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Updated Submission to the CNSC on the Draft Environmental Impact Statement

CNL's Near Surface Disposal Facility

Submitted by:

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Canadian Environmental Law Association

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SUBMISSION TO:

The Canadian Nuclear Safety Commission
Nicole Frigault, Environmental Assessment Officer
280 Slater St., P.O. Box 1046 Station B
Ottawa, ON K1P 5S9

SUBMISSION FROM:

Canadian Environmental Law Association
55 University Avenue, Suite 1500
Toronto, ON M5J 2H7

RE: Revised Comments from the Canadian Environmental Law Association regarding the proposed Near Surface Disposal Facility Draft EIS (Ref No. 80122)

August 15, 2017

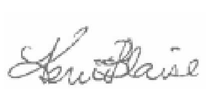
Dear Ms. Frigault:

In response to the public comment extension announced June 16, 2017, the Canadian Environmental Law Association appreciates the opportunity to provide further comment on the draft environmental impact statement for the proposed Near Surface Disposal Facility Project.

Please find attached our report which includes our prior submission's chapter on sustainable development and a revised chapter on human health and safety. This submission is in addition to our comments provided May 19, 2017. Due to outstanding document requests, we also seek the opportunity to provide further comments without prejudice once the extensive amount of missing information and analysis is provided.

Thank you and please let us know if you have any questions.

Sincerely,



CANADIAN ENVIRONMENTAL LAW ASSOCIATION
Kerrie Blaise, Counsel

Contents

List of Acronyms

ECM	Engineered containment mound
HT	Tritiated hydrogen gas
HTO	Tritiated water vapour
HLW	High-level waste
ILW	Intermediate-level waste
LLW	Low-level waste
OBT	Organically-bound tritium
PWR	Pressurised Water Reactor
WAC	Waste Acceptance Criteria

INTRODUCTION

The Canadian Environmental Law Association (CELA) welcomes this opportunity to review the draft environmental impact statement (EIS) for the proposed Near Surface Disposal Facility Project submitted by the proponent, Canadian Nuclear Laboratories (CNL).

For nearly 50 years, CELA has used legal tools, undertaken ground breaking research and conducted public interest advocacy to increase environmental protection and the safeguarding of communities. We work towards protecting human health and our environment by actively engaging in policy planning and seeking justice for those harmed by pollution or poor environmental decision-making.

In this context, CELA has sought to examine compliance and adequacy of the proposed project and its assessment in conjunction with the requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA). CELA has examined whether the project and its assessment adequately consider environmental effects and their significance, mitigation measures, adequacy of proposed follow-up programs, alternative means of carrying out the project and other factors listed under section 19 of CEAA.

Based on CELA's initial review of the draft EIS and the deficiencies contained within, this submission should be considered a commentary on missing and inadequate information for decision making. We reserve the right and intend to provide additional substantive comment on the next version of the EIS.

Based on our review, CELA has made recommendations (see page 2) and a list of information requests to the CNCS (see pages 3 - 4) in order to inform the decision that should be made as a result of the Commission's responsibilities under sections 52 and 53 of CEAA.

Pursuant to our Participant Funding Program application, CELA has engaged the professional services of Dr. Tanya Markvart and Dr. Ian Fairlie. The first chapter of this report titled Sustainable Development evaluates the project's documentation and assessment of effects in compliance with the statutory purpose of CEAA and the principle of sustainable development. The second chapter of our report, titled Human Health and Safety, comments on the omissions in the existing draft and specific areas requiring further information.

SUMMARY OF RECOMMENDATIONS

No.1 CNL defined and used three criteria (technical feasibility, economic feasibility, and environmental effects) to evaluate the alternative means and the preferred NSDF option. CNL, however, did not discuss the relative contributions of the alternative means and the preferred NSDF option to sustainability. Nor, did CNL explain the process by which it incorporated sustainability concerns in its evaluations.

No.2 CNL set out other principles (CNL design principles, INPO nuclear safety culture principles, IAEA safety principles) and CNSC licensing requirements, asserting that these provided the context for its evaluation. It did not, however, show how these principles and requirements influenced the analysis and conclusions.

No.3 CNL's comparative evaluation of alternative means clearly did not capture the complexities in the decisions that must be made in alternative means assessment. Critical questions remain about the trade-offs among the options with respect to their respective contributions to sustainability. These unaddressed trade-offs are especially evident in CNL's 'Evaluation of Alternatives' summary tables for facility type, facility design, facility location, and site selection.

No.4 CNL considered adaptive management in the design of its monitoring program. It is unclear, however, how the notion of adaptive management capacity influenced CNL's evaluation of alternative means as well as its assessment of the proposed NSDF.

No.5 CNL did not provide sufficient detail about the post-closure phase to give the public confidence in the long-term safety of the proposed NSDF project. At this juncture in the EA process CNL has an opportunity to incorporate the concept of 'rolling stewardship' in planning for the long-term monitoring and safety of the NSDF.

No.6 Unfortunately, typographical errors, incorrect statements, scientific inaccuracies and omissions have impeded the ability of CELA to intelligibly comment on the draft EIS. The EIS and accompany Performance Assessment should be rechecked by CNL and published for a second review before the final EIS version is published.

No.7 The definitions of LLW and ILW are unsatisfactory.

No.8 The question, "should the wastes to be stored at the proposed facility be properly categorised as HLW as well as LLW and ILW?" needs to be addressed.

No.9 With regards to possible high temperatures at the facility, the following questions must be addressed:

- What is the estimated heat production rate (kW per m^3) when the facility starts (ie. with 450,000 m^3 in place)?
- What is the maximum temperature envisaged within the ECM?
- What is the safe temperature limit?
- What controls are in place to ensure that temperatures within the facility do not exceed the safe limit?
- What provisions are made for cooling and ventilation?
- What provisions are made for fire prevention

No.10 Unless sufficient assurances can be given on heat rates, maximum temperatures and fire risks within the waste facility, the project should not proceed.

No.11 No attempt has been made in the draft CNL documents to "justify" (as per the main Principles of the International Commission on Radiological Protection) the radiation exposures to people living nearby from the routine emissions from the proposed facility.

No.12 The Draft EIS should recognize the two major nuclear accidents which occurred at Chalk River in the 1950s and their ensuing wastes. Neither accident is mentioned in the existing text.

No.13 The Draft EIS should estimate annual Bq tritium uptakes via inhalation, ingestion and skin absorption in the local population and in workers.

SUMMARY OF INFORMATION REQUESTS

No.1 Describe how sustainability-based criteria were used to evaluate and compare the alternative means as well as the effects of the preferred NSDF option.

No.2 Describe how the three evaluation criteria (technical feasibility, economic feasibility, and likely environmental effects), CNL design principles, INPO nuclear safety culture principles, IAEA safety principles, and CNSC licensing requirements constitute relevant sustainability considerations.

No.3 Provide a description of the process by which consideration for sustainability contributions was incorporated throughout the assessment and design of the preferred NSDF option.

No.4 Provide a comparative evaluation of the alternative means in terms of their relative contributions to sustainability in order to clearly demonstrate to the public that the NSDF is the best option with respect to net contributions to sustainability.

No.5 Describe and demonstrate how trade offs were considered among the options in the comparative evaluation of alternative means.

No.6 Describe how reversibility, retrievability, diversity, and redundancy were incorporated in (a) the comparative evaluation of alternative means and (b) the design and assessment of the preferred NSDF option.

No.7 Provide in-depth plans for the long-term monitoring of the NSDF during the post-institutional control phase.

No.8 Provide a description of how the concept of rolling stewardship will be applied in all phases of monitoring for the NSDF.

No.9 Provide an explanation in response to the following omissions:

- Precise nature of the heat-generating wastes
- Estimated maximum heat emission rates and maximum temperatures in the proposed facility
- Estimates of collective doses to nearby populations

- Estimates of annual tritium uptakes by local population, and specific activity limits
- Detailed geological, hydrogeological and geotechnical information that justifies the Chalk River location for the proposed NSDF, and
- Proposals to remediate the existing groundwater pollution at Chalk River.

No.10 Provide a definition of "long-lived" and "short-lived."

No.11 Confirm whether the dose rate limits at page 3-11 of the Draft EIS are correct, particularly the 10 Sv per hour estimate which is a lethal dose rate.

No. 12 CELA requests that several important CNL documents be made publicly available, including an unredacted version of CNL's Waste Acceptance Criteria (WAC) report, its Safety Analysis Report (SAR) report, and its Criticality Safety Analysis (CSAR) report.

I. SUSTAINABLE DEVELOPMENT

This chapter will provide a sustainability-based evaluation of the Canadian Nuclear Laboratories' Environmental Impact Statement for the proposed Near Surface Disposal Facility project at Chalk River Laboratories.

This submission's analysis rests in part on the purpose of the *Canadian Environmental Assessment Act 2012* (CEAA, 2012), as set out in sections 4(1)(b), (h), and (i):

> 4(1) The purposes of this Act are
> [...]
> (b) to ensure that designated projects…are considered in a careful and precautionary manner to avoid significant adverse environmental effects;
> [...]
> (h) to encourage federal authorities to take actions that promote sustainable development in order to achieve or maintain a healthy environment and a healthy economy; and
> (i) to encourage the study of the cumulative effects of physical activities in a region and the consideration of those study results in environmental assessments.

CELA's evaluation concentrated on the following essential considerations of sustainable development in environmental assessment (EA):

- Evaluation criteria and process (see Section 1.1)
- Consideration of trade-offs (see Section 1.2)
- Consideration of the precautionary principle and associated concepts (see Section 2)
- Long-term monitoring plans (see Section 3)

In the following sections, the key deficiencies in CNL's draft EIS with respect to these sustainability concerns are described. A summary of Information Requests, which would enhance CELA's understanding of CNL's EIS in these regards is included at the end (see Table 1).

1. CNL's Consideration of Sustainability

CELA's approach to analyzing CNL's consideration of sustainability in the subject EIS is based on best practices in sustainability-based EA, which have been established by practitioners and scholars in the field (see Gibson, 2005; Gibson, 2017; Pope & Grace, 2006). In previous EIS public comment processes for proposed nuclear waste management projects, we provided in-depth explanations of how proponents should fulfill their obligations under CEAA in this regard (e.g., Markvart, 2014).

In the following sub-sections, we highlight some key areas where CNL failed to adequately consider sustainability concerns in the NSDF EIS.

1.1 CNL's Evaluation Criteria and Process

Gibson (2005) provides a comprehensive set of sustainability criteria for application in EA. They are rooted in a fundamental concern for the multi-scale interconnections and interdependencies within and between human and biophysical systems and present and future generations, especially effects on inter- and intragenerational equity, ecological system integrity, and governance capacity. In addition, Gibson explains the process by which sustainability considerations should be incorporated throughout the EA process in order to select the best option.

An adequate consideration of sustainability in EA should demonstrate that the preferred option emerged from a comprehensive comparative evaluation of options in light of their relative contributions to sustainability. The proponent must clearly demonstrate that the preferred option would contribute the greatest net social, economic, and environmental benefits to society while avoiding significant adverse effects.

CNL defined and used three criteria (technical feasibility, economic feasibility, and environmental effects) to evaluate the alternative means and the preferred NSDF option. But, CNL did not discuss the relative contributions of the alternative means and the preferred NSDF option to sustainability. Nor, did CNL explain the process by which it incorporated sustainability concerns in its evaluations.

In order to clearly demonstrate to the public that the NSDF option is the best option in light of net contributions to sustainability, CNL should provide the following additional information:

- A description of the sustainability-based criteria that CNL adopted to evaluate and compare the alternative means as well as the effects of the preferred NSDF option;
- A description of how the three criteria (technical feasibility, economic feasibility, and likely environmental effects) constitute relevant sustainability considerations;

- A description of the process by which CNL incorporated consideration for sustainability contributions throughout the assessment and design of the preferred NSDF option; and
- A description of the relative contributions to sustainability of the alternative means and the preferred NSDF option.

In addition, in Section 2.4 CNL set out other principles (CNL design principles, INPO nuclear safety culture principles, IAEA safety principles) and CNSC licensing requirements, asserting that these provided the context for its evaluation. This section however, does not show how these principles and requirements influenced the analysis and conclusions.

The public must have a clear understanding of:

- How these constitute relevant sustainability considerations, and
- How they were integrated in a comparative evaluation of the alternative means leading up to the selection of the preferred option.

1.2 CNL's Consideration of Trade-Offs

One key aspect of evaluating and comparing alternatives in light of sustainability contributions is the consideration of trade-offs among the options. Gibson (2005, 2013) and others (see Morrison-Saunders & Pope, 2013) provide an in-depth explanation of trade-offs and guidelines for dealing with them in EA decision making. As Gibson (2013) explains, substantive trade-offs

> involve choices about what purposes to serve, what alternatives to favour, what design features to incorporate, what enhancements and mitigations to consider adequate and what undertakings to approve with what conditions and implementation controls, etc. Most significantly, substantive trade-offs are about the anticipated effects resulting from these choices. They centre on what predicted damages and risks are accepted as the price to pay for what expected benefits (p.2).

CNL's comparative evaluation of alternative means raises important questions about trade-offs, which should have been addressed before CNL identified the preferred alternatives. These unaddressed trade-offs are especially evident in CNL's 'Evaluation of Alternatives' summary tables for facility type (2.5-2), facility design (2.5-3), facility location (2.5-4), and site selection (2.5-5).

To briefly elaborate, CNL asserted that the above ground concrete vault (AGCV) facility type (table 2.5-2) would offer increased design robustness compared to the ECM option because it would have high strength concrete structural elements and engineered packages for all wastes. CNL stated that this would result in reduced releases of leachate to groundwater compared to the ECM option. In addition, CNL stated that an AGCV facility would offer greater protection from weathering and erosion compared to the ECM. When compared with the ECM, however, CNL noted that the AGCV facility would take longer to build, require at least two sites due to storage capacity/spatial area requirements, be more expensive, and have additional packaging requirements.

CNL explained and presented a table summary of this comparison without any discussion of trade-offs. Instead of conducting an alternative means assessment, the CNL used a simple gradient evaluation framework with 'most favourable' at the highest end, 'favorable' in the middle or neutral point, and 'least favorable' at the lowest end. This framework clearly did not capture the complexities in the decisions that must be made in alternative means assessment. Indeed, it seems that CNL simply tallied the scores.

Critical questions remain about trade-offs among the options with respect to contributions to sustainability. To give one example, without commenting here on the accuracy of their technical assessment, CNL's comparative evaluation of facility types must address whether or not it would be more beneficial with respect to contributions to sustainability to spend more money and time in the short term on the AGCV option, which would require more packaging and more land/area, but provide greater robustness and increased protection to groundwater and from weathering and erosion over the long term.

To set a sound basis for the selection of the NSDF and other associated means as the preferred options, CNL must identify and discuss trade-offs in its comparative evaluation of alternative means.

2. CNL's Consideration of the Precautionary Principle

The purpose of CEAA is to ensure that designated projects are considered in a careful and precautionary manner with regards to all aspects of the assessment process. One overarching concept that should be central to a precautionary approach in nuclear waste management is 'adaptive management capacity', which was incorporated in previous EIS Guidelines for the preparation of OPG's EIS for the Deep Geologic Repository project for low and intermediate-level radioactive waste.

The concept of adaptive management has been widely adopted in the sectors of energy and natural resource management, as it provides an iterative approach to management in the face of,

- Scientific uncertainty and human error;
- Technological innovations and/or advances in scientific understanding;
- New technical or scientific information regarding the design and operation of a project;
- Changes in social and political opinion;
- Changes in policy and regulatory frameworks, including safety standards; and
- Unforeseen events (including natural disasters, malfunctions, accidents and malevolent acts).

Associated design concepts that may increase the level of adaptive management capacity in nuclear waste management facilities include reversibility, retrievability, diversity and redundancy (see OECD, 2001, 2012).

Reversibility is the possibility of reversing one or a series of decisions taken during the lifetime of a nuclear waste management project. Reversal is the actual action of changing a previous decision. The associated implication for design include making provisions for reversal should it be required. Retrievability denotes the action of recovery of the waste packages. Designing a nuclear waste management project so that waste can be deposited or stored in a retrievable manner enhances the reversibility of decisions by providing an additional degree of flexibility. Moreover, a demonstrated possibility to retrieve the waste at each stage after emplacement may increase public confidence in the long-term safety of a project.

Diversity and redundancy are major sources of adaptive management capacity (see Walker & Salt, 2006). The diversity requirement seeks to ensure that decision makers evaluate and compare a range of different alternatives that could achieve the same objective. If the preferred option fails there should be sufficient knowledge about other options to make adaptation feasible. The concept of redundancy is central to enhancing the safety and reliability of complex technologies. An element of a system is redundant if there are backups to do its work if it fails.

Clearly, CNL considered adaptive management in the design of its monitoring program. It is unclear, however, how the notion of adaptive management capacity influenced CNL's evaluation of alternative means as well as its assessment of the proposed NSDF. It is in the public's best interest to have a good understanding of how CNL incorporated and operationalized the concept of adaptive management capacity throughout the EIS as it is critical to the long-term safety of the proposed project.

3. CNL's Long-Term Monitoring Plans

CNL's monitoring plans include three key phases: construction, closure and post-closure. As CNL explains in Section 10 of the EIS, the post-closure stage involves institutional control and post-institutional control, which will continue indefinitely after the year 2400. CNL, however, did not provide sufficient detail about the post-closure phase to give the public confidence in the long-term safety of the proposed NSDF project.

Indeed, the insufficient detail provided in the EIS suggests that CNL intends to abandon the waste once the NSDF project has been transferred into post-institutional control. CNL must provide adequate detail about its plans for the long-term monitoring of the NSDF, as future generations will bear the costs and impacts of the project for hundreds of thousands of years to come.

At this juncture in the EA process, CNL has an opportunity to incorporate the concept of 'rolling stewardship' in planning for the long-term monitoring and safety of the NSDF. As the Canadian Coalition for Nuclear Responsibility explains, rolling stewardship involves:

- Plans for the accurate transmission of information from one generation to the next;
- Plans for the transfer of responsibility from one generation to the next, e.g., a 'changing of the guard' every 20 years;
- Plans for the recharacterization of the waste when necessary;
- Plans to rapidly detect and correct any leakages or other problems;
- Plans for the retrieval of waste as appropriate; and
- Plans for continual adaptive management and monitoring.

In the section, below, CELA provides a summary of the major deficiencies identified with respect to the above described components of CNL's EIS. The section ends with a table presenting associated Information Requests.

Summary of Deficiencies and Information Requests

CNL defined and used three criteria (technical feasibility, economic feasibility, and environmental effects) to evaluate the alternative means and the preferred NSDF option. But CNL did not discuss the relative contributions of the alternative means and the preferred NSDF option to sustainability. Nor did CNL explain the process by which it incorporated sustainability concerns in its evaluations.

In addition, CNL set out other principles (CNL design principles, INPO nuclear safety culture principles, IAEA safety principles) and CNSC licensing requirements, asserting that these provided the context for its evaluation. It did not, however, show how these principles and requirements influenced the analysis and conclusions.

CNL's comparative evaluation of alternative means clearly did not capture the complexities in the decisions that must be made in alternative means assessment. Critical questions remain about the trade-offs among the options with respect to their respective contributions to sustainability. These unaddressed trade-offs are especially evident in CNL's 'Evaluation of Alternatives' summary tables for facility type, facility design, facility location, and site selection.

Clearly, CNL considered adaptive management in the design of its monitoring program. It is unclear, however, how the notion of adaptive management capacity influenced CNL's evaluation of alternative means as well as its assessment of the proposed NSDF.

Finally, CNL did not provide sufficient detail about the post-closure phase to give the public confidence in the long-term safety of the proposed NSDF project. At this juncture in the EA process CNL has an opportunity to incorporate the concept of 'rolling stewardship' in planning for the long-term monitoring and safety of the NSDF.

In order to clearly demonstrate to the public that the NSDF option is the best option in light of net contributions to sustainability, CNL must provide the following additional information in response to the Information Requests we provide in Table 1 below.

Table 1. Information Requests

IR#	Information Request
#1	Please provide a description of the sustainability-based criteria used to evaluate and compare the alternative means as well as the effects of the preferred NSDF option.
#2	Please describe how the three evaluation criteria (technical feasibility, economic feasibility, and likely environmental effects), CNL design principles, INPO nuclear safety culture principles, IAEA safety principles, and CNSC licensing requirements constitute relevant sustainability considerations.
#3	Provide a description of the process by which consideration for sustainability contributions was incorporated throughout the assessment and design of the preferred NSDF option.
#4	Provide a comparative evaluation of the alternative means in terms of their relative contributions to sustainability in order to clearly demonstrate to the public that the NSDF is the best option with respect to net contributions to sustainability.
#5	Describe and demonstrate how trade offs were considered among the options in the comparative evaluation of alternative means.
#6	Describe how reversibility, retrievability, diversity, and redundancy were incorporated in (a) the comparative evaluation of alternative means and (b) the design and assessment of the preferred NSDF option.
#7	Provide in-depth plans for the long-term monitoring of the NSDF during the post-institutional control phase.
#8	Provide a description of how the concept of rolling stewardship will be applied in all phases of monitoring for the NSDF.

II. HUMAN HEALTH AND SAFETY

This chapter will set out omissions and questionable matters on human health and safety matters, contained in two draft CNL documents issued on March 17, 2017 as follows:

- CNL Near Surface Disposal Facility Project EIS. Report 232-509220-Rept-004 (hereafter "Draft EIS") as amended
- CNL Performance Assessment for Near Surface Disposal Facility to support the Environmental Impact Statement. Report 232-509240-ASD-001 (hereafter "PA")

In addition, important health matters are expected to be contained in the following CNL documents which CELA has requested but not yet received due to being marked "security sensitive"[1]:

- NSDF Safety Analysis Report (page 5-548 of the draft EIS states "Worker dose is being assessed as part of the Safety Analysis Report")
- NSDF Criticality Safety Document NSDF-503230 – CSD-001 Deliverable 3.8 (ISR 2017a)
- Unredacted version of NSDF Waste Acceptance Criteria Document Revision 2. 232-508600 WAC002

1. Oversights and Issues with the Draft EIS

1.1 Public Availability of Documents

Several important CNL documents are not yet available for public examination, including an unredacted version of CNL's Waste Acceptance Criteria (WAC) report, its Safety Analysis Report (SAR), and its Criticality Safety Analysis (CSAR) report.

CELA's requests for these documents were denied because they were marked "security sensitive." CELA's inability to obtain these reports, even in part, reflects a process which is neither transparent nor conducive to public review. CELA notes that this submission is not an endorsement of this review process, nor its ability to facilitate meaningful public engagement.

Furthermore, these reports are likely to contain information pertinent to the overall project, particularly CNL's report on criticality. Relatively large amounts of fissile nuclides, including U-235 and Pu-239, are proposed for the facility. Unless it can be demonstrated beyond reasonable doubt

[1] In an email to CELA dated August 8, 2017 from CNL's Pat Quinn, Director of Corporate Communications, CELA was informed that the Criticality Safety Document NSDF-503230-CSD-001 Deliverable 3.8 and the Safety Analysis Report were "not available for release to the public" as they contained "security sensitive" information.

that the probability of a criticality incident (ie. an uncontrolled chain reaction such as that which occurs in a nuclear bomb) involving these nuclides at the proposed facility is extremely remote, the project should not proceed.

1.2 Waste Categories

The CNL documents contain several definitions of LLW and ILW (to be stored at the proposed site) in an attempt to differentiate such radioactive wastes from HLW (not to be stored at the proposed site). These definitions are unsatisfactory.

On the other hand, the IAEA's Specific Safety Guide for near surface disposal facilities (SSG-29, *Near Surface Disposal Facilities for Radioactive Waste*) makes clear that:

- Neither ILW (ie. lasting more than a few hundred years) nor HLW should be placed in these facilities
- Near-surface disposal is an appropriate disposal option only for very low-level wastes, and
- ILW and HLW, which contain larger quantities of long-lived radionuclides should not be stored in surface or near surface facilities.[2]

Despite this guidance, the Draft EIS is proposing that the NSDF should contain some ILW (ie. less than 1% by volume). Since the volume of wastes is 1,380,000[3] cubic metres, this still means that 13,800 cubic metres of ILW is proposed to be placed in the NSF. This is a large amount and is expected to contain the heat-generating wastes.

1.2.1 Heat-Generating Wastes

The reports also state that heat–generating HLW, such as spent nuclear fuel and reprocessing wastes, will not be disposed of at the site, but large amounts and concentrations of heat-generating nuclides, including Cs-137, Sr-90 and several actinides are proposed to be stored on site, as shown in table 4.2 of the PA report.

For example, it can be calculated (as shown in the table below) that about 160 kilos of heat-generating Cs-137 is proposed to be disposed of in the NSF. This is a large amount of Cs-137 relative to the small amounts emitted annually at most nuclear reactors.

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[2] IAEA Safety Standard, SSG-29, *Near Surface Disposal Facilities for Radioactive Waste* (2014)
[3] CNL Performance Assessment for Near Surface Disposal Facility to support the Environmental Impact Statement. Report 232-509240-ASD-001, amended Table 4-2

Nuclide	Radioactivity Bq	Specific activity Bq/g	Weight g	Weight kg
^{137}Cs	5.31E+17	3.3E+12	1.6E+05	160

The presence of these heat-generating wastes acts to blur the CNL's waste definitions. In CELA's view, the question - should the wastes to be stored at the proposed facility be properly categorised as HLW as well as LLW and ILW? - needs to be addressed.

1.3 Possible High Temperatures

On page 3-11, the draft EIS states "…waste shall have a thermal power rate below 2 kilowatts per cubic metre (kW/m^3) for LLW in accordance with CSA Standard N292.0-14 *General Principles for the Management of Radioactive Waste and Irradiated Fuel*."

However, CELA questions whether the CSA's proposed 2 kW per m^3 restriction is adequate. When the proposed facility is full (ie. containing 1.38 million cubic metres of wastes), the facility in theory could be generating more than 2 GW of heat. This is a huge amount of heat as it is approximately equivalent to the heat output of a large operating Pressurised Water Reactor (PWR).

The IAEA's General Safety Guide (GSG – 1) Classification of Radioactive Waste states in para 2.33 that "Management of decay heat should be considered if the thermal power of waste packages reaches several watts per cubic metre."[4] This is ~1,000 times more restrictive than CNL's 2 kW per cu metre. Para 2.33 adds that "More restrictive values may apply, particularly in the case of waste containing long-lived radionuclides", as is the case here.

The following questions must therefore be answered:

- What are the estimated heat production rates (kW per m^3) when the facility starts (ie. with 450,000 m^3 in place) and ends (ie with 1,380,000 m^3 in place)?
- What is the maximum temperature envisaged within the engineered containment mound (ECM)?
- What is the safe temperature limit?
- What controls are in place to ensure that temperatures within the facility do not exceed the safe limit?
- What provisions are made for cooling and ventilation?

[4] IAEA Safety Standards Series No. GSG-1, *Classification of Radioactive Waste* (2009), available online: http://www-pub.iaea.org/books/iaeabooks/8154/Classification-of-Radioactive-Waste

- What specific fire risks are envisaged?
- What specific provisions are made for fire prevention and fire control?

Unless sufficient assurances can be given on heat rates, maximum temperatures and fire risks within the waste facility, the proposed project should not proceed.

1.4 No 'Justification' of Radiation Exposures Provided

The International Commission on Radiological Protection (ICRP) has established three principles for all practices involving radiation exposures to the public: justification, optimisation and limitation. Justification, according to the ICRP, requires that collective doses arising from the practice have to be evaluated and compared with any benefits accruing from the facility.

No attempt has been made in the draft CNL documents to "justify" the radiation exposures to people living nearby from the routine emissions from the proposed facility, for instance, from the proposed annual tritium emissions of 6.5 TBq.

1.5 No Discussion of Chalk River Nuclear Accidents in 1952 and 1958

The CNL reports reviewed do not mention the two major nuclear accidents which occurred at Chalk River in the 1950s and their ensuing wastes. CELA reminds the Commission of the partial meltdown which occurred in 1952 at the National Research Experimental reactor operated by Atomic Emergency of Canada Limited (AECL) and of the second event in 1958, involving a fuel rupture and fire in the National Research Universal (NRU) reactor building.

It is likely that highly radioactive debris from these accidents still exist given the long half-lives of the nuclides involved. CELA asks that information on the nuclear wastes from these accidents be given in the Draft EIS.

1.6 High Annual Tritium Emissions

The Draft EIS report (see Table 4-2) estimates that 4.82 E+15 Bq of tritium will be initially stored at the facility. This is a very large amount of tritium; 4,820,000,000,000,000 Bq of tritium to be exact.

Table 7.1 on page 7-7 of the PA report states that in 2070 the tritium emission rate per second will be 12,000 Bq. From this estimate, it can be back-calculated that in 2020, the airborne emission rate of tritium (both tritiated hydrogen gas, HT, and tritated water vapour, HTO) from the facility will initially be 6.5 E+12 Bq per year. This is a high emission rate, exceeding annual tritium emissions from most nuclear power plants in North America (though not heavy water reactors). However, it is only roughly one thousandth of the above amount of tritium in the facility. In other words, tritium emissions may even be higher than estimated in the PA report.

CELA asks if the estimated annual tritium emission rate is correct, given the relatively high temperatures in the facility and the consequent high evaporisation rates of tritium, and given the extreme mobility of tritium? Furthermore, how was the tritium emission estimate in table 7.1 derived? What models and assumptions were used in its derivation?

By 2070, and assuming for the purposes of these calculations that no more wastes are added, the amount of tritium in the facility will have decayed to an estimated 2.9 E+14 Bq and the annual amount of tritium emitted to air will have declined to 4.0 E+11 Bq. Again, only about one thousandth of the amount stored is estimated to be emitted each year by 2070.

1.7 No Estimates of Annual Tritium Uptakes by Local Population

Because of the high estimated emission rates of tritium to air, tritium intakes (ie. via inhalation, ingestion, and skin absorption) would be an important health consideration for local people. Tritium doses from air emissions will be much greater than doses from the ingestion of tritiated water leachates. No Bq estimates are made for annual tritium intakes in local residents. These estimates should be carried out.

1.8 Organically Bound Tritium

Exposures to workers and local people from organically-bound tritium (OBT) are not mentioned in the documents. These are serious omissions.

1.9 No Collective Dose Estimates

The CNL reports do not contain estimates of collective doses, that is population doses, arising from the facility for the people living in or near Chalk River, Ontario. These are also serious omissions.

1.10 No Consideration of Existing Nearby Pollution

The CNL's documents do not consider the need for remediation of the massive groundwater contamination nearby on the Chalk River site. Neither do the CNL's documents discuss the radiation exposures to local populations from this existing contamination and annual releases at Chalk River. It appears that CNL is proposing to add to these problems rather than deal with them. Therefore remediation of these areas, with proper containment and treatment of leachates (which continue to be generated) should be discussed in the CNL's reports.

2. Technical Matters

2.1 Need for Separate ILW and LLW Tables

Table 4.2 of the PA report sets out the nuclide inventories of the proposed NSDF. However, this single table mixes intermediate and low-level wastes.

In addition to table 4.2, it is necessary to show two separate tables - one each, for ILW nuclide amounts and LLW nuclide amounts (and possibly a table for HLW nuclide amounts).

It should be noted that previous discussions which limited ILW to short-lived wastes no longer apply in these documents. The PA report makes clear (page 4-2) that ILW will contain some very long-lived wastes.

2.2 Lax Limit for Tritium in Drinking Water

Section 4.2 of the PA report states that a drinking water limit of 7,000 Bq per litre is used in the assessment. This is extremely lax given the current recommendation of the Ontario Drinking Water Advisory Council (ODWAC) of 20 Bq per litre.[5] CELA considers that the safer recommended tritium limit of 20 Bq per litre should be used throughout the proposals.

The following table demonstrates various drinking water limits in use.

Table 2. Tritium in drinking water limits

Agency	**Tritium limit** (Bq per litre)
CNL	7,000
US EPA	740
European Union	100
Recommended by Ontario Government's ACES in 1994	20
Recommended by Ontario Government's ODWAC in 2009	20
US State of Colorado	18
US State of California	15

[5] Ontario Drinking Water Advisory Council, *Report and Advice on the Ontario Drinking Water Quality Standard for Tritium* (2009), available online: http://meteopolitique.com/Fiches/nucleaire/documentation/01/Nucleaire_eau-potable-Ontario-Tritium.pdf

2.3 Paucity of Information on Geotechnical and Hydrogeological Site Characterization

The draft EIS contains little information on geotechnical and hydrogeological site characterization. This is required to demonstrate that optimum site selection, site evaluation, and surface and sub-surface drainage issues have been investigated at the selected location. Only one reference (on page 5-168 of the EIS) is given to any site investigation and this only contains an outline summary with little detail.

2.4 Adequacy of Tritium Leachate Prevention Measures

The PA report (section 4.2) states that the tritium inventory available for leaching can be limited by either:

1. Excluding a small number of packages with high tritium content from the NSDF, or
2. Subjecting such consignments to special packaging requirements which are designed to be leak tight and can be credited not to leach during the period of operations.

CELA requests the Commission to ask whether these measures are adequate. Also do they consider preventative measures for the more important tritium-to-air emissions? Further technical discussion is required given the seriousness of the resulting tritium doses to the public.

2.5 No Specific Activity Limits Cited

Section 4.4.2 of the PA report states that specific activity limits were defined for any waste accepted for disposal at the NSDF for:

- All α emitting radionuclide
- All long-lived β and ϒ emitting radionuclides
- All short-lived β and ϒ emitting radionuclides

CELA requests the definitions used for "long-lived" and "short-lived" nuclides and the actual activity limits used by CNL. These explanations and activity limits are not cited in the existing documents provided to date.

2.6 Package Surface Dose Rate Limits

Page 3-11 of the EIS report states that the dose rate limits of Type 5 waste packages for contact-handleable waste are as follows:

- The maximum gamma-radiation level of each waste package, measured on contact, must be less than 2 millisieverts per hour (2 mSv/h);
- The maximum gamma-radiation level of each waste package, measured at 1 m, must be less than 0.1 mSv/h; and,
- The maximum beta-particle radiation field of each waste package, measured on contact, must be less than 10 Sv/h.

CELA requests a response as to whether these estimates are correct, particularly the latter estimate of 10 Sv per hour, which is a lethal dose rate. CELA also asks, what is the dose rate limit for the maximum beta-particle radiation field of each waste package, measured at 1 m?

2.7 Corrections to Data

In table 3.2.1-1 on page 3.8 of the EIS report, CELA seeks clarification as to the entries in the last two lines and whether they are correctly positioned (ie. should they be swapped?). In addition, in table 4-2 of the PA report, is the activity figure for U-238 (1.24E+13 Bq) correct? If so, this would imply about 1,000 tonnes of uranium-238 in the proposed facility.

CONCLUSION

CELA has sought to identify the gaps and omissions in the existing Draft EIS as regards to (a) its consideration of the purposes of CEAA and (b) the project's impacts on human health and safety. CELA requests that all recommendations (see pages 4-5) and information requests (see pages 6-7) be provided before the CNL's proposal for the near surface facility is allowed to proceed.

These comments are additional to our comments dated May 19, 2017 and without prejudice to providing further comments once the extensive amount of missing information and analysis is provided.

All of which is respectfully submitted this 16th day of August, 2017:

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
Per

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Executive Director and Counsel

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