Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 19-H4.6

File / dossier : 6.01.07
Date: 2019-09-06
Edocs: 5988276

Oral Presentation

Submission from the Concerned Citizens of Renfrew County and Area

In the Matter of the

Whiteshell Laboratories

Application to renew the Nuclear Research and Test Establishment Decommissioning Licence for the Whiteshell Laboratories site for a period of ten years

Commission Public Hearing

October 2-3, 2019

Exposé oral

Mémoire de Concerned Citizens of Renfrew County and Area

À l'égard de

Laboratoires de Whiteshell

Demande pour le renouvellement, pour une période de dix ans, du permis de déclassement d'un établissement de recherche et d'essais nucléaires pour les Laboratoires de Whiteshell

Audience publique de la Commission

Les 2 et 3 octobre 2019

Canada

This page was intentionally left blank

Cette page a été intentionnellement laissée en blanc

Whiteshell Laboratories Decommissioning Licence Renewal

Submission from Concerned Citizens of Renfrew County and Area

September 6, 2019

Our group is dedicated to a clean and healthy environment in the Ottawa Valley free of pollution from the nuclear industry. We requested funds from the CNSC's Participant Funding Program to participate in the licence hearing for the Whiteshell Laboratories, because proposed activities under the new license would have a major impact on Chalk River Laboratories, increasing risks of radioactive pollution in Renfrew County and Area.

Canadian Nuclear Laboratories (the licence applicant) is owned by a multinational consortium composed of SNC Lavalin and two U.S. companies - Fluor and Jacobs Engineering. The consortium has decided – without formal governmental approval or consultation – that the Chalk River Laboratories, in the Ottawa Valley, are the target destination for the decommissioning wastes from the Whiteshell Laboratories.

Furthermore, the consortium is speeding up decommissioning activities at the Whiteshell Laboratories and shipping wastes as fast as possible to the Chalk River Laboratories – even though the current decommissioning plan for Whiteshell (prepared by Atomic Energy of Canada Limited prior to its restructuring) calls for a gradual and phased approach in which decommissioning activities are timed to the availability of properly-sited and formally-approved waste disposal facilities.

Dr. Hartmut Krugmann's report (appended below) indicates that the consortium's actions will result in double-handling and double-transporting of waste. This means shipping waste at higher radioactivity levels, which creates unnecessary health and safety risks. Double-handling and double-transporting will also greatly increase overall waste management costs, including the construction of new temporary storage facilities.

These seemingly irrational actions appear to be driven by the provisions of a contract between the Government of Canada (represented by Atomic Energy of Canada Limited) and the consortium. This contract – issued in secrecy and haste during the 2015 federal election period in violation of the "Caretaker Convention" – may provide a perverse incentive to engage in a "shell game" of moving wastes from Whiteshell to Chalk River.

Our group recently obtained a 2013 Memorandum to the Minister through the Access to Information Program. The main concern of the Government at that time was to find a quick way to reduce a rapidly-growing, multi-billion-dollar federal nuclear waste liability. The memo called for "incentivized contracts with the private sector." In an effort to make the case for faster decommissioning the memo cited experiences in other countries. For example the memo claimed that by contracting clean-up work, the U.S.

government had saved $550 million and speeded up the decommissioning of the Rocky Flats site (a nuclear weapons facility for fabrication of plutonium "pits") by 14 months.

However, the memo did not fully detail experiences at Rocky Flats, where significant residual plutonium contamination remains following clean-up activities. And the memo failed to note that other countries that opted for a policy of immediate decommissioning already had long-term waste management or disposal facilities – unlike Canada.

There are no approved waste disposal facilities at the Chalk River Laboratories. This federal facility is located in a seismically active area with fractured, porous bedrock on the Ottawa River, a major water resource for millions of Canadians. The Ottawa River has national heritage river status in recognition of its cultural, ecological and recreational significance. The Chalk River Laboratories property is completely unsuitable for long-term radioactive waste management.

The consortium's actions are also likely a result of the Government of Canada's failure to develop appropriate policies and strategies pursuant to the 1992 *Radioactive Waste Policy Framework*. This *Framework* states that waste owners (such as the federal government – Canada's largest "owner" of low- and intermediate-level waste) must meet their responsibilities "in accordance with approved waste disposal plans." The federal government has not done so – it has abdicated its responsibilities.

In addition to shipping waste as quickly as possible to Chalk River, a major component of the consortium's speeded-up decommissioning approach for Whiteshell is "entombment" of the WR-1 reactor, with its many long-lived radioactive components. The consortium proposes to entomb the reactor by filling it with grout and concrete and then abandon it in place, even though the International Atomic Energy Agency states that entombment is not an acceptable decommissioning strategy[1].

In 2018 the CNSC decided to renew the Whiteshell decommissioning licence for only year so as to provide additional time for Canadian Nuclear Laboratories to address all comments regarding its proposed WR-1 reactor entombment. Canadian Nuclear Laboratories has been unable to address these comments. There is no approved decommissioning and waste disposal plan for the WR-1 reactor. Nor has a plan to abandon the low level waste trenches at Whiteshell Laboratories yet been approved[2].

[1] Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities. Specific Safety Guide No. SSG-47. International Atomic Energy Agency, Vienna, 2018

[2] "The concept for in situ disposal of these trenches was included under the decommissioning licence in 2003 by the Commission, but the safety case must still be approved. This is expected to be completed and submitted to the CNSC over the next licencing period." (CMD 19-H4, page 13 of 88).

Why then would the Commission even consider a 10-year period for the Whiteshell decommissioning licence? Dr. Krugmann recommends another 1-year extension of the current licence. We concur.

It is particularly troubling that Canadian Nuclear Laboratories is making preparations to ship the high-level fuel wastes currently stored at Whiteshell to Chalk River. Double-handling and double-transporting of high-level spent fuel wastes would entail significantly increased safety and security risks, in addition to needless expense.

Dr. Krugmann's report is subtitled "*The Wisdom of Making a Strategic U-Turn back to a more Gradual and Phased Decommissioning Approach*." The International Atomic Energy Agency agrees:

> If the waste management infrastructure is available, including for waste disposal, then immediate dismantling is the preferred strategy… If the waste management infrastructure is not available when decommissioning is anticipated, efforts should be made to synchronize the timing of the development of the waste management infrastructure with the anticipated timing of decommissioning.[3]

Dr. Krugmann recommends that priority be given "to identifying and developing sites for national facilities for the final disposal of radioactive waste from federal sites." We concur.

Developing and siting disposal facilities should be a priority for the Government of Canada - particularly a geological repository for its long-lived wastes. This priority should be reflected in the decommissioning plans for all federal nuclear reactor sites – including Douglas Point, Gentilly-1, and the Nuclear Power Demonstration Reactor in Rolphton, Ontario; as well as Whiteshell and Chalk River.

We urge the Commission to make a decision that conforms to the safety requirements of the International Atomic Energy Agency and that upholds Canada's responsibilities under the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

Your failure to do so would create an unreasonable risk to the environment, to the health and safety of persons, and to national security; and would show a lack of respect for Canada's international obligations.

We again urge you to read Dr. Krugmann's report and to act in accordance with his recommendations.

[3] Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities. Specific Safety Guide No. SSG-47. International Atomic Energy Agency, Vienna, 2018

Managing Hazards Associated with Whiteshell Laboratories Decommissioning Wastes:

The Wisdom of Making a Strategic U-Turn Back to a More Gradual and Phased Decommissioning Approach

A report summarising
comments on CNL's Licence Renewal Application
submitted to the

Canadian Nuclear Safety Commission

On behalf of

Concerned Citizens of Renfrew County and Area

Northwatch

Prepared by Hartmut Krugmann PhD

September 6, 2019

Table of Contents

Executive Summary

In pushing for a much accelerated decommissioning pace for the Whiteshell Laboratories (WL) site, with the end-state envisioned for as early as 2029 (the end of Canadian National Laboratories' (CNL)'s proposed licencing renewal period) or even earlier (around the end of CNL's contract under the GoCo arrangement in 2026), CNL's new strategic decommissioning plan for WL not only envisages double-handling/transporting of waste at higher radioactivity levels, implying higher waste management costs and increased health & safety risks (both to waste handlers/operators and to the public), but also waste consolidation for interim storage (or perhaps even disposal) at a place – Chalk River Laboratories (CRL) – clearly not suited for that purpose. At the same time, with the new urgency to get WL decommissioned as soon as possible, the urgency of finding and developing a still much needed facility for final waste disposal seems to be getting entirely lost.

1 Introduction

On 15 November 2018, Canadian Nuclear Laboratories (CNL) submitted an application for Renewal of the Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell laboratories (WL) to the Canadian Nuclear Safety Commission (CNSC).

CNSC has scheduled public hearings for 2-3 October 2019 in Lac du Bonnet, Manitoba, to discuss CNL's licence renewal application, providing Indigenous peoples, non-governmental organizations and members of the public with an opportunity to inform and influence the decision-making process by preparing and presenting written comments on CNL's licence renewal application and related documentation, for consideration by the Commission in reaching a final decision on the application.

The Concerned Citizens of Renfrew Country and Area (CCRCA) and Northwatch, two non-governmental organizations (NGOs) of citizens living near Chalk River Laboratories (CRL) or on the transportation route between Whiteshell and Chalk River and dedicated to a clean and healthy environment in the Ottawa Valley and northern Ontario that is free of pollution from the nuclear industry, applied for and were granted financial assistance under the Commission's Participant Funding Program (PFP) in support of their participation in the licence renewal application review and Commission hearing process.

CCRCA's proposed review was to focus on the characteristics and hazards of WL decommissioning wastes and ways and means to manage these wastes, while Northwatch's review was to examine issues and risks associated with the transportation of WL radioactive wastes, in view of CNL's plan to relocate virtually all WL's radioactive wastes to CRL, as part of CNL's plan to complete the clean-up and closure of Whiteshell Laboratories within the next licence period. In view of the highly complementary objectives and thematic foci of the two reviews, CCRCA and Northwatch have agreed to join forces and pool resources to undertake one integrated review, rather than two separate overlapping and potentially partially duplicative reviews. The present report summarises the comments relating to the licence renewal application that have arisen from this broader integrated review.

2 Background and context

Whiteshell Laboratories (WL) was established in the early 1960s to carry out nuclear research and development activities for higher temperature versions of the CANDU (CANada Deuterium Uranium) reactor. The initial focus of research was the Whiteshell Reactor-1 (WR-1) and the Organic Cooled Reactor (OCR) concept, which began operation in 1965. The OCR program was discontinued in the early 1970s in favour of the heavy-water-cooled CANDU system. WR-1 continued to operate in support of AECL research programs, until it was shut down in 1985.

The WL site is located approximately 100 km northeast of Winnipeg, Manitoba, near Pinawa, Manitoba. The site includes lands on both the east and west side of the Winnipeg River. The property covers 4375 hectares (ha), although the majority of the WL facilities fall within a 40-ha area, adjacent to the east shore of the Winnipeg River. The Waste Management Area (WMA), the Concrete Canister Storage Facility (CCSF) and other facilities are located approximately 2 to 3 km north-east of the main site campus.

As result of the financial impact of the federal government's program review process, AECL made a business decision in 1997 to discontinue research programs and operations at WL. Subsequently, AECL received government concurrence in 1998 to proceed with actions to commence closure of WL via decommissioning **[1].**

In 1999, AECL began to prepare plans for decommissioning of the Whiteshell Laboratories that would meet regulatory requirements. Pursuant to the then *Canadian Environmental Assessment Act*, an environmental assessment of the envisaged decommissioning project was undertaken. As a first step, a document outlining the scope of the project and assessment was issued in December 1999 following consultations with the public and federal and provincial government departments. A draft (Rev.1) of what is referred to as Comprehensive Study Report (CSR) was submitted to CNSC in April 2000. A revised CSR (Rev.2) was submitted in March 2001, incorporating comments from members of the public, non-government stakeholders as well as federal and provincial government departments, and taking into account the results of additional studies in the Winnipeg River and in the Waste Management Area (WMA) to confirm the appropriateness of the decommissioning proposals for those areas **[2].** The final CSR was published in 2002.

Based on the results of the environmental assessment, as documented in the CSR, AECL began to develop detailed decommissioning plans (DDP) for the Whiteshell Laboratories (WL) to be organized in 12 volumes, with a view to securing the necessary regulatory approval for the envisaged WL decommissioning effort. Because of the staged manner of the WL decommissioning process, DDP volumes have been developed sequentially, as and when needed to secure formal approval from CNSC as a licence condition for particular decommissioning activities to be initiated, and CNSC has used the DDP volumes as a reference to verify compliance with this licence condition, as laid down in CNSC's Licence Condition Handbook **[3]**.[1]

The overall decommissioning approach and strategy for the WL complex is set out in Volume 1 (DDP 1) under the heading "Program Overview", with detailed decommissioning plans for individual WL nuclear facilities (to be) covered in Volumes 2 through 12. The latest CNSC-approved version of DDP 1 ("Program Overview"), Rev.4, dates back to January 2002 **[4]**. DDP 1 is in the process of being revised to reflect changes in the WL decommissioning strategy that are being proposed by CNL under their present licence renewal application for the period 2020 – 2029 (see section 4 below for a summary of those changes).

The initial decommissioning licence for WL was issued in 2003 and ran up to 2008, followed by a 10-year decommissioning licence for the period 2009 – 2018, which was extended by one year, to 2019. The licence renewal CNL is currently seeking is for the period 2020 – 2029.

---

[1] As of today, two of the 12 DDP volumes (or parts of volumes) still need to be developed:

a) Volume 8, Part 1 and 2 (for the decommissioning of the HLW Standpipes and the ILW Bunkers, B417, Amine Tanks, respectively, both located in the Waste Management Area (WMA); and
b) Volume 11 (for the decommissioning of Building 402).

The following DDP volumes represent decommissioning activities that have already been completed:

- Volume 3 (Van der Graaff Accelerator)
- Volume 4 (Neutron Generator)

3 The original decommissioning strategy

3.1 The 'preferred alternative' identified by the initial environmental assessment

The comprehensive study report (CSR) presenting the results of the initial environmental assessment highlights **the availability of a national facility for the final disposal of nuclear waste as essential to completing the decommissioning of the WL site**: (emphasis is the author's). The basic rationale for decommissioning the WL complex was to move site waste off-site only when off-site disposal would be available or when the safety of managing wastes in existing facilities would be compromised. Noting that "the long-term management of nuclear waste is contingent upon finding a nationally acceptable solution consistent with federal policy on waste management", the CSR points out that "no options or sites have been defined or approved that will provide such a solution". The CSR goes on to note:

- Provision of national waste disposal facilities is not within the Whiteshell Laboratories Decommissioning Project scope;
- Until a national facility is available, the wastes arising from the decommissioning project will [have to] remain in other secure interim waste management facilities licensed by the CNSC."

In considering environmentally acceptable alternatives for achieving the WL decommissioning program, the CSR starts from the premise, suggested by an early version of DDP 1 **[4]** that the main difference between alternatives would be the time required to complete the program, as the same decommissioning steps and activities would be involved to get the job done, whatever the time frame within which the decommissioning program might be completed.

The CSR assessed three decommissioning alternatives which had been provided by AECL as an input into the environmental assessment process, as mentioned in DDP 1 **[4]**:

- Alternative 1: end-state to be reached in 20 years (shortest possible period to deliver the program);
- Alternative 2: end state to be reached in 100 years (longest conceivable period to complete the program);
- Alternative 3: end state to be reached in 60 years (intermediate time frame over which to deliver the program).

Based on the feedback received during public consultations, Alternative 1 was understood to be the public's preference. But such a short time frame was felt to have two significant drawbacks: a) greater occupational health and safety risks and higher operational costs associated with the handling of radioactive waste, in particular high-level waste (HLW) in the form of irradiated fuel from WR-1, given that earlier waste handling would result in higher occupational radiation doses and require more extensive and hence expensive shielding and the use of more costly automated remote-control waste handling equipment; and b) the high likelihood that an off-site waste disposal facility would not be available within 20 years, thus making it necessary to transfer radioactive wastes (HLW, ILW, and some of the LLW) to off-site interim storage facilities before they could be sent to the national disposal facility,

which in turn would imply double-handling of waste, higher health & safety risks to workers and increased waste management (transport and storage) costs.

These downsides of Alternative 1 would matter less for Alternative 2 (which was based on the assumption that it would take at most 100 years to implement a national disposal policy and bring on-stream one or more national waste repositories) and Alternative 3 (which was seen as a way to optimize occupational health & safety levels and operational costs). For both alternatives, deferred dismantling of nuclear facilities and decommissioning buildings as they come to the end of their economic and structural life (and not before) would imply lower radioactivity levels and reduced occupational radiation doses and operational costs, and make it more likely that one or more national waste disposal facilities would be available by 2050.

Alternative 3 was considered superior to Alternative 2 (provided that a waste disposal facility would become available by 2050) in that a) decreases of radioactivity levels and workers' health and safety risks were found to be relatively insignificant beyond the time horizon of Alternative 3, b) potentially costly maintenance or replacement of WL facilities would be less of a problem for shorter time horizons (before 2050) than for longer time horizons (after 2050) , and c) overall not quite as much waste would accumulate and require disposal if the decommissioning program did not stretch out beyond 2050.

Overall, based on technical, economic, public and environmental considerations, Alternative 3 was identified as the preferred alternative. This alternative also was seen to have built-in flexibility in being able to adapt its decommissioning schedule to the time when off-site waste disposal capacity would actually turn out to become available, decommissioning (some of the) WL facilities, and moving waste off-site, earlier or later (even after 2050) in case waste disposal repositories would become available an earlier or later.

The CSR concluded that for Alternative 3 (the 'Preferred Alternative') the decommissioning of WL was not likely to cause significant, adverse environmental effects, taking into account the mitigation measures recommended in the report.

It is noteworthy that the choice of the decommissioning alternative ended up falling on Alternative 3 (intermediate time frame of 60 years) and not Alternative 2 (short time frame of 20 years), even though public preference was for getting the job done as quickly as possible so as to get rid of the radioactive waste sooner rather than later. Various government and non-government stakeholders intervened with written comments arguing in favour of the shortest possible decommissioning timelines on various grounds.

AECL responded to these comments by vigorously defending the rationale for more gradual WL decommissioning over a longer (intermediate) time horizon. Selected relevant written stakeholder comments and AECL's responses are found in the **Appendix A** to this paper. In line with the approach recommended by the CSR, AECL argued that awaiting the development and opening of one or more national facilities for final waste disposal and in the interim storing WL decommissioning wastes at the WL site as necessary would make it possible to transfer all WL wastes directly to the final disposal site, thus avoiding double-handling and double-transporting of waste and benefitting from lower operational health and safety risks and costs due to reduced waste transport needs and lower radiation levels.

3.2 Decommissioning options and scope of work under the 'preferred alternative'

The initial environmental assessment, as summarised in the CSR, came up with the following recommended decommissioning options **[2]**:

- Entire removal of facilities as a general strategy;
- In-situ disposal -- with some additional monitoring and analysis as well as a supplementary environmental assessment and safety analysis to support the final in-situ end state -- as the most environmentally sound and cost-effective solution for the following two project components:
  a) river sediments, on the grounds that even near the outfall to the Winnipeg River sediment surveys found no risk to human or ecological health (for details see Appendix B in [2]; and
  b) low-level waste (LLW) in the trenches located within the Waste Management Area (WMA), on the grounds that no significant transport of waste contaminants beyond the trench boundaries had been observed and it was very unlikely that contaminants could move beyond the boundaries of the WMA within the period of institutional control (estimated at 200 years) (for details see Appendix C in [2])[2];
- Decommissioning of the following facilities:

Nuclear Facilities	Radioisotope Facilities	General Infrastructure
• Shielded Facilities • Van de Graaf Accelerator • Neutron Generator • Active Liquid Waste Treatment Centre (ALWTC) • Whiteshell Reactor -1 (WR-1) • Concrete Canister Storage Facility (for HLW) • Waste Management Area (WMA)	• R&D Laboratory (Building 402) • Decontamination Centre (Building 418) • Active Waste Storage (Building 511)	• Non-nuclear buildings • Landfill • Sewage Lagoon • Buried Services • Contaminated Lands ("Affected Lands")

- A phased approach to implementing the WL decommissioning project, preceded by operational shut-down work, with activities proposed to be sequenced as follows:
  - ***Phase 1*** *(approximately 5 years)* –
    - Focus on placing nuclear and radioisotope buildings and facilities in a safe interim (monitoring & surveillance) state
    - Complete decommissioning of Van de Graaff Accelerator and the Neutron Generator.
  - ***Phase 2*** *(approximately 10 years)* –
    - Regular monitoring and surveillance of all buildings and facilities
    - Focus on placing the Waste Management Area in a passive operational state

[2] After further assessments, the recommended in-situ disposal of the LLW trenches in the WMA was qualified in the final CSR published in 2002, to the effect that most but not all LLW trenches, more specifically 21 out of the total of 25 trenches could be left in situ, pending a final safety assessment. A 2019 reassessment indicated that one of the 4 trenches to be remediated may also be a candidate to be left in situ, again pending a final safety assessment, thus suggesting that 21 or 22 of the LLW trenches may be left in situ **[1]**.

  - Establishing interim processing, handling and storage facilities, required during monitoring & surveillance and decommissioning activities.
- ***Phase 3*** *(approximately 45 years) --*
  - Focus on bringing the site to a final end state that fulfils all pertinent regulatory and national policy requirements
  - Timing and sequence of decommissioning activities to be determined largely by the availability of waste disposal facilities and the age and structure of engineered structures and buildings
  - Part of the WL site, namely the Waste Management Area (WMA), to be placed under institutional control after completion of all decommissioning activities and to remain under such control for an additional 200-year period.

3.3 Management of waste under the 'preferred alternative'

Noting that the WL decommissioning program essentially amounts to a process of managing the WL site waste (to be generated by the program as well as already existing and stored from past operation), the CSR provides the following estimate of the amounts of WL waste that would need to be managed, eventually to be transferred to off-site disposal facilities or (in the case of the river sediments and LLW trenches) to be disposed of in-situ.

	Low-level waste (LLW) (m^3)	**Intermediate-level waste (ILW)** (m^3)	**Irradiated reactor fuel (HLW)** (metric tonnes)	**'Deminimis' waste**[a] (m^3)
Inventory of stored waste	21,000	1,400	28	
Additional waste to be generated by decommissioning program	12,000	1,400	--	50,000
Total	33,000	2,800	28	

[a] This is waste that is below regulatory concern

Note: Radioactive liquid waste stored at the site from the Thorium Fuel Reprocessing Experiment (TFRE) is to be processed into a solid waste form.

4 Recent WL decommissioning progress: a new pattern of quickening pace and waste transports to Chalk River

In its Commission Member Document (CMD) for the 2-3 October 2019 WL decommissioning licence renewal hearing CNL points out that "much progress has been made on the decommissioning of the WL site over the 2008 – 2018 and 2018 – 2019 licence periods in terms of decommissioning of both nuclear and non-nuclear facilities, construction of new facilities to enable further decommissioning activities, and improvements to general site services" and provides a brief overview of decommissioning accomplishments so far **[1]**. The following selected activities and results are illustrative, not only of decommissioning progress so far but also of apparent changes in the overall decommissioning strategy:

- Decommissioning/demolition of further component parts of the 'Shielded Facilities', namely the "Warm Cells" 14-18" and Thorium Fuel Reprocessing Experiment (TFRE) tanks and piping (following the interim decommissioning of Hot Cells 6-12 and the Storage Blocks during the first decommissioning licence period 2003 – 2008);
- Final decommissioning of the SLOWPOKE Demonstration Reactor (SDR);
- Cementation of Active Liquid Wastes from historical fuel reprocessing experiments, for storage in the WMA;
- The remaining quantity of unirradiated WR-1 fuel material was removed from WL;
- The WL Shielded Modular Above Ground Storage (SMAGS) building was constructed and was partially filled with containers of radioactive waste. **The waste is being removed and shipped to CRL** (author's emphasis) in preparation for the re-purposing of SMAGS as a Cask Loading Facility (CLF) for intermediate-level wastes;
- A Soil Storage Compound (SSC) for storing radioactively contaminated soils was constructed in the Waste Management Area (WMA) and is operational;
- A Waste Clearance Facility and a Waste Handling Area were constructed on the main WL campus;
- The Cesium Pond experimental area was remediated and decommissioned – the **contaminated soils from the Cesium Pond were characterized, sorted by radioactive contamination levels, stored in the WMA, and subsequently transferred to CRL** (author's emphasis);
- More than 25 smaller, redundant, non-nuclear and nuclear-related auxiliary buildings (totalling approximately 2700 m2) were shut down and demolished;
- Pre-project work on WMA Standpipes was performed, and a contract for a design/build for remediation facilities for the Standpipes and Intermediate Level Waste Bunkers was issued to a qualified contractor having relevant decommissioning experience (design is nearing completion);
- The decommissioning of the Field Irradiation Gamma (FIG) and the Zoological Environment Under Stress (ZEUS) experimental areas was completed;
- A new Modular Office Complex (9 modular trailers) was constructed at the WMA **in preparation for increased work load and decommissioning activity in and around the WMA** (author's emphasis), and a new WMA Access/ByPass road and an expanded WMA Protected Area (PA)was also constructed **in preparation to enable the use of additional equipment for the remediation of standpipes and ILW bunkers** (author's emphasis));
- The collection and processing of Intermediate-Level Liquid Waste (ILLW) via the Active Liquid Waste Treatment Centre (ALWTC) (B200) was terminated, and much of the existing inventory was shipped off-site for processing;
- Two Low-Level Liquid Waste (LLLW) collection systems were constructed in Buildings B100 and B300, and the ALWTC facility was shut down, allowing for operational clean up and decommissioning;

The above list signals CNL's apparent intention to take the decommissioning of the WL complex in a new direction, away from the original decommissioning strategy, in that: a) the pace of decommissioning

activity and associated work load appears to have been increasing and b) some of the waste resulting from ongoing decommissioning and demolition activities is being transferred to CRL (rather than being stored at WL).

The latter issue (waste transports from WL to CRL) had already come into sharper focus earlier this year (2019) as a result of information provided by Atomic Energy Canada Limited (AECL) in response to a request, dated 03 February 2019, for information on shipments of radioactive wastes to Chalk River[3] from the Concerned Citizens of Renfrew County and Area (CCRCA) under the Access to Information and Privacy (ATIP) Act request **[5]**. AECL's "First Release Package" showed tangible evidence of a clear pattern of radioactive waste shipments to Chalk River, starting in January 2015, from five federal nuclear sites including Whiteshell (as well as from various other public-sector and private-sector organizations).

For Whiteshell, radioactive waste shipments to CRL commenced in October 2017 and up to the end of January 2019, resulted in the transfer to CRL of approximately 3000 metric tonnes (about 3500 m2 in volume) of packaged radioactive wastes, more than 90% (in weight and volume) of the total of radioactive wastes transferred to CRL from all five federal nuclear sites. More details are found in **Appendix B**.

This brings us to CNL's strategic decommissioning plan for the upcoming 10-year licencing period (2020 – 2029), which is examined in the next section.

5 The new strategic decommissioning plan for Whiteshell

Up-front in the executive summary of its CMD for the WL decommissioning licence renewal application hearings, CNL spells out its strategic plan for decommissioning the WL nuclear site in a nutshell [1]:

- ➔ "At the end of the proposed ten year licensing period [in 2029], the CNL plan is that all of WL will have been decommissioned to its final end-state, including the final decommissioning of the WR-1 reactor and the proposed in situ decommissioning (ISD) of certain Low-Level Waste (LLW) trenches in the Waste Management Area (WMA) (see previous paragraph), and the implementation of post closure institutional controls. **All other LLW, all Intermediate Level Waste (ILW), and all High Level Waste (HLW), will be retrieved, characterized, and (re-) packaged (as necessary) for shipment to either Chalk River Laboratories (CRL)** (emphasis is the author's) or another suitable, licensed storage/disposal facility;"
- ➔ "It is anticipated that the physical **decommissioning activities at WL will be completed on, or before 2026** (emphasis is the author's); final documentation may take additional time;" and
- ➔ "CNL's strategic plan, as stated in the preceding paragraph, is to **relocate most (if not all) of WL's radioactive wastes, except for certain trench wastes, to CRL within the next licence period, as one part of the CNL plan to complete the cleanup and closure of Whiteshell Laboratories** (emphasis is the author's)**."**

[3] CCRCA's access to information request was formulated as follows: "*Clarification Feb 3, 2019 – For the period of January 1, 2014 to January 31, 2019, what type(s) (including radioisotope composition) and amounts (in Bq and kg) of radioactive wastes have been sent to CRL, and from which organizations and on what dates*."

The CNL CMD adds: "starting in 2017, CNL commenced the relocation of Whiteshell Laboratories radioactive wastes to CRL. As of 15 July 2019, 3,557 m^3 of LLW and 18 m^3 of ILW have been safely transported to CRL in 175 shipments.[4] These shipments have covered 335,000 km of roads, with zero incidents/accidents and zero non-conformances. CNL anticipates that a total of approximately 1500 shipments of Low-Level Waste, 500 shipments of Intermediate-Level Wastes and 46 shipments of High-Level Waste (the baskets of irradiated reactor fuel from the Concrete Canister Storage Facility)[5] will be transferred to Chalk River during the completion of the Whiteshell Labs Closure Project."

It is clear from this summary statement that CNL has been following a new strategic approach to decommissioning Whiteshell Laboratories that amounts to moving away from the original approach, virtually into the opposite direction. The apparent intention is to greatly accelerate the pace of WL decommissioning and complete the WL decommissioning job as fast as possible, in just a few years – essentially a shift from the 'preferred alternative' of the CSR to alternative 1 (complete decommissioning as fast as possible, within 20 years).

The intention is, further, to immediately ship the vast majority of the decommissioning waste and other waste off-site to CRL for storage, rather than storing the waste at the WL site, so as to achieve the envisaged WL end state and site closure by the end of the of the next licence period (2029), with physical decommissioning operations to be completed by 2026 (i.e. about the end of CNL's current 10-year contract (2015-2025) with the multinational consortium). Waste shipments from the WL site to CRL started in October 2017 (see Section 5 and Appendix 2). Nearly 10% of the estimated total required number of 2050 shipments have already taken place, and somewhat more than 10% of the estimated total volume of waste has been already been shipped. (See **Appendix C** for more details.) Waste shipments are envisaged to continue until the end-state is reached for the WL site.

6 Implications of the new WL strategic decommissioning plan

CNL's new strategic plan for the decommissioning of the WL complex has various implications that are briefly analyzed in this section.

6.1 Longer-term storage of WL decommissioning waste at CRL

CNL's new strategy of transferring WL decommissioning wastes to Chalk River Labs (CRL), rather than storing them at the WL site, does nothing to address the issue of its final disposal. CRL is located on a geological fault line, within a seismically active area, right next to a major water body, the Ottawa River, which is the source of drinking water for millions of people downstream. Thus, the site's hydrogeological and biophysical conditions are such that it does not meet the criteria for hosting a facility for final waste disposal: relative isolation from the biosphere and sufficient containment of waste through natural barriers. This leaves longer-term interim storage at CRL (for eventual disposal elsewhere) as the only

[4] These figures of WL waste volumes shipped to CRL as of 15 July 2019 are reasonably consistent with our own estimate (of volumes shipped as of 31 January 2019) based on information in the AECL "First Release Package" (see Section 4 and Appendix 2).

[5] Additional irradiated fuel is being stored in a total of 171 concrete standpipes, which will add an estimated 1-4 HLW shipments to the 46 shipments of HLW (irradiated fuel) from the CCSF **[6]**.

viable management option for any radioactive waste shipped to CRL (HLW, ILW, LLW containing significant amounts of long-lived radioisotopes as well as hazardous chemical waste and mixes of such waste), the only exception being very low-level radioactive waste which, however, did not need to be shipped to CRL, as it could be disposed of at the WL site.

In other words, the main difference that transferring WL waste to CRL makes is that the waste is stored at CRL rather than at the WL site. Either way, a waste disposal facility would still have to be found.

However, while AECL's original WL decommissioning strategy highlights the availability of a final repository, or lack thereof, as a major constraint to rapid WL decommissioning (within a time frame of around 20 years) and therefore opts for a substantially longer decommissioning time frame (around 60 years), CNL's new strategy plan pushes for rapid WL decommissioning (coupled with waste transfer to CRL) while being silent on the need for a facility for eventual waste disposal.

While CNL's new strategic plan implies significant disadvantages in terms of increased waste management costs and risks, as discussed in sub-sections 6.2, 6.3, and 6.4, one wonders what, if anything, there is to be gained from adopting the new approach. Two things come to mind. For one, local residents in and around Pinawa and non-government organizations in Manitoba - most of whom were in favour of a speedy decommissioning process and a rapid transition to an essentially waste-free end-state of the WL site at the time the initial environmental assessment was undertaken - might now be pleased to see this happen, even if the WL radioactive waste legacy is merely shifted to another place (CRL) rather than removed all-together, simply leaving another local community, around CRL, up in arms. For another, it is not inconceivable that consolidating nuclear waste from the WL site at CRL might be seen by CNL as bringing about certain operational or administrative advantages. In any case, neither of these possible motivations should serve as an excuse to belittle or ignore the fundamental principle that existing nuclear waste legacies must be dealt with in such a way as avoid leaving an undue burden to future generations.

6.2 Double-handling and double-transporting of WL waste

Given that CRL is not a site suitable for final waste disposal, as argued in sub-section 6.1 above, CNL's new strategic plan entails double-handling and double-transporting WL nuclear waste. Following the transfer of WL waste to Chalk River, the waste would eventually have to be shipped off-site again for accommodation in a national facility for final waste disposal. Each transfer would involve a number of handling steps, starting with the recovery of the waste from where and how it is stored, to its re-packaging for transport, its transfer to the final disposal facility, and finally its unloading and emplacement in the disposal facility. Each step would entail additional costs, as well as additional occupational and public risks that could be avoided if WL waste were sent directly to a final waste disposal facility.

6.3 Higher radioactivity levels due to earlier decommissioning

By pushing for earlier and faster decommissioning of the WL site, CNL's strategic plan implies higher radioactivity levels and radiation fields around waste containers and waste packages during WL

decommissioning and waste transfer to CRL. This, in turn, means that radiation doses received by operators handling the waste during decommissioning and transfer to CRL are correspondingly higher.

Longer decommissioning deferment periods such as the 60-year period envisaged under the original decommissioning strategy can make a significant difference to the intensity of radiation fields generated by nuclear waste. For illustration, radioactivity levels of structural reactor vault components for the Whiteshell Reactor-1 (WR-1) drop by more than a factor 1000 within 50 years after reactor shutdown (**[4]**, p.40).

In section 3 of CNL's CMD where decommissioning plans for the proposed 10-year licence renewal period are presented, CNL attempts to provide a justification for their new decommissioning strategy of moving towards reduced deferment periods, claiming that it is consistent with the evolution of international best practices and that their strategic decommissioning plan incorporates international standards and current best practices **[1]**. But the claim remains unsubstantiated. No details or references are provided in support of this claim.

6.4 Higher risks and costs, in particular waste transport risks and costs

The core elements of CNL's strategic plan – a much shorter decommissioning deferment period, WL waste transfer to CRL, and interim storage at CRL – all substantially add to the cost as well as health and safety risks, including waste transportation related costs and risks, associated with the decommissioning the WL site, when compared to AECL's original decommissioning strategy.

Costs

As far as costs are concerned, higher radioactivity levels in and around nuclear waste due to the shorter deferment period increase the extent to which costly shielding and remote handling equipment is required in waste handling operations, especially for HLW (irradiated fuel) and ILW. Packaging and transporting WL waste to CRL is a costly undertaking in itself, especially for HLW and ILW requiring special packages and transport containers. And new storage facilities may be needed at CRL to accommodate WL waste which in the case of HLW and ILW have greater shielding requirements and are therefore more costly.

AECL's Detailed Decommissioning Plan, Vol.1 – Program Overview (DDP 1), Rev.4, 2002, estimated the additional decommissioning and waste management cost associated with moving from a 60-year decommissioning time frame ('preferred alternative') to a 20-year time, broadly representative of CNL's new strategic plan, to be in the range of CAD 50 -130 million **[4]**. This range of incremental costs for the 20-year decommissioning time frame was also adopted in the CSR **[2]**. To these cost figures, the costs of transferring WL waste to CRL and the cost of storing it there as well as general cost escalation/inflation would have to be added to arrive at a more credible estimate for the (certainly much greater) additional WL decommissioning cost under CNL's decommissioning plan.

Risks

When it comes to health & safety risks, CNL's new strategic decommissioning plan enhances these risks when compared to AECL's original decommissioning strategy, both in terms of occupational risks

(increased radiation doses to waste operators) and in terms of public risks (increased radiation doses to members of the public), because of double-handling/transporting of waste and the shorter decommissioning deferment period and hence higher radiation levels and larger radiation exposures during waste handling. Public risks are enhanced, in particular, due to the ongoing and planned waste transports of WL waste to CRL, given that accidents cannot be ruled out.

Transportation risks

Since nuclear waste transports became an integral part of CNL's decommissioning plans in 2016, with the development of a Decommissioning & Waste Management (D&WM) Integrated Waste Transportation Strategy for all CNL wastes and the establishment of a new WL Waste Certification and Transportation Branch within a newly established WL Waste Management Division, and since waste shipments from WL to CRL were initiated in 2017, CNL has maintained in its annual compliance/safety reports to CNSC **[7, [8], [9]** that it has complied with all relevant CNSC, Transport Canada, and IAEA regulations and standards **[10], [11], [12]**. CNL further reports having worked closely with WL and CNSC in handling, packaging, and shipping special types of nuclear waste, such as Uranium-Thorium Solution (UTS) waste drum, first reclassified and then repackaged into Type A drums for shipment to CRL in Dec 2017 for storage there as ILW, or WL irradiated fuel from to be accommodated in a Used Fuel Transportation Package (UFTP), leased from the Nuclear Waste Management Organization (NWMO) for shipment to CRL in a Type B transportation package, starting in 2020 **[8]**. CNL also prides itself on having maintained an immaculate safety record in its 175 shipments of WL waste from the WL site to CRL since 2017, with no accidents, incidents, and non-conformances (see Section 5 above and **[1]**).

While compliance with waste transport regulations, collaboration with CNSC on transporting special waste types, and an apparently good transport safety record so far is to be welcomed, it does not mean that there are no risks associated with transporting radioactive waste or that accidents could not happen in future. For one, a small fraction (less than 10%) of the estimated total waste shipments currently anticipated have taken place so far, i.e. the vast majority of waste transfers are still to come. For another, accidents could be caused for reasons outside the control of nuclear waste truck drivers, such as negligent behaviour of other drivers. Imagine, for instance, a broadside collision with an 18-wheeler long-haul truck such as the one that flattened the bus carrying the Humboldt Broncos team and killed a number of team members, or imagine a collision with a train.

The possibility of an accident resulting in radioactive waste spillage, land and water contamination, and possible adverse occupational and public health impacts, can never be discounted when nuclear waste is shipped across long distances. In comparison with AECL's original WL decommissioning strategy, CNL's new strategic plan significantly increases this risk by involving double-handling/transporting waste at higher waste radioactivity levels.

7 Conclusion

CNL's intentions for how to decommission the WL site fly into the face of the original rationale for more gradual phased decommissioning, which AECL helped develop and vigorously defended via-à-vis critical stakeholders during the initial environmental assessment. The new intentions are entirely incompatible with the original decommissioning rationale in accepting, rather than avoiding, the prospect of double-handling/ transporting radioactive waste and associated cost increases and occupational/public health & safety risks -- and in ignoring, rather than embracing the cost savings and health and safety benefits from deferred decommissioning.

At the same time, the need for a final waste disposal facility no longer seems to figure as a significant factor in the new strategic decommissioning plan for the WL site. The new urgency of getting the WL site decommissioned as soon as possible appears to have eclipsed the continuing urgency of finding and developing facilities that are suitable for the disposal of long-lived nuclear waste.

8 Recommendations

The following recommendations are offered:

1) CNL's new strategic plan for the decommissioning of the WL, which marks a drastic departure from AECL's original approach, should be revised with a view to moving back to a more gradual and phased decommissioning approach.

2) The pace at which the WL site is currently being decommissioned should be decelerated, decommissioning activities should be stretched over a longer time horizon, in moving back toward the original decommissioning approach to decommissioning the WL site.

3) Ongoing transfers of WL decommissioning waste to CRL should be halted and the WL waste should revert to being stored at WL.

4) Priority should be given to identifying and developing sites for national facilities for the final disposal of radioactive waste from federal sites.

5) CNL should be granted a temporary licence of 1 year duration only during which time they should be requested to come up with a revised WL decommissioning approach and strategy along the lines of the original strategy and approach reflected in PPD 1 **[4]** and the initial environmental assessment (CSR) **[2]**.

References

1. Canadian Nuclear Laboratories (CNL) Ltd., Commission Member Document (CMD) prepared for the Canadian Nuclear Safety Commission (CNSC) Public Hearing, October 2-3, 2019, in the matter of CNL's application to renew the Nuclear Research and Test Establishment Decommissioning Licence for the Whiteshell Laboratories site for a period of 10 years, 30 July 2019
2. Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report (CSR), Rev.2, March 2001; Vol.1: Main Report, Vol.2: Appendices, Vol.3: Addendum, November 2001
3. Canadian Nuclear Safety Commission (CNSC), Licence Condition Handbook for Whiteshell Laboratories, Compliance Framework Document Associated with the Whiteshell Laboratories Decommissioning Licence, NRTEDL-W5-8.04/2018, Rev.0, 01 February 2016
4. The Whiteshell Laboratories Detailed Decommissioning Plan, Vol.1 – Program Overview, RC-2143-1, Rev.4, January 2002
5. Atomic Energy Canada Limited (AECL), "First Release Package" provided to the Concerned Citizens of Renfrew County and Area (CCRCA) in response to CCRCA's request for information, under the Access to Information and Privacy (ATIP) Act, on shipments of radioactive wastes to Chalk River, 03 February 2019
6. Whiteshell Laboratories Closure Project, Application for the Renewal of the Nuclear Research and Test Establishment Decommissioning Licence for the Whiteshell Laboratories, for the period January 2020 – December 2029), WLD-CNNO-18-0033-L, 15 November 2018
7. Canadian National Laboratories, Annual Compliance Monitoring Report, Whiteshell Laboratories Annual Compliance Monitoring Report for 2018, WL-00583-ACMR-2018, Revision 0
8. Canadian National Laboratories, Annual Safety Report, Whiteshell Laboratories Annual Safety Review for 2017, WL-00583-ASR-2017, Revision 0
9. Canadian National Laboratories, Annual Safety Report, Whiteshell Laboratories Annual Safety Review for 2016, WL-00583-ASR-2016
10. Canadian Nuclear Safety Commission (CNSC), Packaging and Transport of Nuclear Substances Regulations, 2015
11. Transport Canada, Transportation of Dangerous Goods Act, 1992
12. International Atomic Energy Agency (IAEA), Regulations for the Safe Transport of Radioactive Material, 2018 Edition, No. SSR-6 (Rev.1)

Appendix A: Selected comments and responses on draft Whiteshell Environmental Assessment, 2001

Source: Comprehensive Study Report (CSR), Rev.2, March 2001; Vol.3: Addendum, Appendix: "Responses to Public and Technical Review Comments, on the Draft Comprehensive Study Report (CSR) on the Whiteshell Laboratories Decommissioning Project, Rev.2, March 2001" **[2]**

Comment Number	Comments by	Comment (as summarized by CNSC)	Response (by AECL)
26	Concerned Citizens of Manitoba	We are opposed to the fact that AECL is not planning to decommission the WL in the near future. We believe that decommissioning should be commencing immediately	Decommissioning will commence following completion of the EA process and establishment of the regulatory/licensing structure required to implement the project.
93	Local Government District of Pinawa	There is no valid safety argument for deferring decommissioning other than for the WR1 core. Even with WR1 the fuel channel assemblies could be easily removed and stored as is done in the CANDU power reactors when they are retubed. There is a strong ethical and safety argument against committing the decommissioning risks to future generations. These risks should be minimized by doing as much as possible now to put the wastes in a safe and easily retrievable state.	The rationale for deferment is detailed in Sec. 3.3. Although WR-1 is the basis for the argument, there are significant quantities of WR-1 waste already stored in the WMA facilities as a result of the WR-1 operational program. **Since AECL will have a significant presence and will manage waste at WL for decades the optimized plan is based on transfer of decommissioning waste directly to disposal facilities.**
194	Pinawa Resident	If waste disposal facilities are not ready in time to complete the decommissioning of Whiteshell to complete the decommissioning of Whiteshell Labs in 20 years, the wastes at Whiteshell Labs should be moved out of Manitoba to Chalk River Labs or some other suitable radioactive waste storage site.	The rationale for moving waste when disposal is available is given in Sec. 3.3. **Moving waste initially to alternate storage and then to disposal incurs additional personnel dose. Therefore, the reference plan is to manage wastes within existing facilities until disposal is available.** Additional detail on the process for designing and implementing an enhanced monitoring program at the WMA, assessing the fitness for service of existing storage facilities and for stablishing remediation schedules has been added to the Addendum.
195	Pinawa Resident	Leaving the nuclear waste around for 60 years is not how to decommission a nuclear facilities responsibly.	**The project schedule is dependent on waste disposal facilities being available off-site** and the schedule **assumptions for waste disposal are 2025 for low-level waste and 2050 for high-level waste.** For radiation safety considerations the activity in the WR-1 core is being permitted to decay for approx. 50 years before dismantling begins.
202	Pinawa Resident	When people see that a nuclear facility cannot be decommissioned in a timely manner, then they will not want nuclear industry to start in their area. This will put in jeopardy the future of the nuclear industry and AECL. As a result, AECL and resources to clean up Whiteshell Labs may	**The optimized decommissioning plan to minimize radiation doses and to control costs is scheduled over 60 years to coincide with waste disposal assumptions.**

		not exist in the future. Therefore Whiteshell Labs needs to be cleaned now, and the radioactive waste must be removed now.	
208	Pinawa Resident	There is no guarantee that we could transport the waste out of Manitoba. Therefore we need a transportation corridor to remove the waste now. We need to start transporting the waste down corridor, and keep transporting the waste to keep the corridor open.	**Waste cannot be transported until there are established waste disposal facilities to receive it.** The shipping schedules will be addressed consistent with waste disposal facility availability.
211	Pinawa resident	A major problem with the Whiteshell Labs Decommissioning Project is that the people given responsibility for decommissioning the lab do not have the authority to decommission the lab. They cannot decommission the lab until the waste disposal facilities are built, and they have no control over whether the waste disposal facilities will ever be built. By moving the radioactive waste to Chalk River, it will then be located closer to where the authority to dispose of it is located.	The rationale for moving waste when disposal is available is given in Sec. 3.3. **Moving waste initially to alternate storage and then to disposal incurs additional personnel dose. Therefore the reference plan is to manage wastes within existing facilities until disposal is available. Where necessary, and disposal facilities are not yet available, additional waste management facilities will be built at the WL WMA for interim storage.**

Appendix B: Radioactive wastes shipped to Chalk River from other federal nuclear sites in the period 01/01/2014 – 31/01/2019

Federal site from which wastes were shipped	**Period over which wastes were shipped**	**No. of days on which shipments were received by CRL**	**No. of packages received by CRL**	**Total mass of waste received by CRL** (metric tonnes)	**Total volume of waste received by CRL** (m^3)
NDP Reactor	29/01/2015 – 15/05/2018	15	623	16	73
Douglas Point	03/01/2017 – 30/01/2019	2	11	12	17
Port Hope	05/09/2018 – 05/12/2018	3	11	1	3
Gentilly 1	07/03/2018 – 24/01/2019	13	813	206	198
Whiteshell Labs	02/10/2017 – 28/01/2019	51	548	3004	3499
Grand Total		**84**	**2006**	**3239**	**3790**

Findings from the analysis of the AECL First Release Package data can be summarized as follows:

a) Radioactive waste shipments to CRL from the other AECL took sites were initiated in January 2015 and proceeded over the remaining 4-year period (Jan 2015 – Jan 2019) covered by the AECL First Release data. No such radioactive waste shipments seem to have taken place in 2014. **Shipments from Whiteshell commenced in October 2017**.

b) Over the 4-year period, shipments on a total of 84 different days were received by CRL from other AECL sites, **on the majority of days (51 days or about 60% of the total) from Whiteshell**.

c) Each of the 84 shipments comprised one or more 'packages', for an overall **total of 2006 packages, of which 548 or about 27% from Whiteshell**.

d) In terms of mass, a **total of about 3240 metric tonnes** of (packaged?) radioactive waste was received by CRL from the other AECL sites, **predominantly (more than 90%) from Whiteshell**.

e) In terms of volume, a **total about 3790 m^3** of (packaged) radioactive waste were received by CRL from the other AECL sites, **again predominantly (more than 90%) from Whiteshell**.

f) The radioisotope contents of radioactive waste consignments (packages, shipments) range from one single (or one predominant) radioisotope to more complex mixes of radioisotopes that may contain different fission products, transuranic isotopes, activation products (i.e. radioisotopes generated through neutron capture by stable isotopes), radioisotopes like H-3 and C-14 that may be generated through (ternary) fission or neutron capture induced activation, and/or naturally occurring radioisotopes like Ra-226 or K-40.

g) Data blocks for radioactive waste shipments from Douglas Point, Gentilly 1, and Whiteshell are labelled “protected sensitive”. Radioisotope & radioactivity level data pairs for shipments from Douglas Point and Gentilly 1 are heavily redacted such that one or more (up to 10) radioisotope names & activity level data pairs per shipment or per package are blackened out completely. Some similar redacting, but to a lesser extent, was also done to the Whiteshell data. It looks like the redacting has been focused, among others, on rendering inaccessible data on very long-lived transuranic radioisotopes such as PU-239 , PU-240, PU-242, CM-245/PU-241, AM-243, and/or other very-long-lived radioisotopes. The presence of significant amounts of such very long-lived radioisotopes in waste packages/shipments would render these ILW type waste packages/shipments, and this may have motivated the redacting, but this is no more than a hypothesis for further examination.

Appendix C: Numbers of radioactive waste shipments and volumes (to be) shipped from Whiteshell to Chalk River

	CNL plans numbers and estimated volumes of waste shipments from WL to CRL[a]	Radioactive wastes received by CRL from WL so far	Proportion of radioactive wastes already shipped
LLW -- number of shipments	1,500		
ILW – number of shipments	500		
HLW – number of shipments	47 – 50[b]		
Total number of shipments	2,047 – 2,050	51[e] (175)[d]	 (~ 8.5%)
LLW – volume (to be) shipped (m^3)	25,500	(3,557)[d]	
ILW – volume (to be) shipped (m^3)	1,560	(18)[d]	
HLW – volume (to be) shipped (baskets)	94 – 96[c]		
Total radioactive waste volume (m^3)	27,154 – 27,156	3,500[e] (3,575)[d]	~ 13%

Endnote: In addition to the above-listed waste shipments/volumes, there may be a need to transport **intermediate-level liquid waste (ILLW)** not processed on-site at WL and/or the **residual solid waste from onsite ILLW processing** as well as an **estimated 500 m^3 of hazardous and mixed wastes**, to be shipped off-site to licenced waste receivers for treatment and/or disposition.
(Sources: CNL application for WL licence renewal for 10-yr period 01/2020 – 12/2029, 15 November 2018 [6], Appendix D
CNL CMD for licence renewal application hearing, 01Aug2019) [1])

Footnotes:

a. Based on CNL licence renewal application, 15 November 2018 [6], Appendix D; and CNL CMD for licence renewal application hearings, 30 July 2019 [1].
b. This includes an estimated 1-4 shipments of HLW removed from the 171 concrete standpipes [6]
c. This includes an estimated 2-4 baskets of HLW removed from the 171 concrete standpipes [6]
d. As per the cover letter of the CNL staff CMD dated (30 July 2019) for the WL licence renewal application hearings (02-03Oct19) indicating total waste volumes already shipped and number of shipments from WL to CRL that have already taken place, as of 15 July 2019 [1]
e. This is the number of days on which (one or more) shipments were received by CRL, and the waste volumes already received for the period 01/10/2017 – 31/01/19, as per the AECL "First Release Package" [5].