

**WWMF Licence Renewal  
Application Reference Material  
for the Public and CNSC  
Website Publication**



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# Record of Decision

DEC 22-H104

In the Matter of

Applicant Ontario Power Generation Inc.

Subject Application for Acceptance of Ontario Power  
Generation's Revised Consolidated Financial  
Guarantee

Date of  
Decision December 6, 2022

**RECORD OF DECISION – DEC 22-H104**

Applicant: Ontario Power Generation

Address/Location: 700 University Avenue, Toronto, Ontario, M5G 1X6

Purpose: Application for Acceptance of Ontario Power  
Generation's Revised Consolidated Financial Guarantee

Application received: August 2, 2022

Hearing: Public Hearing in Writing – Notice of Hearing in Writing  
published on August 10, 2022

Date of decision: December 6, 2022

Panel of Commission: Dr. T. Berube, Presiding Member

<b>Financial Guarantee: Accepted</b>
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## 1.0 INTRODUCTION

1. On [August 2, 2022](#), Ontario Power Generation Inc. (OPG) submitted an application to the Canadian Nuclear Safety Commission<sup>1</sup> (CNSC) for the acceptance of its revised consolidated financial guarantee for the future decommissioning of OPG's nuclear facilities. OPG's current consolidated financial guarantee expires on December 31, 2022. OPG requested that the Commission accept the revised financial guarantee for the 2023-2027 period.
2. The facilities under OPG's consolidated financial guarantee, along with their current operating licences, are as follows:
  - Darlington Nuclear Generating Station (PROL 13.03/2025)
  - Darlington Waste Management Facility (WFOL-W4-355.01/2023)
  - Pickering A and B Nuclear Generating Station (PROL 48.01/2028)
  - Pickering Waste Management Facility (WFOL-W4-350.00/2028)
  - Bruce A and B Nuclear Generating Station<sup>2</sup> (PROL 18.02/2028)
  - Central Maintenance Facility (under PROL 18.02/2028)
  - Central Storage Facility<sup>3</sup> (under PROL 18.02/2028)
  - Western Waste Management Facility (WFOL-W4-314.00/2027)
  - Radioactive Waste Operations Site-1 (WNSL-W1-320.05/2029)
3. OPG's nuclear facilities are located at various sites in the province of Ontario. The Pickering and Darlington Nuclear Generating Stations are located in the traditional territory of the Michi Saagiig Anishinaabe people. These lands are covered by the Williams Treaty between Canada and the Mississauga and Chippewa Nations. The Bruce Nuclear Generating Station location is in the traditional territory of the Anishinabek Nation: the peoples of the 3 fires known as Ojibway, Odawa and Pottawatomie Nations. Thanks are given to the Chippewas of Saugeen, and the Chippewas of Nawash, now known as the Saugeen Ojibway Nation, as the traditional keepers of this land. The Bruce region is also homeland to the Historic Saugeen Métis and to the Métis Nation of Ontario.
4. Subsection 24(5) of the [Nuclear Safety and Control Act](#)<sup>4</sup> (NSCA) provides that a licence may contain any term or condition that the Commission considers necessary for the purposes of the NSCA, including a condition that an applicant provide a financial guarantee in a form that is acceptable to the Commission. The Commission has imposed such licence conditions requiring that OPG maintain an acceptable financial guarantee for the future decommissioning of its nuclear facilities. CNSC regulatory document

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<sup>1</sup> The *Canadian Nuclear Safety Commission* is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal component.

<sup>2</sup> Although operated by Bruce Power, OPG retains ownership of and responsibility for the decommissioning costs associated with the Bruce A and B Nuclear Generating Stations.

<sup>3</sup> The Central Storage Facility is also referred to as the Contaminated Tools Storage Facility or the Contaminated Tooling Storage Facility. The CSF is a newly constructed storage facility to support the Major Component Replacement outages at the Bruce A and B Nuclear Generating Stations.

<sup>4</sup> Statutes of Canada (S.C.) 1997, c. 9.

[REGDOC 3.3.1 Financial guarantees for decommissioning of nuclear facilities and termination of licensed activities](#)<sup>5</sup> provides guidance on the attributes of an acceptable financial guarantee in terms of liquidity, certainty of value, adequacy of value, and continuity.

5. OPG's current consolidated financial guarantee is satisfied by the "Nuclear Funds" which consist of Ontario Nuclear Funds Agreement (ONFA) Funds and the Nuclear Fuel Waste Act (NWFA) Trust. The Nuclear Funds are discussed further in Section 3.2 of this *Record of Decision*. OPG proposed that its financial guarantee continue to be satisfied by the Nuclear Funds for the 2023-2027 period.

#### Issue

6. OPG is required to maintain a financial guarantee for the decommissioning of the nuclear facilities listed in paragraph 2 of this *Record of Decision*, per the conditions of the facilities' respective licences. OPG is required to revise its financial guarantee and associated decommissioning plans at least every 5 years or when requested by the Commission. As such, OPG has revised the preliminary decommissioning plans, the associated cost estimates, and the financial guarantee for the 2023-2027 period. OPG is requesting that the Commission accept its revised financial guarantee.

#### Panel

7. Pursuant to section 22 of the NSCA, the President established a panel of the Commission consisting of Dr. Timothy Berube to consider the application. A [notice of hearing in writing](#) was published on August 10, 2022. The Commission, in conducting a public hearing based on written materials, considered written submissions from OPG ([CMD 22-H104.1](#)) and CNSC staff ([CMD 22-H104](#)). The Commission also considered a written intervention from the Nuclear Transparency Project ([CMD 22-H104.2](#)).

#### Participant Funding Program

8. Pursuant to paragraph 21(1)(b.1) of the NSCA, the Commission has established a [Participant Funding Program](#) (PFP) to facilitate the participation of Indigenous Nations and communities, members of the public and stakeholders in Commission Proceedings or in engagement activities with CNSC staff on matters of regulatory interest. Participant Funding was not made available for this hearing in writing, however, the CNSC received a request for funding from the Nuclear Transparency Project to facilitate their engagement with CNSC staff on this matter. In accordance with the PFP process, the CNSC subsequently provided the Nuclear Transparency Project with \$3,000 to meet with CNSC staff, review the CMDs on the record for this hearing, and to submit an intervention.

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<sup>5</sup> REGDOC-3.3.1 *Financial guarantees for decommissioning of nuclear facilities and termination of licensed activities*, CNSC, January 2021

## 2.0 DECISION

9. Based on its consideration of this matter, as described in more detail in the following sections of this *Record of Decision*, the Commission concludes that the proposed revised financial guarantee for the future decommissioning of OPG's nuclear facilities is acceptable.

Therefore,

<p>the Commission, pursuant to licence conditions imposed on OPG under section 24(5) of the <i>Nuclear Safety and Control Act</i>, accepts the revised consolidated financial guarantee proposed by Ontario Power Generation Inc. for its nuclear facilities located in Ontario for the period from 2023-2027.</p>
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10. With this decision, the Commission accepts OPG's revised financial guarantee of \$20,480 million (January 1, 2023 present value dollars), increasing on a yearly basis to \$22,303 million in 2027, as described in Schedule B of the Fifth Amending Agreement.<sup>6</sup> The Commission accepts OPG's proposed financial guarantee instruments in the form of the Nuclear Funds.
11. The Commission is satisfied that, with this decision, the CNSC Financial Security and ONFA Access Agreement shall be amended to reflect the revised financial guarantee amount in accordance with the Fifth Amending Agreement no later than December 31, 2022.

## 3.0 ISSUES AND COMMISSION FINDINGS

12. The Commission assessed the evidence submitted on the record for this hearing and considered the acceptability of OPG's proposed revised financial guarantee. The Commission considered whether the proposed financial guarantee met the criteria set out in REGDOC 3.3.1 and whether OPG would satisfy the applicable licence conditions for each facility. Each of the nuclear facility licences have a licence condition requiring the Commission's acceptance of its financial guarantee. With the exception of PROL 18.02/2028, each licence has a condition that states:

*"The licensee shall maintain a financial guarantee for decommissioning that is acceptable to the Commission."*

Bruce Power's licence for the Bruce A and B NGS licence, PROL 18.02/2028, contains licence condition 11.2 which states that:

*"The licensee shall notify the Commission of any changes regarding the obligations of decommissioning and financial guarantees under the Lease Agreement with Ontario"*

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<sup>6</sup> Attachment 1, [CMD 22-H104.1](#)

*Power Generation Inc., as described in 15.1”.*

### 3.1 Decommissioning Plans and Cost Estimates

13. OPG submitted information on the revised preliminary decommissioning plans for its nuclear generating stations, nuclear waste management facilities, and other nuclear facilities, and provided information on its plans for the management of used nuclear fuel and low and intermediate level waste.<sup>7</sup>
14. OPG provided the Commission with the cost estimates for its various decommissioning programs from January 1, 2023 onwards and with information on the methodology used to calculate the cost estimates.<sup>8,9</sup> OPG reported that the total decommissioning cost estimate for 2023 is \$20,480 million (January 1, 2023 present value dollars<sup>10</sup>), increasing to \$22,303 million in 2027, as shown in Table 1.<sup>11</sup>

**Table 1: Proposed 2023-2027 Total Financial Guarantee Cost Estimate**

Year	Total Cost Estimate (M\$)
2023	20,480
2024	21,149
2025	21,764
2026	22,140
2027	22,303

15. OPG submitted that the total revised cost estimate for January 1, 2023 had increased by \$919 million, to \$20,480 million, since the last review in 2017.<sup>12</sup> OPG explained that this increase was due to updated planning assumptions including: updated nuclear generating station end of life dates, cancellation of OPG’s proposed low and intermediate level waste deep geological repository project, and updated waste management costs.
16. CNSC staff assessed OPG’s preliminary decommissioning plans and found that the revised plans provide a basis for credible cost estimate for the future decommissioning of OPG’s nuclear facilities.<sup>13</sup> CNSC staff confirmed that OPG’s cost estimation methodology is aligned with both international practices for decommissioning cost estimation and with REGDOC 3.3.1.<sup>14</sup>

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<sup>7</sup> Section 3.0, [CMD 22-H104.1](#)

<sup>8</sup> Tables 2 to 6, [CMD 22-H104.1](#)

<sup>9</sup> Section 4.0, [CMD 22-H104.1](#)

<sup>10</sup> Dollar amounts in this *Record of Decision* are in 2023 present value dollars unless otherwise indicated.

<sup>11</sup> Table 7, [CMD 22-H104.1](#)

<sup>12</sup> Appendix D, [CMD 22-H104.1](#)

<sup>13</sup> Section 3.1, [CMD 22-H104](#)

<sup>14</sup> Section 2.2.3, [CMD 22-H104](#)

### 3.2 Financial Guarantee

17. OPG proposed that its financial guarantee continue to be satisfied by the Nuclear Funds. The Nuclear Funds consist of Ontario Nuclear Funds Agreement (ONFA) Funds, pursuant to [O. Reg. 53/05: PAYMENTS UNDER SECTION 78.1 OF THE ACT](#)<sup>15</sup>, and the Nuclear Fuel Waste Act (NWFA) Trust, pursuant to the [Nuclear Fuel Waste Act](#).<sup>16</sup> CNSC staff provided detailed information on each of these funds in section 2.1 of CMD 22-H104.
18. OPG submitted that the Nuclear Funds are projected to have a fair market value in excess of the proposed cost estimate throughout the 2023-2027 period. The fair market value of the Nuclear Funds is projected to be \$25,148 million on January 1, 2023 and increase to \$28,250 million by January 1, 2027, as shown in Table 2.<sup>17</sup>

**Table 2: 2023-2027 Forecasted Fair Market Value of the Nuclear Funds**

Year	Nuclear Funds (M\$)
2023	25,148
2024	26,102
2025	27,011
2026	27,768
2027	28,250

19. CNSC staff provided the Commission with information on the Provincial Guarantee, a guarantee made payable to the CNSC by the Province of Ontario should OPG not meet its decommissioning obligations. CNSC staff noted that OPG met the financial guarantee requirement for the 2018-2022 period without provision of the Provincial Guarantee, and that, given that the value of the Nuclear Funds is projected to exceed the total financial guarantee, OPG anticipates that the Provincial Guarantee will not be required for the 2023-2027 period. CNSC staff assessed OPG's financial guarantee proposal and concurred with OPG that, at this time, a Provincial Guarantee is not required for the 2023-2027 period.<sup>18</sup>
20. OPG provided a draft of the Fifth Amending Agreement to the CNSC Financial Security and ONFA Access Agreement.<sup>19</sup> The primary purpose of the amendment is to update the financial guarantee amount on a yearly basis from 2023-2027. CNSC staff confirmed that, should the Commission accept OPG's proposed financial guarantee, the Fifth Amending Agreement will be signed by the parties responsible for its execution.<sup>20</sup>
21. CNSC staff assessed OPG's revised financial guarantee against the criteria set out in

<sup>15</sup> O. Reg 53/05 under the [Ontario Energy Board Act](#), S.O. 1998, c.15, Sched B

<sup>16</sup> S.C. 2002, c. 23

<sup>17</sup> Table 8, [CMD 22-H104.1](#)

<sup>18</sup> Section 2.2.5, [CMD 22-H104](#)

<sup>19</sup> Attachment 1, [CMD 22-H104.1](#)

<sup>20</sup> Section 2.2.5, [CMD 22-H104](#)

REGDOC 3.3.1 and determined that the financial guarantee met the criteria pertaining to liquidity, certainty of value, adequacy of value, and continuity.<sup>21</sup> CNSC staff reported that OPG's proposed financial guarantee for the 2023-2027 period is adequate for the decommissioning of the facilities and recommended that the Commission accept the revised consolidated financial guarantee.<sup>22</sup>

22. CNSC staff confirmed that OPG is required to report annually to the CNSC on the status and adequacy of the financial guarantee. CNSC staff reported that OPG has satisfied this requirement throughout the current financial guarantee term through the submission of an annual written report and ONFA year-end statements.<sup>23</sup>

### 3.3 Intervention

23. The intervention by the Nuclear Transparency Project ([CMD 22-H104.2](#)) provided several recommendations pertaining to transparency and accessibility of financial guarantee information. The Commission acknowledges the importance of transparency and encourages OPG and CNSC staff to continue to make relevant financial guarantee information available to the public and to consider the recommendations raised by this intervenor.

### 3.4 Commission Findings

24. Following the Commission's analysis of the evidence submitted on the record for this hearing, the Commission concludes that OPG's proposed financial guarantee instruments and revised financial guarantee amount are acceptable. The Commission is satisfied that OPG's revised preliminary decommissioning plans provide the basis for a credible cost estimate. The Commission is also satisfied that OPG continues to meet licensing requirements related to financial guarantees. The Commission comes to these conclusions on the basis that:
  - The Commission agrees with CNSC staff's assessment that OPG's financial guarantee submission meets the criteria set out in REGDOC-3.3.1.
  - The Commission agrees with CNSC staff's assessment that OPG's revised preliminary decommissioning plans provide the basis for a credible cost estimate for the future decommissioning of the nuclear facilities covered under OPG's consolidated financial guarantee.
  - The Commission is satisfied that the Nuclear Funds are appropriate financial guarantee instruments per REGDOC 3.3.1.
  - The Commission agrees with CNSC staff's assessment that the proposed consolidated financial guarantee is adequate for the future decommissioning of the nuclear facilities covered under OPG's consolidated financial guarantee.

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<sup>21</sup> Executive Summary, [CMD 22-H104.1](#)

<sup>22</sup> Section 3, [CMD 22-H104](#)

<sup>23</sup> Section 2.2.6, [CMD 22-H104](#)

25. The Commission notes that OPG is required to report annually to the CNSC on the status and adequacy of the financial guarantee. The Commission expects to be notified if CNSC staff identify any concerns with the adequacy of the financial guarantee in its review of the annual reports.
26. The Commission expects to be informed should there be an impact on decommissioning cost estimates due to revised decommissioning timelines, such as any future changes to the anticipated end of life dates of the nuclear facilities.

#### 4.0 CONCLUSION

27. The Commission concludes that OPG's proposed revised financial guarantee will continue to provide for the future decommissioning of OPG's nuclear facilities. Therefore, the Commission accepts OPG's proposed revised financial guarantee for 2023-2027. The Commission is satisfied that, with this decision, the CNSC Financial Security and ONFA Access Agreement shall be amended to reflect the revised financial guarantee amount in accordance with the Fifth Amending Agreement.

Timothy  
Berube

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Timothy Berube  
Date: 2022.12.06  
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Dr. Timothy Berube  
Presiding Member,  
Canadian Nuclear Safety Commission

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Date



**2024 PREDICTIVE EFFECTS ASSESSMENT  
ADDENDUM FOR THE WESTERN WASTE  
MANAGEMENT FACILITY EXPANSION PROJECT  
– MULTI-PURPOSE STORAGE BUILDING**

**01098-REP-79139-00006 R001**

**REPORT PREPARED FOR:**

Ontario Power Generation  
Nuclear Sustainability Services,  
Western Waste Management  
Facility  
177 Tie Rd  
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**REPORT PREPARED BY:**

Ecometrix Incorporated  
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<b>ONTARIOPOWER</b> GENERATION	
ACCEPTED .....	<input checked="" type="checkbox"/>
ACCEPTED AS NOTED .....	<input type="checkbox"/>
REVISE AND RESUBMIT .....	<input type="checkbox"/>
<u><i>Cammie Cheng</i></u> Signature	<u>May 29, 2025</u> Date
Name : Cammie Cheng	
Department : Nuclear Environment Projects Support	
THIS ACCEPTANCE DOES NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS OR OMISSIONS OR FROM ANY OBLIGATIONS OR LIABILITY UNDER THIS CONTRACT.	

**2024 PREDICTIVE EFFECTS ASSESSMENT  
ADDENDUM FOR THE WESTERN WASTE  
MANAGEMENT FACILITY EXPANSION PROJECT  
– MULTI-PURPOSE STORAGE BUILDING**

**01098-REP-79139-00006 R001**



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## REVISION HISTORY

Revision Number	Date	Comments
R000	15-Nov-2024	Initial issue of report.
R001	27-May-2025	Revised to incorporate: <ul style="list-style-type: none"><li>• Section 1.2 – Comparison of assumptions with 2016 WWMF Expansion Project PEA</li><li>• Section 7.1.1.1 – Consideration of Species at Risk</li></ul>

## LAND ACKNOWLEDGMENT

OPG acknowledges that the Nuclear Sustainability Services – Western Waste Management Facility is located on the traditional territory of the Chippewas of Saugeen First Nation and the Chippewas of Nawash Unceded First Nation, collectively known as the Saugeen Ojibway Nation, who are the traditional keepers of the land. The area is also home to many diverse First Nations, Inuit and Métis peoples and as a company, we remain committed to fostering positive and mutually beneficial relationships with Indigenous people and communities across Ontario.

## LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
AO	Aesthetic Objective
BEC	Bruce Eco Industrial Park Worker
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environmental Quality Guidelines
CNSC	Canadian Nuclear Safety Commission
CO	Carbon Monoxide
COPC	Contaminant of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSM	Conceptual Site Model
DGR	Deep Geological Repository
DSC	Dry Storage Containers
ECA	Environmental Compliance Approval
ECCC	Environment and Climate Change Canada
EcoRA	Ecological Risk Assessment
EMP	Environmental Monitoring Program
EMS	Environmental Management System
ERA	Environmental Risk Assessment
ESA	Endangered Species Act
HHRA	Human Health Risk Assessment
ILW	Intermediate Level Waste
L&ILW	Low-Level and Intermediate-Level Waste
LOPB	Large Object Processing Building
LLSB	Low Level Storage Building
LLW	Low Level Waste
MAC	Maximum Acceptable Concentration
MCR	Major Component Replacement
MECP	Ontario Ministry of Environmental, Conservation and Parks
MPSB	Multi-Purpose Storage Building
MWMT	Maximum Weekly Mean Temperatures
NEW	Nuclear Energy Worker
NHIC	Natural Heritage Information Centre
NOx	Nitrogen Oxide Compounds
NSS-WWMF	Nuclear Sustainability Services – Western Waste Management Facility
OPG	Ontario Power Generation
PEA	Predictive Effects Assessment
PERA	Predictive Environmental Risk Assessment
PM	Particulate Matter

PWQO	Provincial Water Quality Objectives
QA	Quality Assurance
RCSB	Retube Component Storage Building
SAR	Species at Risk
SARA	Species at Risk Act
SARO	Species at Risk in Ontario
SCS	Site Condition Standard
SG	Steam Generator
SGSB	Steam Generator Storage Building
SGSS	Steam Generator Storage Solution
SOx	Sulfur Dioxide Compounds
SRD	South Railway Ditch
TLD	Thermoluminescent Dosimeters
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UCLM	Upper Confidence Limit of Mean
WD	West Ditch
WSP	Water Supply Plant
WWMF	Western Waste Management Facility

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## 1.0 Introduction

Ontario Power Generation (OPG) plans to construct and operate the Multi-Purpose Storage Building (MPSB) within a parcel of land referred to as the “North Site” (also the “North Yard”) within the existing Nuclear Sustainability Services – Western Waste Management Facility (NSS-WWMF), situated on the Bruce Power nuclear site (**Figure 4-2**). The structure will be used to store sixty-four (64) steam generators (SGs) accepted as part of neighbouring Bruce Power’s ongoing Major Component Replacement (MCR) activities. The 64 SGs include twenty-four (24) SGs currently stored at the NSS-WWMF’s Steam Generator Storage Building (SGSB) and an additional forty (40) SGs set to be removed from the Unit 3, Unit 4, Unit 5, Unit 7 and Unit 8 reactors from Bruce Power. The 24 SGs stored within the SGSB will be transferred to the MPSB before an additional eight (8) SGs are transferred from Bruce Power’s Unit 3 to the MPSB in late 2024. An additional thirty-two (32) SGs will be delivered from Bruce Power to the MPSB over the lifetime of the MCR program, beginning with SGs from Bruce Power’s Unit 4 near the end of 2025.

To accommodate the proposed MPSB, it is necessary to demonstrate to the Canadian Nuclear Safety Commission (CNSC) and the Ontario Ministry of Environment, Conservation and Parks (MECP) that the MPSB will have no significant adverse environmental impacts. The preparation of this Predictive Effects Assessment (PEA) Addendum is intended to supplement the 2016 WWMF Expansion Project PEA (AMEC, 2016), which would not have specifically considered the potential for environmental effects from the proposed MPSB as its specific design was not finalized during the preparation of the 2016 PEA. This PEA Addendum may also be relied upon to support future ERAs and/or PERAs completed for other NSS-WWMF projects, as applicable. It should be noted that the term “predictive effects assessment” is equivalent to the predictive environmental risk assessment (PERA) as defined in Canadian Standards Association (CSA) N288.6:22, *Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills* (CSA, 2022); both a PEA and PERA attempt to estimate the effects of contaminants and/or biophysical stressors on human health and the environment (including wildlife) resulting from the development of a new facility or other facility changes.

This PEA Addendum has been prepared to meet the requirements outlined in CSA N288.6:22 (CSA, 2022) and CNSC REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (CNSC, 2020). Clause 11.1 of CSA N288.6:22 and Section 4.1.1 of REGDOC-2.9.1 both identify the need for a revised predictive environmental risk assessment when there is a proposed major facility change. From OPG’s perspective, construction and operation of the MPSB is not considered a proposed major facility change, as the development of the North Site had previously been assessed in the 2016 WWMF Expansion Project PEA (AMEC, 2016) and is currently approved for development and licensed for nuclear waste management. Given that the construction of a number of low- and intermediate-level waste (L&ILW) buildings (e.g., Low Level Storage Building [LLSB], Retube Component Storage Building [RCSB] and SGSB) had been previously assessed in the 2016 PEA, the intent of this PEA Addendum is to demonstrate that any environmental or human health impacts resulting from

the MPSB Project are bounded by the results and conclusions presented in the 2016 PEA and to support the licensing process for the NSS-WWMF.

## 1.1 Indigenous Communities and Engagement

Indigenous peoples inhabit numerous communities within the vicinity of the NSS-WWMF. The Bruce nuclear site is situated within the traditional lands and treaty territory of Saugeen Ojibway Nation (Bruce Power, 2024). Saugeen Ojibway Nation comprises the Chippewas of Nawash Unceded First Nation (Neyaashiinigmiing) and the Chippewas of Saugeen First Nation. Saugeen Ojibway Nation has two main on-reserve communities located approximately 30 km (Chippewas of Saugeen First Nation Reserve No. 29) and 80 km (Cape Croker Reserve No. 27) north of the Bruce nuclear site. Traditional hunting-ground reserves used by members of the First Nations communities are located approximately 115 km north of the Bruce nuclear site. Other Indigenous communities nearby include the Georgian Bay Métis Nation of Ontario and the Historic Saugeen Métis (Bruce Power, 2024).

## 1.2 Comparison with 2016 WWMF Expansion Project PEA

As described in the 2016 WWMF Expansion Project PEA (AMEC, 2016), OPG previously proposed expanding the NSS-WWMF to accommodate additional buildings for the processing and storage of used fuel and L&ILW including construction and operation of:

- Four Used Fuel Dry Storage Buildings (UFDSB 5 to 8);
- Four L&ILW storage buildings (any combination of Low Level Storage Building (LLSB), Retube Component Storage Building (RCSB) and Steam Generator Storage Building (SGSB));
- One Waste Sorting Building (WSB);
- One Large Object Processing Building (LOPB); and,
- Repurposing an existing LLSB or using one of the new LLSBs for staging and overpacking of L&ILW.

As the 2016 PEA considered the construction and operation of buildings designed for the storage of SGs, the intent of this PEA Addendum is to demonstrate which of the MPSB Project's interactions with the environment remain bounded by the 2016 PEA with no further assessment required, and which are not bounded and require further assessment.

**Table 1-1** shows key assumptions of the 2016 PEA and compares them with the assumptions of the MPSB project. This comparison helps identify which assumptions are still valid and which ones need additional consideration in this PEA Addendum.

**Table 1-1: Comparison of MPSB PEA Assumptions with 2016 WWMF Expansion Project PEA**

Environmental Component	Relevant Assumption(s) from 2016 WWMF Expansion PEA Assessment	Comparison with PEA Addendum for MPSB
Atmospheric Environment – Air Quality and Noise	<ul style="list-style-type: none"> <li>No radiological air emissions associated with site preparation and construction activities; radiological emissions during operation assumed to be negligible for SGSBs.</li> <li>Predicted concentrations of non-radiological air quality contaminants and noise levels were modelled assuming simultaneous development of multiple NSS-WWMF expansion areas and the construction and operation of multiple waste storage and waste processing buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Radiological emissions are assumed to be negligible for the MPSB.</li> <li>2016 PEA air quality and noise modelling is bounding of the MPSB.</li> </ul> <p><b>No changes to 2016 PEA assumptions for the MPSB. The 2016 PEA is bounding.</b></p>
Surface Water Environment – Water Quantity and Quality	<ul style="list-style-type: none"> <li>Following site preparation and construction, ground surfaces within the developed expansion areas were assumed to be paved; therefore, minimal infiltration expected in areas of hardened surfaces.</li> </ul>	<ul style="list-style-type: none"> <li>The North Site will remain as a gravel surface following construction of the MPSB; this modification is likely to result in different water quality concentrations and surface water runoff volumes from those predicted in the 2016 PEA. This deviation from the 2016 PEA is only applicable to the operation and maintenance phase; the assessment of surface water impacts during the site preparation and construction phases remain bounded by the 2016 PEA. The potential impact of the gravel surface on the surface water environment during the operation and maintenance phase will be assessed in this PEA Addendum.</li> </ul>

Environmental Component	Relevant Assumption(s) from 2016 WWMF Expansion PEA Assessment	Comparison with PEA Addendum for MPSB
		<b>The 2016 PEA is <u>not</u> bounding for the operation and maintenance phase of the MPSB (see Section 5.1.2.1).</b>
Aquatic Environment	<ul style="list-style-type: none"> <li>Potential effects to the aquatic environment and aquatic receptors are dependent on project interactions with the surface water environment.</li> </ul>	<ul style="list-style-type: none"> <li>Potential interactions with the surface water environment during the operation and maintenance phase are different from those assessed in the 2016 PEA; the potential impact of the gravel surface on ecological receptors will be assessed in this PEA Addendum.</li> </ul> <p><b>The 2016 PEA is <u>not</u> bounding for the operation and maintenance phase of the MPSB (see Section 5.1.2.2).</b></p>
Groundwater – Quality and Quantity	<ul style="list-style-type: none"> <li>Hardened surfaces impose the greatest potential change to precipitation recharge, which has the greatest negative effect on groundwater quantity.</li> <li>Project activities will not interact with groundwater locally in any appreciable way such that new contaminants will be introduced into groundwater through precipitation recharge.</li> <li>The existing tritium plume migration direction within the footprint of the NSS-WWMF may be influenced by changing precipitation recharge rates or interception with deep foundation drains in expansion area #2.</li> </ul>	<ul style="list-style-type: none"> <li>The surface of the North Site will remain as a gravel surface; precipitation recharge will be comparable to existing conditions. Thus, there are no expected interactions with groundwater quantity or influence of the existing tritium plume that are not bounded by the 2016 PEA.</li> <li>There are no planned MPSB activities that have the potential to introduce new contaminants to the groundwater environment than those already considered in the 2016 PEA.</li> </ul> <p><b>No changes to 2016 PEA assumptions for the MPSB. The 2016 PEA is bounding.</b></p>

Environmental Component	Relevant Assumption(s) from 2016 WWMF Expansion PEA Assessment	Comparison with PEA Addendum for MPSB
Geology (Soils)	<ul style="list-style-type: none"> <li>Potential for atmospheric non-radiological contaminants to be deposited to soil surfaces.</li> </ul>	<ul style="list-style-type: none"> <li>2016 PEA air quality modelling is bounding of the MPSB; thus, the assessment of soil quality is bounded.</li> </ul> <p><b>No changes to 2016 PEA assumptions for the MPSB. The 2016 PEA is bounding.</b></p>
Terrestrial Environment	<ul style="list-style-type: none"> <li>Potential effects to the terrestrial environment are dependent on project interactions with the atmospheric environment and radiation/radioactivity.</li> </ul>	<ul style="list-style-type: none"> <li>2016 PEA air quality and noise modelling is bounding of the MPSB; thus, potential interactions with the terrestrial environment are bounded.</li> <li>Radiation dose from the storage of SGs in the MPSB is not bounded by the 2016 PEA; radiation dose from the MPSB is assessed for potential effects to terrestrial ecological receptors in this PEA Addendum.</li> </ul> <p><b>With respect to radiation and radioactivity, the 2016 PEA is <u>not</u> bounding for the MPSB (see 'Radiation and Radioactivity' below).</b></p>
Radiation and Radioactivity	<ul style="list-style-type: none"> <li>NSS-WWMF expansion area #2 previously assumed to be the location of one Large Object Processing Building (LOPB); no storage of SGs was assumed.</li> </ul>	<ul style="list-style-type: none"> <li>The North Site (i.e., expansion area #2) will contain the MPSB which will store SGs. The potential radiation dose from the storage of SGs within the MPSB is not bounded by the 2016 PEA and is assessed for human and terrestrial ecological receptors in this PEA Addendum.</li> </ul>

Environmental Component	Relevant Assumption(s) from 2016 WWMF Expansion PEA Assessment	Comparison with PEA Addendum for MPSB
		<b>Considering radiation and radioactivity, the 2016 PEA is <u>not</u> bounding (see Section 5.1.5).</b>
Human Health (Public)	<ul style="list-style-type: none"> <li>Potential effects to human health are dependent on project interactions with other environmental components, such as the surface water and atmospheric environments, and radiation/radioactivity.</li> </ul>	<ul style="list-style-type: none"> <li>2016 PEA air quality and noise modelling is bounding of the MPSB; thus, potential health effects from air quality and noise are bounded for human receptors.</li> <li>2016 PEA assessment of surface water quality is bounding of the MPSB during site preparation and construction, when potential water quality impacts are assumed to be greatest; thus, potential health effects from surface water quality are bounded for human receptors.</li> <li>Radiation dose from the storage of SGs in the MPSB is not bounded by the 2016 PEA; radiation dose from the MPSB is assessed for potential human health effects in this PEA Addendum.</li> </ul> <p><b>With respect to radiation and radioactivity, the 2016 PEA is <u>not</u> bounding for the MPSB (see 'Radiation and Radioactivity' above).</b></p>

## 2.0 Objectives and Scope

The objective of this PEA Addendum is to predict any potential risk posed by contaminants and physical stressors in the environment associated with the construction and operation of the MPSB; specifically, any Project activities associated with the MPSB that were not assessed as part of the 2016 PEA will be assessed as part of this PEA Addendum to characterize potential risk to human and ecological receptors.

The scope of the PEA Addendum first includes a qualitative description and screening level assessment of all Project activities to identify potential Project interactions with various distinct environmental components (**Section 5.0**). Project activities determined to have a direct and/or insufficiently mitigated interaction with one or more environmental components will be quantitatively assessed, and predicted effects and risk to human health (**Section 6.0**) and ecological health (**Section 7.0**) will be investigated. Where applicable and scientifically justifiable to do so, this PEA Addendum will consider results presented in the 2016 WWMF Expansion Project PEA (AMEC, 2016) as being adequately bounding of potential effects and risk posed by the MPSB due to the prior assessment's larger scope and inherent level of conservatism.

Consistent with CSA N288.6:22 (CSA, 2022), the scope of this assessment only considers normal operation of the MPSB and does not assess potential risk or effects associated with accidents.

Furthermore, there is currently only a conceptual decommissioning plan for the MPSB after its operational life. The existing Preliminary Decommissioning Plan for the NSS-WWMF will be updated to include decommissioning planning for the MPSB. Any potential environmental effects associated with decommissioning are assumed to be bounded by those of other Project phases assessed in this PEA Addendum.

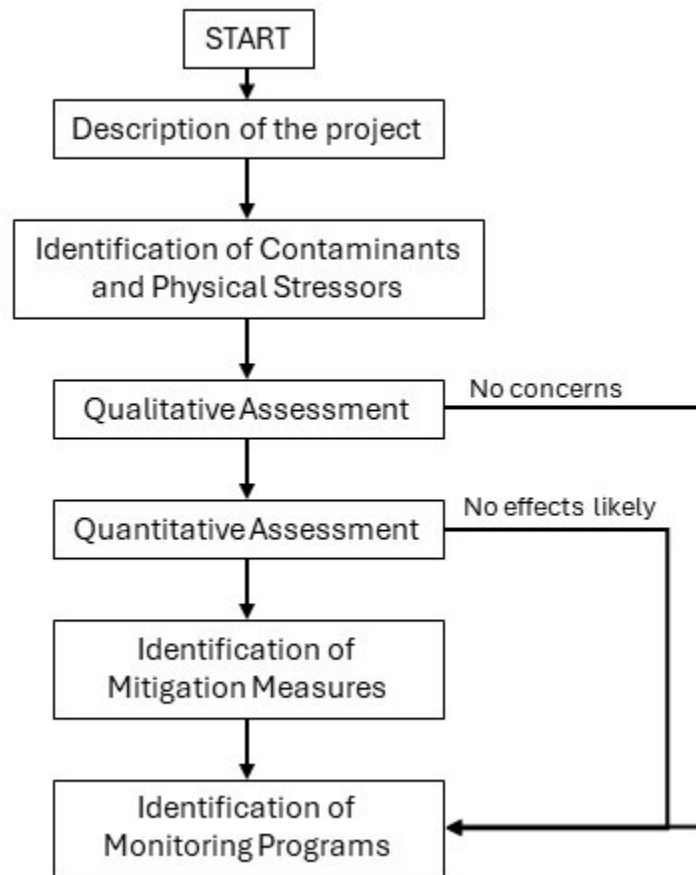
Cumulative effects (**Section 8.0**) due to the operation of the MPSB will be evaluated and compared against the conditions described in the 2021 NSS-WWMF ERA (Ecometrix, 2022a), emissions from other facilities on the Bruce Nuclear site and future expansion activities at the NSS-WWMF as assessed from the 2016 PEA.

The need for mitigation measures and/or environmental monitoring (**Section 9.0**) related to operation of the MPSB will be considered based on the predicted risk and conclusions of this PEA Addendum.



### 3.0 Structure of the Assessment

The PEA Addendum is carried out in accordance with ERA guidance as per CSA N288.6:22 (CSA, 2022) and CNSC REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (CNSC, 2020). The steps in the assessment are illustrated at a high level in **Figure 3-1**.



**Figure 3-1: Steps in the Predictive Environmental Risk Assessment**

A qualitative assessment of potential environmental effects related to Project activities (i.e., of potential project-environment interactions) identifies activities that require a quantitative predictive risk assessment.

The quantitative risk assessment in **Figure 3-1** includes consideration of risk to both human receptors (predictive human health risk assessment [HHRA]) and ecological receptors (predictive

ecological risk assessment [EcoRA]). These are two components of ERA as described by CSA N288.6:22 (CSA, 2022).

The mitigation measures mentioned in **Figure 3-1** refer to environmental protection measures associated with the Project, which include measures to monitor and/or control emissions, as described in CNSC REGDOC-2.9.1 on Environmental Protection (CNSC, 2020).

The monitoring programs mentioned in **Figure 3-1** refer to the environmental monitoring programs (EMP). Any additions to the existing EMP that may be needed in relation to the construction and operation of the MPSB will be described.

The following sections of this report address the structure outlined in **Figure 3-1**, including:

- Section 4.0** Description of the Project (including contaminants of potential concern)
- Section 5.0** Potential Project-Environment Interactions
- Section 6.0** Predictive Human Health Risk Assessment
- Section 7.0** Predictive Ecological Risk Assessment
- Section 8.0** Cumulative Effects Assessment
- Section 9.0** Environmental Management
- Section 10.0** Quality Assurance
- Section 11.0** Conclusions and Recommendations

## 4.0 Description of the Project

### 4.1 Project Overview

The NSS-WWMF sits within the Bruce nuclear site, which is located on the east shore of Lake Huron, approximately 18 km north of Kincardine and 17 km southwest of Port Elgin, Ontario, Canada (**Figure 4-1**). The NSS-WWMF covers an area of 19 hectares within the OPG-retained lands and is a Class 1B nuclear facility for the management of L&ILW and used fuel. The NSS-WWMF currently consists of the L&ILW management area and the used fuel management area (**Figure 4-2** and **Figure 4-3**). Used fuel refers to the uranium dioxide fuel bundles which have been removed from a reactor, have been stored in an irradiated fuel bay for at least 10 years, and have been loaded into a Dry Storage Container (DSC) and transferred to the designated facility for interim dry storage. DSCs are vacuum dried and contain no liquid. L&ILW consists of Low Level Waste (LLW) and Intermediate Level Waste (ILW) (**Figure 4-3**).

The proposed MCR Steam Generator Storage Solution (SGSS) will be called the Multi-Purpose Storage Building (MPSB) (**Figure 4-2** and **Figure 4-3**). The MPSB will be used for the storage of 64 steam generators (SGs) and is expected to have a service life of 50 years. The previously planned four (4) L&ILW buildings as described in the 2016 PEA (AMEC, 2016) are proposed to be replaced with the MPSB composed of a tarp building for storage of the SGs at the NSS-WWMF.

The proposed MPSB will be located on the North Site of the NSS-WWMF, which is one of the four expansion areas identified at the site (**Figure 4-2** and **Figure 4-3**), and is expected to accommodate the SGs associated with Bruce Power's ongoing MCR activities. The MPSB is assessed here as a steel-framed, tarp-roofed building with the steel framing sitting atop a concrete foundation wall. The building will be constructed on-grade with an exposed underlying gravel surface (**Figure 4-4** and **Figure 4-5**). The source term for the SGs is expected to be 400  $\mu\text{Sv/h}$  at 1 m from the surface of the waste container .

The proposed location of the MPSB within the North Site (**Figure 4-3**) is designed to keep the SGs as far away from the NSS-WWMF perimeter fence line as possible to minimise the dose received at the fence line. The SGs will be placed within the MPSB on top of saddles at a height of 2 ft off the ground surface. The 64 SGs stored within the North Site may include SGs currently stored at the NSS-WWMF's SGSB and additional SGs removed from Unit 3, Unit 4, Unit 5, Unit 7 and Unit 8 reactors from the Bruce Power. Shielding may be included along the northern North Site fence line if required as indicated by routine thermoluminescent dosimeter (TLD) monitoring at the NSS-WWMF perimeter.

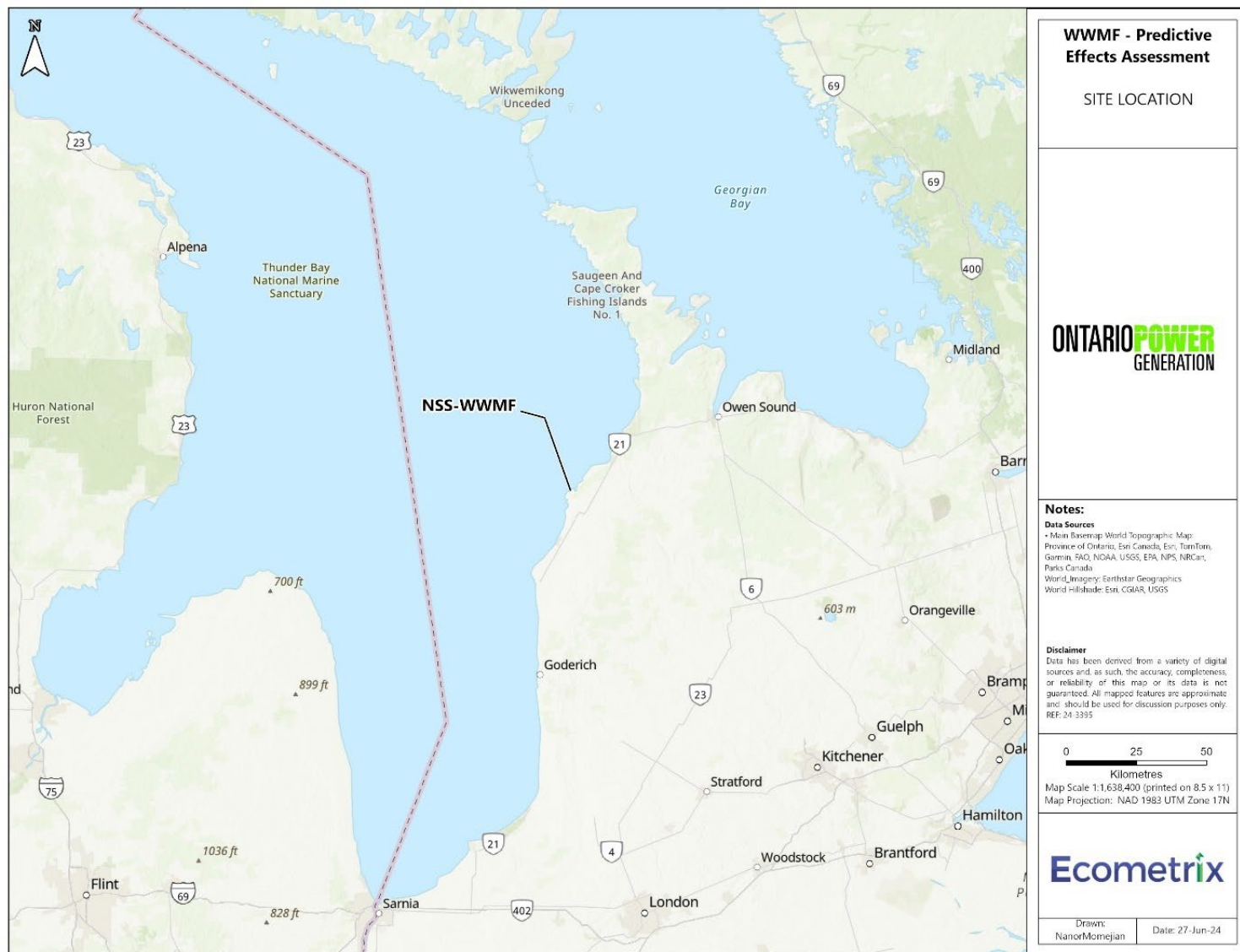
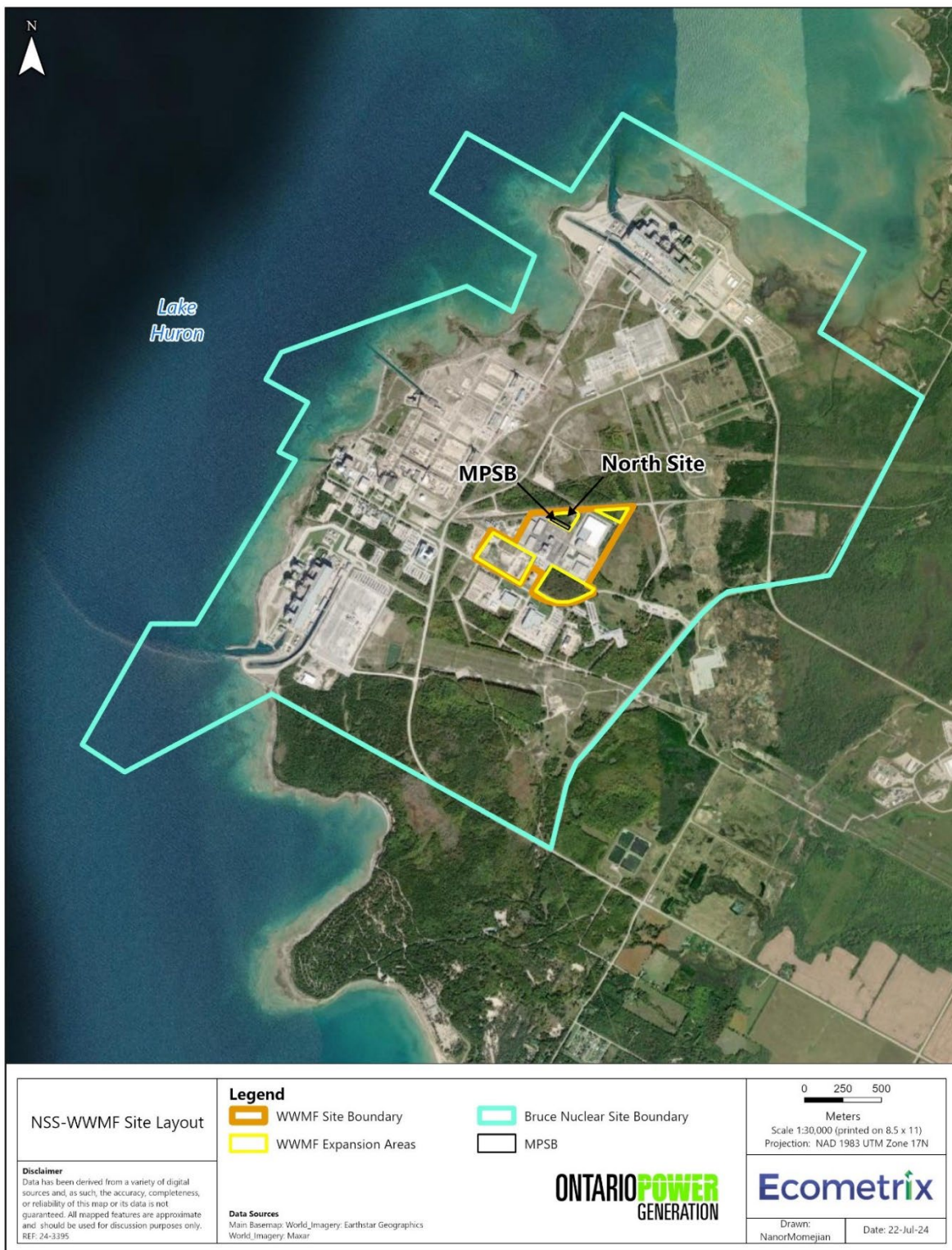


Figure 4-1: NSS-WWMF Site Location and Vicinity





**Figure 4-2: NSS-WWMF Site Layout**



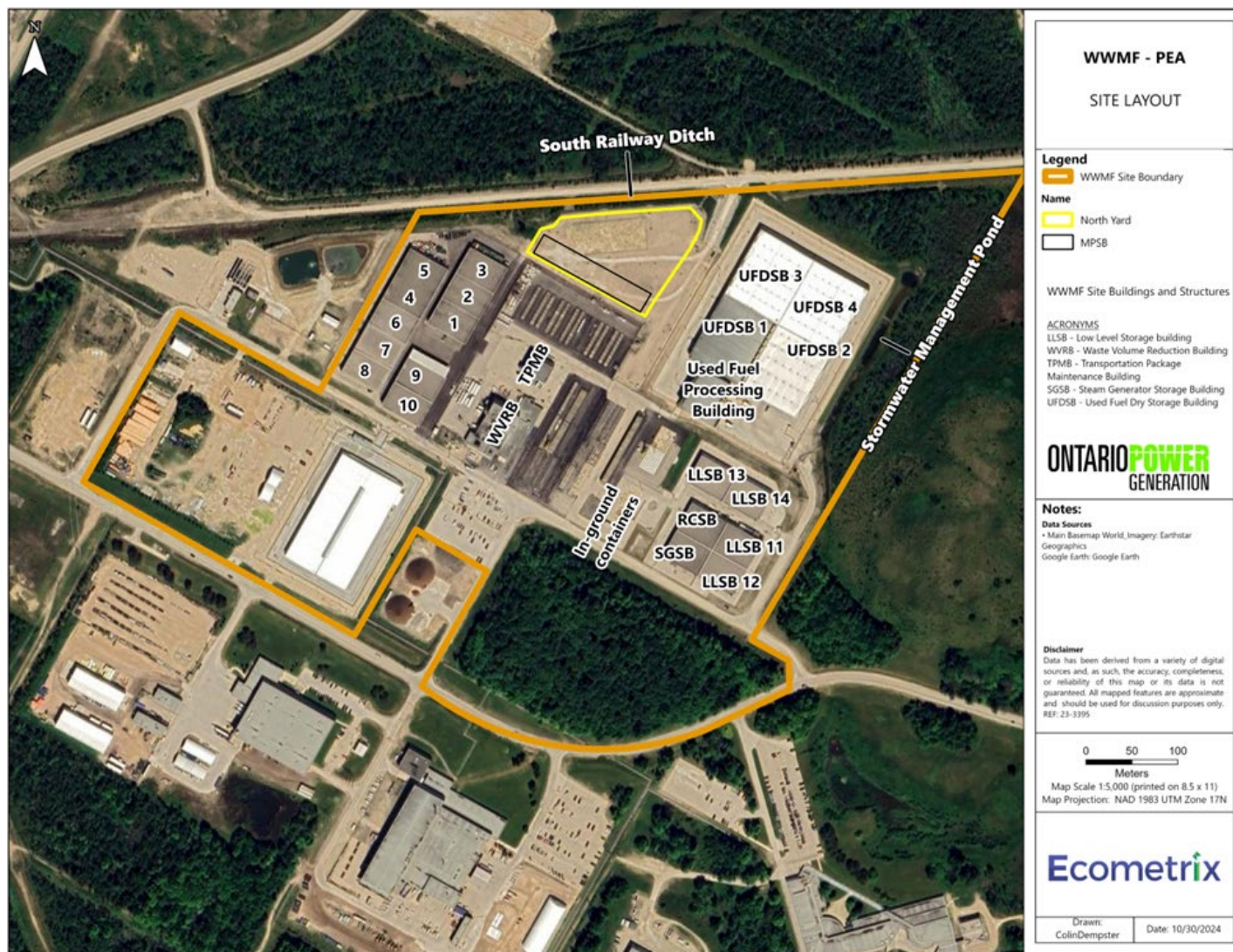
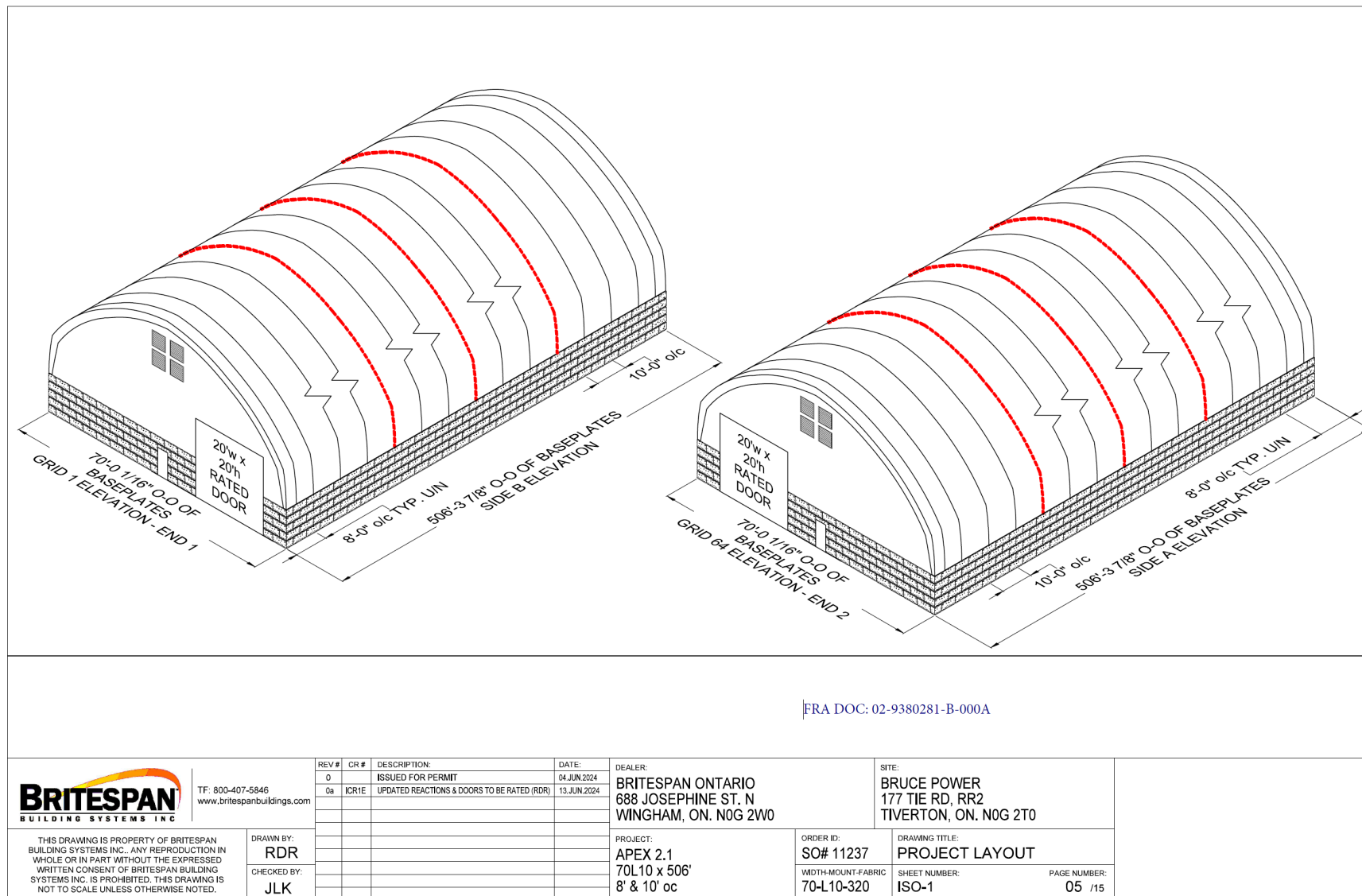
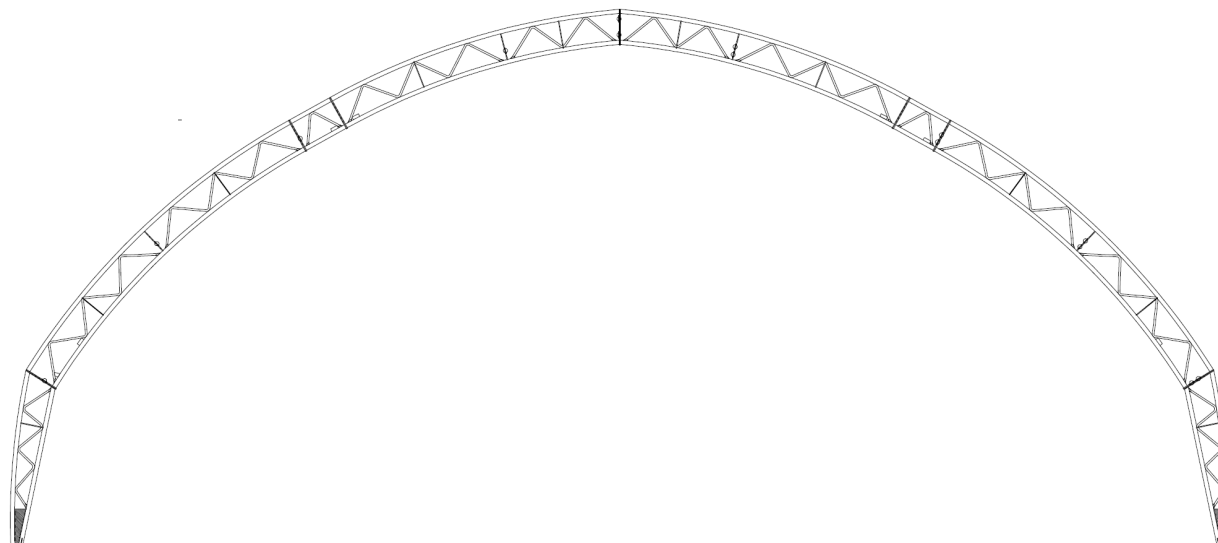


Figure 4-3: Site Layout showing the L&ILW, UFDSD with respect to the MPSB and the North Site



**Figure 4-4: Isometric Drawing of the Proposed Multi-Purpose Storage Building**



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	06	ICR1E	UPDATED REACTIONS & DOORS TO BE RATED (RDR)	13 JUN 2024				
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Figure 4-5: Proposed Steel Framing Design for Multi-Purpose Storage Building



## 4.2 Project Activities

Four main phases are associated with the Project and include:

- **Site Preparation:** This phase includes all activities associated with preparing the Project area for construction of the MPSB. Activities may include clearing the site, excavation, grading, compaction, and installation of perimeter fencing.
- **Construction:** This phase includes all activities associated with constructing the MPSB and begins immediately following site preparation and ends once the facility is ready to accept waste.
- **Operation and Maintenance:** This phase includes all activities associated with normal operation of the MPSB and includes accepting and storing wastes and performing regular inspections and maintenance activities.
- **Decommissioning:** This phase includes all activities associated with decommissioning of the MPSB, and will include the preparation of detailed decommissioning plans and site decommissioning and restoration.

### 4.2.1 Site Preparation Phase Works and Activities

Site preparation involves preparing the North Site for MPSB-related construction activities. All site preparation activities are assumed to be completed at approximately the same time before construction of the MPSB begins. For the purposes of this PEA Addendum, the following site preparation activities are assumed to occur during pre-construction.

#### 4.2.1.1 Site Clearing and Maintenance of Cleared Areas

Currently, the area of the proposed MPSB (shown on **Figure 4-2**) has largely been cleared; thus, no vegetation clearing will be required. The North Site would need to be maintained to ensure that new vegetation does not grow, and that the area remains clear of debris. Any new vegetation required to be cleared would need to be transported off-site for disposal in accordance with applicable standards and regulations.

#### 4.2.1.2 Grading and Compaction

Grading and compaction will be required on the overall site and in the area where backfilling of the structure's foundation has occurred. Conventional heavy machinery will distribute fill across the MPSB's footprint and other construction equipment such as graders and vibratory rollers will be used. All site preparation activities including grading and compaction will be done under industry best practices, including directing surface runoff to the existing drainage infrastructure. All machinery, tools and equipment will be demobilized after the completion of the work.

#### 4.2.1.3 Installation of Perimeter Fencing

Installation of 1,500 feet (ft) of perimeter fencing and modifications to the existing fenceline will involve minor excavations for hydro fence posts and ground wires. The installation will involve the use of smaller-scale construction and excavation equipment. Fencing installation also includes backfill of ground wire trench with imported material, and compaction. The removal of 900 ft of the existing fencing, the chain link, and the barb wire, will be completed by hydro excavating around the fence posts. The waste slurry disposal is expected to be managed off-site. The removal of the existing fencing will be followed by proper hauling and disposal of the removed material and the asphalt around the fence post.

The installation of perimeter fencing is only meant to restrict access to the NSS-WWMF site from unauthorized persons and members of the public. The fenceline itself is not designed to provide radiation shielding to human and ecological receptors beyond the NSS-WWMF perimeter. A series of thermoluminescent dosimeters (TLDs) will monitor radiation fields during operation of the MPSB. Should perimeter radiation doses approach the allowable limit, additional mitigation measures are expected to be utilized, including the installation of concrete block shielding at the fenceline or covering stored SGs with lead blankets to reduce/eliminate skyshine.

#### 4.2.1.4 Transportation and Storage of Construction Materials, Equipment, Trailers and Personnel

During the site preparation phase, construction materials, equipment and personnel will be transported to and remain within the North Site area for extended periods of time. This will result in an increase in the number of passenger vehicles and heavy construction vehicles which will require daily access to the NSS-WWMF. A spill management plan will be in place within the construction island as a result of these activities.

#### 4.2.1.5 Vehicle and Equipment Operation, Maintenance and Refueling

Refuelling by a refuelling truck and maintenance of construction equipment and vehicles will occur on an as-needed basis within the North Site area of the NSS-WWMF. A spill management plan will be in place within the area as a result of these activities.

#### 4.2.1.6 Stormwater Management and Drainage

The Storm Water Management System is currently being evaluated for placement and impact. Potential stormwater mitigation measures will be considered as part of the evaluation. It is expected that three existing catch basins and one maintenance hole will be moved to accommodate the MPSB footprint. It is anticipated that OPG will employ best practices for stormwater management that would meet Ontario Ministry of Environment, Conservation and Parks (MECP) requirements and industrial sewage works rules (MECP, 2003a) per the NSS-WWMF Environmental Compliance Approval (ECA).

## 4.2.2 Construction Phase Works and Activities

The construction phase involves the construction of the MPSB. For the purposes of this PEA Addendum, the following activities are assumed to occur during construction.

### 4.2.2.1 MPSB Construction

As shown in **Figure 4-4** and **Figure 4-5**, the new MPSB structure will consist of a steel frame structure that is covered with fabric/tarp, overlying a gravel surface. Concrete Lock Blocks will be used for the perimeter of the building foundation, and rip-rap underneath the foundation for erosion prevention. The building will arrive pre-fabricated to the North Site and will require only craning into place. All concrete blocks are cast off site. The structure installation will include mobilizing tools and equipment, installing building trusses and inner reinforcing steel and cable tie downs. Lastly, fabric tenting will be installed, along with the solar lights. At the end of the MPSB construction activities, all tools and equipment will be demobilized.

The MPSB will be built to the National Building Code of Canada (NBC) 2020 standard, and is required to have a third-party Fire Assessment which needs to comply with CSA N393-22.

### 4.2.2.2 Construction Waste Management

Construction activities are expected to produce negligible quantities of conventional construction waste and no radioactive waste. Potential waste streams include gravel, wood (from the truss installation), domestic refuse, and metal and concrete. On-site waste management and off-site disposal is expected to be the responsibility of the construction contractor selected by OPG. Once the MPSB is built, the areas surrounding the structure will not require further excavation and are expected to remain as gravel surfaces.

### 4.2.2.3 Transportation and Storage of Construction Materials, Equipment, Trailers and Personnel

During the construction phase, construction materials, equipment, and trailers will continue to be transported to and from the North Site. This will increase the amount of daily vehicle traffic (i.e., passenger vehicles, heavy construction machinery) moving to and within the NSS-WWMF.

### 4.2.2.4 Vehicle and Equipment Operation, Maintenance and Refueling

Refuelling by a refuelling truck and maintenance of construction equipment and vehicles will occur on an as-needed basis within the NSS-WWMF area in areas designated for such activities.

### 4.2.2.5 Stormwater Management and Drainage

Stormwater Management will be performed for the NSS-WWMF as per the Stormwater Management Plan (to be developed as part of the Project), which would meet Ontario MECP requirements and industrial sewage works rules (MECP, 2003a).

### 4.2.3 Operation and Maintenance Phase Works and Activities

The operation and maintenance phase is assumed to commence once construction is complete. The operation of the NSS-WWMF is governed by the Waste Facility Operating Licence and existing OPG policies and procedures covering all aspects of the waste management systems and related infrastructure. The MPSB will be incorporated into the existing NSS-WWMF operating policies and procedures.

#### 4.2.3.1 Transfer of Waste to the MPSB

The MPSB is proposed to be used for the storage of 64 SGs and is expected to have a service life of 50 years. Waste transportation procedures for the new buildings will be the same as the applicable waste transfer procedures for the existing buildings. Transportation vehicles carrying the steam generators will deliver their wastes directly to the MPSB. Unloading and placement of waste in the MPSB will be done in accordance with approved NSS-WWMF procedures.

#### 4.2.3.2 Operation of the MPSB

Storage of wastes at the MPSB will occur in accordance with approved OPG policies and practices. The MPSB will require regular inspection and maintenance; maintenance is anticipated to consist largely of tarp roofing inspections and routine scheduled maintenance of mechanical components (e.g., service doors). The MPSB will also be subject to regular radiation dose monitoring (e.g., TLDs) consistent with other NSS-WWMF waste storage structures and existing OPG dose monitoring procedures.

Waste packages must be surveyed and be free of loose external contamination before leaving the NSS-WWMF. Based on knowledge of existing waste buildings, it is expected that negligible quantities of L&ILW, such as contaminated wipes, floor sweepings, rags and cleaning materials may be produced in the MPSB during operation and maintenance. These wastes will be managed according to approved OPG policies and practices.

Operation and maintenance of the MPSB will require minimal use of potentially hazardous substances. Small quantities of non-radioactive domestic waste typical of a commercial/industrial facility (e.g., cleaning solutions) may be produced during operation and maintenance of the facility.

#### 4.2.3.3 Stormwater Management and Drainage

The infiltration capacity of the NSS-WWMF North Site area may be slightly increased relative to that considered in the 2016 PEA for operation of the MPSB, due to the retention of gravel surfaces. This may result in lower peak runoff flows but potentially higher levels of erosion and sediment deposition into the stormwater system than what was assessed in the 2016 PEA (AMEC, 2016). Therefore, a total suspended solids (TSS) assessment was completed and mitigation measures were identified to ensure TSS loadings would be within ECA requirements. Stormwater from the MPSB area is expected to shed into the gravel surface and into a series of catch basins before being redirected to the South Railway Ditch (SRD) (**Figure 4-3**).

Furthermore, it is anticipated that OPG will continue to employ best practices for stormwater management that would meet the MECP requirements and industrial sewage works rules (MECP, 2003a). All site grading and stormwater management activities will be undertaken during the site preparation phase.

#### 4.2.4 Decommissioning Works and Activities

At this stage, there is only a conceptual decommissioning plan for the MPSB after its operational life. OPG will update the existing preliminary decommissioning plan for the NSS-WWMF to include the MPSB. Decommissioning activities will begin by first planning for decommissioning, specifically through the production of detailed decommissioning plans and submission of these plans to the CNSC. Following regulatory approval, the site will be decommissioned, beginning with surveys to assess the extent of the contamination, and the eventual decontamination and removal of equipment and waste materials (e.g., concrete, metal) from the site. Site restoration will occur once all contaminated materials have been properly removed and disposed of and the MPSB structure and surrounding infrastructure have been demolished.

No hazardous or radiological materials will be used in the construction of the MPSB. Additionally, the MPSB is not expected to become contaminated during normal operation since the SGs will be cleaned of any external surface contamination before storage. As such, interactions with the environment during the decommissioning phase are expected to be minimal and are bounded by the other Project phases assessed in this PEA Addendum.

## 5.0 Potential Project-Environment Interactions

The MPSB has the potential to affect various components of the environment, including the surface water environment, atmospheric environment (air quality and noise), soil, shallow groundwater (by transfer from air to soil porewater), the terrestrial and aquatic environment (terrestrial, riparian and aquatic ecological receptors) and human health (workers outside the NSS-WWMF and members of the public). Based on the description of Project activities (**Section 4.00**) the potential for impact on components of the environment is evaluated qualitatively in this section at a screening level to identify interactions that warrant further quantitative assessment (see **Table 5-1**).

Workers on-site during the site preparation, construction, and operations and maintenance phases will be working under OPG's existing Radiation Protection Program and Health and Safety Management Systems. Normal work planning procedures will be followed, and worker doses will be monitored as usual. The same assumption applies to on-site workers and contractors working on the surrounding Bruce Power property adjacent to the NSS-WWMF. As such, worker health from the MPSB Project is not considered further in the PEA Addendum. Thus, the assessment of human health in this PEA Addendum relates only to members of the general public located outside of the Bruce Power property.

Table 5-1: Identification of Project-Environment Interactions

Project Activities	Atmospheric Environment (air and noise)	Surface Water Environment (quality and quantity)	Groundwater (quality and quantity)	Geology (Soils)	Radiation and Radioactivity	Terrestrial Environment	Aquatic Environment	Human Health (public)
<b>Site Preparation</b>								
Site Clearing and Maintenance of Cleared Areas	✓	O	O	O	-	✓	O	✓
Grading and Compaction	✓	O	O	O	-	✓	O	✓
Installation of Utilities, Perimeter Fencing	✓	-	-	O	-	✓	-	✓
Transportation and Storage of Construction Materials, Equipment, Trailers and Personnel	✓	O	O	O	-	✓	O	✓
Vehicle and Equipment Operation, Maintenance and Refueling	✓	O	O	O	-	✓	O	✓
Stormwater Management and Drainage	-	✓	O	O	-	O	✓	O
<b>Construction</b>								
MPSB Construction	✓	O	O	O	-	✓	O	✓
Construction Waste Management	✓	O	O	O	-	✓	O	✓
Transportation and Storage of Construction Materials, Equipment, Trailers and Personnel	✓	O	O	O	-	✓	O	✓
Vehicle and Equipment Operation, Maintenance and Fueling	✓	O	O	O	-	✓	O	✓

Project Activities	Atmospheric Environment (air and noise)	Surface Water Environment (quality and quantity)	Groundwater (quality and quantity)	Geology (Soils)	Radiation and Radioactivity	Terrestrial Environment	Aquatic Environment	Human Health (public)
Stormwater Management and Drainage	-	✓	O	O	-	O	✓	O
<b>Operation and Maintenance</b>								
Transfer of Waste to the MPSB	O	O	O	O	✓	✓	O	✓
Operation of the MPSB	-	-	-	-	✓	✓	-	✓
Stormwater Management and Drainage	-	✓	O	-	-	-	✓	O

**Notes:**

- ✓ Indicates direct interaction with the environmental component. Further quantitative assessment required.
- O Indicates interaction with the environmental component. No further quantitative assessment required as the interaction is considered negligible or sufficiently mitigated.
- Indicates no interaction with the environmental component. No assessment required.



## 5.1 Qualitative Assessment of Project-Environment Interactions

**Table 5-1** summarizes the potential interactions of the Project with various environmental components as either direct or negligible interactions. The following section details these interactions and assesses the risk qualitatively or identifies that the interaction is further assessed quantitatively in **Section 6.0** and **Section 7.0**.

### 5.1.1 Atmospheric Environment (Air Quality and Noise)

The atmospheric environment consists of the air surrounding the Project area within which air pollutants and elevated noise levels may be experienced by humans or ecological receptors. All phases of the Project are expected to interact with the atmospheric environment.

#### 5.1.1.1 Air Quality

##### 5.1.1.1.1 Radiological Emissions

No radiological air emissions are expected during any phase of the Project. No radiological materials are associated with site preparation and construction. During operation and maintenance of the MPSB, radiological wastes will be contained, and as a result, no radiological emissions are expected during normal operations. Thus, radiological emissions to the atmosphere are considered negligible and are not assessed further in the PEA Addendum. Gamma radiation from the MPSB is discussed in **Section 5.1.5**.

##### 5.1.1.1.2 Non-Radiological Emissions

Site preparation and construction are expected to involve the use of both light and heavy equipment and vehicles that could release non-radiological air emissions (e.g., engine exhausts) into the atmosphere. Excavation, grading, stormwater works and other sub-surface activities that disrupt the soil surface may contribute to particulate matter (PM) and dust emissions in the air.

OPG will follow typical construction best practices including implementation of an Environmental Management Plan. The construction Environmental Management Plan will include protocols for dust suppression during site preparation and construction to reduce the release of particulates and dust into the atmosphere. The on-site storage of excess soils may also contribute to particulate and dust emissions and may also be subject to dust suppression protocols as required. During construction, waste materials (e.g., concrete) may also contribute particulates and dust to the atmosphere. Other chemicals including fuels (gasoline or diesel), oils, paints, solvents and cleaners may release volatile compounds into the atmosphere from use or accidental spills. However, the quantity and frequency of these releases are considered negligible as these chemicals will be securely stored, and spill prevention practices will be put into place.

Once operation of the MPSB begins, there would be exhaust emissions from vehicles during the transfer of waste materials. Vehicle traffic associated with MPSB operation is expected to be

bounded by predicted traffic levels assessed as part of the 2016 PEA (AMEC, 2016), given the prior assessment's larger scope.

The screening of air quality COPCs against ambient air quality criteria/standards in this PEA Addendum is consistent with the methodology used in the 2016 WWMF Expansion Project PEA (AMEC, 2016). Air quality modelling conducted as part of the 2016 PEA assumed that the simultaneous construction of all buildings was considered unrealistic and was thus not considered as the bounding scenario. Multiple scenarios were identified, each of which involved the development of expansion areas 1 through 4 in varying combinations. For this PEA Addendum, Scenario A from the 2016 PEA, where expansion areas 1, 2 and 3 are all developed at the same time, was selected to conservatively represent the development of the MPSB within the North Site (i.e., expansion area 2). As noted in the 2016 PEA, operations and maintenance activities at future NSS-WWMF expansion areas (implied to be inclusive of the MPSB) are assumed to be bounded by the site preparation and construction phases as impacts to the atmospheric environment from excessive dust generation and the operation of heavy equipment and vehicles are assumed to be greater during those earlier Project phases (AMEC, 2016). For full details regarding the assumptions and parameters used in the modelling of air emissions, the reader is directed to the 2016 PEA. Results of the atmospheric emissions dispersion modelling are presented in Appendix H of the 2016 PEA (AMEC, 2016).

The concentration of COPCs in air were compared against updated Ontario MECP's Ambient Air Quality Criteria (AAQCs) (MECP, 2020) and Canadian Ambient Air Quality Standards (CAAQS) (ECCC, 2023a) from the Canadian Council of Ministers of the Environment (CCME) to determine whether predicted concentrations of atmospheric COPCs could pose a risk to human receptors over the lifetime of the MPSB project. Concentrations were directly compared to guidelines with the same averaging periods. The AAQCs with averaging times of 24 hours or longer are considered protective of chronic health effects and have been selected for use in this PEA Addendum. Given that development of the MPSB is expected to last for less than one year, air criteria with annual averaging periods are not retained for the screening assessment. The air quality guidelines applied for the screening are shown below in **Table 5-2**.

**Table 5-2: Ambient Air Quality Guidelines Used in the PEA Addendum**

Parameter	AAQC	Averaging Time	CAAQS	Averaging Time
Carbon monoxide	13 ppm (14,895 µg/m <sup>3</sup> )	8-Hour	NA	NA
Nitrogen dioxide	100 ppb (188 µg/m <sup>3</sup> )	24-Hour	17 ppb <sup>a, b</sup> (31.98 µg/m <sup>3</sup> )	Annual
Sulfur dioxide	275 µg/m <sup>3</sup> <sup>c</sup>	24-Hour	5 ppb <sup>a, b</sup> (13.1 µg/m <sup>3</sup> )	Annual
PM <sub>2.5</sub>	27 µg/m <sup>3</sup> <sup>a</sup>	24-Hour	27 µg/m <sup>3</sup> <sup>a</sup>	24-Hour
PM <sub>10</sub>	50 µg/m <sup>3</sup>	24-Hour	NA	NA

Parameter	AAQC	Averaging Time	CAAQS	Averaging Time
Total suspended particulates (TSP)	120 µg/m <sup>3</sup>	24-Hour	NA	NA

**Notes:**

<sup>a</sup> 2020 target

<sup>b</sup> Represents the average over a single calendar year of all 1-hour average concentrations

<sup>c</sup> Screening criteria retained from the 2016 WWMF Expansion Project PEA; MECP 24-hour criteria no longer available. Ambient air quality criteria converted to µg/m<sup>3</sup> where presented in other units by the regulatory agency.

AAQC – Ontario MECP Ambient Air Quality Criteria (MECP, 2020)

CAAQS – Canadian Ambient Air Quality Standard (MECP, 2019)

Averaging Time - Averaging times for ambient air quality criteria protective against chronic effects are generally 24 hours or longer

µg/m<sup>3</sup> – micrograms per cubic metre of air

ppm - parts per million

ppb – parts per billion

NA – Not available

#### 5.1.1.1.2.1 Human Health Air Quality Screening

Predicted air concentrations at receptor location BF14 (farm resident) from the 2016 PEA (AMEC, 2016) is considered the bounding scenario for the assessment of air quality for this PEA Addendum as that receptor location is the nearest receptor to the North Site in the predominant southern wind direction (**Figure 5-1**). This receptor location was predicted to experience the highest concentration of atmospheric COPCs compared to the other nearby receptors in the 2016 PEA. Given that this receptor location is considered bounding for this PEA Addendum and no ambient air quality guidelines are exceeded at this receptor location, no further assessment is required for the assessment of non-radiological atmospheric COPCs and their potential impacts on human health.

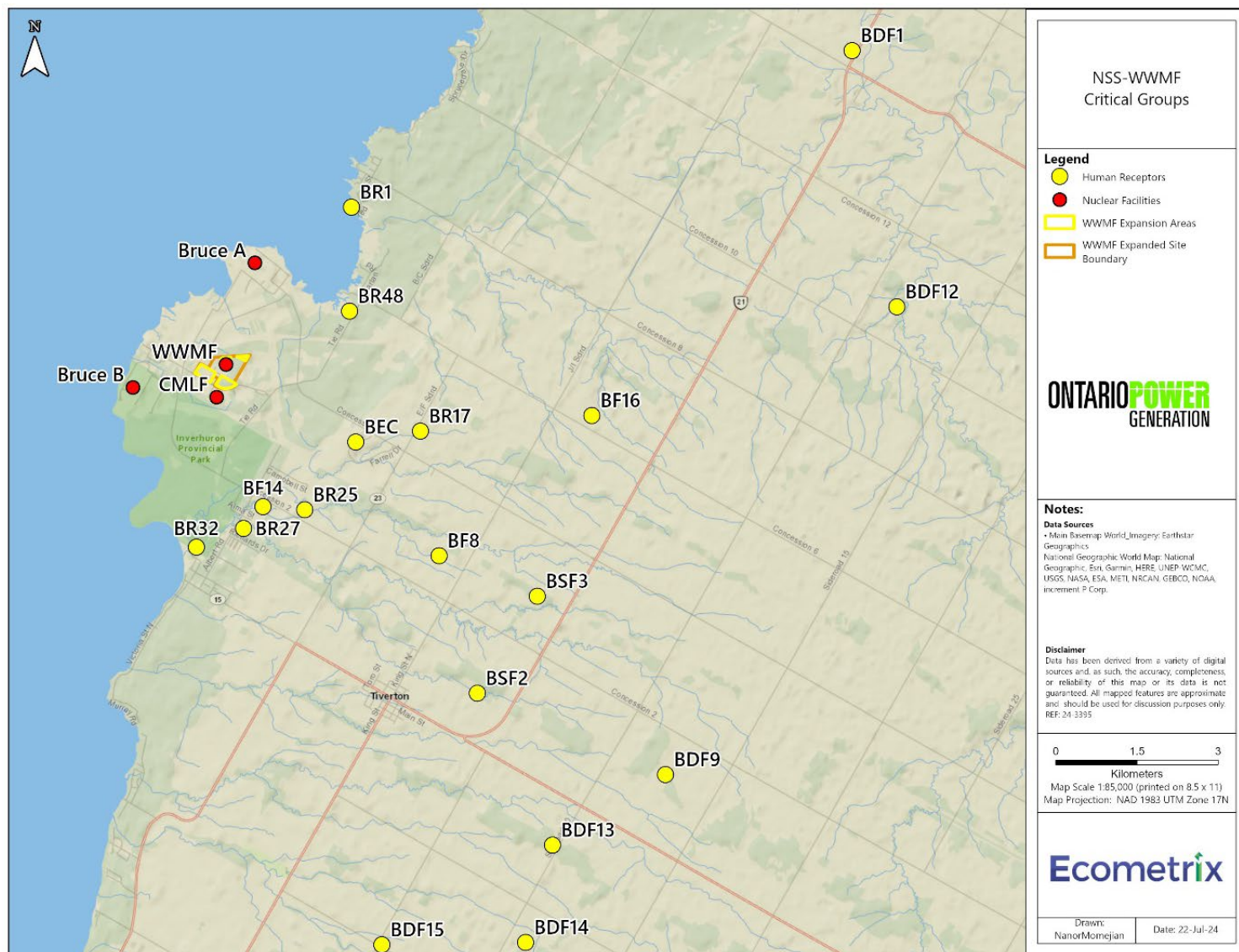


Figure 5-1: Potential Critical Groups from the 2016 PEA

**Table 5-3: Air Quality Screening for the Critical Permanent Receptor (BF14) Considering Maximum Airborne COPC Concentrations**

COPC	Averaging Period	Air Quality Screening Criteria ( $\mu\text{g}/\text{m}^3$ )	Criteria	Predicted Maximum Concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	% of Criteria
<b>Site Preparation</b>					
TSP	24-hour	120	AAQC	53.5	45%
PM <sub>10</sub>	24-hour	50	AAQC	26.7	53%
PM <sub>2.5</sub>	24-hour	27	AAQC/CAAQS	16.4	61%
NO <sub>2</sub>	24-hour	188 <sup>a</sup>	AAQC	20.9	11%
SO <sub>2</sub>	24-hour	275	AAQC	36.7	13%
CO	8-hour	14,893 <sup>b</sup>	AAQC	703.3	4.7%
<b>Construction (Scenario A)</b>					
TSP	24-hour	120	AAQC	51.0	43%
PM <sub>10</sub>	24-hour	50	AAQC	27.8	56%
PM <sub>2.5</sub>	24-hour	27	AAQC/CAAQS	16.5	61%
NO <sub>2</sub>	24-hour	188 <sup>a</sup>	AAQC	36.2	19%
SO <sub>2</sub>	24-hour	275	AAQC	36.7	13%
CO	8-hour	14,893 <sup>b</sup>	AAQC	773.6	5.2%

**Notes:**

<sup>a</sup> Converted from 100 ppb to  $\mu\text{g}/\text{m}^3$  assuming a molecular weight of 46.01 g/mol for NO<sub>2</sub>.

<sup>b</sup> Converted from ppm to  $\mu\text{g}/\text{m}^3$  assuming a molecular weight of 28.01 g/mol for CO.

<sup>c</sup> Source: Appendix H, 2016 WWMF Expansion Project PEA (AMEC, 2016)

$\mu\text{g}/\text{m}^3$  – micrograms per cubic metre of air

#### 5.1.1.1.2.2 Ecological Health Air Quality Screening

For ecological receptors, receptor locations 3 (ER4), 4 and 5 from the 2016 PEA (AMEC, 2016) are considered bounding for this PEA Addendum as these are the closest receptor locations modelled near the location of the North Site (**Figure 5-2**). These locations were predicted to experience the highest concentrations of atmospheric COPCs (**Table 5-4 to Table 5-7**) compared to the other ecological receptor locations assessed in the 2016 PEA. The AAQC for total suspended particulates (TSP) was exceeded at ecological receptor locations 3 (ER4) and 4 for both the site preparation and construction phases. However, as described in the 2016 PEA, there are likely no adverse effects on ecological receptors associated with elevated TSP concentrations as any effects from the site preparation and construction phases will be short-term and mitigated by dust suppression construction practices (AMEC, 2016). The conclusions of



the 2016 PEA remain unchanged; therefore, no further quantitative assessment is required for non-radiological atmospheric COPCs and their potential impacts on ecological health.



**Figure 5-2: Terrestrial Biota Air Quality and Noise Locations from 2016 PEA**

**Table 5-4: Predicted Worst Case Scenario 24-Hour TSP Concentrations at Ecological Receptor Locations**

Receptor Location	Baseline Concentration (µg/m <sup>3</sup> )	Predicted Concentration (µg/m <sup>3</sup> )	AAQC (µg/m <sup>3</sup> )	Predicted Concentration as % of Criteria
<b>Site Preparation</b>				
3 (ER4)	48.2	<b><u>228.4</u></b>	<b><u>120</u></b>	<b><u>190%</u></b>
4	48.3	<b><u>345</u></b>	<b><u>120</u></b>	<b><u>288%</u></b>
5	48.4	63.6	120	53%
<b>Construction</b>				
3 (ER4)	48.2	<b><u>304.2</u></b>	<b><u>120</u></b>	<b><u>254%</u></b>
4	48.3	<b><u>280.9</u></b>	<b><u>120</u></b>	<b><u>234%</u></b>
5	48.4	71.7	120	60%

**Notes:**

All air quality predictions are 24-hour averaging periods.

**Bold** indicates an exceedance of the selected air quality criteria.

Source: Table 5-11 from 2016 WWMF Expansion Project PEA (AMEC, 2016)

µg/m<sup>3</sup> – micrograms per cubic metre of air

**Table 5-5: Predicted Worst Case Scenario 24-Hour NO<sub>2</sub> Concentrations at Ecological Receptor Locations**

Receptor Location	Baseline Concentration (µg/m <sup>3</sup> )	Predicted Concentration (µg/m <sup>3</sup> )	AAQC (µg/m <sup>3</sup> ) <sup>a</sup>	Predicted Concentration as % of Criteria
<b>Site Preparation</b>				
3 (ER4)	37.8	38.1	188	20%
4	22.8	42.1	188	22%
5	21.9	33.4	188	18%
<b>Construction</b>				
3 (ER4)	37.8	100.7	188	54%
4	22.8	127.9	188	68%
5	21.9	44.5	188	24%

**Notes:**

<sup>a</sup> Converted from ppb to µg/m<sup>3</sup> assuming a molecular weight of 46.01 g/mol for NO<sub>2</sub>.

All air quality predictions are 24-hour averaging periods.

**Bold** indicates an exceedance of the selected air quality criteria.

Source: Table 5-12 from 2016 WWMF Expansion Project PEA (AMEC, 2016)

µg/m<sup>3</sup> – micrograms per cubic metre of air



**Table 5-6: Predicted Worst Case Scenario 24-Hour SO<sub>2</sub> Concentrations at Ecological Receptors**

Receptor Location	Baseline Concentration (µg/m <sup>3</sup> )	Predicted Concentration (µg/m <sup>3</sup> )	AAQC (µg/m <sup>3</sup> ) <sup>a</sup>	Predicted Concentration as % of Criteria
<b>Site Preparation</b>				
3 (ER4)	55.5	55.5	275	20%
4	56.6	56.6	275	21%
5	58.5	58.5	275	21%
<b>Construction</b>				
3 (ER4)	55.5	55.9	275	20%
4	56.6	56.9	275	21%
5	58.5	58.5	275	21%

**Notes:**

<sup>a</sup> Retained from the 2016 WWMF Expansion Project PEA; MECP 24-hour criteria no longer available.

All air quality predictions are 24-hour averaging periods.

**Bold** indicates an exceedance of the selected air quality criteria.

Source: Table 5-13 from 2016 WWMF Expansion Project PEA (AMEC, 2016)

µg/m<sup>3</sup> – micrograms per cubic metre of air

**Table 5-7: Predicted Worst Case Scenario 8-Hour CO Concentrations at Ecological Receptors**

Receptor Location	Baseline Concentration (µg/m <sup>3</sup> )	Predicted Concentration (µg/m <sup>3</sup> )	AAQC (µg/m <sup>3</sup> ) <sup>a</sup>	Predicted Concentration as % of Criteria
<b>Site Preparation</b>				
3 (ER4)	479.5	966.2	14,893	6.5%
4	476	1,360.30	14,893	9.1%
5	468.3	1,079.60	14,893	7.2%
<b>Construction</b>				
3 (ER4)	479.5	975	14,893	6.5%
4	476	1,198.20	14,893	8.0%
5	468.3	921.7	14,893	6.2%

**Notes:**

<sup>a</sup> Converted from ppm to µg/m<sup>3</sup> assuming a molecular weight of 28.01 g/mol for CO.

All air quality predictions are 8-hour averaging periods.

**Bold** indicates an exceedance of the selected air quality criteria.

Source: Table 5-14 from 2016 WWMF Expansion Project PEA (AMEC, 2016)

µg/m<sup>3</sup> – micrograms per cubic metre of air

Considering the above interactions, the assessment of non-radiological air pollutants (e.g., particulate matter, dust, engine exhausts) is considered bounded by the 2016 PEA, and no further quantitative assessment is required in this PEA Addendum.

#### 5.1.1.2 Noise

During site preparation and construction, elevated levels of noise may be produced. Light and heavy equipment and vehicles can produce loud sounds and vibrations during their operation. In addition, banging sounds typical of an active construction site are expected during site preparation and construction.

During operation and maintenance, noise may be produced by trucks transferring waste materials to the MPSB. As noted, vehicle traffic associated with MPSB operation is expected to be bounded by predicted traffic levels assessed as part of the 2016 PEA (AMEC, 2016), given the prior assessment's larger scope. Furthermore, it is expected that noise produced by vehicles and machinery during site preparation and construction would be bounding of noise produced by vehicles during operation of the MPSB.

##### 5.1.1.2.1 Human Health Noise Screening

The Ontario MECP does not have prescribed noise and vibration limits from construction activity. Health Canada recommends that project-related noises do not exceed 75 dBA; above this level, noise is likely to cause sleep disturbance or disturb vulnerable populations (HC, 2017).

The 2016 PEA predicted noise levels at three receptor locations, R1, R2 and R3. These locations coincide with the air quality receptor locations BF14, BR48 and BR32 from the 2016 PEA, respectively. Similar to the air quality modelling, the 2016 PEA modelled noise levels assuming a "worst case" exposure scenario, where multiple NSS-WWMF expansion areas and waste storage buildings would be developed simultaneously. Receptor R2 (BR48) was modelled to experience the greatest maximum noise level from site preparation and construction activities and has been retained as the bounding scenario for the assessment of noise for human receptors. Results of the noise modelling and comparison with applicable noise guidelines is presented below in **Table 5-8** for the site preparation and construction phases and in **Table 5-9** for the operations and maintenance phase. Neither the Health Canada guideline for site preparation and construction activities nor the ON MECP noise guidelines for the operations phase were exceeded, indicating no risks to human receptors from noise based on the selected bounding scenario from the 2016 PEA. Thus, no further quantitative assessment is required for noise with respect to human health risks.

**Table 5-8: Site Preparation and Construction Noise Screening Assessment**

Receptor Location	Baseline Minimum Noise Levels Leq (1 h) dBA	Modelled NSS-WWMF Site Preparation / Construction Maximum Noise Levels	Combined Maximum Noise Levels (Baseline + Site Prep or Baseline + Construction)	Health Canada Noise Guideline
Units	Leq (1 h) dBA	Leq (1 h) dBA*	dBA	dBA
<b>Site Preparation</b>				
R2 – Baie du Doré (BR48)	40	38	42	75
<b>Construction</b>				
R2 – Baie du Doré (BR48)	40	37	42	75

**Notes:**

Noise levels obtained from 2016 PEA (AMEC, 2016)

Leq (1 h): one-hour equivalent noise levels

dBA: A-weighted decibels

\*Site preparation noise impacts include both Clearing and Grubbing activities.

**Table 5-9: Operation and Maintenance Noise Screening Assessment**

Receptor Location	Modelled NSS-WWMF Existing and Future Operational Daytime Noise Levels (Maximum)	ON MECP Daytime Noise Level Limits (Class 3, rural area)	Modelled NSS-WWMF Existing and Future Operational Nighttime Noise Levels (Maximum)	ON MECP Nighttime Noise Level Limits (Class 3, rural area)
Units	Leq (1 h) dBA	Leq (1 h) dBA	Leq (1 h) dBA	Leq (1 h) dBA
<b>Operation and Maintenance</b>				
R2 – Baie du Doré (BR48)	27	45	27	40

**Notes:**

Noise levels obtained from 2016 PEA (AMEC, 2016)

Leq (1 h): one-hour equivalent noise levels

dBA: A-weighted decibels

#### 5.1.1.2.2 Ecological Health Noise Screening

The ecological receptor locations for the noise assessment are consistent with those modelled for the air quality assessment in the 2016 PEA (AMEC, 2016). The noise assessment for this PEA Addendum only considers results from the 2016 PEA that are applicable specifically to expansion area #2 (i.e., the North Site) either independently or as part of the simultaneous construction of NSS-WWMF expansion areas 1, 2 and 3, which is considered a worst-case bounding scenario for the North Site. The modelling of noise during operations and maintenance assumed Scenarios OD, which assumes the operation of one (1) Large Object Processing Building (LOPB) in the North Site area. This is considered conservative for the MPSB as the modelled source sound power level for the LOPB is 99 dBA while the source sound power levels of a steam generator storage building (SGSB; comparable to the MPSB) is 96 dBA. No modelled scenarios considered the operation of a SGSB within the North Site. For further details regarding the modelling of noise for the WWMF Expansion Project, the reader is directed to the 2016 PEA (AMEC, 2016).

For this PEA Addendum, receptor locations 3 (ER4) and 4 were retained to represent the bounding scenario for the MPSB Project. Receptor location 3 (ER4) is retained for experiencing the highest modelled noise levels due to MPSB Project activities, and receptor location 4 is retained for being the closest receptor location adjacent to the North Site just outside the northern NSS-WWMF perimeter fence line. The maximum noise levels modelled for receptor locations during the site preparation, construction and operations and maintenance phases of the WWMF Expansion Project are summarized in **Table 5-10**.

The 2016 PEA assumed that a 3 dB or more change in linear noise levels is expected to adversely affect mammals and herpetofauna receptors, consistent with the ecological noise screening criteria used in the Deep Geologic Repository (DGR) environmental assessment (AMEC, 2016). Consistent with guidance from Environment and Climate Change Canada (ECCC), a linear noise level increase of 10 dB or more is likely to impact birds (ECCC, 2023b). As such, the noise screening criteria applied for mammals and herpetofauna is an increase of more than 3 dB and the noise screening criteria for birds is an increase of 10 dB or more.

Noise modelling indicated multiple exceedances of both the mammalian/herpetofauna and avian screening criteria at various ecological receptor locations. However, consistent with results of the 2016 PEA, adverse effects to ecological receptors due to noise are not expected to occur. Wildlife species at the NSS-WWMF include those that are accustomed to living near roads and human developments (AMEC, 2016). Furthermore, the relatively short timeframe for site preparation and construction activities is expected to result in temporary noise disturbances that will quickly resolve once construction has ended, as indicated by the Operations and Maintenance results in **Table 5-10**. Furthermore, OPG will follow typical construction best practices including implementation of an Environmental Management Plan to mitigate Project-related sound generation.

Overall, noise impacts resulting from development and operation of the MPSB are considered bounded by the 2016 PEA. The conclusions of the 2016 PEA remain unchanged; therefore, no further quantitative assessment for noise is required.

**Table 5-10: Modelled Maximum Changes to Noise Levels (Leq (1 h)) at the North Site for Nearby Ecological Receptors**

Receptor Location	WWMF Baseline ERA Noise Levels (dB)	Modelled Noise Levels due to Project Activities (dB)	Combined Modelled Noise Levels (dB)	Modelled Change to Noise Levels (dB)	Exceeds mammalian and herpetofauna screening? (+3 dBA from baseline)	Exceeds avian screening? (+10 dBA from baseline)
<b>Site Preparation <sup>a</sup></b>						
3 (ER4)	67	85	85	+18	<b>Yes</b>	<b>Yes</b>
4	67	78	78	+11	<b>Yes</b>	<b>Yes</b>
<b>Construction <sup>b</sup></b>						
3 (ER4)	67	81	81	+14	<b>Yes</b>	<b>Yes</b>
4	67	72	73	+6	<b>Yes</b>	No
<b>Operation and Maintenance <sup>c</sup></b>						
3 (ER4)	67	62	68	+1	No	No
4	67	53	67	+0	No	No

**Notes:**

All sound levels are Leq (1-hr) values.

**Bold** indicates an exceedance of the identified noise screening criteria.

Source: Appendix D, Table D-1 to Table D-16 from 2016 WWMF Expansion Project PEA (AMEC, 2016)

<sup>a</sup> Represents maximum noise levels produced during site preparation for expansion area #2 (i.e., North Site) when considering the following site preparation activities: clearing the site, grubbing and removing overburden, install underground site services, final preparation of site.

<sup>b</sup> Represents maximum noise levels produced during construction for expansion area #2 (i.e., North Site) when considering the following construction activities: pour foundation/footings, install walls, install roof. Excludes activities “pour the floor” and “install torched on roof” as these are not applicable to the MPSB.

<sup>c</sup> Represents maximum noise levels produced during operations and maintenance when considering scenario OD, which assumes the operation of one (1) Large Object Processing Building (LOPB) in the North Site area. No modelled scenarios considered the operation of a SGSB within expansion area #2 (i.e., the North Site).



Considering the above interactions, the assessment of noise is considered bounded by the 2016 PEA, and no further quantitative assessment is required in this PEA Addendum.

## 5.1.2 Surface Water Environment and Aquatic Environment

### 5.1.2.1 Surface Water Environment

The surface water environment at the NSS-WWMF includes surface runoff and drainage features on the property such as the SRD and the West Ditch (WD). Water within the SRD drains in a northeastern direction into the nearby Stream C, which itself flows northward and discharges into the Baie du Doré in Lake Huron. Water within the WD drains westward directly into Lake Huron. As explained in the 2016 PEA, any potential impacts to sediments are considered minor relative to impacts to surface water (AMEC, 2016); thus, the assessment of surface water impacts is inherently considered to be protective of sediments found within the NSS-WWMF's drainage features.

During all Project phases, there are no sources of radiological contamination that would result in impacts to surface water. No radiological materials are associated with site preparation and construction; during operations and maintenance, radiological wastes will be securely contained, and as a result, no radiological emissions are expected to be released to surface water.

During all Project phases, surface runoff will be directed towards the existing stormwater drainage infrastructure (i.e., catch basins, storm sewers, oil grit separators). The stockpiling of building and waste materials and the operation of heavy machinery, vehicles and other equipment may impact surface water by introducing metals, suspended solids and other organic pollutants into the stormwater and drainage system. While impacts are expected to be minimized by following construction best practices and OPG's spill management protocols, the use of building materials and equipment and the on-site storage of wastes has the potential to increase the amount of chemical constituents in the surface water environment. Furthermore, the retention of gravel surfaces within the North Site has the potential to increase the amount of TSS loadings in surface water runoff being directed into the stormwater and drainage system relative to the scenario considered in the 2016 PEA, where the ground was assumed to be paved during the operation phase.

#### 5.1.2.1.1 Human Health Surface Water Screening

Consistent with the 2016 PEA, the potential increase in annual drainage flow to surface water associated with the development of the MPSB does not represent an adverse impact to human health. The expected update to the existing stormwater management system will be compliant with all necessary regulatory requirements and utilize design best practices to mitigate any flood risk; therefore, changes to surface water flow is not assessed further in this PEA Addendum.

Members of the public are restricted from accessing the NSS-WWMF site, and thus have no direct access to surface water or stormwater features on the property. Human receptors may come into direct contact with potentially contaminated waters discharged from the NSS-WWMF

into the Baie du Doré. Furthermore, potentially contaminated water discharged from the NSS-WWMF into Lake Huron may be taken up by the nearby Kincardine water supply plant (WSP) located approximately 15 km south of the Bruce nuclear site. However, the extended travel distance from the on-site stormwater system and drainage ditch (i.e., the SRD) to the Baie du Doré and the subsequent dilution once surface water is discharged into Lake Huron suggest that human health impacts from contaminated surface waters is unlikely. The screening of surface water COPCs is consistent with the 2016 PEA.

As described in the 2016 PEA, predicted water quality results were produced by conservatively assuming all four potential NSS-WWMF expansion areas would be developed simultaneously. Details of the water quality and water quantity modelling are provided in the 2016 PEA (AMEC, 2016). The 2016 PEA scenario most applicable to the development of the MPSB would be Case 1, where it was assumed that surface water drainage from all four expansion areas is directed to the SRD. The North Site (i.e., expansion area 2) sits directly adjacent to the SRD and is the second smallest expansion area at approximately 1.30 hectares (ha), or about 10.5% of the total expansion area (12.36 ha) when considering all four expansion areas together. Thus, considering runoff from all four expansion areas to represent runoff from the North Site entering into the SRD is considered bounding for the MPSB Project and is a conservative overestimate of potential surface water impacts.

The list of surface water COPCs is consistent with the 2016 PEA and includes TSS, metals (zinc, copper), dissolved chlorides, and phosphorus. The relevance of these parameters is discussed in Section 5.4.3.1 of the 2016 PEA (AMEC, 2016).

The surface water screening assessment (**Table 5-11**) uses updated drinking water criteria obtained from either *Health Canada Guidelines for Canadian Drinking Water Quality* (HC, 2024) or *Ontario Drinking Water Quality Standards, Objectives and Guidelines* (MECP, 2003b). The most restrictive screening value from the federal and provincial sources indicated were retained for the screening assessment. The use of drinking water guidelines to screen the ingestion exposure pathway is considered protective of incidental dermal contact exposures, as ingestion is considered to be a more direct route of exposure to potentially harmful substances.

**Table 5-11: Surface Water Screening from 2016 PEA**

Parameter	Predicted Concentration in SRD (mg/L)	Selected Screening Criteria (mg/L)	Interpretation	Parameter Retained for Further Assessment?	Reference
Copper	0.004	MAC: 2 AO: ≤ 1.0	Essential element. MAC based on gastrointestinal effects (short-term), liver and kidney effects (long-term). AO based on taste.	No	Health Canada (2024)
Zinc	0.091	AO: ≤ 5.0	AO based on taste.	No	Health Canada (2024)
Total Phosphorus	0.050	NV	Phosphorous is an essential nutrient which is present at a 98th percentile concentration of 8 mg/L in municipal water sources.	No	ON MECP (2011)
<b><u>Chloride</u></b>	<b><u>395</u></b>	<b><u>AO: ≤ 250</u></b>	Although the AO (based on taste and potential for corrosion) is exceeded, there is no human toxicity benchmark for chloride. It is unlikely to present an adverse effect to human health at the predicted concentration.	No	Health Canada (2024)
Total Suspended Solids <sup>a</sup>	88.6	NV	There are no human health screening criteria for TSS.	No	None

**Notes:**

Predicted concentrations were obtained from the 2016 PEA (AMEC, 2016)

<sup>a</sup> Site preparation and construction phase only.

**Bold** indicates an exceedance of a screening criteria.

MAC – Maximum Acceptable Concentration; considered a health-based guideline.

AO – Aesthetic Objective; not a health or risk-based guideline.

NV – No screening value.

Apart from chloride, no drinking water screening guidelines were exceeded when considering on-site predicted surface water concentrations in the SRD from the 2016 PEA. The drinking water criteria for chloride is an aesthetic objective based on taste; thus, an exceedance of this guideline does not indicate a health risk from chloride ingestion. Additionally, the 2016 PEA assumed ground surfaces would be paved during operations, which would be expected to increase the volume of surface water runoff being directed into the SRD and would require larger amounts of road salting to maintain safe walking and driving conditions. As the North Site is now expected to remain as a gravel/sand surface, lower concentrations of chloride in surface water runoff are expected due to less frequent applications of road salt and an increase in surface water infiltration into the ground.

Given the above considerations, the assessment of surface water impacts in the 2016 PEA is considered bounding of the MPSB and no further assessment is required in this PEA Addendum.

#### 5.1.2.1.2 Ecological Health Surface Water Screening

The 2016 PEA (AMEC, 2016) considered the operations and maintenance phase as being representative of the worst-case scenario for surface water flow, as a larger portion of the ground was assumed to be paved/hardened and thus impervious to soil infiltration compared with the site preparation and construction phases. Thus, only the operations and maintenance phase is considered in the 2016 PEA with respect to the assessment of water quantity. Case 1 from the 2016 PEA is considered applicable to the MPSB Project, where it is assumed that runoff from all four expansion areas is directed to the SRD. The North Site where the MPSB is located is situated within the SRD watershed and sits adjacent to the SRD along the north property fenceline. It should be noted that the North Site is now expected to remain as a gravel/sand surface and will not be paved, though the surface water quantity assessment from the 2016 PEA is retained as a conservative bounding scenario for the MPSB Project.

When considering Case 1, the 2016 PEA determined that the SRD would experience an increase in surface water flow of 35.4%, exceeding the screening benchmark of a  $\pm 15\%$  deviation from baseline conditions. However, the SRD currently exhibits a stable morphology due to its relatively low gradient and connectivity to the Wetland Complex, a connection that allows for the attenuation of water levels within the SRD. As described in the 2016 PEA (AMEC, 2016), assuming the management of peak flows and water quality through an adequately designed stormwater system, the maximum mean annual increase in surface water flow of 35.4% is likely to have a positive effect by increasing inundation of cattail-dominated areas of the main channel and areas of the Wetland associated with the SRD. This will in turn provide additional habitat for important aquatic species (e.g., Northern Redbelly Dace) which is considered a positive effect. Considering the above, and noting again that the North Site is today expected to remain unpaved, it is understood that Case 1 as assessed in the 2016 PEA is considered bounding of the MPSB Project and represents an overestimate of potential impacts to surface water quantity. Thus, the assessment of surface water quantity assessment in the 2016 PEA is considered bounding of the MPSB Project, and no further assessment is required in this PEA Addendum.

With regard to surface water quality, the retention of gravel surfaces at the North Site during the operation and maintenance phase represents a significant change from the 2016 PEA, as the exposed gravel surface is likely to change potential COPC inputs to surface water. Since ecological receptors reside in and around the SRD, there is potential for direct exposure to COPCs from surface water. As a result, potential impacts to the surface water environment will be quantitatively assessed in this PEA Addendum for the predictive ecological risk assessment only (**Section 7.0**).

#### 5.1.2.2 Aquatic Environment

The aquatic environment at the NSS-WWMF considers the various aquatic and riparian habitats surrounding the MPSB (i.e., the SRD and WD and their respective downstream receiving waters) and the diverse groups of aquatic (e.g., fish, benthic invertebrates) and semi-aquatic (e.g., frogs, turtles) receptors that rely on those habitats for survival, including federally and provincially-protected Species at Risk (SAR).

Since direct interactions between Project activities and the surface water environment were identified for the site preparation and construction phases, the subsequent effects on the aquatic environment will be quantitatively assessed for these phases. Demonstrating that potential impacts to the surface water are overall deemed to be negligible or adequately managed through mitigation measures and construction best practices will subsequently demonstrate protection of aquatic and riparian receptors in the aquatic environment.

#### 5.1.3 Groundwater (Quality and Quantity)

During the site preparation, construction, and operation and maintenance phases, any surface water or precipitation infiltrating through exposed soils can potentially result in chemical constituents reaching the underlying groundwater system rather than being diverted to surface drainage. Surface water and precipitation interacting with contaminated soils could potentially impact groundwater quality by infiltrating the ground and carrying water-bound chemical pollutants below the water table. However, overall groundwater quality impacts are not anticipated due to the expected implementation of existing OPG spill management protocols and construction best practices for managing exposed soils on site. Potential impacts due to a spill event investigation and associated corrective actions are not considered in this document. Given that the stored SGs will be delivered to the NSS-WWMF as a sealed package (i.e., drained of all water, vacuumed sealed and free of loose surface contamination) and traffic volumes are expected to be reduced following building construction, potential impacts to groundwater via leaks and spills during the operations and maintenance phase are considered negligible. Any major precipitation events that have the potential to temporarily influence groundwater quantity and flow are expected to be mitigated by the existing stormwater and drainage infrastructure, where runoff would be directed to the South Railway Ditch and eventually drain into the Baie du Doré in Lake Huron; therefore, no impacts to groundwater quantity are expected.

Dewatering of groundwater is not expected during excavation activities as excavations are expected to remain limited in extent. It is expected that a construction Environmental

Management Plan will be followed if excavation depths contact the groundwater table, and this plan will include best practice procedures that are intended to be protective of contact with groundwater.

Therefore, based on the current understanding that dewatering will not occur, impacts to the groundwater quality and quantity as a result of the MPSB Project will be negligible, and are not assessed further in this PEA Addendum.

#### 5.1.4 Geology (Soils)

During site preparation, construction, and operation and maintenance of the MPSB, any exposed soil could be impacted as a result of excavations, or the use, storage, and transportation of machinery, building materials and chemical constituents related to different phases of the Project. Soil and other excavated materials may be stored for future use at the NSS-WWMF or be removed off-site in accordance with applicable regulations.

As noted in **Section 5.1.3**, soil quality (including the gravel surface of the North Site) is not expected to be impacted as a result of any Project activities as any potential spills will be managed following site-specific procedures and existing OPG spill management protocol. Potential impacts due to a spill event investigation and associated corrective actions are not considered in this document. During operations and maintenance, the stored SGs will be delivered to the NSS-WWMF as a sealed package (i.e., drained of all water, vacuumed sealed and free of loose surface contamination) and traffic volumes are expected to be minimal compared with the site preparation and construction phases; thus, impacts to soil related to spills and leaks are considered negligible.

A construction Environmental Management Plan will also be in place and will detail construction best practices and mitigation measures for managing soils. Excavations are also expected to remain limited. The removal of the previous fencing will be completed through hydro excavation. This activity is not expected to impact the soil or surface water at the site, as the soil waste slurry is expected to be collected and managed off-site.

Therefore, impacts to soil quality as a result of the MPSB Project are considered negligible, and are not assessed further in the PEA Addendum.

#### 5.1.5 Radiation and Radioactivity

Increased radiation or radioactivity levels in the environment are not expected during site preparation and construction as these phases do not involve the use of radioactive materials or the modification of facilities that use radioactive materials.

During the operation and maintenance phase, no radioactivity will be released to air, water or the ground as all radionuclides are expected to be contained within the MPSB (**Section 5.1.1.1.1**). Additional shielding measures (e.g., concrete shielding at the perimeter fence, lead

blanketing) may be implemented should thermoluminescent dosimeter (TLD) monitoring indicate that additional shielding is required.

During operation and maintenance, it is expected that there will be gamma radiation fields emitted during the transfer and storage of SGs within the MPSB. The design of the MPSB will provide some shielding in the walls, which will be verified upon the completion of the structure design. As noted, additional shielding may be installed at the perimeter fence line if required as indicated by routine TLD monitoring at the NSS-WWMF perimeter.

Since gamma radiation fields from the transfer and storage of waste containers at the MPSB during the operation and maintenance phase can impact humans and terrestrial receptors, it is considered further for quantitative assessment in this PEA Addendum.

### 5.1.6 Terrestrial Environment

The terrestrial environment considers the various terrestrial habitats within and immediately surrounding the MPSB site and the diverse groups of plants and animals that rely on those habitats for survival, including federally and provincially-protected Species at Risk (SAR). Although the MPSB site is highly disturbed and is not considered to contain significant terrestrial habitat, some plant and animal species adapted to urban and disturbed environments may reside there. Interactions between the Project and the terrestrial environment are expected to occur as a result of either direct disturbance of the ground (e.g., excavation), the release of air pollutants and noise/vibrations into the atmospheric environment, or the emission of gamma radiation fields.

The MPSB will be constructed within the existing NSS-WWMF site, which consists of numerous buildings, parking lots, and gravel areas, and outdoor laydown areas where equipment and materials are stored. As characterized in the most recent 2021 NSS-WWMF ERA (Ecometrix, 2022a), the terrestrial environment contains the following significant habitats within the Terrestrial Monitoring Area:

- Amphibian Woodland Breeding Habitats;
- Amphibian Wetland Breeding Habitats;
- Special Concern and Rare Wildlife Species Habitat;
- Turtle Wintering Areas;
- Deer Yard Areas; and,
- Terrestrial Crayfish Habitat.

The Terrestrial Monitoring Area consists of the entire NSS-WWMF property and a portion of the surrounding Bruce Power property, bordered by the powerline corridor to the east, Tie Road to



the southeast, a second powerline corridor to the south, a service road to the west, and the edge of a narrow, forested parcel of land to the north. Vegetation and wildlife communities located within the Terrestrial Monitoring Area for the proposed future NSS-WWMF were found to be typical of those found in the Lake Simcoe-Rideau Ecoregion. Upland communities and ecosites consist of deciduous, mixed wood, coniferous and cultural habitats. Wetland communities at the NSS-WWMF and ecosites consist of swamps, marshes and open water wetlands (Ecometrix, 2022a).

During all phases of the Project, there is the potential for vehicle collisions with wildlife that may result in injuries or road mortalities. Wildlife surrounding the MPSB may be impacted by air emissions (e.g., vehicle exhausts, dust) and loud noises and vibrations during site preparation and construction. During operation and maintenance, wildlife may be exposed to direct gamma radiation fields from the MPSB where waste materials are stored.

During site preparation and construction, various measures outlined in the construction Environmental Management Plan will be followed to minimize impacts to the terrestrial environment and local wildlife. The Environmental Management Plan will identify best practices relating to air and water management, noise control, contaminated and excess soil management, and general wildlife management. Safe driving best practices will be used to avoid vehicle collisions with wildlife.

Since direct interactions between Project activities and the atmospheric environment were identified for the site preparation and construction phases, the subsequent effects on the terrestrial environment will be quantitatively assessed for these phases. In addition, a quantitative assessment of radiation exposures near the MPSB during the operation and management phase will be completed for terrestrial wildlife.

### 5.1.7 Human Health (Public)

During site preparation and construction, OPG staff will be working under the existing OPG Health and Safety Management Systems. Similarly, on-site contractors are expected to work in accordance with their own health and safety programs and procedures. Once operation of the MPSB begins, OPG staff will be working under the existing Radiation Protection Program. For these reasons, the assessment of potential Project effects to on-site workers are not considered in this PEA Addendum. The same assumption applies to on-site Bruce Power workers and contractors working in close proximity to the North Site beyond the NSS-WWMF perimeter fencing.

Members of the general public will not have direct access to the MPSB as the entire NSS-WWMF site is enclosed by perimeter fencing and is continuously protected by security personnel. The nearest public road is situated approximately 1 km away from the proposed MPSB area, and no permanent or temporary residences or walking trails are located adjacent to the NSS-WWMF site. The closest off-site human receptor is assumed to be at the Bruce nuclear site boundary, at the intersection of Tie Road and Central Services Road, which leads to the main guard house.

Off-site human receptors may be impacted by Project activities. This is primarily expected to be due to loud noises and vibrations associated with site preparation and construction. Human receptors may come into contact with airborne dust at the site perimeter. As noted in **Section 5.1.1.1.2**, dust suppression techniques used during site preparation and construction is expected to reduce the amount of dust emissions released to the atmosphere. Human receptors at the NSS-WWMF site boundary may be exposed to air constituents associated with engine emissions during site preparation and construction. During operation and maintenance, human receptors in close proximity to the site boundary of the NSS-WWMF may be exposed to direct gamma radiation fields emitted from the MPSB.

Since direct interactions between Project activities and the atmospheric environment were identified, the subsequent effects on human health (e.g., dust, engine emissions, noise) will also be quantitatively assessed for the site preparation and construction phases. In addition, a quantitative assessment of direct gamma radiation exposures to the general public at the NSS-WWMF site boundary from the MPSB during the operation and maintenance phase will be completed.

### 5.1.8 Identification of Contaminants of Potential Concern and Physical Stressors

The environmental stressors investigated further in this PEA Addendum include surface water quality (ecological receptors only) and radiation.

The 2016 PEA had assumed that developed areas of the NSS-WWMF, including the North Site, would be paved; however, the area surrounding the MPSB will remain as sand and gravel, thus increasing the amount of precipitation that could infiltrate into the ground and reducing the amount of surface runoff being directed into the North Site stormwater system and existing drainage features, primarily the SRD. The presence of sand and gravel may contribute to higher loadings of suspended solids and facilitate increased sedimentation in the stormwater system and SRD (relative to that considered in the 2016 PEA) due to increased amounts of surface erosion. Any changes to water quality can negatively impact ecological receptors that rely on the surface water environment for habitat or as an area for obtaining prey items and drinking water. Consistent with the 2016 PEA, priority COPCs retained to assess potential impacts to the surface water environment include total suspended solids (TSS), metals (zinc, copper), dissolved chlorides, phosphorus, and water temperature.

Lastly, radiation fields associated with the storage of radiological wastes can act as a potential stressor to both human and terrestrial biota from the MPSB, within the North Site at the NSS-WWMF.

## 5.2 Quantitative Assessment of Project-Environment Interactions

As previously noted, **Table 5-1** summarizes the potential interactions of the Project with various environmental components either as direct, indirect or negligible interactions. Direct interactions identified in **Table 5-1** and further characterized as unbounded by the 2016 PEA in **Section 5.1** will be assessed quantitatively in **Sections 6.0** and **Section 7.0**. Additionally, **Section 8.0** will

quantitatively assess potential cumulative effects between the MPSB and the existing NSS-WWMF site.

**Section 6.0** will quantitatively assess potential risks to human health from gamma radiation released from the MPSB during operation and maintenance.

**Section 7.0** will quantitatively assess potential risks to ecological receptors from surface water impacts during site preparation, construction and operation and maintenance of the MPSB, and from gamma radiation fields from the MPSB during operation and maintenance.

Additionally, **Section 8.0** will quantitatively assess cumulative effects with respect to radiation dose received by nearby members of the public from the existing Bruce Nuclear site, current and future NSS-WWMF operations and the proposed MPSB.

### 5.3 Climate Change Considerations

Changes in climate have the potential to affect meteorological parameters that influence dispersion over the long term (i.e., the life of the Project). This may influence deposition rates and subsequent environmental media concentrations. Considering site preparation and construction activities are anticipated to last for a short duration (less than one year), the impact of climate change on meteorological conditions during those Project phases is minimal.

A likely increase in frequency and severity of extreme weather events over the coming decades due to climate change may affect the Project. Changes in climate during the lifetime of the Project may result in increased precipitation which would result in additional runoff. Additionally, extreme precipitation and flooding events are expected to increase over time. The design of the water management infrastructure would include additional capacity to accommodate climate change, as applicable. Additionally, the Project will be designed using engineering best practices (e.g., installing skirting around catch basins to protect and stabilize catch basins and adjacent areas) which will account for considerations of climate change risks and extreme weather events. OPG's existing Emergency Management Program addresses actions to be taken to respond to emergencies which would include extreme weather events.

Overall, considering the limited interactions of the Project with the environment, and the existing measures (e.g., Emergency Management Program, consideration of climate change risks and extreme weather events in infrastructure design) to mitigate adverse interactions between the environment and the Project, the impacts of climate change on the Project are considered negligible and are not assessed further in this PEA Addendum.

## 6.0 Predictive Human Health Risk Assessment

### 6.1 Problem Formulation

The problem formulation provides the objectives, goals, framework and methodology for the predictive human health risk assessment (HHRA) and consists of identifying the relevant components for the HHRA. These components include the human receptors that may be potentially present in or around the NSS-WWMF Site; the chemical and radiological contaminants in or around the NSS-WWMF Site; and the exposure pathways by which receptors could be exposed to contaminants in the environment. A conceptual site model (CSM) illustrates the relationships between the above components, based on the results of the problem formulation.

#### 6.1.1 Health and Safety of On-site Workers

Workers, contractors, and visitors within the NSS-WWMF site are potentially exposed to environmental contaminants, both chemical and radiological, but these exposures are considered and controlled through OPG's Health and Safety Management System and the Radiation Protection Program, and are not considered in this HHRA, as discussed below. Similarly, Bruce Power workers, contractors and site visitors working near the NSS-WWMF on Bruce Power lands are assumed to be protected by Bruce Power's health and safety and radiation protection programs, and are also not considered in this HHRA.

The Health and Safety Management System Program is designed to ensure the protection of employees, contractors and visiting members of the public. The program outlines a systems approach used to manage risks associated with activities, products and services of OPG Nuclear operations. Contractors are required to maintain a level of safety equivalent to OPG staff while working at an OPG workplace. Work at OPG is subject to safe work planning requirements where safety hazards are identified and mitigating measures are communicated through Pre-Job Briefings. Routine or planned work is governed by approved procedures and operating instructions.

During operation and maintenance of the SG waste storage within the MPSB, OPG's Radiation Protection Program will be applied. The Radiation Protection Program is designed to ensure that doses for employees, contractors and visiting members of the public are below regulatory limits, and As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account. Employee radiation doses are monitored to ensure they do not exceed exposure control levels that are below regulatory limits. Doses to visitors and contractors are also monitored. Only workers classified as Nuclear Energy Workers (NEWs) may perform radioactive work. Visitors are limited to non-radioactive work and escorted by a NEW. Personal information is collected for the purposes of dose reporting.

As human exposures on the site are kept within safe levels through the Health and Safety Management System Program and Radiation Protection Program, on site workers are not

addressed further in the predictive HHRA. Thus, the focus of the predictive HHRA is on off-site members of the public.

## 6.1.2 Receptor Selection and Characterization

### 6.1.2.1 Receptor Selection

As noted, the focus of the predictive HHRA is on potential risk to off-site members of the public. Off-site members of the public are potentially exposed to low levels of airborne or waterborne contaminants and radiation fields. The most-affected off-site members of the public are defined as the “critical group”. Potential critical groups are defined through site specific surveys and their doses were calculated in the 2016 WWMF Expansion Project PEA (AMEC, 2016).

For off-site members of the public, the receptors are selected based on the results of Bruce Power’s site-specific survey carried out in 2021. The 2021 site-specific survey was updated in 2023 to incorporate results of the 2021 Census data from Statistics Canada. Based on the updated site-specific survey, the following five receptor types were identified:

- **Non-farm residents:** this category includes full-time residents of the area surrounding the Site. Their food intake is mostly from grocery stores.
- **Farm residents:** farm residents are more likely to consume their own crop or livestock, and only a portion of their food intake is from grocery stores.
- **Subsistence farm resident:** Formerly called Mennonite farm residents (AMEC, 2016), the subsistence farm residents get a larger portion of their food, milk and water intake from local sources, and half of their diet is self-produced.
- **Dairy farm residents:** The Dairy farm residents consume fresh milk from their own farm and a higher fraction of locally grown produce and livestock.
- **Bruce Eco Industrial Park Worker:** Also referred to as the Bruce Energy Centre worker (AMEC, 2016), the Bruce Eco Industrial Park worker represents occupational exposures at a location near the facility. These persons do not live at one of the other locations.
- **Hunter/Fisher:** The Hunter/Fisher receptor represent residents that may catch and consume wild game and fish in greater quantities than the other residents of the different categories. The characteristics of this resident have been developed based on surveys of the Saugeen Ojibway Nation, Historic Saugeen Métis, and the Métis Nation of Ontario.

Consistent with the 2016 PEA (AMEC, 2016), the resident receptor groups include different age classes, including an “Adult” (16 to 70 years old), a “Child” (6 to 15 years old) and an “Infant” (0 to 5 years old), as per CSA N288.1:20 (CSA, 2020). The Bruce Eco Industrial Park worker only

considers an “Adult” class receptor. The locations of the receptors from AMEC (2016) are shown in **Figure 5-1**.

Specific to this PEA Addendum, an additional receptor (**Figure 6-1**) is considered in this assessment to evaluate the radiation dose from the SGs once the MPSB is in operation. The receptor is located immediately outside the Bruce Nuclear site property boundary:

- **The guard house receptor:** This receptor is a local resident receptor (e.g., BR48) and is assumed to spend 1% of their time at the intersection of Tie Road and Central Services Road outside the Bruce nuclear site property boundary. This intersection is the closest location to the NSS-WWMF that a member of the public can access.

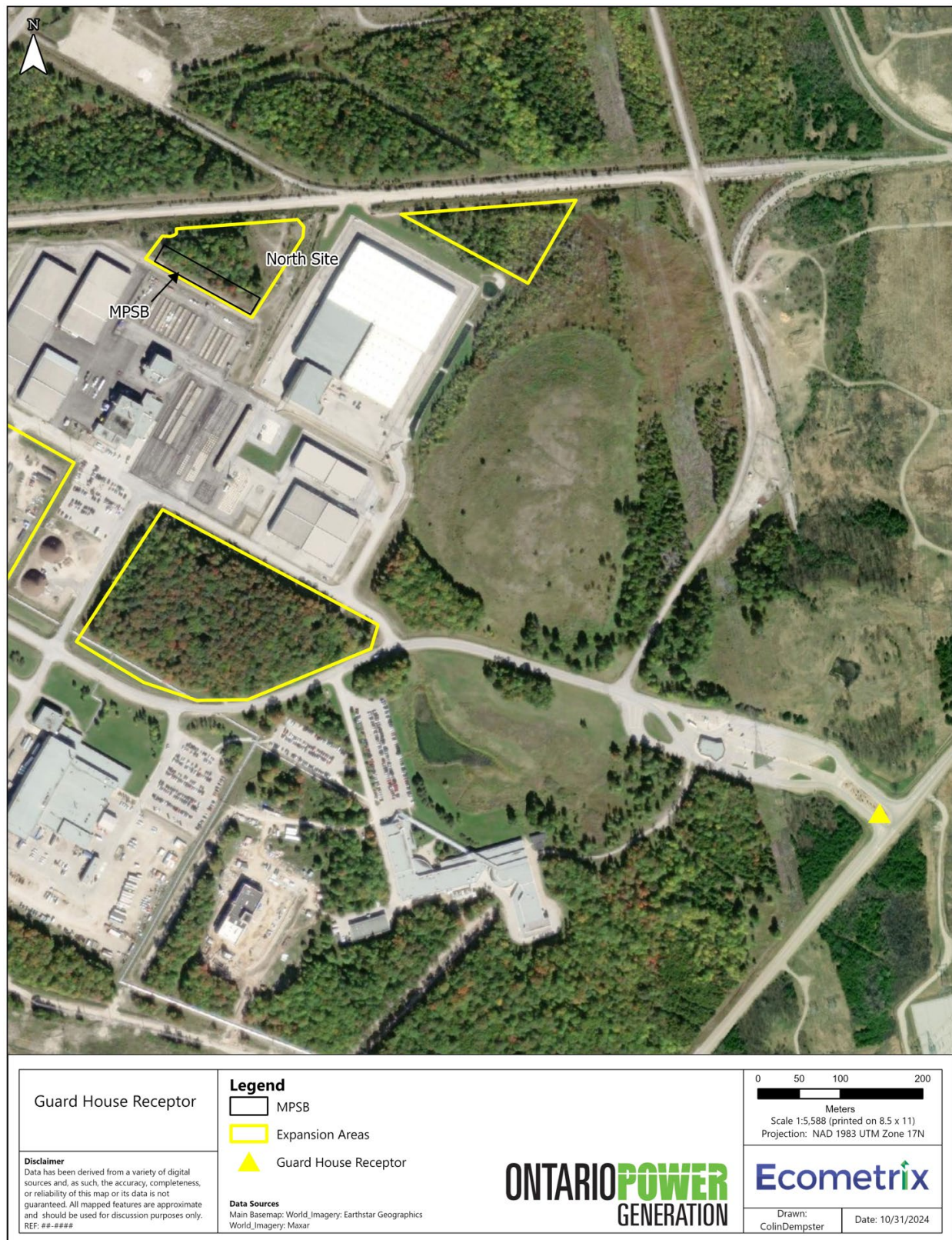
As discussed in **Section 1.2**, numerous Indigenous communities exist in the vicinity of the Bruce nuclear site. However, consistent with the 2016 PEA (AMEC, 2016), Indigenous community members (as represented by the Hunter/Fisher) were not retained as a specific receptor group. The rationale is that the concentrations of chemical contaminants in air, water and foodstuffs and radiation exposures from the NSS-WWMF at the nearest Indigenous community are expected to be lower than those at the nearest critical group due to expected dispersion and dilution. Therefore, the total dose to a member of an Indigenous community is expected to be less than that received by the critical group nearer to the NSS-WWMF boundary.

The general characteristics of the receptors as presented by AMEC (2016) are provided in **Table 6-1**. Bolded receptors in **Table 6-1** have been retained for assessment in the predictive HHRA as they represent the nearest receptors to the NSS-WWMF by distance and/or are the closest receptors that exist downwind of the NSS-WWMF in the predominant wind direction, as shown in Figure 2-6 of the 2021 NSS-WWMF ERA (Ecometrix, 2022a).

**Table 6-1: Identification of Human Receptors for the Predictive HHRA**

Receptor Group		General Characteristics of Receptors
Non-farm residents	BR1	Non-farm resident, Lakeshore. Scott Point, Located north of the Bruce nuclear site, about 4 km from the NSS-WWMF.
	BR17	Non-farm resident, Inland. Located to the east of the Bruce nuclear site, about 4 km from the NSS-WWMF.
	BR25	Non-farm resident, Inland. Located to the southeast of the Bruce nuclear site, about 3 km from the NSS-WWMF.
	BR27	Non-farm resident, Inland, Trailer Park. Located to the south of the Bruce nuclear site, about 3 km from the NSS-WWMF.
	BR32	Non-farm resident, Lakeshore. Located to the south of Bruce nuclear site in Inverhuron, about 4 km from the NSS-WWMF and is the nearest receptor to the North Site in the predominant southwestern wind direction.
	<b>BR48</b>	Non-farm resident, Inland. Located to the east of the Bruce nuclear site near Baie du Doré, about 3 km from the NSS-WWMF and is the closest permanent receptor to the North Site by distance.
Farm resident	BF8	Agricultural, farm resident. Located to the southeast of the Bruce nuclear site, about 7 km from the NSS-WWMF.
	BF14	Agricultural, farm resident. Located to the southeast of the Bruce nuclear site, about 3 km from the NSS-WWMF and is the nearest receptor to the North Site in the predominant southern wind direction
	BF16	Agricultural, farm resident. Located to the east of the Bruce nuclear site, about 7 km from the NSS-WWMF.
Subsistence farm resident	BMF2	Agricultural, farm resident. Located to the southeast of the Bruce nuclear site, about 8 km from the NSS-WWMF.
	BMF3	Agricultural, farm resident. Located to the southeast of the Bruce nuclear site, about 7 km from the NSS-WWMF.
Dairy farm residents	BDF9	Agricultural, dairy farm resident. Located to the southeast of the Bruce nuclear site, about 11 km from the NSS-WWMF.
Industry workers	BEC	Worker in BEC (Now known as Bruce Eco-Industrial Park). Located to the east of the Bruce nuclear site, about 3 km from the NSS-WWMF.





**Figure 6-1: Guard House Receptor for the Predictive HHRA**



### 6.1.2.2 Receptor Characterization

The receptor characterization is consistent with the 2016 PEA (AMEC, 2016). Food and water consumption rates and other receptor characteristics are described in further detail in that report.

For this predictive HHRA, it is assumed that all resident receptors spend 100% of their time living in a single location as shown in **Figure 5-1**. The member of the public at the guard house is assumed to have an occupancy factor of 0.01 (1% of the year) and represents a conservative 87.6 hours spent near the guard house at the intersection of Tie Road and Central Services Road.

### 6.1.3 Human Health Exposure Pathways and Conceptual Model

As discussed in **Section 5.1**, no non-radiological interactions with the environment as a result of the MPSB Project that are unbounded by the 2016 PEA were identified. **Table 6-2** summarizes the human health exposure pathways from the MPSB Project for the human receptors identified for the PEA Addendum.

**Table 6-2: Human Health Exposure Pathways**

Receptor Group	Environmental Media	Exposure Pathway
Local Resident Receptor (BR48) at the Guard House	Air	Radiation exposure

### 6.1.4 Screening Assessment

#### 6.1.4.1 Radiation

The Steam Generators (SGs) are assumed to emit 400  $\mu\text{Sv/h}$  at a 1 m distance from the surface of the SGs. These SGs will be stored within the MPSB within the North Site, several metres from the North Fence Line of the NSS-WWMF. The nearest member of the public is expected to be located approximately 1 km from the proposed MPSB area, near the Guard House at the Bruce Nuclear site boundary, and is conservatively assessed to quantify the dose to a member of the public in close proximity to the Bruce nuclear site. The radiation dose to the Guard House receptor is quantified and considered further in the exposure assessment below.

### 6.1.5 Summary

Based on the Problem Formulation, the focus of the exposure assessment is on exposure of the Guard House receptor to gamma radiation from the storage of SGs within the MPSB.

## 6.2 Exposure Assessment

In the exposure assessment, the exposure of human receptors to gamma radiation is quantified in terms of radiation dose for the proposed storage of waste within the North Site. This dose

estimate considers several buildings containing waste including the MPSB, therefore the resulting calculated dose would be an overestimate of risk.

The dose rate for the local resident receptor located at the guard house using reference dry storage containers (DSCs) and representative DSCs are  $4.70 \times 10^{-2} \mu\text{Sv/a}$  and  $2.67 \times 10^{-2} \mu\text{Sv/a}$ , respectively. This receptor is exposed to the hourly dose rate for 87.6 hours (1% occupancy). This is a conservative estimate of the duration of time members of the public could spend at the intersection of Tie Road and Central Services Road outside the Bruce nuclear site property boundary. The dose rate for this receptor is conservatively protective of other public human receptors identified in the Problem Formulation.

The dose rate for the Guard House Receptor is summarized in **Table 6-3**.

**Table 6-3: Predicted Dose Rate for Human Receptors from the MPSB**

Receptor	Dose Rate using Reference <sup>b</sup> DSC	Dose Rate using Representative <sup>b</sup> DSCs
Local Resident Receptor at the Guard House <sup>(a)</sup>	5.36E-04 $\mu\text{Sv/h}$ (4.70E-02 $\mu\text{Sv/a}$ )	3.04E-04 $\mu\text{Sv/h}$ (2.67E-02 $\mu\text{Sv/a}$ )

**Notes:**

- (a) The dose at the Guard house is representative of the member of the public, located at the Bruce Nuclear site boundary. The dose rate presented in  $\mu\text{Sv/a}$  is based on an occupancy of 1%. These dose rates meet the public dose rate limit of 1000  $\mu\text{Sv/a}$ .
- (b) Reference DSC assumes 10-year burnup of fuel. Representative DSC assumes average burnup.

## 6.3 Hazard Assessment

The public dose limit for radiation protection is 1000  $\mu\text{Sv/a}$ , as described in the Radiation Protection Regulations under the *Nuclear Safety and Control Act* (Nuclear Safety and Control Act, 1997). This limit is defined as an incremental dose. It is set at a fraction of natural background exposure to radiation. Public doses arising from licensed facilities are compared to the public dose limit and higher doses are considered unacceptable.

## 6.4 Risk Characterization

### 6.4.1 Radiation

The public dose estimates for the residential receptor at the Guard House with reference and representative DSCs are 4.70  $\mu\text{Sv/a}$  and 2.67  $\mu\text{Sv/a}$ , respectively. These dose estimates represent approximately 0.5% and 0.3% of the regulatory public dose limit (1,000  $\mu\text{Sv/a}$ ) for the receptor at the Guard House. Since the receptor at the Guard House is a member of the public that is expected to receive the highest dose from MPSB, the demonstration that the Guard House receptor is protected implies that other potential critical groups near the NSS-WWMF site are also protected.

Since the dose estimates are a fraction of the public dose limit, no discernable health risks are anticipated due to exposure of potential receptor groups to gamma radiation from the proposed MPSB within the NSS-WWMF.

## 6.5 Discussion on Uncertainty

The data used in the predictive HHRA were concluded to be of adequate quality to support the objectives of the PEA Addendum. This PEA Addendum largely relies on results from the previously completed 2016 PEA (AMEC, 2016), which considered a larger, more complex development project consisting of multiple expansion areas of the NSS-WWMF. For additional information on uncertainties associated with the modelling used to assess human health impacts, the reader is directed to Section 6.6 of the 2016 PEA (AMEC, 2016).

With respect to this PEA Addendum, results from the 2016 PEA are considered overly conservative because they consider 1) the simultaneous development of multiple, larger development areas at the NSS-WWMF, 2) a larger fleet of construction vehicles and equipment, and 3) some project activities and interactions that are not directly applicable to the MPSB Project. Relying on results from the 2016 PEA provides a conservative upper bound for any potential human health effects associated with the MPSB; specific effects from the MPSB may be smaller than those described in this PEA Addendum. Additionally, the PEA Addendum considers maximum concentrations and noise levels for the screening assessment; this is considered conservative and not representative of real-world exposures for human receptors, who would likely be exposed to lower concentrations and sound levels.

The 1% annual occupancy time assumed for the Guard House receptor is considered to be conservative. It is unlikely that any members of the public would be standing or walking within close proximity of the Bruce nuclear site for extended periods of time. It is more reasonable to assume that members of the public would be driving along Tie Road next to the Bruce nuclear site boundary, greatly reducing the time they may be potentially exposed to gamma radiation fields emitted by the MPSB.

Regarding the radiation assessment, OPG will only accept SGs based on existing waste acceptance criteria for low- and intermediate-level radioactive waste. Current acceptance criteria stipulate that the working distance gamma radiation dose rate shall not exceed 40 millirem per hour (mrem/h) at a distance of 1 meter (3.3 feet) from any point on the cartridge surface. Furthermore, the contact gamma radiation dose rate at any point of the cartridge surface shall not exceed 200 mrem/h. These limits cannot be exceeded; thus, assuming the waste acceptance criteria when estimating the DSC dose rate is considered conservative.

## 7.0 Predictive Ecological Risk Assessment

### 7.1 Problem Formulation

#### 7.1.1 Receptor Selection and Characterization

As discussed in **Section 5.1**, the environmental stressors investigated further in this predictive ecological risk assessment (EcoRA) include potential surface water impacts associated with changes in water quantity and water quality due to increased surface runoff. Additionally, gamma radiation fields emitted from the MPSB during the operation and maintenance phase has the potential to negatively impact nearby ecological receptors.

The terrestrial and aquatic ecological receptors outlined below represent receptors considered in this predictive EcoRA. Terrestrial receptors are considered to be potentially in contact with the MPSB (i.e. birds and bats perching on the roof of the structure), or are considered to be just north of the NSS-WWMF. Aquatic receptors are located in the SRD just north of the NSS-WWMF. As it is impractical to assess potential effects on all species of biota at the NSS-WWMF site, a select group of representative species are chosen. These organisms are selected because they are known to exist on the site, represent major taxonomic/ecological groups, represent major pathways of exposure, have ecological significance (e.g., Species at Risk), or have important intrinsic or socioeconomic value. The rationale for the selection of ecological receptors for the predictive EcoRA is consistent with both the 2016 PEA (AMEC, 2016) and the 2021 NSS-WWMF ERA (Ecometrix, 2022a). The protection of a representative receptor provides reasonable assurance that all species within the same feeding niche or ecological clade are protected as well, including federally and provincially-listed Species at Risk (SAR). The list of ecological receptors considered for the predictive EcoRA includes:

- Aquatic Vegetation
  - Cattail (*Typha sp.*)
- Aquatic Invertebrates
  - Digger Crayfish (*Creaserinus fodiens*)
  - Benthic Invertebrates (Community)
- Fish
  - Northern Redbelly Dace (*Chrosomus eos*)
  - Spottail Shiner (*Notropis hudsonius*)
  - Smallmouth Bass (*Micropterus dolomieu*)
- Terrestrial Vegetation
  - Grass (*Poaceae sp.*)
  - Eastern White Cedar (*Thuja occidentalis*)
- Terrestrial Invertebrates
  - Earthworm (*Lumbricus sp.*)
  - Bee (*Bombus sp.*)
- Herpetofauna
  - Northern Leopard Frog (*Lithobates pipiens*)

- Midland Painted Turtle (*Chrysemys picta*)
  - Northern Water Snake (*Nerodia sipedon*)
- Riparian Birds
  - Mallard (*Anas platyrhynchos*)
  - Bald Eagle (*Haliaeetus leucocephalus*)
- Riparian Mammals
  - Muskrat (*Ondatra zibethicus*)
- Terrestrial Birds
  - Wild Turkey (*Meleagris gallopavo*)
  - American Robin (*Turdus migratorius*)
- Terrestrial Mammals
  - Northern Short-tailed Shrew (*Blarina brevicauda*)
  - Little Brown Myotis (*Myotis lucifugus*)
  - White-tailed Deer (*Odocoileus virginianus*)
  - Red Fox (*Vulpes vulpes*)

#### 7.1.1.1 Consideration of Species at Risk

A recent review of the flora and fauna identified in Table 2-7 presented in the 2021 NSS-WWMF ERA (Ecometrix, 2022a) was conducted to verify the current status of confirmed or potential SAR for the NSS-WWMF site. The SAR list from the 2021 ERA was supplemented by considering additional potential SAR based on anecdotal sightings/observations at the NSS-WWMF site (provided by OPG), or the likely presence of suitable habitat types in the nearby area. A species was retained as a SAR for this PEA Addendum if it was confirmed to exist at the NSS-WWMF site, or is known (or highly likely) to exist in the surrounding area.

New SAR not previously identified in the 2021 ERA list and retained for this PEA Addendum include the Western Chorus Frog (*Pseudacris triseriata*), Gypsy Cuckoo Bumblebee (*Bombus bohemicus*), Bank Swallow (*Riparia riparia*), Canada Warbler (*Cardellina canadensis*), Chimney Swift (*Chaetura pelagica*), Eastern Red Bat (*Lasiurus borealis*), Hoary Bat (*Lasiurus cinereus*), and the Silver-haired Bat (*Lasionycteris noctivagans*). Previously identified SARs that have since been removed from the SAR list for this PEA Addendum include the Common Nighthawk (*Chordeiles minor*), Eastern Ribbonsnake (*Thamnophis sauritus*), and the Olive-sided Flycatcher (*Contopus cooperi*). These three species are no longer considered SAR for the purpose of this PEA Addendum as they are not federally or provincially-listed as “endangered” or “threatened” species as of May 2025.

The list of potential SAR identified in **Table 7-1** below were compared against the Schedule 1 list from the federal *Species at Risk Act* (SARA) (Government of Canada, 2025), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) list (COSEWIC, 2023), and the Species at Risk in Ontario list (SARO) (MECP, 2025) under the provincial *Endangered Species Act* (ESA). To be conservative, if a species is listed as threatened or endangered by either SARA, COSEWIC or SARO, the species is included in **Table 7-1**. As the general prohibitions under the SARA and provincial ESA do not apply to species of “special concern”, and CSA N288.6 does not specify

species of “special concern” to be ecologically significant, species with both a federal and provincial status of “special concern” are not listed in **Table 7-1**.

Exposure models for the specific assessment of many SAR are typically lacking. All of the SAR identified for this PEA can be assessed by reference to surrogate species already selected as ecological receptors for the predictive EcoRA, except for the Little Brown Myotis, which was retained as its own ecological receptor and is itself a suitable surrogate for the other identified at-risk bat species. Detailed justifications for selections of each of the surrogate species, based on habitat, diet, and ecological niche considerations, are presented below.

Table 7-1: Species at Risk and Surrogate Receptor Species for the Predictive EcoRA

Species at Risk (Scientific Name)	SARA (Federal)	COSEWIC (Federal)	SARO (Provincial)	Ecological Category / Feeding Niche	Last Observed	Surrogate Species (Scientific Name)
<b>Terrestrial Invertebrates</b>						
Monarch ( <i>Danaus plexippus</i> )	Endangered	Endangered	Special Concern	Terrestrial invertebrates	2021	Earthworm ( <i>Lumbricus sp.</i> )
Gypsy Cuckoo Bumblebee ( <i>Bombus bohemicus</i> )	Endangered	Endangered	Endangered	Terrestrial invertebrates	NA <sup>b</sup>	Bee ( <i>Bombus sp.</i> )
<b>Herpetofauna</b>						
Queensnake ( <i>Regina septemvittata</i> )	Endangered	Endangered	Endangered	Riparian reptile	NA <sup>b,c</sup>	Northern Water Snake ( <i>Nerodia sipedon</i> )
Spotted Turtle ( <i>Clemmys guttata</i> )	Endangered	Endangered	Endangered	Riparian reptile	NA <sup>b,c</sup>	Midland Painted Turtle ( <i>Chrysemys picta marginata</i> ) <sup>a</sup>
Western Chorus Frog ( <i>Pseudacris triseriata</i> )	Threatened	Threatened	No status	Riparian amphibian	NA <sup>b</sup>	Northern Leopard Frog ( <i>Lithobates pipiens</i> ) <sup>a</sup>
<b>Terrestrial Vegetation</b>						
Butternut ( <i>Juglans cinerea</i> )	Endangered	Endangered	Endangered	Terrestrial vegetation	2022	Eastern White Cedar ( <i>Thuja occidentalis</i> )
<b>Birds</b>						
Bank Swallow ( <i>Riparia riparia</i> )	Threatened	Threatened	Threatened	Terrestrial birds – aerial insectivore	2024	American Robin ( <i>Turdus migratorius</i> )
Barn Swallow ( <i>Hirundo rustica</i> )	Threatened	Special Concern	Special Concern	Terrestrial birds – aerial insectivore	2023	American Robin ( <i>Turdus migratorius</i> )
Bobolink ( <i>Dolichonyx oryzivorus</i> )	Threatened	Special Concern	Threatened	Terrestrial birds – ground-feeding omnivore	2021	American Robin ( <i>Turdus migratorius</i> )
Canada Warbler ( <i>Cardellina canadensis</i> )	Threatened	Special Concern	Special Concern	Terrestrial birds – aerial insectivore	2024	American Robin ( <i>Turdus migratorius</i> )
Chimney Swift ( <i>Chaetura pelagica</i> )	Threatened	Threatened	Threatened	Terrestrial birds – aerial insectivore	2023	American Robin ( <i>Turdus migratorius</i> )
Eastern Meadowlark ( <i>Strunella magna</i> )	Threatened	Threatened	Threatened	Terrestrial birds – ground-feeding omnivore	2024	American Robin ( <i>Turdus migratorius</i> )
Eastern Whip-poor-will ( <i>Antrostomus vociferus</i> )	Threatened	Special Concern	Special Concern	Terrestrial birds – aerial insectivore	2024	American Robin ( <i>Turdus migratorius</i> )
Golden-winged Warbler ( <i>Vermivora chrysoptera</i> )	Threatened	Threatened	Special Concern	Terrestrial birds - foliage insectivore	NA <sup>b,c</sup>	American Robin ( <i>Turdus migratorius</i> )



Species at Risk ( <i>Scientific Name</i> )	SARA (Federal)	COSEWIC (Federal)	SARO (Provincial)	Ecological Category / Feeding Niche	Last Observed	Surrogate Species ( <i>Scientific Name</i> )
Least Bittern ( <i>Ixobrychus exilis</i> )	Threatened	Special Concern	Threatened	Riparian birds – piscivore	2020	Bald Eagle ( <i>Haliaeetus leucocephalus</i> )
Red-headed Woodpecker ( <i>Melanerpes erythrocephalus</i> )	Endangered	Endangered	Endangered	Terrestrial birds – aerial omnivore	2022	American Robin ( <i>Turdus migratorius</i> )
Wood Thrush ( <i>Hylocichla mustelina</i> )	Threatened	Threatened	Special Concern	Terrestrial birds – ground-feeding omnivore	2024	American Robin ( <i>Turdus migratorius</i> )
<b>Mammals</b>						
Eastern Red Bat ( <i>Lasiurus borealis</i> )	No status	Endangered	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Eastern Small-footed Myotis ( <i>Myotis leibii</i> )	No status	No status	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Hoary Bat ( <i>Lasiurus cinereus</i> )	No status	Endangered	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Little Brown Myotis ( <i>Myotis lucifugus</i> )	Endangered	Endangered	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Northern Myotis ( <i>Myotis septentrionalis</i> )	Endangered	Endangered	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Silver-haired Bat ( <i>Lasionycteris noctivagans</i> )	No status	Endangered	Endangered	Mammalian insectivore	NA <sup>b</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )
Tri-Coloured Bat ( <i>Perimyotis subflavus</i> )	Endangered	Endangered	Endangered	Mammalian insectivore	NA <sup>b,c</sup>	Little Brown Myotis ( <i>Myotis lucifugus</i> )

**Notes:**  
Species at Risk with both a federal and provincial status of “special concern” have been excluded from the table, as the general prohibitions under the *Species at Risk Act* and *Endangered Species Act* do not apply to species of “special concern”, and CSA N288.6:22 (CSA, 2022) does not consider species of “special concern” to be ecologically significant.  
<sup>a</sup> Represented by the Northern Redbelly Dace and Spottail Shiner, as there is a lack of exposure factor and toxicity data for turtles and frogs.  
<sup>b</sup> Not reported as present at the NSS-WWMF, but noted to be a potential SAR for the regional area.  
<sup>c</sup> Species identified as a potential SAR in the 2021 NSS-WWMF ERA (Ecometrix, 2022a) based on a desktop review using NHIC natural heritage area mapping tools, and has been retained for re-assessment as a potential SAR for this PEA Addendum.

#### 7.1.1.1.1 Terrestrial Invertebrates

The Monarch (*Danaus plexippus*) is a milkweed butterfly. It is a migrating butterfly species that covers long distances between Ontario and Florida or central Mexico annually through four generations. In Ontario, Monarch caterpillars feed on milkweed plants and are confined to meadows and open areas with food sources. Adult butterflies are found in more diverse habitats. Potential risk to Monarch is expected to be adequately assessed by Earthworm (*Lumbricus sp.*), as they are both terrestrial invertebrates. Both the Earthworm and Monarch caterpillar are exposed to airborne emissions, directly and through soil or plants; however, Earthworms dwell underground and are directly exposed to soil in contrast to the Monarch. Therefore, using the Earthworm to represent a monarch caterpillar is conservative.

The Gypsy Cuckoo Bumble Bee (*Bombus bohemicus*) is a medium-sized bumble bee historically found across Canada. Like other bees, they likely feed on pollen and nectar from a variety of flowering plants. They are a parasitic bee, taking over existing colonies of other bumble bees. In recent years, the Gypsy Cuckoo Bumble Bee is now only found in three provinces following drastic population decline; in Ontario, it is known to exist in Pinery Provincial Park on Lake Huron, approximately 115 km south of the NSS-WWMF site. A generic bee has been retained as an ecological receptor for the predictive EcoRA, which is representative of bees including the Gypsy Cuckoo Bumble Bee.

#### 7.1.1.1.2 Herpetofauna

The Queensnake (*Regina septemvittata*) is an aquatic species that is usually found within a few metres from water. The habitat of the Queensnake is primarily rivers, streams and lakes with clear water; Queensnakes are often found hiding in rocky or gravel covered sediment. This snake species is expected to be adequately assessed by the Northern Water Snake (*Nerodia sipedon*) in this predictive EcoRA, which inhabits similar aquatic environments.

The Spotted Turtle (*Clemmys guttata*) is a semi-aquatic species that inhabits wetlands, marshes, bogs, and ditches, and primarily ingests aquatic invertebrates, but has been recorded in the Baie du Doré wetlands. A fish model (i.e., Northern Redbelly Dace) is used for the assessment of turtles since there is a lack of exposure factor and toxicity data for turtles. Both organisms reside in water, and they share similar exposure pathways; thus, the assessment of fish is expected to be protective of turtle communities for this predictive EcoRA.

The Western Chorus Frog (*Pseudacris triseriata*) is a small tree frog requiring both terrestrial and aquatic habitats in close proximity. They primarily breed in seasonally dry, temporary ponds that are devoid of predators, and feed mostly on terrestrial invertebrates. The availability of scientific information to assess amphibians as part of an EcoRA is limited, as these receptors are not well characterized and have multiple, distinct life-stages. Therefore, frogs are evaluated based on the community assessment of fish (i.e., Northern Redbelly Dace). The assessment of a fish receptor is considered protective of the most sensitive life stage of frogs, which is the tadpole.

#### 7.1.1.1.3 Terrestrial Vegetation

Butternut (*Juglans cinerea*) is a medium-sized tree, belonging to the walnut family, which can reach up to 30 m in height. In Ontario, Butternut usually grows alone or in small groups in deciduous forests, in sunny openings and near forest edges. It prefers moist, well-drained soil and is often found along streams, or on well-drained gravel sites. Potential risk to this species is expected to be adequately assessed by reference to other terrestrial plant species such as the Eastern White Cedar (*Thuja occidentalis*), as they receive similar exposure to airborne emissions via soil.

#### 7.1.1.1.4 Birds

Barn Swallows (*Hirundo rustica*) are aerial insectivores and feed over open areas such as fields, meadows, watercourses and waterbodies. In Ontario, Barn Swallow typically nest in small openings in man-made buildings, such as barns. Barn Swallows are typically observed foraging over lawns, open field areas, wetlands and along the lakeshore. The Bank Swallow (*Riparia riparia*) is an aerial insectivore that feeds over open areas such as fields, meadows, watercourses, and waterbodies. Bank swallows nest colonially in small to large colonies where there are natural or artificial soft soil banks, such as natural river and lake bluffs, in which they create nesting burrows.

The Bobolink (*Dolichonyx oryzivorus*) is an omnivore that is found in open areas and large fields and typically forages primarily on seeds and invertebrates. Similarly, Wood Thrush (*Hylocichla mustelina*) are also omnivores which typically forage on invertebrates and fruits. They prefer woodland habitat.

The Canada Warbler (*Cardellina canadensis*) is a small bird that primarily eats insects, often consuming them mid-flight or gleaning them off foliage. The Canada Warbler is a regular migrant species. The American Robin is considered a suitable representative species for the Canada Warbler considering their similar diet and the American Robin's higher exposure to soil.

The Chimney Swift (*Chaetura pelagica*) is a relatively small bird that feeds almost exclusively on flying insects, consuming flies, beetles, and moths while in flight. They tend to nest in caves and hollow trees, and in urbanized areas can be found nesting in buildings and man-made structures, including chimneys.

Eastern Meadowlark (*Sturnella magna*) are omnivores which typically forage on or near the ground for insects, seeds, and berries. Eastern Meadowlark also breeds in grasslands and prairie, as well as pastures and hay fields. The Eastern Meadowlark builds its nest on the ground, covered with a roof woven from grasses. The Golden-winged Warbler (*Vermivora chrysoptera*) breeds in shrubby habitats and also tends to occur in wetland habitats. As adults, the Golden-winged Warblers move into mature forests. The Golden-winged Warbler eats insects such as spiders that have been gleaned off of foliage.

The Eastern Whip-poor-will (*Antrostomus vociferus*) is a medium-sized bird typically active at dusk and rarely seen during daytime hours. The Eastern Whip-poor-will is often found in areas with a mix of open woodlands, savannahs or in more mature, forested areas. They are exclusively insectivores, consuming moths, beetles and other flying insects.

The Red-headed Woodpecker (*Melanerpes erythrocephalus*) is a medium-sized bird, easily identified by its bright red head, neck and breast, with black colouring on its back and white on its underside. They are aerial omnivores, and will consume a diverse diet of insects, fruit, and seeds.

Terrestrial birds that are aerial insectivores (i.e., Bank Swallow, Barn Swallow, Canada Warbler, Chimney Swift, Eastern Whip-poor-will), foliage insectivores (i.e., Golden-winged Warbler), aerial omnivores (i.e., Red-headed Woodpecker), or ground-feeding omnivores (i.e., Bobolink, Eastern Meadowlark, Wood Thrush) are all represented by the American Robin (*Turdus migratorius*) in the predictive EcoRA, given their similar diet and exposure characteristics. The American Robin is also assumed to ingest larger quantities of soil as it forages on the ground, which is representative of other ground-feeding birds and protective of aerial feeders.

The Least Bittern (*Ixobrychus exilis*) is the smallest bird in the heron family, with brown and beige plumage and a black crown. They primarily feed on fish, but are also known to prey upon small reptiles, amphibians, crustaceans, small mammals, and small birds and their eggs. Given the similarities in diet, the Bald Eagle (*Haliaeetus leucocephalus*) is considered a suitable surrogate for the Least Bittern.

#### 7.1.1.1.5 Mammals

Little Brown Myotis (*Myotis lucifugus*), Eastern Red Bat (*Lasiurus borealis*), Eastern Small-footed Myotis (*Myotis leibii*), Northern Myotis (*Myotis septentrionalis*), Tri-Coloured Bat (*Perimyotis subflavus*), Hoary Bat (*Lasiurus cinereus*), and Silver-haired Bat (*Lasionycteris noctivagans*) are all aerial insectivores. Like other bats, they forage during the night and roost within or underneath trees or buildings during the day. Potential risk to bat species is expected to be adequately assessed by the Little Brown Myotis (also called Little Brown Bat) due to the similarity in habitats and eating habits across these bat species.

### 7.1.2 Ecological Receptor Exposure Pathways and Conceptual Site Model

As discussed in **Section 5.1**, direct interactions between MPSB Project activities and the surface water environment were identified. Additionally, ecological receptors may be exposed to gamma radiation emitted from SGs stored within the MPSB during operations. The ecological conceptual model presented in **Table 7-2** summarizes the relevant exposure pathways for aquatic and terrestrial receptors based on interactions between MPSB Project activities and the applicable environmental components.

Exposure pathways consider the various routes by which radionuclides and/or chemicals may enter the body of the receptor, or for radionuclides, may exert effects from outside the body.

Exposures to environmental media may be primary (i.e., by contact) or secondary (i.e., via constituent transport through the food chain).

Considering the sources of non-radiological COPCs to the environment are from the surface water pathway, the main routes of exposure include the ingestion of or exposure within potentially contaminated surface waters in on-site stormwater and drainage infrastructure. For the radiation assessment, terrestrial ecological receptors in contact with and in close proximity to the MPSB, along with aquatic receptors in close proximity to the MPSB, may be exposed to external gamma radiation emitted from the MPSB during the operation and maintenance phase.

**Table 7-2: Ecological Conceptual Site Model Summary**

Receptor Category	Ecological Receptor	Relevant Exposure Pathway(s)
Aquatic Vegetation	Cattail	Water immersion Radiation exposure
Aquatic Invertebrates	Digger Crayfish	Water immersion Radiation exposure
	Benthic Invertebrates	
Fish	Northern Redbelly Dace	Water immersion Radiation exposure
	Spottail Shiner	
	Smallmouth Bass	
Terrestrial Vegetation	Grass	Radiation exposure
	Eastern White Cedar	
Terrestrial Invertebrates	Bee	Radiation exposure <sup>a</sup>
	Earthworm	
Herpetofauna	Northern Leopard Frog	Water immersion <sup>b</sup> Radiation exposure
	Midland Painted Turtle	
	Northern Water Snake	
Riparian Birds	Mallard	Radiation exposure
	Bald Eagle	
Riparian Mammals	Muskrat	Radiation exposure
Terrestrial Birds	Wild Turkey	Radiation exposure
	American Robin	
Terrestrial Mammals	Northern Short-tailed Shrew	Radiation exposure
	Little Brown Myotis	
	White-tailed Deer	
	Red Fox	

**Note:**

<sup>a</sup> Applies only to the Bee. As Earthworms live in the soil, they would have limited exposure to gamma radiation fields.

<sup>b</sup> Due to a lack of available ecotoxicological information and risk assessment-relevant parameters for herpetofauna, these receptors are modelled as a fish. This is considered protective of tadpoles, understood to be the most sensitive life stage in this receptor group.

### 7.1.3 Screening Assessment

#### 7.1.3.1 Surface Water Environment

##### 7.1.3.1.1 Surface Water Quality

Changes to water quality have the potential to negatively impact ecological receptors that rely on the surface water environment at the NSS-WWMF for habitat and sustenance. Chemical pollutants and changes to nutrient concentrations can negatively affect a sensitive organism's growth, survival or reproductive capabilities. Maintaining surface water quality within its current range of natural variability and preventing the pollution of surface waters with chemical constituents is important for the protection of ecological systems at the NSS-WWMF. Unlike human receptors, ecological receptors are able to access restricted areas of the NSS-WWMF property, and thus could come into direct contact with potentially contaminated surface waters within the SRD and the on-site stormwater management systems.

Consistent with the 2016 PEA and as noted in **Section 5.1.8**, the assessment of surface water quality includes the following indicator parameters: TSS, metals (zinc, copper), dissolved chlorides, phosphorus, and water temperature. The rationale for the selection of these indicator parameters is described in the 2016 PEA (AMEC, 2016). As indicated in **Section 5.1.2.1**, any potential impacts to sediments are considered minor compared to potential impacts to surface water (AMEC, 2016); thus, the assessment of surface water quality impacts is inherently considered to be protective of sediments.

As noted in **Section 5.1.2.1.1**, the assessment of surface water quality impacts assumed the Case 1 scenario as described in the 2016 PEA (AMEC, 2016), where surface water runoff from the simultaneous development of all four expansion areas is directed to the SRD. As the MPSB will be located within the SRD watershed and sits directly adjacent to the SRD (**Figure 7-1**), it is assumed that this scenario is most applicable to the MPSB Project. Consistent with the 2016 PEA, the only indicator parameter expected to have a greater effect during site preparation and construction than during operation and maintenance is TSS, as site preparation and construction activities typically provide an increased potential for erosion and sediment loading in surface water runoff. Therefore, potential surface water quality impacts for copper, zinc, total phosphorus, temperature and chloride were only assessed for the operation and maintenance phase, while the surface water quality assessment for TSS considers both site preparation/construction and operations and maintenance separately.

The retention of gravel surfaces at the North Site represents a significant change from the surface water quality assessment conducted in the 2016 PEA, which had assumed the developed expansion areas of the NSS-WWMF would be paved. Gravel surfaces are expected to allow for increased precipitation infiltration into the ground, resulting in less surface water runoff being directed to the stormwater and drainage infrastructure, as compared to the 2016 PEA. A portion of the infiltrating surface water is expected to enter the shallow groundwater, which discharges into the SRD (Ecometrix, 2022b). Conservatively assuming a 10X dilution factor of groundwater discharging into a surface water body (MECP, 2011), it is expected that any water transported to



the SRD through shallow groundwater would contain diluted concentrations of waterborne contaminants compared with surface runoff from the North Site.

Gravel surfaces are likely to result in higher TSS loadings in surface water runoff due to the increased erosion potential of the exposed gravel material. For this reason, an updated impact and mitigation assessment for TSS loadings in the SRD resulting from unpaved ground surfaces at the NSS-WWMF North Site was conducted. The assessment determined that the retention of a gravel surface during operation of the MPSB would result in higher TSS loadings than an asphalt surface; however, assuming a conservative TSS loading of 140 mg/L from the North Site, downstream TSS loadings in the SRD were found to not exceed 17.91 mg/L assuming a stormwater system removal rate of 80%.

The ecological surface water screening assessment uses updated water screening criteria obtained from either the Ontario Provincial Water Quality Objectives (PWQO) list, the CCME Canadian Environmental Quality Guidelines (CEQG) for the protection of aquatic life, and information from the most recent 2021 NSS-WWMF ERA (Ecometrix, 2022a) where available. Both the provincial PWQOs and CCME CEQGs are generally protective of all aquatic life (fish, benthic invertebrates, etc.) and are considered protective of sensitive species and/or sensitive life stages. The selection of ecological screening criteria is presented below:

- **Copper:** The toxicity of copper is dependent on water hardness. The Interim PWQO for copper where water hardness exceeds 20 mg/L (applicable to the SRD during all open water seasons) is 0.005 mg/L (MOEE, 1994). The CCME CEQG for the protection of freshwater aquatic life where hardness exceeds 180 mg/L is 0.004 mg/L (CCME, 2024). Results from the 2021 NSS-WWMF ERA indicate that water hardness in the SRD reaches a maximum of 400 mg/L; thus, the CCME CEQG of 0.004 mg/L is selected as the screening value for copper.
- **Zinc:** The Interim PWQO for zinc is 0.02 mg/L (MOEE, 1994). The CCME CEQG guideline is applicable to dissolved zinc concentrations and the equation used to derive a screening value is unreliable in cases where water hardness is measured above 399 mg/L (CCME, 2024). For this reason, the PWQO of 0.02 mg/L is selected as the screening value for zinc.
- **Phosphorus:** The provincial PWQO states that a total phosphorus concentration below 0.03 mg/L will eliminate excessive plant growth in rivers and streams (MOEE, 1994). The CCME provides the Canadian Guidance Framework for phosphorus for developing phosphorus guidelines. The recent 2021 NSS-WWMF ERA does not report updated phosphorus concentrations in surface water. Considering baseline results from the 2016 PEA and the CCME guidelines, the SRD and its downstream receiving waterbodies are considered meso-eutrophic (0.02-0.035 mg/L phosphorus) to eutrophic (0.035-0.1 mg/L phosphorus). Both the PWQO and CCME guidance will be considered in the screening of predicted phosphorus concentrations in the SRD.

- **Chloride:** There is no provincial PWQO for chloride or salinity. The CCME CEQG for the protection of freshwater aquatic life is 120 mg/L (CCME, 2024). Thus, the CCME CEQG of 120 mg/L is selected as the screening value for chloride.
- **TSS:** There is no provincial PWQO for TSS. The CCME guideline for TSS is defined for clear flow and high flows. For this screening assessment, the long-term clear flow requirement is considered applicable (i.e., maximum average increase of 5 mg/L from background levels) (CCME, 2024).
- **Temperature:** The general PWQO for temperature states that “the natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed” (MOEE, 1994). Guidance from the CCME states that “thermal additions to receiving waters should be such that the maximum weekly mean temperature is not exceeded” (CCME, 2024). The recent 2021 NSS-WWMF ERA does not report updated surface water temperatures for the SRD; in the 2016 PEA, the maximum weekly mean temperature (MWMT) was calculated to be 20.2 °C for the SRD in mid-summer in 2014 (AMEC, 2016). Consistent with the 2016 PEA, increases in temperature are assessed within the context of expected annual average increases to water temperature that may similarly increase the MWMT. Increases are evaluated qualitatively with respect to impacting aquatic species and communities.

Results of the ecological surface water screening are presented in **Table 7-3**. Predicted concentrations within the SRD are retained from the 2016 WWMF PEA (AMEC, 2016), except for the predicted concentration of TSS during the operation and maintenance phase, which was calculated specifically for this PEA Addendum. A qualitative discussion and interpretation of potential risks is presented further in this section.

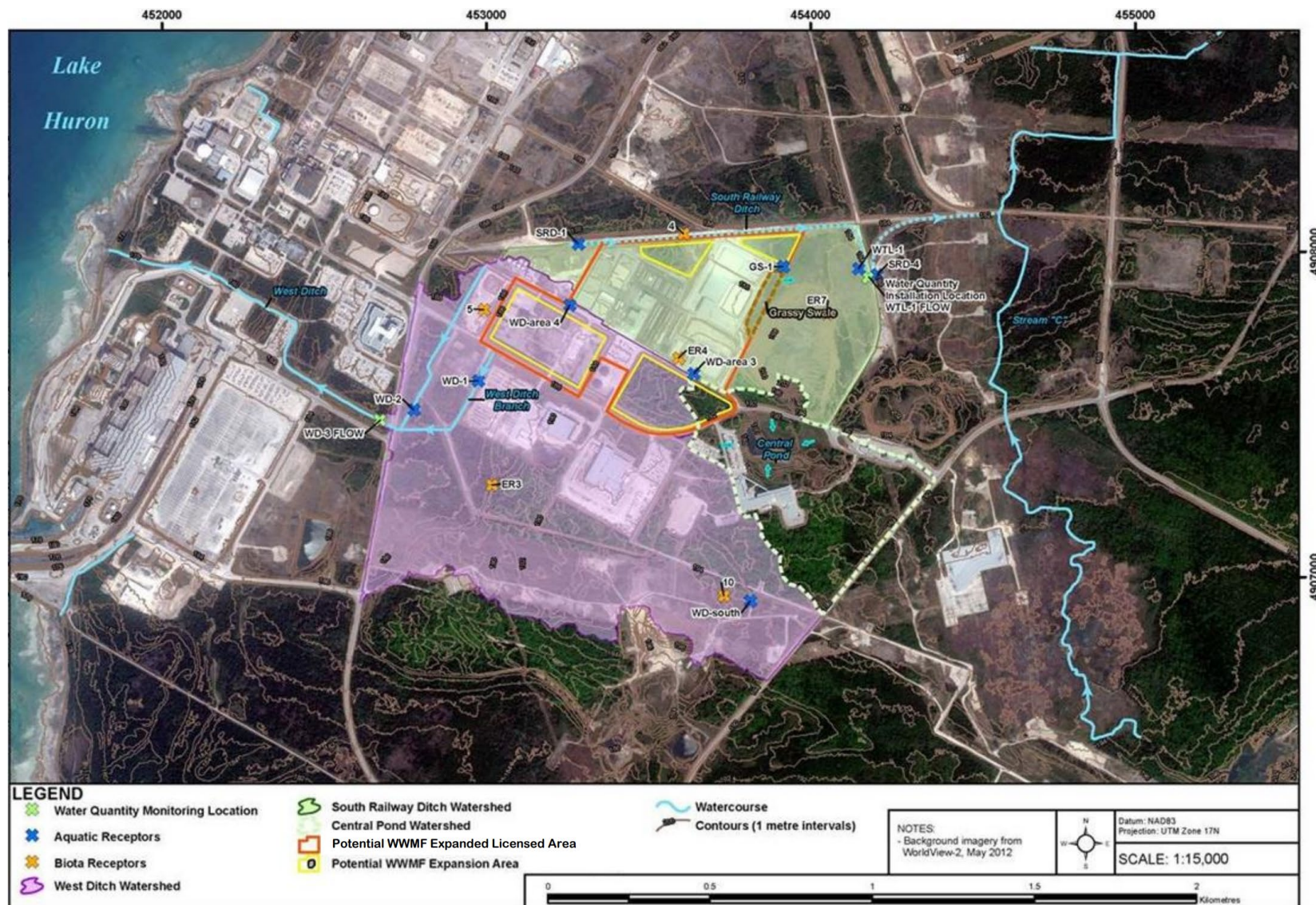


Figure 7-1: Potential Expansion and Watershed Areas of the NSS-WWMF



**Table 7-3: Ecological Screening of Water Quality Results for the Predictive EcoRA**

Parameter	Units	Predicted Concentration within the SRD	Selected Surface Water Screening Criteria (Source)	Exceedance of Screening Criteria?	Interpretation
Copper	mg/L	0.004	0.004 (CCME)	No	No risks.
Zinc	mg/L	<b><u>0.091</u></b>	0.02 (PWQO)	<b><u>Yes</u></b>	Predicted maximum zinc concentration in the SRD exceeds screening criteria.
Total Phosphorus	mg/L	0.050	0.03 (PWQO) 0.02-0.1 (CCME)	No	No risks; values are within range for meso-eutrophic to eutrophic systems.
Chloride	mg/L	<b><u>395</u></b>	120 (CCME)	<b><u>Yes</u></b>	Predicted maximum chloride concentration in the SRD exceeds screening criteria.
TSS (Site preparation and construction)	mg/L	<b><u>88.6</u></b> (13.55 mg/L baseline)	5 mg/L increase from background (CCME)	<b><u>Yes</u></b>	Predicted maximum TSS concentrations in the SRD exceeds background values by more than 5 mg/L.
TSS (Operation and maintenance)	mg/L	17.91 (13.55 mg/L baseline)	5 mg/L increase from background (CCME)	No	No risks.
Temperature	°C	<b><u>10.04</u></b> (8.5 °C baseline)	Thermal additions to the receiving water should be such that the MWMT is not appreciably elevated to levels expected to impact the diversity, distribution and abundance of aquatic species. (CCME)	<b><u>Yes</u></b>	An estimated increase of 1.5°C in the SRD, above the baseline annual average temperature and therefore a potential similar increase to the MWMT.

**Bold/underline** indicates predicted concentration within the SRD exceeds the selected surface water quality screening criteria.

Predicted maximum concentrations of zinc and chloride exceeded their respective surface water screening values when considering the Case 1 modelling scenario presented in the 2016 PEA. Total suspended solids were found to exceed the screening criteria (5 mg/L increase from baseline) for site preparation and construction phases but not the operations and maintenance phase. Additionally, the predicted water temperature in the SRD was found to increase by 1.5 °C from measured background values.

Though certain parameters exceed their respective screening criteria, impacts to surface water quality and ecological receptors residing within the surface water environment are not expected due to MPSB project activities. The predicted values screened in **Table 7-3** represent maximum concentrations or maximum deviations from baseline conditions. It is unlikely that these “worst-case” conditions would persist for extended periods of time or would occur simultaneously across all areas of the stormwater system and SRD drainage system. Ecological receptors, especially those that are mobile, are unlikely to experience persistent maximum concentrations of chemical pollutants or maximum deviations from baseline TSS and temperature levels. It is possible that individual non-mobile receptors (e.g., individual cattails) may be at risk in areas where the concentrations of chemical constituents are deemed to be elevated; however, similar to the conclusions of the 2021 NSS-WWMF ERA, the viability of the overall cattail population is not expected to be at risk resulting from impacts at the level of individual plants. As shown in **Table 7-3**, once site preparation and construction activities cease, TSS concentrations are expected to return to background levels during the operations and maintenance phase. The relatively short construction timeframe for the MPSB provides further evidence that any water quality impacts resulting from site preparation and constructed activities are expected to be temporary and will likely resolve once operation of the MPSB begins.

It needs to be stated again that Case 1 as assessed in the 2016 PEA is considered bounding of the MPSB Project and represents an overestimate of potential impacts to surface water quality. The MPSB Project will only see the development of the North Site (i.e., expansion area 2), rather than the simultaneous development of all four NSS-WWMF expansion areas. Assuming the MPSB Project will result in runoff volumes and surface water quality impacts equivalent to the development of all four expansion areas is overly conservative and likely to result in an overestimate of risks.

Additionally, while the 2016 PEA had assumed that developed areas of the NSS-WWMF would be paved, the North Site will remain an unpaved, gravel surface. This is expected to increase the water infiltration capacity of the ground at the North Site and ultimately reduce the amount of surface water runoff being directed into the SRD. As noted previously, a portion of the infiltrating surface water is expected to enter the shallow groundwater, which eventually discharges into the SRD (Ecometrix, 2022b). Conservatively assuming a 10X dilution factor of groundwater discharging into a surface water body (MECP, 2011), it is expected that any water transported to the SRD through shallow groundwater would contain diluted concentrations of waterborne contaminants compared with surface runoff from the North Site. Conservatively applying the 10X dilution factor to the concentrations in **Table 7-3** results in estimated

groundwater inputs to the SRD that meet surface water screening criteria. Furthermore, a portion of infiltrating water may flow downwards into deeper groundwater. Conservatively assuming the surface water concentrations in **Table 7-3** to represent groundwater concentrations, the ON MECP Table 1 Full Depth Background Site Condition Standards (SCSs) are less conservative than the screening criteria selected in **Table 7-3** (where available) and these Table 1 SCSs are met using these assumed concentrations. Total phosphorous is considered for impacts into aquatic ecological receptors, for which the assumptions in **Table 7-3** would represent an overestimate of groundwater inputs to the downgradient surface water body, Lake Huron, with the consideration of groundwater attenuation prior to discharge. TSS is not expected to impact groundwater quality within the deeper groundwater systems.

Furthermore, the retention of gravel surfaces at the North Site is also expected to result in less road salting being required to maintain safe walking and driving conditions, likely reducing a significant contributing source of chloride. Thus, the concentrations assessed in **Table 7-3** are likely an overestimate of parameter concentrations likely to occur from the MPSB Project.

Considering the qualitative interpretation of risks presented above, the MPSB Project is not expected to result in any surface water quality impacts and is not anticipated to adversely affect ecological receptors within the surface water environment. No further assessment of surface water impacts is warranted for the predictive EcoRA.

#### 7.1.3.2 Radiation

Ecological receptors in close proximity to the MPSB will experience external exposure to direct gamma radiation due to the storage of SGs within the MPSB. The radiation dose to aquatic receptors within the SRD and terrestrial plant, bird and mammal receptors is quantified and considered further in the exposure assessment below.

#### 7.1.4 Summary

The surface water screening assessment determined that predicted concentrations of zinc, chloride and TSS (during site preparation and construction only) exceeded their respective surface water quality screening criteria. However, the predicted concentrations are considered either temporary (i.e., TSS concentrations resolving after construction activities have ended) or are overly conservative due to the design of the MPSB. Thus, there are no expected impacts to surface water quality, and no adverse affects to ecological receptors interacting with the surface water environment during MPSB project activities.

Therefore, based on the Problem Formulation, the focus of the exposure assessment is on exposure of the terrestrial and aquatic receptors to gamma radiation emitted from the MPSB.

## 7.2 Exposure Assessment

The assessment of external exposure of terrestrial and aquatic receptors to gamma radiation from the MPSB is based on the estimated administrative dose targets for the proposed storage

of waste within the North Site. This dose estimate considers several buildings containing waste including the MPSB, therefore the resulting calculated dose would be an overestimate of risk.

The estimated dose rates immediately outside the MPSB could be up to the administrative dose target of 0.5  $\mu\text{Sv/h}$ . It is difficult to translate the human effective dose to a whole-body absorbed dose for many wildlife species due to a variety of different body geometries and a lack of species-specific tissue depth measurements and radiation weighting factors; however, it has been assumed that the whole-body effective dose for humans ( $\mu\text{Sv/h}$ ) is equivalent to the whole-body absorbed dose for wildlife ( $\mu\text{Gy/h}$ ), as human tissue and wildlife tissue, for the purpose of estimating absorbed dose, are practically equivalent.

The majority of terrestrial ecological receptors as well as all aquatic receptors within the SRD are expected to be located directly outside the North Site boundary. Therefore, for these receptors, the dose rates are similar to the dose rates estimated for humans at the fence line. This is conservative for receptors residing under soil or water, which both provide shielding. In addition, some terrestrial receptors such as birds and bats may be closer in proximity to the MPSB itself, therefore the dose rates for these receptors are similar to the dose rates estimated for humans at the roof. The dose rates were estimated for the roof of the SGSB, which is assumed to store waste from Unit 1, Unit 2, Unit 3 and Unit 6 from Bruce Power. It is assumed that the dose estimated for humans at the SGSB is a conservative representation of the gamma radiation dose experienced by terrestrial ecological receptors at the roof of the MPSB.

Using the assumed dose rate for a member of the public at the northern fence line for representative and reference DSCs (0.106  $\mu\text{Sv/h}$ ), the dose rate to terrestrial and aquatic ecological receptor at the north fence line is estimated to be 0.106  $\mu\text{Gy/h}$  (2.54  $\mu\text{Gy/d}$  or  $2.54 \times 10^{-3}$  mGy/d).

Using the assumed dose rate for a member of the public at the roof of the MPSB for representative and reference DSCs (279  $\mu\text{Sv/h}$ ), the dose rate to any ecological receptor sitting on the roof is estimated to be 279  $\mu\text{Gy/h}$  (6696  $\mu\text{Gy/d}$  or 6.70 mGy/d).

The above assessment is conservative as it assumes the ecological receptor is always located at the MPSB (24 hours per day, 365 days per year) and does not incorporate an occupancy factor based on the fraction of time a mobile receptor is likely to be in close proximity to the MPSB.

### 7.3 Effects Assessment

Radiation dose benchmarks of 400  $\mu\text{Gy/h}$  (9.6 mGy/d) and 100  $\mu\text{Gy/h}$  (2.4 mGy/d) (UNSCEAR, 2008) were selected for the MPSB assessment of effects on aquatic biota and terrestrial biota, respectively, as recommended in the CSA N288.6-22 standard. This is a total dose benchmark, therefore the dose to biota due to each radionuclide of concern is summed to compare against this benchmark. For aquatic receptors presumed to inhabit the SRD just north of the WWMF, the benchmark of 9.6 mGy/d was used to assess radiation dose to aquatic receptors at the MPSB.



The terrestrial benchmark of 2.4 mGy/d was used to assess radiation dose to terrestrial receptors just at the north fence line and at the roof of the MPSB.

## 7.4 Risk Characterization

The estimated dose rate to terrestrial and aquatic ecological receptors residing at the north fence line in close proximity to the MPSB is  $2.54 \times 10^{-3}$  mGy/d, three orders of magnitude lower than the 2.4 mGy/d radiation benchmark for terrestrial biota and the 9.6 mGy/d radiation benchmark for aquatic biota. Since the dose estimates at the fence line are a small fraction of the terrestrial and aquatic dose benchmarks, no discernable health risks to terrestrial and aquatic biota are anticipated at the fence line due to exposure to radiation from the MPSB.

The estimated dose rate to terrestrial ecological receptors such as bats and birds located on the roof of the MBSB is 6.70 mGy/d, which exceeds the 2.4 mGy/d radiation benchmark for terrestrial biota. While the dose rates exceed the radiation benchmark for terrestrial biota, the estimated dose rates were calculated for the roof of the SGSB, which is assumed to store waste from Unit 1, Unit 2, Unit 3 and Unit 6 from Bruce Power. It is assumed that the dose estimated for humans at the SGSB is a conservative representation of the gamma radiation dose experienced by terrestrial ecological receptors at the roof of the MPSB. Additionally, it is assumed that the dose rate of 6.70 mGy/d considers that the bird or bat species spends 100% of its time on the roof of the MPSB. The MPSB is proposed to be a tarped structure and is not considered to be appropriate for nesting. It is also within the portion of the NSS-WWMF that will largely remain as gravel surfaces with limited vegetation, meaning the North Site area is not considered to be suitable habitat, nor a food source for bird and bat species. As a result, these receptors are more realistically expected to spend less than 30% of their time on the roof of the MPSB. Considering the occupancy factor of 30%, the dose estimate to any bird or bat receptors on the roof of the MPSB is 2.01 mGy/d, and meets the 2.4 mGy/d radiation benchmark for terrestrial biota.

Given that the dose estimates are likely over-estimated, and with the consideration of a reduced occupancy factor, no discernable health risks to terrestrial and aquatic biota are anticipated due to exposure to radiation from the MPSB.

## 7.5 Discussion on Uncertainty

The data used in the predictive EcoRA were concluded to be of adequate quality to support the objectives of the PEA Addendum. This PEA Addendum largely relies on results from the previously completed 2016 PEA (AMEC, 2016), which considered a larger, more complex development project consisting of multiple expansion areas of the NSS-WWMF. For additional information on uncertainties associated with the modelling used to assess environmental and ecological impacts, the reader is directed to Section 7.6 of the 2016 PEA (AMEC, 2016). With respect to this PEA Addendum, results from the 2016 PEA are considered overly conservative because they consider 1) the simultaneous development of multiple, larger development areas at the NSS-WWMF, 2) a larger fleet of construction vehicles and equipment, and 3) some project

activities and interactions that are not directly applicable to the MPSB Project. Relying on results from the 2016 PEA provides a conservative upper bound for any potential environmental and ecological effects associated with the MPSB; specific effects from the MPSB Project may be smaller than those described in this PEA Addendum. Additionally, the PEA Addendum considers maximum concentrations and noise levels for the screening assessment; this is considered conservative and not representative of real-world exposures for mobile ecological receptors, which would likely be exposed to lower concentrations or sound levels as they move around the NSS-WWMF and surrounding areas.

As previously discussed in **Section 6.5**, OPG will only accept SGs based on existing waste acceptance criteria for low- and intermediate-level radioactive waste. Current acceptance criteria stipulate that the working distance gamma radiation dose rate shall not exceed 40 millirem per hour at a distance of 1 meter (3.3 feet) from any point on the cartridge surface. Furthermore, the contact gamma radiation dose rate at any point of the cartridge surface shall not exceed 200 millirem per hour. These limits cannot be exceeded; thus, assuming the waste acceptance criteria when estimating the DSC dose rate is considered conservative.

## 8.0 Cumulative Effects Assessment

In order to ensure radiation releases from the addition of the MPSB within the NSS-WWMF meet radiation safety limits for humans, the combined radiation dose from current Bruce Power operations, including current and future NSS-WWMF operations, must be considered together with the potential radiation release from the future operation of the MPSB. Dose associated with current NSS-WWMF operations is retained from the 2021 NSS-WWMF ERA (Ecometrix, 2022a), while dose associated with future operations (i.e. future expansion and development) is retained from the 2016 PEA (AMEC, 2016). This is considered conservative, as the 2021 ERA would capture doses from any new expansion activities that were predicted in the 2016 PEA that have since occurred following completion of the 2016 PEA.

The total doses to ecological receptors are not monitored annually by Bruce Power, however, doses to the representative ecological receptors were estimated for the NSS-WWMF within the 2021 ERA and are considered to be sufficiently protective of these receptors. In order to ensure radiation from the addition of the MPSB within the NSS-WWMF meets radiation safety benchmarks for wildlife, the combined radiation dose calculated for the NSS-WWMF must be considered together with the potential radiation release from the future operation of the MPSB.

### 8.1 Human Health

The local resident receptor at the guard house is conservatively considered to be comparable to residential receptor BR48, the closest critical receptor that is a member of the public within the NSS-WWMF and Bruce Power environmental monitoring program. It is conservatively assumed that the dose at the guard house is combined with the annual dose at BR48 to evaluate cumulative risk of the MPSB and other future expansion activities as assessed in the 2016 PEA. The 2016 PEA did not assess dose resulting from direct exposure to radiation fields given that the NSS-WWMF is located far enough away from members of the public such that dose from direct radiation exposure is negligible (AMEC, 2016); while this result remains true, as noted in **Section 6.1.2**, this PEA Addendum conservatively considers the closest location a member of the public could be near the NSS-WWMF at the Bruce Nuclear site boundary at the guard house.

The combined radiation dose for the local resident receptor at the guard house (i.e. BR48) is presented in **Table 8-1** below. The total dose received by the BR48 receptor from current Bruce Power and NSS-WWMF operations, the MPSB, and future emissions from the NSS-WWMF was estimated to be 1.34  $\mu\text{Sv/a}$ . This is a conservative assessment, as BR48 is assumed to spend 1% of time per year at the Guard House. The cumulative dose is well below the public dose limit for radiation protection of 1 mSv/a. As the total cumulative dose is only a fraction of the public dose limit, no health risks are expected within the general public.

**Table 8-1: Cumulative Radiation Dose to the Guard House Receptor from the NSS-WWMF and MPSB**

Receptor	Units	Dose from MPSB <sup>a</sup>	Dose from Bruce Power and NSS-WWMF <sup>b</sup>	2016 PEA Total Dose from Future Expansion Activities	Predicted Total Combined Dose
Local resident at the Guard House (e.g., BR48)	µSv/a	4.70 x10 <sup>-2</sup> <sup>(a)</sup>	1.17 <sup>(b)</sup>	0.12 <sup>(c)</sup>	1.34

**Notes:**

<sup>(a)</sup> The dose estimated using reference DSCs for the Guard House. This receptor is representing the amount of time a residential receptor (i.e. BR48) spends at the intersection of Tie Road and Central Services Road outside the Bruce Nuclear site property boundary. The dose rate (in µSv/a) is based on an exposure duration of 1% (87.6 hrs) per year.

<sup>(b)</sup> Estimated total dose for adults at BR48, which represents the most conservative dose between adults, children and infants at this location from the 2023 Bruce Power Environmental Protection Report (Bruce Power, 2024).

<sup>(c)</sup> Estimated incremental dose to adult human receptor BR48 based on estimated air and surface water emissions from the 2016 PEA (AMEC, 2016). Value is from Case One, where its is assumed all drainage discharged to SRD.  
µSv/a – microSievert per year

## 8.2 Ecological Health

The 2021 NSS-WWMF ERA (Ecometrix, 2022a) also calculated total maximum and upper confidence limit of the mean (UCLM) doses received by various terrestrial and aquatic receptors from NSS-WWMF operations within the NSS-WWMF and the SRD. No cumulative effects assessment was done for aquatic receptors in the West Ditch, Baie Du Doré and Lake Huron as well as the terrestrial receptors at RWOS1, as radiation releases from the NSS-WWMF to these locations are considered negligible. The combined radiation doses received by ecological receptors are presented in **Table 8-2** below. The radiation doses from the MPSB consider the ecological receptors at the north fence line as well as the dose rates from the roof using the process described in **Section 7.2**. An occupancy factor of 100% was assumed at the north fence line, and an occupancy factor of 30% was assumed at the roof of the MPSB. Total dose as assessed in the 2016 PEA (AMEC, 2016) is also included in the calculation of cumulative effects to account for future development and waste storage activities at the NSS-WWMF; this is considered conservative as this would include dose from waste storage structures built between completion of the 2016 PEA to the time of this publication which would also be captured in dose calculations from the recent 2021 NSS-WWMF ERA (Ecometrix, 2022a).

The maximum combined radiation dose and the combined UCLM radiation dose met the terrestrial and aquatic benchmarks of 2.4 mGy/d and 9.6 mGy/d for all terrestrial and aquatic receptors, respectively. The maximum radiation dose to the assessed ecological receptors was determined to be experienced by the Bald Eagle, which experienced a radiation dose that represents 88% of the terrestrial dose limit. This result is likely to be an overestimate of any real-world exposure scenarios, as it is unlikely that aerial receptors such as birds and bats would occupy the roof of the MPSB for 30% of the year. Given that the MPSB will utilize tarp roofing, it is unlikely that the roof would provide suitable nesting habitat. Overall, no discernable health risks to terrestrial and aquatic biota are anticipated due to cumulative radiation doses from NSS-WWMF and the MPSB.

Table 8-2: Cumulative Radiation Dose to Ecological Receptors from NSS-WWMF

Receptor Class	Ecological Receptor	Units	Max Dose from NSS-WWMF <sup>a</sup>	UCLM Dose from NSS-WWMF <sup>a</sup>	Dose from MPSB at North Fence Line <sup>b</sup>	Dose from MPSB at the Roof <sup>c</sup>	2016 PEA Total Dose from Future Expansion Activities <sup>d</sup>	Total Max Dose <sup>e</sup>	Total UCLM Dose <sup>f</sup>	Dose Benchmark	% of Dose Benchmark (Max)	% of Dose Benchmark (UCLM)
Aquatic Vegetation	Cattail	mGy/d	2.64E-03	4.80E-04	2.54E-03	NA	2.21E-02	2.73E-02	2.51E-02	9.6	0.28%	0.26%
Aquatic Invertebrates	Benthic Invertebrates <sup>g</sup>	mGy/d	5.47E-03	9.90E-04	2.54E-03	NA	2.04E-02	2.84E-02	2.39E-02	9.6	0.30%	0.25%
Fish <sup>h</sup>	Northern Redbelly Dace	mGy/d	2.64E-02	4.04E-03	2.54E-03	NA	2.23E-02	5.12E-02	2.89E-02	9.6	0.53%	0.30%
Herpetofauna	Northern Leopard Frog	mGy/d	1.75E-02	2.81E-03	2.54E-03	NA	2.57E-02	4.57E-02	3.10E-02	9.6	0.48%	0.32%
	Northern Water Snake	mGy/d	1.74E-02	2.81E-03	2.54E-03	NA	2.57E-02	4.56E-02	3.10E-02	9.6	0.48%	0.32%
	Midland Painted Turtle	mGy/d	1.74E-02	2.81E-03	2.54E-03	NA	2.57E-02	4.57E-02	3.10E-02	9.6	0.48%	0.32%
Terrestrial Vegetation	Grass	mGy/d	9.08E-04	6.32E-04	2.54E-03	NA	8.40E-03	1.18E-02	1.16E-02	2.4	0.49%	0.48%
	Eastern White Cedar	mGy/d	5.30E-04	3.27E-04	2.54E-03	NA	8.40E-03	1.15E-02	1.13E-02	2.4	0.48%	0.47%
Terrestrial Invertebrates	Earthworm	mGy/d	3.63E-02	5.09E-03	2.54E-03	NA	8.40E-03	4.72E-02	1.60E-02	2.4	1.97%	0.67%
	Bee	mGy/d	1.14E-03	6.82E-04	2.54E-03	2.01E+00	8.64E-03	2.02E+00	2.02E+00	2.4	84%	84%
Riparian Birds	Bald Eagle	mGy/d	6.53E-02	1.11E-02	2.54E-03	2.01E+00	3.55E-02	2.11E+00	2.06E+00	2.4	88%	86%
	Mallard	mGy/d	4.15E-02	7.34E-03	2.54E-03	2.01E+00	3.31E-02	2.09E+00	2.05E+00	2.4	87%	86%
Terrestrial Birds	American Robin	mGy/d	6.99E-02	9.68E-03	2.54E-03	2.01E+00	8.40E-03	2.09E+00	2.03E+00	2.4	87%	85%
	Wild Turkey	mGy/d	1.67E-02	2.65E-03	2.54E-03	2.01E+00	8.40E-03	2.04E+00	2.02E+00	2.4	85%	84%
Riparian Mammals	Muskrat	mGy/d	3.40E-02	6.03E-03	2.54E-03	NA	3.74E-02	7.40E-02	4.60E-02	2.4	3.08%	1.92%
Terrestrial Mammals	Little Brown Myotis	mGy/d	3.33E-02	5.84E-03	2.54E-03	2.01E+00	8.64E-03	2.05E+00	2.03E+00	2.4	86%	84%
	Northern Short-Tailed Shrew	mGy/d	6.52E-02	8.92E-03	2.54E-03	NA	8.40E-03	7.61E-02	1.99E-02	2.4	3.17%	0.83%
	Red Fox	mGy/d	6.39E-02	8.98E-03	2.54E-03	NA	8.40E-03	7.48E-02	1.99E-02	2.4	3.12%	0.83%
	White-Tailed Deer	mGy/d	7.00E-04	3.78E-04	2.54E-03	NA	8.40E-03	1.16E-02	1.13E-02	2.4	0.49%	0.47%

**Notes:**

Project-related effects from the MPSB and effects from the existing NSS-WWMF are considered negligible for terrestrial receptors at the RWOS1 and aquatic ecological receptors in the West Ditch and Baie Du Doré (i.e., Smallmouth Bass); thus, no cumulative effects assessment is required.

<sup>a</sup> Total radiation dose estimates for ecological biota at the NSS-WWMF (Ecometrix, 2022a)

<sup>b</sup> The dose rate to any ecological receptor at the north fence line is estimated to be 2.54E-03 mGy/d, using the assumed dose target for a member of the public at the northern fence line for representative and reference DSCs (0.106 µSv/h).

<sup>c</sup> The dose rate to any ecological receptor sitting on the roof using an occupancy factor of 30% is estimated to be 2.01 mGy/d, using the assumed dose rate for a human at the roof for representative and reference DSCs (279 µSv/h)

<sup>d</sup> Table 7-4 from the 2016 PEA (AMEC, 2016)

<sup>e</sup> The total max dose is the sum of the max NSS-WWMF dose, the dose to the ecological receptor at the north fence line and the dose to the ecological receptor sitting at the roof.

<sup>f</sup> The total UCLM dose is the sum of the max NSS-WWMF dose, the dose to the ecological receptor at the north fence line and the dose to the ecological receptor sitting at the roof.

<sup>g</sup> Representative of Digger Crayfish

<sup>h</sup> Northern Redbelly Dace representative of Spottail Shiner.

UCLM – Upper confidence limit on the mean; mGy/d – milligray per day; NA – not applicable

## 9.0 Environmental Management

### 9.1 Environmental Management System

OPG's Environmental Policy requires that OPG maintain an Environmental Management System (EMS) consistent with the ISO 14001 Environmental Management System Standard. The EMS provides the structure and processes to ensure implementation and follow-up on the environmental programs needed to comply with the Environmental Policy. As part of OPG's EMS, environmental performance targets, including reportable spills and environmental compliance, are reviewed annually to ensure that opportunities for continuous improvement are identified and implemented. The programs include OPG's approach to ensure compliance with applicable statutory and regulatory requirements.

During construction and operation of the MPSB, OPG's EMS will continue to require the assessment of environmental risks associated with the facility's activities, and to ensure that these activities are conducted such that any adverse impact on the natural environment is as low as reasonably achievable. Additionally, OPG will obtain all required environmental approvals and permits for the Project.

The specific mitigation and emission monitoring measures implemented as part of the MPSB operation are discussed in **Section 9.2**.

### 9.2 Emission Monitoring and Control

During site preparation and construction, OPG will follow the Environmental Management Plan for construction of the MPSB. The Environmental Management Plan will outline the site-specific measures that will be followed to ensure compliance with federal, provincial and municipal regulations, mitigation of potential environmental impacts, and pollution prevention. OPG and its contractors will employ best practices for environmental management which will be outlined in the Environmental Management Plan.

Once the MPSB is operational, additional thermoluminescent dosimeters (TLDs) will be installed around the MPSB to monitor ambient dose rates. The purpose is to ensure that gamma dose rates adjacent to the MPSB remain below the dose rate target of 0.5 µGy/hr. TLD measurements will be summarized in the quarterly reports for the NSS-WWMF.

### 9.3 Environmental Monitoring Programs

Environmental monitoring at the NSS-WWMF site has been conducted for many years and the environmental performance is reported to the CNSC on a regular basis.

This PEA Addendum was developed in accordance with CSA N288.6:22 and estimates potential risk posed by non-radiological contaminants and radionuclides on human and ecological receptors in the environment resulting from the construction of the proposed MPSB at the NSS-WWMF. The outcome of an ERA, whether baseline or predictive, is to provide risk-based



recommendations, either for the EMP or for environmental control measures. The EMP, in turn, provides environmental data for use in future ERAs, and may confirm the effectiveness of control measures. Emission controls for the MPSB are identified in **Section 9.2**.

Based on the results of the PEA Addendum, no additional environmental monitoring as a result of the MPSB Project has been identified.

## 10.0 Quality Assurance

All data submitted for inclusion in this PEA Addendum was verified by OPG or other personnel under contract with OPG prior to submission to Ecometrix.

The environmental data provided by OPG were collected by qualified staff and analyzed by qualified performing laboratories, such as the Bruce Power Health Physics Lab. The EMP has its own quality assurance (QA) program that encompasses activities such as sample collection, laboratory analysis, laboratory quality control, and external laboratory comparison (OPG, 2019). The station chemistry laboratory also has its own QA program and analyses sent externally utilize accredited laboratories.

Throughout the planning and preparation of the PEA Addendum, all Ecometrix staff worked under an ISO 9001:2015 certified Quality Management System. All work was internally reviewed and verified. Reviews included verification of data and calculations, transcription in the report, as well as review of report content and formatting. Comments have been dispositioned and addressed as appropriate during report revisions. The review process has been documented through a paper trail of review comments and dispositions.

## 11.0 Conclusions and Recommendations

Potential interactions between the MPSB and various environmental components during all phases of the Project were evaluated qualitatively. Based on the qualitative assessment of Project-Environment interactions, the following assessment areas were identified as the focus of the quantitative assessment in the PEA Addendum:

- Surface water impacts relating to changes in surface water quality (ecological risk assessment only).
- Gamma radiation from the MPSB during operation.

### 11.1 Human Health Risk Assessment

For exposure of human receptors to gamma radiation from the MPSB, the potential dose to the local resident receptor (i.e. BR48) was evaluated at the Guard House located at Tie Road and Central Services Road outside the Bruce nuclear site property boundary. The public dose estimates for the local resident receptor with reference and representative DSCs are 4.70  $\mu\text{Sv/a}$  and 2.67  $\mu\text{Sv/a}$ , respectively. Considering the existing and potential future facilities on the NSS-WWMF, the dose to BR48 could be up to 1.34  $\mu\text{Sv/a}$ . These dose rates meet the regulatory public dose limit of 1,000  $\mu\text{Sv/a}$ .

Overall, since the dose estimates are a small fraction of the public dose limit and natural background exposure, no discernable health risks are anticipated due to exposure of potential critical groups to gamma radiation from the MPSB.

### 11.2 Ecological Risk Assessment

The screening assessment of surface water indicated that predicted surface water quality is not expected to result in adverse effects to ecological receptors. Exceedances of any surface water screening criteria are representative of the extremely conservative assumptions used to assess potential affects associated with the MPSB. Results from the 2016 WWMF Expansion Project PEA are considered to be an overestimate of risks given the project's larger construction scope and inherently conservative assumptions.

For exposure of ecological and aquatic terrestrial receptors to gamma radiation from the MPSB, the dose rate at the north fence line of the NSS-WWMF could be as high as 2.81E-03 mGy/d, which meets the terrestrial and aquatic benchmarks of 2.4 mGy/d and 9.6 mGy/d, respectively.

The dose rate to terrestrial ecological receptors such as birds and bat species at the roof of the MPSB, considering an occupancy factor of 30%, could be as high as 2.11 mGy/d. This meets the applicable radiation benchmark of 2.4 mGy/d for terrestrial receptors.

The combined dose from the north fence line at 100% occupancy and the roof at 30% occupancy in addition to the operations of the NSS-WWMF also remain below the radiation dose benchmarks for terrestrial and aquatic receptors.

### 11.3 Recommendations

Implementation of an Environmental Management Plan during site preparation and construction activities will help mitigate any potential environmental impacts. The Environmental Management Plan will outline procedures relating to air (dust) and water management, noise control, contaminated and excess soil management, and general wildlife management. OPG and its contractors will employ best practices for environmental management which will be outlined in the Environmental Management Plan.

In addition to the Environmental Management Plan, the following plans or documents are recommended to describe mitigations that will prevent or manage impacts to human health and/or terrestrial/aquatic environments:

- A stormwater management plan for site preparation and construction (to provide the plans for mitigating erosion and sediment transport to the surface water environment);
- A stormwater management plan for post development including design requirements;
- Spill management protocol;
- Confirmation of dewatering requirements;
- Health and Safety Management Systems for protection of on-site workers and contractors; and
- Radiation Protection Program (during operation).

Once the MPSB is operational, additional TLDs will be installed around the MPSB to monitor ambient dose rates. The purpose is to ensure that gamma dose rates adjacent to the MPSB remain below the dose rate target of 0.5  $\mu\text{Gy/hr}$ . TLD measurements will be summarized in the quarterly reports for the NSS-WWMF.

## 12.0 References

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- Ecometrix (Ecometrix Incorporated), 2022b. Conceptual Site Model – CSA N288.7 Implementation at WWMF and RWOS1. Report No. W-REP-07294-00001. October.
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- MECP (Ministry of the Environment, Conservation and Parks), 2019. Canadian Ambient Air Quality Standards. June.
- MECP (Ministry of the Environment, Conservation and Parks), 2020. Ontario's Ambient Air Quality Criteria.

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- Nuclear Safety and Control Act., 1997. c.9 General Nuclear Safety and Control Regulations. SOR/2000-202. Radiation Protection Regulations. Report No. SOR/2000-203.
- OPG (Ontario Power Generation), 2019. Dosimetry and Radiological Environmental Quality Assurance Program Manual. Report No. N-MAN-03416.3-0020 R016. November.
- UNSCEAR, 2008. Sources and Effects of Ionizing Radiation, Report to the General Assembly with Scientific Annexes. United Nations Scientific Committee on the Effects of Atomic Radiation.

## AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 5956-D8CJYL  
Issue Date: March 25, 2025

Ontario Power Generation Inc.  
Post Office Box, No. 7000 B21  
Tiverton, Ontario  
N0G 2T0

Site Location: Western Waste Management Facility  
Lot 19 and 20, Concession 4  
Kincardine Municipality, County of Bruce  
N0G 2T0

*You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:*

### Description Section

A radioactive waste storage and processing facility, consisting of one (1) two-stage thermal Incinerator, including the following major components:

- one (1) propane fired primary combustion chamber, having a nominal heat input of 4,571 megajoules per hour, operating from 800 degrees Celsius to 1,220 degrees Celsius;
- one (1) propane / waste oil fired secondary combustion chamber, having a nominal heat input of 2,126 megajoules per hour, operating from 1,000 degrees Celsius to 1,220 degrees Celsius;
- one (1) flue gas treatment system in which slaked lime and activated carbon are injected into the flue gas to neutralize acid gas and adsorb trace organic and heavy metals;
- one (1) baghouse dust collector, having 171 square metres of aramid-felt filter bags, or equivalent, and a pulse jet cleaning mechanism;
- exhausting into the air at a volumetric flow rate up to 2.27 cubic metres per second through a stack, designated as S1, having an exit inside diameter of 0.34 metre, extending 7.3 metres above the roof and 21.0 metres above grade;
- one (1) emergency vent;



including the Equipment and any other ancillary and support processes and activities, operating at a Facility Production Limit of up to **2,270 kilograms of Waste incinerated per day**, discharging to the air as described in the Original ESDM Report.

*For the purpose of this environmental compliance approval, the following definitions apply:*

1. "ACB list" means the document entitled "Air Contaminants Benchmarks (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", as amended from time to time and published by the Ministry and available on a Government website;
2. "Acceptable Point of Impingement Concentration" means a concentration accepted by the Ministry as not likely to cause an adverse effect for a Compound of Concern that,
  - a. is not identified in the ACB list, or
  - b. is identified in the ACB list as belonging to the category "Benchmark 2" and has a concentration at a Point of Impingement that exceeds the concentration set out for the contaminant in that document.

With respect to the Original ESDM Report, the Acceptable Point of Impingement Concentration for a Compound of Concern mentioned above is the concentration set out in the Original ESDM Report;

3. "Acoustic Assessment Report" means the report, prepared in accordance with Publication NPC-233 and Appendix A of the Basic Comprehensive User Guide, by Cheng Wu Li / Ontario Power Generation and dated November 29, 2024 submitted in support of the application, that documents all sources of noise emissions and Noise Control Measures present at the Facility, as updated in accordance with Condition 5 of this Approval;
4. "Acoustic Assessment Summary Table" means a table prepared in accordance with the Basic Comprehensive User Guide summarising the results of the Acoustic Assessment Report, as updated in accordance with Condition 5 of this Approval;
5. "AERMOD" means the dispersion model developed by the American Meteorological Society/U.S. Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) including the PRIME (Plume Rise Model Enhancement) algorithm;
6. "Approval" means this entire Environmental Compliance Approval and any Schedules to it;
7. "Basic Comprehensive User Guide" means the Ministry document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended;

8. "Continuous Monitoring Plan" means a plan to continuously monitor and record the operating temperature in the secondary chamber of the Incinerator, the opacity in the flue gas leaving the Incinerator, the concentration of oxygen in the undiluted flue gas leaving the Incinerator, and the concentrations of carbon monoxide, nitrogen oxides, and hydrogen chloride in the flue gas leaving the Incinerator;
9. "Continuous Monitoring System" means the continuous emission monitoring system described in the Continuous Monitoring Plan, consisting of continuous monitors and recording devices;
10. "Company" means **Ontario Power Generation Inc.** operating as **Western Waste Management Facility** that is responsible for the construction or operation of the Facility and includes any successors and assigns in accordance with section 19 of the EPA;
11. "Compound of Concern" means a contaminant described in paragraph 4 subsection 26 (1) of O. Reg. 419/05, namely, a contaminant that is discharged from the Facility in an amount that is not negligible;
12. "Description Section" means the section on page one of this Approval describing the Company's operations and the Equipment located at the Facility and specifying the Facility Production Limit for the Facility;
13. "Director" means a person appointed for the purpose of section 20.3 of the EPA by the Minister pursuant to section 5 of the EPA;
14. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;
15. "Emission Summary Table" means a table described in paragraph 14 of subsection 26 (1) of O. Reg. 419/05;
16. "Environmental Assessment Act" means the *Environmental Assessment Act*, R.S.O. 1990, c.E.18;
17. "EPA" means the *Environmental Protection Act*, R.S.O. 1990, c.E.19;
18. "Equipment" means equipment or processes described in the ESDM Report, this Approval and in the Schedules referred to herein and any other equipment or processes;
19. "Equipment with Specific Operational Limits" means the Incinerator any Equipment related to the thermal oxidation of waste or waste derived fuels, fume incinerators or any other Equipment that is specifically referenced in any published Ministry document that outlines specific operational guidance that must be considered by the Director in issuing an Approval;

20. "ESDM Report" means the most current Emission Summary and Dispersion Modelling Report that describes the Facility. The ESDM Report is based on the Original ESDM Report and is updated after the issuance of this Approval in accordance with section 26 of O. Reg. 419/05 and the Procedure Document;
21. "Facility" means the entire operation located on the property where the Equipment is located;
22. "Facility Production Limit" means the production limit placed by the Director on the main product(s) or raw materials used by the Facility;
23. "Highest Ranking Person" means the highest ranking person regularly present at the Facility who has management responsibilities relating to the Facility;
24. "Incinerator" means the thermal incinerator and associated major components described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;
25. "Log" means a document that contains a record of each change that is required to be made to the ESDM Report and Acoustic Assessment Report, including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a Point of Impingement and all changes to information associated with a Modification to the Facility that satisfies Condition 2;
26. "Manager" means the Manager, Technology Standards Section, Technical Assessment and Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Technical Assessment and Standards Development Branch, as those duties relate to the conditions of this Approval;
27. "Minister" means the Minister of the Environment, Conservation and Parks or such other member of the Executive Council as may be assigned the administration of the EPA under the Executive Council Act;
28. "Ministry" means the ministry of the Minister;
29. "Modification" means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the Facility that may discharge or alter the rate or manner of discharge of a Compound of Concern to the air or discharge or alter noise or vibration emissions from the Facility;
30. "Noise Control Measures" means measures to reduce the noise emissions from the Facility and/or Equipment including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers;

31. "O. Reg. 419/05" means Ontario Regulation 419/05: Air Pollution – Local Air Quality, made under the EPA;
32. "Original ESDM Report" means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of O. Reg. 419/05 and the Procedure Document by Navin Bindra / Ontario Power Generation Inc., and dated April 30, 2024, submitted in support of the application, and includes any changes to the report made up to the date of issuance of this Approval;
33. "Point of Impingement" has the same meaning as in section 2 of O. Reg. 419/05;
34. "Point of Reception" means Point of Reception as defined by Publication NPC-300;
35. "Pre-test Plan" means a plan for the Source Testing including the information required in Section 5 of the Source Testing Code;
36. "Procedure Document" means Ministry guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018, as amended;
37. "Processes with Significant Environmental Aspects" means the Equipment which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of O. Reg. 419/05 and the Procedure Document;
38. "Publication NPC-207" means the Ministry draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the Ministry, August 1978, as amended;
39. "Publication NPC-233" means the Ministry Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended;
40. "Publication NPC-300" means the Ministry Publication NPC-300, "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300", August 2013, as amended;
41. "Schedules" means the following schedules attached to this Approval and forming part of this Approval namely:
  - Schedule A - Supporting Documentation
  - Schedule B - Test Contaminants;
  - Schedule C - Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls); and
  - Schedule D - Source Testing Procedure;
42. "Source Testing" means sampling and testing to measure emissions resulting from operating the Equipment at a level of maximum production within the approved operating range of the Equipment;

43. "Source Testing Code" means the Ontario Source Testing Code, dated June 2010, prepared by the Ministry, as amended;
44. "Test Contaminants" means those contaminants set out in Schedule B of this Approval;
45. "Toxicologist" means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants;
46. "Waste Oil" means the liquid wastes that are part of the feedstocks in Wastes defined below;
47. "Wastes" means the low level radioactive wastes approved under Certificate of Approval (Air) Number 64/1/138 dated January 21, 1976 and the radioactive wastes approved by the Canadian Nuclear Safety Commission under the current Waste Facility Operating Licence Western Waste Management Facility; and
48. "Written Summary Form" means the electronic questionnaire form, available on the Ministry website, that documents whether Modifications were undertaken at the Facility and compliance with the Approval, in the previous calendar year.

*You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:*

## **TERMS AND CONDITIONS**

### **1. GENERAL**

1. Except as otherwise provided by this Approval, the Facility shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this Approval and in accordance with the following Schedules attached hereto:
  - Schedule A - Supporting Documentation
  - Schedule B - Test Contaminants
  - Schedule C - Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)
  - Schedule D - Source Testing Procedure

### **2. OPERATIONAL FLEXIBILITY**

1. Pursuant to section 20.6 (1) of the EPA and subject to Conditions 2.2 and 2.3 of this Approval, future construction, alterations, extensions or replacements are approved in this Approval if the future construction, alterations, extensions or replacements are Modifications to the Facility that:
  - a. are within the scope of the operations of the Facility as described in the Description Section of this Approval;

- b. do not result in an increase of the Facility Production Limit above the level specified in the Description Section of this Approval; and
  - c. result in compliance with the performance limits as specified in Condition 4.
- 2. Condition 2.1 does not apply to,
  - a. the addition of any new Equipment with Specific Operational Limits or to the Modification of any existing Equipment with Specific Operational Limits at the Facility; and
  - b. Modifications to the Facility that would be subject to the Environmental Assessment Act.
- 3. Condition 2.1 of this Approval shall expire ten (10) years from the date of this Approval, unless this Approval is revoked prior to the expiry date. The Company may apply for renewal of Condition 2.1 of this Approval by including an ESDM Report and an Acoustic Assessment Report that describes the Facility as of the date of the renewal application.

### **3. REQUIREMENT TO REQUEST AN ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION**

- 1. Prior to making a Modification to the Facility that satisfies Condition 2.1.a. and 2.1.b., the Company shall prepare a proposed update to the ESDM Report to reflect the proposed Modification.
- 2. The Company shall request approval of an Acceptable Point of Impingement Concentration for a Compound of Concern if the Compound of Concern is not identified in the ACB list as belonging to the category “Benchmark 1” and a proposed update to an ESDM Report indicates that one of the following changes with respect to the concentration of the Compound of Concern may occur:
  - a. The Compound of Concern was not a Compound of Concern in the previous version of the ESDM Report, and
    - i. the concentration of the Compound of Concern exceeds the concentration set out for the contaminant in the ACB list; or
    - ii. the Compound of Concern is not identified in the ACB list; or
  - b. The concentration of the Compound of Concern in the updated ESDM Report exceeds the higher of,
    - i. the most recent Acceptable Point of Impingement Concentration, and

- ii. the concentration set out for the contaminant in the ACB list, if the contaminant is identified in that document.
3. The request required by Condition 3.2 shall propose a concentration for the Compound of Concern and shall contain an assessment, performed by a Toxicologist, of the likelihood of the proposed concentration causing an adverse effect at Points of Impingement.
4. If the request required by Condition 3.2 is a result of a proposed Modification described in Condition 3.1, the Company shall submit the request, in writing, to the Director at least 30 days prior to commencing to make the Modification. The Director shall provide written confirmation of receipt of this request to the Company.
5. If a request is required to be made under Condition 3.2 in respect of a proposed Modification described in Condition 3.1, the Company shall not make the Modification mentioned in Condition 3.1 unless the request is approved in writing by the Director.
6. If the Director notifies the Company in writing that the Director does not approve the request, the Company shall,
  - a. revise and resubmit the request; or
  - b. notify the Director that it will not be making the Modification.
7. The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.
8. If the Director approves the request, the Company shall update the ESDM Report to reflect the Modification.
9. Condition 3 does not apply if Condition 2.1 has expired.

#### **4. PERFORMANCE LIMITS**

1. Subject to Condition 4.2, the Company shall not discharge or cause or permit the discharge of a Compound of Concern into the air if,
  - a. the Compound of Concern is identified in the ACB list as belonging to the category "Benchmark 1" and the discharge results in the concentration at a Point of Impingement exceeding the Benchmark 1 concentration; or
  - b. the Compound of Concern is not identified in the ACB list as belonging to the category "Benchmark 1" and the discharge results in the concentration at a Point of Impingement exceeding the higher of,



- i. if an Acceptable Point of Impingement Concentration exists, the most recent Acceptable Point of Impingement Concentration, and
  - ii. the concentration set out for the contaminant in the ACB list, if the contaminant is identified in that document.
2. Condition 4.1 does not apply if the benchmark set out in the ACB list has a 10-minute averaging period and no ambient monitor indicates an exceedance at a Point of Impingement where human activities regularly occur at a time when those activities regularly occur.
3. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set out in Ministry Publication NPC-300.
4. The Company shall, at all times, ensure that the vibration emissions from the Facility comply with the limits set out in Ministry Publication NPC-207.
5. The Company shall operate any Equipment with Specific Operational Limits approved by this Approval in accordance with the Original ESDM Report and Condition 4.6 of this Approval.
6. The Company shall ensure that the design and operation of the Incinerator complies with the following limits:
  - a. The concentration of oxygen, as recorded by the Continuous Monitoring System in the undiluted flue gas leaving the Incinerator, shall not be less than 6 percent by dry volume calculated as the rolling arithmetic average of 40 minutes of data, with a time resolution as specified in the Continuous Monitoring Plan.
  - b. The concentration of carbon monoxide, as recorded by the Continuous Monitoring System in the flue gas leaving the Incinerator stack, shall not exceed 25 parts per million by dry volume calculated as the rolling arithmetic average of 4 hours of data, with a time resolution as specified in the Continuous Monitoring Plan.
  - c. The concentration of total hydrocarbons, having a carbon content expressed as equivalent methane, being the rolling arithmetic average of 10 measurements taken at approximately 1 minute intervals, in the undiluted flue gas leaving the Incinerator, shall not exceed 50 parts per million by dry volume.
  - d. The operating temperatures leaving the secondary combustion chamber of the Incinerator, as monitored by the Continuous Monitoring System, shall not be less than 1,000 degrees Celsius at a residence time of not less than 2 seconds, with a recording time resolution as specified in the Continuous Monitoring Plan.
  - e. The opacity, as recorded by the Continuous Monitoring System in the flue gas leaving the Incinerator stack, shall:
    - i. not exceed 5 percent, calculated as the rolling arithmetic average of 2 hours of data; and
    - ii. meet the requirements of Section 46 of O. Reg. 419/05.

- f. The concentration of suspended particulate matter in the flue gas leaving the Incinerator stack shall not exceed 14 milligrams per dry cubic metre normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals.
- g. The concentration of mercury in the flue gas leaving the Incinerator stack shall not exceed 20 micrograms per dry cubic metre normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals.
- h. The concentration of isomers of dioxins and furans, as outlined in Schedule C of this Approval, in the flue gas leaving the Incinerator stack, shall not exceed 80 picograms per dry cubic metre in toxicity equivalent normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals, as calculated following the procedure outlined in Schedule C of this Approval.
- i. The concentration of hydrogen chloride, as recorded by the Continuous Monitoring System in the flue gas leaving the Incinerator stack, shall not exceed 27 milligrams per dry cubic metre normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals and calculated as the rolling arithmetic average of 24 hours of data, with a time resolution as specified in the Continuous Monitoring Plan.
- j. The concentration of nitrogen oxides (as nitrogen dioxide), as recorded by the Continuous Monitoring System in the flue gas leaving the Incinerator stack, shall not exceed 198 milligrams per dry cubic metre normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals and calculated as the rolling arithmetic average of 24 hours of data, with a time resolution as specified in the Continuous Monitoring Plan.
- k. The concentration of sulphur dioxide in the flue gas leaving the Incinerator stack, shall not exceed 56 milligrams per dry cubic metre normalized to 11 percent oxygen at a reference temperature of 25 degrees Celsius and a reference pressure of 101.3 kilopascals.

## **5. DOCUMENTATION REQUIREMENTS**

- 1. The Company shall maintain an up-to-date Log.
- 2. No later than March 31 in each year, the Company shall update the Acoustic Assessment Report and shall update the ESDM Report in accordance with section 26 of O. Reg. 419/05 so that the information in the reports is accurate as of December 31 in the previous year.
- 3. The Company shall make the Emission Summary Table (see section 27 of O. Reg. 419/05) and Acoustic Assessment Summary Table available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the Facility.

4. The Company shall, within three (3) months after the expiry of Condition 2.1 of this Approval, update the ESDM Report and the Acoustic Assessment Report such that the information in the reports is accurate as of the date that Condition 2.1 of this Approval expired.
5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

## **6. WRITTEN SUMMARY FORM AND ANNUAL REPORTING**

1. Subject to Condition 6.2, the Company shall prepare, and make available to the Ministry upon request, no later than June 30 of each year, a Written Summary Form signed by the Highest Ranking Person.
2. Condition 6.1 does not apply if:
  - a. Condition 2.1 has expired; and
  - b. the Written Summary Form has been completed for the year in which Condition 2.1 expired.
3. The Company shall prepare and submit an annual summary report to the District Manager not later than March 31 of each year. The annual summary report shall include, but not be limited to, the summaries of the amounts of Wastes and Waste Oil burned, the types and sources of the Wastes burned, any non-compliance with the performance limits as specified in Condition 4 of this Approval, any environmental complaint received, a summary and interpretation of compliance and monitoring data collected, description of any operating problems encountered and corrective action taken.

## **7. OPERATION AND MAINTENANCE**

1. The Company shall prepare and implement, not later than three (3) months from the date of this Approval, operating procedures and maintenance programs for all Processes with Significant Environmental Aspects, which shall specify as a minimum:
  - a. frequency of inspections and scheduled preventative maintenance;
  - b. procedures to prevent upset conditions;
  - c. procedures to minimize all fugitive emissions;
  - d. procedures to prevent and/or minimize odorous emissions;
  - e. procedures to prevent and/or minimize noise emissions;
  - f. procedures for record keeping activities relating to the operation and maintenance programs;
  - g. procedures to identify and record the Wastes and their types (chlorinated and non-chlorinated, liquid or solid);

- h. procedures to handle, store and feed the Wastes and to remove, handle and dispose ash from the Incinerator; and
  - i. procedures to calibrate the Continuous Monitoring System.
- 2. The Company shall ensure that all Processes with Significant Environmental Aspects and the Continuous Monitoring System are operated and maintained in accordance with this Approval, the operating procedures and maintenance programs.
- 3. If the Wastes contain chlorinated constituents, the operating temperatures of the Incinerator, as recorded by the Continuous Monitoring System in the secondary chamber of the Incinerator, shall be increased to a minimum of 1,200 degrees Celsius at a minimum residence time of two (2) seconds.
- 4. The Company shall not burn more than 45 litres of Waste Oil per hour in the secondary chamber of the Incinerator.

## **8. COMPLAINTS RECORDING AND REPORTING**

- 1. If at any time, the Company receives an environmental complaint from the public regarding the operation of the Equipment approved by this Approval, the Company shall take the following steps:
  - a. Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.
  - b. Notify the District Manager of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the District Manager.
  - c. Initiate appropriate steps to determine all possible causes of the complaint, and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint.
  - d. Complete and retain on-site a report written within five (5) business days of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

## **9. NOTIFICATION**

- 1. The Company shall immediately notify the District Manager of non-compliance of performance limits as specified in Condition 4 of this Approval or an equipment upset/malfunction that causes the emergency stack cap opening and the action taken to address the cause of the occurrence.

2. The Company shall prepare and submit to the District Manager a written follow-up event report not later than fourteen (14) days after a non-compliance of performance limits as specified in Condition 4 of this Approval or an equipment upset/malfunction that causes the emergency stack cap opening. The event report shall include:
  - a. a description, time and date of occurrence;
  - b. duration of equipment upset/malfunction;
  - c. the cause of non-compliance or equipment upset/malfunction; and
  - d. the action taken to prevent a reoccurrence.
3. Prior to making a Modification to the Facility that satisfies Condition 2.1 of this Approval, the Company shall notify the District Manager, in writing, not later than thirty (30) days prior to making the Modification to the Facility .

## **10. RECORD KEEPING REQUIREMENTS**

1. Any information requested by any employee in or agent of the Ministry concerning the Facility and its operation under this Approval, including, but not limited to, any records required to be kept by this Approval, shall be provided to the employee in or agent of the Ministry, upon request, in a timely manner.
2. Unless otherwise specified in this Approval, the Company shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this Approval, including,
  - a. a copy of the Original ESDM Report and each updated version;
  - b. a copy of each version of the Acoustic Assessment Report;
  - c. supporting information used in the emission rate calculations performed in the ESDM Reports and Acoustic Assessment Reports;
  - d. the records in the Log;
  - e. copies of each Written Summary Form prepared under Condition 6.1 of this Approval;
  - f. records of maintenance, repair and inspection of Equipment related to all Processes with Significant Environmental Aspects; and
  - g. all records related to environmental complaints made by the public as required by Condition 8 of this Approval.

3. Unless otherwise specified in this Approval, the Company shall retain daily records for one (1) year for the calendar year of the following:
  - a. hours of operation of the Incinerator;
  - b. operating temperatures of the Incinerator;
  - c. the Incinerator's burning rates of Wastes and Waste Oil; and
  - d. types and sources of the Wastes.
4. The Company shall retain for at least two (2) years from the date of their creation the following:
  - a. all records produced by the Continuous Monitoring System; and
  - b. all records on the calibration of the Continuous Monitoring System.

## **11. CONTINUOUS MONITORING**

1. The Company shall, install, conduct and maintain the Continuous Monitoring System in accordance with the Continuous Monitoring Plan acceptable to the Manager.

## **12. SOURCE TESTING**

1. The Company shall perform Source Testing following the Source Testing Procedure outlined in Schedule D of this Approval, to determine the rate of emission of the Test Contaminants, listed in Schedule B of this Approval, from the Incinerator.
2. The Company shall repeat the Source Testing on an annual basis unless the Company has received a confirmation in writing from the District Manager to change the frequency of the Source Testing or discontinue the Source Testing.

## **13. CHANGE OF OWNERSHIP**

1. The Company shall notify the Director in writing, and forward a copy of the notification to the District Manager, within thirty (30) days of the occurrence of any of the following changes to Facility operations:
  - a. the ownership of the Facility;
  - b. the operator of the Facility;
  - c. the address of the Company;



- d. the partners, where the Company is or any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B.17, shall be included in the notification; or
  - e. the name of the corporation where the Company is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C.39, shall be included in the notification.
2. In the event of any change in ownership of the Facility, the Company shall notify the successor of the existence of this Approval and provide the successor with a copy of this Approval, and the Company shall provide a copy of the notification to the District Manager and the Director.

#### **14. REVOCATION OF PREVIOUS APPROVALS**

1. This Approval replaces and revokes all Certificates of Approval (Air) issued under section 9 EPA and Environmental Compliance Approvals issued under Part II.1 EPA to the Facility in regards to the activities mentioned in subsection 9(1) of the EPA and dated prior to the date of this Approval.

### **SCHEDULE A**

#### **Supporting Documentation**

1. Environmental Compliance Approval Application, dated April 23, 2024, signed by Kapil Aggarwal, and submitted by the Company;
2. Emission Summary and Dispersion Modelling Report, prepared by Navin Bindra, and dated April 30, 2024;
3. Acoustic Assessment Report, prepared by Cheng Wu Li of Ontario Power Generation and dated November 29, 2024;
4. Revised information, submitted by email on August 16, 2024, and prepared by Navin Bindra / Ontario Power Generation Inc.

## **SCHEDULE B**

### **Test Contaminants**

- Nitrogen Oxides (NO<sub>x</sub>)
- Sulphur Dioxide (SO<sub>2</sub>)
- Total Particulate Matter

### **List of Metals:**

- Arsenic
- Barium
- Beryllium
- Cadmium
- Copper
- Chromium
- Lead
- Manganese
- Mercury
- Nickel
- Silver
- Zinc

### **List of Polychlorinated Biphenyls of Concern:**

- Dichloro biphenyls (D2PCB)
- Trichloro biphenyls (T3PCB)
- Tetrachloro biphenyls (T4PCB)
- Pentachloro biphenyls (P5PCB)
- Hexachloro biphenyls (H6PCB)
- Heptachloro biphenyls (H7PCB)
- Octachloro biphenyls (O8PCB)
- Nanochloro biphenyls (N9PCB)
- Decachloro biphenyls (D10PCB)

### **List of Volatile Organic Compounds:**

- Acetaldehyde
- Acrolein
- Benzene
- 2-butanone
- Chloroethene
- Ethylbenzene
- Formaldehyde
- Phenol
- Styrene
- Tetrachloroethene
- Toluene
- total hydrocarbons
- 1,1,1-trichloroethane
- Trichloroethene
- Xylenes

**List of Polycyclic Organic Matter:**

- acenaphthylene
- acenaphthene
- anthracene
- benzo(a)anthracene
- benzo(b)fluoranthene
- benzo(k)fluoranthene
- benzo(a)fluorene
- benzo(b)fluorene
- benzo(ghi)perylene
- benzo(a)pyrene
- benzo(e)pyrene
- 2-chloronaphthalene
- chrysene
- coronene
- dibenzo(a,c)anthracene
- 9,10 - dimethylantracene
- 7,12 - dimethylbenzo(a)anthracene
- fluoranthene
- fluorene
- indeno(1,2,3 - cd)pyrene
- 2 - methylantracene
- 3 - methylcholanthrene
- 1 - methylnaphthalene
- 2 - methylnaphthalene
- 1 - methylphenanthrene
- 9 - methylphenanthrene
- naphthalene
- perylene
- phenanthrene
- picene
- pyrene
- tetralin
- triphenylene
- dibenzo(a,h)anthracene
- dibenzo(a,e)pyrene
- quinoline
- biphenyl
- o-terphenyl
- m-terphenyl
- p-terphenyl

## SCHEDULE C

### Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of each isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MECP publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 noted below.

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO <sub>2005</sub> Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1
12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO <sub>2005</sub> Toxic Equivalency Factors [TEFs]
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003
25	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

**NOTE:**

- Sum of toxicity equivalents of individual isomers

## **SCHEDULE D**

### **Source Testing Procedures**

1. The Company shall submit, within twelve (12) months of the previous Source Testing, to the Manager a Pre-Test Plan for the Source Testing required under this Approval. The Company shall finalize the Pre-Test Plan in consultation with the Manager.
2. The Company shall not commence the Source Testing required under this Approval until the Manager has approved the Pre-Test Plan.
3. The Company shall complete the Source Testing not later than six (6) months after the Manager has approved the Pre-Test Plan.
4. The Company shall notify the Manager, the District Manager and the Director in writing of the location, date and time of any impending Source Testing required by this Approval, at least fifteen (15) days prior to the Source Testing.
5. The Company shall submit a report (hardcopy and electronic format) on the Source Testing to the Manager, the District Manager and the Director not later than six (6) months after completing the Source Testing. The report shall be in the format described in the Source Testing Code, and shall also include, but not be limited to:
  - a. an executive summary;
  - b. an identification of the applicable North American Industry Classification System code (NAICS) for the Facility;
  - c. records of operating conditions at the time of Source Testing, including but not limited to the following:
    - i. types (chlorinated or not) and sources of the Wastes;
    - ii. hourly feed rates of Wastes and Waste Oil to the Incinerator;
  - d. all relevant records produced by the Continuous Monitoring System;
  - e. verification method and source of the data used for demonstrating the residence time requirements, as per Condition 4.6.d of this Approval;
  - f. results of Source Testing, including the emission rate, emission concentration, and relevant emission factor of the Test Contaminants from the Incinerator;

- g. results of dispersion calculations in accordance with AERMOD, or any other method accepted by the Director, indicating the Point of Impingement concentrations of the Test Contaminants listed in Schedule B of this Approval; and
  - h. a tabular comparison of Source Testing results for the Targeted Sources and Test Contaminants to original emission estimates described in the Company's application and the ESDM Report.
- 6. The Director may not accept the results of the Source Testing if:
  - a. the Source Testing Code or the requirements of the Manager were not followed;
  - b. the Company did not notify the Manager, District Manager and Director of the Source Testing; or
  - c. the Company failed to provide a complete report on the Source Testing.
- 7. If the Director does not accept the results of the Source Testing, the Director may require re-testing. If re-testing is required, the Pre-Test Plan strategies need to be revised and submitted to the Manager for approval. The actions taken to minimize the possibility of the Source Testing results not being accepted by the Director must be noted in the revision.
- 8. If the Source Testing results are higher than the emission estimates in the Company's ESDM Report, the Company shall update their ESDM Report in accordance with Section 26 of O. Reg. 419/05 with the results from the Source Testing report and make these records available for review by staff of the Ministry upon request. The updated Emission Summary Table from the updated ESDM Report shall be submitted with the report on the Source Testing.

*The reasons for the imposition of these terms and conditions are as follows:*

**1. GENERAL**

Condition No. 1 is included to require the Approval holder to build, operate and maintain the Facility in accordance with the Supporting Documentation in Schedule A considered by the Director in issuing this Approval.



**2. OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION AND PERFORMANCE LIMITS**

Conditions No. 2, 3 and 4 are included to limit and define the Modifications permitted by this Approval, and to set out the circumstances in which the Company shall request approval of an Acceptable Point of Impingement Concentration prior to making Modifications. The holder of the Approval is approved for operational flexibility for the Facility that is consistent with the description of the operations included with the application up to the Facility Production Limit. In return for the operational flexibility, the Approval places performance based limits that cannot be exceeded under the terms of this Approval. Approval holders will still have to obtain other relevant approvals required to operate the Facility, including requirements under other environmental legislation such as the Environmental Assessment Act.

**3. DOCUMENTATION REQUIREMENTS**

Condition No. 5 is included to require the Company to maintain ongoing documentation that demonstrates compliance with the performance limits as specified in Condition 4 of this Approval and allows the Ministry to monitor on-going compliance with these performance limits. The Company is required to have an up to date ESDM Report and Acoustic Assessment Report that describe the Facility at all times and make the Emission Summary Table and Acoustic Assessment Summary Table from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the Facility.

**4. WRITTEN SUMMARY FORM AND ANNUAL REPORTING**

Condition No. 6 is included to require the Company to prepare, and make available to the Ministry upon request, a yearly Written Summary Form, to assist the Ministry with the review of the site's compliance with the EPA, the regulations and this Approval.

**5. OPERATION AND MAINTENANCE**

Condition No. 7 is included to require the Company to properly operate and maintain the Processes with Significant Environmental Aspects to minimize the impact to the environment from these processes.

**6. COMPLAINTS RECORDING AND REPORTING PROCEDURE**

Condition No. 8 is included to require the Company to respond to any environmental complaints regarding the operation of the Equipment, according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

**7. NOTIFICATION**

Condition No. 9 is included to require the Company to notify the District Manager so that the environmental impact and subsequent compliance with the Act, the regulations and this Approval can be verified.

## **8. RECORD KEEPING REQUIREMENTS**

Condition No. 10 is included to require the Company to retain all documentation related to this Approval and provide access to employees in or agents of the Ministry, upon request, so that the Ministry can determine if a more detailed review of compliance with the performance limits as specified in Condition 4 of this Approval is necessary.

## **9. CONTINUOUS MONITORING, SOURCE TESTING**

Conditions No. 11 and 12 are included to require the Company to gather accurate information, so that the environmental impact and subsequent compliance with the EPA, the regulations and this Approval, can be verified.

## **10. CHANGE OF OWNERSHIP**

Condition No. 13 is included to require the Company to notify/report to the Ministry so that compliance with the EPA, the regulations and this Approval can be verified.

## **11. REVOCATION OF PREVIOUS APPROVALS**

Condition No. 14 is included to identify that this Approval replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the EPA and dated prior to the date of this Approval.

**Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s).  
9277-ANDJ3R issued on October 19, 2017**

In accordance with Section 139 of the *Environmental Protection Act*, you may by written notice served upon me, the Ontario Land Tribunal and in accordance with Section 47 of the *Environmental Bill of Rights*, 1993, the Minister of the Environment, Conservation and Parks, within 15 days after receipt of this notice, require a hearing by the Tribunal. The Minister of the Environment, Conservation and Parks will place notice of your appeal on the Environmental Registry. Section 142 of the *Environmental Protection Act* provides that the notice requiring the hearing ("the Notice") shall state:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the *Environmental Protection Act*, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

Registrar\*  
Ontario Land Tribunal  
655 Bay Street, Suite 1500  
Toronto, Ontario  
M5G 1E5  
OLT.Registrar@ontario.ca

and

The Minister of the Environment,  
Conservation and Parks  
777 Bay Street, 5th Floor  
Toronto, Ontario  
M7A 2J3

and


The Director appointed for the purposes of  
Part II.1 of the *Environmental Protection Act*  
Ministry of the Environment,  
Conservation and Parks  
135 St. Clair Avenue West, 1st Floor  
Toronto, Ontario  
M4V 1P5

**\* Further information on the Ontario Land Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349 or 1 (866) 448-2248, or [www.olt.gov.on.ca](http://www.olt.gov.on.ca)**

This instrument is subject to Section 38 of the *Environmental Bill of Rights*, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at <https://ero.ontario.ca/>, you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the *Environmental Protection Act*.

DATED AT TORONTO this 25th day of March, 2025



---

Nancy E Orpana, P.Eng.  
Director  
appointed for the purposes of Part II.1 of the  
*Environmental Protection Act*

VA/

c: District Manager, MECP Owen Sound  
Navin Bindra, Ontario Power Generation Inc.



## Directorate of Nuclear Cycle and Facilities Regulation

File No.: 4.05.02

e-Doc 7036507

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OPG Proprietary

CD # W-CORR-00531-01915

June 19, 2023

Ms. Heather Brown  
Vice President, Environment, Health & Safety  
Ontario Power Generation

**Subject: CNSC Staff Review of OPG Response to CNSC Staff Comments on OPG's Submission – Dry Storage Container Processing Building Ventilation Stack Monitor Assessment for the Darlington, Pickering and Western Waste Management Facilities (WMFs)**

Dear Ms. Brown,

Canadian Nuclear Safety Commission (CNSC) staff reviewed Ontario Power Generation's (OPG) response [1] to CNSC staff further comment on OPG's submission [2].

As a result of the review, CNSC staff are satisfied with OPG's response and have no further comments. CNSC staff accept OPG's request to remove the dry storage container processing building ventilation stack monitoring at the Pickering, Darlington and Western WMFs on January 1, 2024, provided that OPG communicates the change in the Q1 2023 Environmental Emissions Data report and posts it on OPG's website as stated in [1]. OPG is requested to notify CNSC staff when the report is posted on OPG's website. CNSC staff recommend that OPG communicates the proposed change to Indigenous Nations and Communities through various communication channels (e.g., meetings etc.).

Should you require further information or clarification regarding this letter, please do not hesitate to contact me at [taline.kalindjian@cnsccsn.gc.ca](mailto:taline.kalindjian@cnsccsn.gc.ca).

Best Regards,

Taline Kalindjian  
Project Officer  
Wastes and Decommissioning Division  
Canadian Nuclear Safety Commission

c.c.: C. Barua, K. Lynchahon, H. Innis, E. Wheatley (OPG)  
S. Watt, R. van Hoof (CNSC)

**References:**

- [1] Letter from A. Del Pino (OPG) to T. Kalindjian (CNSC), “*OPG Response to CNSC Staff Review of OPG’s Submission - Dry Storage Container Processing Building Ventilation Stack Monitor Assessment for the Darlington, Pickering, and Western Waste Management Facilities*”, CD# W-CORR-00531-01898, April 26, 2023, e-Doc [7036960](#)
  
- [2] [2] Letter from M. Welt for K. Aggarwal and J. Wooland (OPG) to T. Kalindjian and S. Watt (CNSC), Dry Storage Container Processing Building Ventilation Stack Monitor Assessment for the Darlington, Pickering and Western Waste Management Facilities, CD# W-CORR-00531-01788, December 9, 2021, e-Doc [6700342](#)



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

## Record of Decision

In the Matter of

Applicant Ontario Power Generation

Subject Application to Renew the Waste Facility  
Operating Licence for the Western Waste  
Management Facility

Public Hearing  
Date April 12, 2017





## **RECORD OF DECISION**

Applicant: Ontario Power Generation

Address/Location: 700 University Avenue, Toronto, Ontario M5G 1X6

Purpose: Application to renew the Waste Facility Operating Licence for the Western Waste Management Facility

Application received: May 16, 2016

Date of public hearing: April 12, 2017

Location: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario

Members present: M. Binder, Chair  
S. Demeter S. McEwan  
S.A. Soliman R. Velshi

Secretary: M.A. Leblanc  
Recording Secretary: P. McNelles  
Senior General Counsel: L. Thiele

<b>Applicant Represented By</b>	<b>Document Number</b>
L. Morton, Vice-President, Nuclear Waste Management D. Howe, Director, Western Waste Operations A. Webster, Director, Nuclear Waste Operations Support D. Witzke, Director, Nuclear Waste Engineering R. McCalla, Director, Environment Operations Support E. Schwartz, Manager, Health Physics C. Lorencez, Director, Nuclear Safety Division	CMD 17-H3.1 CMD 17-H3.1A CMD 17-H3.1B
<b>CNSC staff</b>	<b>Document Number</b>
R. Jammal, H. Tadros, K. Glenn, S. Oue, M. Rinker, K. Noble, A. McAllister, N.-O. Kwamena, C. Ducros, R. Lane, C. Cole, S. Djeffal and K. Sauvé	CMD 17-H3 CMD 17-H3.A CMD 17-H3.B
<b>Intervenors</b>	<b>Document Number</b>
See appendix A	

**Licence: Renewed**



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## 1.0 INTRODUCTION

1. Ontario Power Generation Inc. (OPG) has applied to the Canadian Nuclear Safety Commission<sup>1</sup> for the renewal of the Waste Facility Operating Licence (WFOL) for its Western Waste Management Facility (WWMF) located in the Municipality of Kincardine, Ontario. The current operating licence, W4-314.03/2017, expires on May 31, 2017. OPG requested a renewal of the licence for a period of ten years, from June 1, 2017 to May 31, 2027.
2. The WWMF is located on approximately 19 of the 932 hectares that is the site of the Bruce Nuclear Power Development (BNPD) on the shores of Lake Huron, within the Municipality of Kincardine. The entire BNPD site is owned by OPG. The majority of the site was leased to Bruce Power Inc. (Bruce Power) in May 2001. OPG is the owner and licensed operator of the WWMF within the BNPD site.
3. The WWMF includes both the Low and Intermediate Level Waste (L&ILW) Storage Facility and the Used Fuel Dry Storage Facility (UFDSF). The L&ILW Storage Facility consists of the Waste Volume Reduction Building, the Transportation Package Maintenance Building, 14 above-ground Low Level Storage Buildings (LLSBs), two above-ground refurbishment waste storage buildings, and various in-ground containers, trenches and tile holes for intermediate-level radioactive waste (ILW) storage. The UFDSF processes and stores dry storage containers (DSCs) containing used nuclear fuel solely from the Bruce Nuclear Generating Station (BNGS).
4. The WWMF licence authorizes OPG to operate the safe handling, management, and the interim storage of radioactive wastes, including L&ILW, from all 20 reactors located at the Bruce, Darlington and Pickering sites, and the used nuclear fuel produced by the BNGS. OPG has developed the WWMF site in stages since 1974, with additional structures to accommodate wastes produced during reactor operation, maintenance and refurbishment. The WWMF licence also authorizes OPG to receive low-level radioactive waste from the Darlington, Pickering and Bruce nuclear generating stations to the Waste Volume Reduction Building. Furthermore, the current WWMF licence authorizes the construction of an additional nine storage buildings for L&ILW, 108 in-ground storage containers for intermediate-level radioactive waste, 20 in-ground containers for heat exchangers, and two DSC storage buildings. This authorization was issued by the Commission in 2007.<sup>2</sup>
5. The existing WWMF licence allows OPG to construct and operationalize waste storage structures. While some of the approved structures have been constructed, OPG has requested that activities already approved in the current licence be carried over into the renewed licence. These activities include the construction and operation of:

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<sup>1</sup> The *Canadian Nuclear Safety Commission* is referred to as the “CNSC” when referring to the organization and its staff in general, and as the “Commission” when referring to the tribunal component.

<sup>2</sup> Canadian Nuclear Safety Commission Record of Decision – *Application to Renew the Operating Licence for the Western Waste Management Facility*, April 11, 2007, Ontario Power Generation.

- 5 storage buildings for low- and intermediate-level waste (L&ILW SBs)
  - 54 in-ground containers (IC-18s)
  - 20 in-ground containers for heat exchangers (IC-HXs)
6. By this renewal application, OPG is also requesting approval for construction and operation of the following new storage structures adjacent to the current WWMF area within the Bruce Power site boundary:
- 4 storage buildings for used dry fuel (UFDSBs)
  - 6 storage buildings for low- and intermediate-level waste (L&ILW SBs)
  - 216 in-ground containers (IC-18s)
  - 10 in-ground containers for heat exchangers (IC-HXs)
  - 1 large object processing building
  - 1 waste sorting building

The new structures would provide additional storage capacity for used nuclear fuel and L&ILW, as well as processing facilities to manage the wastes.

7. In addition, OPG is requesting that the Commission authorize the consolidation of the licensed activities of import and export of nuclear substances, currently authorized under OPG's Nuclear Substances and Radiation Devices Licence No. 12861-15-19.0, into the proposed WWMF licence.

#### Issue

8. In considering the application, the Commission is required to decide:
- a) what environmental assessment review process to apply in relation to this application;
  - b) if OPG is qualified to carry on the activity that the licence would authorize; and
  - c) if, in carrying on that activity, OPG will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

#### Public Hearing

9. Pursuant to section 22 of the NSCA, the President of the Commission established a Panel of the Commission to review the application. The President of the Commission authorized R. Velshi to participate in this hearing, as she became engaged with this matter while still holding office as a member of the Commission. The Commission, in making its decision, considered information presented for a public hearing held on April 12, 2017 in Ottawa, Ontario. The public hearing was conducted in accordance

with the *Canadian Nuclear Safety Commission Rules of Procedure*.<sup>3</sup> During the public hearing, the Commission considered written submissions and heard oral presentations from OPG (CMD 17-H3.1) and CNSC staff (CMD 17-H3). The Commission also considered oral and written submissions from 18 intervenors (see Appendix A for a list of interventions). The hearing was webcast live via the CNSC website, and video archives are available for a three-month period following the hearing.

## 2.0 DECISION

10. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Decision*, the Commission concludes that OPG is qualified to carry on the activity that the licence will authorize. The Commission is of the opinion that OPG, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, renews the Waste Facility Operating Licence issued to Ontario Power Generation Inc. for its Western Waste Management Facility located in Kincardine, Ontario. The renewed licence, WFOL-W4-314.00/2027, is valid from June 1, 2017, until May 31, 2027, unless suspended, amended, revoked or replaced.

11. The Commission includes in the licence the conditions as recommended by CNSC staff in CMD 17-H3.
12. The Commission authorizes the consolidation of the licensed activities of import and export of nuclear substances from OPG's Nuclear Substances and Radiation Devices Licence No. 12861-15-19.0 into the proposed WWMF licence. The Commission concurrently amends OPG's Nuclear Substances and Radiation Devices Licence No. 12861-15-19.0. to remove the reference to the Western Waste Management Facility located in Appendix: Locations of Licensed Activities, of that licence.
13. The Commission notes that CNSC staff can bring any matter to the Commission as applicable. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the LCH.
14. The Commission authorizes the construction activities as outlined in the proposed licence. OPG is to submit to CNSC staff an environmental management plan, construction verification plan, and the project design requirements prior to the commencement of construction activities, as contemplated in licence condition 15.1.
15. The Commission takes notice of OPG's commitment to submit to CNSC staff a report confirming the need for any of the proposed structure(s) for which the necessity of that

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<sup>3</sup> Statutory Orders and Regulations (SOR)/2000-211.

structure(s) is contingent upon future regulatory and licensing decisions that may occur during the WWMF licence period, prior to the commencement of construction activities. Under CNSC staff's proposed licence condition 15.2, for the structures listed in Table 2 of Appendix A of the licence, the Commission will first have to accept a commissioning report submitted by OPG, before operation may commence. With respect to the structures listed in Table 3 of Appendix A, the Commission by this decision delegates the acceptance of a commissioning report as recommended in section 4.11 of CMD 17-H3, to the staff positions there listed.

16. The Commission accepts the delegations of authority as recommended in section 4.11 of CMD 17-H3, except in the case of the acceptance of the commissioning report for the structures list in Table 2 of Appendix A of the licence, as detailed in the above paragraph.
17. The Commission also wishes to make it clear, and to address the concerns raised by the Saugeen Ojibway Nation (SON), that this licence is not prejudging the outcome of future regulatory decisions pertaining to waste management at the Bruce NGS site.
18. With this decision, the Commission directs CNSC staff to report annually on the performance of the WWMF as part of an annual *Regulatory Oversight Report*. CNSC staff shall present this report at a public proceeding of the Commission, where members of the public will be able to participate.

### **3.0 ISSUES AND COMMISSION FINDINGS**

19. In making its licensing decision, the Commission considered a number of issues relating to OPG's qualification to carry out the proposed activities and the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed.

#### **3.1 Application of the *Canadian Environmental Assessment Act***

20. In coming to its decision, the Commission was first required to determine whether an Environmental Assessment (EA) under the *Canadian Environmental Assessment Act* of 2012<sup>4</sup> (CEAA, 2012), was required.
21. The application is for a licence renewal, to include the authorization for the construction of additional structures. The Commission notes that licence renewal is not designated as a project under CEAA, 2012. With respect to the proposed new construction, the Commission is satisfied that none of the additional activities sought to be authorized amount to a project as designated in the Schedule to the *Regulations Specifying Physical Activities*.<sup>5</sup> In particular,

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<sup>4</sup> *Canadian Environmental Assessment Act*, 2012 (S.C. 2012, c. 19, s. 52)

<sup>5</sup> *Regulations Designating Physical Activities* (SOR/2012-147)



- Section 34 of the Schedule relates to the expansion of a facility for processing certain isotopes, a manufacturing facility or other processing facility, and the WWMF is not such a facility. Thus, section 34 is not engaged.
  - The WWMF is not a facility for long-term management and disposal of irradiated fuel or nuclear waste, as it is an interim storage facility. Thus, section 38 is not engaged.
22. The Commission notes that two previous EAs were performed in 2003 and 2006, respectively, under the prior *Canadian Environmental Assessment Act*, 1992<sup>6</sup> (CEAA, 1992), regarding the preparation, construction and operation of additional facilities at the WWMF. In 2006, the Commission concluded that the EAs performed adequately assessed the potential environmental impacts, that the construction project, taking into account the implementation of mitigation measures, was not likely to cause significant adverse environmental effects, and that all applicable requirements of CEAA 1992 were satisfied.<sup>7</sup>
23. CNSC staff reported that an EA was conducted under the NSCA for this licence renewal. CNSC staff's findings from that EA include, but are not limited to:
- OPG's environmental protection programs meet CNSC regulatory requirements.
  - OPG's PEA assessed the potential environmental (ecological and human health) effects from the WWMF emissions and complies with CSA N288.6-12.
  - The results of the CNSC IEMP confirm that the public and the environment in the vicinity of the WWMF site are protected from any harmful effects associated with releases from the site.
24. The Commission noted that the WWMF is within the larger Bruce Power NGS site, and asked CNSC staff to explain how they separate the effects of each facility when performing the EA. CNSC staff reported that there are specific monitoring programs dedicated to monitoring each of the facilities, therefore the specific releases from each facility are accounted for. CNSC staff stated that the IEMP considers specific radionuclides and effluent streams at each site, and that site-wide ERAs are also performed. CNSC staff added that the total dose to the public includes the doses from the WWMF and the Bruce Power NGS, however the proportion of the total dose from the WWMF is calculated. CNSC staff noted that the essential aspect is the protection of the public regarding the overall public dose, not the dose rate from each individual site.

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<sup>6</sup> *Canadian Environmental Assessment Act* (S.C. 1992, c. 37)

<sup>7</sup> CNSC Record of Proceedings, Including Reasons for Decision: *Environmental Assessment of the Construction and Operation of the Western Waste Management Facility Refurbishment Waste Storage Project*, March 2006.

25. Addressing the effects of the total suspended solid values on aquatic life, CNSC staff reported that this is an intermittent stressor due to the freezing and thawing of the water, and that the environment is usually able to recover quickly, in comparison with a more frequent stressor. CNSC staff noted that it is hard to predict if any residual damage from the intermittent stressor will occur.
26. The Commission considered the results of past EAs performed under CEAA 1992, the EA performed under the NSCA, and is satisfied that an EA under CEAA 2012 is not required as the *Regulations Designating Physical Activities* does not apply to this licence renewal application. The Commission considers the environmental review that was conducted by CNSC staff to be acceptable and thorough. The Commission notes that the NSCA provides a strong regulatory framework for environmental protection. Whether an EA under CEAA 2012 is required or not, the CNSC regulatory system ensures that adequate measures are in place to protect the environment and human health in accordance with the NSCA and its Regulations.

### 3.2 Management System

27. The Commission examined OPG's Management System which covers the framework that establishes the processes and programs required to ensure that the WWMF achieves its safety objectives and continuously monitors its performance against these objectives, and fosters a healthy safety culture. Based on information submitted by OPG and CNSC staff, the Commission considered the following specific areas of this safety and control area (SCA):

- Management System
- Organization
- Safety Culture

CNSC staff rated the WWMF performance in this SCA for the period of 2007-2016 as satisfactory.

#### 3.2.1 Management System

28. The Commission considered OPG's management system documents and CNSC staff's verification of whether OPG's management system is implemented in accordance with CNSC regulatory requirements. OPG informed the Commission that the WWMF performs detailed audits and monitoring of its management system in order to provide for continuous improvements of that management system, and to ensure the safe and reliable operation of the WWMF. OPG added that the WWMF's management system is compliant with the requirements of CSA standard N286-12, *Management system requirements for nuclear facilities*<sup>8</sup> and ensures that this facility meets its safety objectives. CNSC staff informed the Commission regarding their inspections and

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<sup>8</sup> CSA Group – CSA N286-12, *Management system requirements for nuclear facilities*, 2012.

desktop reviews during the current licence period, and stated that OPG had addressed inspection findings in a timely and satisfactory manner and took all appropriate corrective actions. CNSC staff confirmed that OPG's management system for the WWMF complies with the CSA N286-12 standard.

### 3.2.2 Organization

29. The Commission assessed the information provided by OPG and CNSC staff regarding the organizational structure at the WWMF, the responsibilities and day-to-day operations of that facility, and changes to the organizational model used by OPG during the current licence period. OPG informed the Commission that these changes allow for best practices to be implemented at all of OPG's licensed sites, and that the WWMF receives direct support from OPG's central management functions. CNSC staff stated that a thorough review of OPG's revised organizational structure was performed, and CNSC staff concluded that these changes did not impact the safe conduct of licenced activities.

### 3.2.3 Safety Culture

30. The Commission considered the information regarding the safety culture at the WWMF. OPG informed the Commission that it routinely monitors its nuclear safety culture through the use of Nuclear Safety Culture Monitoring Panels as established in the Nuclear Energy Institute's (NEI) best practice document NEI-09-07, *Fostering a Strong Nuclear Safety Culture*.<sup>9</sup> OPG stated that these panels examine the information from the safety culture programs in order to identify the areas of strength and the areas for focused attention within the organization. OPG added that, in 2015, a Nuclear Safety Culture Assessment was performed and the results showed that the OPG Nuclear Waste Management group had a healthy safety culture. The assessment identified areas for improvement, and the next assessment will take place in 2018. CNSC staff informed the Commission that, based on their review, CNSC staff is of the opinion that OPG's management system and supporting documents related to safety culture are adequate to monitor, foster and continually improve the safety culture at the WWMF. CNSC staff added that the establishment of the safety culture monitoring panel meets CNSC requirements.
31. Asked if the Power Workers' Union had raised any safety concerns with OPG management with respect to the WWMF, the OPG representative responded that OPG works in collaboration with the Union, and that there are processes for Union members to raise safety concerns, as part of the safety culture at the facility. The OPG representative added that there are joint working groups between the Union and management in order to work through any concerns that may arise.

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<sup>9</sup> Nuclear Energy Institute – NEI-09-07, *Fostering a Healthy Nuclear Safety Culture*, March, 2014.

#### *3.2.4 Conclusion on Management System*

32. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate organization and management structures in place, and that the operating performance at the WWMF in the current licence period provides a positive indication of OPG's ability to adequately carry out the activities under the proposed renewed licence.

### **3.3 Human Performance Management**

33. Human performance management encompasses activities that enable effective human performance through the development and implementation of processes that ensure licensee staff is sufficient in number in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties. The Commission's consideration of this SCA includes the following specific areas:

- Human performance program
- Personnel training

CNSC staff evaluated the WWMF performance related to this SCA and rated it as satisfactory for the period 2007-2016.

#### *3.3.1 Human Performance Program*

34. The Commission considered the tools developed by OPG to reduce error, establish and maintain defences, identify and resolve organizational weaknesses, identify and respond to error precursors, and to identify and implement necessary improvements. OPG informed the Commission that the Human Performance Program at the WWMF includes the key behavioral expectations regarding worker activities, supervisory activities, behavioral improvement, and the reporting and evaluation activities used to assess performance and identify areas for improvement. CNSC staff informed the Commission that the proposed licence is the first licence for the WWMF to specify a requirement to implement and maintain a human performance program, and that the goal of that program is to continually reduce the frequency and severity of events through the systematic reduction of human error and the management of defences. CNSC staff has assessed OPG's Human Performance Program and find that it meets requirements. CNSC staff added that, as part of ongoing regulatory oversight activities, CNSC staff will assess the implementation of the Human Performance Program at the WWMF.

#### *3.3.2 Personnel Training*

35. The Commission assessed OPG's personnel training programs to determine if they meet regulatory requirements. OPG informed the Commission that OPG's Nuclear Training Program is used to develop and maintain competent personnel in order to

ensure the safe operation of the WWMF. OPG provided an overview of general and job-specific training, and stated that the WWMF is fully compliant with the requirements stated in REGDOC-2.2.2, *Personnel Training*.<sup>10</sup> CNSC staff advised the Commission that OPG has a well-documented Systematic Approach to Training (SAT), and noted that OPG's training programs are appropriate for the activities conducted at the WWMF. CNSC staff informed the Commission that an inspection of personnel training occurred at the WWMF in May 2016, and that, overall, CNSC staff was satisfied with the results of that inspection and with the corrective action plan to address the minor deficiency that was uncovered. CNSC staff stated that they would continue to monitor the training and qualification program at the WWMF and, based on their assessment, CNSC staff is of the view that the WWMF meets the expectations for personnel training.

### *3.3.3 Conclusion on Human Performance Management*

36. Based on its consideration of the presented information, the Commission concludes that OPG has appropriate programs in place and that current efforts related to human performance management provide a positive indication of OPG's ability to adequately carry out the activities under the proposed licence.

## **3.4 Operating Performance**

37. Operating performance includes an overall review of the conduct of the licensed activities and the activities that enable effective performance as well as improvement plans and significant future activities at the WWMF. CNSC staff reviewed the following specific areas encompassed by this SCA:

- Conduct of licensed activity
- Reporting and trending

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2010 and fully satisfactory for the period 2011-2016.

### *3.4.1 Conduct of Licensed Activity*

38. The Commission considered the operating practices of the WWMF. OPG submitted that it operates and manages the WWMF in accordance with the licensing basis and applicable standards. OPG stated that procedures are utilized in all aspects of the WWMF operation, including providing direction on the waste that is acceptable for processing storage, as detailed in the WWMF licensing basis. OPG provided to the Commission an overview of the performance of the WWMF, new component installations, qualification and testing, production history and plans for future improvements. OPG also provided details on the implementation in 2016 of the Work

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<sup>10</sup> Canadian Nuclear Safety Commission Regulatory Document – REGDOC-2.2.2, *Personnel Training*, December, 2016.

Management process, which is intended to reduce events and improve productivity, component reliability and system availability. CNSC staff reported that the implementation of OPG's WWMF operations programs provides safe and secure facility operation with adequate regard for health, safety, security, radiation protection, environmental protection, and Canada's international obligations. CNSC staff provided additional information regarding the waste operations and future construction activities at the WWMF.

39. CNSC staff informed the Commission that OPG possesses a Nuclear Substances and Radiation Devices Licence #12861-15-19.0 that authorizes OPG to send contaminated laundry from the WWMF to the United States to be laundered and returned to the WWMF. CNSC staff stated that OPG is requesting the consolidation of the licensed activities of import and export of nuclear substances from their Nuclear Substances and Radiation Devices Licence with the proposed WWMF licence renewal. CNSC staff confirmed that these activities will continue to be limited to contaminated materials other than controlled nuclear substances as defined in the *Nuclear Non-Proliferation Import and Export Control Regulations*.<sup>11</sup>
40. On the proposed construction of new facilities or structures as listed on Table 2 in Appendix A of the licence, the Commission asked if there was a distinction between the requirement for approval before construction, or approval before commissioning. The SON representative responded that it would be optimal if Commission approval was required prior to the commencement of construction activities, as opposed to prior to the commissioning of new facilities, as it more fully addresses the concerns of the SON. However, the SON representative also noted that the SON had asked that a hold point be set at a minimum at the construction stage or at the commissioning stage, prior to operation.
41. Asked if the inclusion of a hold point for proposed construction activities would be beneficial to the relations between the SON, CNSC and OPG, the SON representative responded that the inclusion of a hold point would be empowering and of great importance to First Nations peoples, who historically felt disenfranchised with the use and regulation of nuclear technology within their territory.
42. Clarifying its position on the hold point for the commissioning of the proposed new buildings, CNSC staff reported that it is recommending to the Commission that a hold point be placed on the commissioning of new buildings, based on the acceptance of the commissioning reports. CNSC staff stated that the designs for these buildings are very similar to the existing structures; therefore the expectation for OPG is to implement the latest versions of codes and standards, as well as to ensure the protection of the environment, which CNSC staff will verify.
43. The Commission noted the commitment by OPG to not commence any construction activities of structures linked to future regulatory processes (i.e. the proposed Deep Geological Repository for ILW and LLW) unless OPG can demonstrate the necessity

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<sup>11</sup> *Nuclear Non-proliferation Import and Export Control Regulations* (SOR/2000-210)

for such structures in light of developments regarding the status of ILW and LLW.

44. The Commission asked about the time required to construct the proposed structures. The OPG representative responded that the total project cycle is approximately five years, and the actual construction portion would take about eighteen months.
45. Asked about the assessments for the two potential locations where the proposed new structures would be constructed, the OPG representative stated that both locations are considered in the predictive effects assessment (PEA), and that OPG is seeking approval to construct these structures at both locations.
46. On the division of work between Bruce Power and OPG with respect to the dry storage process, Bruce Power provided an overview of their commercial arrangement with OPG and their spent fuel storage process on site, and stated that the spent fuel is later shipped to the WWMF. The Bruce Power representative added that there is a large amount of shared operational experience and that there is clear responsibility with respect to fuel transfer. The OPG representative provided an overview of its procedures and obligations regarding fuel storage, transfer, and radiation protection, and stated that there is a detailed documentation process to ensure each party meets its commitments. The Commission notes that there will be collaboration between OPG and Bruce Power at the WWMF throughout the proposed new construction activities and the total life of the facility.
47. Regarding the spike in the value for the total stored activity that occurred in 2008, CNSC staff reported that this spike was due to an increase in the low-level waste (LLW) volume from the Bruce A refurbishment project. The OPG representative added that this spike was also due to intermediate-level waste (ILW), in the form of retube waste components. The Commission noted that these values represent annual storage as opposed to cumulative storage.
48. On the storage of liquid waste at the WWMF, the OPG representative reported that there is a small volume of liquid waste oil that is stored within a dyked area before it is incinerated, and that other liquid waste products are solidified at the nuclear power plants before being transported to the WWMF.

#### *3.4.2 Reporting and Trending*

49. CNSC staff informed the Commission that it verified that OPG's program for reporting to the Commission with respect to the activities at the WWMF exceeds regulatory requirements. CNSC staff stated that, during the reporting period, no significant events occurred and no Event Initial Reports (EIRs) were presented to the Commission. CNSC staff stated that there were forty-one low safety-significant reportable events at the WWMF; however, there were no adverse effects on the health and safety of persons or the environment, and OPG took all corrective action when necessary. CNSC staff is of the opinion that OPG's reporting and implementation of corrective actions is satisfactory. The Commission notes that sections 29 and 30 of the *General Nuclear*

*Safety and Control Regulations*<sup>12</sup> outline the specific scenarios under which a licensee must file a report to the Commission, including the information that is relevant to that event.

### *3.4.3 Conclusion on Operating Performance*

50. Based on the above information, the Commission concludes that the operating performance at the WWMF during the current licence period provides a positive indication of OPG's ability to carry out the activities under the proposed licence.
51. The Commission authorizes the construction activities as outlined in the proposed licence. OPG is to submit to CNSC staff an environmental management plan, construction verification plan, and the project design requirements prior to the commencement of construction activities, as contemplated in licence condition 15.1.
52. The Commission takes notice of OPG's commitment to submit to CNSC staff a report confirming the need for any of the proposed structure(s) for which the necessity of that structure(s) is contingent upon future regulatory and licensing decisions that may occur during the WWMF licence period, prior to the commencement of construction activities. Under CNSC staff's proposed licence condition 15.2, for the structures listed in Table 2 of Appendix A of the licence, the Commission will first have to accept a commissioning report submitted by OPG, before operation may commence. With respect to the structures listed in Table 3 of Appendix A, the Commission by this decision delegates the acceptance of a commissioning report as recommended in section 4.11 of CMD 17-H3, to the staff positions there listed.

### **3.5 Safety Analysis**

53. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or the operation of a facility, and considers the effectiveness of preventive measures and strategies in reducing the effects of such hazards. It supports the overall safety case for the facility. CNSC staff reviewed the following specific areas encompassed by this SCA:
  - Deterministic Safety Analysis
  - Hazard analysis
  - Criticality safety

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2010 and fully satisfactory for the period 2011-2016.

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<sup>12</sup> *General Nuclear Safety and Control Regulations* (SOR/2000-202)



### *3.5.1 Hazard Analysis*

54. OPG informed the Commission that Fire Hazard Analyses (FHA) were completed for all LLW and ILW facilities at the WWMF, and all recommendations have been implemented or planned for execution. CNSC staff confirmed that OPG performed these FHAs and is implementing the recommendations from the FHAs in accordance with the corrective action plan. CNSC staff is monitoring OPG's corrective action work and is satisfied with OPG's progress to date. CNSC staff informed the Commission that fire protection compliance inspections were conducted in October 2009 and March 2013 and that, based on those inspections, CNSC staff is of the view that the fire protection program at the WWMF meets regulatory requirements and the overall condition of the facility is satisfactory with respect to fire protection.

### *3.5.2 Deterministic Safety Analysis*

55. OPG informed the Commission that deterministic safety analysis methods are employed to assess the overall safety of the WWMF, and that worst-case accident scenarios have been identified. OPG stated that the results of the safety analysis were used to update the Safety Report and the Safety Design Envelope, and that the Safety Report is reviewed every five years and revised as necessary to incorporate new information from assessments and operational experience. CNSC staff confirmed that OPG conducted several assessments, including an environmental risk assessment, to ensure the safety of the WWMF operations. CNSC staff informed the Commission that the most recent safety report for the WWMF was reviewed in 2012, and CNSC staff considered it to be acceptable. The Commission recognizes that licence condition 4.2 of the proposed licence requires OPG to implement and maintain a safety analysis report. The Commission notes that the next revision of the WWMF safety report is due in 2017.

### *3.5.3 Criticality Safety*

56. OPG informed the Commission that criticality assessments have been completed for the used fuel stored in the DSCs at the WWMF. Those assessments have demonstrated that there can be no criticality of spent fuel under normal conditions or under any postulated accident scenario at the WWMF. CNSC staff confirmed that the spent fuel currently stored at the WWMF cannot become critical in air or in water; therefore OPG is not required to maintain a nuclear criticality safety program for the WWMF.

### *3.5.4 Conclusion on Safety Analysis*

57. On the basis of the information presented, the Commission concludes that the systematic evaluation of the potential hazards and the preparedness for reducing the effects of such hazards is adequate for the operation of the WWMF and the activities under the proposed licence.

### 3.6 Physical Design

58. Physical design includes activities to design the systems, structures and components to meet and maintain the design basis of the facility. The design basis is the range of conditions, according to established criteria, that the facility must withstand without exceeding authorized limits for the planned operation of safety systems. CNSC staff reviewed the following specific areas encompassed by this SCA:

- Design Governance
- Facility Design
- Structure Design
- System Design
- Component Design

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016. These specific areas will be discussed concurrently in this section.

59. OPG informed the Commission that its Nuclear Waste Management program has robust processes to ensure that the physical design of the WWMF complies with the licensing basis and safety case. OPG stated that all engineering activities, facility operations, and any changes made to the facility/facility operations are implemented using procedures and work instructions that satisfy the WWMF operating licence, safety envelope, and meet all regulatory requirements.
60. CNSC staff informed the Commission that OPG's implementation of physical design SCA requirements in accordance with CNSC regulatory requirements was evaluated through various compliance activities. CNSC staff confirmed that OPG has a formal service agreement with the Technical Standards and Safety Authority as the Authorized Inspection Agency, and CNSC staff also confirmed that OPG's pressure boundary program complies with CNSC regulatory requirements. CNSC staff stated that OPG continues to submit third party reviews with respect to its fire protection program, to provide confirmation that compliance criteria are met, and CNSC staff is of the view that these third party reviews meet regulatory requirements. CNSC staff informed the Commission that it assessed OPG's documentation and analyses under this SCA, and found them acceptable.
61. The Commission recognizes that OPG would be compliant with the following new/updated codes and standards for any new designs at the WWMF under the proposed licence and LCH:
- CSA N393-13, *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances*<sup>13</sup>

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<sup>13</sup> CSA Group – CSA N393-13, *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances*, 2013

- CSA N285.0-08 (Updates 1 and 2; and 2012 Annex N), *General Requirements for Pressure Retaining Systems and Components for CANDU Nuclear Power Plants*<sup>14</sup>
- NRCC NBCC (2010), *National Building Code of Canada*<sup>15</sup>
- NRCC NFCC (2010), *National Fire Code of Canada*<sup>16</sup>
- ASME B31.1 (2010), *Power Piping*<sup>17</sup>
- B15-09 (2009 and Update 1), *Boiler, Pressure Vessel and Pressure Piping Code*<sup>18</sup>

62. Regarding the need for seismic qualification for the structures at the WWMF, the OPG representative informed the Commission that the structures at the WWMF were built in accordance with the NBCC, and that there is no requirement for these buildings to be seismically qualified. The OPG representative stated that this was documented in the safety report and reviewed again after the Fukushima accident, and added that, if the structure were to collapse on the storage containers, the release to the public would be minimal. CNSC staff reported that the NBCC has its own requirements for seismic capability, so the WWMF structures will withstand seismic events based on that code. CNSC staff stated that the WWMF structures are not qualified to design basis earthquakes or review level earthquakes, as those requirements are reserved for nuclear power plants. The Commission notes that all structures at the WWMF are compliant with the NBCC.

### 3.6.1 Conclusion on Physical Design

63. On the basis of the information presented, the Commission concludes that the design of the WWMF is adequate for the operation period included in the proposed licence.

## 3.7 Fitness for Service

64. Fitness for Service covers activities that are performed to ensure the systems, components and structures at the WWMF continue to effectively fulfill their intended purpose. CNSC staff reviewed the following specific areas encompassed by this SCA:

- Equipment Reliability
- Maintenance
- Structural Integrity
- Aging Management

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<sup>14</sup> CSA Group – CSA N285.0-08, *General Requirements for Pressure Retaining Systems and Components for CANDU Nuclear Power Plants*, 2008

<sup>15</sup> National Research Council Canada – *National Building Code of Canada*, 2010, < [http://www.nrc-cnrc.gc.ca/eng/publications/codes\\_centre/2010\\_national\\_building\\_code.html](http://www.nrc-cnrc.gc.ca/eng/publications/codes_centre/2010_national_building_code.html)>.

<sup>16</sup> National Research Council Canada – *National Fire Code of Canada*, 2010, < [http://www.nrc-cnrc.gc.ca/eng/publications/codes\\_centre/2010\\_national\\_fire\\_code.html](http://www.nrc-cnrc.gc.ca/eng/publications/codes_centre/2010_national_fire_code.html)>.

<sup>17</sup> American Society of Mechanical Engineers – ASME B31.1, *Power Piping*, 2010.

<sup>18</sup> CSA Group – B51-09, *Boiler, Pressure Vessel and Pressure Piping Code*, 2009.

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016. These specific areas will be discussed concurrently in this section.

65. OPG advised the Commission of its commitment to maintain all of the systems, structures, equipment and components that are important to safety and reliability at the WWMF, and that the implementation of OPG's reliability and aging management programs ensure the continued fitness-for-service for those systems. OPG stated that, under OPG's equipment reliability program, system performance monitoring is performed on critical WWMF systems in order to trend the system performance data and initiate investigations or maintenance activities. OPG added that both preventive maintenance activities and corrective maintenance activities are planned and executed, and that the structural integrity of all the waste storage containers at the site is monitored in order to protect the health and safety of persons and the environment.
66. CNSC staff informed the Commission that, through inspections and desktop reviews, CNSC staff have confirmed that OPG maintains all of the structures and supporting infrastructure in accordance with expectations and regulatory requirements, and verified that the WWMF is currently in compliance with CNSC regulatory document RD-334, *Aging Management for Nuclear Power Plants*.<sup>19</sup> CNSC staff assessed that OPG carries its aging management activities in accordance with the integrated aging management program and has implemented plans to address plausible aging mechanisms in the waste storage containers, and that OPG's fire protection system meet the requirements of the *National Fire Code of Canada* and NFPA standard 801.<sup>20</sup> CNSC staff informed the Commission that, based on its assessment of OPG's documentation, CNSC staff is of the view that OPG has adequate programs and activities in place to monitor aging and maintain the systems, structures and components at the WWMF.
67. The Commission notes that the WWMF will be compliant with REGDOC-2.6.3, *Aging Management*<sup>21</sup> by July 15, 2017, and will be compliant with the aforementioned CSA standard N393-13 by September 15, 2017.
68. Addressing the contingency plans for the replacement of aging structures or facilities, the OPG representative reported that OPG has an extensive aging management program for the WWMF, will continue to monitor the fitness for service of all systems, structures and components, and will enact the contingency plans if necessary. OPG stated that, if waste is to be stored at the WWMF for longer than originally intended, the service life of the structures could be extended up to certain limits and, if necessary, waste would be retrieved and transferred to new structures. Regarding the Rad Waste

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<sup>19</sup> Canadian Nuclear Safety Commission Regulatory Document, RD-334, *Aging Management for Nuclear Power Plants*, June, 2011.

<sup>20</sup> National Fire Protection Association, NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 2014.

<sup>21</sup> Canadian Nuclear Safety Commission Regulatory Document, REGDOC-2.6.3, *Aging Management*, March, 2014.

Operation Site 1 (RWOS 1), the OPG representative stated that the vast majority of that waste was removed previously, and the remaining waste is scheduled to be removed starting in 2019.

### *3.7.1 Conclusion on Fitness for Service*

69. The Commission is satisfied with OPG's programs for the inspection and life-cycle management of key safety systems. Based on the above information, the Commission concludes that the equipment as installed at the WWMF is fit for service.

## **3.8 Radiation Protection**

70. As part of its evaluation of the adequacy of the measures for protecting the health and safety of persons, the Commission considered the past performance of OPG in the area of radiation protection. The Commission also considered the radiation program at the WWMF to ensure that both radiation doses to persons and contamination are monitored, controlled and kept as low as reasonably achievable (ALARA), with social and economic factors taken into consideration. CNSC staff reviewed the following specific areas encompassed by this SCA:

- Application of ALARA
- Worker dose control
- Radiation protection program performance
- Radiological hazard control
- Estimated dose to public

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016.

71. CNSC staff noted that OPG had implemented and maintained an effective radiation protection program (RPP) as required by the *Radiation Protection Regulations*,<sup>22</sup> and that no worker or member of the public had received a radiation dose in excess of regulatory limits as a result of the licensed activities conducted at the WWMF.

### *3.8.1 Application of ALARA*

72. OPG informed the Commission that the RPP at the WWMF was implemented in accordance with a series of standards and procedures, including the objective of keeping the collective doses ALARA. OPG added that annual reviews are performed on WWMF ALARA targets, and that the facility design and RPP elements were developed to fulfill the ALARA principle. CNSC staff informed the Commission that the RPP implemented at the WWMF was developed in-line with CNSC regulatory guide G-129, *Keeping Radiation Exposures and Doses "As Low as Reasonably*

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<sup>22</sup> *Radiation Protection Regulations* (SOR/2000-203)

*Achievable (ALARA)*”<sup>23</sup>. CNSC staff stated that OPG’s RPP at the WWMF was assessed, and confirmed that OPG integrates ALARA into planning, scheduling, and work control. OPG also establishes and monitors performance against ALARA targets for work conducted at the WWMF. CNSC staff stated that they are of the view that the WWMF is in compliance with regulatory expectations and requirements to ensure that radiation exposures are maintained ALARA.

### 3.8.2 Worker Dose Control

73. OPG informed the Commission that limiting individual worker doses is one of the processes of the RPP at the WWMF, and that during the reporting period there were no action level exceedances related to worker doses. OPG stated that the exposure control program at the WWMF ensures that worker doses were consistently below the regulatory limits set out in the *Radiation Protection Regulations*, and that OPG is in full compliance with regulatory requirements. OPG added that enhanced radiological contamination monitoring equipment has been procured and installed at the WWMF, including a new whole body counter for employee internal dose monitoring. CNSC staff informed the Commission that OPG uses CNSC licensed dosimetry services to monitor, assess, record and report employee, visitor and contractor doses at the WWMF, as established in the RPP. CNSC staff stated that OPG uses a combination of processes and procedures to control and limit worker doses, and that CNSC staff is of the opinion that OPG’s worker dose control program is in compliance with regulatory requirements at the WWMF.

### 3.8.3 Radiation Protection Program Performance

74. OPG informed the Commission that a corporate-wide radiation protection audit was completed in 2015, and that no major non-conformances specific to the WWMF were found. CNSC staff confirmed that there were no action level exceedances, as well as no contamination control events in excess of OPG’s contamination control action level for the WWMF. CNSC staff informed the Commission that OPG’s RPP at the WWMF was assessed using multiple compliance activities, including inspections and the desktop reviews of compliance reports. CNSC staff is satisfied with improvements made by OPG to their RPP based on the results of those compliance activities and stated that the corrective actions taken by OPG were acceptable in all cases. CNSC staff added that the aforementioned procurement of additional radiation monitoring equipment constituted an improvement to the RPP, and CNSC staff is of the view that OPG’s RPP at the WWMF is satisfactory.
75. Addressing the use of wireless technology to augment the WWMF radiation protection program, the OPG representative stated that redundancy and fail-safe behaviour will be part of the design considerations. CNSC staff reported that the proposed dosimeter with wireless capability would not be used for the assessment of the regulatory dose as it would be used only for work planning and dose control during job activity, and would

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<sup>23</sup> Canadian Nuclear Safety Commission Regulatory Guide – G-129, *Keeping Radiation Exposures and Doses “As Low as Reasonably Achievable (ALARA)”*, October, 2004.

be reviewed by CNSC staff before being implemented.

#### *3.8.4 Radiological Hazard Control*

76. CNSC staff informed the Commission that OPG's RPP implemented at the WWMF ensures that there are adequate measures in place to monitor and control radiological hazards. CNSC staff stated that OPG conducted radiological dose rate and contamination monitoring measurements at the WWMF during the licence period, and no adverse trends or deficiencies were seen. CNSC staff is of the opinion that OPG adequately controls radiological hazards at the WWMF.

#### *3.8.5 Estimated Dose to the Public*

77. OPG informed the Commission that the WWMF maintains a perimeter dose monitoring program to monitor the dose to the public from that facility, and stated that the maximum potential dose to a member of the public at the site boundary in one year is well below the regulatory annual dose limit. OPG added that, since 2007, all measured dose rates have been better than the target dose rates, and that any/all contributions from the WWMF to the offsite public dose are included as part of the Bruce Power Environmental Monitoring Program. CNSC staff informed the Commission that, as the WWMF is located within the site boundary of the Bruce Nuclear Generating Station (BNGS), the perimeter dose information from the WWMF is included in the overall BNGS public dose estimate. CNSC staff confirmed that the public dose associated with the WWMF accounts for a small fraction of the overall site dose to the public, and also confirmed that the estimated dose to the public from the WWMF is well below the regulatory annual public dose limit.
78. The Commission noted that the Bruce Grey Health Unit is the public health authority for the region containing the WWMF, and that it has not expressed any concerns regarding the WWMF activities. CNSC staff reported that this health unit does regular surveillance and reporting with regards to the health of the community, and its representatives have come before the Commission in past proceedings. CNSC staff added that this health unit has never requested that a specific kind of longitudinal study be performed in the community.

#### *3.8.6 Conclusion on Radiation Protection*

79. The Commission is of the opinion that, given the mitigation measures and safety programs that are in place or will be in place to control radiation hazards, OPG provides adequate protection to the health and safety of persons and the environment.

### **3.9 Conventional Health and Safety**

80. Conventional health and safety covers the implementation of a program to manage workplace safety hazards. This program is mandatory for all employers and employees

in order to reduce the risks associated with conventional (non-radiological) hazards in the workplace. This program includes compliance with Part II of the *Canada Labour Code*<sup>24</sup> and conventional safety training. CNSC staff evaluated OPG's performance in this SCA focusing on the following specific areas:

- Performance
- Practices
- Awareness

After evaluating the WWMF's performance in this SCA, CNSC staff rated it as satisfactory for the period 2007-2010, and fully satisfactory for the period 2011-2016. CNSC staff noted that routine inspections had not identified major findings in this area, and that OPG continues to demonstrate its ability to keep workers safe from occupational injuries while conducting its licensed activities.

### *3.9.1 Performance*

81. A key performance measure for this area is the number of lost-time injuries that occur each year. OPG stated that several indicators are monitored at the WWMF, including the all injury rate and the accident severity rate, and stated that both of these rates were below the target rate from 2010-2016. OPG added that the target rates have also decreased during the current licence period. CNSC staff stated that the frequency of lost-time injuries at the WWMF as reported by OPG remains low. CNSC staff has reviewed OPG's corrective actions and concluded that they were appropriate. CNSC staff added that no areas of concern for this SCA were identified.

### *3.9.2 Practices*

82. OPG informed the Commission that worker safety is the number one priority at the WWMF, and that the conventional safety program manages the conventional workplace risks at that facility. OPG described the employee health and safety policy, which lays out the requirements, expectations, goals and targets for conventional worker health and safety at the WWMF. OPG added that it maintains an internal responsibility system throughout the organization where every employee has the shared responsibility to work co-operatively to prevent workplace injuries and illnesses. CNSC staff informed the Commission that OPG has appropriate procedures in place and adheres to conventional safety standards, such as standard NFPA 12,<sup>25</sup> to ensure that hazardous materials do not pose an unreasonable risk to persons or the environment. CNSC staff added that safe work practices were observed at the WWMF during inspections and other compliance verification activities. CNSC staff is of the view that OPG continues to view conventional health and safety as an important consideration, provides safe work practices, and has achieved a high level of personnel safety at the WWMF.

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<sup>24</sup> R.S.C., 1985, c. L-2

<sup>25</sup> National Fire Protection Association – NFPA 12: *Standard on Carbon Dioxide Extinguishing Systems*, 2015



83. The Commission takes note that several intervenors representing unions and other organizations within the nuclear field expressed the view that the operations of the WWMF are performed in accordance with safe worker practices and policies. These intervenors also reported that OPG has a highly developed safety culture at the WWMF and strong safety programs with respect to conventional health and radiological safety.
84. The Commission notes that, in addition to the NSCA and its Regulations, OPG's activities and operations must comply with the *Canada Labour Code*, Part II: *Occupational Health and Safety*. The Commission recognizes that, in accordance with the licence requirements, OPG must report to the Province of Ontario on any reports made to other regulatory bodies, under the *Occupational Health and Safety Act of Ontario*<sup>26</sup> and the *Labour Relations Act*.<sup>27</sup>

### 3.9.3 Awareness

85. OPG informed the Commission that its employee health and safety policy is a commitment to the prevention of workplace injuries and illnesses and is used to continuously improve the safety performance of the WWMF. OPG stated that, under the internal responsibility system, each employee is expected to be proactive in identifying and solving health and safety issues. CNSC staff informed the Commission that OPG has established conventional health and safety policies and programs at the WWMF to ensure that workers are protected from any physical, chemical and radiation hazards that may arise due to the work performed at that facility, and that OPG develops and delivers safety-related training courses to the employees and contractors.

### 3.9.4 Conclusion on Conventional Health and Safety

86. Based on the information presented, the Commission is of the opinion that the health and safety of workers and the public was adequately protected during the operation of the facility for the current licence period, and that the health and safety of persons will also be adequately protected during the continued operation of the facility.

## 3.10 Environmental Protection

87. Environmental protection covers OPG's programs that identify, control and monitor all releases of radioactive and hazardous substances and minimize the effects on the environment which may result from the licensed activities. It includes effluent and emissions control, environmental monitoring and estimated doses to the public. The Commission considered submissions from OPG and CNSC staff that encompass the following specific safety areas:

- Effluent and emissions control
- Environmental management system (EMS)

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<sup>26</sup> *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1

<sup>27</sup> *Labour Relations Act*, 1995, S.O. 1995, c. 1, Sched. A

- Assessment and monitoring
- Protection of the public
- Environmental risk assessment (ERA)

CNSC staff verified OPG's performance with respect to environmental protection through the review of OPG's reports, submissions and routine compliance inspections. The findings of the conducted inspections were minor in nature and have been adequately addressed by OPG. CNSC staff rated the WWMF's performance in this SCA as satisfactory for the period 2007-2016.

88. The Commission recognizes that CNSC staff has verified that OPGs environmental protection program at the WWMF is compliant to the requirements of REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*.<sup>28</sup>

### 3.10.1 Effluent and Emissions Control

89. The Commission considered the information submitted by OPG regarding the airborne and liquid releases resulting from the licenced activities at the WWMF, the impact of those releases on the environment, and OPG's monitoring and control of those releases. The Commission recognizes that data submitted by OPG for tritium, iodine, carbon-14, gross alpha, gross beta-gamma and particulate releases were well below the licence limits throughout the licence period, for airborne and liquid releases.
90. CNSC staff confirmed that OPG monitors and controls airborne and liquid environmental releases, and that both airborne and liquid releases were well below the licence limits. CNSC staff informed the Commission that the release limits for the WWMF are based on the Derived Release Limits (DRL) established for that facility, and that the DRLs are calculated using CSA standard N288.1-08, *Guideline for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*<sup>29</sup>, and that OPG will be fully compliant with the 2014 edition of that standard by December 31, 2017. CNSC staff stated that atmospheric emissions from the stacks are effectively controlled, and that the air-cleaning systems at the WWMF are maintained and tested with respect to the CSA standard N288.3.4-13, *Performance testing of nuclear air cleaning systems at nuclear facilities*<sup>30</sup>. The Commission notes that OPG has committed to complete the transition to be fully compliant with CSA N288.3.4-13 by December 31, 2017. CNSC staff added that stormwater and subsystem drainage is monitored at the WWMF, that those results are reported to CNSC staff and to the Ontario Ministry of the Environment and Climate Change (MOECC). CNSC staff is of the view that those results show that there are no adverse effects to the health and safety of persons or the

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<sup>28</sup> Canadian Nuclear Safety Commission Regulatory Document – REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, December, 2016.

<sup>29</sup> CSA Group – CSA N288.1-08, *Guideline for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*, 2008.

<sup>30</sup> CSA Group – CSA N288.3.4-13, *Performance testing of nuclear air cleaning systems at nuclear facilities*, 2013

environment from the operation of the facility.

91. Addressing intervenor E. Bourgeois' concern regarding the public disclosure of the inventory of each radionuclide at the WWMF site, the OPG representative stated that it received many requests for this information, and that OPG is taking steps to reply to all of them to provide the information for waste volumes and activities. The OPG representative stated that all of the radionuclide inventories are tracked based on the characterization performed at the nuclear facility before being shipped to the WWMF. The intervenor stated that he would have appreciated the inventory data but was unable to obtain it and instead relied on the inventory data from CNSC staff in CMD 17-H3. The intervenor voiced the opinion that the inventory data should be public, and that it is very important to know the exact inventory and activity at the WWMF. CNSC staff reported that the radionuclide inventories are verified using spot-checks, confirmatory readings and inspections. CNSC staff noted that it is not feasible to track the waste by each isotope, and that the international practice is to track total volumes and total activity, which is in line with the *Joint Convention for the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*<sup>31</sup> (Joint Convention) reporting, which is monitored by Natural Resources Canada. The latest report was made public in December 2016. OPG reported that radionuclide-specific information was included in the Reference Waste Inventory Report for the Deep Geological Repository (DGR), which is publically available on the website of the Canadian Environmental Assessment Agency. CNSC staff reported that the radionuclide inventories are not part of the annual Regulatory Oversight Reports, but will include that information if the Commission requires it.
92. A spokesperson for intervenor E. Bourgeois clarified the expressed concern regarding the elements that would be stored inside of the proposed Large Objects Processing Building (LOPB). The OPG representative stated that, under the base reference case, that building will be used to segment the steam generator and other large metal components for easier future storage, such as in the proposed DGR. The OPG representative added that, under the base reference plan, the LOPB will not be used for the decontamination and free release of components.
93. Regarding the groundwater tritium contamination in water sample hole 231, the OPG representative noted it has been a long-standing and well discussed issue, and is due to condensation running down into the electrical ductwork from the waste stored in the building. CNSC staff stated that they are satisfied with the mitigation measures taken by OPG and that CNSC staff is continuously monitoring that area of the site. CNSC staff confirmed that no adverse effects to health or the environment are predicted. The Commission noted that there was a spike in the activity levels, which peaked in the period 2009-2010, and was due to the installation of a stormceptor, which cut into the middle of the aquifer. OPG stated that it has performed extensive studies on this issue. CNSC staff reported that the tritium levels are still below the derived release limits and

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<sup>31</sup> International Atomic Energy Agency – INFCIRC/546, *Joint Convention for the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*, 1997. <<https://www.iaea.org/topics/nuclear-safety-conventions>>

that safety is maintained. The OPG representative stated that no significant impact from the tritium in the water has been seen in the lake.

94. Several intervenors raised concerns regarding the incinerator at the site, such as the reliability, waste reduction, higher emissions and the overall appropriateness of the incinerator at the WWMF. The OPG representative submitted in reply that the emissions from the incinerator are monitored and regulated by the CNSC and the MOECC, the incinerator meets the emission requirements, and that the use of the incinerator allows for a very high volume reduction, more so than any form of compaction. The OPG representative added that improvements are being made to increase the availability of the incinerator to attain the target availability of 75%. The Commission notes that incinerators are used in this manner in several other countries and that OPG participates in IAEA technical meetings to ensure it maintains international best practices. Addressing the efficiency of the incinerator, the OPG representative stated that it is utilized to a level far below the allowable limit, which leads to the assumption that it has a very low efficiency, and that the actual volume-reduction value depends on the type of waste being incinerated.
95. E. Bourgeois questioned if OPG determined what form of waste was in each bag that is sent for incineration. The OPG representative confirmed to the Commission that the incinerator is the safest method for volume reduction, and there are limits on what waste may be incinerated. For example, no highly-tritiated waste is allowed. The OPG representative stated that there are several controls in place, described the waste-sorting process and radiation monitoring, and stated that the employee dosimetry process proves that workers at the WWMF are not exposed to high levels of radiation. CNSC staff explained OPG's waste sorting and waste monitoring processes, beginning from the nuclear power plant and ending at the WWMF for incineration. CNSC staff added that inspections and spot-verifications are employed to ensure that the correct process is being followed.
96. The same intervenor voiced concern that a COG study found alpha particles at the Bruce Power site related to its incinerator, and cited possible alpha contamination at that facility. Addressing the use of radiation monitors near the incinerator, the OPG representative stated that alpha monitors are in place on the processing floor at the incinerator. The OPG representative informed the Commission that there have been no alpha events at that site. Addressing the measurement of Carbon-14, the OPG representative stated that OPG maintains a radiation protection and safety program in accordance with CNSC regulations, national standards and international practices, and that C-14 is monitored as part of the bioassay sample program.
97. The spokesperson for E. Bourgeois raised concern regarding the role of particulates in the environment. CNSC staff explained that the predictive effects assessment (PEA) considers the effect of particulates on air quality. CNSC staff reported that exceedances for particulates were seen at the site boundary, and that OPG-proposed mitigation methods should mitigate those issues. CNSC staff stated that the concentrations of particulate in the air are below the ambient air quality criteria, and CNSC staff found

them to be acceptable. Regarding the source of the particulates, CNSC staff reported that some of that matter comes from the incinerator, but it is also generated through the construction and operation of the facility. The OPG representative submitted that there will be no off-site impacts from the particulates.

98. In the hearing, the Commission noted that there have been extensive concerns expressed by intervenors related to the DRLs, and also noted that OPG is re-visiting the DRL calculations based on the new CSA standard. CNSC staff provided additional information regarding the DRLs and reported that there are three different levels of limits imposed on the licensee (such as licence limits, DRLs and action levels), and that the DRLs are used to ensure the facility is compliant with the *Radiation Protection Regulations*. In terms of calculating the actual dose to the public from the WWMF, CNSC staff stated that the same modelling and calculation procedures are used as for calculating the DRLs, and that the total dose to the public from the WWMF is on the order of 1/1000<sup>th</sup> of the limit in the *Radiation Protection Regulations*. The Commission noted that, for certain radionuclides, the DRL is larger than the total radionuclide inventory, as pointed out by F. Greening in his intervention. CNSC staff reported that, even in a catastrophic event, there would be no exceedance of the public dose limit. CNSC staff stated that the DRL is not used as a control method for the site. The OPG representative stated that there are internal investigation limits that are set slightly above the normal emission rate. The OPG representative added that there is adherence to the ALARA principle, and that action levels are in place to protect workers and the public. CNSC staff added that action levels and DRLs are not the only compliance tools, and that action levels are performance-based and based on the releases expected during normal operation. F. Greening proposed that the DRLs should be calculated according to the CSA standard N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents*<sup>32</sup>, instead of CSA N288.1. CNSC staff stated that CSA N288.2 is applicable only to accident scenarios.
99. In his intervention, F. Greening raised concern about the fugitive emissions of tritium and C-14, based on data and calculations from a Nuclear Waste Management Organization (NWMO) report<sup>33</sup>. Addressing that issue, the OPG representative informed the Commission that the effluent monitoring program is compliant with CSA N288.5-11<sup>34</sup>, and stated that fugitive emissions have been identified and that OPG is working on improving its environmental management program. CNSC staff reported that fugitive emissions are a known phenomenon and are more difficult to monitor than other forms of emissions, but that OPG did consider fugitive emissions in their PEA, which was reviewed and accepted by CNSC staff. CNSC staff added that defense-in-depth principles ensure that the public is protected and that monitoring done by CNSC

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<sup>32</sup> CSA Group – CSA N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents*, 2014.

<sup>33</sup> Garisto, N.C. et al, - NWMO Report DGR-TR-2009-09, *Deep Geologic Repository Pre-Closure Safety Assessment (VI)*, August, 2009.

<sup>34</sup> CSA Group – CSA N288.5-11, *Effluent monitoring programs at Class I facilities and uranium mines and mills*, 2011.

staff and the Ontario Ministry of Labour confirms that all the WWMF emissions contribute a very small dose to the public. The OPG representative stated that the ERA found no offsite impact from the WWMF emissions, and explained the calculation procedure for the maximum probable emission rate, which considers other sources of emissions and is used to determine if additional monitoring or controls are required. The OPG representative informed the Commission that, after the maximum probable emission rate was considered, the dose to the public from the WWMF was still small and represents a small portion of the total public dose from the Bruce Power site. The Commission noted that the fugitive emissions could be significantly higher than the reported emissions, and expressed the view that the issue of fugitive emissions should be reported in future documentation and assessments. The OPG representative confirmed that OPG will address this matter during the re-evaluation of its risk assessments.

### 3.10.2 Environmental Management System

100. OPG informed the Commission that the environmental management system (EMS) at the WWMF provides the structure and processes to implement their environmental policy, including the review of environmental performance targets, reportable spills, environmental compliance, and radioactive waste generation, as well as the identification of areas of the environment which the WWMF has the potential to affect. OPG stated that the EMS at the WWMF is consistent with the International Organization for Standardization (ISO) standard 14001, *Environmental Management System Standard*<sup>35</sup>. CNSC staff confirmed through their compliance verification activities that annual management reviews of the EMS are occurring, and that corrective actions are documented, by reviewing OPG's meeting minutes. CNSC staff confirmed that the EMS at the WWMF is compliant with the requirements of REGDOC-2.9.1 and conforms to the ISO-14001 standard.

### 3.10.3 Assessment and Monitoring

101. OPG informed the Commission that it employs an extensive groundwater monitoring program, and notes that the level of tritium in the groundwater wells has been trending downwards since 2010 after the addition of various tritium mitigation methods. CNSC staff summarized its review of OPG's groundwater monitoring, perimeter dose monitoring and source monitoring, as well as CNSC staff's Independent Environmental Monitoring Program (IEMP). CNSC staff stated that, from the results of these aforementioned monitoring programs, OPG has adequate measures in place to protect the public and the environment from the releases from the WWMF. The Commission notes that the IEMP data for 2016 is scheduled to be made public by the summer of 2017.
102. Commission notes that OPG has committed to submitting its implementation plans for the WWMF to meet CSA standard N288.4-10 (R2015), *Environmental monitoring*

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<sup>35</sup> International Organization for Standardization – ISO 14001, *Environmental Management System Standard*, 2015

*programs at Class I nuclear facilities and uranium mines and mills*<sup>36</sup> and for CSA standard N288.7-15, *Groundwater protection programs at Class I nuclear facilities*<sup>37</sup>, by December 31, 2017.

103. Addressing the suitability of active and passive samplers for radiation monitoring at the greater Bruce Power site, and by extension the radiation monitoring data used by OPG in the ERA for the WWMF, the OPG representative provided an overview of the studies performed with respect to the active and passive samplers at the Pickering site, and stated that, due to the larger variability with the passive samplers, they were removed by OPG. Regarding the comments by E. Bourgeois's in his intervention on the active and passive BF14 and BF7 receptors measurements, the OPG representative reported that E. Bourgeois, in his intervention, is correct with certain assumptions. However, a number of factors need to be taken into account, and a monitor is not always needed to capture the necessary dose information. CNSC staff informed the Commission that the Ontario Ministry of Labour also has surveillance programs to monitor radionuclide emissions from nuclear power plants in Ontario, and those reports are made public. Several intervenors enquired as to why the active sampler is considered to be the more accurate measurement, when the passive sampler physically collects tritium, and questioned the accuracy and effectiveness of the active monitors in general. CNSC staff reported that it studied both samplers, and came to the determination that active samplers were more accurate. CNSC staff noted that, regardless of the sampler used, the dose consequences are very low.
104. The Commission noted that there were elevated levels of copper and zinc in one area of the WWMF site, and was informed that those exceedances are not related to the WWMF operation. Addressing the cause of the elevated zinc and copper levels, the OPG representative reported that it was the result of historical work from when there used to be other facilities, such as solvent treatment facilities and oil unloading facilities in the area of the contamination. Those historical activities are not related to the WWMF. The OPG representative added that the ERA showed no adverse impact to the species living in that area of the site. CNSC staff reported that it considered this contamination when reviewing OPG's ERA, and accepted OPG's explanation regarding the elevated copper and zinc levels.

#### *3.10.4 Protection of the Public*

105. OPG informed the Commission that the WWMF has MOECC environmental compliance approvals for air and liquid emissions of non-radiological substances. OPG stated that the releases of hydrocarbons, dioxins and furans are well below the allowable limits, and that the releases are reported to the MOECC. CNSC staff informed the Commission that OPG is required to demonstrate that the health and safety of the public is protected from exposures to hazardous (non-radiological) substances released from the facility, and that, based on their review of OPG's programs, CNSC staff

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<sup>36</sup> CSA Group – CSA N288.4-10 (R2015), *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*, 2010 (Re-affirmed 2015).

<sup>37</sup> CSA Group – CSA N288.7-15, *Groundwater protection programs at Class I nuclear facilities*, 2015

is of the opinion that OPG's programs are protective of the public.

106. CNSC staff reported that several studies on the health of workers at the Bruce Power site and the health of members of the public showed no risk of increased cancers, and that there is a large amount of available data. The Commission noted that there was a proposal put forth during the Bruce Power licence renewal hearing that a public health survey be performed. CNSC staff responded that several studies, such as the RADICON study, have been performed, and no increased risks to the community have been found. An intervenor stated that there are multiple factors that may affect cancer rates, and that radiation may affect the rates of other diseases as well, as such the background should not be ignored and precautions should be taken. The Commission recognized that the background radiation varies substantially throughout the world, but there have been no studies that show an increase in cancer in regions with a high background radiation.
107. The Commission notes that the intervention from the Bruce Grey Health Unit expressed the view that the renewal of the WWMF would allow for the continued safe isolation and containment of ILW, LLW and spent fuel, without significant adverse effects to human health or the environment.

### 3.10.5 Environmental Risk Assessment

108. The Commission considered the ERA performed by OPG for the WWMF, and noted that it was performed in accordance with CSA standard N288.6-12, *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*<sup>38</sup>. OPG informed the Commission that, due to the low level of both radiological and non-radiological emissions and low noise levels, under that standard no human health effects are likely. OPG stated that the ERA showed that the continued WWMF operations do not pose a significant risk to the surrounding environment. CNSC staff informed the Commission that they reviewed the PEA submitted by OPG, and stated that the conclusions of the PEA and the guidance in standards CSA N288.4-10 and CSA N288.5-11, *Effluent monitoring programs at Class I facilities and uranium mines and mills*<sup>39</sup>, will be used to update the environmental and effluent monitoring plans at the WWMF. CNSC staff stated that they are satisfied with the work performed by OPG and is of the view that the continued operation of the WWMF does not pose an unreasonable risk to human health or the environment.
109. The Commission noted that several intervenors raised concerns over the rationale for the decision by OPG to not include certain fish species as Valued Ecosystem Components (VECs) in the ERA. CNSC staff provided an overview of its review process for OPG's ERA of the WWMF, including taking into account previous EAs

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<sup>38</sup> CSA Group – CSA N288.6-12, *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*, 2012.

<sup>39</sup> CSA Group – CSA N288.5-11, *Effluent monitoring programs at Class I facilities and uranium mines and mills*, 2011.



and ERAs in that region and the consideration of appropriate VECs from the previous assessments. CNSC staff added that the ERAs are reviewed at a minimum every five years or if new scientific evidence comes to light, and that the intervenors' views regarding VECs will be considered when making revisions to future ERAs. CNSC staff reported that the documents provided to them by the intervenors regarding these VECs had not been available to CNSC staff at the time of the review of OPG's ERA, and informed the Commission that CNSC staff is committed to considering this information in future ERAs and reviews.

110. Asked if the intervenors and identified Aboriginal groups were directly engaged with regards to the VECs that were included in the ERAs, the OPG representative responded that the requirement to consult for ERAs is narrower than for EAs, and that there are different parameters that must be considered with respect to EAs and ERAs. The OPG representative stated that OPG met with several Aboriginal groups and maintains ongoing engagement and discussion with these groups regarding the VECs that will be included in the ERAs. On whether the scope of an EA performed under the NSCA is narrower than that of an EA performed under CEAA 2012, CNSC staff stated that the scope is not narrower and that both provide a robust analysis that considers the same factors.
111. Addressing the public review and consultation process for ERAs, CNSC staff reported that, for an EA under the NSCA, an EA Report is produced, which considers information from the ERA, as well as other sources such as regulatory oversight reviews, technical documents, and the IEMP. CNSC staff stated that the EA report, including the conclusions from the ERA, is made publically available in CNSC staff's CMD 60 days before the public hearing. CNSC staff added that meetings with the public prior to finalizing the EA report are undertaken on a case-by-case basis. Information obtained from intervenors is considered for the next iteration of an ERA and is also used in the environmental monitoring and compliance programs.
112. The Commission noted that the consideration of potential updates to the VECs would have been beneficial had it occurred before the licence renewal hearing. CNSC staff reported that, as the ERAs are updated every five years, the WWMF will always have a living, valid ERA, and that CNSC staff's recommendations from the most recent version are the ones presented to the Commission. Regarding the joint consideration of VECs by OPG and Bruce Power, the Bruce Power representative stated that it is in continuous discussion with Indigenous groups, and that Bruce Power and OPG are working on a joint study with the Métis Nation of Ontario (MNO) regarding additional VECs. The Bruce Power representative added that Bruce Power's most recent ERA will be brought before the Commission later this year.
113. The Commission recognized that several of the intervenors expressed concern over the content of the ERAs, and asked CNSC staff if they discuss each matter with the Indigenous communities until a consensus is reached and then report on those results in the Regulatory Oversight Reports. CNSC staff responded that the performance of the WWMF is included in the annual Regulatory Oversight Report that is presented to the

Commission for which participant funding is also provided, and that periodic reports regarding the Environmental Protection SCAs are updated throughout the year. Regarding future plans for environmental monitoring and ERAs, the Commission noted that CNSC staff committed to further engagements with these intervenors regarding potential modifications to the ERAs and environmental monitoring programs.

114. The Commission recognizes that noise was identified as a physical stressor in the ERA, and asked CNSC staff if the level of noise related to the WWMF operations could cause adverse effects to human health or the environment. CNSC staff confirmed that OPG considered noise as a stressor in the ERA and PEA, and that CNSC staff reviewed the level of noise generated from the WWMF operations, new construction activities, and OPG's mitigation measures, and CNSC staff is satisfied that there will be no adverse effects from the level of noise from that site. Regarding the noise modelling performed by OPG during its ERA, CNSC staff stated that OPG's specific models were not reviewed; however, CNSC staff noted that OPG employed recognized industry models, and CNSC staff is satisfied with the results of those models.
115. An intervenor raised concern regarding the accuracy of noise monitoring results, as well as the level of noise OPG considered in its ERA. The OPG representative responded that the WWMF is compliant with the MOECC *Environment Noise Guidelines for Stationary and Transportation Sources*<sup>40</sup>, which limit the noise to 45 dB during the hours of 7:00 AM to 7:00 PM, and 40 dB from 7:00 PM to 7:00 AM, for the rural area in which the WWMF is situated. The OPG representative stated that, as a mitigating factor to reduce the level of noise, construction activities do not occur during the nighttime hours.
116. The Commission noted the concerns of the MNO regarding OPGs ERA and PEA, and the MNO representative stated that those assessments did not adequately account for the effects on the current use of lands and resources. Elaborating on that point, the MNO representative stated that MNO disagreed with certain VECs that were selected or not selected by OPG for consideration during those assessments, and is continuing to work with OPG on the issue of VECs for future assessments.

### 3.10.6 Conclusion on Environmental Protection

117. Based on the assessment of the application and the information provided at the hearing, the Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, OPG will provide adequate protection to the health and safety of persons and the environment. The Commission notes that OPG and CNSC staff will pursue further engagements with Indigenous groups with respect to the potential inclusion of additional VECs in the next cycle of ERAs for the WWMF.

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<sup>40</sup> Ontario Ministry of the Environment and Climate Change – NPC-300, *Environment Noise Guidelines for Stationary and Transportation Sources – Approval and Planning*, August, 2013.

< <https://www.ontario.ca/page/environmental-noise-guideline-stationary-and-transportation-sources-approval-and-planning> >

### 3.11 Emergency Management and Fire Protection

118. Emergency Management and Fire Protection cover OPG's measures for preparedness and response capabilities which exist for emergencies and for non-routine conditions at the WWMF. The Commission considered submissions from OPG and CNSC staff that encompass the following specific safety areas:

- Nuclear emergency preparedness and response
- Fire emergency preparedness and response

CNSC staff rated the WWMF's performance in this SCA as satisfactory for the period 2007-2016.

#### 3.11.1 Nuclear Emergency Preparedness and Response

119. The Commission considered OPG's preparedness and response to potential emergencies at the WWMF. OPG informed the Commission about annual hazardous material spill drills conducted at the site, as well as annual fire and medical drills performed in cooperation with Bruce Power. OPG stated that Bruce Power provides adequately trained personnel and equipment suitable to various emergencies, and further stated in CMD 17-H3.1 that Bruce Power provides OPG with a letter confirming the inspections and maintenance of their emergency equipment each year. OPG added that the safety case of the facility was re-examined following the Fukushima event in Japan, and that, while no significant gaps in the safety case were identified, enhancements were made to post-event worker response procedures and OPG purchased additional emergency equipment. CNSC staff noted that OPG made improvements to the WWMF emergency management program and processes pursuant to a direction that was sent to licensees under the authority of subsection 12(2) of the GNSCR<sup>41</sup> after the Fukushima event, as well as pursuant to REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*<sup>42</sup>. CNSC staff verified that OPG is currently in compliance with CNSC regulatory document RD-353, *Testing and Implementation of Emergency Measures*<sup>43</sup>, and further stated that a focused compliance inspection was performed on OPG's emergency management program, and along with additional compliance verification activities, CNSC staff is of the view that OPG's emergency preparedness program is satisfactory. The Commission notes that OPG has committed to the full compliance of REGDOC-2.10.1 (Version 2), *Nuclear Emergency Preparedness and Response*<sup>44</sup>, by December 31, 2018.

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<sup>41</sup> *General Nuclear Safety and Control Regulations* (SOR/2000-202)

<sup>42</sup> CNSC Regulatory Document – REGDOC – 2.10.1, *Nuclear Emergency Preparedness and Response*, October, 2014.

<sup>43</sup> CNSC Regulatory Document – RD-353, *Testing and Implementation of Emergency Measures*, October, 2008.

<sup>44</sup> CNSC Regulatory Document – REGDOC – 2.10.1 (Version 2), *Nuclear Emergency Preparedness and Response*, February, 2016.

### *3.11.2 Fire Preparedness and Emergency Response*

120. OPG informed the Commission that the fire detection and protection systems are in compliance with the NFCC and NBCC, and that all inspections, testing and maintenance of fire detection and protection systems were performed in accordance with the NFCC. OPG provided details on several improvements made to its fire protection program during the course of the licence period, and stated that internal audits and assessments conducted in 2013 and 2016, respectively, did not indicate any deficiencies with the WWMF fire protection program. OPG added that the fire protection systems will respond to emergency situations as per the design basis, and that adequate responses to two minor events in 2013 and 2015 ensured that there were no negative impacts on the health and safety of OPG workers, the public, or the environment. CNSC staff informed the Commission that, through compliance verification activities such as inspections and desktop reviews, the fire protection program at the WWMF had been found to meet regulatory requirements and the requirements of the operating licence. CNSC staff stated that reports from third party reviews for the WWMF fire protection program were reviewed and audited, and CNSC staff is of the view that they meet regulatory requirements.

### *3.11.3 Conclusion on Emergency Management and Fire Protection*

121. Based on the above information, the Commission concludes that the fire protection measures and emergency management preparedness programs in place, and that will be in place, at the WWMF are adequate to protect the health and safety of persons and the environment. The Commission also recognizes the adequacy of emergency services and equipment provided by Bruce Power at the WWMF site.

## **3.12 Waste Management**

122. Waste management covers the licensee's site-wide waste management program. CNSC staff evaluated OPG's performance with regards to the following specific safety areas:
- Waste Minimization
  - Waste Management Practices
  - Decommissioning Plans

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016. These specific areas will be discussed concurrently in this section.

123. OPG informed the Commission of its waste management program at the WWMF, including the applicable regulatory documents and standards that are followed at that site, and informed the Commission regarding the generation and storage of LLW and ILW, as well as how it pertains to OPG's EMS. OPG presented information on new initiatives to minimize and manage waste, such as the "Likely Clean" waste

segregation program, targets for non-processible waste, and pilot projects on waste sorting and external waste reprocessing. OPG also provided details regarding the decommissioning program and the preliminary decommissioning plan (PDP), stating that it was developed and is being managed in accordance with regulatory requirements. OPG stated that, under the PDP, all of the waste will be removed prior to decommissioning, therefore there will be little residual radiation, and there will be no need to defer decommissioning of the facility.

124. CNSC staff confirmed that the waste management program at the WWMF is in compliance with standards CSA N292.2-07, *Interim dry storage of irradiated fuel*<sup>45</sup> and CSA N292.3-08, *Management of low-and intermediate-level radioactive waste*<sup>46</sup>. CNSC staff informed the Commission that OPG's PDP meets the requirements of CSA standard N294-09, *Decommissioning of facilities containing nuclear substances*<sup>47</sup> and regulatory guide G-219, *Decommissioning Planning for Licenced Activities*<sup>48</sup>. CNSC staff noted that, if additional structures were to be constructed at the WWMF site, the PDP would be revised. CNSC staff is of the view that OPG has an acceptable waste management program at the WWMF, and that OPG will continue to adequately provide for the protection of the workers, the public, and the environment.
125. The Commission notes that OPG has committed to ensuring that the WWMF will be fully compliant with the requirements of CSA N292.0-14, *General Principles for the Management of Radioactive Waste and Irradiated Fuel*<sup>49</sup>; CSA N292.2-13, *Interim Dry Storage of Irradiated Fuel*<sup>50</sup>; and CSA N292.3-14, *Management of Low-and Intermediate-Level Radioactive Waste*<sup>51</sup>, by October 31, 2017. The Commission recognizes that CNSC staff accepted the timeline for the implementation of these standards, and that CNSC staff will monitor the implementation progress and conduct compliance verification activities.
126. The CNA representative commented that spent fuel and other waste from nuclear operations does provide a challenge for the nuclear industry, and stated that spent fuel does provide an opportunity for future development and innovation.
127. The Commission acknowledges that the submission for the periodic update of the PDP for the WWMF was received on January 30, 2017, and is currently under evaluation by CNSC staff.

### 3.13 Security

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<sup>45</sup> CSA Group – CSA N292.2-07, *Interim dry storage of irradiated fuel*, 2007

<sup>46</sup> CSA Group – CSA N292.3-08, *Management of Low-and Intermediate-Level Radioactive Waste*, 2008

<sup>47</sup> CSA Group – CSA N294-09, *Decommissioning of facilities containing nuclear substances*, 2009.

<sup>48</sup> Canadian Nuclear Safety Commission Regulatory Document – G-219, *Decommission Planning for Licensed Activities*, June, 2000.

<sup>49</sup> CSA Group – CSA N292.0-14, *General Principles for the Management of Radioactive Waste and Irradiated Fuel*, 2014

<sup>50</sup> CSA Group – CSA N292.2-13, *Interim Dry Storage of Irradiated Fuel*, 2013

<sup>51</sup> CSA Group – CSA N292.3-14, *Management of Low-and Intermediate-Level Radioactive Waste*, 2014

128. Security covers the programs required to implement and support the security requirements stipulated in the relevant regulations and the licence. This includes compliance with the applicable provisions of the GNSCR and the *Nuclear Security Regulations*.<sup>52</sup> CNSC staff evaluated OPG's performance with regards to the following specific safety areas:

- Facilities and equipment
- Response arrangements
- Security practices
- Drills and exercises

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2010 and fully satisfactory for the period 2011-2016. These specific areas will be discussed concurrently in this section.

129. The Commission has considered OPG's security program at the WWMF, and in its submissions at the hearing, OPG provided information on the purpose and objectives, the key elements, and the protection measures of the WWMF security program. OPG stated that the physical security program is implemented through contracted security services provided by Bruce Power Security, who implement the WWMF security program in accordance with OPG's policies and procedures. OPG also provided details on the importance and key elements of its cyber-security program at the WWMF. The Commission notes that the security program at the WWMF is in compliance with the following regulatory documents:

- RD-321, *Criteria for Physical Protection Systems and Devices at High-Security Sites*;<sup>53</sup>
- RD-363, *Nuclear Security Officer Medical, Physical and Psychological Fitness*;<sup>54</sup>
- RD-361, *Criteria for Explosive Substance Detection, X-Ray Imaging and Metal Detection Devices at High-Security Sites*,<sup>55</sup> and
- REGDOC-2.12.2, *Site Access Security Clearance*<sup>56</sup>

The Commission recognizes that OPG has committed to the full compliance of REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*,<sup>57</sup> by May 31, 2018.

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<sup>52</sup> SOR/2000-209

<sup>53</sup> Canadian Nuclear Safety Commission Regulatory Document – RD-321, *Criteria for Physical Protection Systems and Devices at High-Security Sites*, December, 2010

<sup>54</sup> Canadian Nuclear Safety Commission Regulatory Document – RD-363, *Nuclear Security Officer Medical, Physical and Psychological Fitness*, November, 2008

<sup>55</sup> Canadian Nuclear Safety Commission Regulatory Document – RD-361, *Criteria for Explosive Substance Detection, X-Ray Imaging and Metal Detection Devices at High-Security Sites*, December, 2010

<sup>56</sup> Canadian Nuclear Safety Commission Regulatory Document – REGDOC-2.12.2, *Site Access Security Clearance*, April, 2013

130. CNSC staff informed the Commission regarding the onsite security inspections, as well as the desktop reviews and other assessments of OPG's documentation and analyses. CNSC staff has accepted the results of those compliance verification activities, as well as OPG's responses to compliance notices. CNSC staff also noted that, in October 2015, OPG participated in the IAEA International Physical Protection Advisory (IPPA) Service mission, and OPG submitted its practices for international review. The Commission notes that the IPPA is an international peer review of Canada's physical protection measures, which Canada invited, and in which OPG took part. CNSC staff added that an updated safety analysis report that includes the construction and commissioning of new storage buildings will be reviewed and verified. CNSC staff is of the opinion that OPG maintained robust physical protection measures and properly implemented security program upgrades at the WWMF, and that the security program at the WWMF continues to exceed the regulatory requirements for a high-security nuclear facility.
131. The Commission concludes that OPG has made adequate provision for the physical security of the facility, and is of the opinion that OPG will continue to provide for it during the proposed licence period.

### **3.14 Safeguards and Non-Proliferation**

132. The CNSC's regulatory mandate includes ensuring conformity with measures required to implement Canada's international obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*. Pursuant to the NPT, Canada has entered into a safeguards agreement with the International Atomic Energy Agency (IAEA). The objective of this agreement and its Additional Protocol is for the IAEA to provide credible assurance on an annual basis to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there is no undeclared nuclear material or activity in this country.
133. The scope of the non-proliferation program for the WWMF is limited to the tracking and reporting of foreign obligations and origins of nuclear material. This tracking and reporting assists the CNSC in the implementation of Canada's bilateral nuclear cooperation agreements with other countries. The import and export of controlled nuclear substances, equipment and information identified in the *Nuclear Non-proliferation Import and Export Control Regulations*<sup>58</sup> require separate authorization from the CNSC.
134. CNSC staff evaluated OPG's performance with regards to the following specific areas:

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<sup>57</sup> Canadian Nuclear Safety Commission Regulatory Document – REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources*, May, 2013

<sup>58</sup> Nuclear Non-proliferation Import and Export Control Regulations (SOR/2000-210)

- Nuclear material accountancy and control
  - Access and assistance to the International Atomic Energy Agency
  - Operational and design information
  - Safeguards, equipment, containment and surveillance
135. After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016. These specific areas will be discussed concurrently in this section. The Commission notes that "Non-proliferation" was added to this SCA in 2012, therefore the compliance ratings for the period 2008-2011 consider the former Safeguards SCA only. The Commission wishes to make clear that this distinction does not impact its current consideration of the licence renewal application.
136. OPG informed the Commission that the WWMF met all safeguards conditions in its operating licence, all applicable IAEA safeguards requirements, and met the terms of the agreement between Canada and the IAEA pursuant to the NPT. OPG provided details regarding the compliance activities of the WWMF with respect to the IAEA's fuel verification program, and stated that annual self-assessments and worker qualification are performed to ensure the adherence to the safeguards program. OPG stated that the WWMF is in full compliance with CNSC regulatory document RD-336, *Accounting and Reporting of Nuclear Material*<sup>59</sup>, and takes into consideration CNSC guidance document GD-336, *Guidance for Accounting and Reporting of Nuclear Material*<sup>60</sup>. OPG added that the IAEA is informed of expansion plans at the WWMF, and that OPG will request the IAEA to identify any IAEA measures which need to be addressed to allow for the expansion of the facility.
137. CNSC staff informed the Commission that the safeguards program conforms to the measures required by the CNSC to meet Canada's international obligations, including those additional measures regarding non-proliferation. CNSC staff stated that they monitor the performance of the WWMF through participation in IAEA inspections and through regulatory oversight activities independent of the IAEA, including onsite inspections and desktop reviews of OPG compliance reporting and the relevant WWMF documentation. The Commission noted that the compliance activities include the timely reporting on the movement and location of all nuclear material, as well as the provision of access and assistance to IAEA inspectors regarding safeguards activities. CNSC staff added that CNSC staff's activities will ensure that the construction and operation of new structures will be compliant with all applicable documents and standards. CNSC staff is of the opinion that the WWMF meets regulatory requirements, that the overall performance for this SCA is satisfactory and that OPG is qualified to carry out its authorized activities.
138. Addressing the public availability of the information regarding the volume of waste at the WWMF, CNSC staff stated that there is a small subset of material that is

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<sup>59</sup> Canadian Nuclear Safety Commission Regulatory Document – RD-336, *Accounting and Reporting of Nuclear Material*, June, 2010.

<sup>60</sup> Canadian Nuclear Safety Commission Guidance Document – GD-336, *Guidance for Accounting and Reporting of Nuclear Material*, June, 2010.



considered to be safeguarded nuclear material. CNSC staff added that this information is protected information and therefore is not available to the public, however it is reported to the IAEA in a protected manner.

139. Based on the above information, the Commission is satisfied that OPG has provided for, and will continue to provide for, adequate measures in the areas of safeguards and non-proliferation at the WWMF that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

### **3.15 Packaging and Transport**

140. Packaging and transport covers the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility. The licensee must adhere to the *Packaging and Transport of Nuclear Substances Regulations*<sup>61</sup> and Transport Canada's *Transportation of Dangerous Goods Regulations*<sup>62</sup> for all shipments leaving the facility. CNSC staff evaluated OPG's performance with regards to the following specific safety areas:

- Packaging and transport
- Package design and maintenance
- Registration for use

After evaluating the WWMF's performance in this SCA, CNSC rated it as satisfactory for the period 2007-2016. These specific areas will be discussed concurrently in this section.

141. The Commission considered OPG's nuclear radioactive materials transportation program at the WWMF. OPG informed the Commission of the objective of the program, the controls and procedures regarding the shipping and handling of radioactive material, and the emergency response for transportation incidents. OPG submitted that all offsite transportation of radioactive materials is in accordance with the *Packaging and Transport of Nuclear Substances Regulations*, and that an internal program is in place to maintain an equivalent level of safety for workers, members of the public and the environment, for on-site transfers of radioactive material. OPG added that all transport drivers and transportation packaging is compliant with CNSC regulations, and that OPG provides briefings and training to emergency personnel in the event of an accident involving the transportation of radioactive material on public roads.
142. CNSC staff informed the Commission about its evaluation of OPG's radioactive material transportation program at the WWMF. CNSC staff reported on the onsite inspections and desktop reviews of compliance reporting. From the results of those

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<sup>61</sup> SOR/2000-208

<sup>62</sup> SOR/2001-286

compliance verification activities, CNSC staff has determined that OPG's documentation and overall performance is acceptable and meets regulatory requirements, and is of the view that OPG is qualified to carry out the authorized activities under this SCA.

143. With regards to traffic accidents that occurred while transporting nuclear substances to and from the WWMF, the OPG representative informed the Commission that there were no accidents that caused injury to a person or a radioactive release. The OPG representative stated that, in total, for the past forty-three years there have been seven minor accidents related to the WWMF activities, and that in only one of those accidents the OPG employee was at fault. The OPG representative also provided an overview of the driver training program.
144. Based on the above information, the Commission is satisfied that OPG is meeting regulatory requirements regarding packaging and transport.

### **3.16 Aboriginal Engagement and Public Information**

145. CNSC staff informed the Commission that the CNSC made available up to \$75,000 through its Participant Funding Program (PFP) to assist members of the public, Indigenous groups, and other stakeholders in providing value-added information to the Commission through informed and topic-specific interventions. Based on recommendations from the Funding Review Committee, external to the CNSC, the CNSC awarded participant funding for a total amount of \$59,112.20 to the following recipients, who were required to submit a written intervention and make an oral intervention at the Commission's public hearing:

- Eugene Bourgeois
- Métis Nation of Ontario (MNO)
- Historic Saugeen Métis (HSM)

#### *3.16.1 Aboriginal Engagement*

146. The common law duty to consult with Aboriginal peoples applies when the Crown contemplates action that may adversely affect established or potential Aboriginal and/or treaty rights. The CNSC, as an agent of the Crown and as Canada's nuclear regulator, recognizes and understands the importance of building relationships and engaging with Canada's Aboriginal peoples. The CNSC ensures that all of its licensing decisions under the NSCA uphold the honour of the Crown and considers Aboriginal peoples' potential or established Aboriginal and/or treaty rights pursuant to section 35 of the *Constitution Act, 1982*<sup>63</sup>.

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<sup>63</sup> *Constitution Act, 1982*, Schedule B to the *Canada Act 1982*, 1982, c. 11 (U.K.).

147. OPG informed the Commission that it is committed to engaging the Indigenous communities regarding its nuclear waste operations and future projects, and that OPG maintains an Indigenous Relations policy in accordance with REGDOC-3.2.2, *Aboriginal Engagement*<sup>64</sup>. OPG stated that, over the past five years, OPG has worked with over eleven Aboriginal communities and held numerous meetings with the Indigenous communities who have rights and/or interests in OPG's nuclear operations, including the current and planned operation of the WWMF. OPG added that engagement with the communities during the relicensing process included communication by e-mail, telephone, in-person meetings, community information sessions and presentations, and that several site tours were conducted at the WWMF.
148. CNSC staff reported that it had identified four Aboriginal groups and affiliated organizations which may be interested in the proposed licence renewal, as the proposed activities are located within their respective treaty lands and/or asserted traditional territories. These four groups were:
- Saugeen First Nation and the Chippewas of Nawash Unceded First Nation, together referred to as Saugeen Ojibway Nation
  - Historic Saugeen Métis
  - Métis Nation of Ontario
  - Union of Ontario Indians

CNSC staff provided an overview of its own Aboriginal engagement and consultation activities related to this licence application, including letters, telephone calls, and meetings. The Commission notes that these aforementioned organizations have requested that the CNSC keep them informed of its licensing reviews when its members have been identified.

149. CNSC staff reported to the Commission that its review of OPG submission had confirmed that OPG has met the requirements of REGDOC-3.2.2. CNSC staff concluded, based from its review of the information contained in the licence renewal application, that the proposed activities are not likely to result in any adverse impacts to potential or established Aboriginal and/or treaty rights. The Commission recognizes that all identified First Nation and Métis groups are encouraged to participate in the licence review process and the public hearing process.
150. The Commission enquired as to why the Union of Ontario Indians did not file an intervention. CNSC staff noted that that group is not a rights-holder, and that it is a political organization to which many First Nation communities belong. CNSC staff stated that this group was kept informed of the hearing and of the participant funding, therefore if this organization wished to participate, they had the opportunity to do so.

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<sup>64</sup> Canadian Nuclear Safety Commission Regulatory Document – REGDOC-3.2.2, *Aboriginal Engagement*, February, 2016.

151. Addressing any significant communication issues between the HSM and OPG, the HSM representative reported that there were no significant issues during their engagement with OPG or with CNSC staff. The HSM representative provided an overview of the correspondence between the HSM and CNSC staff, and stated that CNSC staff was timely, attentive and helpful in answering questions. The HSM representative noted that the engagement logs and plans signed by the HSM and OPG show a fair exchange of information. The Commission noted that there is a formal five-year agreement between the HSM and OPG that was signed on September 28, 2013, and enquired if OPG is interested in renewing that agreement. The OPG representative responded that OPG will work with the HSM to renew that agreement, and noted their appreciation of the engagement work that was undertaken with the HSM.
152. Asked if any information requests from the HSM were denied by OPG or the CNSC, the HSM representative provided an overview of the purpose and process for information requests, and stated that no information request had ever been denied.
153. At the request of the Commission, the MNO confirmed that they did not have any residual concerns regarding the WWMF licence renewal process, provided that all of the commitments made by OPG were acted upon. The OPG representative reiterated the commitments made by the organization, and added that OPG will work closely with the MNO to integrate their knowledge into future work, such as future ERAs. The MNO and OPG representatives stated that both organizations are working toward the same goals. CNSC staff added that it had engaged the MNO regarding the WWMF licence renewal process, and committed to future meetings with that organization.
154. Addressing the Commission's request for clarification on traditional land use, the MNO representative provided a brief overview of MNO land rights and traditional activities that occur on those lands. The MNO representative noted that the SON and HSM also have rights and activities on that land, but added he is not a consultant for those organizations.
155. The SON representative stated that it has a long history of participation in the EA of this facility, as well as other nuclear industry projects or proposed projects.
156. The SON representative provided an overview of its engagement with OPG and CNSC staff regarding the WWMF licence renewal application, OPG's commitment to the SON to understand and address legacy issues relating to OPG's operations within its traditional territory, as well as issues pertaining to the proposed DGR project. The SON representative stated that SON has raised concerns in several meetings and telephone calls with OPG representatives, and that it presented its own proposal to CNSC staff, where discussions are ongoing.
157. The Commission suggested that OPG bring together all the identified Indigenous communities in order to develop a consensus on ERAs, PEAs, and other topics of interest. The OPG representative noted that that would entail a significant challenge and that they would take that suggestion into consideration. The OPG representative

stated that OPG typically meets with each group individually to discuss their individual concerns. Representatives from the identified Indigenous groups stated that, while they are supportive of such dialogue, each group has unique rights, interests and ways of life to consider, therefore their preference is to discuss their concerns with OPG individually. The Commission enquired if Bruce Power and OPG would have a joint meeting with Indigenous groups at the WWMF site, and the Bruce Power representative stated that that is a difficult proposition, but provides an opportunity for future workshops to discuss common issues.

158. Regarding individual perceptions of risk due to the proximity of the WWMF to MNO lands, the MNO representative stated that recent surveys show some trends that individual citizens are avoiding the area around nuclear facilities due to the perceived risk of contamination, regardless of actual risk. The Commission expressed interest in reviewing this data, and the MNO representative stated they would share the data with the Commission. Asked if an educational process may help alleviate those perceptions, the MNO representative stated that is a difficult question to answer as education programs are in place, however some individuals still have negative perceptions of the nuclear facilities. The MNO representative provided examples of how those perceptions may affect their way of life.
159. Several intervenors representing Indigenous groups expressed that they were unaware that OPG was transporting nuclear materials to and from the WWMF. CNSC staff stated that it provided additional information and clarity to these intervenors and that it is part of the reason for the proposal that the Nuclear Substance and Radiation Device Licence be integrated into the Waste Management Facility Operating Licence. CNSC staff added that discussions with these intervenors prompted changes to the proposed licence conditions to clearly state the permitted activities.
160. The Indigenous groups expressed their appreciation to the Commission for its consideration of their interventions. The Commission wishes to note here that it is appreciative of the historical information provided by several of the Aboriginal groups who acted as intervenors for this hearing.

### 3.16.2 Public Information

161. A public information program is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities. Paragraph 3(j) of the *Class I Nuclear Facilities Regulations*<sup>65</sup> requires that licence applications include “the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed.”
162. OPG informed the Commission regarding its Public Information Program (PIP), which includes community consultation programs, disclosures, and community outreach. OPG presented a detailed description of each program and the forms of outreach it

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<sup>65</sup> SOR/2000-204

provides, such as the posting of public disclosure reports, newsletters, websites and social media, a 24-hour call centre, meetings with elected officials, and tours of the WWMF. OPG described future plans to improve upon its PIP for the WWMF, and stated that the PIP is in compliance with regulatory document RD-99.3, *Public Information and Disclosure*<sup>66</sup>.

163. CNSC staff reported to the Commission on its review of OPG's public engagement activities throughout the current licence period, and stated that those activities are appropriate to keep the public informed. CNSC staff is of the view that OPG has a satisfactory public information and disclosure program for the WWMF that meets CNSC regulatory requirements.
164. Based on this information, the Commission is satisfied that OPG's public information program meets regulatory requirements and is effective in keeping Indigenous communities and the public informed of facility plans and operations. The Commission encourages OPG to continue to create, maintain and improve its dialogue with the neighbouring communities.
165. The Commission is also satisfied with OPG's commitment to not proceed with construction of new buildings if the need is not demonstrated and to submit to the CNSC the justification for the construction of new buildings. The Commission recognizes that the hold point requiring Commission approval for the commissioning of the structures can provide for future potential opportunities for public engagement, and is appreciative of the concerns raised by the SON.
166. The Commission acknowledges the efforts made by CNSC staff in relation to the CNSC's obligations regarding Aboriginal engagement and consultation. The Commission is satisfied that the proposed licence renewal will not cause any adverse impacts to any potential or established Aboriginal or treaty rights and that the engagement activities undertaken for this licence renewal have been adequate.

### **3.17 Decommissioning Plan and Financial Guarantee**

167. The Commission requires that licensees have operational plans for decommissioning and long-term management of waste produced during the life-span of the facility. In order to ensure that adequate resources are available for safe and secure future decommissioning of the WWMF site, the Commission requires that an adequate financial guarantee for the realization of the planned activities is put in place and maintained in a form acceptable to the Commission throughout the licence period.
168. The Commission notes that the PDP for the WWMF was considered in the "Waste Management" SCA in Section 3.11 of this *Record of Decision*.

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<sup>66</sup> Canadian Nuclear Safety Commission Regulatory Document – RD/GD-99.3, *Public Information and Disclosure*, March, 2012.

169. Under subsection 24(5) of the NSCA, the Commission has exercised its authority to, by licence, require OPG to provide an acceptable FG, and paragraph 3(1)(l) of the GNSCR mandates that “an application for a licence shall contain a description of any proposed financial guarantee related to the activity for which a licence application is submitted”.
170. The Commission notes that OPG’s consolidated FG for all of its Ontario assets, including the WWMF, for the period 2013-2017 was accepted in 2012, as described in that 2012 *Record of Decision*.<sup>67</sup> OPG provides annual FG reports to CNSC staff, and updates the FG every five years, in accordance with G-219 and G-206, *Financial Guarantees for the Decommissioning of Licenced Activities*.<sup>68</sup> CNSC staff reported to the Commission that the projected total FG requirement for 2016 was \$15,553M, and that the total available funds for the guarantee stood at \$17,957M. CNSC staff noted that, as the available funds are greater than the projected decommissioning costs, it is of the view that the FG meets CNSC requirements for 2017.
171. Asked if the FG for the WWMF will be sufficient if proposed projects such as the DGR are not approved, the OPG representative stated that it is too early to know definitively the effect of future regulatory and licensing decisions on OPG’s decommissioning and waste management costs.
172. The Commission anticipates that the revised PDP and FG for the next five-year cycle will be presented to the Commission by the end of 2017.
173. Based on this information, the Commission considers that the preliminary decommissioning plans and related financial guarantee are acceptable for the purpose of the current application for licence renewal.

### **3.18 Cost Recovery**

174. The Commission notes that there is a requirement under paragraph 24(2)(c) that the licence application be accompanied by the prescribed fee. CNSC staff reported that OPG is in good standing with respect to the *Cost Recovery Fees Regulations*<sup>69</sup> requirements with respect to the WWMF.

### **3.19 Nuclear Liability Insurance**

175. The Commission notes that the WWMF is required to maintain nuclear liability insurance. CNSC staff reported that OPG has maintained nuclear liability insurance for

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<sup>67</sup> Record of Proceedings, Including Reasons for Decision In the Matter of *Ontario Power Generation Inc. Financial Guarantee and Licence Amendments for OPG's Class I Nuclear Facility Licences in Ontario*. Public Commission Hearing Date: October 24, 2012.

<sup>68</sup> Canadian Nuclear Safety Commission Regulatory Document – G-206, *Financial Guarantees for the Decommissioning of Licenced Activities*, June, 2000.

<sup>69</sup> SOR/2003-212

the duration of the WWMF's current licence period and must continue to maintain nuclear liability insurance under the *Nuclear Liability and Compensation Act*<sup>70</sup> which came into force on January 1, 2017. OPG informed the Commission that insurance inspections are conducted at the WWMF at the request of the nuclear property or conventional insurers.

176. The Inverhuron Committee raised concern with regards to the risks involved with the WWMF, and stated that the insurance for the facility is inadequate. CNSC staff stated that they are unaware of any high risks at the facility, and informed the Commission that the WWMF is insured in accordance with the requirements of the *Nuclear Liability and Compensation Act*. The Commission notes that the insurance coverage requirements under the NSCA are determined and administered by the Minister of Natural Resources, not the CNSC.

### **3.20 Improvement Plan and Significant Future Activities**

177. The Commission recognizes that CNSC staff has been monitoring the implementation of improvements to the WWMF based on the Fukushima action plan, and that CNSC staff is of the view that OPG's progress is satisfactory. The Commission notes that CNSC staff will continue to monitor OPG's implemented improvements through routine compliance activities.
178. The Commission noted the proposed improvements for the WWMF and asked how CNSC staff would follow up on OPG's commitments to these improvements. CNSC staff responded that it would review the proposed improvements, and if they become part of the licensing basis, then CNSC staff would conduct compliance verification activities to enforce regulatory compliance. The Commission noted that the proposed changes are not mandatory. However, if OPG were to choose to not follow through with the proposed improvements, the Commission would be informed through mechanisms such as the Regulatory Oversight Reports.
179. Asked about future plans for the total WWMF inventory, the OPG representative responded that they would consider reporting to the Commission the total annual waste volume and the changes in volume from year-to-year, and suggested that the Regulatory Oversight Reports would be one mechanism to accomplish this. CNSC staff stated that all waste inventories in Canada will be reported to the IAEA under the purview of Natural Resources Canada, for inclusion in the Joint Convention Report, which will be available for public review in May 2018.

### **3.21 Licence Length and Conditions**

180. OPG requested the renewal of the current operating licence for a period of 10 years. CNSC staff recommended the renewal of the licence for a period of 10 years, stating

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<sup>70</sup> S.C. 2015, c. 4, s. 120



that OPG is qualified to carry on the licensed activities authorized by the licence. CNSC staff also recommended that annual reports on the facility be provided for consideration by the Commission at public meetings. In making its recommendation, CNSC staff stated that OPG has strong operating experience and demonstrated compliance in carrying out the activities under the previous licence, and that the hazards and impacts of those hazards are well-characterized and predicted in the environmental impact report. CNSC staff reported that the ratings for all SCAs were stable or improved over the previous licence period. CNSC staff added that annual regulatory oversight reports presented to the Commission at public proceedings allow for frequent public updates regarding licensee performance and CNSC regulatory oversight activities, including public participation.

181. The Commission notes that several intervenors were supportive of a ten-year licence, while other intervenors recommended a shorter licence term or that a ten-year licence be conditional upon periodic public reviews.
182. Based on all the information considered for this licence renewal application, the Commission is satisfied that a 10-year licence is appropriate. The Commission accepts the licence conditions as recommended by CNSC staff.

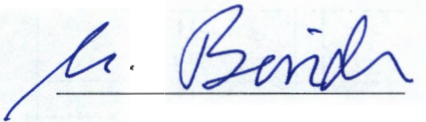
#### **4.0 CONCLUSION**

183. The Commission has considered the information and submissions of the applicant, CNSC staff and all participants as set out in the material available for reference on the record, as well as the oral and written submissions provided or made by the participants at the hearing.
184. The Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, OPG provides adequate protection to the environment. The Commission finds that the renewal, with the requested new construction, does not constitute a designated project under CEAA 2012. The Commission notes that the NSCA provides a strong regulatory framework for environmental protection, and is satisfied that the environment will be protected in the licence period. The Commission considers the environmental review that was conducted by CNSC staff to be acceptable and thorough.
185. The Commission is satisfied that the applicant meets the requirements of subsection 24(4) of the *Nuclear Safety and Control Act*. That is, the Commission is of the opinion that the applicant is qualified to carry on the activity that the proposed licence will authorize and that the applicant will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.
186. Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control*

*Act*, renews the Waste Facility Operating Licence issued to Ontario Power Generation for its Western Waste Management Facility located in Kincardine, Ontario. The renewed licence, WFOL-W4-314.00/2027, is valid from June 1, 2017, until May 31, 2027, unless suspended, amended, revoked or replaced.

187. The Commission includes in the licence the conditions as recommended by CNSC staff in CMD 17-H3.
188. The Commission authorizes the consolidation of the licensed activities of import and export of nuclear substances from OPG's Nuclear Substances and Radiation Devices Licence No. 12861-15-19.0 into the proposed WWMF licence. The Commission concurrently amends OPG's Nuclear Substances and Radiation Devices Licence No. 12861-15-19.0 to remove the reference to the Western Waste Management Facility located in Appendix: Locations of Licensed Activities, of that licence.
189. The Commission notes that CNSC staff can bring any matter to the Commission as applicable. The Commission directs CNSC staff to inform the Commission on an annual basis of any changes made to the LCH.
190. The Commission authorizes the construction activities as outlined in the proposed licence. OPG is to submit to CNSC staff an environmental management plan, construction verification plan, and the project design requirements prior to the commencement of construction activities, as contemplated in licence condition 15.1.
191. The Commission takes notice of OPG's commitment to submit to CNSC staff a report confirming the need for any of the proposed structure(s) for which the necessity of that structure(s) is contingent upon future regulatory and licensing decisions that may occur during the WWMF licence period, prior to the commencement of construction activities. Under CNSC staff's proposed licence condition 15.2, for the structures listed in Table 2 of Appendix A of the licence, the Commission will first have to accept a commissioning report submitted by OPG, before operation may commence. With respect to the structures listed in Table 3 of Appendix A, the Commission by this decision delegates the acceptance of a commissioning report as recommended in section 4.11 of CMD 17-H3, to the staff positions there listed.
192. The Commission accepts the delegations of authority as recommended in section 4.11 of CMD 17-H3, except in the case of the acceptance of the commissioning report for the structures list in Table 2 of Appendix A of the licence, as detailed in the above paragraph.
193. The Commission also wishes to make it clear, and to address the concerns raised by the SON, that this licence is not prejudging the outcome of future regulatory decisions pertaining to waste management at the Bruce NGS site.

194. With this decision, the Commission directs CNSC staff to report annually on the performance of the WWMF as part of an annual *Regulatory Oversight Report*. CNSC staff shall present this report at a public proceeding of the Commission, where members of the public will be able to participate.

A handwritten signature in blue ink, reading "M. Binder", is written over a horizontal line.

MAY 29 2017

Michael Binder  
President,  
Canadian Nuclear Safety Commission

Date

## Appendix A – Intervenors

Historic Saugeen Métis, represented by P. McArthur, G. Govier and G. Wiechert	17-H3.11 17-H3.11A
Métis Nation of Ontario, represented by P. Richardson, D. Dusome, L. Duval, A. Alibhai and G. Conacher	17-H3.18
Eugene Bourgeois and A. Tilman	17-H3.20 17-H3.20A
Canadian Nuclear Association, represented by J. Barrett and S. Coupland	17-H3.16
Saugeen Ojibway Nation, represented by A. Monem and R. Kahgee	17-H3.12
Bruce Power, represented by J. Scongack	17-H3.10
Frank Greening	17-H3.2 17-H3.2A
Hydro Pensioners of Ontario, Georgian Bay District Pensioners Association, Bruce Sub Group	17-H3.3
Hydro Pensioners Association of Ontario, Toronto District	17-H3.4
County of Bruce	17-H3.5
The Inverhuron Committee	17-H3.6
Council of the Corporation of the Municipality of Kincardine	17-H3.7
Corporation of the Township of Huron-Kinloss	17-H3.8
Kincardine and District Chamber of Commerce	17-H3.9
Power Workers' Union	17-H3.13
Canadian Nuclear Laboratories	17-H3.14
Canadian Nuclear Workers' Council	17-H3.15
Town of Saugeen Shores	17-H3.17
Board of Health for the Grey Bruce Health Unit	17-H3.19

May 16, 2016

CD# W-CORR-00531-01118

Mr. Marc Leblanc  
Commission Secretary  
Canadian Nuclear Safety Commission  
280 Slater Street  
Ottawa, Ontario  
K1P 5S9

Dear Mr. Leblanc:

**Application for Renewal of Western Waste Management Facility Operating Licence**

Reference: 1. CNSC letter, S. Oue to L. Mitchell, "Application for Renewal of the Western Waste Management Facility Waste Facility Operating Licence", April 7, 2016, CD# W-CORR-00531-01140.

The purpose of this letter is to request approval from the Canadian Nuclear Safety Commission to renew the Western Waste Management Facility (WWMF) Waste Facility Operating Licence (WFOL), WFOL-W4-314.03/2017 for another ten year term, from June 1, 2017 to May 31, 2027. The current ten-year WFOL expires on May 31, 2017.

OPG Waste Inc., a corporation owned by Ontario Power Generation (OPG) Inc. is located at 700 University Avenue, Toronto, Ontario, M5G 1X6. The WWMF is located on the Bruce nuclear site within the Municipality of Kincardine in south-western Ontario. The WWMF is licensed by the Canadian Nuclear Safety Commission (CNSC) under section 24(2) of the *Nuclear Safety and Control Act* (NSCA) to provide for the safe handling, management and interim storage of radioactive wastes.

Upon renewal, OPG requests a change to the facilities listed in Appendix C associated with Part IV e) of the current licence for the site preparation, construction or construction modification to include, in total, authorization for:

- 4 storage buildings for used fuel dry storage;
- 11 storage buildings for low or intermediate level radioactive waste;
- 270 in-ground storage containers (IC-18s) for intermediate level waste;
- 30 in-ground containers for heat exchangers (IC-HXs);
- Large Object Processing Building; and,
- Waste Sorting Facility.

Because of land constraints within the WWMF licensed area, OPG is requesting that the licensed area be expanded to include areas identified as the woodlot and construction laydown area. The expanded area will include the appropriate security measures required for each additional building. A Predictive Effects Assessment was conducted to determine the impact on human health and on non-human biota from the activities to be located in these areas, and it concluded that with mitigation measures, there are no adverse effects.

These facilities would not alter the basic purpose and activities associated with the WWMF. The additional storage and increased processing capability at WWMF will continue to provide safe, interim storage for radioactive waste generated by the operation of Ontario's nuclear power plants under their current respective operating licences.

Except for the Large Object Processing Building and Waste Sorting Facility, no significant changes are anticipated in the designs that have previously been accepted by the CNSC for similar buildings and structures at WWMF. Prior to construction, specific project design requirements are submitted to the CNSC in accordance with the WWMF WFOL Licence Condition 3 – Construction.

This licence renewal application demonstrates that OPG is qualified to operate the WWMF, and has made adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

The applicable Regulations under the *Nuclear Safety and Control Act* require specific information to be contained in an application for licence renewal. In response to Reference 1, the following attachments are included with this application:

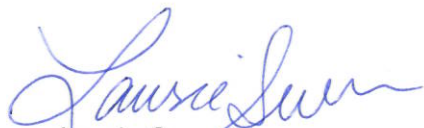
- Attachment 1 provides a copy of the Land Ownership;
- Attachment 2 provides a matrix that identifies the specific location of the information requested in Reference 1 to support the WWMF WFOL Licence Renewal Application; and,
- Attachment 3 provides the application and describes the objective of each Safety and Control Area and the programs in place to ensure compliance with the objectives. Also described is WWMF's performance since the last licence renewal in 2007 and our planned improvements.

Table 1 provides a list of commitments made in this correspondence and their target completion dates.

Consistent with OPG's approach towards open and transparent public communications, OPG will post this application on our external website [www.opg.com](http://www.opg.com).

Should you have any questions, or requests for further information, please contact Ms. Leslie Mitchell, Manager, Regulatory Programs Strategy and Support, at [leslie.j.mitchell@opg.com](mailto:leslie.j.mitchell@opg.com), or (905) 839-6746 ext. 5198, or cell at 905-767-1530.

Sincerely,



Laurie Swami  
Senior Vice President  
Decommissioning & Nuclear Waste Management

Attach.

cc:	Haidy Tadros	CNSC (Ottawa)
	Karine Glenn	CNSC (Ottawa)
	Shirley Oue	CNSC (Ottawa)
	Shona Thompson	CNSC (Ottawa)

**Table 1****Summary of Regulatory Management Actions made in this Letter****Submission Title:** "Application for Renewal of Western Waste Management Facility Operating Licence"**Regulatory Management Actions (REGM):**

No.	Description	Target Completion Date
1.	WWMF will complete a gap analysis and implementation plan for meeting the requirements of CSA Standard N393-12, <i>Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances</i> .	August 31, 2016
2.	WWMF will complete a gap analysis and implementation plan for meeting the requirements of CSA Standards N292.0-14, <i>General Principles for the Management of Radioactive Waste and Irradiated Fuel</i> , N292.2-13, <i>Interim Dry Storage of Irradiated Fuel</i> , and N292.3-14, <i>Management of low-and-intermediate-Level Radioactive Waste</i> .	August 31, 2016
3.	WWMF will complete a gap analysis and implementation plan for meeting the requirements of CSA Standard N288.3.4, <i>Performing Testing of Nuclear Air-Cleaning Systems at Nuclear Facilities</i> .	December 31, 2016
4.	WWMF will meet the requirements of REGDOC-2.6.3, <i>Aging Management</i> .	July 15, 2017
5.	WWMF will complete a gap analysis and implementation plan for meeting the requirements of CSA Standard N288.4, <i>Environmental Monitoring Program at Class I Nuclear Facilities and Uranium Mines and Mills</i> .	December 31, 2017
6.	WWMF will complete a gap analysis and implementation plan for meeting the requirements of CSA Standard N288.7, <i>Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills</i> .	December 31, 2017
7.	WWMF meet the requirements of REGDOC-2.12.3, <i>Security of Nuclear Substances: Sealed Sources</i> for the storage and transportation of category 4 and 5 sealed sources.	May 31, 2018



Attachment 1 to OPG Letter, L. Swami to Marc Leblanc,  
“Application for Renewal of Western Waste Management Facility Operating Licence,”  
CD# W-CORR-00531-01118

## **ATTACHMENT 1**

### **Land Ownership and Control**



# Transfer/Deed of Land

Form 1 — Land Registration Reform Act

SoftDocs® 41 Wordprocessor Interface  
OPG-Bruce Waste Inc.

**A**

FOR OFFICE USE ONLY

(1) Registry <input checked="" type="checkbox"/>	Land Titles <input type="checkbox"/>	(2) Page 1 of 3 pages
(3) Property Identifier(s)	Block	Property
P900499		Additional: See Schedule <input type="checkbox"/>
(4) Consideration		
NIL ----- 00/100 Dollars \$NIL		
(5) Description This is a: Property Division <input type="checkbox"/> Property Consolidation <input type="checkbox"/>		
1. Part of Lots 18, 19, 20, 21, 22, 23 and 24, Concession A or Lake Range and Part of the Original Road Allowance between Lots 20 and 21 (closed by By-Law 811), Concession A or Lake Range, all designated as PARTS 12, 21, 22, 23, 24, 25, 26, 29, 30, 32, 33, 34, 35, 36, 64, 65, 68 and 69 on Plan 3R-7352, Township of Bruce, now in the Municipality of Kincardine, in the County of Bruce		
- as described on Schedule annexed		

New Property Identifiers

*See Certificate Attached*

Executions

Additional: See Schedule ☐

(6) This Document Contains	(a) Redescription New Easement Plan/Sketch <input type="checkbox"/>	(b) Schedule for: Description <input checked="" type="checkbox"/> Additional Parties <input type="checkbox"/> Other <input checked="" type="checkbox"/>	(7) Interest/Estate Transferred Fee Simple <i>Confirming Deed</i>
----------------------------	---	---	---

(8) Transferor(s) The transferor hereby transfers the land to the transferee and certifies that the transferor is at least 18 years of age and that see attached Schedule A entitled "Electricity Act, 1998 Registration Statement"

Name(s)  
OPG WASTE INC.

Signature(s)  
By: *David W. Drinkwater*  
Name: David W. Drinkwater  
Title: Executive Vice President  
Law and Corporate Department

Date of Signature  
Y M D  
2001 04 24

We have the authority to bind the corporation.

By: *Richard Dicerni*  
Name: Richard Dicerni  
Title: Executive Vice President  
and Corporate Secretary

Date of Signature  
Y M D  
2001 04 24

(9) Spouse(s) of Transferor(s) I hereby consent to this transaction.  
Name(s)

Signature(s)

Date of Signature  
Y M D

(10) Transferor(s) Address for Service  
C/o 700 University Avenue, Toronto, Ontario M5G 1X6

(11) Transferee(s)  
OPG WASTE INC.

Date of Birth  
Y M D

(12) Transferee(s) Address for Service  
C/o 700 University Avenue, Toronto, Ontario M5G 1X6

(13) Transferor(s) The transferor verifies that to the best of the transferor's knowledge and belief, this transfer does not contravene section 50 of the Planning Act.  
Date of Signature  
Y M D  
Signature  
Solicitor for Transferor(s) I have explained the effect of section 50 of the Planning Act to the transferor and I have made inquiries of the transferor to determine that this transfer does not contravene that section and based on the information supplied by the transferor, to the best of my knowledge and belief, this transfer does not contravene that section. I am an Ontario solicitor in good standing.  
Name and Address of Solicitor  
Signature  
Date of Signature  
Y M D

(14) Solicitor for Transferee(s) I have investigated the title to this land and to abutting land where relevant and I am satisfied that the title records reveal no contravention as set out in subclause 50(22)(c)(ii) of the Planning Act and that to the best of my knowledge and belief this transfer does not contravene section 50 of the Planning Act. I act independently of the solicitor for the transferor(s) and I am an Ontario solicitor in good standing.  
Name and Address of Solicitor  
Signature  
Date of Signature  
Y M D

(15) Assessment Roll Number of Property  
Cty. Mun. Map Sub. Par. MULTIPLE

(16) Municipal Address of Property  
Bruce Generating Station (Part)

(17) Document Prepared by:  
BLAKE, CASSELS & GRAYDON LLP  
Barristers and Solicitors  
Box 25, Commerce Court West  
Toronto, Ontario M5L 1A9  
(416) 863-2400  
ATTENTION: Edward M. Perlmutter

Fees and Tax	
Registration Fee	60-
Land Transfer Tax	(.)
Total	60-

11208441

SCHEDULE A

P900499

TO TRANSFER/DEED OF LAND

ELECTRICITY ACT, 1998 REGISTRATION STATEMENT

1. OPG-Bruce Waste Inc. is a person referred to in section 124 of the *Electricity Act, 1998* and is a person from which no consent was required in respect of the transfer in the transfer order, as amended, pursuant to subsection 116(5) of the *Electricity Act, 1998*.
2. OPG-Bruce Waste Inc. changed its name by Articles of Amendment effective April 12, 2001 to OPG Waste Inc. as registered in the Land Registry Office for the Registry Division of Bruce on \_\_\_\_\_, 2001 as No. \_\_\_\_\_.
3. The interests described in Box (7) in the lands (the "Lands") described in Box (5) in the Form 1 under the *Land Registration Reform Act* to which this schedule is attached were transferred unconditionally to OPG-Bruce Waste Inc. from Ontario Hydro by or pursuant to a Transfer Order, as amended, made under the *Electricity Act, 1998*, which transfer has taken effect.
4. There were no conditions or other provisions in the Transfer Order, as amended, that restrict the power or right of the Transferor to transfer the interest described in Box (7) in the Lands.
5. The foregoing statements are statements made pursuant to section 124 of the *Electricity Act, 1998*.
6. This transfer/deed of land is being registered to record the name of Transferee on title to the Lands.
7. Pursuant to Section 135 of the *Electricity Act, 1998* the *Land Transfer Tax Act* does not apply to any transfer of assets by or pursuant to a transfer order.
8. Where applicable, by the *Power Commission Amendment Act, 1973* proclaimed March 4, 1974, the name of The Hydro-Electric Power Commission of Ontario was changed to Ontario Hydro.

P900499

SCHEDULE

In the Township of Bruce, now in the Municipality of Kincardine, County of Bruce:

1. Part of Lots 18, 19, 20, 21, 22, 23 and 24 Concession A or Lake Range, and Part of the Original Road Allowance between Lots 20 and 21, (Closed by By-Law 811), Concession A or Lake Range.

All designated as PARTS 12, 21 to 25 both inclusive, 26, 29, 30, 32, 33, 34, 35, 36, 64, 65, 68 and 69, on Plan 3R-7352.

2. Part of Lots 11, 12, 13, 14 and 15, Concession A or Lake Range, and Part of McNabb Street on the Town Plot of Inverhuron (Crown Survey No. VI) (Closed by By-Law 77-11) designated as PARTS 1, 2 and 3 on Plan 3R-7351, save and except PART 1 on Plan 3R-7355.

Together with an easement in, on, over, along and upon those parts of Lots 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 and part of original allowance for road along the shore of Lake Huron Concession A or Lake Range designated as PARTS 45, 46, 47 48, 91, 92, 93, 123, 125 and 127 on Plan 3R-7352 for the purposes of pedestrian and vehicular access and installing constructing, repairing, replacing and using services, utilities, sewers, telecommunications equipment, conduits, pipes and cables and such other uses as may reasonably be required by an owner or occupant of the said lands pursuant to this transfer order and subject to such reasonable restrictions as may be imposed by the owner of the subject lands from time to time.

And Together with an easement in, over, along and across those parts of Lots 11, 12, 13, 14, 15 and part of McNabb Street (closed by By-Law 77-11), Lot 1 west side of Head Street, Lot 1 east side of Raglan Street, Lot 1 west side of Raglan Street, Lot 1, east side of Morin Street, Lot 1 west side of Morin Street, Lot 1 east side of Russell Street, part of Head Street (closed by By-Law 1752), part of Raglan Street (closed by By-Law 810) and part of Morin Street (closed by By-Law 810), designated as PARTS 15, 16, 18, 19, 20, 21, 25 and 26 on Plan 3R-7351 and PART 1 on Plan 3R-7355 for the purposes of pedestrian and vehicular access and installing constructing, repairing, replacing and using services, utilities, sewers, telecommunications equipment, conduits, pipes and cables and such other uses as may reasonably be required by an owner or occupant of the said lands pursuant to this transfer order and subject to such reasonable restrictions as may be imposed by the owner of the subject lands from time to time.

And Together with an easement in, on, over along and upon those parts of Lots 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and part of the original allowance for road allowance between Lots 20 and 21, Concession A or Lake Range designated as PARTS 5, 13, 14, 15, 16, 17, 18, 27, 28, 66, 113, 116, 118 and 120 on Plan 3R-7352 for the purposes of pedestrian and vehicular access and installing constructing, repairing, replacing and using services, utilities, sewers, telecommunications equipment, conduits, pipes and cables and such other uses as may reasonably be required by an owner or occupant of the said lands pursuant to this transfer order and subject to such reasonable restrictions as may be imposed by the owner of the subject lands from time to time.

## **ATTACHMENT 2**

**Table 1: WWMF Licence Application Matrix**

**Table 2: Changes Between Previous and this Applications**

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

**Table 1: WWMF Licence Application Matrix**

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
<b>General Nuclear Safety and Control Regulations</b>			
<b>General Application Requirements</b>			
3. (1) An application for a licence shall contain the following information;			
(a)	The applicant's name and business address;	n/a	Ontario Power Generation Inc. 700 University Avenue Toronto, Ontario M5G 1X6  <u>Mailing Address c/o:</u> Ms. Laurie Swami Senior Vice President Decommissioning and Nuclear Waste Management 1340 Pickering Parkway, 4 <sup>th</sup> Floor Pickering, Ontario L1V 0C4
(b)	The activity to be licensed and its purpose;	n/a	Cover Letter – OPG letter, Laurie Swami to Marc Leblanc, “Application for Renewal of Western Waste Management Facility (WWMF) Operating Licence, and Amendment for WWMF Expansion”, May 16, 2016, CD# W-CORR-00531-01118.
(c)	The name, maximum quantity and form of any nuclear substance to be encompassed by the licence;	n/a	Attachment 3, Section 1.1
(d)	A description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;	Security	Attachment 3, Section 2.12
(e)	The proposed measures to ensure compliance with the <i>Radiation Protection Regulations</i> , the <i>Nuclear Security Regulations</i> and the <i>Packaging and Transport of Nuclear</i>	Radiation Protection  Security	Attachment 3, Section 2.7  Attachment 3,

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
	<i>Substances Regulations, 2015;</i>	Packaging & Transport	Section 2.12  Attachment 3, Section 2.14
(f)	Any proposed action level for the purpose of section 6 of the <i>Radiation Protection Regulations</i> ;	Radiation Protection  Environment Protection	Attachment 3, Section 2.7  Attachment 3, Section 2.9
(g)	The proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;	Security  Radiation Protection	Attachment 3, Section 2.12  Attachment 3, Section 2.7
(h)	The proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;	Security	Attachment 3, Section 2.12.2
(i)	A description and the results of any test, analysis or calculation performed to substantiate the information included in the application;	Safety Analysis	Attachment 3, Section 2.4
(j)	The name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;	Waste Management	Attachment 3, Section 2.11
(k)	The applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;	Management System	Attachment 3, Section 2.1
(l)	A description of any proposed financial guarantee relating to the activity to be licensed;	Financial Guarantee	Attachment 3, Section 3.5

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
(m)	Any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence.	n/a	n/a
1.1	<p>The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant:</p> <p>(a) is qualified to carry on the activity to be licensed, or</p> <p>(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.</p>	n/a	Refer to “Other Information” below.
(2)	Subsection (1) does not apply in respect of an application for a licence to import or export for which the information requirements are prescribed by the <i>Nuclear Non-Proliferation Import and Export Control Regulations</i> , or in respect of an application for a licence to transport while in transit for which the information requirements are prescribed by the <i>Packaging and Transport of Nuclear Substances Regulations</i> .	n/a	n/a
<b>Other Information Pursuant to 1.1 (as provided in Attachment 4<sup>1</sup>)</b>			
(1)	Summary of programs and supporting documentation needed to support the licence application organized under each SCA, including other matters of regulatory interest. The programs and supporting documentation should be	All SCA	Attachment 3, Sections 2.1 to 2.14

<sup>1</sup> CNSC letter, S. Oue to L. Mitchell, “Application for Renewal of the Western Waste Management Facility Waste Facility Operating Licence”, April 7, 2016, CD# W-CORR-00531-01140, CNSC e-doc 4950490.



Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
	sufficiently detailed to describe the safety and control measures that will be implemented at WWMF for each SCA.		
(2)	Description of WWMF’s approach to safety, including reference to corporate and facility specific documents which enunciate the safety policies and standards to which WWMF must adhere.	Management System	Attachment 3, Section 2.1
(3)	Documents describing the organizational structure, roles and responsibilities of organizational units and management; including documents governing the day to day operation and conduct of the organization.	Management System	Attachment 3, Section 2.1
(4)	Information on WWMF’s performance for each SCA during the current licence period, relative to OPG’s expectations, including any trends	All SCA	Attachment 3, Sections 2.1 to 2.14
(5)	Assessment of existing and future safety challenges, along with a safety improvement plan to address these challenges during the next licence period	All SCA	Attachment 3, Sections 2.1 to 2.14
(6)	Describe opportunities for improvements and any safety improvement plans to address identified safety challenges	All SCA	Attachment 3, Sections 2.1 to 2.14
(7)	A description of the proposed operating plan for the next licensing period	General Operating Performance	Attachment 3, Section 1 Attachment 3, Section 2.3
(8)	Information on significant activities envisaged beyond the end of the next licensing period, if any	All SCAs	Attachment 3, Sections 2.1 to 2.14
(9)	Provide a list of federal, provincial, municipal or other regulations, other than the regulations pursuant to the NSCA, which WWMF must abide by	Other	Attachment 3, Section 3.7
(10)	Provide a description of any obligations for municipal, provincial or other federal authorities and any obligations for public and/or private	Other	Attachment 3, Section 3.8.1

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
	organizations		
(11)	Provide a list of any permits, certificates and licences issued by authorities other than the CNSC	Other	Attachment 3, Section 3.8
(12)	Provide updated Derived Release Limits and Operating Release Limit reports for the facility	Environmental Protection	Attachment 3, Section 2.9
(13)	Provide OPG’s plans and schedule, including dates, with respect to complying with each of the standards, codes and CNSC regulatory documents found in Attachment 2 (unless recommended to be included under recommendations and guidance), including transition measures as appropriate.	All SCA	Attachment 3, Sections 2.1 to 2.14
(14)	Summary of the current status of all open actions items, as well as issues and requests that were discussed during the last WWMF Commission hearings or meetings, including a plan and date for resolution.	Other	Attachment 3, Section 3.8.2
(15)	Provide justification to ensure that any proposed action level for the purpose of section 6 of the <i>Radiation Protection Regulations</i> will provide timely warning of any potential or actual loss of control of part of the radiation protection program.	Radiation Protection  Environmental Protection	Attachment 3, Section 2.7  Attachment 3, Section 2.9
<b>Application for Renewal of Licence</b>			
5. An application for the renewal of a licence shall contain:			
(a)	The information required to be contained in an application for that licence by the applicable regulations made under the Act; and	n/a	Cover Letter Attachment 3, Section 1
(b)	A statement identifying the changes in the information that was previously submitted.	n/a	Attachment 2, Table 2
<b>Obligations – Representatives of Applicants and Licensees</b>			
15. Every applicant for a licence and every licensee shall notify the Commission of			
(a)	the persons who have authority to act	n/a	Attachment 3,

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 "Application for Renewal of Western Waste Management Facility Operating Licence,"  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
	for them in their dealings with the Commission;		Section 2.1.10
(b)	the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and		
(c)	any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs.		
Class I Nuclear Facilities Regulations			
LICENCE APPLICATIONS, General Requirements			
3. An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations:			
(a)	A description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;	n/a	Attachment 3, Section 1
(b)	Plans showing the location, perimeter, areas, structures and systems of the nuclear facility;	n/a	Attachment 3, Section 1
(c)	Evidence that the applicant is the owner of the site or has authority from the owner of the site to carry out the activity to be licensed;	n/a	Attachment 1
(d)	The proposed quality assurance program for the activity to be licensed;	Management System	Attachment 3, Section 2.1
(e)	The name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;	Other Matters of Regulatory Interest	Attachment 3, Section 3.1
		Environmental Protection	Attachment 3, Section 2.9
(f)	The proposed worker health and safety policies and procedures;	Conventional Health & Safety	Attachment 3, Section 2.8
(g)	The proposed environmental protection policies and procedures;	Environmental Protection	Attachment 3, Section 2.9
(h)	The proposed effluent and environmental monitoring programs;	Environmental Protection	Attachment 3, Section 2.9

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
(i)	If the application is in respect of a nuclear facility referred to in paragraph 2(b) of the <i>Nuclear Security Regulations</i> , the information required by section 3 of those Regulations;	Security	Attachment 2, Section 2.12,
(j)	The proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and	Community Relations	Attachment 3, Sections 3.2 and 3.3
(k)	The proposed plan for the decommissioning of the nuclear facility or of the site.	Waste Management	Attachment 3, Section 2.11.4
<b>Licence to Operate</b>			
6. An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3:			
(a)	A description of the structures at the nuclear facility, including their design and their design operating conditions;	n/a	Attachment 2, Section 1
(b)	A description of the systems and equipment at the nuclear facility, including their design and their design operating conditions;	n/a	Attachment 2, Section 1
(c)	A final safety analysis report demonstrating the adequacy of the design of the nuclear facility;	Safety Analysis	Attachment 2, Section 2.4
(d)	The proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility;	Operating Performance	Attachment 2, Section 2.3
(e)	The proposed procedures for handling, storing, loading and transporting nuclear substances and hazardous substances;	Package & Transport	Attachment 2, Section 2.14
(f)	The proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;	Safeguards	Attachment 2, Section 2.13
(g)	The proposed commissioning program for the systems and equipment that will be used at the nuclear facility;	n/a	Project specific.
(h)	The effects on the environment and	Other Matter of	Attachment 3,

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
	the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;	Regulatory Interest (Environmental Assessment)  Environmental Protection	Section 3.1  Attachment 3, Section 2.9
(i)	The proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, the health and safety and hazardous substances into the environment, including their physical, chemical and radiological characteristics;	Other Matter of Regulatory Interest (Environmental Assessment)  Environmental Protection	Attachment 3, Section 3.1  Attachment 3, Section 2.9
(j)	The proposed measures to control releases of nuclear substances and hazardous substances into the environment;	Environmental Protection	Attachment 3, Section 3.1
(k)	The proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including measures to (i) assist off-site authorities in planning and preparing to limit the effects on an accidental release, (ii) notify off-site authorities of an accidental release or the imminence of an accidental release, (iii) report information to off-site authorities during and after an accidental release, (iv) assist off-site authorities in dealing with the effects of an accidental release, and (v) test the implementation of the measures to prevent or mitigate the effects of an accidental release;	Emergency Preparedness	Attachment 3, Section 2.10.1
(l)	The proposed measures to prevent acts of sabotage or attempted sabotage at the nuclear facility, including measures to alert the licensee to such acts;	Security	Attachment 3, Section 2.12

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

Regulatory Requirement	Description of Regulatory Requirement	Related Safety Control Area	Location in Submission
(m)	The proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers; and	Training	Attachment 3, Section 2.2
(n)	The results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.	Training	Attachment 3, Section 2.2
<b><i>Nuclear Security Regulations</i></b>			
<b>Part 2 Security Of Nuclear Facilities Listed in Schedule 2 – Licence Applications</b>			
41	An application for a licence in respect of a nuclear facility shall contain, in addition to the information required by sections 3 to 8 of the <i>Class I Nuclear Facilities Regulations</i> , a description of the physical protection measures to be taken to ensure compliance with sections 42 to 48.	Security	Attachment 3, Section 2.12
<b><i>Nuclear Substances and Radiation Devices</i></b>			
3. (1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i> :			
(a) to (o)		Radiation Protection  Security	OPG holds several licences under the Nuclear Substances and Radiation Devices Regulations, as listed in Attachment 3, Sections 2.7 and 2.12. However, OPG is not applying for these activities under this licence application.

Attachment 2 to OPG Letter, L. Swami to Marc Leblanc,  
 “Application for Renewal of Western Waste Management Facility Operating Licence,”  
 CD# W-CORR-00531-01118

**Table 2: Changes Between Previous and this Applications**

<b>Parts of Previous Application</b>	<b>Contents of Previous Application (July 2006)</b>	<b>Parts of Current Application</b>	<b>Contents of Current Application (May 2016)</b>
Letter of Application	Letter and the Western Waste Management Facility Safety Report	Letter of Application	Letter, including attachments
		Attachment 1	Land Ownership and Control
		Attachment 2	Table 1: WWMF Licence Application matrix Table 2: Changes Between Previous and This application
		Attachment 3	WWMF Licence Renewal Application

Attachment 3 to OPG Letter, L. Swami to Marc Leblanc,  
“Application for Renewal of Western Waste Management Facility Operating Licence,”  
CD# W-CORR-00531-01118

### **ATTACHMENT 3**

#### **WWMF Licence Renewal Application**





# **Western Waste Management Facility**

## **Application for Licence Renewal**



**May 2016**

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## EXECUTIVE SUMMARY

The purpose of this report is to request approval from the Canadian Nuclear Safety Commission (CNSC) to renew the Western Waste Management Facility (WWMF) Waste Facility Operating Licence (WFOL) for another ten year term from June 1, 2017 to May 31, 2027. The current ten year WFOL W4-314.03/2017 for the WWMF expires on May 31, 2017.

Upon renewal, Ontario Power Generation Inc. (OPG) requests a change to the facilities listed in Appendix C associated with Part IV e) of the current licence for the site preparation, construction or construction modification to include, in total, authorization for:

- 4 storage buildings for used fuel dry storage;
- 11 storage buildings for low or intermediate level radioactive waste;
- 270 in-ground storage containers (IC-18s) for intermediate level waste;
- 30 in-ground containers for heat exchangers (IC-HXs);
- Large Object Processing Building; and
- Waste Sorting Facility.

Because of land constraints within the WWMF licensed area, OPG is requesting that the licensed area be expanded to include areas identified as the woodlot and construction laydown area. A Predictive Effects Assessment was conducted to determine the impact on human health and on non-human biota from the activities to be located in these areas, and it concluded that with mitigation measures, no adverse effects are expected.

WWMF has been operating safely since it was established in 1974. The additional buildings and structures would not alter the basic purpose and activities associated with the WWMF. The ongoing operation of WWMF will enable the nuclear generating stations in Ontario to continue operating as planned under their current respective operating licences.

OPG has been safely transporting radioactive materials for over 45 years, and has never had an accident resulting in a radioactive release or serious personal injury. OPG drivers transporting radioactive materials have an excellent safety record on the roads and have travelled over 3 million kilometers during the last 9 years (current licensing period between 2007 and 2015) without any at fault incidents.

This report presents information on the performance of WWMF in areas related to the fourteen Safety and Control Areas. During the current licensing period, WWMF has operated safely and reliably to protect the public, the workers and the environment. OPG is proud of its excellent record in conventional and radiological worker safety, and is well positioned for the continued operation of WWMF.

OPG is committed to innovative and responsible solutions for managing radioactive materials safely, efficiently and cost effectively, and making investments for the continued safety operation of WWMF.

OPG has built a healthy safety culture that permeates the organization, and demonstrates a focus to improve organizational effectiveness through the use of best practices, enhanced behaviours and learning.



## 1.0 OVERVIEW

Ontario Power Generation (OPG) is an Ontario-based electricity generation company whose principal business is the generation and sale of electricity in Ontario. Electricity generated by nuclear power comes with the by-product of radioactive waste. OPG is committed to the responsible and comprehensive management of all its radioactive waste, and has been safely storing this waste at its waste management facilities located at the Bruce, Pickering and Darlington nuclear sites.

This licence renewal application for the WWMF, located on the Bruce nuclear site within the Municipality of Kincardine, Ontario demonstrates that:

- (1) OPG is qualified to operate the WWMF; and,
- (2) OPG has and will continue to make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed to in operating this facility.

The WWMF is licensed by the CNSC under section 24(2) of the *Nuclear Safety and Control Act*. It is a Class IB nuclear facility as defined in the *Class 1 Nuclear Facilities Regulations* to provide for the safe handling, management, and the interim storage of radioactive wastes, including low and intermediate level radioactive waste (L&ILW) from all 20 reactors located at Bruce, Darlington and Pickering sites, and used fuel produced by Bruce Power Nuclear Generating Stations (NGS). The WWMF site has been developing in stages since 1974 to accommodate wastes produced during reactor operation, maintenance and refurbishment.

The current ten-year WFOL for WWMF (WFOL-W4-314.03/2017) expires on May 31, 2017. OPG is requesting a renewal of the operating licence for another ten (10) years, from June 1, 2017 to May 31, 2027. The renewal would allow OPG to continue with the safe interim storage of used fuel and L&ILW.

During the 10 year licence period that is being requested, several activities will affect the operations at the WWMF. OPG will be pursuing the refurbishment of the Darlington NGS, and the extended operation of the Pickering NGS. These will result in ongoing shipments of L&ILW to the WWMF in similar or potentially greater quantities than occur today. Similarly, Bruce Power will commence the major component replacement program, which will result in sustained levels of low and intermediate level waste including additional steam generators and retube wastes. This will extend the life of the Bruce Power reactors resulting in an increase number of used fuel bundles produced that requires interim storage in dry storage containers at WWMF.

Upon renewal, OPG requests a change to the facilities listed in Appendix C associated with Part IV e) of the current licence for the site preparation, construction or construction modification to include, in total, authorization for:

- 4 storage buildings for used fuel dry storage;
- 11 storage buildings for low or intermediate level radioactive waste;
- 270 in-ground storage containers (IC-18s) for intermediate level waste;
- 30 in-ground containers for heat exchangers (IC-HXs);
- Large Object Processing Building; and,

- Waste Sorting Facility.

These buildings and structures are described in more detail in Sections 1.3 and 1.4 of this application. Except for the Large Object Processing Building and Waste Sorting Building, no significant changes are anticipated in the designs that have been previously approved for similar buildings and structures on-site. Project specific design requirements will be submitted to the CNSC in accordance with the WWMF WFOL Licence Condition 3 – *Construction* prior to the start of construction. Consistent with OPG's practice, OPG will construct any new facilities on an as needed basis. In addition, the operation of any building or structures would only begin following OPG's submission of a commissioning report and its acceptance by the Commission or a person authorized by the Commission, in accordance with Condition 2.2 of the current licence.

To provide for safe interim waste storage until long term or permanent facilities are in service, the licensed area will be expanded outside the existing licensed area to accommodate some of the new buildings. The expanded area will include the appropriate security measures required for each additional building, as described in Section 2.12.3. A predictive effects assessment was conducted to identify the effects to human and non-human biota, and is described in Section 3.1.2 of this application.

Figure 1 shows the existing licensed area in red. The woodlot and construction laydown areas are two locations currently being considered for the expansion. This expansion would not alter the basic purpose and activities associated with the WWMF. The additional storage capacity at the WWMF will enable the generating stations to continue operating as planned under their current respective operating licences.

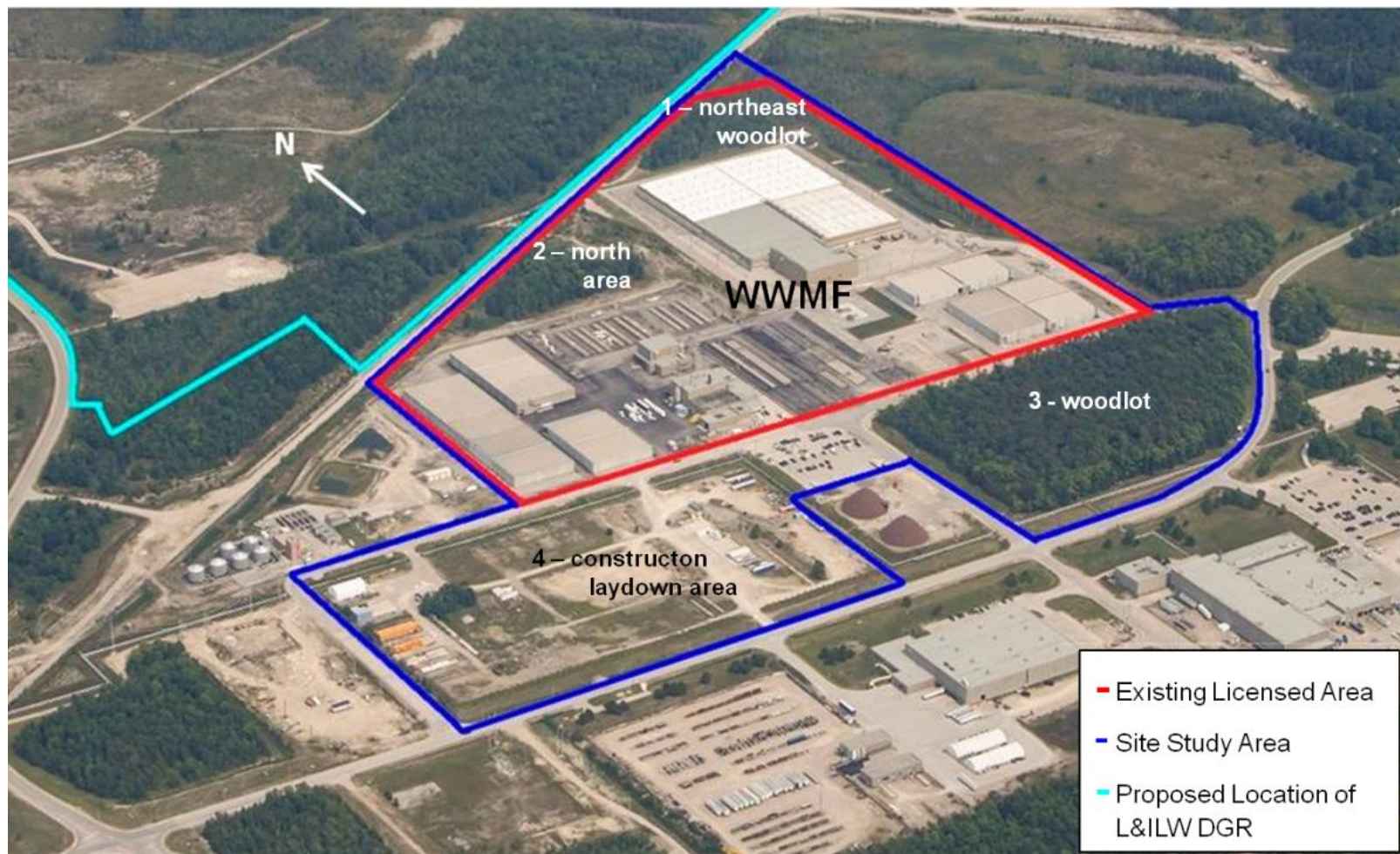


Figure 1: WWMF Site

## 1.1 Classification of Radioactive Waste

During the operation of a nuclear facility, waste is produced much like any other industry. Some of this waste becomes radioactive and must be handled using special procedures. OPG categorizes the radioactive waste into low, intermediate and high level waste.

- **Low-Level Radioactive Waste (LLW)** is radioactive waste having a dose rate less than 10 mSv/h (1 rem/h) at 30 cm. LLW consists of minimally radioactive material that has become contaminated during routine cleanup and maintenance, and includes (but is not limited to) lightly contaminated metal objects and parts, incinerator ash, insulation, drummed wastes, solidified liquids and desiccant. These items make up about 95% of the total non-fuel waste volume. LLW received from the Bruce, Darlington and Pickering NGSs are received at the Waste Volume Reduction Building (WVRB) at the WWMF where it is processed through either incineration or compaction to reduce its volume, or stored as is.
- **Intermediate-Level Radioactive Waste (ILW)** is radioactive waste having a dose rate greater than or equal to 10 mSv/h (1 rem/h) at 30 cm. ILW consists primarily of used reactor core components, ion exchange columns, resins, and filters used to keep the reactor water system clean. ILW is more radioactive than LLW, and requires shielding to protect workers during handling. This waste is not processed for volume reduction, and makes up about 5% of the total volume of non-fuel waste produced by the NGSs.
- **High Level Radioactive Waste (also referred to as irradiated fuel or used fuel)** is defined as a CANDU (CANada Deuterium Uranium) fuel bundle that was irradiated in a reactor core. It is stored at the nuclear station in irradiated fuel bays for a period of typically ten years or more, and then transferred into dry storage containers (DSCs).

### Maximum Quantity of Radioactive Waste (Nuclear Substances) at WWMF

The maximum quantity of high level radioactive waste (irradiated uranium) is interpreted as the maximum amount in the form of spent fuel bundles that can be stored in Used Fuel Dry Storage Buildings (UFDSBs) on site.

The maximum quantity of L&ILW is interpreted as the maximum amount of non-fuel radioactive waste that can be stored in the buildings/structures that have been designed for the purpose of storing the waste.

Table 1 shows the maximum quantities of low, intermediate and high level radioactive waste.

**Table 1: Maximum Quantity of Radioactive Waste (Nuclear Substances) at WWMF**

<b>Nuclear Substance</b>	<b>Form/Location</b>	<b>Maximum Quantity</b>
Irradiated Uranium	Solid as spent fuel bundles stored in Used Fuel Dry Storage Buildings (UFDSBs).	1,536,000 bundles (500 DSCs per UFDSB x 8 UFDSB x maximum 384 bundles per DSC)
Low Level Waste	Solids mainly stored in Low Level Storage buildings (LLSBs).	136,500 m <sup>3</sup> (LLSB 1-10: 7,050 m <sup>3</sup> each + LLSB 11-12: 7,000 m <sup>3</sup> each + LLSB 13 - 20: 6,500 m <sup>3</sup> each)
	Solid Heat Exchangers stored in in-ground containers (IC-HXs).	71 IC-HX (41 IC-HX existing + 30 IC-HX planned)
Low Level Waste	Liquid stored in one LLSB.	3500 m <sup>3</sup> (One half of one LLSB)
Intermediate Level Waste	Solids stored in above or below ground storage structures.	
	Steam Generator Storage Buildings (SGSBs)	72 units (24 units x 3 SGSBs)
	Retube Component Storage Buildings (RCSBs)	880 units (220 containers per RCSB x 4 RCSBs)
	Quadricells	360 m <sup>3</sup>
	Contaminated Tool Storage Area	4700 m <sup>3</sup>
	Trenches (Stage 1, 3 and 3E)	5870 m <sup>3</sup>
	Tile Holes (Stage 1 and 3)	224 m <sup>3</sup>
	In Ground Containers (ICs)	
	IC-2	40 m <sup>3</sup>
	IC-12	240 m <sup>3</sup>
	IC-18	9,720 m <sup>3</sup> (18m <sup>3</sup> per IC-18 x 10 batches x 54 IC-18s per batch)

## 1.2 Existing Western Waste Management Facility

The WWMF site was established in 1974 in an area on the Bruce Nuclear site, and shown in Figure 2 and Figure 3. The WWMF is dedicated to the processing, and the interim storage of L&ILW received from the OPG owned Nuclear Power Generating Stations (Darlington, Pickering and both Bruce Power NGSs), and the interim storage of used fuel from Bruce Power NGS. OPG's approach to the interim management of used fuel is to store all the used fuel generated at a nuclear generating station on the site where it is produced.

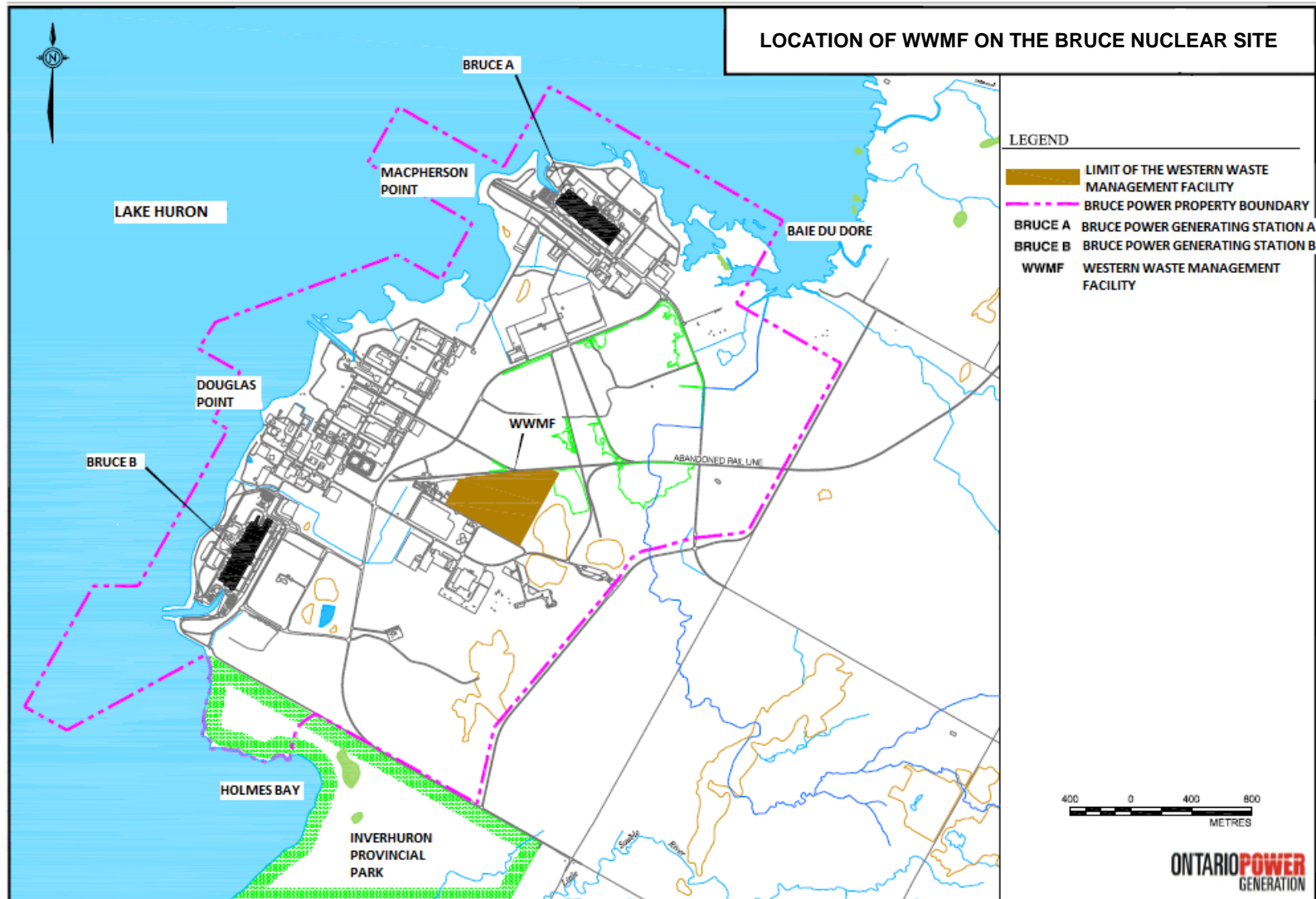


Figure 2: Bruce Nuclear Site



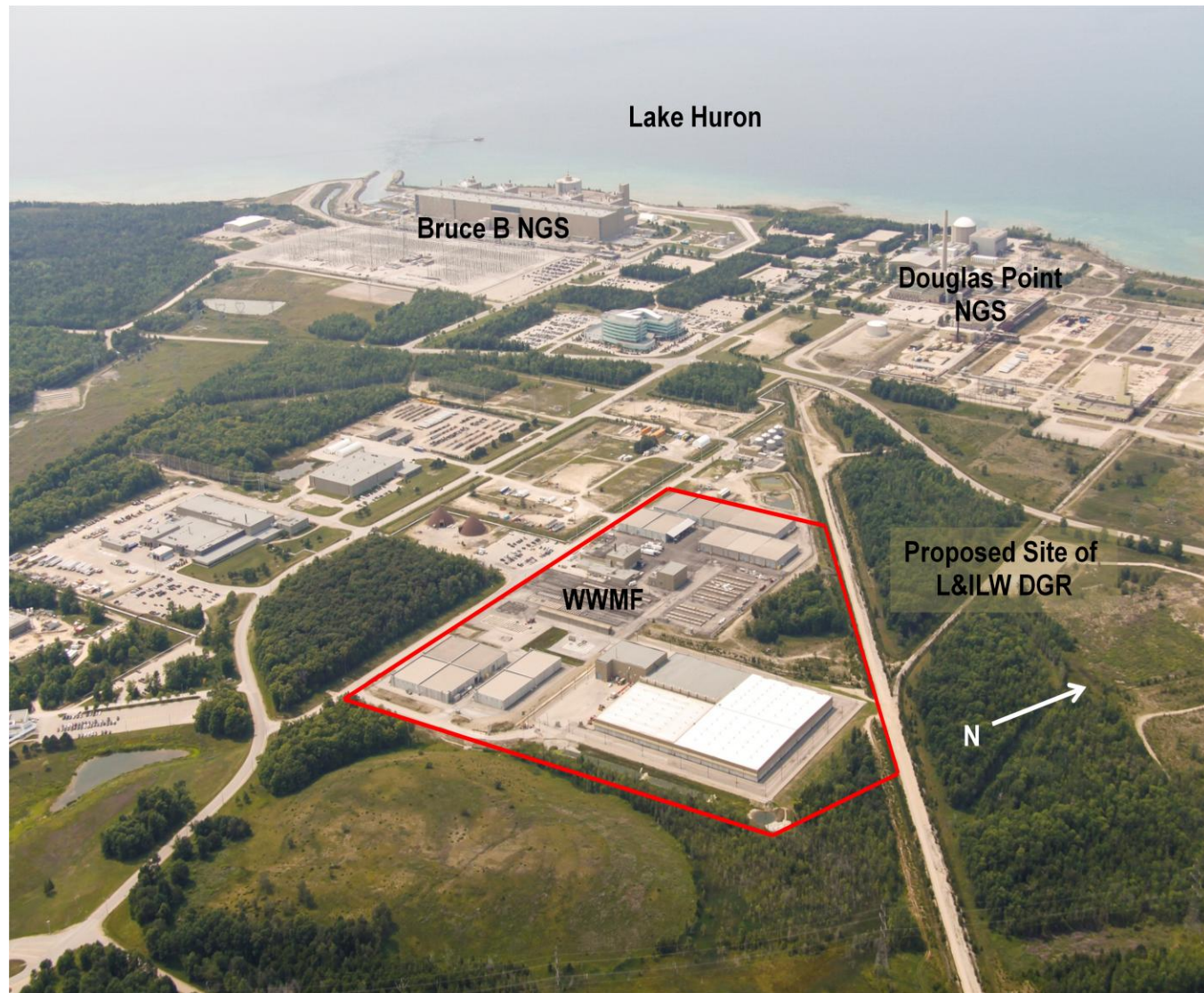


Figure 3: WWMF on the Bruce Nuclear Site

WWMF is approximately 19 hectares in size. It has undergone an orderly development in stages since 1974. Additional storage buildings and structures are constructed when required, as shown in Table 2 and Table 3.

Figure 4 shows the current layout of WWMF. Approximately 75% of the 19 hectares of the WWMF is dedicated to the management and storage of L&ILW. This area now includes 16 above-ground storage buildings for low and intermediate level wastes. Fourteen of these buildings (LLSB 1 to 14) are used to accommodate low level waste, and one for steam generators, and one for retube components. In addition, WWMF also has an amenities building, a WVRB, a transportation package maintenance building, quadricells, in-ground containers, trenches and tile holes. These buildings and structures are used for the processing and storage of L&ILW received from OPG's Pickering, Darlington and Bruce Power NGSs.

Approximately 4 hectares of the WWMF site are dedicated to the management and storage of used fuel received from the Bruce Power NGS. The used fuel dry storage area is a security-protected area located northeast of the L&ILW storage area, and consists of a DSC processing building and four DSC storage buildings.

The WWMF is fenced to limit access. Normal personnel access to and from the WWMF site is via the Amenities Building. Vehicular traffic enters the WWMF site through gates located in the access control fence. Vehicular traffic entering the used fuel dry storage area is minimal and controlled. Access control to this area is provided by a security system.



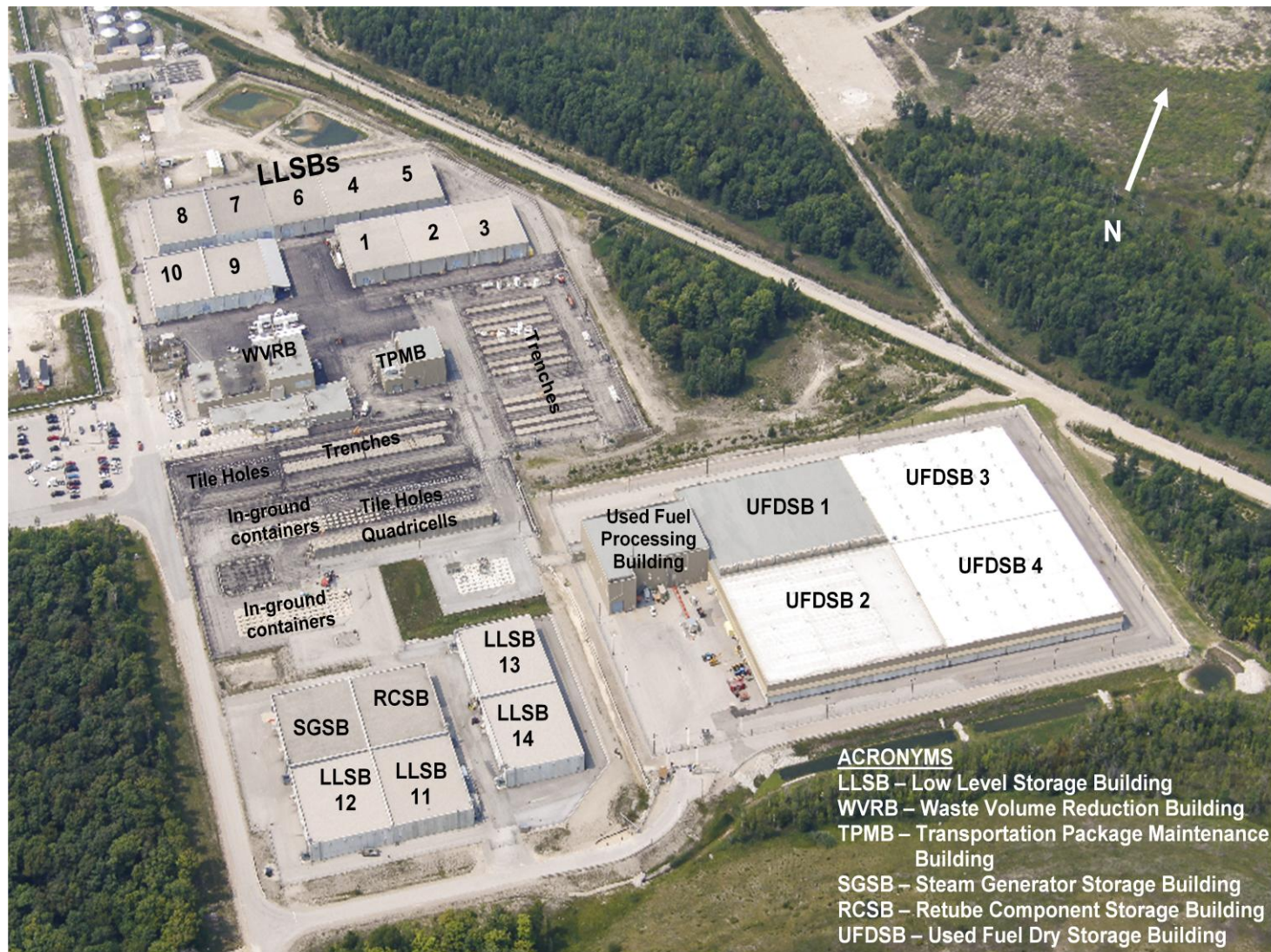


Figure 4: Layout of WWMF in 2016

**Table 2: Chronology of Development for L&ILW at WWMF**

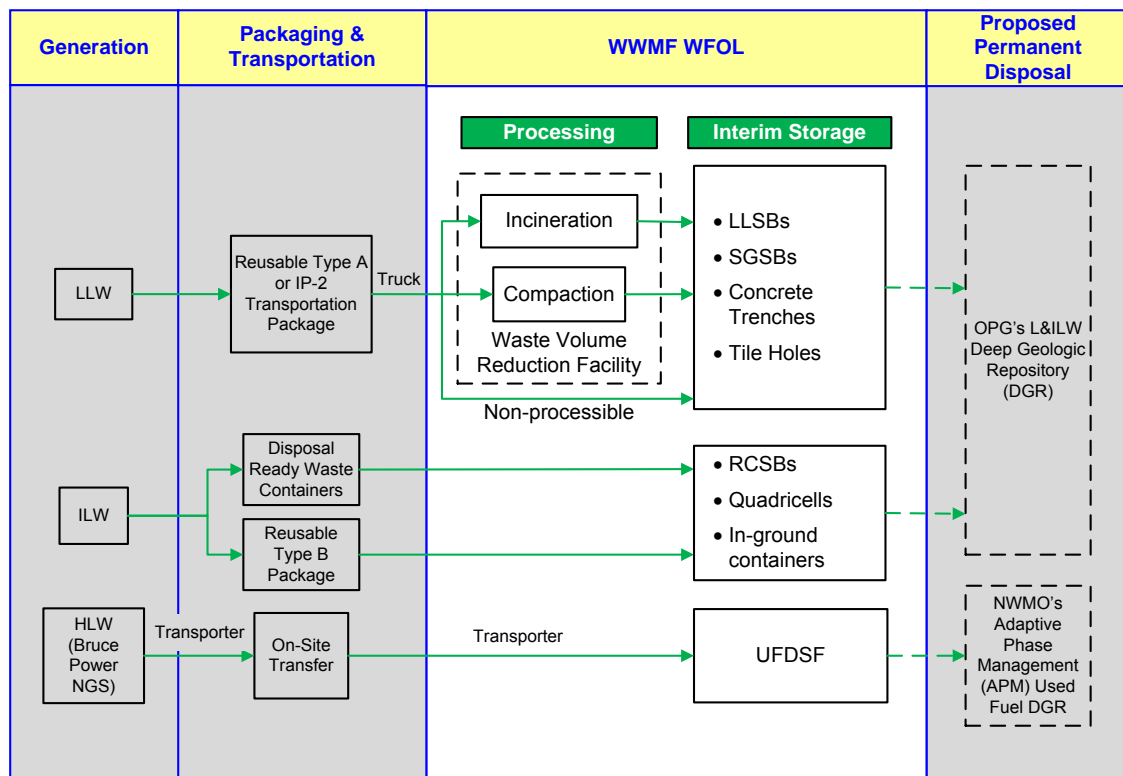
Structure/Building	Units	Number/ Capacity	In-Service Dates
<b>Above-Ground Structure or Building</b>			
Low-Level Storage Buildings	1	7,050 m <sup>3</sup>	Oct 1982
	2	7,050 m <sup>3</sup>	Dec 1985
	3	7,050 m <sup>3</sup>	Mar 1988
	4	7,050 m <sup>3</sup>	Jun 1989
	5	7,050 m <sup>3</sup>	Jun 1989
	6	7,050 m <sup>3</sup>	Nov 1992
	7	7,050 m <sup>3</sup>	Dec 1999
	8	7,050 m <sup>3</sup>	May 2002
	9	7,050 m <sup>3</sup>	Dec 2004
	10	7,050 m <sup>3</sup>	Jan 2007
	11	7,000 m <sup>3</sup>	May 2009
	12	7,000 m <sup>3</sup>	Sep 2011
	13	7,000 m <sup>3</sup>	Jul 2013
	14	7,000 m <sup>3</sup>	Jul 2013
Steam Generator Storage Building	1	24 units	Jan 2007
Retube Component Storage Building	1	192 containers	Jan 2007
Quadricells		360 m <sup>3</sup>	Oct 1978
Contaminated Tool Storage Area		4,700 m <sup>2</sup>	Sep 1990
<b>In-Ground Structures</b>			
Trenches	Stage 1	2,080 m <sup>3</sup>	Dec 1974
	Stage 3	1,440 m <sup>3</sup>	Mar 1976
	Stage 3E	2,350 m <sup>3</sup>	May 1979
Tile Holes	Stage 1	80 m <sup>3</sup>	Mar 1974
	Stage 3	144 m <sup>3</sup>	Jun 1977
In-Ground Containers	Type (#)		
	IC-2 (20)	40 m <sup>3</sup>	Dec 1985
	IC-12 (20)	240 m <sup>3</sup>	Mar 1987
	IC-18 (8)	144 m <sup>3</sup>	Jun 1989
	IC-18 (32)	576 m <sup>3</sup>	Dec 1990
	IC-18 (54)	972 m <sup>3</sup>	Oct 1993
	IC-18 (50)	900 m <sup>3</sup>	May 1997
	IC-18 (54)	972 m <sup>3</sup>	Feb 2002
In-Ground Heat Exchanger Containers (IC-HXs)	IC-18 (54)	972 m <sup>3</sup>	Jul 2013
	Area 1, Phase 1	23	1991
	Area 1, Phase 2	4	1993
	Area1, Phase 3	10	1997
	Area 2, Phase 4	4	2002
<b>Processing</b>			
Waste Volume Reduction Building	n/a	n/a	1977
• Renovations & Upgrades			2002
Radioactive Incinerator	n/a	n/a	1977 - 2001
• Replacement			Dec 2002
Box Compactor	n/a	n/a	
• B-400 Box Compactor			1993 – 2010
• B-1000 Box Compactor			2011
<b>Amenities Building</b>			Dec 2001
<b>Transportation Package Maintenance Building</b>			Dec 2004

**Table 3: Chronology of Development for Used Fuel at WWMF**

Building	Number	Capacity	In-Service Dates
Processing Building			Oct 2002
Storage Building	#1	500 DSCs (nominal)	Oct 2002
	#2	500 DSCs (nominal)	Dec 2007
	#3	500 DSCs (nominal)	Dec 2012
	#4	500 DSCs (nominal)	Dec 2012

### 1.3 Management of Low and Intermediate Level Radioactive Waste

Figure 5 shows the flow of radioactive waste starting from generation at a nuclear facility through to packaging and transportation, processing and interim storage at WWMF, to ultimate disposal. This licence application pertains only to the section related to the processing (Sections 1.3.3 and 1.4.2) and interim storage (Sections 1.3.5 and 1.4.3) under the WWMF Waste Facility Operating Licence. The three areas shaded in gray: Generation (Section 1.3.1), Packaging and Transportation (Section 1.3.2), and Disposal (Section 1.6) are briefly described here for context, but are outside the scope of this licence application.



**Figure 5: Waste Management of L&ILW and Used Fuel**

### 1.3.1 Generation of L&ILW

During normal operations involving radioactive work at the NGSs, solid waste (e.g. protective clothing, cleaning material, bags, containers, etc.) is generated which becomes contaminated with radionuclides. L&ILW is collected from waste receptacles throughout the stations. The Active Waste Program provides three receptacles for this waste: Active, Active Metal and Likely Clean. Bags of waste are taken from these receptacles.

Active waste is checked for tritium and gamma; that information is then transferred onto a Radioactive Material Tag, which is attached to the radioactive waste bag. The radioactive waste bag is then segregated either into an incinerable, compactable or non-processible shipping container, then shipped to WWMF for processing.

Active metal bags are checked for tritium and gamma; that information is then transferred onto a Radioactive Material Tag, which is attached to the bag or item. The bag or item is then placed into a non-processible radioactive shipping container, and then shipped to WWMF for storage.

The Likely Clean waste is monitored for tritium, alpha, beta, and gamma emitters. If it is determined that the waste is radioactive, it is monitored and transported off-site as active waste for processing at the WWMF. Non-radioactive or radioactive material below the acceptance waste criteria and in accordance with the *Nuclear Substance and Radiation Devices Regulations* is sent for disposal at licensed landfills.

### 1.3.2 Packaging and Transportation of L&ILW

In a typical year OPG completes approximately 700 truck shipments of radioactive materials. Many of these shipments are from Pickering and Darlington NGSs to the WWMF. All shipments are carried out in accordance with federal and provincial regulations for the transportation of radioactive materials.

The type of packaging used for transportation of radioactive material as described in Section 2.11 Packaging and Transportation is dictated by the CNSC's *Packaging and Transport of Nuclear Substance Regulations* and Transport Canada's *Transportation of Dangerous Goods Regulations*. Package types can range from industrial packaging such as boxes to more rugged Type B packages, depending on the radiological hazard.

All LLW is currently transported in packages from Pickering and Darlington NGSs to the WWMF inside exclusive-use, standard, 12m (40 ft) road trailers and Industrial Package (IP)-2 freight containers that meet CNSC transportation package requirements. Intermediate level waste is transported in Type B packages, which are designed to withstand severe accident conditions and have received a package design approval certificate from the CNSC.

A range of safety measures are used to ensure prevention of a release of radioactivity from a transportation accident involving a shipment of low and intermediate level waste:

- Meeting the regulatory requirements on the design of the transportation packages used to move L&ILW waste between sites;

- OPG's existing transportation program;
- Operating experience from more than 45 years of transporting radioactive materials;
- Training of personnel involved with transportation; and,
- A Transportation Emergency Response Plan.

OPG has been safely transporting radioactive materials for over 45 years, and has never had an accident resulting in a radioactive release or serious personal injury. OPG drivers transporting radioactive materials have an excellent safety record on the roads and have travelled over 3 million kilometers during the last 9 years without any at fault incidents.

### **1.3.3 Processing of L&ILW at WWMF**

As shown in Figure 5, processing of radioactive waste is a licensed activity under the WWMF licence. As discussed in Section 1.3.1, LLW that is generated at the nuclear facilities is segregated at the source into processible (for incineration or compaction) or non-processible wastes prior to being transported to the WWMF (Figure 6). All incoming L&ILW received at the WWMF must meet the waste acceptance criteria.

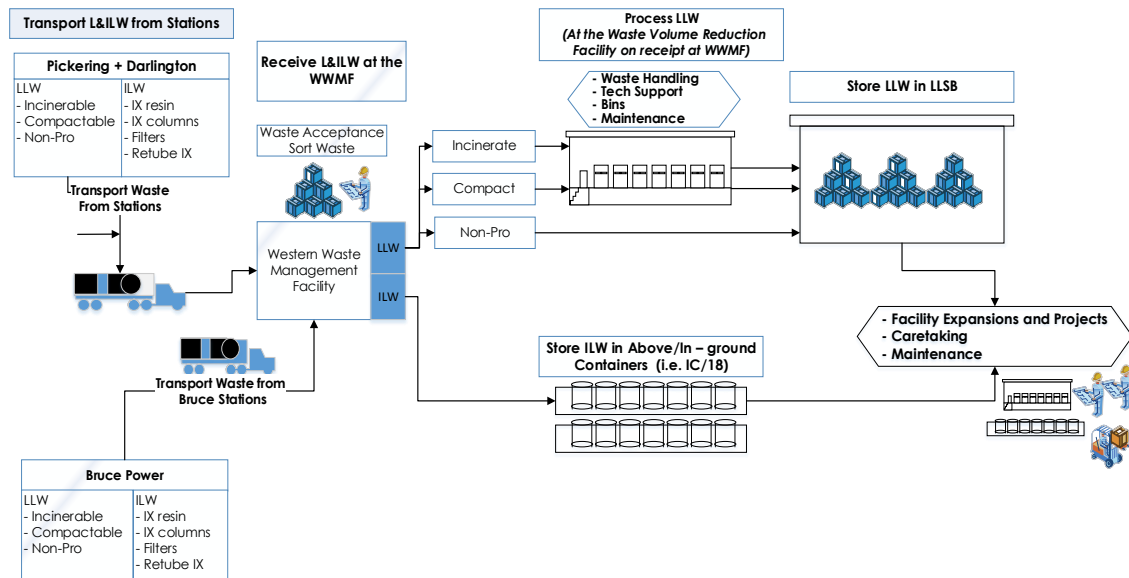
For processible wastes, volume reduction involves processing waste into a smaller volume, either through incineration or compaction, to reduce the handling and storage requirements, and to minimize future disposal needs. About 60% of all LLW sent to the WWMF is either incinerated or compacted at the WVRB. Non-processible LLW received at the WWMF is further sorted prior to it being sent to an LLSB for interim storage.

ILW is packaged in Type B transportation packages or disposal ready waste containers, transported to WWMF and sent directly to an above ground storage building, or an in-ground structure for interim storage.

Incinerable wastes are volume-reduced in a batch controlled air incinerator. The incinerator is designed to accept bagged and boxed solid wastes with a maximum dose rate of 0.60 mSv/h on contact and 100 MPCa (maximum permissible concentration in air) tritium, and it can burn up to 2,270 kg of waste per day. It provides a high volume reduction factor, currently 37:1, and produces a stable waste material in the form of ash. The ash is discharged into 2.5 m<sup>3</sup> rectangular metal containers, and the ash-filled containers are then sent to an LLSB and stored on site.

The high temperature exhaust gas stream from the incinerator is cooled using a spray cooler. Powdered hydrated lime is injected into the cooled exhaust gas stream to neutralize acid gases such as hydrogen chloride and sulphur dioxide. Activated carbon injected into the gas stream adsorbs heavy metals and the unburned organic compounds to transfer them from gas phase to solid phase. The baghouse particulate filtration system then removes all solid phase materials from the gas stream. A small amount of ash is collected in the incinerator's baghouse filter which is placed in a separate ash bin, and sent to storage on site.





**Figure 6: L&ILW Operations Process**

Air emissions from the incinerator are continuously monitored and have always been within regulatory limits, as described in Section 2.9.2. The incinerator currently operates under an Ontario Ministry of Environment and Climate Change amended Environmental Compliance Approval (ECA #8047-8GLPAM, dated May 10, 2011) with concurrence by the CNSC.

The box compactor is designed to compress dry radioactive waste, up to a maximum 2 mSv/h on contact, into stackable steel boxes, that are approximately 2.5 m<sup>3</sup> in volume. The compressed waste is retained in the steel box by integral anti-spring back devices and a steel lid. These stackable boxes are removed from the box compactor by forklift truck and transferred to a storage building. This compaction process produces a net volume reduction factor of approximately 5:1.

Non-processable waste received in containers suitable for direct storage are transferred by forklift truck from the WVRB to an above-ground storage building or an in-ground structure. All storage containers for L&ILW are monitored and assigned unique bar-codes for waste tracking purposes.

The floor drainage within the WVRB is treated as potentially radioactive, and is drained to an active drainage holding sump located in the radioactive incinerator room (Figure 7). The sump is sampled and analyzed for radioactivity and chemical characterization. Depending on the radioactivity concentration, the sump is pumped either to the sewage system or into a tanker for transfer to the Bruce NGS active liquid waste management system.

An inactive drainage holdup sump is located in the compactor area. Access to the sump is sealed to minimize possible contamination. The inactive sump discharges to a lift station and is then discharged to the site sewage processing plant.

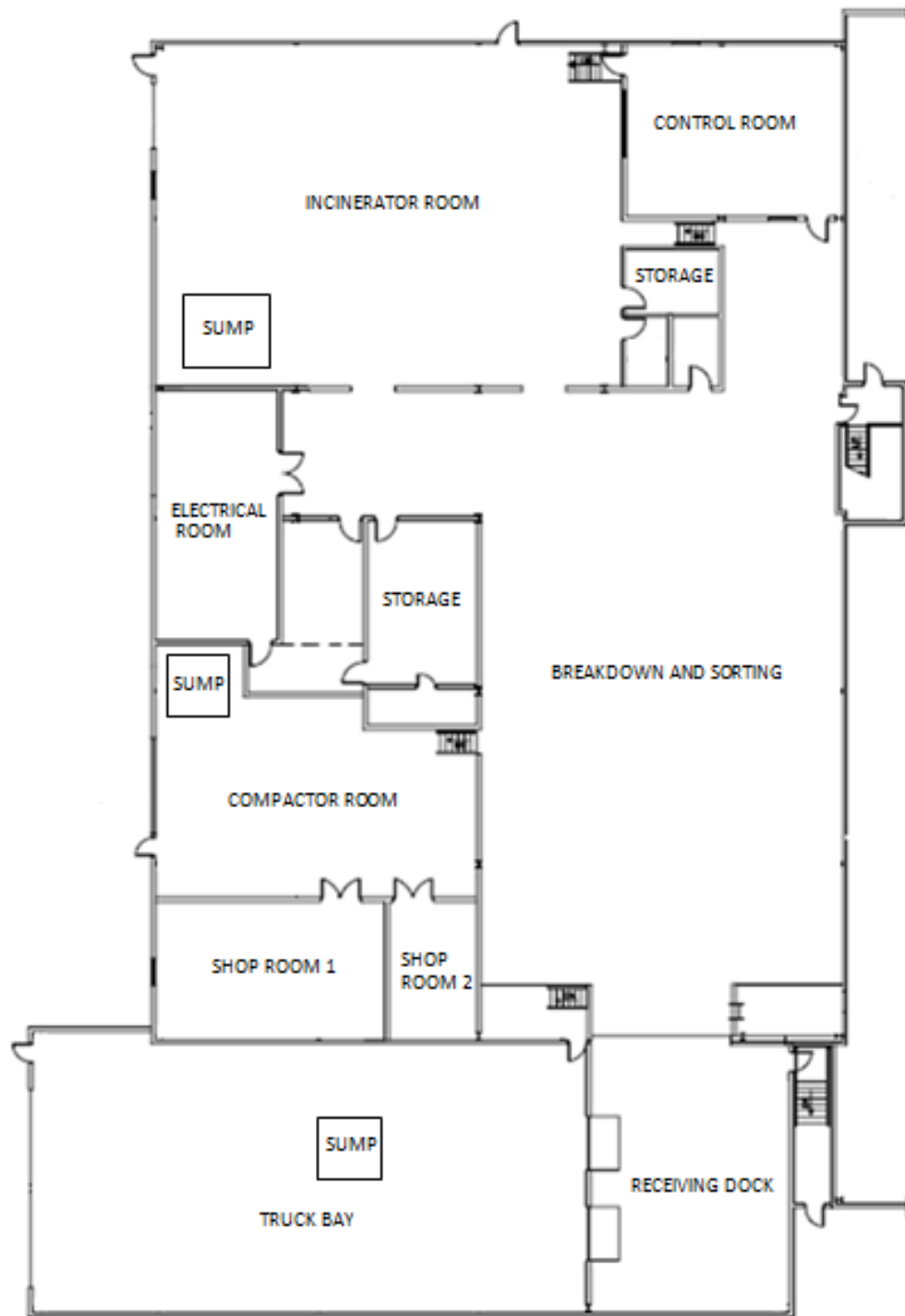


Figure 7: Layout of WVRB

#### **1.3.4 Additional Processing Capability during the Next Licensing Period**

##### **(a) Large Object Processing Building**

OPG is considering the construction and operation of a Large Object Processing Building for the processing of large metallic components such as steam generators or large heat exchangers. The Large Object Processing Building would be a single-story structure with a robust floor capable of supporting a rail-mounted gantry crane. Conceptually the processing facility would utilize prefabricated pre-stressed concrete, similar to the existing storage buildings for L&ILW. Operations within the building would include segmenting activities such as cutting and grinding as well as packaging activities.

The primary function of the large object processing building would be to safely process the steam generators and other large components into segments, and to be able to eventually place these segments in the L&ILW Deep Geologic Repository (DGR). The processing of the large components would also enable OPG to remove and recycle elements of these components that are not radiologically contaminated. The remaining segments will be required to meet the DGR waste acceptance criteria. The potential location for the new Large Object Processing Building is inside the current licensed area of WWMF, and the planned construction date would be 2 to 3 years in advance of the in-service date of the L&ILW DGR.

##### **(b) Waste Sorting Building**

The existing WWMF licence allows for the retrieval and reprocessing of L&ILW, including sorting, processing and/or diversion to conventional disposal or free release, subject to meeting the established clearance level. OPG is planning on constructing and operating a building specifically for this purpose in order to lower the volume of L&ILW stored on site. The building will be approximately 2,500 m<sup>2</sup>. The potential location of the new Waste Sorting Building is inside of the current licensed area, near the WVRB.

#### **1.3.5 Storage Facilities for L&ILW at WWMF**

Since storage operations began at the site in 1974, there has been an evolution in storage structure designs to incorporate a smaller footprint, better efficiency and more robust designs. Initially all wastes were placed in small capacity in-ground structures. The modular nature of the storage structures incorporated improvements in the design and construction techniques to be included in each evolution. All storage structures are designed to match the physical and radiological characteristics of the waste being stored.

Table 2 lists the principal storage structures being used and the volumes of waste that are stored in each type of structure. The following sections describe the structures that are used for interim storage.



### 1.3.5.1 Above-ground Storage Buildings

There are currently sixteen above-ground storage buildings for L&ILW located at WWMF. Fourteen of these storage buildings are used to accommodate low level waste, one storage building is for steam generators, and another storage building is for retube components from Bruce Power NGS.

#### (a) Existing Low Level Storage Buildings

As mentioned above, there are currently fourteen low level waste storage buildings in operation at WWMF. An above-ground LLSB is a warehouse-like building (Figure 8, Figure 9 and Figure 10) used to store LLW with contact radiation fields less than 10 mSv/h at 30 cm. The approximate building dimensions are 50 m long by 30 m wide by 8 m high, and each building can store about 7,000 m<sup>3</sup> of waste.



Figure 8: Low Level Storage Building

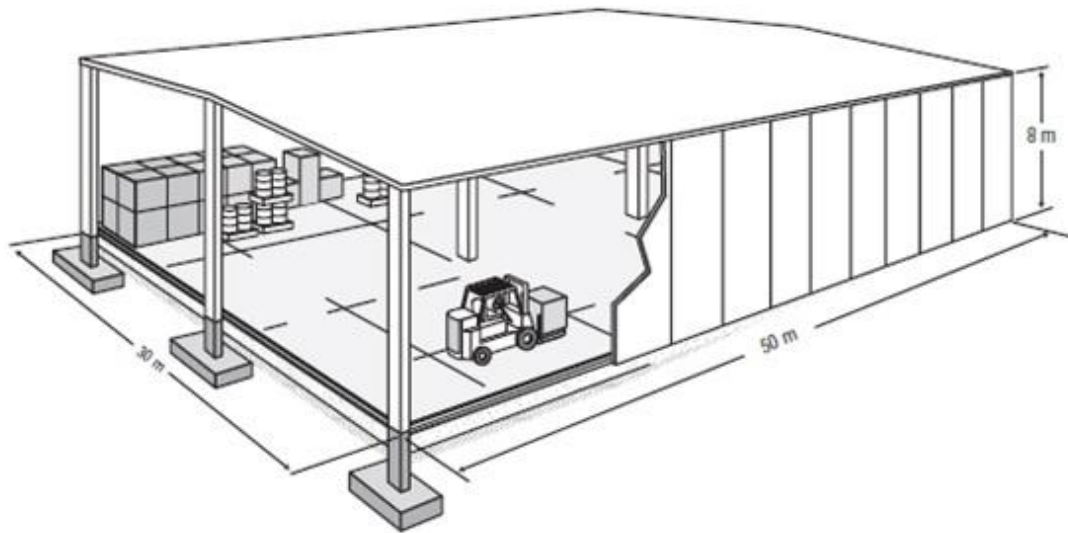


Figure 9: Cutaway of an LLSB

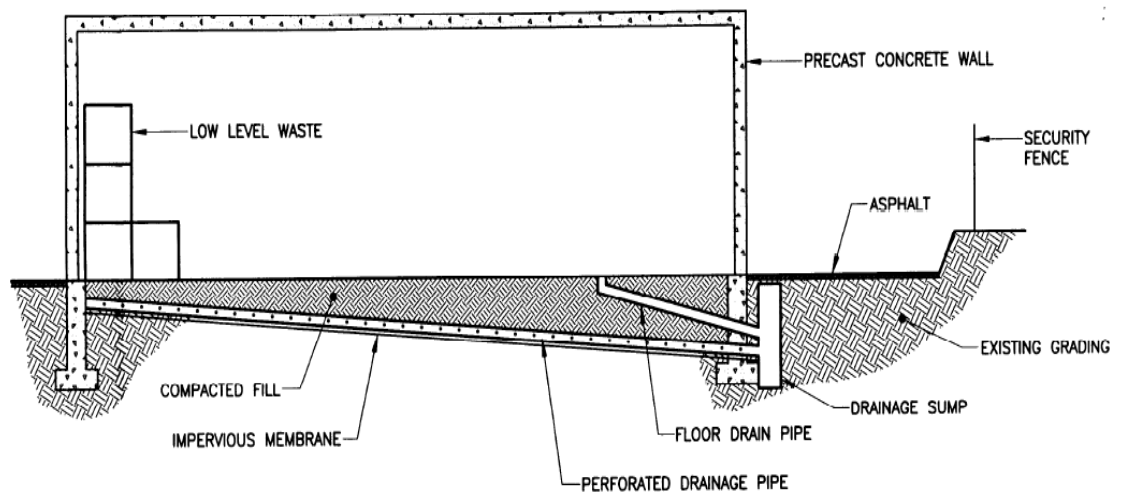


Figure 10: Typical LLSB Layout

LLSBs are constructed in accordance to the *National Building Code of Canada*, and the *National Fire Code of Canada* in accordance with the licence requirements in place at the time. They are constructed using prefabricated, pre-stressed concrete panels, which are joined with an overlap to prevent any radiation streaming between the panels. The panels are 38 cm thick and can be removed from the structure to allow for waste retrieval and dismantling of the storage structure. The concrete roofs of the LLSBs vary in thickness from 10 cm to 16 cm to meet radiation shielding requirements. The LLSB floor is constructed of poured concrete.

The buildings are unheated and are provided with a gaseous carbon dioxide fire extinguishing or suppression system, fire detection system and internal fixed lighting. A geomembrane liner and water collection system is also provided directly below the LLSBs for floor and sub-floor drainage. The drainage lines are directed to a sump where water can be collected, sampled and, if necessary, treated prior to discharge.

The freestanding stackable steel containers for LLW are stacked to heights of 6 m (4 to 6 containers high) inside the LLSBs. Either a conventional forklift for the lower tier packages or a special boom-based heavy forklift for the upper tiers is used to stack waste packages in the LLSBs.

With CNSC approval, a Liquid Waste Area can be constructed within an LLSB to facilitate the storage of liquid waste. The Liquid Waste Area is isolated by way of a curbed dyke, and the dimensions can be altered to suit the volume of liquid waste that is stored. The curbed area is sealed with a plastic liner to contain any liquid that may leak or spill. Liquid waste is stored in suitable containers. It is solidified before storage, or incinerated in the case of waste oils.

#### **(b) Steam Generator and Retube Waste Storage Buildings**

WWMF currently has one storage building to store steam generators and another storage building to store retube waste in retube waste containers from the refurbishment of Bruce Power Units 1 and 2 (Figure 11 and Figure 12). The design requirements of the steam generator and retube waste storage buildings are generally the same as the low level storage buildings described above. The Fire Hazard Assessment considered the storage of metal components within metal containers, and determined that a carbon dioxide fire suppression (or extinguishing) system was not required for these buildings.

The available space within these structures will continue to be used to satisfy the waste arising from the Bruce Power Major Component Replacement program. As that effort progresses, OPG expects to construct additional buildings for retube waste containers and for steam generators. Where practical, OPG will use any available space in these buildings to store other non-combustible low and intermediate level waste.



**Figure 11: RWC Storage at WWMF**



**Figure 12: Storage of Steam Generators**

**(c) Quadricells**

There are currently fifteen reinforced concrete quadricells at WWMF (Figure 13). Quadricells are designed to store operational ILW e.g. spent resin liners. Each quadricell has a 24 m<sup>3</sup> storage capacity which provides a total storage of 360 m<sup>3</sup> of waste.

Thirteen quadricells are filled, and there have been no additions to the quadricells since 1989. Two quadricells remain empty as reserve. There are no plans to construct additional quadricells.



**Figure 13: In-ground Containers (foreground) and Quadricells (background)**

**1.3.5.2 In-Ground Storage**

**(a) In-Ground Containers**

The design of in-ground containers has evolved from small capacity 1 m<sup>3</sup> precast concrete tile holes to large capacity 18 m<sup>3</sup> prefabricated in-ground steel liners. The early tile holes were constructed by digging a trench to the required depth, pouring a concrete slab, setting the sampling pipes, and then backfilling the area around the sampling pipes. Most of the tile holes are fitted with a retrievable steel liner into which the waste was placed. A subsurface drainage system is located at the base of the tile holes to prevent water from accumulating around the tile hole and to provide a means of detecting leakage. There are 224 tile holes in service and OPG has no plans to construct additional tile holes.



In more recent years, the “IC” series of in-ground containers have been used to store both low and intermediate level waste. The containers have storage capacities of 2 m<sup>3</sup> (IC-2), 12 m<sup>3</sup> (IC-12) and 18 m<sup>3</sup> (IC-18) with the majority of the containers being IC-18s (Figure 13). There are currently 20 IC-2s, 20 IC-12s and 252 IC-18s on site. The IC-12s and IC-18s are designed to accept intermediate level waste, e.g. ion exchange (IX) resin containers.

Except for size, the main design features of the IC series of structures are similar (Figure 14). Each structure has an outer carbon steel liner that is leak-tested before installation. The IC-18s can be fitted with different types of inserts to allow other wastes, such as reactor core components, to be stored. Figure 15 shows the loading of an in-ground container.

There is an interspace between the waste package and the outer fixed liner. This interspace is sampled to detect possible water ingress by using a sampling pipe attached to the exterior of the IC-18 liners. This pipe permits access to the space between the waste-packaging container and the IC-18 liner for periodic sampling and monitoring without removing the shielding cover. A pump can be lowered to the bottom of the IC-18 sampling pipe for water removal, if water is detected. Waste can be retrieved by directly lifting the waste packages out of the in-ground containers.

In the past, OPG stored waste heat exchanger tube bundles from moderator, primary heat transport and auxiliary systems in in-ground containers, known as IC-HXs. There are currently 41 in-ground containers for heat exchangers (IC-HXs) at WWMF, with the last one constructed in 2002. The diameter and depth of the augured holes can be altered to suit the various sized containers.

#### **(b) Concrete Trenches**

Concrete trenches are in-ground structures that have been designed to accept operational L&ILW such as drummed waste and waste of irregular shapes with radiation fields up to 150 mSv/hr. Most of the trenches are approximately 40 m long by 4 m wide and 3 m deep, and are divided into 3 compartments. The trench walls are 38 cm thick and the in-ground portions of the exterior walls are waterproofed with emulsified asphalt. The bottom of each trench compartment slopes to a sump and standpipe to permit water detection and removal (Figure 16). The technology evolved over time so some design details vary (see Figure 16 a, b). After the waste is placed into the trench, 30 cm precast concrete lid caps with neoprene gaskets are placed on the trenches. The total capacity of the 15 in-ground trenches is approximately 5,800 m<sup>3</sup>. There are no plans to build additional trenches.

The surrounding ground surface is graded to direct surface water away from the structures. There is a drainage system adjacent to and underlying each trench. The drainage systems prevent the accumulation of water between the concrete storage structures and the surrounding low-permeability silt till deposit. The drainage systems also provide a convenient means of detecting and controlling any potential leakage of contaminated water from the storage structures.

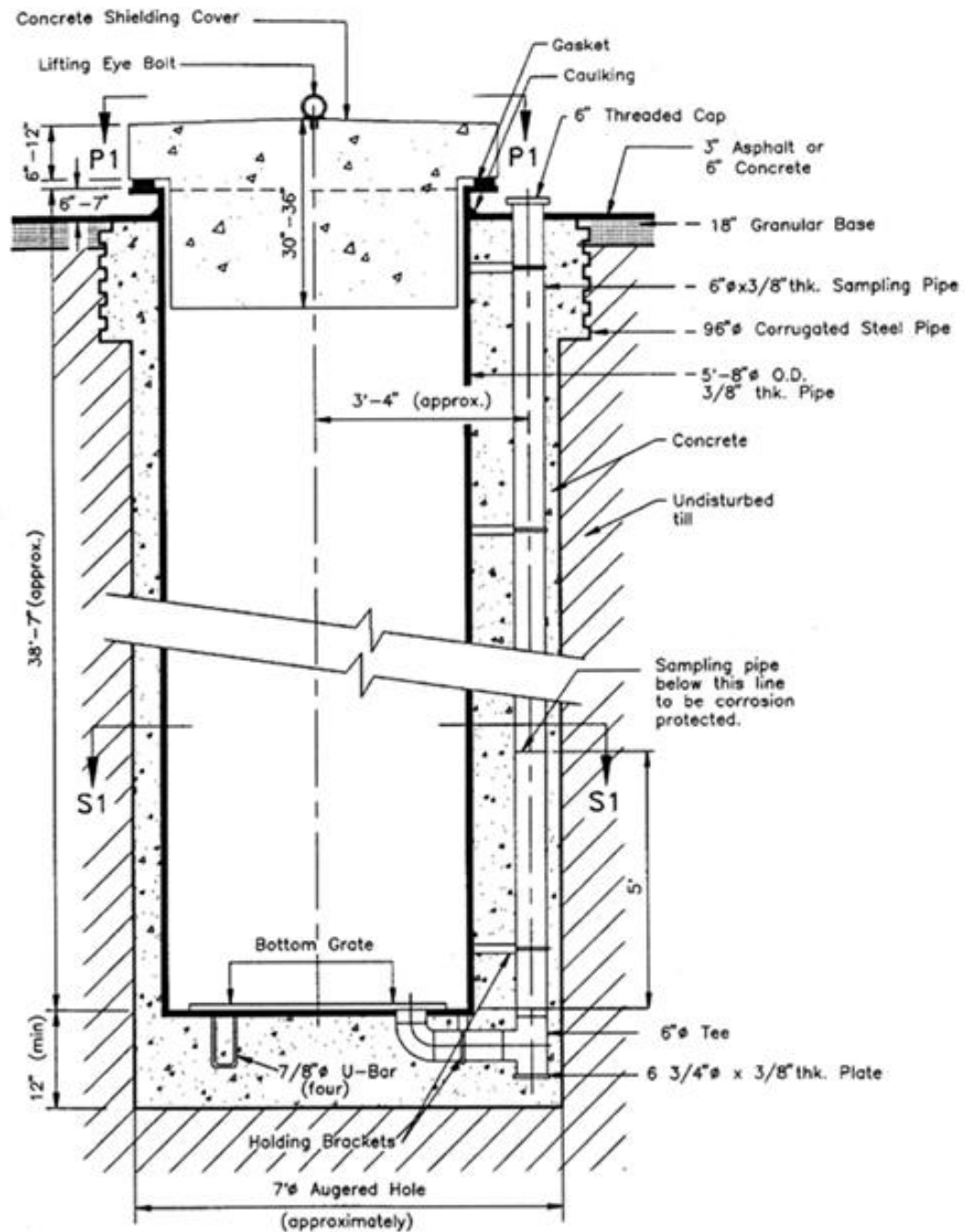
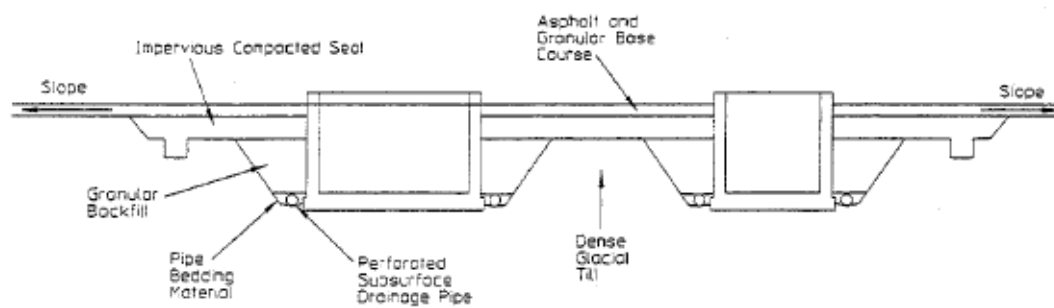


Figure 14: Cross-Section of IC-18

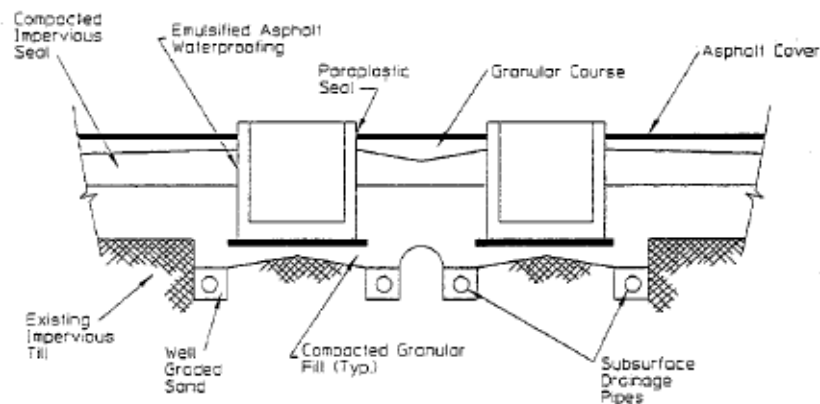


Figure 15: Loading an IC-18





(a) STAGE 1 TRENCHES



(b) STAGE 3 and 3E TRENCHES

Figure 16: Sectional View of Subsurface Drainage and Backfill Material around Trenches

### 1.3.6 Additional Storage Buildings and Structures for L&ILW during the Next Licensing Period

#### (a) Additional above-ground Storage Buildings

Over the next licensing period, OPG plans to construct up to 11 above-ground storage buildings, summarized in Section 1.7, to accommodate L&ILW.

- Five of the eleven storage buildings are approved in the current licence, and OPG is requesting that they be carried over into the next licensing period. The planned location for these L&ILW storage buildings is the north area as shown in Figure 1 and in Figure 17.

- Two other storage buildings were assessed in previous environmental assessments as described in Section 3.1, but not included in the current licence. One of the buildings was assessed in the LLSB 9-10-11 Environmental Assessment using the open space between LLSB 1 and 9 and east of LLSB 6 (see Figures 4 and 17), and the other building was assessed in the Refurbishment Waste Storage Environmental Assessment as one of the six storage buildings in the north area, as shown in Figure 17 [R1; R2]. OPG is requesting that these two buildings be included in the licence.
- Because of land constraints on the WWMF, OPG will need to construct four additional storage buildings outside the current licensed area - either in the construction laydown area or woodlot (Figure 1). A predictive effects assessment has been conducted to identify the impacts to human and non-human biota, and is described in Section 3.1.

OPG's strategy of constructing buildings as needed means the specific siting of these buildings will be determined at a later date. Currently, four areas are being considered - two areas are within the current WWMF (north area, and the northeast area as shown in Figure 1) and two areas are outside the WWMF (construction laydown area, and the woodlot area as shown in Figure 1). The north area within WWMF will be developed first for the construction of storage buildings for low and intermediate level waste. This area has already been EA assessed and approved [R1]. Once the land space within WWMF is filled, OPG plans to construct the additional storage buildings for L&ILW in either one of the two locations (construction laydown area and/or woodlot shown in Figure 1) outside the WWMF licensed area.

The same activities will occur in these buildings as are allowed under the current licence. No significant changes are anticipated in the designs that have been previously approved for similar structures on site. The storage buildings for L&ILW will utilize existing design requirements for LLSB, RCSB or the SGSB. However, the design requirements will be updated to meet current codes and standards, incorporate any lessons learned from the previous design, meet site specific constraints and incorporate any operational improvement requirements. They will also meet regulatory dose requirements at the facility fence, and at the Bruce site boundary fence.

In order to allow operational flexibility, and to utilize existing space within all the above-ground storage buildings for L&ILW, OPG may store compatible waste types in these buildings. These buildings will be referred to as Multi-Purpose Storage Buildings. In addition, one of the existing LLSBs or one of the new LLSBs may be repurposed and used as a staging and overpacking area for LLW before it is transferred to the L&ILW DGR.

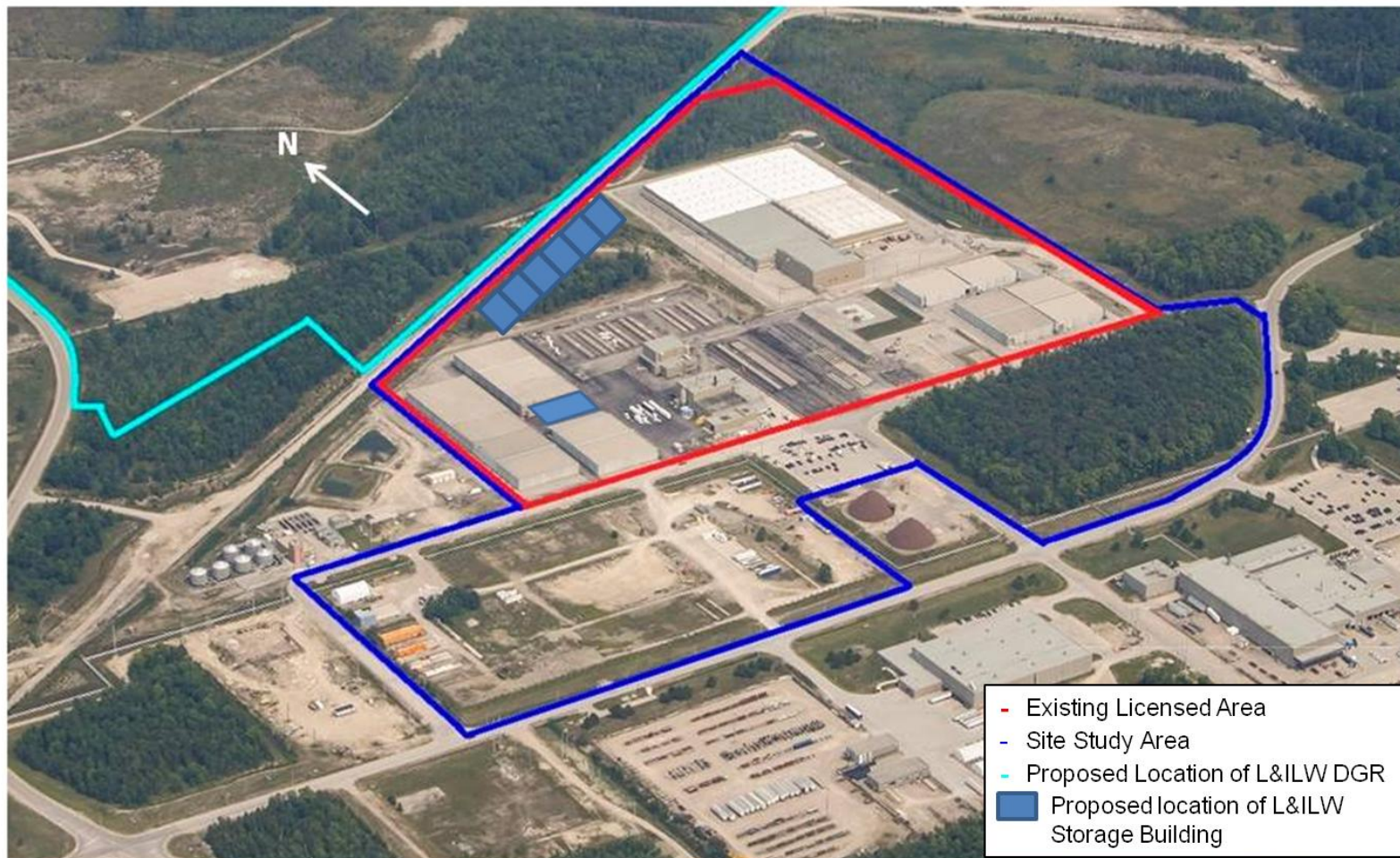


Figure 17: Location of Storage Buildings for L&ILW

Based on projected L&ILW forecasts, the 11 new storage buildings will be used to accommodate LLW, steam generators (and potentially pre-heaters and heat exchangers), retube component wastes (including pressure tubes, calandria tubes, end fittings and shield plugs, spacers), and other compatible wastes. The timing of the construction of the buildings is dependent on the timing and volume of waste expected to be received from the stations. OPG makes decisions on when to construct new buildings approximately 5 years before they are required to ensure sufficient time in advance of the use of the existing available storage space, to allow for the design, site preparation and construction activities.

#### **(b) Additional In-Ground Containers**

##### **IC-18s**

The scope of the project for the Radioactive Waste Operations 2 Environmental Assessment conducted in 2001 included the construction of 108 IC-18s [R3], which are included in the current licence and have been built.

In 2006, OPG conducted the Refurbishment Waste Storage Environmental Assessment, as described in Section 3.1. The scope of the project included 270 IC-18s (5 batches of 54 IC-18s). To align with this Refurbishment Waste Storage environmental assessment which was accepted by the CNSC, OPG is requesting that the 270 IC-18s be included in the next licence.

##### **In-Ground Container – Heat Exchangers (IC-HX)**

In 2006, OPG conducted the Refurbishment Waste Storage Environmental Assessment, as described in Section 3.1. The scope of the project included 30 IC-HXs. To align with this Refurbishment Waste Storage Environmental Assessment, which was accepted by the CNSC, OPG is requesting that the construction of 30 IC-HXs be included in the next licence.

#### **1.4 Management of High Level (Used Fuel) Waste**

The Used Fuel Dry Storage Facility (UFDSF) is a security-protected area located northeast of the L&ILW storage facility area, and consists of a DSC processing building and four (4) storage buildings designed to provide interim storage space for up to 2,000 DSCs (about 768,000 bundles) for used fuel generated by Bruce Power NGS. The UFDSF was placed in service in October 2002 and received the first DSC from Bruce Power NGS in February 2003 (Table 3). A second DSC Storage Building was placed into service in 2007, and two additional storage buildings were constructed and placed into service in 2012. As of the end of 2015, 1,145 DSCs have been safely stored in the DSC storage building at the WWMF. Based on contractual agreements with Bruce Power to process up to 130 DSCs per year, OPG expects that the next storage building will be needed by 2019.

#### **1.4.1 Dry Storage Containers**

A DSC is a free standing reinforced concrete container with an inner steel liner and an outer steel shell, for the storage and on-site transfer of used CANDU fuel. It is made of two sub-assemblies, a lid and a base. The base provides the storage space for the used fuel.

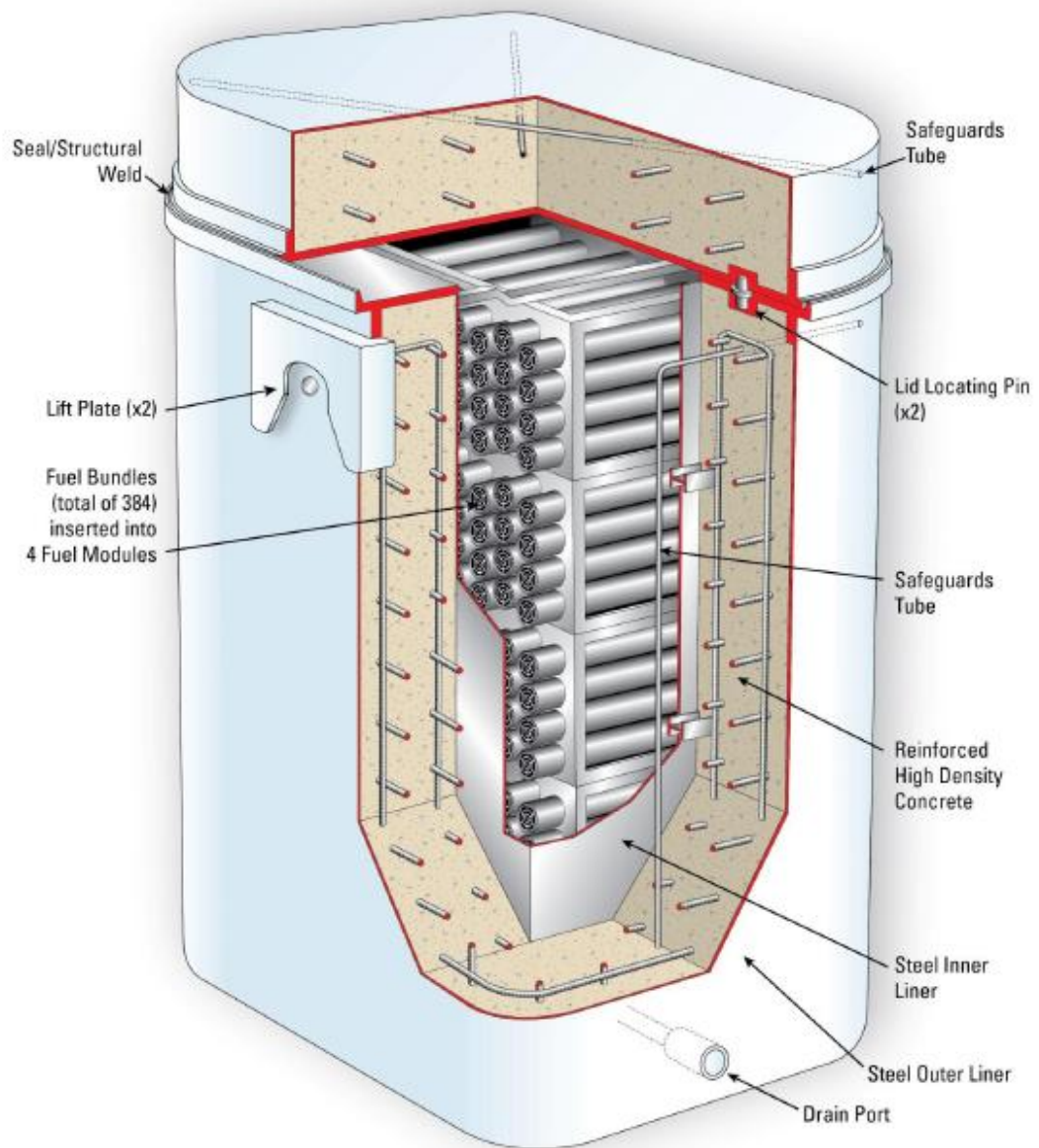
The DSC MKII constitutes the reference container design for the WWMF. The DSC is a double-shell rectangular container, with exterior dimensions of 2.121 m x 2.419 m by 3.557 m in height (including the lid), and an inside cavity of 1.046 m x 1.322 m by 2.520 m. The nominal thickness of each carbon-steel shell is 13 mm. The DSC walls consist of 520 mm (nominal thickness) concrete placed between the inner liner and the outer shell. The reinforced high-density concrete provides radiation shielding and structural strength while maintaining adequate used fuel decay heat dissipation. The concrete has a density in the range of 3.5 to 3.7 Mg/m<sup>3</sup> and a compressive strength of at least 40 MPa. The maximum total mass (including the lid of 11 Mg) is approximately 60 Mg when empty and approximately 70 Mg when loaded with four modules (384 used fuel bundles).

All welds that form this containment system and all welds attaching items to the containment system are classified as “Nuclear Welds”. Helium is used as the inert cover gas in the DSC cavity to protect the fuel bundles from potential oxidation reactions and to facilitate leak testing of the containment boundary.

The DSC is designed with the provision for installing safeguards seals. Two separate U-shaped 25.4 mm outer diameter stainless steel tubes are embedded in the DSC walls and floor in the plane of the outer reinforcing grid. These tubes are placed so that each tube runs across the centre of opposite container walls. Two similar tubes are embedded in the DSC lid and run diagonally across the lid. The configuration of the safeguards tubes is shown in Figure 18. These tubes are used for attaching two different types of International Atomic Energy Agency (IAEA) seals.

#### **1.4.2 Used Fuel Dry Storage Processing**

The processing of a DSC begins with the preparation of new DSCs at the DSC processing building and ends with the storage of loaded, hermetically sealed DSCs in storage buildings for used fuel. The steps are summarized in Figure 19.



**Figure 18: Dry Storage Container**



# The Used Fuel Dry Storage Process

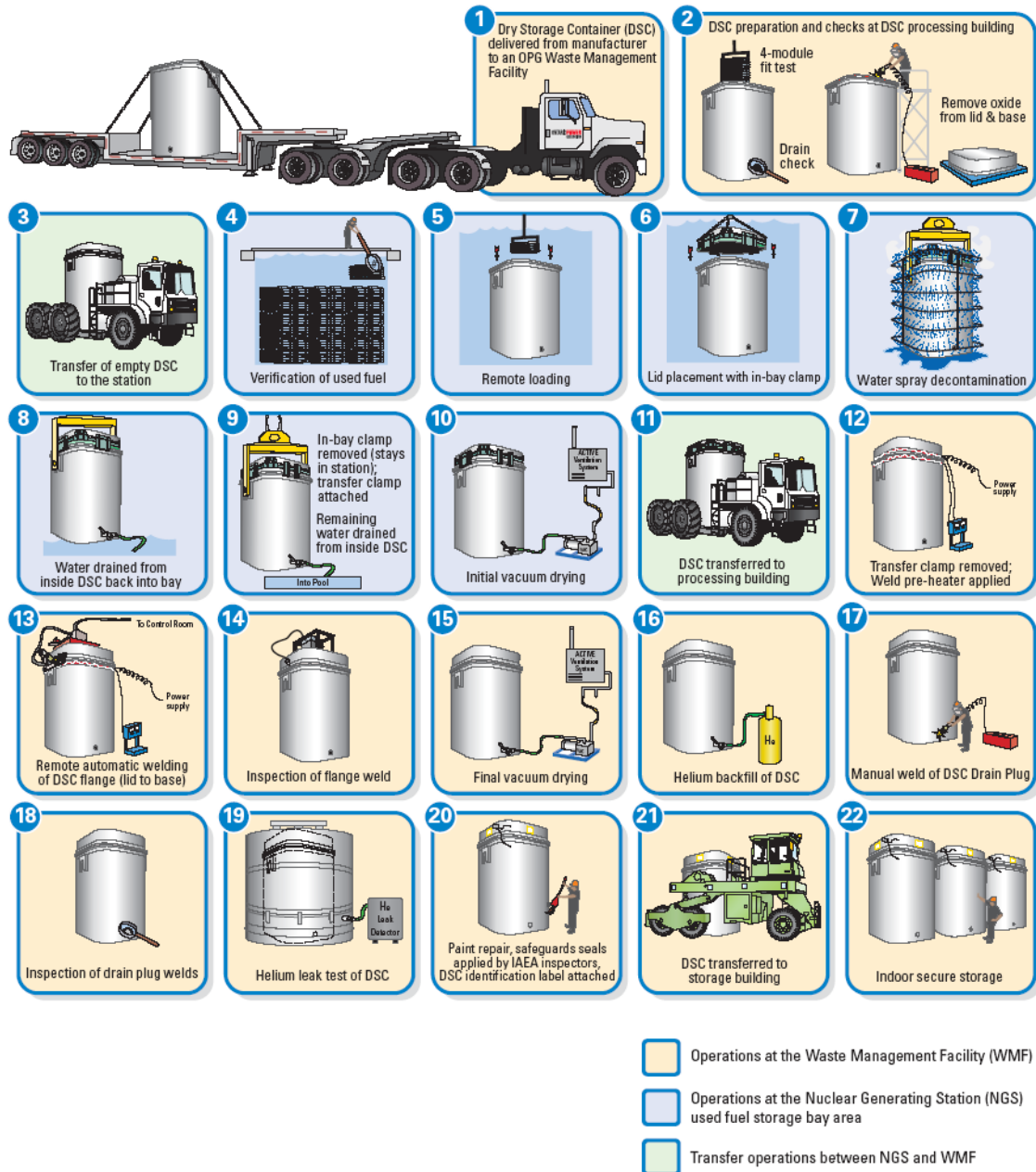


Figure 19: Used Fuel Dry Storage Process

### **Steps 1-3: Preparing and Transferring Empty DSCs**

New, empty DSCs are received from the manufacturers at the DSC processing building, where they are prepared and then transported to the Bruce Power NGS for subsequent loading of used fuel.

One of two vehicles (either the DSC Transfer Vehicle or the DSC Transporter) is used to transfer both new (empty) and loaded DSCs between WWMF and Bruce Power NGS.

### **Steps 4 – 10: Loading a DSC at Bruce Power NGS**

The process of loading, decontamination, draining and initial drying are completed at Bruce Power under their operating licence. At the Bruce Power NGS, after a 96 bundle module has been loaded, it is transferred under water to a DSC. Each DSC is designed to hold four storage modules, each with a capacity to hold 96 bundles, for a total capacity of 384 bundles per loaded DSC.

While the loaded DSC is still submerged in water in the loading bay, the in-bay clamp is used to secure the DSC lid to the container. The DSC is lifted out of the water, then drained and the DSC exterior is decontaminated. The in-bay clamp is replaced with the transfer clamp, and the DSC interior cavity is vacuum-dried in preparation for on-site transfer to the WWMF.

Prior to leaving the NGS, Bruce Power will survey and decontaminate the entire exterior surface of the loaded DSC and its components including lid flange, drain housings, and the transfer clamp to ensure there is no detectable loose contamination as per OPG's Waste Acceptance Criteria<sup>1</sup>.

### **Step 11: DSC transfer between Bruce Power NGS and the DSC processing building at the WWMF**

The Transfer Vehicle or Transporter picks up a loaded DSC from the Bruce Power NGS after confirmation that it meets OPG's waste acceptance criteria. Both the vehicle and the DSC are monitored for contamination and decontaminated, as required, before leaving the station.

The vehicle with a loaded DSC then leaves the station and travels along the Bruce site roads to the WWMF in accordance with security and safeguards requirements for on-site transportation. The maximum lift height required for loading/unloading a DSC is about 0.60 m, which is well within the safety envelope of 2.4 m. When traveling with a DSC, the DSC Transfer Vehicle operates at low speed and has a short stopping distance where stopping is essentially instantaneous. The vehicle is always operated from the cab by a trained vehicle operator.

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<sup>1</sup> The Waste Acceptance Criteria requires that Bruce Power ensure that external dose rates on the DSC are within OPG's specified limits [ $<100 \mu\text{Sv/h}$  (10 mrem/h) on contact on the sides and top;  $<200 \mu\text{Sv/h}$  (20 mrem/h) on contact on the bottom]. Whenever the dose rate exceeds  $15 \mu\text{Sv/h}$  (2.5 mrem/h) at 30 cm, DNWMD shall be notified in advance of the transfer so that necessary precautions can be assessed.



## **Steps 12 - 20: Processing a DSC at WWMF**

The loaded DSC is transported on Bruce site roads to the WWMF Used Fuel Dry Storage area, where it is off-loaded at the DSC processing building for further processing, as follows:

- **Receiving a Loaded Dry Storage Container (Step 12)** - Upon arrival at the DSC processing building, both the vehicle and the DSC are re-monitored for contamination. After the loaded DSC is received at the DSC processing building, the DSC is lifted from the receiving bay floor using the overhead crane and lifting beam and moved into the workshop.
- **Dry Storage Container Lid Seal Welding (Step 13)** - The DSC is moved to a welding station where the DSC drain port transfer plug, transfer clamp and seal are removed and the weld pre-heater is installed. The pre-heater is used to heat the DSC weld flange to a prescribed temperature. At the conclusion of lid welding, the weld machine is removed and the DSC is allowed to cool.
- **Welding Inspections (Step 14)** - The Phased Array Ultrasonic Testing system is used for the inspection of the DSC lid-to-base seal weld. The scanner is mounted on the DSC base's top flange and is held in place by three magnetic wheels. A loading ramp is used to minimize the force required by the operator when engaging and disengaging the scanner. The inspection covers 100% of the weld as well as the Heat Affected Zone. After completion of the lid weld inspection, partially processed DSCs may be transferred to the surveillance area and temporarily stored for up to one year from time of loading.
- **Final Vacuum Drying, Helium Backfill, and Drain Port Seal Welding (Steps 15 – 18)** - After successful completion of the weld inspection, the DSC is lifted into another work station for final vacuum drying and helium backfilling. The lifting beam is removed and the vacuum drying/helium backfilling system connected.
- **Helium Leak Testing (Step 19)** - Helium leak testing is carried out using a vacuum chamber (bell jar). The lid of the bell jar is removed and the seal-welded DSC is lifted into the lower half of the bell jar. The bell jar lid is craned over the DSC and sealed onto the base of the bell jar. Using the vacuum skid, air is first removed from the bell jar and then the helium leak detector is activated. If a leak is detected, the vacuum equipment is removed and remedial work is carried out. A follow-up leak test is then performed.
- **Decontamination, Paint Touch Up and Safeguards Seals (Step 20)** - Exterior DSC surfaces are checked for loose surface contamination at the time of receipt and decontaminated if needed. Areas affected by the welding are cleaned and painted. Touch-up paint is also applied to scrapes or scuffs on the DSC that may have resulted from handling. Painting is carried out in the paint bays. Documentation and identification labelling are completed and permanent safeguards seals are installed in a designated IAEA surveillance area.
- **Dry Storage Container Placement and Storage (Steps 21 and 22)** - The DSC is moved, using the Transporter, to a location in a UFDSB for storage (Figure 20). In the UFDSB, the Transporter unloads the DSC in a designated storage location.



Figure 20: Storage of DSCs

#### 1.4.3 Storage Building for Used Fuel

Each UFDSB is designed to have an approximate area of 5,300 m<sup>2</sup>, and a nominal storage capacity of approximately 500 DSCs. Walls in the storage buildings for used fuel consist of 0.20 m thick precast concrete panels from ground level to a 4.2 m height. Vertical louvres and metal cladding are installed at upper wall elevations. Reinforced concrete floor slabs are designed to accommodate heavy wheel load traffic and the weight of the loaded DSCs. The floors are constructed for long service with minimal maintenance, to retain surface alignment and provide a hard, smooth and durable surface. Floors are sloped to provide drainage to floor drains. The DSC processing building and the UFDSBs are designed to the *National Building Code of Canada* and the *National Fire Code of Canada*.

The building roof has provisions for drainage of rainwater and melted snow. Access to the roof is by the use of an outside, all weather, and permanent stairway. The building is grounded to protect against lightning.

#### **1.4.4 Additional Storage Buildings for Used Fuel during the Next Licensing Period**

For planning purposes, a 12-month in-bay buffer space and a minimum of one core dump emergency reserve space in the station's irradiated fuel bays are assumed. OPG intends to construct four additional storage buildings to accommodate DSCs from Bruce Power NGS, to be located outside of the current WWMF licensed area.

The design of the proposed UFDSBs will be similar to the design of the existing UFDSB design which are approved and in use at all three of OPG's waste management facilities for the storage of DSCs. The UFDSBs will be designed to have an approximate area of 5,300 m<sup>2</sup>, and a nominal storage capacity of approximately 500 DSCs.

Two locations - either in the woodlot or the construction laydown area south of WWMF (shown in Figure 1) are being assessed during the conceptual design study to determine the best location to site the UFDSBs. These buildings will be within a designated secured area as required by the *Nuclear Security Regulations* under the *Nuclear Safety and Control Act*.

The buildings will be designed to ensure that when filled, the dose rate at the facility fence will be less than 0.5 µSv/h (0.05 mrem/hr) on a quarterly averaged basis, and the dose rate at the Bruce site boundary shall be less than 0.010 mSv/year (1.0 mrem/year). Processing activities will continue in the existing processing building located within the existing WWMF. Similar to the Pickering Waste Management Facility, OPG may conduct a campaign to transfer DSCs already processed and stored, from the existing storage buildings (1 to 4), into buildings 5, 6, 7 or 8.

### **1.5 Description of Other Supporting Facilities at WWMF**

#### **1.5.1 Transportation Package Maintenance Building**

The Transportation Package Maintenance Building consolidates many of the maintenance activities at WWMF into one location. The building houses two bays for maintenance work on transportation packages plus control maintenance and mechanical maintenance workshops.

The Transportation Package Maintenance Building includes an area for two trailer bays with a laydown area for the transportation packages, overhead crane and work stations. There is also a bay support area consisting of workbenches, general storage cabinets, hazardous material storage cabinets, and spot decontamination areas.

Radiological emissions from the Transportation Package Maintenance Building are reported along with other WWMF radiological emissions in the WWMF Quarterly Operations Reports.

### **1.5.2 Amenities Building**

The Amenities Building is approximately 1,200 m<sup>2</sup> building and provides entry space, office space, locker and shower facilities, and lunchroom facilities for the WWMF staff.

Office, cafeteria, and associated areas are designated as Zone 1. Zone 1 is a clean area inside the *zoned area* that is considered equivalent to public domain. Locker rooms and associated areas are designated as Zone 2. Zone 2 is an area inside the *zoned area* that is normally free of contamination but is subject to infrequent cross-contamination due to the movement of personnel and equipment from contaminated areas. This zone may also contain enclosed, sealed radioactive systems and sources (i.e., active ventilation ducts, radioactive monitoring pipelines, and constancy check sources).

## **1.6 Long-Term Waste Management**

As shown in Figure 5, the long term management or permanent disposal of L&ILW and used fuel is outside the scope of the WWMF licence renewal application. It is included here to demonstrate OPG's commitment to managing its waste from cradle to grave.

### **1.6.1 OPG's L&ILW Deep Geologic Repository**

OPG assumes that the L&ILW DGR which is currently undergoing an environmental assessment and licensing, will be constructed and become operational near the end of the requested licensing period.

OPG's commitment to safely managing its nuclear waste includes the long-term disposal of L&ILW. An environmental assessment for a project to prepare, construct and operate the L&ILW DGR on the Bruce Nuclear Site within the municipality of Kincardine, Ontario, was conducted. The L&ILW DGR would be designed to manage the L&ILW produced from the continued operation of OPG-owned nuclear generations at Bruce, Pickering and Darlington. Additional information is included in Section 3.1 Environmental Assessment.

### **1.6.2 NWMO Adaptive Phase Management for Used Fuel Deep Geological Repository**

In November 2002, the Canadian Parliament passed the *Nuclear Fuel Waste Act* which provides the legal framework for the Government of Canada to make a decision on the long-term management of Canada's used nuclear fuel. The *Nuclear Fuel Waste Act* required the majority owners of nuclear fuel waste to form a Nuclear Waste Management Organization (NWMO) to study approaches for managing Canada's used nuclear fuel. NWMO is therefore responsible for the long-term management of Canada's used nuclear fuel waste that currently exists and that which will be produced in the future. The NWMO is now implementing the Adaptive Phase Management which involves the siting and development of a deep geological repository for used nuclear fuel.

## 1.7 Summary of Buildings/Structures for Next Licensing Period

Table 4 summarizes previous WWMF Environmental Assessment approvals and WWMF operating licences. The first two columns on the left list the buildings and structures, and show what has already been constructed under the previous licence which expired in May 2007. The middle two columns show what is in the current WFOL which includes what was built up to December 2015 and what was approved under the current licence but which has not yet been built. The last two columns on the right show what was previously approved and being carried over into the next licensing period, and the additional buildings (with planned in-service dates in brackets) that are required to support the refurbishment and continued operation of the Darlington, Pickering and Bruce Power NGSs.

In addition to the buildings and structures carried over from the previous licence, and those already assessed and approved within previously conducted environmental assessments, OPG is seeking approval to accommodate additional storage structures over the next licensing period to 2027. These new structures will provide additional storage capacity for used fuel, and L&ILW, as well as processes to manage the wastes. These activities will not alter the basic purpose and activities associated with the WWMF.

OPG is requesting a renewal of the WWMF WFOL for another ten year term from June 1, 2017 to May 31, 2027. Upon renewal, OPG requests a change to the facilities listed in Appendix C associated with Part IV e) of the current licence for the site preparation, construction or construction modification to include, in total as shown in Table 5, authorization for:

- 4 storage buildings for used fuel dry storage;
- 11 storage buildings for low or intermediate level radioactive waste;
- 270 in-ground storage containers (IC-18s) for intermediate level waste;
- 30 in-ground containers for heat exchangers (IC-HXs);
- Large Object Processing Building; and,
- Waste Sorting Facility.

The planned in-service dates are shown in Table 4 in brackets for each of the buildings and structures to be constructed over the next ten years. These dates would coincide with, and be determined by business decisions.

For the construction of additional L&ILW storage buildings, OPG plans to utilize the north area within WWMF first, and then use areas outside the WWMF licensed area, either in the construction laydown or woodlot areas (Figure 21).

For the siting of the used fuel dry storage buildings, OPG is in the process of assessing both the construction laydown and woodlot areas. The construction laydown area is currently the preferred area to be developed first (Figure 21).

Table 4: Summary of Existing and Planned Storage Buildings/Structures at WWMF

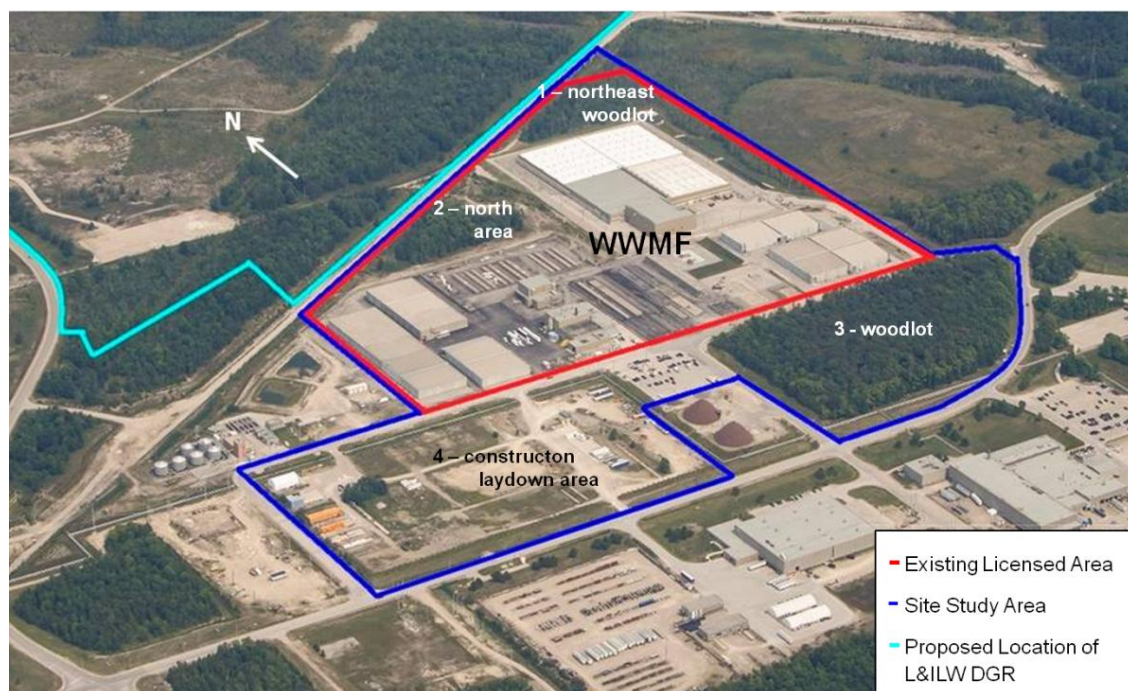
Storage Buildings / Structures at WWMF	Constructed under Previous licence	Current Licence WFOL-W4-314.03/2017* <i>*licensed for 9 additional SB for L&amp;ILW, 108 IC-18, 20 IC-HX and 2 SB for used fuel</i>		Next Licence Renewal (2017 – 2027)	
		Constructed between 2007 – 2015	Buildings Approved, but not yet built (2016 – 2017)	Approved in Previous Licence, not yet built and carried into next licence <sup>a</sup> approved in WFOL-WF-314.03/2017	New Projects to be included in the 2017 – 2027 Licence Period <sup>b</sup> EA assessed, but not in WFOL-W4-314.03/2017 licence <sup>c</sup> In scope of current "PEA"
Storage buildings for used fuel <sup>[R4]</sup>	SB 1 (Oct 2002) SB 2 (Dec 2007)	SB 3 (Dec 2012) SB 4 (Dec 2012)	0	0	<u>4 SBs for used fuel</u> <sup>[R5], c</sup> <ul style="list-style-type: none"> <li>• UFDSB 5 (2019)</li> <li>• UFDSB 6 (2019)</li> <li>• UFDSB 7 (2027)</li> <li>• UFDSB 8 (2031)</li> </ul>
Storage buildings for L&ILW <sup>[R2], [R3], [R4]</sup> (including LLSBs, RCSBs and SGSBs)	LLSB 8 (May 2002) LLSB 9 (Dec 2004) LLSB 10 (Jan 2007) RCSB 1 (Jan 2007) SGSB 1 (Jan 2007)	LLSB 11 (May 2009) LLSB 12 (Sep 2011) LLSB 13 (Jun 2013) LLSB 14 (Jun 2013)	5 SBs for L&ILW →	<u>5 SBs for L&amp;ILW:</u> <sup>[R1], a</sup> →LLSB 15 (2019) <sup>[R1], a</sup> →LLSB 16 (2019) <sup>[R1], a</sup> →RCSB 2 (2020) <sup>[R1], a</sup> →LLSB 17 (2023) <sup>[R1], a</sup> →SGSB 2 (2023) <sup>[R1], a</sup>	<u>2 SBs for L&amp;ILW</u> <sup>[R1], [R2], b</sup> <ul style="list-style-type: none"> <li>• LLSB 18 (2025)</li> <li>• RCSB 3 (2025)</li> </ul> <u>4 SBs for L&amp;ILW</u> <sup>[R5], c</sup> <ul style="list-style-type: none"> <li>• LLSB 19 (2028)</li> <li>• SGSB 3 (2028)</li> <li>• RCSB 4 (2028)</li> <li>• LLSB 20 (2031)</li> </ul>
In-ground containers (IC-18s) <sup>[R1], [R3]</sup>	198 (last batch of 54 built in Feb 2002) <sup>[R3]</sup>	Batch 5 (54 IC-18s built in Jul 2013) <sup>[R1]</sup>	Batch 6 (54 IC-18) →	→Batch 6 (54 IC-18) <sup>[R1], a</sup>	<ul style="list-style-type: none"> <li>• Batches 7 - 10 (216 IC-18) <sup>[R1], b</sup></li> </ul>
In-ground containers (IC-HX) <sup>[R1], [R3]</sup>	41 (last 4 built in 2002)	0	20 IC-HX →	→20 IC-HX (TBD) <sup>[R1], [R3], a</sup>	<ul style="list-style-type: none"> <li>• 10 IC-HX <sup>[R1], b</sup></li> </ul>
Other Structures					<ul style="list-style-type: none"> <li>• Large object processing building <sup>[R5]</sup> (2024)</li> <li>• Sorting Facility <sup>[R5]</sup> (2020)</li> </ul>

**Legend:**

→ Buildings previously approved and carried over into the next licensing period.

**Table 5: Buildings and Structures in Licence and Environmental Assessments**

<b>Buildings/Structures</b>	<b>Number Carried Over from WFOL W4-314.03/2017</b>	<b>Number not in WFOL, but approved in previously conducted EAs</b>	<b>Number of New Buildings/Structures Requested</b>	<b>Total</b>
Storage Buildings for used fuel	0	0	4	4
Storage Buildings for L&ILW	5	2	4	11
In-Ground Containers (IC-18s)	54	216	0	270
In-Ground Containers (IC-HXs)	20	10	0	30
Large Object Processing Building	0	0	1	1
Waste Sorting Facility	0	0	1	1



**Figure 21: WWMF Expansion Areas**

## 2.0 SAFETY AND CONTROL AREAS

### 2.1 MANAGEMENT SYSTEM

The OPG Nuclear Management System defines the organizational structure, roles and responsibilities, applicable program elements, and the interfaces amongst them and applies to all OPG nuclear facilities. The Management System is compliant to the requirements of CSA N286-12 and establishes the processes and programs required to ensure the OPG Nuclear Waste Management organization achieves its safety objectives, continuously monitoring performance against the objectives, and fostering a healthy safety culture. WWMF staff understands and manages work and financial liabilities to accurately plan and forecast expenditures, ensuring value for money.

OPG's key documents for the Management System SCAs and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Nuclear Safety Policy	N-POL-0001	R003
Health and Safety Management System Program	OPG-PROG-0010	R003
Nuclear Management System	N-CHAR-AS-0002	R018
Nuclear Waste Management	W-PROG-WM-0001	R013

#### 2.1.1 Nuclear Safety Policy

OPG's Nuclear Management System receives its direction from the policies set by the OPG Board of Directors.

OPG's Nuclear Safety Policy was established in recognition that nuclear power poses unique hazards due to the enormous energy in the reactor core, radioactive material and decay heat produced by the fuel. OPG's policy objective is the protection of our workers, the public and the environment from these hazards.

The Nuclear Safety Policy sets expectations for all OPG employees. The policy states that:

*"Nuclear safety shall be the overriding priority in all activities performed in support of OPG nuclear facilities. Nuclear safety shall have clear priority over schedule, cost and production."*

To meet this expectation, OPG's Board of Directors establishes that everyone shall demonstrate respect for nuclear safety by:

- Knowing how their work impacts on Controlling power, Cooling fuel and Containing radioactivity (known as the 3 C's);
- Applying Event-Free tools and defences to prevent events; and,
- Reporting adverse conditions so they can be corrected.



It is also an expectation that OPG employees will embrace and exhibit the traits of a healthy nuclear safety culture. Based on industry best practice, the following traits of a healthy nuclear safety culture are included in the Nuclear Safety Policy:

- Personal Accountability
- Questioning Attitude
- Effective Safety Communication
- Leadership Safety Values and Actions
- Decision-Making
- Respectful Work Environment
- Continuous Learning
- Problem Identification and Resolution
- Environment for Raising Concerns
- Work Processes.

These traits are continuously reinforced, promoted, and applied by staff in all work performed. Many of the daily meetings that occur at WWMF involve a discussion of the nuclear safety traits and a sharing of good practice respecting the application of the trait or an experience where application of the trait could have been better utilized.

Other policies set by the OPG Board of Directors are also applicable to operations of the WWMF. For example, the Employee Health and Safety Policy sets the expectations for the protection of workers, across OPG, from the conventional hazards associated with the operation of the facilities, and the Environmental Policy establishes expectations both for the protection of the environment and its enhancement through biodiversity initiatives. The implementing management system documents for these policies are applied to the WWMF operations, as described in the applicable sections of this application.

### **2.1.2 Nuclear Management System Charter**

OPG's Nuclear Safety Policy is implemented through a series of governing documents which together form the Nuclear Management System. The first implementing governing document is the Nuclear Management System Charter. The Charter establishes the programs that provide the specific measures that are applied in the day to day, safe, reliable operation of the OPG nuclear facilities. The Charter defines the organization responsibilities, interfaces, and applicable program elements to achieve the requirements of:

- *General Requirements for Pressure-retaining Systems and Components in CANDU Nuclear Power Plants, CSA Standard N285.0;*
- *Material Standards for Reactor Components for CANDU Nuclear Power Plants, CSA Standard N285.6; and,*
- *Management System Requirements for Nuclear Facilities, CSA Standard N286-12.*

The programs identified in the Charter describe the measures that are applied as activities are performed in the facilities or in support of ongoing safe operation.

The nuclear management system implementation is monitored through a series of activities, including external and internal audits, performance metrics designed to capture the key outcomes of the programs, management assessments, and the corrective action and continuous improvement processes, including benchmarking of industry best practices. All of these activities allow OPG to identify opportunities to improve performance and make its operations safer and more reliable.

### **2.1.3 Nuclear Waste Management Program**

One of the programs in the nuclear management system, and as described in the Charter, is the Nuclear Waste Management Program.

Activities at the WWMF are largely performed in accordance with the same processes as are applied at the other OPG nuclear facilities; however there are instances where it has been necessary to develop specific procedural documents to address the unique aspects and risks associated with nuclear waste operations, including transportation. The Nuclear Waste Management Program identifies the specific procedural documents, together with any necessary exceptions to the generally applicable nuclear management system procedures. Most of the specific procedural requirements apply to the handling of waste at the WWMF, such as the operation of the L&ILW waste processing systems, and the handling and storage of the used fuel dry storage containers.

As with all other parts of the OPG nuclear management system, implementation of the management system for WWMF is assessed on an on-going basis.

### **2.1.4 Current Operations**

During the current licensing period, WWMF achieved several improvement objectives targeted at making the management system more effective and efficient. The results from the Governance Simplification and Fleetview Program Health and Performance Reporting are described in detail below.

#### Governance Simplification

In 2011, OPG's Nuclear Waste Management Operations, including WWMF, transitioned from a complete set of stand-alone processes into the OPG nuclear fleet processes. A team was created to ensure a smooth transition to the OPG Nuclear (OPGN) governance framework. The Governance Simplification project was a major undertaking as it worked towards reducing, simplifying and aligning the number of governing documents that are maintained.

The Decommissioning and Nuclear Waste Management (DNWM) Governance Simplification Project mandate included:

- Reducing the current program documents from five to three;
- Superseding or obsoleting DNWM governance by adopting OPGN governance where appropriate and where it makes good business sense; and,

- Streamlining the DNWM processes to avoid duplication of procedures and instructions throughout the DNWM facilities.

During the licensing period, all programs applicable to DNWM transitioned to N286-12, to meet the requirements of the new DNGS licence (effective January 1, 2016). This helped build on the strengths of the Nuclear Management System, including implementation of industry best practices. This initiative is now complete.

#### Fleetview

Fleetview program health and performance reporting is a fleet-wide functional review and reporting process to monitor and routinely report on overall program effectiveness of those programs as defined within the nuclear management system.

Each Fleetview program health and performance reporting is conducted in accordance to three defined areas including oversight and leadership, execution performance, and program action plan. This review is conducted by the Nuclear Executive Committee on a pre-established review schedule, and enhancements or new initiatives are identified based on performance.

The Fleetview Program Health and Performance Reporting now include Nuclear Waste Management Facilities along with OPG Nuclear Power Plants as applicable.

As with all Fleetview programs, oversight of the Fleetview initiative is performed collectively by the senior nuclear management team.

### **2.1.5 Business Continuity**

The objectives of the OPG Business Continuity Program are to ensure approved response strategies and recovery priorities are in place for critical functions during incidents that threaten continuity, and recovery guidance is in place for recovering from incidents.

Approved strategies are intended to:

- Protect employee and public health and safety;
- Limit significant impacts to the environment as well as to OPG's assets, reputation and operational continuity; and
- Maintain financial viability.

To ensure OPG's business continuity, OPG performs Business Impact Analyses and develops Continuity Plans in response to that analysis. This involves conducting a risk analysis of the impacts that a temporary disruption of the processes would have on the company. Continuity Plans are established to mitigate the identified risks, if necessary.

Pursuant to this process, DNWM has conducted a Business Impact Analysis. The activities performed by DNWM were all assessed as being capable of being unavailable for more than a week (including several weeks or months) without significant consequences. As the activities were assessed to be low risk, Continuity Plans were not developed.

### **2.1.6 Nuclear Safety Culture**

OPG monitors the health of its nuclear safety culture through Nuclear Safety Monitoring Panels. These panels were established based on the industry best practices documents in the Nuclear Energy Institute's NEI-09-07, *Fostering a Strong Nuclear Safety Culture*. The Nuclear Safety Culture Monitoring Panel examines information from a variety of the processes that have been implemented, such as the corrective action process, the human performance program, audits and self-assessments, external inspections such as CNSC inspections or industry evaluations, employee concerns, and business performance monitoring. This information is evaluated against the traits of a healthy nuclear safety culture to identify strengths and areas for focused attention within the organization. The panel, which is composed of all of the managers and senior leadership within DNWM, jointly evaluate the information and approve any initiatives or re-enforce communications as needed.

In 2015 a Nuclear Safety Culture Assessment was performed consistent with our practice for safety culture assessments of our nuclear power plants. The Assessment found, based on information from a review of Station Condition Records and other documents, an 81 question survey sent to all DNWM personnel, and interviews and field observations, that DNWM has a healthy Nuclear Safety Culture. The Assessment identified some areas for improvement, such as improving the communication of OPEX, enhancing employee awareness of the processes for the effective escalation and timely resolution of issues, and improving the communication between work groups. DNWM's Nuclear Safety Culture will be assessed again in 2018, in accordance with the 3 year cycle required by OPG's Nuclear Safety Culture Assessment Procedure.

### **2.1.7 Independent Assessments**

OPG evaluates the effectiveness of the management systems and controls on key business and operating risks. This is accomplished through internal audits, nuclear oversight audits and assessments and management self-assessments. An annual audit plan that identifies the specific audits and nuclear oversight reviews to be conducted in the coming year is approved by the OPG Board of Directors. The annual audit plan is based on key risk areas, legal and regulatory requirements, and reflects the planned management self-assessments and third party reviews.

Audits of OPG's Nuclear Management System and related activities are performed by the Nuclear Oversight organization in accordance with OPG's Independent Assessment program. Managed processes are subject to audits once every three years, unless otherwise specified.

Findings from the independent audits and assessments are resolved through OPG's corrective action program. Improvements arising from the independent assessments are noted in the specific safety and control areas.

### **2.1.8 Self Assessment and Benchmarking**

The OPG Nuclear Self Assessment and Benchmarking procedure requires that Directors and Managers plan and schedule divisional and departmental level Self Assessments and Benchmarking for each upcoming year.

OPG participates in a number of industry peer groups, facilitating good opportunities to benchmark our nuclear management practices with other utilities. Similarly, peers from other utilities visit OPG facilities to gain insights. These relationships are important to ensure OPG continues to gain insight on industry best practice in all areas.

The focus of OPG's recent benchmarking is on the experience with emerging technologies that could minimize the volume of waste that requires storage at the WWMF. For example, industry experience in decontamination of metal components and in large object segmentation has been sought by OPG and is under consideration for application as part of the radioactive waste handling processes.

### **2.1.9 Management of Contractors**

OPG has extensive practice in the use of contractors to engineer, procure, and construct new facilities or to implement design improvements to our existing facilities.

Contractors are qualified by OPG Supply Chain Quality Services under a process that ensures that the contractor has developed and implemented a management system that meets the applicable requirements outlined in the CSA Standard N286-12.

The contractors OPG uses have a long history of working in the nuclear industry and with OPG in particular. They have proven capability to meet the quality standards necessary for a nuclear facility.

These contractors are equally careful in the selection and use of sub-contractors. OPG requires that any sub-contractors must work under the contractor's quality program to ensure there is an assurance that the agreed quality standards and expectations will be met, regardless of who is performing the work in the field. Field verification activities are performed by OPG personnel to ensure the quality program requirements are being achieved.

Where possible, OPG will temporarily turn the contractor work area over to the contractor as a Construction Island where the contractor assumes the role of 'Constructor' as defined in the *Ontario Occupation Health and Safety Act*. As Constructor, the contractor assumes responsibility and liability for conventional safety and environmental safety associated with the contractor work. The contractor produces a site specific Health and Safety Plan and Environmental Safety Plan which is accepted by OPG prior to the contractor work start. Radiation protection remains the responsibility of OPG.

Where a Construction Island is not feasible, OPG maintains the role of Constructor and provides oversight to the contractor. In this case, contractor work will be carried out in accordance with all OPG processes and procedures. OPG maintains responsibility and liability for conventional safety, environmental safety and radiation protection of the contractor work.

## 2.1.10 Organization

During the licensing period, OPG adopted a center-led organizational model. Under this structure, there are two types of functional organizations: those accountable for delivering company-wide programs; and those accountable for operations.

Central functions establish one point of accountability for an entire function, to deliver functional support across all business units. Examples of such central functions include Human Resources, Supply Chain, Finance, Records, Environment and Corporate Relations and Communications. These central functions ensure best practices are implemented across all of OPG's facilities, and enable the development of the expertise necessary to provide operations support.

The Senior Vice-President, DNWM has the authority to act for OPG in dealings with the Commission, and is responsible for the management and control of licensed activities at the WWMF. The day-to-day operations and management of the WWMF is the responsibility of the Operations Managers for Low & Intermediate Level Waste and Used Fuel, who report to the Directors of Low and Intermediate Level Waste Operations and Used Fuel Operations, respectively. Only those persons authorized by the Operations Managers supervise operations at the WWMF. The operations organizations receive direct support from the central functions.

Organizational changes are managed following OPG's Organization Design Change procedure. The organization chart for WWMF and supporting center-led organizations is shown in Figure 22.

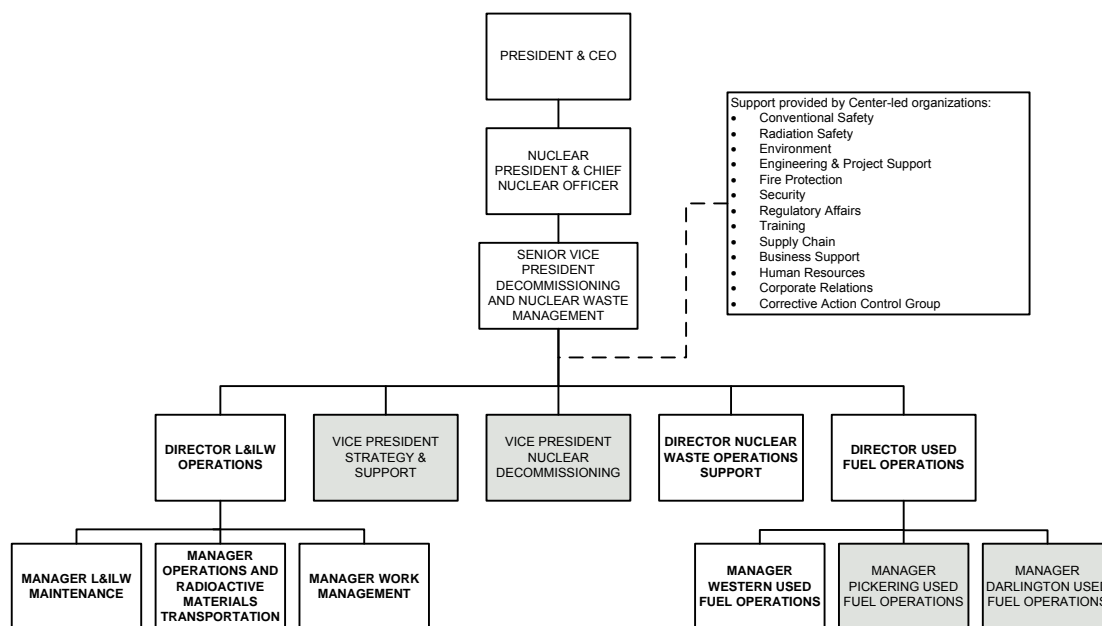


Figure 22: WWMF Organization Chart

### 2.1.11 Event Reporting

For events at WWMF that are determined to be reportable to the CNSC, preliminary reports are submitted to the CNSC which include the location and circumstances of the situation and of any action that WWMF has taken or proposes to take with respect to it in accordance with the *General Nuclear Safety and Control Regulations* subsection 29 (1). A full event report is then submitted to the CNSC in accordance with *General Nuclear Safety and Control Regulations* subsection 29 (2).

A listing of OPG's Waste Management Facilities' reportable events from 2010 to the present is posted on OPG's public website, [opg.com](http://opg.com).

### 2.1.12 Future Plans for Improvement

WWMF will continue to make incremental improvements in work processes and program implementation through:

- Continued adoption of OPG Nuclear governance as appropriate;
- Ongoing use of Fleetview Program Health and Performance Reporting to assist with overall program effectiveness;
- Manage the business to ensure a focus on long-term sustainable performance excellence; and,
- WWMF will develop leadership and management capability at all levels of the organization with a bias toward teaching and learning moments.

OPG does not foresee, during the next 10 years, any substantive changes to the management system. The main focus for the next 10 years at the WWMF will be addressing the increased volume of radioactive waste materials that will arise from the projects that are underway to extend the operational life of the nuclear power generating units at Darlington and at Bruce Power. These are not expected to result in substantive changes to the management system. They will result in new facilities being required.

The other focus at the WWMF will be preparedness for the anticipated transfer of the low and intermediate level wastes into the proposed DGR. New operational processes are expected to be needed to address the handling of the waste in preparation for its placement in the repository; however, the majority of the management system will not be affected. Work on these changes will start after the DGR has received the necessary approvals.

## 2.2 HUMAN PERFORMANCE MANAGEMENT

The Human Performance Program at WWMF is defined by the OPG Nuclear Human Performance Program. OPG's goal is to continually reduce the frequency and severity of events through the systematic reduction of human error and the management of defences in pursuit of zero events of consequence. The key principles that are the foundation for the OPG Nuclear Human Performance Program are:

- People are fallible;
- Error-likely situations are predictable, manageable, and preventable;
- Individual behaviour is influenced by organizational processes and values;
- People achieve high levels of performance based largely on the encouragement and reinforcement received from supervisors, peers, and subordinates; and,
- All events are preventable.

OPG's key documents for the Human Performance Management SCA and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Human Performance	N-PROG-AS-0002	R015
Training	N-PROG-TR-0005	R016

The Human Performance Program includes tools that have been developed to reduce error, to establish and maintain defences, to identify and resolve latent organizational weaknesses, for early identification and response to precursors, and to identify and implement necessary improvements. By systematically identifying and addressing error-likely situations, reducing organizational vulnerability to errors and events and by questioning or enhancing the integrity of defenses, WWMF is positioned to continually improve organizational effectiveness through the use of best practices, enhanced behaviours and learning.

An OPG fleet-wide strategic plan is developed each year in response to human performance trends and events noted in the previous year. The strategic plan is also influenced by industry developments and emerging best practices in sustaining high levels of human performance. The strategic plan focuses on individual, supervisory, and organizational enhancements.



### **2.2.1 Human Performance Program**

The Human Performance Program includes the key behavioural expectations that guide worker activities, the supervisory activities that are applied to observe, recognize, and improve behaviours, and the reporting and evaluation activities that are used to assess performance and identify needed improvement initiatives. Activities within the program include the following:

- Pre-job and post-job briefing to identify expected outcomes and to drive ongoing improvement;
- Established expectations for procedural use and adherence;
- Tools to prevent errors in understanding, such as use of three-way communications and the phonetic alphabet;
- Self-checking and situational awareness before beginning an activity or when returning to an activity after a break;
- Conservative decision making; and,
- Identifying, evaluating, trending, and acting upon human performance issues and accomplishments.

### **2.2.2 Current Operations**

Industry standard performance measures are used to monitor human performance. In addition, coding is applied to Station Condition Records created as part of the Corrective Action program that supports trending of human performance.

The overall effectiveness of the Human Performance Program is measured through the analysis of events that occur to determine whether the event free operations “clock” should be re-set. Targets are set every year based on previous performance to strive for ongoing reduction in the number of clock resets. The resets are divided into Site and Department levels based on their consequence. The more significant events that have consequences in terms of safety or production and that span several organizations or departments are identified as Site Event Free Day Resets. Less significant events are considered to be Department Event Free Day Resets. Each reset triggers a process of communication within the organization that identifies the underlying behavioural aspects of the event and the event-free tools that, if properly applied, may have prevented the occurrence.

In the licensing period there have been two Site Event Free Day Resets as a result of operations at the WWMF. Both events occurred in 2013. The first event involved damage to an outdoor glycol heat exchanger which led to an extended incinerator outage. The second event involved a crane coming into contact with an overhead power line (see section 2.8.2 for details). Detailed investigations were performed following these events and corrective actions to prevent recurrence implemented.

Events that are not Event Free Day Resets are assigned Human Performance codes in the Station Condition Record process and trended to identify patterns of behaviour that are contrary to the expectations set by OPG. Trending of Station Condition Records across all of the OPG nuclear fleet identified that Procedural Use and

Adherence requires focused attention. The identified trend resulted in a specific campaign to re-communicate the behavioural expectation that procedures will be followed as written, and that if the procedure cannot be executed as provided, for the employee to stop and seek additional direction from their supervisor. Any procedures that cannot be executed as written are rapidly revised and re-issued. This ensures procedural compliance is achievable the next time the document is used.

Each year for the resets that occurred, the results of the review of the trend codes, and other data collected through the implementation of the Human Performance Program is assessed and responding initiatives are developed. For example, as described above, initiatives have been developed to enhance procedural use and adherence. Some elements of these initiatives are currently in progress; others will be developed and implemented over the next year; and other elements will be developed and implemented as necessary based on results.

#### **2.2.2.1 Procedure Use and Adherence**

OPG staff is expected to follow procedures as written; requiring employees to stop and consult their supervisor where procedures cannot be followed as written.

Activities that support improvements in procedure use and adherence include the following:

- Observation and coaching by managers in the field;
- Pre- and post-job briefing process;
- Staff communication meetings; and,
- Training.

#### **2.2.2.2 Observation and Coaching**

Manager coaching in the field reinforces expectations of procedure use and adherence through observation during pre-job briefings at the work location. Observations are recorded by supervisors with the purpose of the identification of strengths and weaknesses in human performance behaviors. Strengths are positively reinforced. Results are collected to evaluate areas of excellence and areas needing improvement. Gaps to excellence are addressed through additional targeted improvements.

#### **2.2.2.3 Pre-Job Briefings**

The pre- and post-job briefing component of the Human Performance Program has been an essential element to provide the necessary review and focus for the job at hand. Pre-job briefings are routinely delivered, with enhancements provided by operating experience. Worker led pre-job briefings are being promoted, and found to be very successful due to increased employee interaction and adherence to the required procedures.

#### **2.2.2.4 Staff Communication Meetings**

A variety of communication tools are used to establish and reinforce the expectations respecting procedural use and adherence. The most effective tool is face to face meetings between managers and their staff to discuss the events that have occurred at the facility, or in other facilities, that reinforce the importance of procedural use and adherence. Employees are engaged in the conversation and actively share their own experiences.

#### **2.2.2.5 Training**

Compliant to the requirements in REGDOC-2.2.2, *Personnel Training*, OPG's Nuclear Training Program is used to develop and maintain competent personnel to safely operate, maintain, and improve plant performance, and to drive human performance improvements in a cost effective manner.

Through the Training Program, OPG personnel acquire the skills and knowledge required to discharge the responsibilities of their positions within the organization.

Operations, maintenance, and support staff are trained and qualified under OPG's Nuclear Training Program. The staff training and qualifications includes initial training, on-the-job training, and evaluation. This training is then maintained by periodic re-qualification and refresher training as appropriate.

A training plan is developed for each occupation using a systematic approach to training, identifying the training needed to meet the skill and knowledge requirements of the position. Specialized training is provided where appropriate. The employees' training status is maintained in a Training Information Management System.

The Training Program is closely linked to the Human Performance program. Enhanced or focused training is often utilized in the effort to improve safety and reduce errors at WWMF. The human performance expectations are built into the training courses; for example, the nuclear general employee training that is refreshed annually by all employees contains human performance content.

#### **2.2.2.6 Situational Awareness**

Situational Awareness involves improving the ability of individuals to recognize hazards by anticipating changes and taking action. It is being aware of the surroundings, recognizing changes, and ensuring new hazards are controlled. It is a frame of mind where individuals are actively looking for potential hazards, assessing the hazards, and ensuring controls are in place.

OPG has implemented a requirement that all employees perform a 2-minute job site drill when they reach their job site on first instance and after any breaks, to confirm that the hazards are as expected, the preventative measures identified in the pre-job brief are adequate, that they are on the right equipment and have the tools and protective equipment necessary to safely perform the assigned work activities. Any employee that has concerns is to stop and speak to their supervisor. Managers reinforce this expectation through field observations and perform coaching when necessary to ensure the expectation is being achieved.

### **2.2.3 Future Plans for Improvement**

Going forward, WWMF will continue to implement the Human Performance Program and the Training Program. As described above, the programs include an ongoing aspect of reviewing performance and identifying the areas that would benefit from planned enhancements. Best practices from the nuclear industry will also continue to be evaluated and incorporated into the programs where there is an identified benefit.

## **2.3 OPERATING PERFORMANCE**

### **2.3.1 Operations Program**

OPG operates and manages the Nuclear Waste Operating Facilities in accordance with the facility licensing basis and applicable standards. WWMF uses procedures for all aspects of their operation, including safety related activities, plant and equipment operation and maintenance, work authorizations, equipment labelling, facility access, and plant status.

WWMF has procedures that provide direction on what waste is acceptable for processing and storage at the WWMF in accordance with its licensing basis and applicable standards. These waste acceptance criteria include a process for the review and acceptance of new and non-routine types of waste arising from the nuclear generating stations.

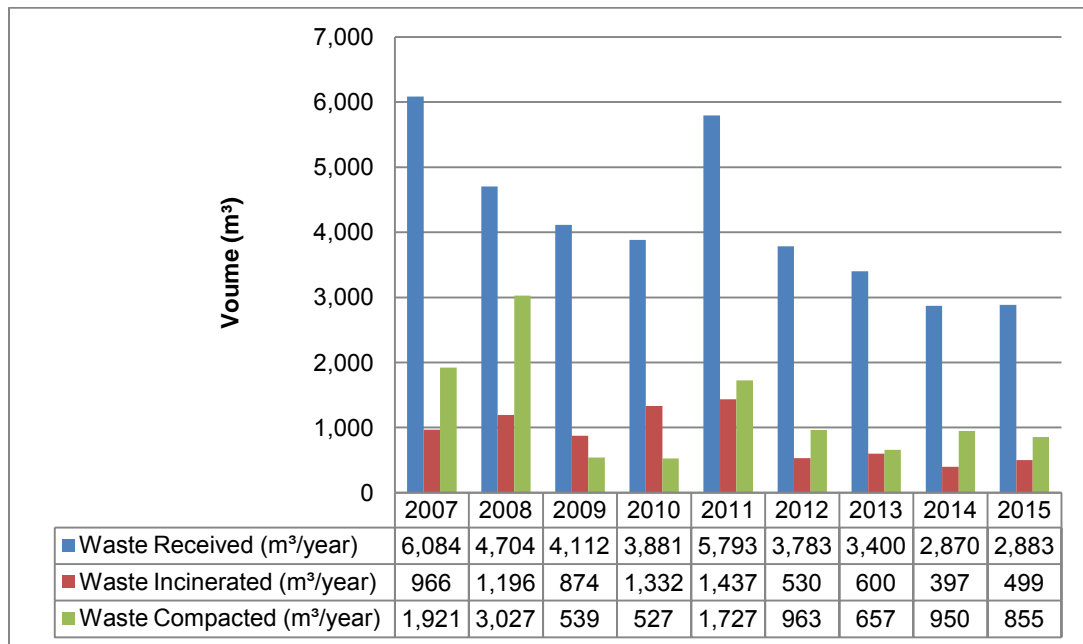
OPG's key documents for the Operating Performance SCAs and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

<b>Document Title</b>	<b>Document Number</b>	<b>Revision #</b>
Nuclear Waste Management	W-PROG-WM-0001	R013
Conduct of Regulatory Affairs	N-PROG-RA-0002	R008
Corrective Action	N-PROG-RA-0003	R010

### **2.3.2 Low and Intermediate Level Waste Operations**

#### **2.3.2.1 Current Operations**

Figure 23 shows the approximate total volume of L&ILW received each year and the amount processed at the L&ILW Storage Facility since 2007. The general decline in volume of waste received over the years is mostly due to more effective waste reduction initiatives at the source (see also section 2.11.2 on Waste Management).



**Figure 23: L&ILW Volumes Received, Incinerated and Compacted at WWMF**

The following results were achieved over the period from 2007 to 2015:

- LLSBs 11, 12, 13 and 14 were constructed and placed in service;
- 54 new IC18's were constructed and placed in service;
- Planned incinerator outages were completed in accordance with an improved outage process and schedules; and,
- Lighting upgrades were completed throughout the WVRB and yard areas.

Fire Hazard Analyses, described in Section 2.4.3, were completed for all L&ILW facilities and the recommendations were implemented, or planned for execution. The recommendations included:

- A transportation packaging and maintenance building operating procedure which was updated to require the doors be closed during normal operation and off-hours;
- All waste going into any LLSB has a lid; and,
- There be no waste oil totes stored in LLSBs 12-14.

#### **(a) Incinerator Performance**

Throughout the reporting period (2007- 2015), the incinerator met all emissions requirements including successful completion of annual stack testing as required by the Ontario Ministry of Environment and Climate Change Environment Compliance Approval. The incinerator continued to perform very well in the environmental area, well below limits set for parameters such as dioxins/furans, metals and particulate.

Emissions are discussed in Section 2.9.2 Environmental Protection – Current Operations.

There were two notable events, in 2013 and 2014, involving overheating of an air duct that is designed to provide combustion air to the incinerator's primary chamber for waste incineration. In response to these events, all incineration of solid waste was stopped until the system was modified to prevent the potential for recurrence. Details of these events can be found in Section 2.5.2.

OPG has targeted incinerator performance for improvement. A comprehensive study was undertaken in 2013 to identify critical incinerator systems that required upgrades to improve overall system reliability and ensure long term performance. The execution of these upgrades began in 2015 and will continue for the next several years.

**(b) Compactor Performance**

The previous compactor was replaced with a newer more reliable model in 2011. This compactor has operated reliably since installation and continues to be a key element of the total volume reduction for L&ILW.

**(c) In-ground Storage**

54 new IC-18s were installed and commissioned in 2013. As part of the project, 54 short shield plugs were manufactured to replace the longer shield plugs currently in place on the IC's containing over-packed resin liners. With these shorter shield plugs, an additional resin liner can be placed in these IC's thereby optimizing the storage space previously lost due to the addition of the overpack.

**(d) Large Metal Components**

A pilot project in 2014, described in Section 2.11.2, sent 3 heat exchangers off site to a licensed third party vendor for volume reduction. The ferrous components of the heat exchangers were put through a metal melting process and produced ingots for sale in the shielding block market. The non-ferrous components (such as copper tube internals) were returned to the WWMF for storage.

**2.3.3 Future Plans for Improvement - L&ILW**

Future improvements at L&ILW Processing and Storage facilities are summarized below with respect to operational initiatives, and improving facility structures and storage containers.

**(a) Operating Initiatives**

Operating initiatives planned for the next ten years to sustain and improve on the current operating processes include the following:

- Reduction in maintenance backlogs, to ensure a high availability for equipment required to process L&ILW;

- Improvements to the work management system to ensure more efficient execution of operations and maintenance activities;
- Implementation of a more Operationally Focused organization whereby all groups including Centre-Led Functional Area Management and centre-led support groups are aligned around the facility and operating priorities;
- Execution of incinerator and auxiliary system modifications to improve both equipment and overall facility performance and reliability; and,
- Upgrades to the existing site sample stations to improve reliability and monitoring of surface and subsurface water runoff.

**(b) Improving Structures and Storage Containers**

Initiatives aimed at improving structures and storage containers in the next ten years include the following:

- Re-packaging of L&ILW containers from some of the trenches. This re-packaging is based on the results of on-going aging management investigations to verify the material conditions of waste containers. This is to ensure that the waste containers can be easily and safely handled in the future;
- Upgrading of the fire detection systems in the LLSBs by installing more reliable linear heat detector systems; and,
- Continued sorting and segregating of stored wastes in LLSBs to identify opportunities for further processing and volume reduction or waste that can be free-released to conventional waste streams.

**2.3.4 Used Fuel Operations**

In order to ensure adequate wet fuel bay space for operation of the Bruce Power NGS, the UFDSF at WWMF operates safely and reliably to transfer, process, and store DSCs from the Bruce Power NGS until a long-term management facility becomes available.

**2.3.4.1 Current Operations for Used Fuel**

In this reporting period, the safety performance of the WWMF used fuel processing and storage facilities has been excellent while meeting all production targets. This includes overcoming the technical challenges of weld wire quality and DSC base flange laminations in (c) and (d) below.

**(a) DSC Transportation**

Empty DSCs, and those loaded with used fuel, are transported on site roads between the Bruce Power NGS and the WWMF by OPG. Since the inception of the WWMF UFDSF in 2002, there have been more than 1,100 on-site transfers of loaded DSCs without incident. Table 6 shows 957 DSCs were processed and stored between 2007 and 2015.

**(b) DSC Reverse Loading**

In the current licence period, OPG has demonstrated that we can perform all of the required DSC reverse loading steps to safely return fuel to a wet fuel bay should it be required. This demonstration included full weld removal using a combination of arc gouging, chipping and grinding. Full weld removal was confirmed by performing a freedom of movement check using a feeler gauge to confirm that the DSC lid was separated from the base. Removal of spent fuel from a DSC was performed where a partially loaded DSC was submerged in the wet fuel bay and one of the spent fuel modules was removed. A DSC drain port was successfully removed by grinding and unscrewing of the drain plug. The remaining steps in the reverse loading process include craning and transportation of the DSC which are routine operations performed regularly at WWMF.

**(c) DSC Weld Wire Operational Impact**

In 2013, 26 DSCs at WWMF (20% of production) had issues with the quality of the completed welds. These were discovered during the post welding inspection using Phased Array Ultrasonic Testing. The root cause was discovered to be a manufacturing change that introduced contaminants in the weld wire that directly influenced the quality. As a result, defects were detected. The specifications for the weld wire were revised by OPG and as a result there have been no further weld porosity issues that can be attributed to this issue. With the exception of the year 2013 the weld quality defects from 2007 through 2015 have been less than the rework target of 10%.

All the 26 DSCs that demonstrated porosity in the welds during Phased Array Ultrasonic Testing were identified for repair. By February 2014, all 26 DSCs were repaired, processed and placed in storage.

**(d) DSC Base Flange Laminations**

OPG first identified an apparent DSC base flange lamination issue in 2012. The laminations were initially attributed to original manufacturing defects, and OPG implemented repairs on the affected DSCs. During subsequent investigations when the base material was analyzed, it was found that the Phased Array Ultrasonic Testing results had been overly conservative in identifying the material as having laminations to the degree originally indicated. As a result, OPG has developed an alternative process to review and evaluate the need for repairs to the base material should laminations be identified. Since its introduction, no DSCs have been identified for repairs.

**(e) Phased Array Ultrasonic Testing**

Phased array ultrasonic testing was introduced for inspecting the DSC lid-to-base containment weld. Phased array ultrasonic testing is a volumetric, non-destructive inspection method that involves electronically steering a beam of sound waves through the weld (and adjacent base materials) to inspect the weld. Phased array ultrasonic testing replaces radiographic inspection, thereby eliminating the health and safety



hazards of the latter method's radiation exposure. Use of radiography to inspect DSCs ceased in 2011. The change in the inspection method was supported through third party expert review and approval of OPG's technical justification (which included the results of physical testing) provided under the auspices of the CANDU Inspection Qualification Bureau in 2010.

**(f) Production History**

The number of DSCs loaded at WWMF between 2007 and 2015 is shown in Table 6. In 2009 Bruce Power identified the need to increase the number of DSCs processed and stored in order to reduce the quantity of used fuel stored in the Bruce B secondary fuel bay, and support Bruce Power in returning Bruce A Units 1 and 2 back to service. Based on this, the Western UFDSF increased production up to a maximum of 130 DSCs per year, as amended in the Bruce Power lease agreement.

**Table 6: DSCs Loaded at WWMF per Year**

<b>Year</b>	<b>Number of DSCs Loaded at WWMF between 2007-2015</b>
2007	75
2008	77
2009	70
2010	130
2011	120
2012	130
2013	130
2014	110
2015	115
<b>TOTAL</b>	<b>957</b>

**2.3.5 Future Plans for Improvement - Used Fuel**

Going forward, the annual rate of DSCs being placed into storage at the WWMF is expected to remain up to 130 DSCs per year. This is based on Bruce Power operating 8 units.

At WWMF, the following future improvements are planned:

- Facility configuration is being reviewed and improved to increase equipment reliability and ensure employee safety;
- Installation of new updated security equipment;

- A new generation DSC Transporter vehicle (the Gen IV) has been designed. The first of this new Transporter was tested in 2013 and remains at Pickering Waste Management Facility. Following modifications and completion of a second vehicle, it will be put in service in 2016 at the Western UFDSF.
- A Work Management process effectiveness review (T16 planning model, adopted from the Generating Stations) is in progress, to ensure a high availability target for equipment required for facility operations.

## 2.4 SAFETY ANALYSIS

Safety Analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards. It evaluates the risk and consequences of normal, abnormal and accident conditions to ensure that the facility does not pose an unacceptable risk to workers or the public. The results of the safety analysis are used in the development of the operating limits and conditions for a facility. Safety analyses and assessments of structures, systems, components or facilities are carried out to determine the impact on workers and the public. Safety assessments are presented in each nuclear waste facility safety report, which also provides an overview of the facility design and operations.

To assess the overall safety of the operation of WWMF storage buildings and structures, deterministic safety analyses are used. Computational tools are used for the dose consequence calculations when required. Bounding (worst-case) accident scenarios are conservatively identified, and the results of off-site dose consequence calculations are then compared against the regulatory dose limits.

OPG's key document for the Safety Analysis SCA and the revision at the time of writing is presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Reactor Safety Program	N-PROG-MP-0014	R005

### 2.4.1 Current Operations

The WWMF safety report addresses the health and safety of workers and the public, and the protection of the environment. It contains information on the UFDSF and L&ILW storage facility and demonstrates that dose rates and emissions from the WWMF under normal and abnormal operating conditions as well as postulated accident conditions are within allowable limits, and pose a negligible risk to the public, the workers, and the environment.

The safety report for the WWMF is reviewed every five years and updated as required to reflect changes in operational experience and information supporting the assumptions made in the assessments. The safety report update process encompasses the systematic identification of safety issues, their prioritization, their resolution, and the physical updates of the safety report. The work planning for safety report updates is prepared approximately two years in advance.

The current version of the WWMF safety report was submitted to CNSC in 2012, and accepted by the CNSC in 2013. The current safety report was updated in accordance with Condition 4.2 of OPG's waste management facility licence WFOL-W4-314.02/2017. The report demonstrates that dose rates and emissions from the WWMF under normal and abnormal operating conditions as well as postulated accident conditions are within allowable limits, and operation of the facility continues to pose a negligible risk to the public, the workers, and the environment. The next update will be in 2017.

Self assessments are performed after selected safety report updates in order to identify issues and to continually improve the update process. For example, a requirement has been documented for a detailed work plan to be prepared approximately 2 years prior to the safety report update. This plan documents the update process, including safety analysis reviews and updates.

Safety analyses for OPG's nuclear waste facilities are conducted using specific procedures unique to these facilities. In 2013, the Safety Assessment group transitioned to the OPGN Nuclear Safety Division. As part of the transition plan, these procedures were updated and brought under the authority of the OPGN Reactor Safety Program in 2015. This Program defines organizational responsibilities and key program elements for the management of issues relating to nuclear safety analysis for all OPGN Class I operating facilities.

## **2.4.2 Safety Assessment Results for WWMF Structures**

### **Low and Intermediate Waste Structures – Normal Operating Conditions**

Waste structures are designed and constructed such that dose rate targets at exterior surfaces of the structures, at facility fences and at site boundaries are achieved. Routine emissions are monitored and shown to be within facility targets, resulting in minimal doses to the public, well below regulatory limits.

### **Low and Intermediate Waste Structures – Malfunctions and Accidents**

Worst case bounding credible accidents are identified for each storage structure type, specific to the activity or type of waste stored in the facility. For example, in a low level waste storage building, fire has been identified as the worst case credible accident that could lead to the maximum radioactive release from these structures. For structures storing large, non-combustible components such as steam generators or re-tube components, a drop of the component is analyzed.

For all accidents considered, radiation doses to both workers and the public are predicted to be well below the regulatory dose limits.

#### **2.4.2.3 Used Fuel Dry Storage Safety Analysis - Normal Operating Conditions**

Shielding analysis is performed to determine dose rates from individual DSCs, and both inside and outside of the storage buildings. Dose rates external to the buildings are determined for workers on site and for members of the public off site. In all cases, assuming storage buildings filled to capacity with 500 DSCs containing 10 year old fuel, predicted doses are well below the regulatory limits. Predicted dose at the site

boundary and for the nearest resident are estimated to be well below detectable levels, and accordingly are well below the CNSC regulatory public dose limit of 1 mSv/year.

#### **2.4.2.4 Used Fuel Dry Storage - Safety Assessment of Malfunctions and Accidents**

The assessment of malfunctions and accidents considered the following main stages of the out-of-station used fuel dry storage operations:

- On-site transfer operations;
- Operations inside the DSC processing building; and
- Storage.

Each event was screened to establish if it could result in any radiological impact to the public and workers. Common mode incidents such as seismic events, flooding, etc. were also considered. Design provisions and procedural measures that could prevent the event or mitigate its consequences were also considered.

Although considered unlikely, for on-site transfer and processing of DSCs (e.g. welding, inspecting, testing, sealing and moving to storage), the bounding accident was identified to be a drop of the DSC, with subsequent 100% fuel sheath failures. The total doses to the public at the Bruce site boundary (750 m from WWMF) and the occupational doses due to this event were assessed to be below the regulatory dose limits.

During the DSC storage phase, the bounding dose consequences are associated with a hypothetical event in which 10% of the DSC seal-welds fail. During storage, both the fuel sheath and the DSC seal-weld must fail for a release of radionuclides to occur. Used fuel with a known damaged or defective sheath is not loaded into a DSC. Failure of the sheath is not expected to occur during the operating life of the storage facility. The total doses to the public at the Bruce site boundary and the occupational doses due to this event were also assessed to be below the regulatory dose limits.

In March 2010, OPG identified potential abnormal scenarios involving multiple vehicles in DSC Processing and Storage Buildings at the WWMF's UFDSF. OPG performed the appropriate assessment and confirmed that the consequences of the postulated scenarios involving operation of multiple vehicles inside the DSC Processing and Storage Buildings at the WWMF's UFDSF are within the safety and design envelope.

A second new DSC transporter (Gen IV) has been manufactured and delivered to the WWMF UFDSF. An assessment confirmed that the new transporter can be operated within the waste management facility's safety and design envelope. The new DSC transporter will be put in service at WWMF in 2016.

#### **Criticality**

Criticality assessments have been completed for the used fuel stored in DSCs for the WWMF. Consistent with expectations for irradiated natural uranium fuel, the analyses and assessments have yielded adequate sub-criticality margin and have demonstrated that there can be no criticality of used CANDU fuel, even should a DSC become filled with water.

It has been demonstrated that there is not enough plutonium which could be released from failed fuel elements to achieve critical mass, even using extremely conservative fuel defect rates.

Used fuel stored in DSCs cannot achieve criticality under normal conditions or under any postulated accident scenario at the WWMF.

### **2.4.3 Fire Hazard Analysis**

OPG completed Fire Hazard Analyses for the LLSBs, to determine the potential risks of a fire within the buildings and to ensure the most appropriate means to mitigate and minimize these risks were included in the design of these facilities. Fire Hazard Assessments were completed by a third party using the current licence codes.

Separate analyses were completed for LLSBs 1-11, LLSBs 12 to 14, the WVRB, and the Transporter Package Maintenance Building. Results are briefly discussed below.

- **LLSBs No.1 to 11**

The report provided numerous recommendations which OPG continues to address.

OPG also completed an environmental dose assessment report on LLSB fire water runoff, which concluded that fire water runoff would not create an unreasonable risk to the environment and the non-human biota at the population level.

- **Waste Volume Reduction Building (WVRB)**

The report recommended a change in the incinerator operating procedure; installation of a manual pull station; and a risk assessment study of a propane explosion and boiling liquid expanding vapour explosion (BLEVE) by an external contractor. All three recommendations have been completed.

The latter risk assessment concluded that the blast wave and thermal radiation from the BLEVE would not damage adjacent structures beyond breaking windows. It further concluded that the propane storage tank installation is well arranged and the risk of fire exposure to the tanks required to create the conditions for a BLEVE is very low.

- **Transportation Package Maintenance Building**

The assessment recommended a change in the operating procedure to include a requirement for interior doors to be closed at night. This has been completed.

- **LLSBs 12 to 14**

The report provided two minor recommendations, that lids be provided for the backlog processible waste stored in LLSBs 12 to 14 to reduce the risk of fire ignition and spread, and that the plastic containers of waste oil should not be stored in LLSB 12 to 14 as was the practice. OPG has implemented both recommendations.

#### 2.4.4 OPG's Response to Fukushima

Following the 2011 event at Fukushima, OPG assessed the impact of consequential event sequences on the existing safety envelope of the WWMF. The initiating and consequential events considered included a seismic event, fire, explosion, loss of power, tornado and thunderstorm. In all scenarios assessed for the WWMF, the consequences of the resulting events were found to be within the existing safety envelope as defined in the safety report for the nuclear waste facility. Further details of OPG's response to this event are described in Section 3.4.

#### 2.4.5 Future Plans for Improvement

- Safety Analysis Methodology

The methodology for performing safety assessments is routinely assessed and updated in order for the methodology to be as up-to-date and accurate as possible. DSC shielding analysis methodology is being updated to incorporate the use of the Monte Carlo N-Particle (MCNP) transport code for dose rate calculations. DSC models (including fuel) are being updated to better represent actual geometries, and analysis assumptions are being reviewed to ensure reasonable conservatism exist. This demonstrates OPG's goal of continuous improvement. These improvements are expected to be used for the 2017 Safety Report update.

- Support for Additional Facilities

In the current WWMF operating licence, there is provision and authorization for additional storage structures remaining to be built at the WWMF site, as described in Section 1.

Since no significant changes are expected for the additional storage facilities, the current safety assessment for accidents with respect to the storage buildings for used fuel, LLSBs, and in-ground containers (IC-HXs and IC-18s) will remain the same and applicable to these additional buildings/structures. If there are significant changes to the design of these buildings/structures, an assessment will be performed to confirm that the design of the required structures is adequate and meets all radiological safety requirements required by *Nuclear Safety and Control Act* and its Regulations.

Furthermore, an additional two buildings are also being requested, namely a Large Object Processing Building and a Waste Sorting Building. Detailed safety assessments will be performed for these new buildings once additional design and location information is available. This is to ensure that the designs of the buildings are adequate and that all radiological safety requirements provided in the *Nuclear Safety and Control Act* and its Regulations are met.

- Safety Analysis Update

Safety analyses will be reviewed and/or performed as necessary prior to requesting permission to construct and/or prior to safety report updates, to confirm that facility operations will not result in any significant radiological consequences to the health and safety of the workers and the public under normal and abnormal operating conditions as well as postulated accident conditions.

## 2.5 PHYSICAL DESIGN

Physical design relates to activities that impact on the ability of systems, structures and components, as described in Section 1, to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

DNWM has robust processes to ensure that the physical design of the WWMF complies with the current safety basis and that all changes are authorized and performed in a controlled manner, and in accordance with the WWMF Operating Licence.

OPG's key documents for the Physical Design SCA and the revision at the time of writing are presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Engineering Change Control	N-PROG-MP-0001	R014
Pressure Boundary	N-PROG-MP-0004	R016
Configuration Management	N-PROG-MP-0005	R005
Software	N-PROG-MP-0006	R009
Conduct of Engineering	N-PROG-MP-0007	R012
Design Management	N-PROG-MP-0009	R011

### 2.5.1 Design Programs

Management of the design basis at the WWMF is now governed by the OPG Nuclear Conduct of Engineering Program. This program provides the framework for performing engineering work in a consistent manner across all OPG Nuclear facilities. Engineering activities, including design management, are implemented via procedures and work instructions to satisfy the following requirements:

- (1) The WWMF configuration is maintained in accordance with the design basis and the facility is operated within its safety envelope;
- (2) All modifications to the facility are designed, constructed, installed, and commissioned in accordance with the design basis;
- (3) Essential facility systems, structures, and components perform their functions safely and reliability within the design basis;
- (4) All relevant legal and regulatory requirements are met; and,
- (5) Continuous improvement is encouraged and fostered to improve facility performance.

The Conduct of Engineering Program is supported by the following additional programs.

- The Design Management Program provides the requirements to manage existing and new designs in accordance with the requirements of the licence, regulations, and best industry practice. It includes specific requirements for creating or modifying design basis documents, performing design verification and assurance activities, and providing the appropriate content and format of design basis documents. The Design Management Program provides direction for preparing detailed designs within DNWM or managing design agencies that prepare designs on behalf of DNWM.
- The Engineering Change Control Program provides requirements to:
  - Ensure that all modifications to systems, structures, and components are designed correctly;
  - Modification designs are reviewed by all stakeholders and authorized by the DNWM Design Authority before being implemented;
  - Modifications are installed in accordance with approved procedures;
  - Modifications are commissioned and tested to demonstrate that design requirements have been met; and,
  - Commissioning results are reviewed and accepted by the appropriate stakeholders before the modified system, structure, or component is placed into service.
- The Pressure Boundary Program provides a managed process for performing repairs, replacements and modifications on pressure retaining systems and components, and reflects the requirements of a pressure boundary quality assurance program. Work on WWMF pressure boundary systems meets the requirements of CSA N285.0-08 and Update No. 2 (including Update No. 1 and Annex M), and additional requirements per Appendix D of the WWMF Operating Licence. The CNSC has regulatory jurisdiction over pressure boundary requirements, including approval of any deviations from those requirements. Authorization for OPG to perform pressure boundary activities is granted by the Technical Standards and Safety Authority, on behalf of CNSC staff.

## **2.5.2 Current Operations**

DNWM adopted OPG Nuclear Conduct of Engineering governance effective December 31, 2012, including the associated programs for Design Management, Engineering Change Control and Pressure Boundary. The transition from legacy DNWM governance was accomplished through a managed process of governance management records that ensured a controlled and thorough adoption process.



Per the current WWMF operating licence, the following codes and standards are used in design:

- *National Building Code of Canada* (2005)
- *National Fire Code of Canada* (2005)
- CSA B51 (2003)
- CSA N285.0-08 including Update 2

DNWM has executed various small and large modifications with no impact on the WWMF's ability to operate within its safety envelope. These modifications have been undertaken to improve the overall performance of the WWMF and to improve safety in design and operations, or to correct legacy deficiencies that affect the design basis. The significant modifications in the last licence period are listed below.

- (1) A modified design of the DSC (referred to as Mark II or MkII) was introduced at the WWMF. Principal changes from the original DSC design include the removal of the vent port and a smaller drain port. These changes took into account operating experience. Elimination of the vent port also simplified the containment boundary of the DSC. Commissioning of the DSC Mark II was completed at the WWMF in 2009.
- (2) Phased Array Ultrasonic Testing was introduced for inspecting the DSC lid-to-base containment weld. Phased Array Ultrasonic Testing is a volumetric, non-destructive inspection method that involves electronically steering a beam of sound waves through the weld (and adjacent base materials) to inspect the weld. Phased Array Ultrasonic Testing replaces radiographic inspection, thereby eliminating the health and safety hazards of the latter method's radiation exposure. Use of radiography to inspect DSCs ceased in 2011. The change in the inspection method was supported through third party expert review and approval of OPG's technical justification (which included the results of physical testing) provided under the auspices of the CANDU Inspection Qualification Bureau in 2010.
- (3) In June 2012, staff identified that fire alarms in certain locations of the WVRB did not meet audibility requirements per the applicable *National Building Code of Canada*. A modification to install appropriate audible and visual alarms that comply with code was completed in the fourth quarter of 2013.
- (4) In July 2013 and February 2014, there were two events involving overheating of an air duct that is designed to provide combustion air to the incinerator's primary chamber for waste incineration at WWMF. The design of the incinerator allowed waste residue to drip down from the primary chamber into the under fire air duct during incineration, leading to elevated temperatures in the duct. Modifications to prevent recurrence were executed successfully in the third quarter 2015 and the incinerator was returned to service.

- (5) Operating experience with the beam detector fire detection systems in LLSBs 1-11 has shown this technology to be less reliable than desired in the prevailing environmental conditions. A modification is underway to replace the beam detector systems with more reliable linear heat detection systems. LLSB 11 was completed in fourth quarter of 2015 and work will continue through 2016 on the remaining buildings.

In 2012, DNWM adopted the standard OPG Nuclear fleet metrics for physical design. The current suite of metrics includes measures of the health of the Engineering Change Control process within DNWM. Quality of design products is monitored using recorded verification results and cold-body design review boards within DNWM. A monthly report card is used to record and track DNWM's performance and to ensure that corrective actions are being taken to address any weaknesses or deficiencies that are observed.

### **2.5.3 Future Plans for Improvement**

DNWM plans to complete the remainder of the LLSB Fire Detection Upgrade modifications on LLSBs 1-10 to improve equipment reliability.

DNWM anticipates new codes and standards or new editions of existing codes and standards to be referenced in the new licence. DNWM will perform gap analyses and formulate transition plans as necessary to ensure compliance. The codes and standards anticipated in the new licence are:

- CSA N286-12, *Management system requirements for nuclear facilities*
- CSA N393-12, *Fire protection for nuclear power plants*
- NRCC NBCC (2010), *National Building Code of Canada*
- NRCC NFCC (2010), *National Fire Code of Canada*

WWMF follows the OPGN governance for pressure boundary. OPGN has a current agreement with the CNSC that freezes the code effective dates of applicable pressure boundary codes and standards throughout the duration of the Darlington NGS Refurbishment project. These frozen code effective dates are in place for WWMF as well. At the end of this project new code effective dates for applicable pressure boundary codes and standards, once accepted by CNSC staff, will be incorporated into OPGN governance. The anticipated WWMF Licence Conditions Handbook would reflect the new code effective dates as necessary at that time.

## 2.6 FITNESS FOR SERVICE

Fitness for Service covers the activities that impact the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure the equipment is available to perform its intended design functions when called upon to do so. Fitness for Service ensures the safety of the public and site personnel, protects the environment and ensures that equipment reliability is maintained at high operating performance standards.

OPG is committed to maintaining WWMF systems, structures, equipment and components that are critical to the safe, reliable and economic transportation, processing and storage of nuclear waste in a fit-for-service state. The implementation of OPG's Reliability, Maintenance and Aging Management Programs ensures the ongoing fitness-for-service of these systems.

OPG's key documents for the Fitness for Service SCA and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Equipment Reliability	N-PROG-MA-0026	R002
Conduct of Engineering	N-PROG-MP-0007	R012
Integrated Aging Management	N-PROG-MP-0008	R006

### 2.6.1 Equipment Reliability

Under OPG's Equipment Reliability Program, system performance monitoring is performed on critical WWMF systems (plant systems and transportation equipment) to ensure ongoing reliable operation.

System performance monitoring involves the trending of system performance and initiation of investigations or maintenance activities before failures occur. Process parameters, field observations, maintenance work order backlogs, Station Condition Reports, inspection results and spare parts status are some of the typical sources of data for performance monitoring. Where appropriate, equipment critical to system reliability are identified and maintenance strategies for these equipment are prepared. Actions to maintain or improve system health are also prepared.

Meetings with facility management, including representation from Operations, Maintenance, Performance Engineering, Design Engineering, Supply Chain, Radiation Protection and Licensing are routinely held to review system health status, maintenance strategies, and improvement plans, and ensure alignment between these work groups for the implementation of improvement plans. There are currently 23 systems at WWMF that are included in the system performance monitoring program. Ongoing management oversight of these improvement plans provides assurance that the plans are being implemented and the improvements are being achieved.

## **2.6.2 Maintenance**

Under DNWM's Nuclear Waste Management Program, recurring preventive maintenance activities are planned, scheduled and executed according to the preventive maintenance program. The management and scheduling of preventive maintenance activities are completed using OPG's enterprise software system 'Asset Suite' which also retains records of all maintenance tasks completed. Feedback inputs from maintenance staff and changes to preventive maintenance activities are managed in the Preventive Maintenance Living Program.

Non-routine maintenance (corrective maintenance) activities are requested, planned and executed using Asset Suite as well. Significant corrective maintenance issues may be identified using the Corrective Action Program and tracked to completion in Asset Suite's Action Tracking module.

As part of system performance monitoring, the status of the maintenance program is routinely assessed and reported to facility management for their review. Metrics for the completion of preventive and corrective maintenance activities are presented, and Station Condition Records are issued to address adverse conditions related to equipment health or the execution of maintenance activities. Corrective actions to address maintenance issues are provided for management approval and are monitored to completion.

## **2.6.3 Structural Integrity**

OPG conducts various activities to ensure the structural integrity of the L&ILW storage structures at WWMF to protect the health and safety of persons and the environment.

At the Western UFDSF, OPG conducts Phased Array Ultrasonic Testing to verify the integrity of the lid closure weld on each loaded DSC. The radiographic inspection system was replaced by the Phased Array Ultrasonic Testing inspection system in 2010 to improve inspection sensitivity and eliminate inspection radiation hazards. As of February 2016 approximately 750 DSCs have been inspected with the Phased Array Ultrasonic Testing system demonstrating the reliability of this improved inspection system.

At the Western L&ILW Storage Facility OPG verifies the structural integrity of its storage structures by checking for the presence of water in the structures on a routine basis and monitoring radioactive contamination levels in the water collected. As well, OPG monitors surface and sub-surface water in the areas immediately around the storage structures for contamination. Any observable trend in surface water or groundwater contamination would be an indicator of possible leakage from or into a storage structure.

Groundwater monitoring has identified higher tritium levels in the groundwater north of the LLSBs. More details on tritium in groundwater can be found in section 2.9.3.2. Follow-up investigations identified a pathway for contaminated condensation to migrate from older LLSBs into the below-grade electrical conduit system and then to groundwater. Stored waste currently blocks access to these conduit penetrations; however, during the LLSB Fire Detection Upgrades in 2017, as these conduit penetrations become accessible, they will be sealed. In the interim, a program of regularly scheduled pump-outs of the affected below grade electrical conduit system

has been implemented, and groundwater tritium concentrations in this area have started to decline.

Due to the inaccessibility of buried heat exchangers for visual inspection, the vessels are filled with nitrogen and pressure tested annually in order to find leaks. A small leak is the first sign of loss of structural integrity of the heat exchanges. Over the past 10 years these in-ground heat exchangers have all passed their annual pressure tests, providing assurance of their structural integrity.

## **2.6.4 Current Operations**

### **2.6.4.1 Aging Management**

Aging is effectively managed if aging effects are understood and controlled, and if aging related degradation mechanisms are mitigated through implementing appropriate corrective actions to prevent the loss of primary safety functions through the asset's service life.

Compliant to the applicable requirements of RD-334, *Aging Management for Nuclear Power Plants*, OPG has implemented an Integrated Aging Management Program at WWMF for safety-related structures. Under this program the DSC and L&ILW Aging Management Plans have been developed.

#### **(a) Dry Storage Containers**

The DSC Aging Management Plan addresses aging mechanisms, such as corrosion, which could potentially affect DSCs. Current aging management activities include:

- General visual check of the condition of the protective coating on the exterior of the DSC, with emphasis on the condition of the coating on the containment welds;
- Periodic inspection and re-inspection of the base plates of a baseline population of DSCs;
- Ultrasonic inspection of indications in the metal of the base perimeter flange;
- Monitoring of chloride levels which have the potential to accelerate corrosion; and,
- Dry Storage Container corrosion monitoring.

Results to date:

- Condition of the coating on the containment welds and the Dry Storage Containers themselves remain in good-to-excellent condition. To date, very few areas on the containment welds have required re-coating (i.e. touch-up)
- No changes have been observed in the condition of the base plates between the time of their initial inspection and re-inspection; the CNSC is provided with annual summary reports of the inspections
- Measured chloride levels to date have a negligible effect on the potential corrosion of the DSC external surfaces

With the ongoing implementation of this Aging Management Program, OPG is confident of DSC integrity throughout and beyond the next licence period.

**(b) Transportation Packages**

The current aging management activities for transportation packages include:

- The periodic non-destructive examination of containment and load-bearing welds.
- The periodic sampling, property testing and trending of test results for the rigid polyurethane foam used in the packages for impact and thermal protection.

Results to date:

- The packages (some are 20+ years old) are in good condition; there are no unacceptable indications in the welds.
- There has been no significant change or degradation of the polyurethane foam properties.

This monitoring will continue, and OPG is confident in the fitness for service of the transportation packages.

**(c) Low & Intermediate Level Waste Storage Structures**

The L&ILW Storage Structures Aging Management Plans address the aging mechanisms that could lead to degradation of the L&ILW structures. These plans integrate various routine monitoring and testing programs with inspections to assess each structure's overall condition and to provide basis for the corrective actions required to maintain each structure's fitness for service.

In the current licensing period, a number of inspections, structure improvements and program improvements have been completed:

- LLSB roof inspections were completed in 2008.
- Roof membranes for LLSBs 1 to 5 were replaced in 2011 and 2013 based on the 2008 inspection and life assessment results.
- Internal inspections of WWMF trenches were completed in 2007 and follow-up inspections were completed in Q3 2015. During the 2015 inspection water was found in the bottom of trench 3-2 and corrosion was observed on the surfaces of the waste drums stored in the trench. The trench was pumped out and the source of the water is being investigated. An inspection of the trench and repackaging of the corroded drums is planned in 2016. To ensure safe handling of the corroded drums during repackaging, specialized equipment and procedures are being developed.
- To address corrosion concerns for carbon steel resin liners identified in previous studies, 350 carbon steel resin liners were removed from IC-18 storage, over-packed in stainless steel containers and then returned to the IC-18 storage in 2007 and 2008.

- IC-18 sample caps were modified in two batches: Camlock sample caps were installed on 92 IC-18s in 2010 to improve accessibility for routine water checks; improved Victaulic caps were installed on 54 IC-18s in 2015 to improve leak tightness and accessibility for routine water checks. The remaining 146 of 252 IC-18s already had either Camlock or screw-on sample caps, both of which have proven to be leak-tight and accessible. All IC-18 sample caps are now complete.
- A condition monitoring life assessment was completed in 2013 on low level waste containers that were considered at risk of not reaching their 50 year design life. Container wall thicknesses were measured and small sections of the container walls were cut-out for metallographic analysis. The oldest container assessed in the 2013 condition monitoring life assessment was stored in 1981. The study concluded that all of the assessed containers will reach their 50 year design life.
- Aging Management Plans have been updated for the in-ground Low and Intermediate Level Waste storage structures to include periodic visual inspections in the preventive maintenance program.

Monitoring will continue and repairs or replacements will be performed as needed throughout the next licence period to ensure the ongoing fitness for service of the L&ILW Storage Structures.

## **2.6.5 Future Plans for Improvement**

OPG has planned a number of initiatives to address aging, obsolescence and to ensure ongoing fitness for service of critical structures, systems and components through the next licence period:

### **(a) Used Fuel Dry Storage Facility**

- Lift-King transporter upgrades are planned to address reliability and obsolescence issues. There are no safety issues with the Lift-King transporter.

### **(b) Transportation Packages**

- Two new Multi-Purpose Transportation Packages will be placed in-service by 2018, to replace existing heavy water ("TDO") packages. The Multi-Purpose Transportation Package design offers an improved seal testing capability over the older package design.
- Nine new ISO transportation packages will be placed into service in 2018.

### **(c) Low & Intermediate Level Waste Storage Facility**

- Replace obsolete overhead doors on older Low Level Storage Buildings;
- Replace obsolete components in Low Level Storage Buildings fire detection and fire suppression systems; and,
- Replace roof membranes for Low Level Storage Buildings 6, 7 and 8.

**(d) Waste Volume Reduction Building**

A number of replacements are planned to improve incinerator reliability and address obsolescence concerns including replacement of:

- Motor Control Centre 2/3,
- Service air compressor,
- Programmable Logic Controller/data handling system,
- Uninterruptible Power Supply,
- Solid waste feed system Programmable Logic Controller,
- Major components of the Continuous Emissions Monitoring system, and
- Induced Draft fan.

A number of incinerator modifications in the areas of the spray cooler elbow, ash bin venting system, feed ram cylinder, and line and carbon delivery system will be completed to improve reliability.

**(e) Planned Inspections and Improvements**

Repackaging of corroded waste drums from trench 3-2, as well as a condition assessment of this trench section is planned to start in 2016. Other plans include condition assessments of selected tile holes and selected In-ground Containers between 2016 and 2019 using remote camera inspection techniques.

**(f) Compliance with REGDOC-2.6.3**

As part of continuous improvement, by July 15, 2017, WWMF will be compliant with REGDOC-2.6.3, *Aging Management*.

**2.7 RADIATION PROTECTION**

OPG has established a comprehensive Radiation Protection Program to protect workers and the Public. This program is in place to support OPG's nuclear waste facility operations and to assure compliance with the *Nuclear Safety and Control Act* and its Regulations, applicable provincial legislation, and OPG's Management System.

OPG's key document for the Radiation Protection SCA and the revision at the time of writing is listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Radiation Protection	N-PROG-RA-0013	R009



### **2.7.1 Radiation Protection Program**

The Radiation Protection Program is implemented through a series of standards and procedures for the conduct of activities within nuclear sites and with radioactive materials intended to achieve and maintain high standards of Radiation Protection including the achievement of the following objectives:

- (1) Controlling occupational and public exposure by:
  - Keeping individual doses below regulatory limits;
  - Avoiding unplanned exposures;
  - Keeping individual risk from lifetime radiation exposure to an acceptable level; and,
  - Keeping collective doses As Low As Reasonably Achievable (ALARA).
- (2) Preventing the uncontrolled release of contamination or radioactive materials from the nuclear sites through the movement of people and materials.
- (3) Demonstrating the achievement of (1) and (2) through monitoring.

#### **(a) Radiation Protection Program Monitoring and Oversight at WWMF**

In addition to Fleetview reporting and assessments described in Section 2.1, the design and execution of the Radiation Protection Program is subject to ongoing monitoring through mechanisms including but not limited to:

- Management review and assessment which includes:
  - Joint Committee on Radiation Protection
  - Monthly Nuclear Oversight Meeting
  - Weekly Management Review Meeting
- Exceptional dosimetry and dose control device measurement results.
- Dose trends.
- Worker and worker representative's input to the Radiation Protection Program through their local Joint Health and Safety Committees.
- Radiation Protection program self-assessments.
- Independent audits.
- External assessments performed by the CNSC.
- Adoption of World Association of Nuclear Operators best practices.
- Investigation of events in which an Action Level has been exceeded.
- Improvements to the Radiation Protection Program, such as enhanced alpha monitoring through workplace controls and specialized alpha radiation protection equipment.

- Trending of Radiation Protection Program measures commonly used in the nuclear industry.
- Benchmarking of OPG practices with the rest of the nuclear industry.
- Reviews of industry operating experience.
- CANDU Owners Group and other research and development programs.

**(b) Performance Indicators**

Established performance indicators include Radiation Protection Program effectiveness measures commonly used in the nuclear industry and OPG defined indicators established for the purpose of monitoring particular program elements. These are captured in OPG's Electronic Performance Reporting systems as well as DNWM Scorecards and Radiation Protection Indices. Specific measures include: personnel contamination incidents, regulatory infractions as well as dose performance versus dose targets.

**(c) Management Control over Worker Practices for Dose and Contamination Control**

Performing radioactive work and exposure to radiation within WWMF requires a systematic approach and is managed through the following processes:

- Limiting individual worker dose.
- Managing dose as a resource, in terms of constraints on work activities.
- Establishing facility design consistent with ALARA principles.
- Assessing hazards for planning and maintaining knowledge of conditions.
- Controlling the use of licensed radioactive devices and equipment.
- Planning all radioactive work taking into account personnel, hardware, procedures, supervision, and the physical environment of the job.
- The planning process includes the anticipation and evaluation of radiation hazards and the selection of appropriate protective measures and dosimetry. The degree of formalization of the planning process and the approval levels for a job is proportional to the potential for exposure. Plans include backout conditions and contingencies. Radiation protection planning decisions are documented in a radiation exposure permit.
- The program elements described in this section ensure compliance with the regulatory requirements to keep exposures ALARA, implement control of occupational and public exposure, and plan for unusual situations.

**d) Licenses**

OPG holds the following Nuclear Substances and Radiation Devices Licences:

- Licence # 12861-2-20.3 for consolidated uses of nuclear substances (815) for nuclear substances and prescribed equipment.
- Licence # 12861-15-17.1 for temporary possession – no use (918) for nuclear substances.
- Licence # 12861-17-20.0 for servicing, installation and dismantling of devices – basic servicing (822) for prescribed equipment.

OPG also holds Dosimetry Service Licence # 12861-11-25.0 for in-house dosimetry services – consolidated (598) for the operation of a dosimetry service.

**2.7.2 Current Operations**

The action levels for dose to workers and for contamination control are as follows:

<b>Application</b>	<b>Action Level</b>	<b>Observations</b>
<u>DOSE TO WORKERS</u> Individual worker external whole body radiation dose received on a job greater than planned.	1 mSv (100 mrem)	The Action Level is exceeded if a person receives an external whole body radiation dose of greater than 1 mSv above the planned dose per shift.
<u>CONTAMINATION CONTROL</u> Beta-gamma surface contamination levels greater than a predetermined activity in the Dry Storage Container Storage Area.	$3.7 \times 10^4$ Bq/m <sup>2</sup> (1 µCi/m <sup>2</sup> )	The Action Level is exceeded if 2 or more Beta-Gamma Surface Contamination Events exceeding $3.7 \times 10^4$ Bq/m <sup>2</sup> (1 µCi/m <sup>2</sup> ) occur per quarter.

There have been no action level exceedences related to dose to workers during the current licence period.

During the current licensing period, there were no recordable doses at the WWMF that exceeded legal limits in the *Radiation Protection Regulations* or that were in excess of OPG's administrative limits. OPG's administrative limits include two control levels for exposure: (1) the Exposure Control Level is 10 mSv/year; and, (2) the Administrative Dose Limit is 20 mSv/year.

Similarly, during the current licensing period, there was no loss of contamination control events in excess of WWMF's contamination control action level.

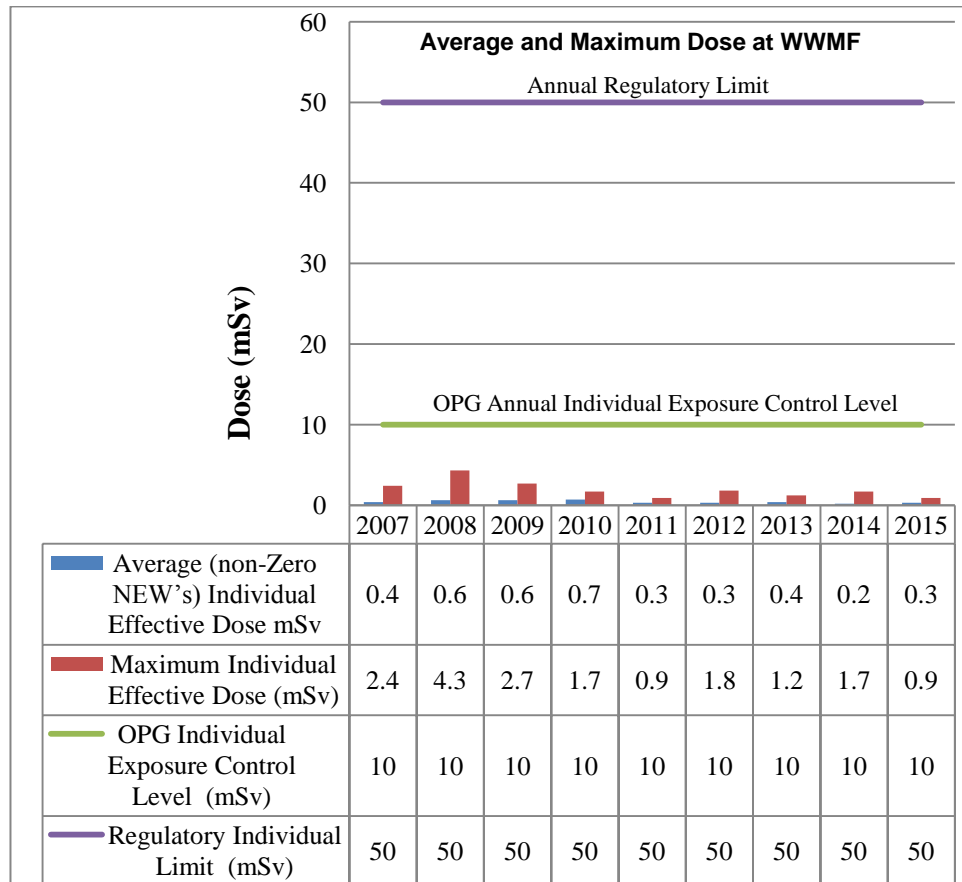
**(a) Collective Dose and Maximum Individual Dose per Year**

OPG's exposure control program continues to be in full compliance with regulatory requirements. In particular, the OPG individual exposure control level of 10 mSv (1 rem) per calendar year is significantly below the single year regulatory limit of 50 mSv (5 rem) per year, and the five-year regulatory limit of 100 mSv (10 rem) averaged over five years for a nuclear energy worker. ALARA targets are

generated on a yearly basis and are based on outages, normal operations, and waste to be received on a volume basis along with special projects (such as movement of waste to accommodate fire detection upgrades). Figure 24 and Table 7 outline the key dose statistics for OPG's WWMF.

In the last licence period, enhanced radiological contamination monitoring equipment has been procured and installed at OPG's WWMF to increase OPG's capability and reliability to detect low levels of radioactive contamination. This consists of new personal whole body contamination monitors and enhanced gamma sensitive portal monitors, as well as large object monitors to detect extremely low levels of radioactivity.

The Health Physics Department has recently commissioned a Whole Body Counter (used to assess and assign dose from internal uptakes of radioactivity) as part of its licensed dosimetry services to the WWMF. This provides enhanced efficiency for the monitoring of staff and visitors.



**Figure 24: Average and Maximum Dose at WWMF**

**Table 7: Key Dose Statistics for OPG's Western Waste Management Facility**

Calendar Year	Total Number of Staff Monitored	Total Number of NEW's*	Collective Dose	Average (total) Individual Effective Dose	Average (non-Zero NEW's) Individual Effective Dose	Maximum Individual Effective Dose
Unit:	#	#	Person-mSv	mSv	mSv	mSv
2007	180	175	20.09	0.1	0.4	2.4
2008	181	181	25.30	0.1	0.6	4.3
2009	203	198	12.48	0.1	0.6	2.7
2010	246	227	33.8	0.1	0.7	1.7
2011	241	225	15.6	0.1	0.3	0.9
2012	242	229	17.7	0.1	0.3	1.8
2013	207	197	18.8	0.1	0.4	1.2
2014	220	205	13.5	0.1	0.2	1.7
2015	200	197	8.67	<0.1	0.3	0.9

\* NEW – Nuclear Energy Worker as defined by the *Nuclear Safety and Control Act*

#### **(b) Contamination Control**

Radioactive contamination controls are in place to reduce occupational and public exposure, and to ameliorate the release of radioactive materials to the environment. The objectives are to prevent a loss of radioactive contamination control, to minimize the area affected if contamination occurs, and to restore the condition to acceptable levels as soon as possible. During the reporting period, no contamination events in excess of regulatory limits have occurred.

#### **(c) Results of Corporate-wide Radiation Protection Audit**

In 2015, a corporate wide Radiation Protection audit was completed. A formal corrective action plan was prepared and approved at the corporate level. No major non-conformances were found specific to the WWMF; however, improvements in the application of Radiation Protection Fundamentals (use of personal protective equipment) were cited. In particular, opportunities for improvement were noted in clarifying the requirements of when respiratory protection was to be worn (and could be removed) as captured on the Radiation Exposure Permits.

### 2.7.3 Future Plans for Improvement

Based on industry best practices, OPG's WWMF will implement new whole body contamination monitors, and will evaluate the alarm set-points and Radon rejection software to reduce spurious alarms.

As the WWMF incorporates new waste storage structures and facilities, culminating in the eventual operation of the L&ILW DGR, there is an opportunity to reduce dose and increase efficiencies through the adoption of a wireless infrastructure for radiation protection equipment. Further opportunities include telemetry for personnel monitoring as an additional safety barrier.

In addition, appropriate controls and engineered systems (fume hoods, tents, HEPA (High-Efficiency Particulate Air) filtration, sorting tables, and sensitive gas-flow alpha/beta detectors) are in place to allow for aggressive decontamination and free release of large items.

## 2.8 CONVENTIONAL HEALTH AND SAFETY

### 2.8.1 Conventional Safety Program

OPG's key documents for the Conventional Health and Safety SCA and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Employee Health and Safety Policy	OPG-POL-0001	R009
Health and Safety Management System	OPG-PROG-0010	R003
Work Protection	N-PROG-MA-0015	R011

The goal of OPG Nuclear's Conventional Safety Program is to ensure the safety and well-being of its workers. This is achieved by ensuring that safety is the number one priority and by managing conventional risks in the workplace associated with WWMF's operations. The Conventional Safety Program is designed to be an integrated system with OPG Nuclear business managed processes, where appropriate, and considers the current organizational structure.

The *Employee Health and Safety Policy* states:

- OPG shall meet or exceed all applicable health and safety legislative requirements, as well as, other associated health and safety standards to which OPG subscribes. OPG shall require that its contractors maintain a level of safety equivalent to that of OPG employees while at OPG workplaces;
- OPG shall ensure that employees are involved in decisions that have an impact on their health and safety, either individually, as a group, or through their employee representative groups;

- OPG shall, ensure that work is planned and performed to protect workers. It shall provide its employees with the information, training, tools, procedures and support required to do their jobs safely; and,
- OPG shall set health and safety targets as part of its annual business planning process. Health and safety performance against these targets shall be regularly measured and evaluated to ensure the effectiveness of OPG's health and safety systems.

The *Employee Health and Safety Policy* further commits to the prevention of workplace injuries and ill health, and to continuous improvement of its employee health and safety performance.

To ensure that the overall objective of managing occupational hazards is met, OPG monitors the following indicators:

- All Injury Rate;
- Accident Severity Rate; and,
- High Maximum Reasonable Potential for Harm Events.

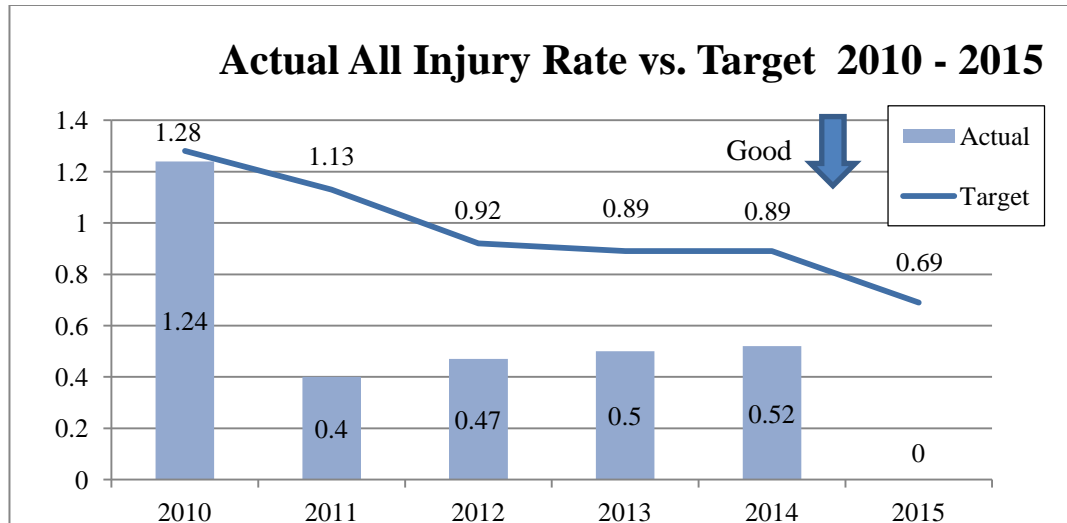
## 2.8.2 Current Operations

The following section provides the results on All Injury Rate, Accident Severity Rate and high Maximum Reasonable Potential for Harm events for the reporting period. All Injury Rates and Accident Severity Rates provided are for the entirety of DNWM which the WWMF is part of.

### (a) All Injury Rate

The All Injury Rate is the number of fatalities, lost-time injuries and medical treatment injuries multiplied by 200,000 hours, divided by the total exposure hours worked.

DNWM's All Injury Rate performance was better than target from 2010 through 2015 as shown in Figure 25. There were three medically treated injuries in 2010 (rolled ankle, back strain, and back pain); one lost time accident in 2011 due to arc flash; and one medically treated injury in each of 2012 (arc flash), 2013 (slip in a parking lot) and 2014 (elbow pain while working at computer workstation). There were no medically treated or lost time injuries in 2015.



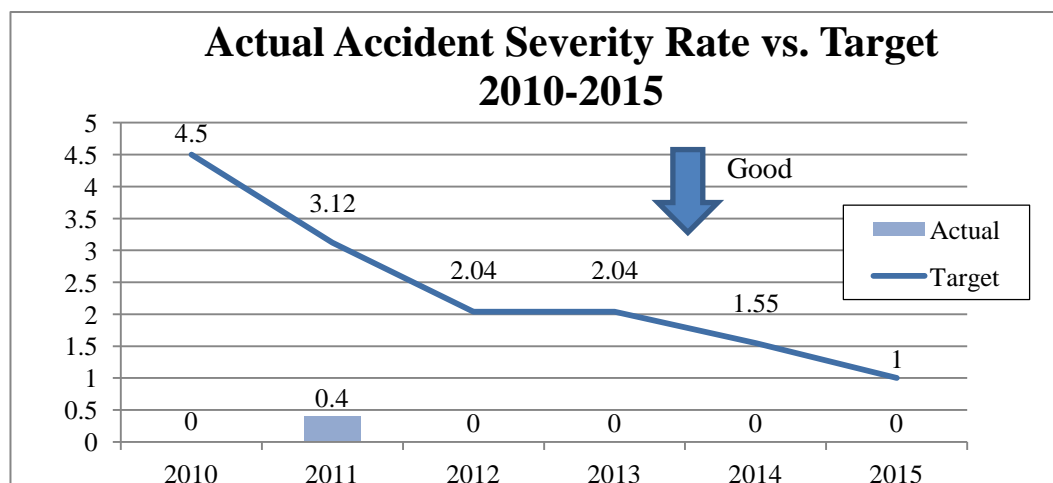
**Figure 25: DNWM All Injury Rate vs. Target**

**(b) Accident Severity Rate**

The Accident Severity Rate is the number of calendar days lost due to work-related injury multiplied by 200,000, divided by total facility hours worked.

DNWM's Accident Severity Rate was better than target from 2010 through 2015 as shown in Figure 26. There was one Lost Time Injury in 2011, where a worker was exposed to a weld arc flash which resulted in one missed day of work. A root-cause investigation was conducted and corrective actions were implemented including training and procedural requirements for welding of DCSs.

Since that day in 2011, DNWM has showed its continued focus on safety performance by working over 1,825 days (or 5 years) without a lost time accident. There has also been a steady decline in medically treated injuries over the last 5 years.



**Figure 26: DNWM Accident Severity Rate vs. Target**



**(c) High Maximum Reasonable Potential for Harm Events**

The Maximum Reasonable Potential for Harm is a rating system used to classify incidents, and to determine the potential severity of safety incidents. These are incidents with potential for injury to personnel; however, no actual injury may have occurred. High Maximum Reasonable Potential for Harm incident investigations offer learning opportunities for continued improvement in safety performance.

During this reporting period (2007 – 2015), there were seven High Maximum Reasonable Potential for Harm events that occurred at OPG's WWMF, as described below.

**Material Handling**

- (1) In June 2011 an employee attempted to assist a fork lift operator with a stuck oil pallet when a steel frame suddenly moved and made contact with the individual's shoulder. Operating Experience of this event was communicated to staff to ensure alignment with management expectations with regard to safe production at all times. A procedure was developed for the task being performed, and a roll out of the Internal Responsibility System was completed to L&ILW staff in November 2012. There have been no repeat events similar to this.

**Mobile Crane**

- (2) In October 2013 a mobile crane contacted live overhead power lines while an employee was driving the mobile crane from a lay down area to the L&ILW Storage Facility. While exiting the lay down area, the boom of the mobile crane came in contact with live overhead power lines (4.16kV). The overhead power lines were replaced / repaired and power was restored by Hydro One. The event was communicated to staff, warning flags were applied to the over head power lines by Hydro One and expectations for crane travel with the boom lowered were re-communicated and reinforced.

**Falling Object**

- (3) In February 2007, an overhead door (estimated to weigh about 1,500 pounds) was in the raised position to allow a worker to bring in a snow blower. A worker returned to lower the door, pressed the down button and the panel door crashed to the floor in an uncontrolled descent. The immediate cause of failure was determined by an outside contractor to be a loose set screw on one of the drive sprockets. Lessons learned from this event were communicated, maintenance program confirmed in place for all overhead doors and preventive maintenance program on in-service overhead doors reviewed to ensure they contain required elements.
- (4) In January 2014, two employees were moving a single person Genie lift from the Bruce Power Central Maintenance Facility garage to the WWMF Transportation Package Maintenance Building using a pick-up truck fitted with a power tailgate. During the move the swivel casters caught against an uneven surface, and the lift inadvertently came into contact with the Transportation Package Maintenance Building garage door and landed on the ground. Lessons learned from this event were communicated to L&ILW staff, a safe work plan was developed for moving single person Genie lifts, and Supervisors conducted Observations and Coaching activities focused on pre-job briefs.

### Flying Object

- (5) In August 2009, during post-maintenance testing of the dry leg of a fire protection system in UFDSB 1, the fire hose in the cabinet furthest from the deluge valve became energized, breaking the cabinet glass and exiting the cabinet with considerable force. The hose became energized because its valve was passing due to improper setup, and because a safety clamp designed to keep the hose from becoming pressurized until the hose was fully deployed was not in its proper position at the time of the incident. A legacy configuration issue was determined to be a contributing cause in this event. Corrective actions included implementation of a strategy with respect to Nuclear Waste Fire Protection Program, training of WWMF operators with responsibility for fire system operation and testing assignments and training of Fire System Engineer(s) for DNWM.

### Working at Heights

- (6) In November 2014 a recycling truck operator working for an external company was at the WWMF site to pick up recycling material. An OPG employee observed the recycling truck operator climb to the top of the truck and into the back of the truck exposing the operator to a potential fall from height. The contractor confirmed the company has a policy on workers accessing the top of the vehicle. The contractor also confirmed they have discussed the incident with the worker, outlined their expectations, and changed their policy for work at the Bruce Power NGS / WWMF so that their workers were no longer allowed to access the top of the vehicle while on site.
- (7) In January 2015, a contract scaffold worker slipped and fell while building a scaffold in the L&ILW zone 3 incinerator room. At the time of the incident, the worker was wearing fall arrest; however, the fall arrest equipment was not tied off. Follow up was conducted with the contractor to reinforce expectations around working at heights and additional oversight was put in place for scaffold work within the facility.

### **(d) Internal Responsibility System**

The Internal Responsibility System is a system within an organization, applied consistently throughout OPG, where everyone has personal and shared responsibility for working together co-operatively, to prevent occupational injuries and illnesses. The duties for a healthy and safe workplace fall on every individual, to the degree they have:

- Authority to do so (based upon their position); and,
- Ability to do so (based upon their expertise and qualifications).

Each person is expected to take the initiative on health and safety issues, work to solve problems, and make improvements on an on-going basis. The Internal Responsibility System is based on the principle that employees themselves are in the best position to identify health and safety problems and identify solutions. The Internal Responsibility System outlines the appropriate resolution level for timely corrections.

### 2.8.3 Future Plans for Improvement

A number of health and safety improvement initiatives have been identified for the WWMF as part of the continuous improvement cycle of the health and safety management system. These include further implementation of the OPGN Human Performance Program tools and processes, an increased focus on Situational Awareness particularly around routine activities such as walking, continued focus on improvements to the Internal Responsibility System as well as a “Total Health Initiative” supporting employees and their families in their efforts to achieve an optimal level of health and functioning, primarily through health education, health promotion, disease and injury prevention, and crisis intervention.

In addition, to reflect WWMF’s commitment to continuously improving and challenging performance, targets for All Injury Rate and Accident Severity Rate have been decreasing.

## 2.9 ENVIRONMENTAL PROTECTION

Compliant to the requirements of REGDOC-2.9.1, *Environmental Protection Policies, Programs and Procedures*, WWMF has in place an environmental protection program.

OPG’s key documents for the Environmental Protection SCA and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Environmental Policy	OPG-POL-0021	R004
Environmental Management System	OPG-PROG-0005	R004
Environmental Management	N-PROG-OP-0006	R018

### 2.9.1 Environmental Management Program

OPG’s Board of Directors has established an environmental policy that requires OPG to maintain an Environmental Management Program consistent with the International Organization for Standardization (ISO) 14001 *Environmental Management System Standard*. OPG’s Environmental Management Program requires assessment of environmental risks associated with the facility’s activities, and to ensure that these activities are conducted such that any adverse impact on the natural environment is ALARA. This program includes OPG’s approach to ensure compliance with applicable statutory and regulatory requirements. The Environmental Management System provides the structure and processes to ensure implementation and follow-up on management programs needed to deliver the environmental policy.

OPG’s Environmental Management System has been implemented at the WWMF site. This is further defined through the framework specified in OPG Nuclear’s Environmental Management Program. This is aligned with OPG’s Plan-Do-Check-Act business model. Through this model, objectives, targets and programs are established, executed, monitored and reviewed with the commitment to continual improvement.

OPG is committed to maintaining registration of the ISO 14001 *Environmental Management System Standard*. Verification that the Environmental Management System Standard is effectively maintained is completed through annual internal audits and compliance audits.

## **2.9.2 Current Operations**

### **2.9.2.1 Environmental Management System**

As part of OPG's Environmental Management System, environmental performance targets, including reportable spills, environmental compliance, and radioactive waste generation are reviewed annually to ensure that opportunities for continuous improvement are identified and implemented. Programming is in place to ensure that facility spill environmental compliance risks and waste generation are reviewed and opportunities for improvement are identified and implemented.

Identification of the OPG Significant Environmental Aspects which apply to WWMF allows for more focus on areas where there is the potential to have a negative (or positive) impact on the environment. The Significant Environmental Aspects that have been identified for the WWMF include the following:

- Habitat and Wildlife Biodiversity Conservation
- Carbon-14 Emissions to Air
- L&ILW Generation and Storage
- Spills
- Emissions of Tritium

Risks associated with these Significant Environmental Aspects are managed through either operational controls or specific programs. Examples include:

- Spills prevention and mitigation,
- Reduction of radioactive waste generation and volume for storage,
- Containment/minimization of emissions/releases from waste,
- Effluent, groundwater, surface water and ambient air monitoring,
- Wildlife habitat conservation, etc.

Performance measures are established to ensure the controls/programs perform as designed and are corrected/improved under the Environmental Management System framework.

For example, spill and compliance targets have been established and tracked during the licence period. Since that time, OPG has consistently met or surpassed these targets. Over the past 9 years, only four spills and four environmental infractions have occurred at the WWMF. These events are summarized below. In all instances there were no impacts to the environment.

### Reportable Spills

On June 20, 2014, there was a leak in the domestic water supply resulting in a chlorinated discharge to the environment.

On March 1, 2013, approximately 50 litres of mixed ethylene glycol and water spilled onto an asphalt surface with some residual ethylene glycol entering the ditch adjacent to the site.

On May 7, 2010, 90 kg of powdered lime spilled onto an asphalt surface with some of the lime entering the ditch adjacent to the site due to rainfall.

On September 16, 2009, approximately 200 litres of water with trace amounts of ethylene glycol spilled onto an asphalt surface with trace amounts of ethylene glycol entering the ditch adjacent to site.

### Environmental Infractions

On June 10, 2013, the frequency of groundwater sampling for the conventional landfill was reduced prior to receiving Ministry of Environment approval. Approval has since been granted.

On October 29, 2008, a physical change to improve incinerator performance was completed without approval from the Ministry of Environment and Climate Change as required through the Environmental Compliance Approval process. The Environmental Compliance Approval was subsequently amended to address the change.

On October 29, 2008, the incinerator emissions exceeded operational requirements for carbon monoxide and hydrogen chloride as per the Environmental Compliance Approval. Operational improvements were subsequently implemented to address these exceedances.

On June 7, 2007, an Environmental Compliance audit showed that a number of waste manifests were not in compliance with Regulation 347. The Hazardous Material Control procedure was revised to include an instruction for the shipping of Hazardous Waste and the control of Waste Manifests at the Western Waste Site. A roll out of the procedure was made to affected staff.

## **2.9.2.2 Radiological Effluent Monitoring Program**

OPG's WWMF is designed to operate within regulatory limits and to ensure that radiological exposure to workers and the public and impacts to the environment are ALARA. The Radiological Monitoring Program monitors site effluents to ensure releases are within the regulatory limits and provides confirmation that systems are performing as designed. The Radiological Monitoring Program at the WWMF is in accordance with CSA N288.5-11, *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*. The effluent pathways monitored at the WWMF consist of the following:

- Liquid effluent discharged from the WWMF site (i.e., stormwater and subsurface drainage);
- Airborne emissions from the incinerator and building ventilation stacks;
- Ambient radiation dose rates at the perimeter of the WWMF; and

- Groundwater within, and in the vicinity of the WWMF.

The results of the effluent monitoring program are provided to the CNSC in the quarterly operations reports and are available to the public on the OPG website. A summary of the results from the past 9 years are provided in the following subsections.

### **Radiological Environmental Monitoring Program**

Radiological emissions from the WWMF are a small fraction of the overall emissions from the Bruce nuclear site. The offsite radiological impacts from the operation of the WWMF, in addition to the other facilities on the Bruce nuclear site, are monitored under Bruce Power's Environmental Monitoring Program. Bruce Power's radiological environmental monitoring includes air, precipitation, water (municipal, well, lake/stream), aquatic samples (fish, sediment, sand), and terrestrial samples (animal products, vegetation, soil). Data gathered from this program, along with emissions data, are used to assess the annual radiological dose to members of the public living or working in the vicinity of the Bruce nuclear site. Results of monitoring and public dose assessment are published in Bruce Power's annual Environmental Monitoring Program report which is submitted to the CNSC and made available to the public. As discussed in Section 2.9.3.1, dose to the public from operation of facilities on the Bruce nuclear site is a very small fraction of the public dose limit.

### **Derived Release Limits**

Derived release limits are derived using CSA N288.1 and approved by the CNSC. Derived release limits are used to establish controls on the releases of radioactive materials. Derived release limits are calculated for radionuclides of potential dose significance in effluent streams, to facilitate the control, reporting, and regulation of radionuclide emissions. The emissions from OPG's WWMF have been consistently less than 1% of the derived release limits. WWMF's current derived release limits are shown in the following table.

<b>Release Category</b>	<b>Radionuclide</b>	<b>Derived Release Limit (Becquerel/week)</b>
Air	Tritium (HTO)	5.67E+15
	Iodine(mfp)	3.64E+10
	Carbon-14	2.09E+13
	Particulate	4.48E+10
	Gross Alpha	6.43E+9
<b>Release Category</b>	<b>Radionuclide</b>	<b>Derived Release Limit (Becquerel/month)</b>
Water	Tritium	6.42E+14
	Carbon-14	5.64E+11
	Gross Alpha	2.44E+10
	Gross Beta-Gamma	3.80E+10

### **Action Levels**

The *Radiation Protection Regulations* state that an “*action level*” means “*a specific dose of radiation or other parameter that if reached, may indicate a loss of control of part of a licensee’s radiation protection program and triggers a requirement for specific action to be taken*”. Action levels are set at a fraction of the derived release limits to provide early detection of a potential loss of control and ensures appropriate action is taken to prevent emission from approaching a derived release limit. Exceeding an action level requires notification to the CNSC, investigation of the cause, corrective action as required, and a report submitted to CNSC. WWMF’s current action levels are shown in the following table.

<b>Release Category</b>	<b>Radionuclide</b>	<b>Action Level (Becquerel/week)</b>
Air	Tritium (HTO)	5.90E+14
	Iodine(mfp)	3.79E+09
	Carbon-14	2.17E+12
	Particulate	4.70E+09
	Gross Alpha	6.69E+08
<b>Release Category</b>	<b>Radionuclide</b>	<b>Action Level (Becquerel/month)</b>
Water	Tritium	6.20E+13
	Carbon-14	5.41E+10
	Gross Alpha	2.34E+09
	Gross Beta-Gamma	3.60E+09

In 2011, the new action levels were developed using CNSC Regulatory Guide G-228, *Developing and Using Action Levels* as a guide. The derived release limits were updated in parallel, due to the availability of new site and meteorological data, as well as updated derived release limit methodology, primarily CSA Standard N288.1-08 *Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities*.

In accordance with Licence Condition 4.2 of the WWMF Operating Licence, WFOL-W4- 314.02/2017, OPG has assessed the proposed changes to the derived release limits and action levels, and found them to be within the existing safety and design envelope, not likely to adversely affect the safe conduct of any licensed activities, nor outside the scope of the licence. Changes are made in accordance with OPG's change control program established in the former NWMD conduct of engineering program.

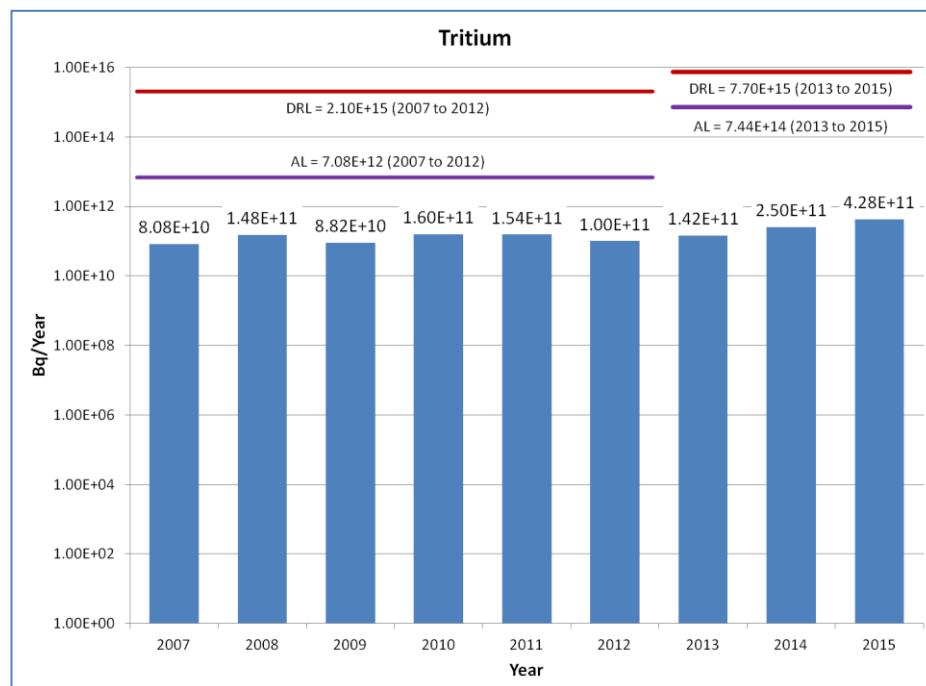
## **Radiological Waterborne Emissions**

Waterborne radioactivity is monitored via the storm water runoff and via the sub-surface drainage systems at the WWMF.

The results of the radiological waterborne emission monitoring programs are reported in the WWMF's quarterly operations reports submitted to the CNSC. Over the past 9 years, six exceedances of the action level have occurred for gross beta waterborne emissions at the WWMF. These occurred between the third quarter of 2010 and fourth quarter of 2012.

As a result of the exceedances, an investigation was performed and the cause of the action level exceedances was found to be related to an increase in surface runoff volume as the WWMF site area expanded over time and higher than normal minimum detection levels in the analysis. The increase in minimum detection levels was caused by interference in the gross beta activity measurement by the presence of dissolved road salt in the surface runoff water in the winter season. Subsequently, the derived release limits and action levels were updated in accordance with the CSA standard to better reflect site conditions. The derived release limits and action levels were approved by the CNSC, and since 2013, when the updated derived release limits and action levels were implemented, there have been no exceedances.

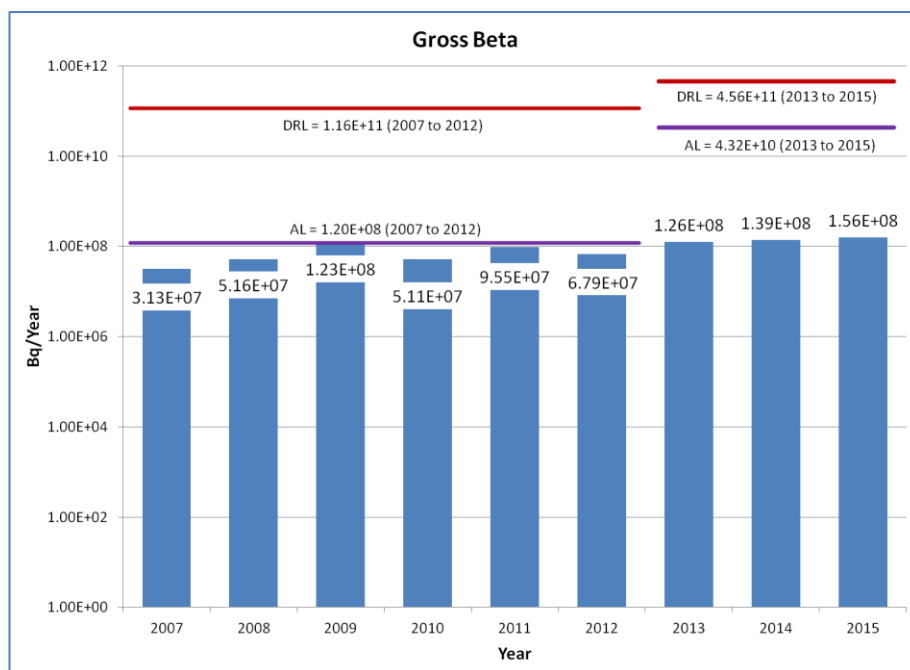
A summary of WWMF's annual radiological waterborne emissions is provided in the following figures. The action level exceedances as noted above are based on total monthly releases. These exceedances are not directly reflected in Figure 28 as these emissions are presented as annual releases not monthly.



**Figure 27: WWMF Annual Tritium Waterborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/month for comparison to annual emissions.





**Figure 28: WWMF Annual Gross Beta Waterborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/month for comparison to annual emissions.

As shown in Figure 27 and Figure 28, the annual waterborne emissions are orders of magnitude below the derived release limits and the current action levels. Over the past 9 years, there has been a slight increasing trend in waterborne emissions. This is attributed to more storage buildings being in operation and increase in subsurface drainage.

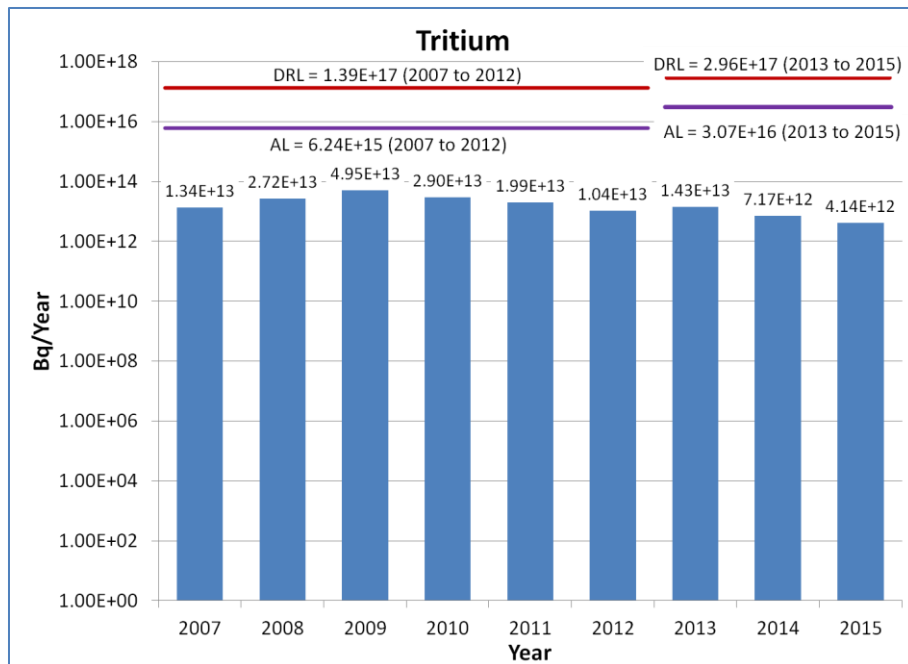
### **Radiological Airborne Emissions**

At the WWMF, the WVRB radioactive waste incinerator stack and ventilation exhaust stack are monitored for tritium, particulate and Iodine-131 emissions while Carbon-14 emissions are monitored on the incinerator stack only. The Transportation Package Maintenance Building ventilation stack is monitored for tritium and particulate emissions.

The UFDSF at WWMF has a ventilation exhaust stack that is monitored for particulate emissions.

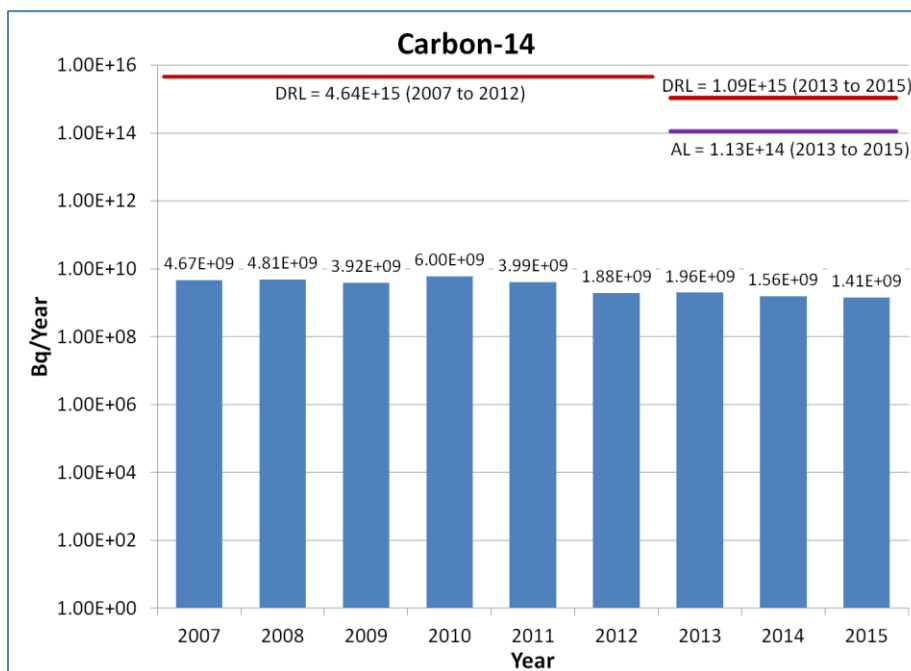
The results of the radiological airborne emission monitoring programs are reported in the WWMF's quarterly operations reports which are submitted to the CNSC. A summary of the annual radiological airborne emissions for WWMF is provided in the following figures.

As shown in Figure 29 to Figure 32, the annual airborne emissions are orders of magnitude below the regulatory derived release limits and action levels with the overall trend in emissions being relatively stable over the past 9 years.



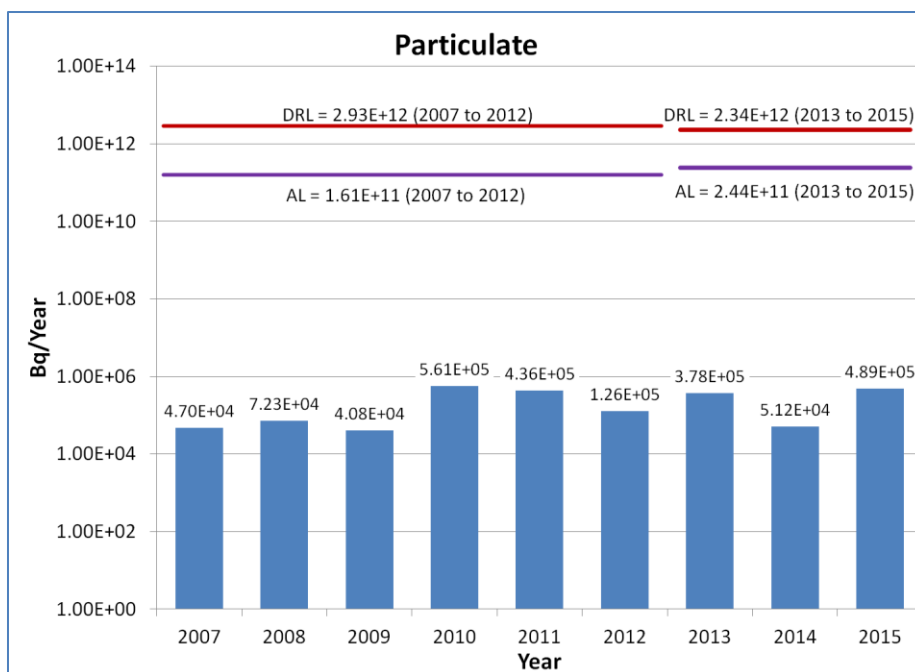
**Figure 29: WWMF Annual Tritium Airborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/week for comparison to annual emissions.



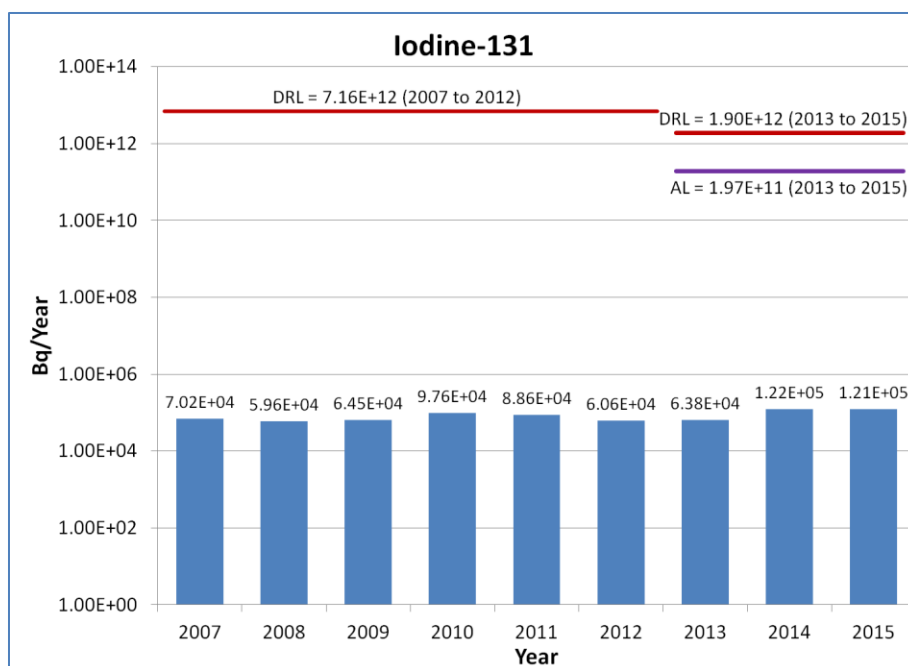
**Figure 30: WWMF Annual Carbon-14 Airborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/week for comparison to annual emissions. No action levels were in place for Carbon-14 prior to 2013.



**Figure 31: WWMF Annual Particulate Airborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/week for comparison to annual emissions.



**Figure 32: WWMF Annual Iodine-131 Airborne Emissions, 2007-2015**

Note: Derived release limits and action levels have been converted to Bq/yr from Bq/week for comparison to annual emissions. No action levels were in place for Iodine-131 prior to 2013.

### 2.9.2.3 Non-radiological Emissions

OPG's WWMF has Ontario Ministry of Environment and Climate Change Environmental Compliance Approvals for air emissions and storm water management.

Under the Air Environmental Compliance Approval, continuous emissions monitoring of the incinerator emissions are completed for carbon monoxide, nitrogen oxides, sulphur dioxide and hydrochloric acid to ensure point of impingement targets are met. Source testing of incinerator emissions is also completed once a year to quantify overall emissions rates of particulate matter, metals, polychlorinated biphenyls, dioxins, furans, polycyclic aromatic hydrocarbons and volatile organic compounds.

The annual source testing results indicate that incinerator emissions are well within the regulatory limit. Provided in Table 8 below is a summary of the source testing results since 2007 for incinerator stack emissions in comparison to the allowable limits specified in the Environmental Compliance Approval. Particulate matter, mercury and total hydrocarbons emissions are less than 0.5% of the allowable limit and dioxins and furans are just 5% of the allowable limit.

**Table 8: 2015 Source Testing Results**

Parameter		Particulate Matter	Mercury	Dioxins and Furans	Total Hydrocarbons
Units		mg/Rm <sup>3</sup>	mg/Rm <sup>3</sup>	pg TEQ/Rm <sup>3</sup>	ppm
Allowable Limit		14	20	80	50
Measured Concentration	2007	1.49	0.17	6.30	3.20
	2008	0.78	0.32	10.4	6.80
	2009	0.64	1.15	4.73	2.37
	2010	0.60	<0.025	2.97	1.33
	2011	0.44	<0.40	1.79	1.13
	2012	1.47	0.038	3.03	2.43
	2013	0.85	0.17	1.80	0.75
	2014	No Data	No Data	No Data	No Data
	2015	0.29	0.27	4.82	0.33

Note: Emission source testing was exempted for 2014 with MOECC approval due to the unavailability of solid waste burning.

Stormwater is monitored under the industrial sewage works Environmental Compliance Approval for total suspended solids to ensure the quality of the effluent is consistent with design objectives. In 2013, significant improvements were completed on the "grassy swale" located east of the WWMF, which flows into the east wetland. Based on the monitoring results, the improvements to the "grassy swale" have resulted in an average total suspended solids reduction of over 80%.

The results of the monitoring programs are reported to the Ontario Ministry of Environment and Climate Change annually as per the conditions of the Environmental Compliance Approvals.

## **2.9.3 Assessment and Monitoring**

### **2.9.3.1 Perimeter Dose Monitoring Program**

WWMF has a perimeter dose monitoring program where Environmental Thermoluminescent Dosimeters are mounted on the perimeter fence of the WWMF as shown on Figure 33 and are changed and analyzed quarterly. Annual performance is reported as the average of all dose rates. Any contributions from WWMF to the public dose from this perimeter monitoring program are incorporated into the Bruce Power Radiological Environmental Monitoring Program.

A dose rate of 0.0005 mSv/h for 2,000 hours of exposure would result in a dose to the public of 1 mSv, the regulatory limit. The average actual perimeter dose rate at the WWMF has consistently been less than the 0.0005 mSv/h, with an overall average less than 0.0001 mSv/h.

### **2.9.3.2 Groundwater Monitoring Program**

The WWMF has an established groundwater monitoring program that has been in place for over two decades. The established routine groundwater monitoring program consists of 20 groundwater wells that monitor overburden and bedrock aquifers in the vicinity of the WWMF for radiological parameters. The results of the groundwater monitoring program are included in the quarterly operations reports submitted to the CNSC.

In 2014, 22 additional wells were installed as part of a groundwater study and monitoring network assessment to increase the distribution of the groundwater data over a two-year period. An additional 13 existing monitoring wells (not part of the routine monitoring program) and 6 surface water sampling locations were also incorporated into the study/assessment. The groundwater study and monitoring network assessment includes eight sampling intervals completed quarterly to monitor seasonal variations in groundwater and surface water conditions with respect to radiological parameters (tritium, Carbon-14, cesium, etc.) as well as conventional parameters (e.g., metals, inorganics, hydrocarbons, etc.) and water levels. The project is scheduled to be completed by the end of 2016 at which time the groundwater monitoring program will be established. Figure 34 shows the locations of all groundwater wells currently on the WWMF.

The results of the study to date are generally consistent with previous assessments with no evidence of adverse offsite impacts to groundwater or surface water.

As reported through the quarterly operations report, localized elevated concentrations of tritium are present onsite in the middle sand aquifer as identified at monitoring well location WSH231 (located directly down gradient of LLSBs 1 to 10). The source of the elevated tritium at WSH231 is thought to be from evaporation in the LLSBs. An extensive study was completed in 2010 to identify the migration pathway to WSH231. Based on the findings of the study, the most probable pathway was identified to be via

an electrical manhole that intersects the groundwater table. The electrical manhole connection to the LLSBs is through electrical conduits that service the buildings. Particle traces in the groundwater completed during the 2010 study identified the preferential flow pathway from the electrical manhole to be towards WSH231 in the middle sand aquifer.

Since 2010, various mitigating measures have been taken including asphalt sealing, LLSB sump sealing, monitoring and pump down of electrical man holes and sealing of some electrical penetrations. Based on the monitoring results from well WSH231, these mitigation measures appear to be improving the groundwater quality in the middle sand aquifer. Presented in Figure 35 is a graph of the tritium concentrations at WSH231 displaying the downward trend in recent years.





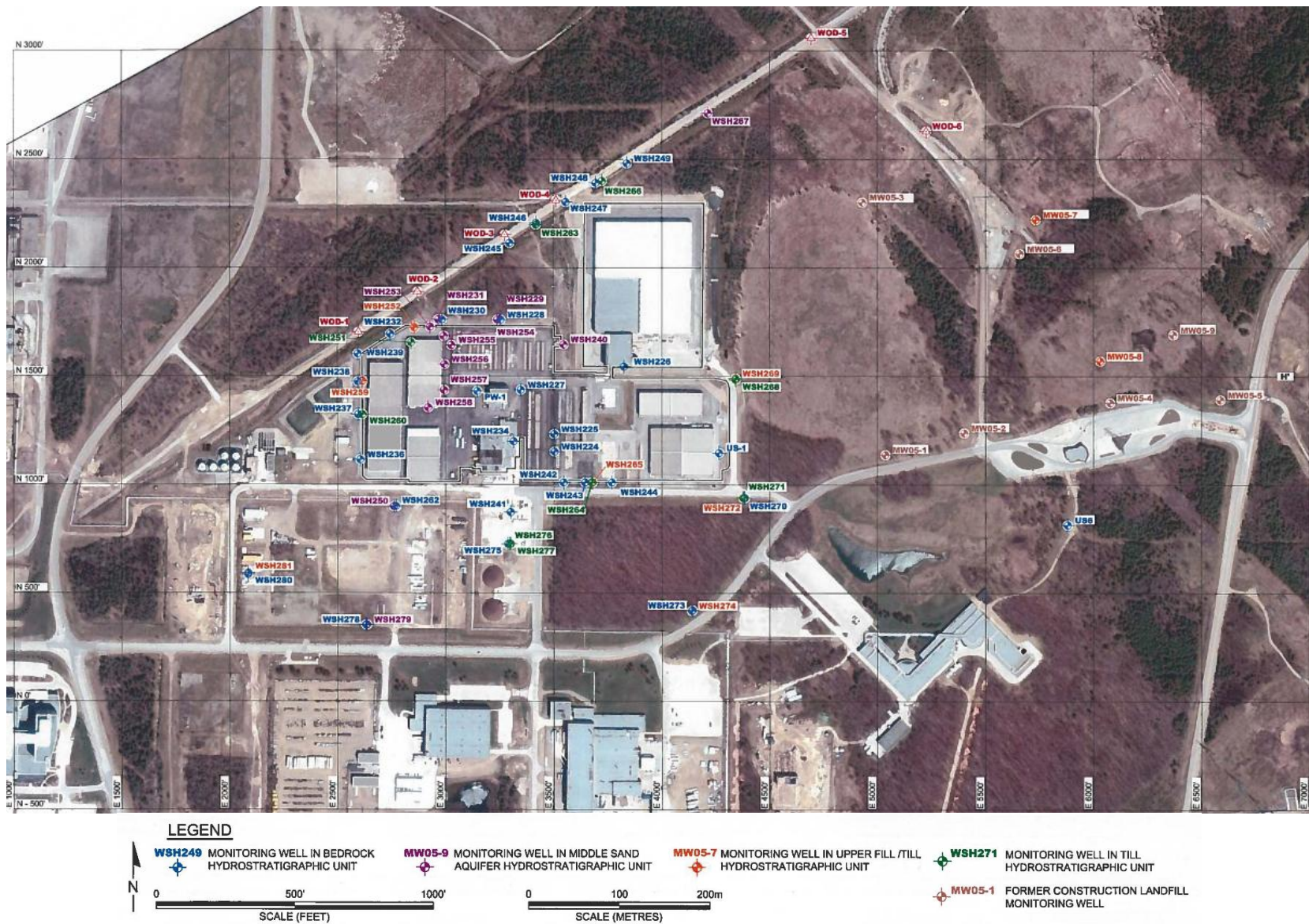


Figure 34: Groundwater Well Locations at the WWMF



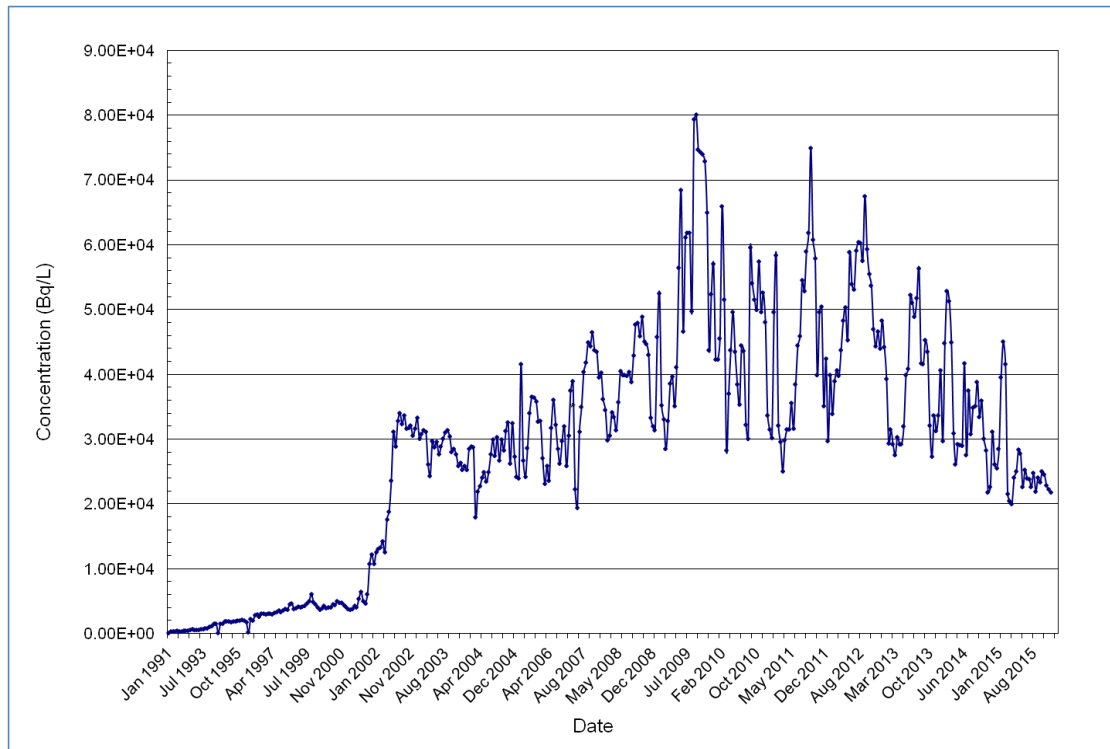


Figure 35: Tritium Concentration in WSH231 (1991 - 2015)

## 2.9.4 Biodiversity Management

OPG has had a very extensive and diverse biodiversity program at the WWMF for many years. In 2012, OPG successfully re-certified the WWMF under the Wildlife Habitat Council's Corporate Wildlife Habitat certification. The WWMF was initially certified in 2007. The Wildlife Habitat Council's *Corporate Wildlife Habitat Certification and International Accreditation Program* recognizes commendable wildlife habitat management and environmental education programs at individual sites. The Wildlife Habitat Council certification adds value to programs by providing third-party credibility and an objective evaluation of projects. An ecological survey is scheduled to be completed in 2016 to identify further biodiversity enhancement initiatives for implementation at the WWMF in 2017 and 2018.

The major initiatives implemented to date at the WWMF under the Biodiversity Program are as follows:

- A partnership with Laurentian University to study Endangered Species at the Bruce Site (2008 to 2015);
- Invasive species monitoring and control to maintain and enhance the ecological resilience of wildlife habitat (2008 to 2012);
- Landfill cap and WWMF Laydown Area Berm naturalization to promote local wildflower and grass biodiversity (2012);

- Completion of a Natural Heritage Study to identify species and features of ecological significance (2008); and,
- Donations to Conservation, Non-Government Organizations and interested parties to support habitat protection and stewardship through the corporate charity program (ongoing).

## **2.9.5 Environmental Risk Assessment**

In 2016, OPG completed an Environmental Risk Assessment for the WWMF in accordance with the CSA Standard N288.6-12 *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills* [R5]. The Environmental Risk Assessment considered previous studies, and includes a Human Health Risk Assessment, and an Ecological Risk Assignment, as described below.

### **2.9.5.1 Human Health Risk Assessment**

The human health risk assessment evaluated the impact on human health of radiological and non-radiological contaminants in different media, as well as a physical stressor resulting from the operations at the WWMF.

For radiological emissions, individual dose to human receptors as the result of operation of all nuclear facilities at the Bruce nuclear site was less than 5 µSv/y for the period of 2009-2013. This represents approximately 0.5% of the public dose limit. Given that the emissions from the WWMF represent a small fraction of the overall emissions from the Bruce nuclear site, the dose to members of the critical group due to the operation of the WWMF is estimated to be less than 0.2 µSv/y. Therefore, the operation of the WWMF presents no radiological risk to the public.

Based on the screening level risk assessment, non-radiological emissions resulting from the operations at the WWMF are compliant with the standards protective of human health (such as Health Canada and Ministry of Environment and Climate Change standards) and therefore no human health effects are likely.

From the results of the field noise level measurements and modelling results, the noise levels generated due to the operation of the WWMF are compliant with the relevant standards. Therefore, it can be concluded that noise as a physical stressor poses no adverse effects to human health. Other than noise, no other physical stressor is considered for the Human Health Risk Assessment, which is consistent with CSA N288.6-12 *Environmental Risk Assessment for Class I Nuclear Facilities and Uranium Mines and Mills*.

### **2.9.5.2 Ecological Risk Assessment**

The ecological risk assessment evaluated radiological and non-radiological contaminants in different media, as well as physical stressors resulting from the operations at the WWMF (Table 9).

Ecological receptors present at the WWMF included terrestrial plants and invertebrates (including insects), aquatic plants and invertebrates, fish, herpetofauna, birds, and mammals. In addition, off-site aquatic receptors residing in Lake Huron could

potentially come into contact with surface water contaminants of potential concern at the site.

**Table 9: ERA – Radiological and Non-radiological Contaminants**

Medium	Soil	Surface Water	Sediment
<b>Contaminants of Potential Concern</b>	Dioxins and Furans	Dissolved Chloride (Cl)	Arsenic
	Sodium Adsorption Ratio	Aluminum	Copper
		Cobalt	Manganese
		Copper	Molybdenum
		Iron	Silver
		Phosphorus	Sodium
		Selenium	Strontium
		Sodium	Tungsten
		Strontium	Zinc
		Zinc	

The risk evaluation for ecological receptors identified the following:

- There are no adverse effects due to exposure to radiological contaminants.
- There are no effects from soil and surface water due to exposure to non-radiological contaminants for terrestrial plants and invertebrates, aquatic plants and invertebrates, fish, herpetofauna, and birds and mammals.
- Physical stressors including noise, bird strikes, and road kill pose no adverse effects to non-human biota.
- Risks to benthic invertebrates (e.g. insect larvae and mollusks) due to exposure to sediment were assessed based on the comparison of sediment chemistry to the Toxicity Reference Values and a qualitative evaluation of benthic invertebrate field data. The conclusions related to the benthic invertebrates are:
  - (a) Copper and zinc in the South Railway Ditch (a human-made environment) exceeded the sediment Toxicity Reference Values, and there is the potential for low to moderate effects to benthic invertebrates. However, it is difficult to distinguish whether the limited benthic invertebrate community in the drainage ditch, which consists primarily of pollution tolerant species, is strictly the product of the poor habitat quality the ditch provides or whether elevated metal concentrations are having an effect. The source of copper and zinc is not associated with WWMF operations. The ability to survive under low oxygen conditions during periods of low flow or no flow (stagnation) is probably the dominant factor governing the benthic invertebrate community in the ditch;

- (b) In the Wetland, downstream of the South Railway Ditch, sediment concentrations were below the Toxicity Reference Values and adverse impacts to the benthic invertebrate community are not anticipated in the Wetland; and,
- (c) Although silver in the West Ditch exceeds the sediment Toxicity Reference Value, only low potential for effects was identified. It should be noted that the West Ditch is not located within the WWMF, and the WWMF is not known to be a source of silver contamination to the West Ditch, therefore silver was not assessed further.

## **2.9.6 Future Plans for Improvement**

The ISO 14001 standard embodies the expectation of continual improvement of the Environmental Management System and, as a consequence, environmental performance. To this end, a review of environmental performance and re-evaluation of objectives and targets in key areas which may impact on the environment is performed.

OPG's WWMF has a program of improvement initiatives aimed at reducing the environmental and radiological risk associated with the handling, processing, and/or storage of used fuel and L&ILW. Initiatives planned to improve environmental monitoring/impact over the next five years include the following:

- Completion of the WWMF groundwater monitoring program enhancement and monitoring network assessment project; and,
- Continuation of biodiversity initiatives.

Consistent with OPG fleet plans and as part of continuous improvement, the WWMF will be transitioning to the following CSA Standards:

- By December 31, 2016, WWMF will conduct a gap analysis and prepare an implementation plan for meeting the requirements of CSA Standard N288.3.4, *Performing Testing of Nuclear Air-Cleaning Systems at Nuclear Facilities*.
- By December 31, 2017, WWMF will conduct a gap analysis and prepare an implementation plan for meeting the requirements of CSA Standard N288.4, *Environmental Monitoring Program at Class I Nuclear Facilities and Uranium Mines and Mills*.
- By December 31, 2017, WWMF will conduct a gap analysis and prepare an implementation plan for meeting the requirements of CSA Standard N288.7, *Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills*.

## **2.10 EMERGENCY MANAGEMENT AND FIRE PROTECTION**

### **2.10.1 EMERGENCY MANAGEMENT**

#### **2.10.1.1 Emergency Management Program**

OPG's key documents for the Emergency Management and Fire Protection SCA and the revision at the time of writing are listed in the table presented below, and will form the basis for future licence conditions.

<b>Document Number</b>	<b>Title</b>	<b>Revision</b>
Nuclear Waste Management	W-PROG-WM-0001	R013
Fire Protection	N-PROG-RA-0012	R011

WWMF's Employee Emergency Response procedure identifies emergency response requirements at WWMF for fire, medical and radiation emergencies. In accordance with the contractual agreements between OPG and Bruce Power, Bruce Power provides Emergency Response Services to OPG for all fire, medical, rescue and spill emergencies that arise at the WWMF. Such services are available 24 hours a day.

In accordance with the Provincial Nuclear Emergency Response Plan and the Bruce Power Nuclear Emergency Response Plan, OPG staff at the WWMF would follow the emergency response instructions from Bruce Power for a Station Emergency at either Bruce Power NGS A or B.

#### **2.10.1.2 Current Operations**

##### **(a) Emergency Management**

OPG and Bruce Power conduct three drill practices at the WWMF (2 fire and 1 medical) in accordance with an agreed annual drill schedule.

Bruce Power also provides personnel adequately trained in search and rescue, fire fighting, spill response, hazardous materials (i.e. hazmat) and first aid and will provide emergency equipment suitable to each emergency. Bruce Power provides OPG a letter confirming the inspections and maintenance of their emergency equipment each year.

OPG performs periodic due diligence assessment on Bruce Power's emergency response facilities, equipment, procedures and personnel to confirm the agreed services will continue to meet the requirements.

Hazardous Material spill drills were conducted annually for the WWMF during the reporting period. Upon completion of each drill, a report was issued which captured lessons learned, corrective actions and valuable operating experience. This is part of spill response improvement and organizational learning.

### **(b) Response to Fukushima Event**

OPG reviewed the initial lessons learned from the Fukushima event in Japan, and re-examined the safety case for the WWMF. In particular, OPG re-examined the underlying defence-in-depth concepts with a focus on external hazards such as seismic, flooding, fire, and extreme weather events, measures for the prevention and mitigation of severe accidents and emergency preparedness

For a complete summary of OPG's response to the Fukushima event, refer to Section 3.4. No significant gaps and no compensatory actions were identified during these reviews; however, some additional technical studies were identified such as beyond design basis seismic event analysis and flood hazard assessment for the WWMF. The technical studies identified the following opportunities to improve the response to design basis events and beyond design basis events:

- For design basis events, OPG has enhanced the post-event worker response procedures.
- For beyond design basis events, internal programs and procedures were revised to improve the post event response (e.g. manual activation of the LLSB fire suppression system). OPG also purchased additional emergency equipment such as satellite phones for the WWMF.

A mutual aid agreement that formalizes support among Canadian nuclear operators in the event of a major emergency at one of our nuclear installations was created between Bruce Power, OPG, Hydro Quebec, New Brunswick Power and AECL.

### **2.10.1.3 Future Plans for Improvement**

The contractual agreements between OPG and Bruce Power for Bruce Power to provide Emergency Response Services will be reviewed and amended as required during the expansion of the WWMF. The emergency response for the new buildings should be similar to that for existing buildings.

## **2.10.2 FIRE PROTECTION**

### **2.10.2.1 Fire Protection Program**

DNWM's goals for Fire Protection are to minimize the risk of radiological releases that are a result of fire, protect facility occupants from death or injury due to fire, minimize economic loss resulting from fire damage to structures, equipment, and inventories, and minimize the impact of radioactive or hazardous material on the environment as a result of fire.

The fire protection provisions for WWMF are currently required to conform to:

- The NFCC 2005;
- The NBCC 2005; and,
- The *Occupational Health and Safety Act* (OHSA).

DNWM's facility specific Fire Protection Program has been incorporated into OPGN's Fire Protection Program to ensure a consistent approach to fire protection across all the nuclear sites. DNWM fire protection procedures and other elements will derive their authority from the OPGN Fire Protection Program. A comprehensive Fire Protection Program will ensure adequate fire protection by minimizing both the probability of occurrence and the consequences of fire at the facilities.

DNWM governance is being reviewed to ensure effective alignment with OPGN's Fire Protection Program. The revision of DNWM's Nuclear Waste Management Division Impairment Manual and associated documentation is currently underway, to ensure it aligns with the OPG Nuclear impairment process.

### **Key Program Elements for WWMF**

The Fire Safety Plan at WWMF meets the requirements of the NFCC. The Fire Safety Plan provides direction with respect to fire prevention, fire protection, emergency procedures, training and drills. The Fire Safety Plan is reviewed, and revised accordingly, on an annual basis to ensure it reflects current field conditions and practices.

Fire drills are conducted in accordance with the NFCC. Annual emergency fire drills were performed at the WWMF, in accordance with the NFCC. Response from the Bruce Power Emergency and Protective Services organization was tested during this process. The interface between WWMF personnel and Bruce Power has been demonstrated as satisfactory. Findings from drills have been satisfactory with no major findings. Improvements to procedures and facilities have been recommended. These recommendations have been assessed and are being implemented as appropriate.

During the reporting period, independent third party reviews were completed biennially to confirm the WWMF fire systems have been operated, inspected, tested and maintained in accordance with the NFCC and the standards listed therein. The reports received indicate that WWMF is in general compliance with the NFCC requirements. Corrective actions resulting from the reviews have been completed. Examples of such actions included installing nameplates on systems, ensuring records are maintained, changing frequencies of inspection, maintenance and testing activities to reflect changed frequencies in the codes and standards and implementing additional work management tasks for hydrant and emergency lighting unit inspection, testing and maintenance. The results of the compliance reviews have been submitted to the CNSC as required by the licence.

## 2.10.2.2 Current Operations

### (a) Fire Protection

Fire protection and detection systems at the WWMF are designed and constructed to comply with applicable fire and building codes (e.g. NFCC and NBCC). During the reporting period, these systems were required to comply with updated pressure boundary code requirements, such as CSA Standard N285.0-08, Update No. 2, *General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants*; CSA B51 (2009) and Update No. 1, *Boiler, Pressure Vessel, and Pressure Piping Code*; and ASME B31.1, *Power Piping Code*, 2010 Edition. OPG is complying with the updated pressure boundary code requirements, applying the additional rigour warranted for the maintenance of these non-nuclear / Class 6 pressure boundary systems with the exception of exempted systems and components documented in OPGN's Design Registration procedure.

All design modifications are reviewed for fire protection impact through the Engineering Change Control process described in OPGN's Modification Process procedure.

As discussed in Section 2.5.2, a project is in progress to replace beam detectors in LLSBs 1 to 11 with linear heat detection to improve the overall fire protection system reliability at the LLSBs. This project was initiated in the current operating window, with linear heat detection being installed in LLSB11 in 2015, and will continue into the next licence period.

Other improvements with respect to improving fire protection or reducing risk included:

- Replacing the wooden framing surrounding the WVRB incinerator stack with a non-combustible material (2013);
- Installing appropriate audible and visual alarms in certain locations at the WVRB (2013);
- Installing a manual station (pull station) at the exit door of the High Efficiency Particulate Air filter room of the WVRB (2015);
- Redesigning the incinerator solid waste and combustion system to prevent localized heating of the air duct (2015); and,
- Installing a properly sized relief valve in the CO<sub>2</sub> fire suppression system to meet American Society of Mechanical Engineers (ASME) B31.1 code requirements (2015).

In accordance with the WWMF licence, inspection, testing, and maintenance of the fire detection and protection systems is performed at the required frequency as stipulated in the NFCC. Personnel performing the inspections, tests and maintenance on fire protection systems are qualified to do so.

Internal audits of the Nuclear Fire Protection Program are conducted to evaluate effectiveness of the program. An audit conducted in 2013 resulted in three (3) findings, namely: unclear DNWM Fire Protection program ownership, DNWM Fire Protection governance deficiencies, and WWMF fire predefines not consistently completed.



An organizational realignment to functionally move the ownership of the Fire Protection Program to one organization within OPG Nuclear has been implemented thereby addressing the audit finding on program ownership. This action resulted in OPGN's Fire Protection program becoming the governing program for the WWMF. This realignment will ensure programmatic consistency, implementation of actions to address past challenges regarding managed system controls plus a unified approach across OPGN with program ownership housed within a single programmatic document.

Predefine performance has improved. As a result, the 2015 audit did not have any findings in the DNWM Fire Protection area.

**(b) Fire Protection Response**

The fire protection systems are capable of responding to emergency situations based on test results.

With respect to operator actions, on July 11, 2013, the excess air duct located beneath the primary chamber of the incinerator at the WWMF experienced localized heating. Smoke was observed to be emanating from the surface. Operators responded by suspending the solid and liquid waste feeds, cooling the area and initiating a response by the Bruce Power Emergency Response Team. There was a repeat event in February 2014. At this time a root cause investigation was completed with measures, including a design modification of the incinerator, taken by OPG to prevent recurrence of a localized heating event of the incinerator air duct. Operations have procedures in place to address emergency situations.

There were no negative impacts on the health and safety of OPG personnel, members of the public, or the environment as a result of either incident.

**2.10.2.3 Future Plan for Improvement**

The project to install linear heat detection to replace beam detectors in the LLSBs 1 – 10 (LLSB 11 complete) will continue into the new licensing period.

Fire protection governance will be reviewed to further align the WWMF with OPG Nuclear.

By August 31, 2016, WWMF will conduct a gap analysis and prepare an implementation plan for meeting the requirements of CSA Standard N393-12, *Fire protection for facilities that process, handle, or store nuclear substances*. A transition plan based on identified gaps, e.g., completion of a Code Compliance Review and Fire Hazard Assessments, will then be executed.

When the licensed area is extended as proposed, assessments will be completed to ensure new buildings or those currently in existence within that area comply with the applicable fire codes and standards.

## **2.11 WASTE MANAGEMENT**

### **2.11.1 Waste Management Program**

OPG Nuclear Waste Management Facilities' Waste Management Program is aligned with, and based on OPG Nuclear's Environmental Management program. The Nuclear Waste Management Facilities work in collaboration with the OPG nuclear generating stations in order to implement strategies for waste minimization and waste management.

L&ILW generation and storage is identified as a Significant Environmental Aspect in OPG's Environmental Management System, as described in Section 2.9.2

L&ILW is generated more significantly during nuclear power plant maintenance outages, but also arises from day-to-day operations. L&ILW produced is the volume of waste generated from nuclear operations that is shipped to the WWMF for processing and storage. L&ILW stored is the final volume of waste that is actually stored at the WWMF following review, acceptance, processing and storage of the produced waste from the same time period.

OPG's key documents for the Waste Management SCA and the revision at the time of writing are presented below, and will form the basis for future licence conditions.

<b>Document Title</b>	<b>Document Number</b>	<b>Revision #</b>
Radiation Protection	N-PROG-RA-0013	R009
Decommissioning Program	W-PROG-WM-0003	R001

### **2.11.2 Current Operations**

OPG Nuclear Waste Management Facilities have taken the lead in establishing an OPGN Fleetwide initiative related to waste minimization. The objective of this initiative is to implement waste strategies across the nuclear fleet, which will improve waste minimization, segregation, sorting and processing of Low Level Waste and ultimately reduce the amount generated and stored.

As discussed in Section 1.3.1 regarding generation of waste at the stations, employees at WWMF ensure that radioactive LLW generated at the facility is segregated properly. Waste receptacles are located throughout the WWMF for likely clean and routine incinerable waste (Figure 36). Compactable and non-processible waste is collected in the staging area and the Transportation Package Maintenance Building only. Each waste staging area has various storage waste bins such as one each for likely clean, incinerable, and compactable.

#### **(a) Integrated Waste Tracking System**

OPG continues to maintain its waste inventory using electronic records using the Integrated Waste Tracking System.

### **(b) Pilot Projects**

In 2012 and 2013, OPG explored some external opportunities for waste reprocessing. Pilot projects were completed to confirm opportunities for volume reduction of large metal components such as heat exchangers, and to verify contents of stored non-processible waste and confirm opportunities for further reprocessing. The pilots provided valuable data in terms of validating options available on the external market for large metal components. The pilots also validated that opportunities do exist within currently stored volumes of non-processible wastes.

The pilot project itself is now complete. OPG will continue to send some waste to a licensed external provider for processing. OPG has sent legacy baled waste and some waste oil. OPG plans to continue sending these two waste streams and to continue with sorting waste in-house.

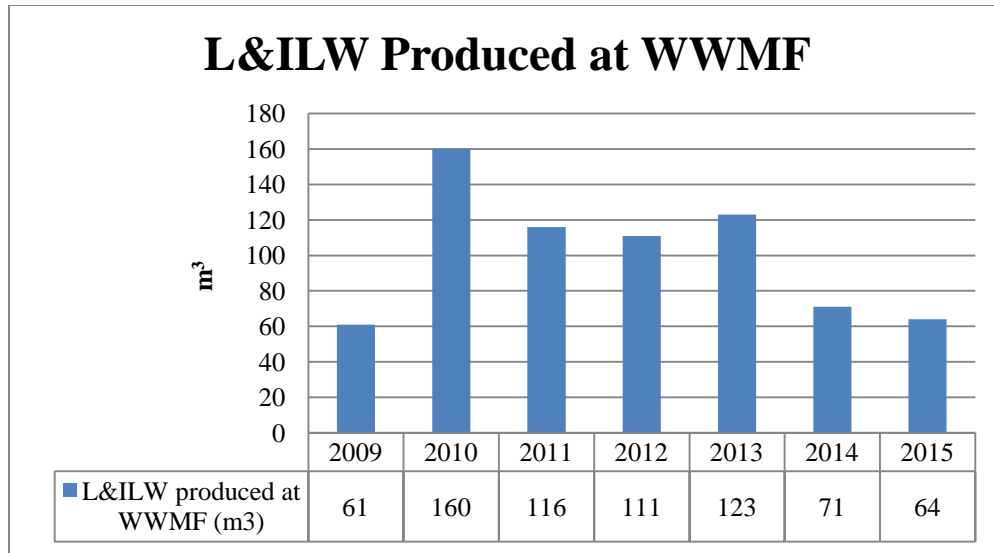
### **(c) Waste Segregation**

In 2013, the WWMF instituted a “Likely Clean” waste segregation initiative to improve its own performance in the area of waste minimization. Specific waste collection stations were set up at the WWMF facilities. Through enhanced radioactive contamination monitoring and procedures, low-level waste that was once considered radioactive by default, is now thoroughly monitored and released if clean. As shown in Figure 37, the volume of waste generated decreased by about 40% since this initiative was implemented.

In 2014, targets were developed for the station waste generators specifically related to the non-processible waste stream. This enables focus to occur on waste reduction at the source. These indicators continue to be used across the fleet to increase awareness and drive improvement.



**Figure 36: Waste Receptacles**



**Figure 37: L&ILW Produced at WWMF**

**(d) Waste Sorting**

In 2014, the WWMF began a waste sorting pilot project. Bins of stored non-processible LLSB wastes and new non-processible waste arising are opened and physically sorted into various streams as shown in Figure 38. Incinerable and compactable materials are segregated for further processing at the WWMF. Metals are segregated and either surveyed, decontaminated and free released or if not able to be decontaminated they are stored for future processing or interim storage.

Throughout 2015, through this initiative 719 m<sup>3</sup> of low level waste was sorted resulting in further volume reduction opportunities through incineration and compaction, as well as being able to free release approximately 73 m<sup>3</sup> of metals. This program continues in 2016.



**Figure 38: Waste Sorting Pilot Project**

### 2.11.3 Future Plans for Improvement

DNWM has identified a strategic initiative to determine options which exist for volume reduction of large metal components, both for waste arising from refurbishment and operations of the nuclear generating stations. This could also provide input into plans for future wastes arising from decommissioning.

Through the OPG waste minimization initiative, specific objectives will continue to be brought forward and implemented. These include:

- Ongoing fleet-wide communication campaigns;
- Reviewing and improving waste sorting practices;
- By August 31, 2016, WWMF will conduct a gap analysis and prepare an implementation plan for meeting the requirements of CSA Standards N292.0-14, *General principles for the management of radioactive waste and irradiated fuel*; 292.2-13, *Interim dry storage of irradiated fuel*; and 292.3-14, *Management of low-and-intermediate-level radioactive waste*; and,
- A focused Steering Committee to oversee Darlington Refurbishment waste issues to ensure minimization is implemented appropriately through the execution of the project.

### 2.11.4 Decommissioning

Planning for the eventual decommissioning of the WWMF is an ongoing process, taking place throughout each stage of the licensed facility lifecycle. The Preliminary Decommissioning Plan is the proposed plan for decommissioning and is prepared in accordance with CSA Standard N294-09 *Decommissioning of Facilities Containing Nuclear Substances* and using CNSC's Regulatory Guide G-219 *Decommissioning Planning for Licensed Facilities* as a guide.

OPG's strategy for decommissioning its nuclear waste facilities, including WWMF, is to dismantle the facilities once all the waste is removed and the facility is no longer required. Since all the wastes will be removed from the facility prior to decommissioning, little residual radioactivity is expected to be present at WWMF and as such there will be no need for any deferment of decommissioning. In some cases however, decommissioning activities may be deferred to align with other related activities on site. At this time, OPG plans to place L&ILW in the DGR expected to be located in Kincardine. Under the Nuclear Waste Management Organization's Adaptive Phased Management program established by the federal government, the long term disposal facility for used fuel is expected to be in service no earlier than 2035, at which time used fuel will start to be transferred from the interim storage location at WWMF to the Adaptive Phased Management facility.

The WWMF Preliminary Decommissioning Plan describes the activities that will be required to decommission and restore the site for other OPG uses. It demonstrates that decommissioning is feasible with existing technologies and it provides a basis for estimating the cost of decommissioning. The Preliminary Decommissioning Plan includes schedules and cost estimates based on the assumptions that form the basis for the plan. OPG will update this plan as required to incorporate lessons learned,

update to regulatory requirements, and industry best practices. These updates will add clarity and detail to the decommissioning of the OPG fleet of nuclear facilities.

The WWMF Preliminary Decommissioning Plan was provided to the CNSC in support of the 2013 to 2017 Financial Guarantee submission (discussed also in Section 3.5). The requirements of CSA N294-09 as well as any relevant domestic and international experience obtained in the previous five years were incorporated into this revision. The next revision of the Preliminary Decommissioning Plan will be submitted to the CNSC by January 31, 2017 as part of the 2018 to 2022 Financial Guarantee submission and updated revisions submitted every 5 years after or when required by the Commission. Following the submission of the Preliminary Decommissioning Plans and respective cost estimates, OPG will also provide the necessary financial guarantee arrangements using G-206 *Financial Guarantees for the Decommissioning of Licensed Activities* as a guide.

OPG continuously monitors and incorporates best practices from the industry and has a high degree of confidence that the current plans are appropriate and sufficient.

## **2.12 SECURITY**

### **2.12.1 Security Program**

The OPG Security Program supports OPG's need to manage residual risk to the public created by the operation of its facilities, protect assets, and respond to security events that impact operations and the public. Key elements of this program include response to threats and maintaining compliance with legislative requirements, while minimizing the adverse impact on legitimate staff and plant operations. The objective of the program is to establish a state of security readiness to ensure safe and secure operation of OPG stations and facilities. OPG's security program includes measures to protect against unauthorized disclosure of prescribed information.

WWMF is in compliance with RD-363, *Nuclear Security Officer Medical, Physical and Psychological Fitness* and REGDOC 2.12.2, *Site Access Security Clearance*.

The OPG physical security program for the WWMF is implemented through contracted security services provided by Bruce Power Security. Bruce Power Security implements OPG's Security Program at WWMF in accordance with OPG's policies and procedures. Bruce Site Security Program has been rated as satisfactory or fully satisfactory in all CNSC Annual Reports on Nuclear Power Plant Performance.

OPG's cyber-security program protects the cyber-critical assets for nuclear safety, physical protection and emergency preparedness functions from cyber-attacks.

The cyber-security program includes the following elements:

- Roles and responsibilities;
- Policies and procedures;
- Staff training and awareness;
- Overall approach to cyber security;
- Configuration management;

- Incident response and recovery;
- Periodic self-assessments;
- Security controls; and,
- Identification and classification of cyber-critical assets.

OPG's key document for the Security SCA and the revision at the time of writing is presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Nuclear Security	N-PROG-RA-0011	R006

### 2.12.2 Current Operations

OPG's program ensures the security of the WWMF's assets through physical and administrative security measures utilizing equipment, personnel, and procedures. The security program at the sites has continued to evolve to meet industry best practices and all regulatory requirements.

- Security measures for WWMF's UFDSF are evaluated against annual OPG threat and risk assessments to ensure credible threats are mitigated.
- Training programs are in place to enhance and sustain improved performance of both OPG and Bruce Power Security Divisions.
- A comprehensive drill program is in place as a means of validating security practices, ensuring regulatory compliance, and identifying areas for improvement in security operations. CNSC evaluated force on force exercises, conducted at the nuclear generation sites, provide performance testing of the nuclear security program. Lessons learned through both OPG and Bruce Power security drills and exercises are applied to enhance the program at WWMF.
- OPG continues to participate in an Inter-Utility Security Working Group, which includes representation from all nuclear power operators in Canada. This group provides benchmarking opportunities to ensure that the program meets industry standards.
- OPG conducts regular meetings with CNSC staff to ensure open communication and that evolving security requirements are understood.
- Security requirements in accordance with the *Nuclear Security Regulations* are in effect at OPG's High Security Sites, including Western UFDSF.

Details of the Security Program for Western UFDSF, including the measures to prevent loss or illegal use, possession or removal of nuclear substances, prescribed equipment or prescribed information, are contained in the site Security Report.

OPG has conducted an assessment with respect to REGDOC-2.12.3 *Security of Nuclear Substances – Sealed Sources* in relation to Category 1, 2 and 3 sealed sources and has determined that we are in compliance with the requirements of this Regulatory Document. Sealed sources are not included in the WWMF Operating

Licence, but are separately licensed under a Nuclear Substance and Radiation Device Licence (Consolidated Uses of Nuclear Substances (B15), Licence No. 12861-2-20.3). OPG does not have any category 1, 2 or 3 sealed sources at the WWMF. OPG does have lower activity category 4 and 5 sealed sources at WWMF.

### **2.12.3 Future Plans for Improvement**

OPG plans to upgrade its security search equipment at the Western UFDSF replacing aging weapons detection, explosive detection and baggage x-ray devices with devices utilizing industry leading technology. These enhancements are scheduled for 2016.

OPG plans on conducting an assessment of the storage and transportation of category 4 and 5 sealed sources with respect to the requirements of REGDOC-2.12.3 and will be compliant with the Regulatory Document's requirements prior to the compliance date of May 31, 2018 as stated in Nuclear Substances and Radiation Devices Licence 12861-2-20.3, licence condition 16(b).

#### **Construction of Additional Protected Area for Used Fuel**

OPG is planning on building four additional storage buildings for used fuel in one of two potential locations (woodlot or construction laydown area), as shown in Figure 1 and summarized in section 1.7.1. Processing of the DSCs will continue to occur within the existing processing building, and the DSCs will be transferred to the new buildings for interim storage. Two storage buildings for used fuel are planned for completion in 2019.

When the specific site is confirmed, the additional buildings will be enclosed within a separate protected area that will be constructed to meet the requirements of the *Nuclear Security Regulations* and CNSC Regulatory Documents, RD-321 and RD-361.

The protected area of the additional UFDSFs will be enclosed by a barrier at its perimeter designed and constructed to inhibit unauthorized entry into the protected area. The barrier will be comprised of a chain link fence with a minimum height of 2.4 meters made of wire not smaller than number 11 gauge, having openings whose sides do not exceed 6 cm in length and topped with three strands of barbed wire. All gates or doors that provide entry or exit to the protected area will be constructed so that they can be closed and locked.

This barrier will be equipped with two independent detection systems designed to detect intrusion into the protected area and detect any tampering that may cause the devices to malfunction. Intrusion and tamper attempts will set off a continuous alarm in a security monitoring room that may only be stopped by a nuclear security officer. A combination of fixed and pan zoom cameras will be installed to provide immediate assessment of the cause of alarms.

Detection and assessment devices will be powered by an uninterruptable power supply designed to power these devices for a period sufficient to allow for an alternative power supply to be implemented.

The protected area will be surrounded by an unobstructed area located on both sides of the protected area barrier that extends at least five meters away from every point of the barrier. The unobstructed area will be free of any structure, equipment or other



obstruction that could be used to penetrate or surmount the barrier or to restrict observation of the unobstructed area and will be continuously illuminated at an intensity and uniformity sufficient to permit clear observation of persons within the unobstructed area.

The perimeter boundary design will include measures to prevent forced vehicle penetration into the protected area by a vehicle as described in the Design Basis Threat and include a vehicle search portal at the vehicle access point.

The entrance to the Protected Area will be constructed to facilitate the search of persons and packages for weapons and explosives upon access and for nuclear material upon egress by nuclear security officers equipped with devices capable of detecting this material.

## **2.13 SAFEGUARDS**

WWMF, under its current WFOL, is required to have in place a program that ensures all obligations arising from the Canada / International Atomic Energy Agency Safeguards agreement are met.

### **2.13.1 Safeguards Program**

The objective of OPG's Safeguards Program is to support OPG compliance with the governing agreement made between the Government of Canada and the IAEA. This is done in connection with the *Treaty on the Non-proliferation of Nuclear Weapons* and any arrangement between Canada and the IAEA made under that agreement. It also provides additional protocols to the agreement between member States and the IAEA for the application of safeguards.

The OPG nuclear safeguards program includes the following elements:

- A communication protocol between the IAEA, the CNSC, and OPG;
- Obligations to meet applicable regulatory requirements and the requirements of safeguards agreements; and,
- Reporting to meet applicable regulatory requirements and the requirements of safeguards agreements.

In 2014, the ownership for Safeguards programs in OPGN moved from the Director, Regulatory Affairs, to the Chief Nuclear Engineer.

OPG's key document for the Safeguard SCA and the revision at the time of writing is presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Safeguards	N-PROG-RA-0015	R007

### 2.13.2 Current Operations

As of March 1, 2007, in accordance with the IAEA requirements, OPG has adopted the integrated safeguards protocol. Under the integrated safeguards protocol, all safeguards commitments were met at the WWMF for the licensed period (2007-2015).

WWMF has met all safeguards conditions in its operating licence, and the terms of the agreement between Canada and the IAEA pursuant to the *Treaty on Non-proliferation of Nuclear Weapons*. The WWMF staff has fully co-operated with the IAEA and facilitated achievement of IAEA safeguards goals. All reports and information necessary for safeguards implementation and compliance continue to be provided on a timely basis. No compliance issues have been identified by IAEA or CNSC staff.

Since 2007, there have been six reportable events at WWMF under the Safeguards Regulations, one regarding a broken IAEA seal and five related to IAEA loss of communication with their monitoring equipment.

In 2014, an IAEA paper seal was broken when a facility operator attempted to open a storage cabinet which had been sealed by the IAEA. This storage cabinet was normally used by the operators, but the IAEA were on site for a 2-week long inspection and were using the cabinet to store their equipment. The operator broke the IAEA seal when attempting to access the cabinet, but was not able to get into the cabinet as it was also locked by the IAEA. The IAEA were notified immediately and they were able to verify that their equipment remained undisturbed. This was an OPG cabinet that the IAEA were allowed to use during an inspection. This was a onetime occurrence. OPG is no longer allowing the IAEA to use OPG cabinets. The importance of IAEA seals was reinforced with staff.

Of the five losses of IAEA communication events, 2 have been the result of failures of the IAEA's modem used for remote monitoring, and 3 have been the result of failures of IAEA equipment inside the IAEA cabinet. The IAEA cabinet is under IAEA lock and seal, and facility staff cannot access the cabinet.

The IAEA Fuel Verification Program includes material accounting, IAEA monthly remote monitoring report and the use of surveillance equipment such as core discharge monitors, bundle counters, cameras, portable verification equipment and containment equipment.

WWMF's compliance with the IAEA's Fuel Verification Program is met through the following, ongoing activities:

- Complying with the Safeguards Agreement and the Additional Protocol;
- Providing services and assistance for IAEA staff tasks and equipment operation;
- Disclosing any records to the IAEA upon request;
- Installing, servicing and operating Safeguards equipment;
- Not interfering in any way with Safeguards equipment, samples or seals;
- Making no changes to operations, equipment or procedures that would affect Safeguards implementation without prior written CNSC approval; and,

- Preparing and submitting nuclear inventory reports per CNSC Regulatory Document RD-336, *Accounting and Reporting of Nuclear Material*.

WWMF staff completes an annual Physical Inventory Taking as part of licence conditions pursuant to the implementation of safeguards by the IAEA. A Physical Inventory Taking is a snapshot of the fuel physical inventory at any given time. Canadian facilities are selected at random by the IAEA for a Physical Inventory Verification that follows the Physical Inventory Taking. If a facility is not chosen for Physical Inventory Verification then CNSC Safeguards Staff performs limited confirmation activities following the annual Physical Inventory Taking process. The IAEA completed a Physical Inventory Verification at WWMF in July 2014.

These IAEA inspections are attended by CNSC staff to review the facility's support for IAEA inspectors, including: escorts and equipment; the provision of accountancy information and supporting documents; the facility compliance with safeguards licence conditions relevant to the inspection activity; and the IAEA's adherence to its rights and obligations relevant to the inspection. No significant compliance issues were identified.

WWMF performs annual self-assessments to ensure OPG adherence to the safeguards program.

As of June 28, 2012, WWMF has been in full compliance with the CNSC Regulatory Document, RD-336, *Accounting and Reporting of Nuclear Material*. CNSC Guidance Document, GD-336, *Guidance for Accounting and Reporting of Nuclear Material* is also used. This includes updating to the *Nuclear Fuel Location and Storage History* (NuFLASH) program to support RD-336 reporting requirements.

OPGN management stays current with the IAEA's safeguards requirements and is committed to meeting OPG's safeguards obligations in an efficient and timely manner.

Trilateral Working Group meetings between the IAEA, CNSC Safeguards Division, and Industry have been initiated and continue to be held to discuss improvements and to address stakeholder issues.

Figure 39 shows DSCs in storage with their IAEA wire seals in place.



Figure 39: DSCs in Storage with IAEA Wire Seals

### 2.13.3 Future Plans for Improvement

- OPG will maintain the safeguards program at the WWMF in compliance with WFOL Condition 7 and CNSC regulatory document RD-336, *Accounting and Reporting of Nuclear Material* as applicable.
- WWMF will continue to perform annual self-assessments to ensure OPG adherence to the safeguards program. Any findings needing attention will be addressed.
- Safeguards personnel will continue to be trained to OPG qualification requirements for safeguards. Safeguards governance will be updated, as required, to reflect any new regulatory standards or guides related to implementation of safeguards measures.
- The *Design Information Questionnaire* (DIQ), which provides a detailed account of facility design information to the IAEA is updated, as required, based on changes to WWMF.

#### Laser Mapping Container Verification System

WWMF's UFDSF has begun field trials for a new IAEA technology intended to become a new seal verification system. The Laser Mapping Container Verification (LMCV) system (Figure 40), designed by the IAEA, is a digital weld identification scanner created to verify and uniquely identify DSC in-situ, a powerful tool for acquiring and verifying the "weld fingerprint" of the DSC.

Since 2012, OPG's Dry Storage Facilities have been working closely with the CNSC International Safeguards Division and the IAEA on applying this technology to the Dry Storage Container.

WWMF is the first location in the world where the IAEA is testing this technology. If accepted for use in Canada, this scanning will replace the current metal seal system on the DSC which is costly for the IAEA and labor intensive for both IAEA and OPG during seal replacement activities.



**Figure 40: Laser Mapping Container Verification System**

The IAEA are informed of expansion plans to the WWMF in the Annual Additional Protocol which is electronically submitted to the CNSC who then forward it to the IAEA. During the design phase of an expansion to the WWMF, OPG will request the IAEA to identify any IAEA measures required for the expansion.

## **2.14 PACKAGING AND TRANSPORT**

### **2.14.1 Packaging and Transport Program**

The objective of the OPG Nuclear's Radioactive Materials Transportation Program is to ensure safe and efficient transportation of radioactive material. The program includes controls and procedures for the handling, packaging, shipment, carriage and receipt of radioactive material, and verification that emergency response for transportation incidents is appropriately established. The program consists of multiple checks and balances, and includes a quality assurance program that is compliant with the quality assurance requirements of *Packaging and Transport of Nuclear Substances Regulations*. The program is supported by OPGN's Radioactive Materials Transportation Emergency Response Plan. Activities related to packaging and transport are performed under the nuclear generating station Power Reactor Operating Licences and the WWMF Operating Licence.

OPGN's Packaging and Transport Program specifies packaging and transport requirements including training, preparation for shipment, loading and unloading, and maintenance and design requirements for waste packages. While the *Packaging and Transport of Nuclear Substances Regulations* and OPG's Radioactive Material Transportation Program apply to off-site transportation, OPG's practice is to provide an equivalent level of safety to workers, the general public, and the environment for on-site transfers. On-site transfers of materials are conducted in accordance with OPGN's Radiation Protection Program. OPG maintains records of its transport activities in accordance with the *Packaging and Transport of Nuclear Substances Regulations*.

OPG's key documents for the Packaging and Transport SCA and the revision at the time of writing are presented below, and will form the basis for future licence conditions.

Document Title	Document Number	Revision #
Radioactive Materials Transportation	W-PROG-WM-0002	R010
Radiation Protection	N-PROG-RA-0013	R009

### **2.14.2 Current Operations**

OPG has been safely transporting radioactive materials for over 45 years, and has never had an accident resulting in a radioactive release or serious personal injury. There have been no dangerous occurrences, accidental releases or imminent accidental releases reportable under the *Packaging and Transport of Nuclear Substances Regulations* and *Transportation of Dangerous Goods Act* during the reporting period. OPG drivers transporting radioactive materials have an excellent safety record on the roads.

OPG typically performs over 700 radioactive shipments per year. During the current licence period, there was only one minor motor vehicle collision involving an OPG radioactive shipment from which there was no release of radioactive material to the environment, and no serious injuries. OPG was not at fault for this motor vehicle collision. In March 2012, an OPG Radioactive Material Transport vehicle carrying empty waste bins (classified as a Class 7 radioactive, excepted empty shipment) was rear-ended on a 400 series highway by a private driver who was then charged. OPG drivers have travelled over 3 million kilometers over the last 9 years without any at fault incidents.

OPG's Radioactive Material Transport Program has a fleet of tractors, trailers, packagings, and Transportation of Dangerous Goods Class 7 Carriers (drivers) for the transportation of:

- L&ILW to the WWMF;
- Non-waste radioactive materials (tools, sources, tritiated heavy water); and,
- Single bundles of used fuel to Canadian Nuclear Laboratories (previously AECL Chalk River Laboratories) for examination and analysis.

All OPG radioactive materials transportation packaging is compliant with the requirements of the *Packaging and Transport of Nuclear Substances Regulations*. The designs of packaging for the most hazardous radioactive materials (Type B) are certified by the CNSC. OPG's Radioactive Material Transportation Program tracks and maintains package certificates and registered user status for all Type B packaging used by OPG.

OPG has an emergency response plan for transportation incidents involving radioactive material called the Transportation Emergency Response Plan. The Transportation Emergency Response Plan is activated when there is an incident involving a radioactive material shipment by road resulting in the potential or actual release of radioactive material to the environment. OPG's radioactive material transportation emergency response capability is tested on an annual basis to validate the effectiveness of the Transportation Emergency Response Plan capability to ensure safety of the public, environment and employees in the event of a transportation emergency. OPG's Radioactive Materials Transport and Emergency Response communication program was presented to emergency responders in communities across the province where our transportation vehicles travel. In an effort to continue to build community and stakeholder understanding, OPG conducted a number of face-to-face discussions on radioactive material transportation and emergency response with provincial/ municipal first responders and municipal leaders along the transportation routes. During the current licence period, OPG has provided 50 training presentations to over 887 emergency personnel.

#### **2.14.2 Package Design and Maintenance**

Packages used to transport higher risk radioactive materials require certification and registration by the CNSC. While packages designed for the transport of low risk radioactive materials do not require certification by the CNSC, these packages are still required to comply with the *Packaging and Transport of Nuclear Substances Regulations*. OPG retains documentation demonstrating all of its packages are in

compliance with the regulations. OPGN's Radioactive Material Transportation Program specifies requirements for training, preparation for shipment, loading and unloading, and maintenance and design requirements for waste packages.

To meet WWMF's responsibilities to the Radioactive Material Transportation Program, each work group must maintain an adequate complement of trained Class 7 Handler/Receivers and receive sufficient oversight from their line management to ensure compliance with Radioactive Material Transportation procedures. In addition, all Type A or Type B radioactive shipments are reviewed by a Radioactive Material Transportation Officer prior to leaving site as a final check before travelling on public roadways.

### **2.14.3 Future Plans for Improvement**

The Radioactive Material Transportation Program includes a strategic equipment replacement plan to ensure that radioactive material transportation packages and their trailers are replaced or supplemented as required. Aging management studies will continue to be conducted on the components most vulnerable to aging, to calibrate the equipment replacement plan on an ongoing basis, and is described in Section 2.6.4.1 Aging Management.

DNWM is in the process of replacing its older radioactive material transportation packages based on these aging management assessments. The designs of the new packages incorporate improvements based on operating and maintenance experience, and utilize industry best-practices.

Program improvements include:

- Procurement and integration into the Radioactive Materials Transport fleet by 2018 of:
  - Two Type B(U) Multi-Purpose Transportation Packages (MPTP) for transporting tritiated heavy water; and,
  - Two Type B(U) Multi-Purpose Transportation Packages for Shielded Flask (MPTP-SF) for transporting radioactive filters and components.
- The above packages will supplement and eventually replace, respectively:
  - Two Tritiated Deuterium Oxide Packages (TDO) for transporting tritiated heavy water; and,
  - Two Radioactive Filter Transportation Packages (RFTPs) for transporting radioactive filters and components.
- Trailers for several radioactive materials transportation packages have been replaced or refurbished as required.
- Six new Type A ISO-40 and three ISO-20 packages are planned for construction to augment the existing fleet of seven Type A ISO packages. These are expected to be in service in 2017.
- Additionally, the existing Work Management System is being adopted to better integrate and coordinate workgroups that are closely tied to the Radioactive Materials Transport activities. This improvement project will consolidate the existing logistics and planning systems previously used to manage the Radioactive Materials Transport activities.

### **3.0 OTHER MATTERS OF REGULATORY INTEREST**

#### **3.1 ENVIRONMENTAL ASSESSMENTS**

##### **3.1.1 Studies under the Canadian Environmental Assessment Act**

###### **3.1.1.1 Additional Low Level Storage Buildings**

A screening level environmental assessment for the construction and operation of Low Level Storage Buildings 9, 10 and 11 was conducted. A draft Environmental Assessment was submitted to the CNSC in Nov 2003. After considering the screening report, the mitigation measures, and comments filed from the public, the CNSC Designated Officer accepted that the project would not cause significant adverse effects.

###### **3.1.1.2 Refurbishment Waste Storage Project**

A screening level environmental assessment was completed in 2006 to provide additional low and intermediate level waste storage capacity to accommodate wastes resulting from reactor refurbishment activities, and from on-going operation of the reactors. The scope of the project included construction and operation of 12 above ground storage buildings for low and intermediate level waste, 270 in-ground containers of type 18 m<sup>3</sup> (IC-18s), and 30 in-ground containers of type HX (IC-HXs).

The environmental assessment considered the impact to the environment which included the biophysical and social features that have the potential to be affected by the project. The environmental component considered included the following:

- Atmospheric Environment: air quality with respect to non-radiological parameters, including noise, meteorology and climatic conditions;
- Hydrology and Surface Water Quality: surface water quantity and quality;
- Aquatic Environment: aquatic biota and habitat;
- Terrestrial Environment: terrestrial biota and habitat;
- Geology, Hydrogeology and Seismicity: geological and hydrogeological conditions (including groundwater quality) and seismic potential;
- Radiation and Radioactivity: environmental radiation and radioactivity, including radionuclide emissions and doses to humans and non-human biota;
- Land Use and transportation;
- Physical and Cultural Heritage Resources: historical, cultural and archaeological resources as well as landscape and visual setting;
- Socio-Economic Conditions: population and economy, community infrastructure, community services, municipal finance and administration, residents and communities.
- Aboriginal Interests: use of lands and other important issues for aboriginal peoples.



Each environmental component is further divided into sub-components that represent a potential pathway or mechanism for the transfer of an effect to a Valued Ecosystem Component.

The Environmental Assessment study report and four technical supporting documents for Terrestrial, Geology Hydrogeology and Seismicity, Radiation and Radioactivity, and an Ecological Risk Assessment were submitted to the CNSC in October 2005. After considering the screening report, the mitigation measures, and comments filed from the public, the CNSC Commission accepted that the project would not cause significant adverse effects. A decision on the Environmental Assessment was made in March 2006.

The Environmental Assessment follow-up and monitoring activities associated with the Refurbishment Waste Storage Environmental Assessment included stormwater and sediment, groundwater, and soil sampling, and identification of active crayfish borrows. Similar to earlier follow-up monitoring results, these sampling results demonstrated that there were no significant adverse environment effects on hydrogeology, ground water, sediment or surface water quality. The crayfish were found to be burrowing chimney crayfish, and present in reasonable numbers in Bruce County including the Bruce nuclear site.

### **3.1.1.3 Deep Geologic Repository Project for Low and Intermediate Level Waste**

In 2005, OPG initiated the regulatory approvals process for site preparation and construction, operation, decommissioning, abandonment and long-term performance of a L&ILW DGR for the long-term management of low and intermediate level wastes. The proposed site for the DGR is on lands located adjacent to the WWMF.

The DGR will be constructed at a nominal depth of 680 m beneath the surface in low permeability limestone overlain by a 200 metre thick cap of low permeability shale. It will accommodate operational and refurbishment low and intermediate level waste from OPG owned or OPG operated nuclear reactors.

In April 2011, OPG submitted its Environmental Impact Statement and nine technical support documents to the CNSC which were intended to comply with all the requirements of the Environmental Assessment guidelines, issued in January 2004. The Environmental Impact Statement and supporting documents were reviewed under a Joint Review Panel.

The assessment of effects of the DGR Project due to normal project development and operation focused on potential interactions of the proposed project with Valued Ecosystem Components – features of the environment which are valued or sensitive and have the potential to be affected by the project.

Valued Ecosystem Components were identified in the draft Environmental Assessment Guidelines, and finalized through a consultative process with the proponent, members of the public, scientists and the regulator. The assessment of effects was completed for a number of different components of the environment, including the physical, cultural and socio-economic.

The assessment followed a source-pathway-receptor approach for screening potential interactions between the DGR Project and Valued Ecosystem Components. The DGR project works and activities represented the source, while a measurable change to the

environment represented a pathway and the Valued Ecosystem Components represented the receptor. Any potential effect with a measurable change was advanced for further assessment, including the cumulative effects assessment.

Thirty-one projects or activities, including WWMF upgrades, expansion and current operations, were identified in the cumulative effects assessment. The objective was to determine whether effects from these projects could overlap in terms of type of effects, in time and in space. Overlaps were identified in areas of aquatic environment, air quality, noise levels, and radiation and radioactivity between the DGR project and WWMF. Their effects were assessed, and it was determined there were no residual adverse cumulative effects.

The Joint Review Panel held many public hearing sessions in 2013 and 2014 in Kincardine and Port Elgin, Ontario. During the review, the Joint Review Panel received written submissions and oral presentations from the proponent and participants including Aboriginal peoples, federal and provincial government agencies, local governments, environmental groups, individuals and organizations. In May 2015, the Joint Review Panel submitted its Environmental Assessment Report to the federal Minister of the Environment and Climate Change. The Joint Review Panel recommended acceptance of the Environmental Assessment on May 6, 2015, citing that there would be no measurable effects on the environment with mitigating measures in place. In February 2016, the federal Minister of the Environment and Climate Change directed OPG to conduct additional studies.

### **3.1.2 Environmental Studies under the *Nuclear Safety and Control Act***

#### **3.1.2.1 Predictive Effects Assessment (2016)**

OPG conducted a Predictive Effects Assessment to determine the impact of the proposed new activities described in Section 1.7 on human health and on non-human biota.

##### **Human Health Risk Assessment**

The Human Health Risk Assessment evaluated the impact on human health of radiological and non-radiological contaminants in different media, as well as physical stressors, resulting from the WWMF expansion project.

For radiological emissions, it is estimated that the highest potential dose to a member of the public from the Project is 0.25  $\mu\text{Sv/y}$ . Taking into account the operation of the existing facilities at the Bruce nuclear site, the dose to a member of the public remains less than 5  $\mu\text{Sv/y}$ . This is less than 0.5% of the regulatory limit for a member of the public of 1 mSv/y, or 1000  $\mu\text{Sv/y}$ . Therefore, it is concluded that there are no adverse radiological effects to the public.

For non-radiological emissions, of all the environmental media considered (including the atmospheric environment [air quality and noise], surface water, sediment, soil, and groundwater), the only non-radiological contaminant which was estimated to exceed the assessment criteria was airborne particulate at the Bruce nuclear site boundary, during the construction period only. However, the concentrations were estimated based on conservative assumptions and the adverse effect is immediately reversible with cessation of emission-generating activities. In addition, the frequency of

occurrence is low. For example, the exceedances of Ambient Air Quality Criteria at the Bruce nuclear site boundary occur less than 1% of the time while construction activities are taking place. Furthermore, the concentrations of these indicators at all specific human receptor locations are below the Ambient Air Quality Criteria values. Therefore, it is concluded that there are likely no adverse effects to human health due to the elevated airborne particulate concentrations.

Consistent with Canadian Standard Association N288.6-12 *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*, noise is the only physical stressor considered for the purposes of the Human Health Risk Assessment. The noise levels were modelled for the nearest human noise receptors during the site preparation and construction phase, and during the operation and maintenance phase of the Project. During the site preparation and construction phases, the increases in noise levels are not considered to have an adverse effect on human health as the increase from each Project phase is less than the 5 dB above baseline noise level criterion. During the operation and maintenance phase, the modelled noise levels are well below the NPC-300 criteria. Therefore, it is concluded that there are likely no adverse effects to human health due to increased noise.

### **Ecological Risk Assessment**

The Ecological Risk Assessment evaluated radiological and non-radiological contaminants in different media, as well as physical stressors resulting from the Project.

The effects from radiological contaminants emitted from the WWMF were determined for indicator species across all trophic levels. The total radiological doses received by the indicator species, taking into account the existing conditions and the emissions from the Project, were estimated to be in the range of 0.53 µGy/h to 3.57 µGy/h, which are well below the benchmark values given in CSA N288.6-12 *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*. Therefore, it was concluded that there are likely no adverse radiological effects to the ecological receptors.

Through the ecological risk characterization, it was determined there are no adverse effects to air quality, soil and groundwater. No adverse effects from predicted air emissions were anticipated since the levels are below screening levels and/or are short in duration. No adverse effects are expected from exposure to soil contaminants. For groundwater there is no direct pathway to receptors; there is potentially a reduction in recharge to the aquifers but this effect is negligible on a regional scale.

The largest changes to surface water quantity are expected in the South Railway Ditch in the event that drainage from all expansion areas is directed to the South Railway Ditch. However, no adverse effect to the biological integrity of the aquatic systems within the South Railway Ditch is expected. Changes in surface water quality as a result of increased total suspended solid loading during clearing and construction phases are expected to have no likely adverse effect to aquatic receptors. Under the scenario where all surface run-off is directed to the South Railway Ditch through a stormwater management facility, a small increase in water temperature in the drainage ditch is predicted. However, this is based on a conservative estimate prior to in-design mitigation and is not expected to constitute an adverse effect to the aquatic environment, Valued Ecosystem Components or indicators. Overall, no adverse effect

to the biological integrity of the aquatic systems within the South Railway Ditch is expected.

Quantitative analysis shows that the Project is unlikely to represent a noise disturbance beyond tolerance on species currently occurring within the vicinity of the WWMF. It is concluded that there are likely no adverse effects on ecological receptors from changes in noise levels that may arise from the Project.

A qualitative assessment was performed to determine the adverse effects associated with lighting, road kill, and bird strikes resulting from the Project. No likely adverse effects were identified for these physical stressors.

The ecological risk characterization on the Valued Ecosystem Components and associated receptors concluded that there is no adverse effect on aquatic receptors from loss of habitat and the potential adverse effects due to the loss of habitat on Eastern White Cedar, the Wetland Complex, Eastern Wood-Pewee, and Little Brown Myotis are acceptable. The adverse effects identified for Butternut trees are acceptable if the identified mitigation measures are implemented.

The Human Health Risk Assessment and Ecological Risk Assessment concluded that no adverse effects are expected provided that mitigation measures to minimize the environmental impacts of the project on human and ecological receptors are implemented. Changes to the WWMF Environmental Monitoring Program are proposed to confirm the accuracy of the Predictive Effects Assessment and the effectiveness of the mitigation measures to be implemented.

Mitigation measures and follow-up actions will be provided in the Predictive Effects Assessment which will be submitted to the CNSC separately.

### **3.2 INDIGENOUS COMMUNITY ENGAGEMENT**

WWMF is required to have in place a Public Information and Disclosure Program to comply with the *Nuclear Safety and Control Act* and associated Regulations. OPG's programs are in accordance with CNSC RD-99.3, *Public Information and Disclosure* and OPG has an Indigenous Relations program in accordance with *REGDOC-3.2.2 Aboriginal Engagement*.

OPG has remained committed to engaging with Indigenous communities about WWMF's nuclear waste operations and future projects. OPG's demonstration of this commitment is directed by a corporate-wide policy that provides a framework for engaging with Indigenous peoples and supporting community programs and community initiatives.

Over the licensing period, OPG continued to build long-term mutually beneficial working relations with Indigenous communities proximate to our operations. OPG continues to build these relationships on a foundation of respect for the languages, customs, and political, social and cultural organizations of Indigenous peoples.

In the fall of 2015, OPG was independently recognized for the work we do with Aboriginal communities. The Canadian Council for Aboriginal Business awarded OPG a silver recognition. The Canadian Council for Aboriginal Business is a national non-profit organization that offers knowledge, resources, and programs to both mainstream

and Aboriginal owned companies that foster economic opportunities for Aboriginal people and businesses across Canada.

### **3.2.1 Nuclear Waste Management Indigenous Relations Program**

Annually, an Indigenous relationship work plan is developed and executed.

Over the past five years OPG has continued to work with over 11 communities and held numerous meetings (approximately 15 per year) on a yearly basis on OPG's waste operations to share information; to consult on issues and concerns; and to work collaboratively on areas of common interest. Participation agreements and memorandums of understanding have also been put in place with a number of Indigenous communities to enable the sharing of information on OPG's waste operations, the DGR and undertaken discussions to address concerns. This has allowed for structured and ongoing opportunities for open and constructive dialogue.

OPG has regularly met with Indigenous communities who have an interest in the current regulatory licensing processes to help inform them of the process; determine their interest in being engaged in the licensing process; current and future facility operations; opportunities for engagement and employment; and identify interests and concerns.

Over the past reporting period OPG met regularly to discuss waste operations with:

- Saugeen Ojibway Nations;
- Williams Treaty First Nations representatives (Chippewa Nations: Georgina Island, Christian Island (Beausoleil), Rama, Mississauga Nations: Scugog, Hiawatha, Curve Lake, Alderville);
- Métis Nation of Ontario –Region 7: including the Métis Councils of Georgian Bay, Moon River and Great Lakes; and,
- Historic Saugeen Métis.

Information meetings/community sessions or briefings were also held concerning nuclear and waste operations with:

- Métis Nation of Ontario – Region 6 and Region 8;
- Mississauga of New Credit First Nation;
- Mohawks of Akwesasne First Nation;
- Mohawks of the Bay of Quinte;
- Six Nations Hereditary Chiefs represented by Haudenosaunee Development Institute (HDI);
- Aamjiwnaang First Nation; and
- Communities on Manitoulin Island.

### **3.2.2 Indigenous WWMF Licence Renewal Program**

In support of the licence renewal, OPG has developed a specific engagement program to:

- Communicate and inform Indigenous communities of the future site operations proposed for the licence period to determine level of interest and concern;
- Take appropriate steps for Indigenous engagement and consultation; and,
- Address and manage concerns as appropriate.

#### **3.2.2.1 Identification and Engagement**

Based on existing relationships and traditional territories as well as work undertaken with past Environmental Assessments, licence review processes, DGR project consultation, and Indigenous engagement, OPG believes the following communities have an Aboriginal interest and/or right with respect to OPG's waste operations at the WWMF:

- Saugeen First Nation (Joint council Saugeen First Nation and the Chippewas of Nawash Unceded First Nation);
- Métis Nation of Ontario – (represented by Regional Consultation Committee Region 7); and,
- Historic Saugeen Métis.

Additionally, on-going information sharing on current operations, events of significance and the licence renewal process for WWMF, including the transportation of waste to the facility, will continue with a number of Indigenous communities based on existing relationships with OPG and at the request of any interested community.

OPG has undertaken early engagement with appropriate Indigenous communities beginning in early 2015, to raise awareness of the process; discuss potential timing of the licensing process; determination of a community's level of desired engagement and interest; what level of engagement is required; and identification of potential capacity requirements. Preliminary information on the nature and scope of the proposed activities over the licence period and how best communities would like to be engaged throughout the licence period have been on-going since early 2015.

Through the course of these early discussions, OPG has committed to fully inform and engage with the identified communities and provide financial capacity to assist them in the ability to learn, understand and participate in the review process. OPG has also committed to continue to strengthen the relationships and maintain open and transparent communication over the life of the next licensing period.

OPG is currently working to formalize these commitments through the development of agreed upon engagement work plans supported with participation agreements to ensure appropriate resources are in place. OPG has also committed to the sharing and review of the Licence Application, Environmental Risk Assessment, Predicted Effects Assessment and future Commission Member Documents with communities. Many communities have identified the need for additional technical resources and support to fully review the documentation. OPG continues to work at finalizing

participation agreements define the engagement plan and to provide necessary capacity in addition to potential funding provided by the CNSC through the Participant Funding Program.

Engagement with communities during the licence renewal process will include timely and frequent communication through electronic correspondence, phone calls, regular face-to-face meetings, community information sessions and presentations. Additionally a number of site visits and tours of the WWMF have been conducted over the past year and more are planned over the course of licence renewal process for community members and citizens to better understand and see first-hand, the current waste operations and proposed licensed activities. Engagement work plans are being finalized and OPG will identify potential opportunities for the CNSC to participate during appropriate information sharing sessions.

### **3.2.3 Future Plans for Improvement**

OPG has worked hard to build strong respectful and mutually-beneficial relationships with Aboriginal communities in proximity to our operations. The relationships continue to mature and build trust and understanding. A number of agreements and Memorandums of Understanding are in place and are reviewed periodically to ensure a framework is in place to enable OPG and the communities to continue to remain informed and engaged in the future and that issues are discussed and resolved in the right forum to allow both parties to continue to work toward common goals.

OPG received a number of suggestions and insights on how to improve our Aboriginal Relations by the Canadian Council for Aboriginal Business. Our Progressive Aboriginal Relations assessment will assist OPG to take further steps over the next three years towards improving our program further to obtain a gold certification.

OPG will provide CNSC staff with interim status updates on the progress of the Aboriginal engagement plan on a regular basis during the regulatory review process leading up to the licensing hearing. If over the course of engagement with communities there are material changes then OPG will provide an update to the engagement report to the CNSC, in a timely manner. And finally OPG plans to provide a summary of engagement activities in their licensing hearing Commission Member Document in accordance with REGDOC-3.2.2 Aboriginal Engagement, section 4.4.

## **3.3 COMMUNITY RELATIONS & PUBLIC INFORMATION PROGRAM**

WWMF is required to have in place a public information and disclosure program in accordance with CNSC RD-99.3, *Public Information and Disclosure* and to comply with the *Nuclear Safety and Control Act* and associated Regulations.

OPG's key document for the Public Information and Disclosure SCA and the revision at the time of writing is listed in the table presented below, and will form the basis for future licence conditions.

<b>Document Title</b>	<b>Document Number</b>	<b>Revision #</b>
Nuclear Public Information Disclosure	N-STD-AS-0013	R00

### 3.3.1 Community Consultation Program

OPG ensures timely, open and transparent communication to maintain positive and supportive relationships and confidence of key stakeholders. OPG develops, maintains and implements an annual public information and disclosure program that takes into consideration:

- The type of facility and activities being regulated;
- The risks to public health, safety, security, and the environment posed by the facility or activity; and,
- The level of public interest or concern.

Annual engagement activities are directed towards community stakeholders, including government, media, business leaders, educational institutions, interest groups, and community organizations. OPG ensures transparent disclosure of our operations and potential impacts, both positive and negative that may occur as a result of our operations.

### 3.3.2 Current Operations

During the reporting period, OPG regularly and proactively provided information to the public on its facility activities. For operational status changes or unscheduled operations that may cause public concern or media interest, OPG follows a protocol to notify key community stakeholders in a timely manner. To support this protocol, OPG maintains a duty on-call position 24 hours a day, seven days a week, to manage this requirement.

Increased efforts over the past four years have resulted in expanded outreach with key stakeholders, government officials and the broader public. This is in response to growing interest by the public and community in OPG's waste operations and OPG's proposed DGR.

On a quarterly basis, OPG publicly posts performance reports on nuclear waste operations at [www.opg.com](http://www.opg.com) and shares this document electronically with key stakeholders. Additionally, starting in 2014 OPG developed and began issuing a quarterly Environment report in an easy to read and understandable format. Annually, OPG posts the Environmental Monitoring Program report on [www.opg.com](http://www.opg.com) for both Pickering and Darlington. Aspects of our nuclear waste operations at WWMF are included in Bruce Power's Environmental Monitoring Program report which is posted on Bruce Power's website.

In 2015, OPG initiated the quarterly posting of Waste Facilities Reportable Events, aligned with OPG's nuclear station disclosure activities.

#### 3.3.2.1 Disclosure Protocol

In 2013, OPG implemented a managed system to carry out the requirements of CNSC RD-99.3, *Public Information and Disclosure*. This included the development and issuance of OPGN's Nuclear Public Information and Disclosure Standard and the development and public posting of an OPG *Nuclear Information Disclosure and*



*Transparency Protocol.* While the guidance is directed at Class IA facilities, all of OPG's nuclear waste operations at the nuclear stations and operations at the WWMF adhere to OPGN's Nuclear Public Information and Disclosure Standard and the *Nuclear Information Disclosure and Transparency Protocol.*

### **3.3.2.2 Community Outreach and Programming**

Through community outreach, OPG has established strong working relations within the community. Regular briefings are provided to elected officials and council, key community organizations, interested groups and the general public on waste operations and the DGR. OPG continues to respond to and support requests for information or briefings. In the past three years briefings and information sharing efforts have substantially increased as a result of interest in the DGR project. OPG has worked to respond to all of these requests and proactively reached out to communities to share information in both Canada and the United States.

Two-way dialogue with the public was facilitated through personal contact, community newsletters, speaking engagements, educational outreach, robust websites, with email response options, and many other products and programs.

To increase the understanding of nuclear waste operations, tours are provided to key stakeholder groups, media and interested groups. At the WWMF, a total of 173 tours were conducted from 2007 to the end of 2015.

OPG received, documented, and responded to concerns, complaints and inquiries raised by the public. A managed process is in place to track actions through to closure.

During the current licence period, communications in support of waste operations and the DGR generated the following:

- 22 newsletters to a combined audience of 260,000 households; and
- Over 17,000 visitors in 2015 to OPG's waste and DGR websites.

OPG relies heavily on websites to provide up-to-date information that is easily accessible by the public and offers opportunities for further contact. In this period, a number of newsletters, reports, media releases, updated stories and links to other agencies and regulatory proceedings were kept current on a number of nuclear-related websites. In 2015, 17,451 visitors accessed OPG's waste management and DGR websites for information.

Social media continues to increase in popularity and use. OPG actively monitors and responds to activity through Tweets, Facebook, and other social media platforms. OPG maintains a Facebook account, a Twitter account with 5,200 followers, and Tweets on relevant nuclear activities and information.

Through OPG's Corporate Citizenship Program and the DGR Community Partnership Program, financial support is provided for community-based programs with a focus on education, environment and community-building events. Each year, support is provided for a number of charitable and non-profit initiatives in our host communities. Employee leadership on local committees and volunteerism helped strengthen the social infrastructure of our host communities.

The WWMF hosted a variety of environmental education and recreational programs geared to students to demonstrate that OPG shares the values of family, safety and environmental stewardship. The WWMF site supports Science Career Paths sessions, The Bluewater Science Fair, Water Works and the Girls Science Club reaching over 5,200 students.

### **3.3.2.3 Community Engagement for WWMF Licence Renewal**

During the licence renewal process OPG will develop and undertake a public community engagement program. The program will:

- Communicate and inform public and Indigenous communities of the future site operations and expansion to determine level of interest and concern;
- Document findings and address concerns;
- Take appropriate steps for public and Indigenous engagement and consultation to help inform the environmental review work as part of OPG's licence submission; and,
- Address and manage concerns as appropriate.

### **3.3.3 Future Plans for Improvement**

OPG plans to:

- Continue to develop and implement a yearly public information program;
- Continue to maintain strong community relationships;
- Track and execute Community (non-regulatory) commitments as described in the DGR project commitment report;
- Establish a Community Advisory Council in Bruce County once a DGR construction licence is issued;
- Continue with website improvements and migration of all relevant DGR information to OPG websites; and,
- Continue to expand public environmental reporting and engagement including environmental follow up programs.

### 3.4 OPG'S RESPONSE TO THE FUKUSHIMA INCIDENT IN 2011

As discussed in Section 2.4, in response to the event on March 11, 2011, a magnitude 9.0 earthquake, followed by a devastating tsunami in Japan that caused a severe nuclear accident at the Fukushima Daiichi nuclear power plant, the CNSC established the Fukushima Task Force to evaluate operational, technical and regulatory implications for Canadian nuclear power plants and requested actions to be completed by major nuclear facilities in Canada.

Pursuant to its authority, the CNSC requested that OPG review initial lessons learned from the earthquake in Japan and re-examine the safety cases in particular the underlying defence-in-depth concept, with the focus on external hazards such as seismic, flooding, fire and extreme weather events; measures for prevention and mitigation of severe accidents; and emergency preparedness. The CNSC also requested that OPG re-examine the assessments from a consequential event sequences perspective and report on implementation plans for short-term, medium-term and long-term measures to address any potential gaps.

Due to the broad scope of the reviews performed by OPG, the DNWM nominated an executive team lead and a supporting work force to manage the extensive work load and tight time lines. This work force consisted of specially assembled teams, which included an overall DNWM coordination team, and specific assessment teams in Used Fuel Operations, L&ILW Operations, and Nuclear Waste Engineering.

In the review of the safety cases, OPG took on a number of actions with the objective of improving defences and mitigating the consequences for both design basis and beyond design basis events, should they occur at its waste management facilities.

#### **A. Safety Cases for Design Basis Events**

OPG performed a systematic review of the impact of the events described above on the following systems:

- Fire detection, protection and water supply;
- L&ILW storage structures;
- Dry storage systems and structures;
- Line communication and Public Address;
- Fixed radiological monitors;
- Transportation packages; and,
- Site drainage and storm water.

The potential consequential failure modes of the above systems, structures, and equipment following the external initiating event were determined and the potential impact to the workers, the public, and the environment from these extreme events was assessed, as well as the need for any preventing or mitigating measures.

OPG did not find any significant gaps during the review of the safety cases for OPG's WWMF. However, some possible improvements and enhancements were identified during this assessment (Table 10). Following the schedule

proposed by the CNSC Management Response guidance for implementing recommendations, OPG has completed the implementation.

## **B. Safety Cases for Beyond Design Basis Events**

For beyond design basis events, the actions fell into two broad categories as discussed below:

### ***a. Emergency Response Capability***

This category of actions includes the revision of internal programs and procedures to improve the post-event response, a review of the need for additional contracts for external emergency services, and the purchase of additional emergency equipment. The following was reviewed:

- The fire safety plans for the WWMF;
- The Employee Emergency Response and Fire Protection procedures;
- The Legal Agreement between Bruce Power and the WWMF for emergency preparedness;
- The Emergency Propane Plan at the WWMF;
- Fire detection and protection systems and equipment;
- The Transportation Emergency Response Plan; and,
- Training qualifications associated with emergency preparedness.

No significant gaps were identified during the emergency preparedness review. However, some possible enhancements were identified (Table 10). Again, OPG has completed the implementation by following the schedule proposed by the CNSC Management Response guidance for implementing recommendations.

### ***b. Technical Studies***

The undertakings in this category which required further evaluation include the assessment of various waste management systems and structures under post-event conditions.

A flood hazard assessment was completed for the WWMF site concluded that:

- A 1-hour probable maximum precipitation event could result in flood levels generally between 0.15 and 0.5 metres, but up to 2 metres in localized areas; and,
- A flooding potential from the lake is insignificant compared to the probable maximum precipitation flood levels.

A public dose assessment as a result of the probable maximum precipitation flood indicated that potential doses to the public would be significantly below the regulatory dose limit.

Flood water modelling was performed to evaluate whether the waste storage structures at WWMF would be “fit for service” following a beyond design basis probable maximum precipitation flood event at WWMF. It was found that all storage structures and buildings would retain their structural integrity during and after a beyond design basis flood event, and would therefore be fit for service.

Flood hazard mitigation for the carbon dioxide fire suppression rooms supporting the LLSBs was considered, and the radiological dose to the public as a result of using water to fight an LLSB fire has been estimated to be below regulatory dose limits. Furthermore, fighting fire with water would not pose an unreasonable risk to the environment.

A seismic assessment of the DSC Processing Building was completed to determine the impact of the building collapsing while an unclamped and non-welded DSC is located inside a weld bay. The analysis assumed the DSC Processing Building collapses and the heaviest roof truss falls on an unclamped and non-welded DSC. It was determined that the lid would be displaced, but not fully removed and the used fuel in the DSC would not be exposed. The assessment concluded that the DSC is sufficiently robust to withstand design basis, and beyond design basis events without a loss of shielding and/or containment integrity.

In the event of an emergency, the OPG emergency preparedness and response procedure includes radiological surveys after the event to confirm that the shielding integrity of the DSCs has not been compromised.

A dose rate assessment was conducted in order to determine the magnitude of the potential public dose at the site boundaries, if all the waste storage buildings at the WWMF were to collapse as a result of a beyond design basis seismic event. Conservatively, rubble was not credited with providing any radiation shielding.

Based on the maximum potential occupancy at the site boundary (24 hours/day, 365 days/year), the dose over the course of a year to a member of the public located at the site boundaries of the WWMF was found to be well below the CNSC annual dose limit of 1 mSv for a member of the public. This value is also used by OPG as the acceptance criterion for abnormal operating events at the WWMF.

**Table 10: Possible Improvements and Enhancements with OPG's Actions Taken**

Item	Possible Improvements and Enhancements	Actions Taken
1	Purchase satellite phones and associated contracts for all facilities, to ensure DNWM has a means of communication if regular phone lines are down, and cell phones cannot be charged due to loss of power. This could be required as a result of a severe weather emergency that results in DNWM employees being stranded at work for up to seven days.	Three Globalstar CST-1700 satellite phones were purchased and these phones can be charged by a computer, an electrical outlet, or a car, which provides flexibility in keeping the phones charged in the event that some of these power sources are impacted by a severe weather event. Also, a contract has been established with Globalstar for access to the satellite and usage. The phone number for the WWMF was provided to the CNSC.
2	Update the OPG document "Environmental Emergency Plan – Propane" to identify the evacuation area of employees in the event of a potential propane tank explosion caused by severe weather event.	A copy of "Environmental Emergency Plan – Propane" was provided to the CNSC. OPG provided the CNSC with information to clarify the roles and expectations of the Propane Emergency Response and the evacuation plan to expediently evacuate all personnel and members of the general public within a 1600 m radius.
3	The DNWM operating procedure for the LLSB did not instruct OPG operations staff to manually activate the LLSB fire suppression system.	The DNWM operating procedure for LLSBs was updated to include instructions for the manual activation of the LLSB fire suppression system. In addition, a procedure for a fire watch following a post-event fire system impairment was created.
4	Assess the carbon dioxide fire suppression system's availability in the event of a loss of Class IV electrical power.	A manual transfer switch that would allow back-up power to be provided to the carbon dioxide fire suppression system supporting LLSBs 11 to 14 was installed. The same change was previously installed for the fire suppression system supporting LLSBs 1 to 10.
5	Investigate if a procedure to lower a suspended DSC in the event of a crane failure, as a result of a beyond design basis event is required.	An OPG review of the postulated suspended DSC event determined that no procedure was required, as the DSC lift height would be lower than the maximum height for a drop within the existing safety envelope, as analysed in the Safety Report.

Item	Possible Improvements and Enhancements	Actions Taken
6	Develop a procedure for the safe shutdown of the nuclear waste management facilities in the event of a beyond design basis event.	A "NWMD Emergency Preparedness and Response" procedure was developed and issued. It includes actions to be taken by staff during and after a beyond design basis event. The procedure includes facility specific checklists for all sites, which comprises the list of components that need to be checked, to ensure the facility is in a safe state.
7	It was identified that the WWMF did not have defined radiation emergency response support in the Bruce Site Services Agreement.	A mutual Aid Agreement for nuclear emergency support was developed, agreed to by Bruce Power, Ontario Power Generation, Hydro Quebec, New Brunswick Power, and Atomic Energy of Canada Limited, and was placed into effect November 30, 2012. In addition, Bruce Power updated their seismic event procedure to include notifications to the WWMF.
8	Review the adequacy of the OPG Transportation Emergency Response Plan to ensure that no significant gaps exist for a response in the event of a significant event at the nuclear stations, coincident with a Radioactive Materials Transportation event. The Transportation Emergency Response Plan response may be slow, or assigned lower priority compared to station responses.	The Radioactive Materials Transportation Emergency Response Plan has been included in OPG's prioritization guide for OPG Nuclear station coincident events.
9	There is no designated portable standby generator dedicated to fixed radiation monitoring at the WWMF WVRB, in the event of a seven day power outage.	WWMF maintains several small diesel generators. An assessment performed by the OPG Nuclear Waste Engineering Department, concluded it is acceptable to power a radiation monitor using a small diesel generator.
10	Assess whether undertaking additional measures to provide food, water etc. is required in the event of a severe weather emergency.	Results of the assessment concluded that additional food, water, and other provisions would be required for this event. OPG procured the required additional items.

Item	Possible Improvements and Enhancements	Actions Taken
11	Investigate the adequacy of the existing Mutual Aid Agreements, and whether additional mutual aid contracts would be required in the event of a severe weather emergency.	Results of the assessment concluded that no additional mutual aid agreements would be needed.
12	Assess whether additional fire response capability would be required in the event of a severe weather emergency at the WWMF.	Results of the assessment concluded that no additional fire response capability would be needed.
13	Investigate whether an alternate fire water supply is required in the event of a severe weather emergency at the WWMF.	Results of the assessment concluded that no additional fire water supply would be needed.

### 3.5 FINANCIAL GUARANTEE

Preliminary decommissioning planning forms the basis for establishing the cost estimate of decommissioning work which in turn is used to calculate the OPG long term financial obligation, segregated funds and financial guarantee requirements.

#### 3.5.1 Cost Estimates

Cost estimates are prepared based on the facility Preliminary Decommissioning Plan to determine the liability to be incurred during decommissioning. In 2011, OPG completed a comprehensive review and update of the Ontario Nuclear Funds Agreement Reference Plan and associated lifecycle cost estimate for nuclear waste management and stations and waste facilities decommissioning as part of the five-year update cycle as required by Ontario Nuclear Funds Agreement. The updated Ontario Nuclear Funds Agreement Reference Plan was approved by Ontario Minister of Finance effective January 1, 2012. The updated and approved cost estimates form the basis of OPG's proposed 2013-2017 CNSC Consolidated Financial Guarantee requirement submission that was accepted by the CNSC in December 2012. OPG is currently working on an update to the currently approved Ontario Nuclear Funds Agreement Reference Plan which is expected to be approved by the Ontario Minister of Finance by end of 2016. The updated and approved cost estimates will form the basis of OPG's 2018-2022 CNSC Consolidated Financial Guarantee submission.



### **3.5.2 Financial Guarantee**

OPG is required to provide and maintain a consolidated financial guarantee for all costs of implementing proposed decommissioning plans for all its Ontario based Class 1 and Waste Nuclear Substance licence facilities. In December 2012 the CNSC accepted OPG's proposed 2013-2017 Consolidated Financial Guarantee. The sources to satisfy the consolidated financial guarantee requirement are the Ontario Nuclear Funds Agreement segregated funds augmented by a Provincial Guarantee. CNSC access to these funds is provided by the *CNSC Financial Security and Ontario Nuclear Funds Agreement Access Agreement* between the CNSC, OPG and the Province of Ontario, and the Provincial Guarantee Agreement between the CNSC and the Province of Ontario. The WWMF is included within this consolidated financial guarantee scope. The consolidated financial guarantee is normally updated on a five-year cycle using the guidance set out in CNSC regulatory documents G-219 and G-206. Specific to WWMF, this requirement is embedded in the WWMF WFOL-W4-314.03/2017 which contains Licence Condition 10.2 which requires OPG to maintain a financial guarantee acceptable to the Commission, and references the accepted documentation supporting the financial guarantee.

### **3.5.3 Financial Guarantee Reporting**

In addition to the 5 year update cycle, OPG provides an annual financial guarantee report to CNSC detailing the status of the guarantee including the amounts accumulated in segregated funds and the value of the Provincial Guarantee required. The report compares the amount of the liabilities and the financial resources available to discharge the obligations. The guarantee remains valid and in effect, and is sufficient.

### **3.5.4 Financial Guarantee Hearing**

The next financial guarantee public hearing before the CNSC Commission is expected to occur towards the end of 2017 where OPG will request that the Commission accept a revision to OPG's consolidated financial guarantee for the 2018-2022 review period.

## **3.6 NUCLEAR LIABILITY INSURANCE**

OPG continues to maintain Nuclear Liability Insurance for its WWMF consistent with the requirements of the *Nuclear Liability Act (1976)*, and will make any required changes to comply with *Nuclear Liability and Compensation Act* when its associated regulations are brought into force. A copy of the most current certificate is attached as Appendix A, confirming that the appropriate insurance is in place. Insurance inspections are conducted at WWMF at the request of the nuclear property or conventional insurers.

### 3.7 COST RECOVERY

OPG has provided timely payments during the licensing period, 2007 to 2016, to the CNSC on a quarterly basis based on receipt of invoices. OPG will continue to make timely payments as required. There is no special request or inquiry about cost recovery at this time.

### 3.8 ADDITIONAL INFORMATION REQUESTED BY CNSC

#### 3.8.1 Other Relevant Regulations, Obligations and Permits

Table 11 provides the list of other regulations, obligations that WWMF must abide by, and permits, certificates and licences issued by authorities other than the CNSC.

**Table 11: Other Legislation (Non-CNSC) That WWMF Abides By**

<b>Regulatory Agencies</b>	<b>Legislation</b>	<b>Legislative Instrument</b>	<b>Reporting Requirements</b>
<b>FEDERAL</b>			
Environment Canada	Canadian Environmental Protection Act	Federal Halocarbon Regulations SOR/2003-289	Semi-annual report on halocarbon releases in excess of 10 kg but less than 100 kg.
Environment Canada	Canadian Environmental Protection Act	CEPA	Annual National Pollutant Release Inventory Report
Environment Canada	Environmental Emergency Regulation	CEPA	Emergency Plan for propane system associated with the incinerator
<b>PROVINCIAL</b>			
Ministry of Environment and Climate Change	Environmental Protection Act	Landfilling Sites, Reg. 232/98	Annual Landfill Report under ECA A272006
Ministry of Environment and Climate Change	Environmental Protection Act		Annual Written Summary report for Air and Noise under ECA 8047-8GLPAM
Ministry of Environment and Climate Change	Environmental Protection Act		Annual Update of the Emission Summary and Dispersion modelling for ECA 8047-8GLPAM

<b>Regulatory Agencies</b>	<b>Legislation</b>	<b>Legislative Instrument</b>	<b>Reporting Requirements</b>
Ministry of Environment and Climate Change	Environmental Protection Act		Source Test Report associated with ECA 8047-8GLPAM
Ministry of Environment and Climate Change	Environmental Protection Act		Annual Industrial Sewage Works Performance Report under ECA 5167-4TYKED for
Ministry of Environment and Climate Change	Environmental Protection Act		Storm water Report under ECA 5381-8ZCP75
<b>MUNICIPAL</b>			
Saugeen Valley Conservation Authorization			SVCA Permit No. 13-015 expired in Apr 2014, as all construction was undertaken prior to expiry.
<b>OTHER</b>			
Technical Standards and Safety Authority	Ontario Technical Standards and Safety Act	Boilers and Pressure Vessels Regulation	Certificate of Authorization (expires April 15, 2017).
Technical Standards and Safety Authority	Ontario Technical Standards and Safety Act	Private Fuel Outlet	Registration # 76600774

### 3.8.2 Open Action Items Discussed in CNSC Hearings and Meetings

There are no open action items remaining from the 2007 CNSC Hearing on WWMF Licence renewal, and the interim status consolidated meetings held in 2010 and 2015.

#### 4.0 ACRONYMS

ALARA	As Low As Reasonably Achievable
CANDU	CANada Deuterium Uranium
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
DGR	Deep Geologic Repository
DNWM	Decommissioning and Nuclear Waste Management Division
DSC	Dry Storage Container
HEPA	High-Efficiency Particulate Air
HX	Heat Exchanger
IAEA	International Atomic Energy Agency
IC	In-Ground Storage Container
ILW	Intermediate Level Waste
ISO	International Organization for Standardization
L&ILW	Low and Intermediate Level Radioactive Waste
LLSB	Low Level Storage Building
LLW	Low Level Radioactive Waste
MCNP	Monte Carlo N-Particle
MPTP	Multi-Purpose Transportation Package
MPTP-SF	Shielded Flask Multi-Purpose Transportation Package
NBCC	National Building Code of Canada
NFCC	National Fire Code of Canada
NGS	Nuclear Generating Station
NWMO	Nuclear Waste Management Organization
OPG	Ontario Power Generation
OPGN	Ontario Power Generation – Nuclear
RCSB	Retube Component Storage Building
RFTP	Radioactive Filter Transportation Package
SGSB	Steam Generator Storage Building
TDO	Tritiated Deuterium Oxide Package
UFDSB	Used Fuel Dry Storage Building

UFDSF	Used Fuel Dry Storage Facility
WFOL	Waste Facility Operating Licence
WVRB	Waste Volume Reduction Building
WWMF	Western Waste Management Facility

## 5.0 REFERENCES

- [R1] OPG Letter, K.E. Nash to G. Riverin, "Environmental Study Report - Western Waste Management Facility Refurbishment Waste Storage Project" (Report #01098-REP-07701-00002 R01)", October 21, 2005, CD# W-CORR-00531-00210.
- [R2] OPG Letter, K.E. Nash to Ben Belfadhel, "Draft Environmental Assessment Study Report for OPG's Proposed Additional Low Level Storage Buildings at the Western Waste Management Facility", November 28, 2008, CD# 01098-CORR-00531-00253.
- [R3] OPG Letter, K.E. Nash to K. Klassen, "Bruce Radioactive Waste Operating Site 2 (RWOS 2) – Submission of Environmental Assessment for Additional Storage of Low and Intermediate Level Wastes", September 14, 2000, CD# 0125-CORR-00531-00081.
- [R4] OPG Letter, K.E. Nash to D. Howard, "Bruce Used Fuel Dry Storage Project Updated Environmental Assessment Submission", December 15, 1997, CD# 01098-00531-SAD-P.
- [R5] OPG Letter, L. Swami to S. Oue, "Environmental Risk Assessment for the Western Waste Management Facility (WWMF)," April 18, 2016, CD# W-CORR-00531-01121.

## APPENDIX A

### INSURANCE CERTIFICATE



#### Certificate of Insurance

No.: 2016-2

Dated: January 21, 2016

This document supersedes any certificate previously issued under this number

This is to certify that the Policy(ies) of insurance listed below ("Policy" or "Policies") have been issued to the Named Insured identified below for the policy period(s) indicated. This certificate is issued as a matter of information only and confers no rights upon the Certificate Holder named below other than those provided by the Policy(ies).

Notwithstanding any requirement, term, or condition of any contract or any other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the Policy(ies) is subject to all the terms, conditions, and exclusions of such Policy(ies). This certificate does not amend, extend, or alter the coverage afforded by the Policy(ies). Limits shown are intended to address contractual obligations of the Named Insured.

Limits may have been reduced since Policy effective date(s) as a result of a claim or claims.

**Certificate Holder:**

Canadian Nuclear Safety Commission  
Headquarters  
280 Slater Street P.O. Box 1046  
Station B  
Ottawa, ON K1P 5S9

**Named Insured and Address:**

Ontario Power Generation Inc.  
700 University Avenue, H18-J18  
Toronto, ON M5G 1X6

**This certificate is issued regarding:**

Western Waste Management Facility

Type(s) of Insurance	Insurer(s)	Policy Number(s)	Effective/ Expiry Dates	Sums Insured Or Limits of Liability	
NUCLEAR LIABILITY • Western Waste Management Facility • Terrorism	Euro Liab. Ins for the Nuc. Ind. (ELNI)	EL036CA16	Jan 01, 2016 to Jan 01, 2017	Limit of Liability	\$ 6,000,000

**Notice of cancellation:**

The insurer(s) affording coverage under the policies described herein will not notify the certificate holder named herein of the cancellation of such coverage.

**Marsh Canada Limited**

120 Bremner Boulevard  
Suite 800  
Toronto, ON M5J 0A8  
Telephone: 416-868-2143  
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Marsh Canada Limited

By:

Diane Flynn



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

## Directorate of Power Reactor Regulation

**OPG Proprietary**

CD# N-CORR-00531-24464

e-Doc 7470936

File 4.01.02

RIB 34124

March 3, 2025

Mr. Mark R. Knutson, P. Eng.  
Senior Vice President, Enterprise Engineering  
and Chief Nuclear Engineer  
Ontario Power Generation Inc.  
889 Brock Road P82-5A1, Pickering ON  
L1W 3J2

### **Subject: OPG Response to CNSC Staff's Comments on Design Codes and Standards Effective Dates for OPG Nuclear Fleet**

Dear Mr. Knutson:

CNSC staff have reviewed Ontario Power Generation (OPG)'s submission [1], in response to the CNSC staff's comments [2] to the proposed code effective dates (CEDs) for OPG nuclear fleet.

Based on the review, CNSC staff are satisfied with OPG's response as OPG has addressed CNSC staff's comments. In relation, CNSC staff concur with OPG's proposed code and standard effective dates for the set of design-related codes and standards in Attachment 2 of the submission [1].

If you have any questions regarding the above, please contact Bei Yang at 905-550-0764 or [bei.yang@cnsccsn.gc.ca](mailto:bei.yang@cnsccsn.gc.ca).

Sincerely,

Andrew Mathai  
Regulatory Program Director  
Darlington Regulatory Program Division



c.c.: R. Richardson, N Greencorn, M. Hornof, J. Sigetich, B. Yang, Darlington Site Office,  
Pickering Site Office

**References:**

1. OPG Letter, M. Knutson to N, Kline, A. Mathai, and N. Greencorn “OPG Response to CNSC Staff’s Comments on Design Codes and Standards Effective Dates for OPG Nuclear Fleet”, November 15, 2024, CD# N-CORR-00531-24302P, e-Doc [7408064](#).
2. CNSC letter, A. Mathai to M. Knutson, “OPG -Design Codes and Standards Effective Dates for OPG Nuclear Fleet”, October 15, 2024, e-Doc [7374720](#).

**OPG Proprietary**

November 24, 2023

CD# W-CORR-00531-01935

**Mr. Robert Buhr**

Senior Project Officer

Wastes and Decommissioning Division

Canadian Nuclear Safety Commission  
280 Slater Street  
Ottawa, Ontario  
K1P 5S9

Dear Mr. Buhr:

**Implementation Plan for CSA N288.8-17 at the Western Waste Management Facility**

The purpose of this letter is to provide CNSC staff with the implementation plan for CSA N288.8-17 *“Establishing and implementing action levels for releases to the environment from nuclear facilities”*, at the Western Waste Management Facility (WWMF) as committed in Reference 1.

OPG currently complies with licence condition (LC) 9.1 in the WWMF Waste Facility Operating Licence, WFOL-W4-314.00/2027, which states in part that, “The licensee shall implement and maintain an environmental protection program, which includes a set of action levels,” by having a set of action levels in place (Reference 2).

OPG prepared a report which includes the new methodology for determining environmental action levels (EALs) based on CSA N288.8, and using this new methodology, it was determined that no EALs were required for the WWMF. The report that included the new methodology and the conclusion that no EALs were required for the WWMF was submitted to CNSC staff in January 2022 (Reference 3). The report, which was technically accepted by CNSC staff (Reference 4), assessed a null set of action levels, which is administratively ambiguous considering the wording for LC 9.1.

As a result, OPG will be including the request for a licence amendment in the next submission of the application to renew the WWMF licence (planned for early 2027) to change the wording in LC 9.1 to remove the specific need for EALs. Implementation of the revised EAL report (Reference 5) is proposed for December 31, 2028, to closely follow the WWMF licence renewal.

OPG commits to being in full compliance with the CSA N288.8-17 at WWMF by December 31, 2028, and to include the request for a licence amendment in the next submission of

the application to renew the WWMF licence (planned for early 2026) to change the wording in LC 9.1 to remove the specific need for EALs, as noted in Table 1.

If you have any questions, please contact Mr. Raphael McCalla, Director, Environment - Nuclear at 905-839-6746, extension 5118.

Sincerely,



Kapil Aggarwal, M. Eng., P. Eng.  
Vice President,  
Nuclear Sustainability Services

cc: T. Kalindjian - CNSC (Ottawa)  
R. Van Hoof - CNSC (Ottawa)

- References:
1. OPG Letter, A. Del Pino to K. Campbell, J. Burta, and N. Greencorn, "Submission: "Submission of OPG's CSA Standard N288.8-17 Compliant Methodology and Proposed Environmental Action Levels for OPG's Nuclear Power Plants and Waste Management Facilities," November 30, 2020, e-Doc 6433644, CD# N-CORR-00531-22227.
  2. OPG Report, 0125-REP-03482-00002 R002, "Derived Release Limits and Environmental Action Levels for the Western Waste Management Facility," November 17, 2017 (Implemented January 1, 2020).
  3. OPG letter, A. Del Pino to K. Campbell, J. Burta, and N. Greencorn, "Revised Submission of OPG's CSA Standard N288.8-17 Compliant Methodology and Proposed Environmental Action Levels for OPG's Nuclear Power Plants and Waste Management Facilities", January 14, 2022, e-Doc 6741740, CD# N-CORR-00531-23032.
  4. CNSC Letter, S. Watt to M. Welt, "Revised Submission of OPG's CSA Standard N288.8-17 Compliant Methodology and Proposed Environmental Action Levels for OPG's Nuclear Power Plants and Waste Management Facilities," June 21, 2023, e-Doc 7068855, CD# W-CORR-00531-01917.
  5. OPG Report, 0125-REP-03482-00004, "Action Levels for Environmental Releases – Western Waste Management Facility," December 10, 2021.

**TABLE 1****Summary of Regulatory Management Actions Undertaken in this Submission**

**Submission Title:** Implementation Plan for CSA N288.8-17 at the Western Waste Management Facility

**Regulatory Management Action (REGM):**

No.	Description	Date to be Completed
	None	

**Regulatory Compliance Action (REGC):**

No.	Description	Date to be Completed
1.	OPG to include proposed wording for LC 9.1 in the next licence renewal application submission for the WWMF operating licence.	Approximately January 30, 2026
2.	OPG to complete implementation of the CSA N288.8-17 at NSS, Western Waste Management Facility	December 31, 2028

**Regulatory Obligation Action (REGO):**

No.	Description	Date to be Completed
	None	

**CNSC Concurrence:** None

**Impact Statement***For Ontario Power Generation Distribution Only***CD#** Error! Reference source not found.

**Title:** Implementation Plan for CSA N288.8-17 at the Western Waste Management Facility

**Action Item No.:** N/A

**SCI:** N/A

**Summary:** This letter provides the implementation plan for the EALs at the WWMF.

**Regulatory Commitments (REGC), Regulatory Obligation (REGO), and Regulatory Management Actions (REGM): 1 REGM**

Commitment		Responsibility	Department	Date
1.0	OPG to complete implementation of the CSA N288.8-17 at the Western Waste Management Facility	R. McCalla	N-COEEOSD	December 31, 2028
1.1.	Ensure WWMF Compliant with CSA N288.8-17 as committed in W-CORR-00531-01935	A Esmaeily	N-COEEOSD	December 29, 2028
1.2.	Confirm WWMF Compliant with CSA N288.8-17 as committed in W-CORR-00531-01935			
1.3.	Regulatory Affairs to include a request to remove the specific requirement for Environmental Action Levels from Licence Condition 9.1 of the WWMF WFOL in the next submission of the licence renewal application.	C Bhagan	W-NSSDLA	December 29, 2028
		Heather Innis	W-NSSDLA	April 30, 2026

**Submission prepared by:** L. Berry

## CNSC Correspondence Routing Sheet

<b>Section 1 – Correspondence Preparation and Review (Co-ordinated by Author)</b>			
<b>Title:</b> Implementation Plan for CSA N288.8-17 at NSS Western Waste Management Facility			
<b>CD#</b> W-CORR-00531-01935		<b>CNSC Due Date:</b> 30 Nov 2023	
This letter completes a: <input type="checkbox"/> REGO <input checked="" type="checkbox"/> REGC <input type="checkbox"/> REGM <input type="checkbox"/> MGMT <input type="checkbox"/>		Associated AR No. 28238641	
N/A			
<ul style="list-style-type: none"> <li>Correspondence package satisfies applicable requirements of N-PROC-RA-0047, Communications with the Canadian Nuclear Safety Commission. <span style="float: right;"><input checked="" type="checkbox"/></span></li> <li>Correspondence package has been prepared using the guidelines in N-GUID-00531-10001, Preparation of Correspondence to the Canadian Nuclear Safety Commission. <span style="float: right;"><input checked="" type="checkbox"/></span></li> <li>Actions documented in letter are planned in accordance with N-PROC-RA-0006, Regulatory Action Management, and <b>accepted by assignees</b>. <span style="float: right;"><input checked="" type="checkbox"/> <input type="checkbox"/> N/A</span></li> <li>Complete Section 3 of this form – Work Impact – New Commitments <span style="float: right;"><input checked="" type="checkbox"/> <input type="checkbox"/> N/A</span></li> </ul>			
<b>REVIEWERS (identified by Author and Line Management) (use extra page if required)</b>			
(1) <b>Name/Title (Sign):</b> Dwayne Sinclair, Section Mgr., Environment		<b>Date:</b> 15-Nov-2023	
(2) <b>Name/Title (Sign):</b> _____		<b>Date:</b> _____	
(3) <b>Name/Title (Sign):</b> _____		<b>Date:</b> _____	
This submission has received adequate review and is accurate and complete in its technical and general statements of fact, and that <b>comments</b> from all <b>reviewers</b> have been appropriately <b>dispositioned</b> .			
<b>AUTHOR</b>			
<b>(Print/Sign):</b> Lionel Berry, Environment Advisor, Env. Programs - Nuclear		<b>Date:</b> 15 Nov 2023	
<b>AUTHOR'S SECTION MANAGER or MANAGER</b>			
<b>(Print/Sign):</b> Ali Esmaily, Section Mgr, Env. Prog. - Nuclear		<b>Date:</b> Nov 15, 2023	
<b>AUTHOR'S MANAGER or DIRECTOR (Print/Sign):</b>			
Raphael McCalla, Director EH&S		<b>Date:</b> Nov 21, 2023	
<b>Section 2 - Final Review and Routing for Signature (Completed by Regulatory Affairs)</b>			
<b>RA SPOC:</b> Charmane Bhagan		<b>Date:</b> Nov 21/23	
<b>RA Manager or RA Site Section Manager:</b> _____		<b>Date:</b> _____	
<b>Others to Concur (as determined by Regulatory Affairs):</b>			
(1) <b>Name:</b> Mark Welt		<b>Date:</b> 21Nov2023	
(2) <b>Name:</b> _____		<b>Date:</b> _____	
(3) <b>Name:</b> _____		<b>Date:</b> _____	
The attached submission has been reviewed/concurred as indicated above and is ready for signature and issuance.			
<b>Designated Licensing Authority:</b> C. Axler		<b>Date:</b> Nov 23, 2023	

## CNSC Correspondence Routing Sheet

### Section 3 – Work Impact – New Commitments (Completed by Author)

**Instructions:**

1. Complete the table below for each new commitment made in the letter (REGO, REGC, REGM, or MGMT). Copy this page if more than 2 commitments are made. Guidance can be found in N-PROC-RA-0006 and N-PROC-AS-0019.
2. Provide the Commitment Owner Alert Group, the overall due date, and the Subject and Description of the commitment Action Request as it should appear in Action Tracking.
3. For each commitment Action Request, provide the associated Action Tracking assignment subject, the responsible person's name, the Alert Group and assignment due date.
4. To add table rows, place cursor in the last cell of the last row and press Tab.

<b>New Commitment Type:</b> REGO <input type="checkbox"/> REGC <input type="checkbox"/> REGM <input checked="" type="checkbox"/> MGMT <input type="checkbox"/>		<b>Commitment Owner Alert Group:</b> N-COEEOSD		<b>Overall Due Date</b> 31 Dec 2028	
<b>Subject of Action Request:</b> OPG to complete implementation of the new Environmental Action Levels at NSS Western Waste Management Facility					
<b>Description of Action Request:</b>					
No.	Assignment Subject	Assignment Details	Responsibility	Alert Group	Due Date
1.					
2.					
3.					
4.					

<b>New Commitment Type:</b> REGO <input type="checkbox"/> REGC <input type="checkbox"/> REGM <input type="checkbox"/> MGMT <input type="checkbox"/>		<b>Commitment Owner Alert Group:</b>		<b>Overall Due Date</b>	
<b>Subject of Action Request:</b>					
<b>Description of Action Request:</b>					
No.	Assignment Subject	Assignment Details	Responsibility	Alert Group	Due Date
1.					

## CNSC Correspondence Routing Sheet

2.					
3.					
4.					

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Prepared by (Name): L. Berry

Date: \_\_\_\_\_