

Critical Flaws, Errors and Omissions in CNSC staff's EA report and case to approve the Chalk River Mound

February 21, 2022

The Environmental Assessment Report, prepared by CNSC staff, is part of a 590 page licensing document, [CMD 22-H7](#), for the Part 1 hearing scheduled for February 22, 2022. The CMD is intended to inform the CNSC Commissioners' consideration of the application to amend the Chalk River Laboratories (CRL) site license to allow construction of the giant radioactive waste mound, known as the "NSDF." The CMD recommends that Commissioners approve the application.

Critical flaws, errors and omissions in CMD 22-H7 must be addressed so that Commissioners have accurate and complete information on which to base their licensing decision.

NB: This is not a comprehensive list of problems with CMD 22-H7. This preliminary list will be modified as additional problems are identified. The current version and updates will be posted [here](#).

Part A ~ CRITICAL FLAWS

1. The report contains **virtually no information** about wastes that would go in the mound.

Section 3 (1) (j) of the *General Nuclear Safety and Control Regulations* requires that an application for a license provide, "**the name, quantity, form, origin and volume of any radioactive waste or hazardous waste**" to be disposed of. The NSDF Environmental Impact Statement only provides a [list](#) of 31 radionuclides that would go in the mound without describing in what waste types they are found (contaminated soils, demolition wastes, commercial wastes, etc.). The radionuclide list is incomplete. Dozens of radionuclides including decay products are missing from the list. There is also no information on quantity, form, origin or volume.

2. Astonishingly, the report makes no mention of long-lived radionuclides

According to the [International Atomic Energy Agency](#) (IAEA), the characteristics of radioactive waste determine what strategies for disposal are acceptable. Significant quantities of “long-lived radionuclides” must be put underground in order to isolate them from the biosphere for the many millennia that they remain hazardous and radioactive.

The proponent’s partial list of radionuclides destined for the dump is [here](#). Twenty-five out of the 31 radionuclides listed in that table are long-lived, with half-lives ranging from four centuries to more than four billion years. They include uranium-233 and plutonium-239 produced for the U.S. nuclear weapons program.

Failure to mention “long-lived radionuclides” or the inability of an above-ground mound to contain them for the duration of their hazard are critical omissions from CMD 22-H7 that make it impossible for Commissioners to make a sound, informed decision on licensing.

3. The report fails to mention Cobalt-60 commercial wastes.

The term “disused sources” does not occur in CMD 22 H-7, despite the fact that the proponent plans to put large numbers of disused, highly radioactive Cobalt-60 sources in the dump. Cobalt-60 (9.06×10^{16} Bq) alone will provide 98% of the initial radioactivity in the dump, even though its radioactivity will rapidly decrease thereafter. Disused sources are only briefly mentioned in the NSDF Waste Acceptance Criteria, the key document providing limits on quantities and radioactivity concentrations of radioactive substances destined for the mound.

Lead shielding must be used to protect workers handling these wastes. Roughly 200 tonnes of lead shielding would be disposed of in the dump, leading to contamination of groundwater. Risks to workers and contamination of groundwater with lead are not discussed in the CMD. Groundwater contamination post-closure is mentioned by CNSC staff but is not considered to be a serious adverse environmental effect.

The International Atomic Energy Agency says that disused Cobalt-60 sources can go into a true near surface disposal facility if they are below a certain concentration of radioactivity(see #3 in Part C below for more on the definition of “near surface disposal”). This is a complex matter that is completely ignored by CNSC staff in CMD 22 H-7. (See item 1 under Part C below for more on this.)

4. Requirements for “waste characterization,” a key step in ensuring safety, are essentially non-existent in the proposed license.

At three places the EA report says "Under CNSC license, Canadian Nuclear Laboratories (CNL) would also have to comply with the CNSC waste characterization requirements as outlined in CNSC Regulatory Document, REGDOC-2.1.1.1 (sic), volume 1." The

document referred to, REGDOC-2.11.1, Volume 1, is not included in the license, so CNL would NOT have to comply with it. And even if it were included in the license, it contains no substantial requirements for waste characterization, stating only that the licensee shall characterize “principal” radionuclides “as applicable”. ([Details](#))

5. The report fails to note deficiencies in the proponent’s siting process

The siting process did not include consideration of any locations other than Atomic Energy of Canada (AECL) properties at Chalk River and Rolphton (which are immediately adjacent to the Ottawa River, a drinking source for millions of Canadians), and AECL’s Whiteshell Laboratories on the Winnipeg River. The International Atomic Energy Agency (IAEA) [says](#) siting is a “fundamentally important activity in the disposal of radioactive waste.” It appears that proximity to contaminated structures awaiting demolition at AECL’s Chalk River Laboratories—not environmental protection—was the priority in the siting for the NSDF.

The proponent and CNSC staff failed to seriously consider alternative sites that would avoid rapid discharge of radioactive and hazardous substances to a major water body, and avoid placing wastes in an area with a high water table.

The southern portion of the mound would be underlain by a feature categorized in 1994 as a ““high-probability” fracture zone,” ten meters wide and over a kilometer long – a potential groundwater flow pathway with “permeability values several orders of magnitude greater than bulk rock mass.” This feature should have eliminated the proposed site from further consideration during the site evaluation stage.

Original site selection criteria announced by the proponent would have excluded any site with more than a 10% slope. The criterion was changed to 25% to allow the chosen site – which lies on the side of a hill, surrounded on three sides by wetlands that drain into Perch Creek 50 metres from the base of the hill, that in turn drains into the Ottawa River less than one kilometre away. Risks of building the NSDF on a hillside - an area of steep slope - are not addressed in CMD 22 H-7.

6. The report fails to address alternative facility types that would better contain the wastes.

According to the International Atomic Energy Agency, a “disposal facility at or near the surface makes it susceptible to processes and events that will degrade its containment and isolation capacity over much shorter periods of time.” Such a facility is not suitable for long-lived radioactive materials according to the IAEA.

Thus the proposed facility would not be in compliance with international safety standards/practice for radioactive waste disposal. The facility would violate a key principle of radioactive waste management - that the radioactive inventory must decay to an

internationally accepted level within the design life of the facility to allow release from regulatory oversight.

The report does not address alternative facility types that would better contain the wastes and not expose them to rain, wind, and snow; and would not require unproven water treatment or “weather cover structure” technologies.

7. There is relatively little about human health risks in the document, beyond the unsupported assertion that radiation doses will be within “acceptable limits.”

These assertions are based on non-transparent models with numerous built-in assumptions. Use of these models results in large uncertainties in assessments of risks and doses. The International Nuclear Workers’ Study ([INWORKS](#)) suggests radiation risks are greater than previously understood and exist even at very low doses.

The report also fails to consider future human exposures to nuclear waste packages containing plutonium and other long-lived substances that will remain dangerously radioactive for tens of thousands of years.

8. The report contains no discussion of “end state” objectives.

Long-lived radionuclides proposed for disposal in the mound - if present in packaged wastes at maximum permitted limits - would not decay to clearance levels for thousands to millions of years.

At 1600 years post-closure, the entire contents of the mound would exceed unconditional clearance levels by more than five-fold, even if all radionuclides were evenly distributed throughout. Hence removal from regulatory control would not be possible for millennia.

CNSC’s environmental assessment report is supposed to cover all licensing stages, including decommissioning and abandonment (removal from regulatory control). But it contains absolutely no mention of an end-state report. This is a fatal omission in the environmental assessment.

More information on this here:

<https://concernedcitizens.net/2022/02/15/cnscs-ea-report-for-the-chalk-river-mound-failure-to-consider-end-state-objectives/>

9. Possible threats to the mound’s integrity, including earthquakes, floods, fires, tornadoes, malfunctions, and accidents were dismissed as “not significant” with no credible analysis.

The Ottawa River is a major fault line and the CRL is completely within the Western Quebec [seismic area](#). The Ottawa Valley has become [tornado prone](#) in recent years and

climate change is increasing the frequency of extreme rainfall events, floods and fires. None of these threats was seriously assessed in the report.

10. The report fails to address the potential for scavenging by future populations.

Human Intrusion after the Institutional Control Period is usually the safety-limiting factor for a near-surface disposal facility. The CNSC staff's EA report includes two scenarios for inadvertent human intrusion, but is mute on the much more likely scenario of scavengers digging into the mound for scrap metal. The NSDF is expected to contain an estimated 33 tonnes of aluminum, 178 tonnes of lead, 3,520 tonnes of copper, and 10,442 tonnes of iron. There is no discussion in the report of the need to prevent scavenging of these materials.

11. The report poorly describes the expected degradation of the mound through a process of “normal evolution”

The Performance Assessment report prepared by the proponent describes [the mound's eventual degradation](#) after 300 years. At that time the mound would still contain large quantities of dangerous long-lived radioactive materials as well as all of the hazardous wastes disposed of during operation. During the mound's degradation and disintegration, mixed radioactive and hazardous industrial wastes (lead, arsenic, beryllium, mercury, benzene, dioxins, PCBs, etc.) would leak into the Ottawa River, essentially forever. Long-lived radionuclides flowing out of the degraded mound would include plutonium, americium, neptunium and many others.

The EA report does not adequately describe how degradation of the top cover, bottom liner, and waste packages will affect the release of the mound's contents. Neither the Performance Assessment nor the EA Report accounts for more rapid mound degradation with more extreme weather events caused by climate change.

The inevitable disintegration of an above-ground mound due to normal and extreme weather, erosion, plant growth, burrowing animals etc. is why landfill type facilities are not suitable for much of the waste that is proposed for this facility.

Part B ~ SERIOUS ERRORS

1. The report includes a **large error** comparing radioactivity in local uranium ore samples to radioactivity in the proposed dump.

CNL **overestimated** radioactivity in local ore samples by 1000 times and incorporated this error in its Safety Case comparison of risks of ingesting ore samples and NSDF waste (more information [here](#)).

CNSC staff then repeated this mistake in Slide 23 in the [powerpoint](#) that accompanies CMD 22 H-7. This slide suggests that radioactivity in the dump would be less than radioactivity in local rocks a few decades after closure. In fact, high-radioactivity waste containers in the dump would exceed levels in surrounding rocks for thousands of years. **This error indicates a need to revise the “Licensed Inventory.”**

2. The report says that “only low-level radioactive waste” would go in the dump.

Wastes with significant quantities of long-lived radionuclides or shorter-lived, high-activity radionuclides are categorized as intermediate level by the IAEA . The [assertion](#) made in October 2017 by Canadian Nuclear Laboratories (CNL) that the NSDF would “only contain low-level radioactive waste,” is misleading and should be corrected. CNL contradicted this in June 2019 when it [told](#) the CNSC: “There are current plans to place ILW [intermediate-level radioactive waste] in aboveground mounds.” Again, IAEA says wastes such as these need to be disposed of underground.

3. The report fails to acknowledge that the mound would not be a “near surface disposal facility”.

The internationally accepted definition of “near surface disposal facility” is “a facility consisting of engineered trenches or vaults constructed on the ground surface or up to a few tens of metres below ground level.” The misnamed NSDF would be similar to a municipal landfill: an above-ground mound 60 feet in height.

Part C ~ OMISSIONS AND OTHER PROBLEMS THAT NEED TO BE ADDRESSED

1. The Waste Acceptance Criteria document is incomplete

According to IAEA TRS-436 guidelines, only sources of Co-60 having a radioactivity lower than $10E+7$ Bq are “low-level wastes” that can be placed in an NSDF. CNL has promised that their waste acceptance criteria (WAC) will be corrected so that only radioactive sources that have reached the regulatory exemption level within 100 years after closure can be accepted into the NSDF. However a revised version of the WAC is not available for the hearing starting February 22, 2022.

The NSDF WAC does not prescribe any radioactivity per unit mass limit for short half-life radionuclides in “leachate-controlled” waste packages. This could enable highly radioactive materials with short half-lives to be disposed of in the dump, by placing them in “leachate-controlled” waste packages.

The proponent provided no description of the leachate-controlled packages to CNSC and the packages are not mentioned or described in CMD 22 H-7. There is no evidence provided that “leachate-controlled” waste packages” would stand up to compaction in the mound or prevent water entry.

2. The report contains no analysis of the impacts of the loss of 30 hectares of high-quality mature forest.

There is no information about **the fate of the tens of thousands of trees** that would be sacrificed for this project. These trees are home for at-risk bats, birds, and many other forms of wildlife. Will the trees be piled and burned? The report is silent on this. These trees are already contaminated with tritium and carbon-14 from years of radioactive gas releases at Chalk River. Will these contaminants now be spread further? What are the impacts of clear-cutting a large forest area on surface and groundwater movement?

3. The EA report fails to mention the truckloads of radioactive demolition waste piled up in shipping containers at Area H that CNL plans to directly abandon in the dump.

There is no evidence the contents of these intermodal shipping containers have been properly analyzed. This would represent an extraordinary means of disposal of radioactive waste, never done before at any disposal facility anywhere in the world.

4. Risks of transporting wastes to the facility have not been considered.

Indigenous communities are on record as opposing transport of radioactive materials through their territories. An Ottawa City Council resolution in April 2021 opposed importation of radioactive waste into the Ottawa Valley. Legacy federal wastes from three provinces are destined for the dump along with commercial wastes from many locations.

Risks associated with transportation, including accidents, worker exposures, public exposures and double-handling are not addressed in the report.

5. The report does not acknowledge or adequately address the serious problem that the groundwater table is at the surface

CNSC staff say “slope depressurization accompanied by rock blasting will be needed to drain groundwater within the rock mass and lower groundwater elevations. Prior to rock blasting, horizontal drains will be drilled in the rock mass to lower the water table”.

This is an admission that the **groundwater table at the surface is a serious problem** with the chosen site. Nothing about slope depressurization or horizontal drains can be found in the environmental impact statement. There is no definition in the EA report of a “horizontal drain” and there are no references. There is no indication that the concept has been reviewed by a competent hydrogeologist.

6. Neither the Licensed Inventory nor the Waste Acceptance Criteria is included in the draft license

The NSDF Licensed Inventory and the Waste Acceptance Criteria would place limits on total quantities and concentrations of individual radionuclides to be disposed of in the mound. The failure to include these as new conditions in an amended license for the Chalk River Laboratories raises doubts about whether they would be enforced.

7. Environmental impacts of a pipeline to discharge treated leachate directly to Perch Lake are omitted from the report.

This pipeline to the lake would be in use when the ground is frozen or covered with water and treated wastewater cannot be discharged into adjacent wetlands. The report fails to note that the pipeline would directly discharge contaminants, including large quantities of tritium, into a water body that drains into the Ottawa River, 1 km away. Tritium cannot be removed by leachate treatment.

The report fails to identify potential impacts of constructing the pipeline, which could include disturbance of overwintering habitat for at-risk Blanding’s Turtles, disruption of fish spawning habitat, removal of wetland vegetation, and release of drilling mud.

8. A late add-on to the project, referred to as a “weather cover structure,” still remains in the design stage

It is therefore impossible to assess whether or not the structure would have a meaningful impact in protecting the wastes from precipitation and high winds during operation of the facility.

9. The report contains no assessment of migration of the existing contaminant plumes owing to construction activities

The report gives no attention to impacts on the wetlands during the construction phase. The route of the pipeline would pass through the already-contaminated Perch Lake wetlands. Construction of a so-called “exfiltration gallery” to discharge wastes from the mound into adjacent contaminated wetlands would also have significant adverse environmental impacts, further adding to the pulse of radioactive and hazardous substances into the Ottawa River.

Omitting an assessment of migration of the existing contaminant plumes owing to construction activities, and the migration of these plumes owing to changes in surface and groundwater movement after construction, is a serious flaw in the EA report.

10. The report does not discuss a proposed “mitigation” measure, described in the “Consolidated Commitment Report,” of bringing additional Port Hope wastes to Chalk River for disposal in the NSDF.

11. The report contains no mention of Thorium-232, the radionuclide that would be present in the largest amount (mass) in the dump.

Thorium-232 is the radionuclide that would be present in the largest amount (mass) in the dump, according to the licensed inventory found in the Waste Acceptance Criteria. CMD22 H-7 contains not one single mention of this isotope, or its origin in Chalk River wastes generated by efforts to produce U-233 for nuclear weapons (through neutron bombardment of Th-232).

The proponent’s “licensed inventory” includes roughly six tonnes of thorium-232, which decays through radium-228, actinium-228, thorium-228, radium-224, radon-220, polonium-216, bismuth-212, polonium-212, and thallium-208. Of these nine decay products, none are included in the inventory.

The history of production of weapons-grade plutonium and U-233 at Chalk River is critical to understanding the origins (and risks) of the wastes that would go in the NSDF. CNSC's failure to consider waste origins - despite section 3(1)(j) of the *General Nuclear Safety and Control Regulations* - invalidates its assessment of the NSDF.

12. Commercial /industrial wastes are not discussed in the report

Given that Chalk River is Canada's only licensed storage facility for commercial radioactive wastes, it would be reasonable to expect a discussion of commercial and industrial wastes in CMD 22 H-7.

The taxpayers of Canada are paying for commercial waste storage at Chalk River, and they will be paying for the disposal of these wastes in some type of disposal facility when one becomes licensed at some point in the future. There are many important questions around industrial and commercial wastes including risks of transport, long-lived radioisotopes, high-activity wastes, risks to workers, and risks to humans during the post closure period. Indigenous communities and the City of Ottawa are on record as opposing importation of radioactive waste into the Ottawa Valley. These issues should be part of a comprehensive EA report.

13. No independent assessment of cost

CMD 22-H7 states that CNSC staff did not factor "facility lifecycle costs" into their review of the NSDF. Canadian taxpayers would be on the hook for CNL's estimated \$750 million cost for the NSDF. The CNSC's decision on approval will be made with no independent review of this cost estimate or whether the NSDF would provide "value for money". Maintaining an above-ground mound and a waste treatment facility (to deal with leachate from wastes exposed to snow and rain) could result in long-term costs far exceeding those of a properly designed in-ground facility.

14. International safety standards (IAEA SSR-5) require maintaining information on a disposal facility, and prohibit reliance on institutional controls for extended periods of time

There is no discussion in the report of requirement 22 in IAEA Safety Standard SSR-5, which says that plans shall be made for "the arrangements for maintaining the availability of information on the disposal facility." Waste should not be abandoned. SSR-5 also says that "the long term safety of a disposal facility for radioactive waste has not to be dependent on active institutional control." The "NSDF" would rely on institutional controls indefinitely - first during the 300 year "institutional control period," and then in the "post institutional control period" (which continues indefinitely). Perpetual institutional control could be seen as an infinite liability for future generations of Canadians.

15. The report includes a "Consolidated Commitment List" that is essentially a list of 856 unenforceable empty promises

CNSC claims that a "Consolidated Commitment Lists" document prepared by CNL "captures all mitigation measures" and would "become an enforceable condition that is set out in the Commission's decision." Most of these 856 "commitments" merely repeat statements found in CNL's 1661-page EIS, but some are new, such as the provision that any Port Hope waste left over the closure of the two mounds there would be sent to Chalk River for disposal. This would worsen, not mitigate, the environmental impacts of the NSDF. These so-called "mitigation measures" are largely unenforceable, empty promises.

16. The EA report contains no references.

It is not possible to verify statements in the EA report unless references are provided.