for uranium ore-contaminated soils and building debris from the Fort Smith area.

On review of the activity concentrations of historic LLRW in the landfill site cell, we believe this site is below regulatory concern as per Schedule 1 and 2 of the CNSC's Nuclear Substances and Radiation Devices Regulations, in that the Fort Smith landfill site cell activity concentration for uranium-238 does not exceed its unconditional clearance level of 1 Bq/g.

2.3.8 Recommendation

That the CNSC concur with our conclusion that no licence is required for the ongoing storage activities for the material in the Fort Smith landfill site cell.

Should it be confirmed that no CNSC licence is required, the LLRWMO will continue to maintain and monitor the Fort Smith landfill site cell until such a time as a federal government long-term waste management option is implemented. During this time, we recommend that CNSC staff continue to maintain an ongoing awareness of the site in order to help maintain the confidence level of property owners and local residents that the site is safely and appropriately managed.

3. INTERIM STORAGE SITES MANAGED BY THE PROPERTY OWNERS

The information and data submitted here is for the information of the CNSC staff only. The LLRWMO assumes that further discussion on these sites would be between the CNSC and the site owners.

3.1 1400 Lakeshore Road East Cell, Mississauga, Ontario

3.1.1 Background

The Arsenal Lands at 1400 Lakeshore Road East, Mississauga, Ontario, were part of a larger property that was used as a training area for the Department of National Defence since before the First World War. The property was developed for the manufacturer of rifles and small arms during the Second World War, and continued manufacturing firearms as Canadian Arsenals into the 1950s. The property was transferred to Canada Post in 1981 and it was then sold to the Metropolitan Toronto Region Conservation Authority (MTRCA) in 1991.

Environmental audits of the property identified the presence of historic low-level radioactive waste. Soils contaminated with radium-226 distributed on and beneath the ground surface, commingled with other waste material behind a building on the southern portion of the site. The radium contamination was introduced during historic site operations.

The remediation of the radium-contaminated soils took place as part of the larger site remediation activities for the other contaminants.

3.1.2 Remediation Activities

Waste consolidation on the Arsenal Lands site took place during 1998 December and 1999 January. The closure of the engineered below ground storage cell took place in 1999 May.

The engineered containment cell consists of cell with a 30 mil PVC liner underlain by a geofabric to prevent puncturing. The consolidated soils were covered with a 30 mil PVC cover that was then covered with approximately 1 m of clean soil and vegetated.

The radium-226 contaminated soils exceeding background concentrations were limited to an area of approximately 1,400 m². Approximately half of the contaminated material was within 15 cm of the surface, and the other half extended to a depth of 1.35 m. The contamination primarily appeared to be ash-like in nature and was present with other non-radioactive wastes.

The result of the remediation activity was the consolidation of 1,912 m³ of radium-226 contaminated soils in the engineered below ground storage cell. This volume contained an estimated activity of 1,200 MBq of radium-226 (based on gamma radiation measurements taken on each truck box). Assuming a nominal 1.2 tonnes per m³ for un-compacted soils, the activity concentration for radium-226 in the consolidated soils is approximately 0.52 Bq/g.

This site is currently licensed by the CNSC.

3.1.3 Property Ownership

The 1400 Lakeshore Road East storage cell is built on a 16-hectare property owned by the Toronto Region Conservation Authority (TRCA).

3.1.4 Timeline

- Discovery of material in 1995 during site characterization by a consultant for the property owner
- LLRWMO completed a radiological site characterization in 1995
- Remediation Project for soil cleanup took place in 1998 December and 1999 January
- LLRWMO has monitored the site for the TRCA since 2000.

3.1.5 Inventory of Materials

- 1,912 m³ of radium-226 contaminated soil in the engineered containment cell
- Activity is estimated at 1,200 MBq radium-226
- Activity concentration is approximately 0.52 Bq/g radium-226.

3.1.6 Current Ongoing Activities

The 1400 Lakeshore Road East engineered containment cell houses radium-226 contaminated soils from past site operations. The LLRWMO continues to monitor the containment cell area on behalf of the property owner.

- Environmental Monitoring Program
 - Gamma radiation survey, yearly
 - Radon twice per year
- Site inspections and groundwater sampling completed by property owner
- Responsibility for site maintenance remains with the property owner.

3.1.7 Conclusions

The 1400 Lakeshore Road East cell houses radium-226 contaminated soils from historic site operations that continue to be the responsibility of the property owner.

On review of the activity concentration of LLRW in the cell, we believe this site is below regulatory concern as per Schedule 1 and 2 of the CNSC's Nuclear Substances and Radiation Devices Regulations, in that the mound activity concentration for radium-226 does not exceed its unconditional clearance level of 1 Bq/g.

3.2 Erskine Avenue Containment Cell, Peterborough, Ontario

3.2.1 Background

The Peterborough belowground containment cell is located at 839 Erskine Avenue, Peterborough, Ontario. The property was most recently used for commercial purposes, however it is now part of a combined piece of land under industrial development by Coca-Cola Limited (CCL). Coca-Cola Limited acquired the properties adjacent to its Minute Maid Company Canada Inc. operation for further development of the production capacity.

Low-Level Radioactive Waste Management Office (LLRWMO) staff identified the potential for uranium ore-contaminated soils on this property following the recovery of ore samples that reportedly came from the previous industrial operation on the property. A site visit concluded that there were further pieces of uranium ore remaining on the property. Environmental audits of the property previously conducted for CCL had not identified the presence of the uranium ore-contaminated soils.

A review of the property's history indicated an ore sorting machinery development operation existed on site from 1964 to 1989. Uranium ore samples were brought to the site for testing and demonstrating sorting equipment sensitivity.

The LLRWMO contacted CCL and presented the existing information and the requirement for further radiological characterization of the site. Radiation surveys and field sampling were used to support CCL's site remediation plans. The data was used to determine the upper limit for local background concentration for the site (0.1 Bq/g radium-226) that was then used as the site remediation criteria.

Soils contaminated with the uranium ore were distributed within approximately 30 cm of the surface. The remediation of the uranium ore-contaminated soils took place as part of the larger site remediation activities for other contaminants on the property.

3.2.2 Remediation Activities

The uranium ore-contaminated soils were consolidated as part of the larger site remediation activities between 29 July and 15 September 2005. The uranium ore-contaminated soils were sorted by radiation surveyors, which resulted in the separation of pieces of ore from the contaminated soils. The closure of the engineered containment cell took place in September 2005.

The uranium ore pieces were shipped to the LLRWMO's licensed facility in Port Hope for repackaging and shipment to its Waste Management Area D storage building at Chalk River Laboratories.

The engineered containment cell consists of a cell with a geotextile liner and a high-density polyethylene geo-membrane cover. The cell was covered by clean fill and finally with an asphalt surface. Iron survey bars were installed at the four corners of the cell for future surface location

referencing.

The remediation activity resulted in the consolidation of 270 m³ of uranium ore-contaminated soils in the engineered containment cell. This volume contained an estimated activity of 198 MBq of uranium-238 (based on sampling of the contaminated soils).

Assuming a nominal 1.6 tonnes per m³ for the compacted soils in the containment cell, the activity concentration for uranium-238 in the consolidated soils is estimated to be 0.46 Bq/g.

3.2.3 Property Ownership

The 839 Erskine Avenue engineered containment cell is located within an approximately 5-hectare property owned by Coca-Cola Limited.

3.2.4 Timeline

- Discovery of material in 2005
- LLRWMO completed a radiological site characterization in 2005
- Remediation Project for soil cleanup took place between July and September of 2005
- Responsibility for site maintenance and monitoring remains with the property owner.

3.2.5 Inventory of Materials

- 270 m³ of uranium ore-contaminated soil in the engineered containment cell
- Activity is estimated at 198 MBq uranium-238, in equilibrium with progeny
- Activity concentration is approximately 0.46 Bq/g uranium-238.

3.2.6 Current Ongoing Activities

- All site activities are completed by the property owner.

3.2.7 Conclusions

The 839 Erskine Avenue engineered containment cell houses uranium ore-contaminated soils from historic site operations that continue to be the responsibility of the property owner.

On review of the activity concentration of LLRW in the cell, we believe this site is below regulatory concern as per Schedule 1 and 2 of the CNSC's Nuclear Substances and Radiation Devices Regulations, in that the cell activity concentration for uranium-238 does not exceed its unconditional clearance level of 1 Bq/g.

4. SUMMARY

On achieving the Nuclear Safety and Radiation Device Regulation's unconditional clearance level concentrations, the LLRWMO concludes that there is no requirement to licence the Passmore Mound, the Beacon Hill Landfill Mound, and the Fort Smith Landfill Cell. Should the CNSC be of the same view, the LLRWMO requests that the CNSC continue to maintain an awareness of the sites for continuity in support of public confidence.

Decisions for the future management of the 1400 Lakeshore Road East Cell and the Erskine Avenue Containment Cell will remain with the property owners of those facilities.