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CMD: 24-H2

Date signed/Signé le : 18 SEPTEMBER 2023

Determination for

Détermination pour

**Ontario Power  
Generation (OPG), Inc.**

**Ontario Power  
Generation (OPG), Inc.**

**Darlington New Nuclear  
Project (DNNP)**

**Nouveau projet nucléaire  
de Darlington (NPND)**

One-Part Public Hearing

Audience publique en une partie

Scheduled for:  
January 2024

Prévue pour :  
Janvier 2024

Submitted by:  
CNSC Staff

Soumise par :  
Le personnel de la CCSN

**Summary**

This CMD pertains to a request for a determination regarding:

- CNSC staff's review and assessment of whether the DNNP Environmental Assessment is applicable to OPG's selection of the General Electric Hitachi BWRX-300 Reactor

The following actions are requested of the Commission:

- Determine, pursuant to the Government of Canada's response to Joint Review Panel Recommendation 1, whether the DNNP Environmental Assessment is applicable to the BWRX-300 Reactor.

The following items are attached:

- Current Status of Joint Review Panel Recommendations

**Résumé**

Le présent CMD concerne une demande de détermination au sujet de :

- L'examen et l'évaluation par le personnel de la CCSN de l'applicabilité de l'évaluation environnementale du projet NPND suite à la sélection par OPG du réacteur General Electric Hitachi BWRX-300

La Commission pourrait considérer prendre les mesures suivantes :

- Déterminer, conformément à la réponse du gouvernement du Canada à la recommandation 1 de la commission d'examen conjoint, si l'évaluation environnementale du NPND s'applique au réacteur BWRX-300

Les pièces suivantes sont jointes :

- État actuel des recommandations de la commission d'examen conjoint

**Signed/signé le**

18 September 2023

**Ducros,  
Caroline**

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## EXECUTIVE SUMMARY

Canadian Nuclear Safety Commission (CNSC) staff would like to acknowledge that the Darlington New Nuclear Project (DNNP) is in the traditional territory of the Michi Saagiig Anishinaabe people. These lands are covered by the Williams Treaties between Canada and the Mississauga and Chippewa Nations.

Ontario Power Generation (OPG) is the operator of the Darlington Nuclear Generating Station, and the licensee for the DNNP. OPG was first issued a CNSC licence to prepare site for the project in 2012, following the completion of an Environmental Assessment (EA) conducted by a Joint Review Panel (JRP) under the [Canadian Environmental Assessment Act, 1992](#). The JRP determined that the DNNP was "... not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review and the Panel's recommendations are implemented." OPG was issued a renewed licence to prepare site in October 2021, following a public hearing in June 2021.

In December 2021, OPG selected the General Electric Hitachi BWRX-300 reactor technology for the DNNP. Pursuant to licence condition 4.1, OPG was required to review the parameters of the BWRX-300 against the Plant Parameter Envelope and the EA. The JRP Recommendation #1 requires the Commission to determine whether the EA is applicable to the BWRX-300.

This CMD presents CNSC staff's assessment, conclusions, and recommendations to support the Commission in this determination. CNSC staff reviewed and verified OPG's documentation and concluded that the deployment of up to four (4) BWRX-300 reactors at the DNNP remains bounded within the EA accepted by the JRP.

CNSC staff recommend that the Commission:

Determine, in accordance with JRP recommendation # 1, that the BWRX-300 technology selected by OPG is within the bounds of the JRP EA

Referenced documents in this CMD are available to the public upon request. Some documents referenced in this CMD may also be available to the public on the Government of Canada's [DNNP Open Government Portal](#) website.

# 1 OVERVIEW

## 1.1 Site Description

The Darlington Nuclear site is located on the north shore of Lake Ontario, and is in the traditional territory of the Michi Saagiig Anishinaabe people. These lands are covered by the Williams Treaties between Canada and the Mississauga and Chippewa Nations. The site is approximately 10 km east of Oshawa and 65 km east of Toronto.

The site consists of the existing Darlington Nuclear Generating Station (DNCS), which has four 881-Megawatt Canada Deuterium Uranium (CANDU) reactors that entered service between 1990 and 1993. The site also consists of a tritium removal facility and a waste management facility.

The portion of the site for the Darlington New Nuclear Project (DNNP) is the eastern third of the overall site. It is bounded by site property limits on the east and north site boundaries, by Lake Ontario to the south, and by Holt Road to the west.

## 1.2 Overview of the DNNP Environmental Assessment

In September 2006, OPG submitted a preliminary application for a Licence to Prepare Site (LTPS) at the Darlington site, for up to four Class IA nuclear power reactors with a combined net output of 4800 MW electrical (MWe). OPG's application did not identify a reactor technology.

Under the 1992 [Canadian Environmental Assessment Act](#) (CEAA) [1], the construction of new nuclear power plant required a Comprehensive Study type of EA in accordance with the [Comprehensive Study List Regulations](#). The CNSC was one of three "Responsible Authorities," that is, a federal entity responsible for ensuring an EA was conducted. The others were the Department of Fisheries and Oceans Canada (DFO) and Transport Canada, because of the likely need for both a *Fisheries Act* authorization and a *Navigable Waters Protection Act* authorization, respectively. The CNSC recommended the project be referred to a joint review panel (JRP), to which the federal Minister of the Environment agreed in March 2008.

OPG submitted its Environmental Impact Statement (EIS) and an updated application for a LTPS to the CNSC in September 2009. The updated application proposed a bounding scenario approach, as a reactor technology had still not been selected. More information on the bounding approach applied to the DNNP will be provided in subsection [2.1.1 – Overview of the Plant Parameter Envelope](#).

The Minister appointed members to the JRP in October 2009. The mandate of the JRP was to assess the environmental effects of the DNNP and to determine whether it is likely to cause significant adverse environmental effects considering the implementation of appropriate mitigation measures.

The JRP process included:



- A public review and comment period on the Environmental Impact Statement (EIS) guidelines, OPG's EIS, and OPG's licence application
- Requests to OPG for additional information deemed necessary by the JRP
- Three open-house information sessions at public venues in the DNNP area, and
- Submissions from federal, provincial, and municipal governments, Indigenous Nations and communities, and other interested parties

The Panel conducted a 17-day public hearing in the Municipality of Clarington between 21 March and 08 April 2011, which addressed themes, including aquatic biota and habitat, radiological and non-radiological emissions, human health, land use and management, and the management of nuclear waste.

In August 2011, the JRP concluded its review of the evidence to support the proposed project and issued its report on the EA for the DNNP [4] (henceforth referred to as "the EA"), stating that:

The Panel concludes that the Project is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review and the Panel's recommendations are implemented.

The Panel directed 67 recommendations to various responsible and federal authorities, to the Province of Ontario, and the Municipality of Clarington. In May 2012, the Government of Canada (GOC) produced a [response report](#) [5] to the EA and accepted the intent of all recommendations within its jurisdiction. These recommendations span the lifecycle of the project, focusing on the site preparation, construction, and operation phases. The GOC concluded, pursuant to the Minister's authority, that the DNNP was not likely to result in significant adverse environmental effects, and in August 2012, the Commission issued a ten-year power reactor site preparation licence to OPG.

Table 14 – *Status of Joint Review Panel Recommendations* in [Appendix B](#) of this CMD provides an overview of the status of all 67 JRP Recommendations.

## 1.3 Current Status of the DNNP

### 1.3.1 Activities from 2013 to September 2023

In 2013, the Government of Ontario deferred construction of new reactors at the DNNP site. Following this announcement, OPG's efforts focused on maintaining the site and addressing JRP recommendations and subsequent commitments to confirm assumptions made in the EA.

In June 2020, OPG submitted an application to the CNSC for the renewal of the Power Reactor Site Preparation Licence (PRSL), which was renewed [2][3] by the Commission in October 2021 following a one part hearing. OPG had not conducted any licensed activities during the original licensing period nor had OPG selected a reactor technology at the time of its renewal application. In its

*Record of Decision* [2], the Commission stated that: “[...] the Commission is satisfied that, in the context of this hearing:

- The selection of a specific technology is not part of the application before it;
- A decision regarding the applicability of the 2011 EA to any selected technology can and will be made at the time that OPG selects a technology and submits an application for a licence to construct a reactor for the DNNP (i.e., prior to construction).”

In December 2021, OPG selected the General Electric Hitachi (GEH) BWRX-300 reactor technology for the DNNP site, and in October 2022, submitted an application for a Licence to Construct (LTC), to build one (1) BWRX-300 reactor. CNSC staff are currently reviewing this application. OPG and the Government of Ontario [intends](#) to construct up to four (4) BWRX-300 reactors, but to date has only applied for an LTC to build a single unit.

As required by the EA Follow-Up Program (see subsection 1.3.2 – *Status of the Environmental Assessment Follow-Up Program* and [Appendix C](#) of this CMD), upon selecting the BWRX-300 reactor technology, OPG was required to fulfill DNNP Commitment D-P-12.1(a), which states:

“Once the specific technology is selected and design information is available, OPG will comprehensively review the EIS to ensure that the results of the EIS remain valid. If this review indicates either a gap or a condition not bounded by the EIS, OPG will initiate corrective actions as necessary. This may include mitigation options.”

This commitment is also specified in condition 4.1 of PRSL 18.00/2031 and the DNNP Licence Conditions Handbook [6], which required OPG to submit documentation to:

“[D]emonstrate that the selected nuclear reactor technology and updated site parameters have been taken into account in an assessment that demonstrates the effects predicted in the EA and the 2009 application are met. OPG’s demonstration is to be in accord with the requirements and guidance of REGDOC-1.1.1.”

In October 2022, OPG submitted two documents to fulfill these requirements:

- Darlington New Nuclear Project: Report for the Review of the Environmental Impact Statement for Small Modular Reactor BWRX-300 [7] (henceforth referred to as the “EIS Review”);
- Use of Plant Parameters Envelope to Encompass the Reactor Designs being Considered for the Darlington Site [8][9] (henceforth referred to as the “PPE Review Report”)

These documents consider the environmental effects from the deployment of up to four (4) BWRX-300 reactors.

This CMD provides CNSC staff's recommendations resulting from the review of both documents and CNSC staff's conclusion regarding the applicability of the existing EA to up to four (4) BWRX-300 reactors. As required by the JRP and the GOC response to Recommendation #1, prior to making a licensing decision on OPG's application for an LTC, the Commission must make a determination pursuant to the Government of Canada's response [5] as to whether the DNNP EA is applicable to the BWRX-300 reactor selected by OPG.

### 1.3.2 Status of the Environmental Assessment Follow-Up Program

CNSC staff note that EAs are planning and decision-making tools. They provide opportunities for Indigenous Nations and communities, the public, and interested stakeholders to participate early on and inform a proponent's planning and project design. If the EA for a project is approved, an EA follow-up program is developed to verify the accuracy of the environmental assessment, and to determine the effectiveness of any mitigation measures. Follow-up programs are updated and revised based on the results of environmental monitoring, updated codes and standards, the identification of new species at risk, and when directed by a Responsible Authority (RA).

As required by CEAA 1992, the CNSC, with the Fisheries and Oceans Canada (DFO) and Transport Canada (TC) acting as Responsible Authorities (RA), required that OPG establish and implement an EA follow-up program. This is captured in DNNP Commitment D-P-12.1 "Environmental Monitoring and Environmental Assessment Follow-up," (EMEAF) [10] which is intended to:

- Verify the predictions of environmental effects that were identified and assessed in the environmental assessment, and
- Determine the effectiveness of mitigation measures to modify existing measures, or implement new measures, where required.

To align with the JRP Recommendations (see [Appendix B](#)) describing follow-up monitoring, OPG's EA follow-up program is described in several "Methodology Reports for Environmental Monitoring and Environmental Assessment Follow-Up," specific to environmental components such as the atmospheric, aquatic, geological and hydrogeological, and terrestrial environments. These plans are tracked through DNNP Deliverables D-P-12.2 through to D-P-12.9. Table 15 in [Appendix C](#) of this CMD provides a brief description of each of these follow-up methodology reports.

The CNSC can assure the implementation of EA Follow-Up Programs through the introduction of specific licensing requirements, including licence conditions or inclusion of specific requirements in a Licence Conditions Handbook. Licence condition 15.2 of site preparation licence PRSL 18.00/2031 [3] requires that OPG implement and maintain the EA Follow-Up Program in accordance with federal guidelines and in consultation with federal RAs and Indigenous Nations and communities.

## 1.4 Current Regulatory Landscape

In August 2019, the [Impact Assessment Act](#) (IAA) came into force, repealing and replacing the [Canadian Environmental Assessment Act, 2012](#) (CEAA 2012), which itself repealed and replaced CEAA 1992. The IAA's [Physical Activities Regulations](#) (Project List) describes "designated projects" for which a federal impact assessment may add value, over and above other federal regulatory oversight mechanisms. Project types included on the Project List are those that are determined to have the greatest potential for adverse and complex effects to the environment in areas of federal jurisdiction.

Subsection 2(3) of the [Physical Activities Regulations \(IAA\)](#) excepts physical activities designated under the regulation, having been previously defined as projects under CEAA (2012), where a determination has been made pursuant to section 67 of CEAA (2012). Pursuant to paragraph 128(1)(c) of CEAA (2012), the legislation is not applicable to a designated project under CEAA where a determination has:

“[CEAA (2012)] does not apply to a project, as defined in [CEAA], that is a designated project as defined in [CEAA (2012)], if [...]

(c) the responsible authority has taken a course of action under paragraph 20(1)(a) or (b), or subsection 37(1) of the former Act in relation to the project.”

The IAA does not apply to the DNNP as a completed EA is in place with a determination made by the JRP pursuant to subsection 37(1) of CEAA (1992), which does not have an expiry date. Nevertheless, the Commission is required to consider JRP Recommendation #1.

## 1.5 Joint Review Panel Recommendation 1

### 1.5.1 Description of JRP Recommendation 1

The selection of a reactor technology that is not one of the four designs considered in the EA required OPG to conduct a review to confirm the continued applicability of the assumptions and conclusions of the EA. The JRP noted that a determination of the applicability of this EA would be made by the authorities responsible for considering licensing the reactor, when a reactor technology was selected by the Government of Ontario.

The JRP Recommendation #1, repeated below in its entirety, along with the GOC response for convenience, is the subject of this CMD.

“The Panel understands that prior to construction, the Canadian Nuclear Safety Commission will determine whether this environmental assessment is applicable to the reactor technology selected by the Government of Ontario for the Project. Nevertheless, if the selected reactor technology is fundamentally different from the specific reactor technologies bounded by the Plant Parameter Envelope, the Panel recommends that a new environmental assessment be conducted.”

The GOC accepted this Recommendation, and in its response noted that:

“The Government of Canada accepts the intent of this recommendation, but acknowledges that any Responsible Authority under the CEAA will need to determine whether the future proposal by the proponent is fundamentally different from the specific reactor technologies assessed by the JRP and if a new EA is required under the CEAA.”

### 1.5.2 CNSC Staff Methodology for Assessing OPG’s PPE and EIS Reviews

When reviewing OPG’s PPE and EIS Review documents, CNSC staff considered the potential difference in environmental effects of up to four BWRX-300 reactors at the DNNP site, and whether these remain within the boundaries of the EA, in light of the JRP Recommendations and the GOC response.

Paragraph 2(1)(a) of CEAA 1992 interprets an environmental effect as, in respect of a project:

- 2 (1)(a) *any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act,*
- (b) *any effect of any change referred to in paragraph [2(1)(a)] on: (i) health and socio-economic conditions, (ii) physical and cultural heritage; (iii) the current use of lands and resources for traditional purposes by aboriginal persons, or (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or*
- (c) *any change to the project that may be caused by the environment.*

As part of OPG’s EA, effects identified in the supporting environmental studies were assessed for whether that effect will impact a valued ecosystem component (VEC) within that environmental component. In the case where an effect is likely to impact a VEC, the EA identified strategies to mitigate the effect of the project on that environmental component. Subsection 2(1) of CEAA 1992 defines mitigation as:

- 2 (1) *“mitigation” means the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.*

CNSC staff’s assessment focused on determining whether the predictions and conclusions of the EA remain valid, taking into consideration the BWRX-300 technology selected by OPG, currently under review for a licence to construct.

Following the CNSC technical assessment process, CNSC staff reviewed OPG’s analysis of the BWRX-300 against the PPE to determine the applicable parameters and whether they fall within or outside the PPE. For parameters that were identified as being outside the PPE, CNSC staff reviewed OPG’s analysis to determine whether the parameter would alter the conclusions of the EA, taking

into consideration OPG's mitigation measures and follow-up activities. This assessment is described throughout subsection *2.1 – The Plant Parameter Envelope (PPE)* of this CMD.

In addition, CNSC staff conducted a technical assessment of OPG's EIS Review against the DNNP EA to evaluate potential changes in environmental effects introduced by the BWRX-300. This assessment is described throughout subsection *2.2 – The Environmental Impact Statement (EIS)* of this CMD.

## **2 MATTERS FOR CONSIDERATION**

### **2.1 The Plant Parameter Envelope (PPE)**

#### **2.1.1 Overview of the Plant Parameter Envelope**

The PPE provides applicants performing early site characterisation work with a framework to assess a site for a nuclear power plant and resolve site-specific environmental characteristics, without specifying a reactor technology [11]. A PPE consists of a set of data derived from available reactor vendor information for multiple reactor technologies under consideration, as well as available site environmental data, and provides a bounding envelope of plant design for use in an EA.

The PPE for the DNNP identified a set of design parameters and associated limiting values from the technologies under consideration by the Government of Ontario at the time. It described the bounding features of the DNNP. The JRP accepted the PPE as a bounding envelope of plant design and site characteristics in the licensing basis for the DNNP.

OPG's use of the PPE approach was intended to allow for the assessment of potential adverse environmental effects associated with the DNNP, without specifying a reactor technology. OPG stated that the "selection of a technology that is not bound by the envelope could require adjustments to the EA to consider any substantial changes to the environment, the circumstances of the DNNP, and new information of relevance to the assessment of the effects of the DNNP" [4].

The DNNP bounding envelope used in the assessment of effects was based on the limiting values for parameters from, where applicable: information directly available for the reactors under consideration; generalized information based on the classification of the reactor; or information directly available from the DNNP site.

Much of the reactor design and safety information originally considered in the PPE was preliminary information that was accepted for the purposes of the EA. In its submission to the JRP, CNSC staff concluded that the PPE approach allowed for the assessment of the potential adverse effects of a range of reactor technologies.

OPG has documented the DNNP PPE in N-REP-01200-10000 – *Use of Plant Parameters Envelope to Encompass the Reactor Designs being Considered for the Darlington Site* [8][9], revising the document several times since the 2009

original submission. The most recent revision updated the PPE to include parameters for the BWRX-300.

OPG's PPE report documents 198 parameters applicable to the DNNP, and presents a bounding envelope for six (6) reactor designs:

- The Advanced Passive (AP) Pressurized Water Reactor (PWR) ("AP-1000")
- The Economic Simplified Boiling Water Reactor ("ESBWR")
- The Advanced Boiling Water Reactor ("ABWR")
- The Advanced Canada Deuterium-Uranium (CANDU) PHWR ("ACR-1000")
- The Enhanced CANDU 600 ("EC-6")
- The BWRX-300 small modular reactor, a design built on the framework of the ESBWR.

OPG was required to compare the BWRX-300 design parameters with the PPE to satisfy DNNP commitment D-P-12.1(a) "Environmental Impact Statement Review". In the event where specific BWRX-300 parameters were not bounded within the PPE, OPG was required to conduct further assessment to determine whether the EA conclusions remained valid or whether additional mitigation measures are required.

Both the PPE document and OPG's EIS Review, documented in NK054-REP-07730-00055 – *Darlington New Nuclear Project Report for the Review of the Environmental Impact Statement for Small Modular Reactor BWRX-300* [7][12], reviewed all 198 parameters and summarised the results as follows:

- 34 parameters were related to the use of cooling towers for the normal plant heat sink. OPG no longer proposes to use cooling towers as the BWRX-300 proposes once-through cooling, and therefore these 34 parameters are not applicable.
- 4 parameters were related to the use of auxiliary boilers as a backup heat sink. OPG's BWRX-300 deployment proposes standby or emergency generators and no longer plans to deploy auxiliary boilers, and therefore these 4 parameters are not applicable.
- 22 parameters were related to the plant's ultimate heat sink, heat exchanger and cooling towers. OPG's BWRX-300 deployment proposes an Isolation Condenser System (ICS) as an ultimate heat sink, in which the ICS water is allowed to boil and steam vented to atmosphere. These 22 parameters are therefore not applicable to the BWRX-300 deployment.
- 130 parameters were assessed as being within their respective envelopes.



CNSC staff reviewed OPG's assessment of the 60 parameters that OPG determined were no longer applicable based on the chosen design, and concluded that potential environmental effects associated with these parameters are not likely to occur, and therefore the associated impacts have been eliminated.

CNSC staff reviewed OPG's assessment of the 130 parameters that OPG identified as within the respective envelopes and concur with OPG's conclusion that these parameters were within the PPE. OPG is expected to continue monitoring the PPE conclusions as the design of the BWRX-300 progresses, to ensure that each parameter remains within their respective envelope.

The EIS Review also determined that eight (8) parameters are not bounded within the PPE and differ from the bounding scenario reactor in the EA. OPG was required to describe the differences in these parameters from the bounding scenario, and evaluate whether these differences remained within the predictions and conclusions of the EA. CNSC staff reviewed OPG's evaluation of these differences and concluded that the EA remains valid. As noted previously, an EA Follow-Up Program will be required to verify the accuracy of the EA and to determine the effectiveness of mitigation measures. This allows for ongoing monitoring and an adaptive management approach to mitigation, control, and oversight.

The eight parameters that differ from the bounding scenario described in the EA are outlined below. Subsections 2.1.2.1 – 2.1.2.5 of this CMD describes CNSC staff's review and conclusions for each of these parameters.

- The maximum short-term rate of water withdrawal from the lake for fire protection purposes is expected to be higher for the BWRX-300 (see subsection [2.1.2.1 – Fire Protection System and Water Supply Requirements](#)).
- The quantity of water stored in the water supply system is expected to be higher for the BWRX-300 than for the bounding scenario reactors (see subsection [2.1.2.1 – Fire Protection System and Water Supply Requirements](#)).
- The foundation embedment of the BWRX-300 is deeper than the embedment for the bounding scenario reactors (see subsection [2.1.2.2 – Depth of BWRX-300](#)).
- The minimum release height above the finished grade is lower for the BWRX-300 than for the bounding scenario reactors (see subsection [2.1.2.3 – Airborne Releases](#)).
- Airborne radioactive emissions to atmosphere are in different proportions than the emissions assessed in the EA (see subsection [2.1.2.3 – Airborne Releases](#)).



- The volumetric activity of solid radioactive wastes generated by the operation of the BWRX-300 is in different proportions than that assessed in the EA (see subsection [2.1.2.4 – Solid Radioactive Waste Volumetric Activity and Spent Fuel Cask Weight](#)).
- Due to the higher activity of BWRX-300 spent fuel, the spent fuel cask weight is higher than assessed in the EA (see subsection [2.1.2.4 – Solid Radioactive Waste Volumetric Activity and Spent Fuel Cask Weight](#)).
- The importance factor for wind load on the design of the BWRX-300 facility differs from that assessed in the EA (see subsection [2.1.2.5 – Importance Factor for Wind Loads](#)).

In addition to identifying parameters outside the EA bounding scenario, OPG's EIS Review undertook an evaluation of on-site and near-site existing baseline environmental conditions, as well as identifying changes from the EIS to the present day in the assessments underpinning the conclusions of the EA. CNSC staff's review of OPG's EIS review submission is outlined in subsection [2.2 – The Environmental Impact Statement \(EIS\)](#) of this CMD.

## **2.1.2 Parameters outside of the Bounds of the Original PPE**

This subsection describes CNSC staff review of the eight (8) parameters that OPG identified as outside of the bounds of the PPE for up to four BWRX-300 reactors. Where parameters relate to similar topics, they have been grouped together for discussion.

### **2.1.2.1 Fire Protection System and Water Supply Requirements**

The PPE identifies three parameters applicable to the Fire Protection System:

- the maximum use or maximum short-term withdrawal rate
- the average monthly use or the average rate of withdrawal
- the water volume stored in tanks or basins specifically designated for fire protection systems

The PPE also identifies similar parameters for other systems that receive raw water from the municipal supply:

- the potable water and sanitary waste systems
- the demineralized water supply system

Water requirements and discharge rates for non-nuclear related systems are not strictly dependent on reactor design.

In its submission, OPG explained that for the four-unit BWRX-300 station, the maximum short-term withdrawal rate from Lake Ontario for fire protection purposes would be greater than the flowrate evaluated in the EA, and that the total quantity of water stored for fire protection purposes in the water supply system (e.g., tanks, basins, or similar) would be greater than that specified in the EA.

Table 1 below provides a comparison of these parameters between the bounding scenario assessed in the EA and for up to four BWRX-300 reactors.

For the fire protection system, Table 1 compares the maximum short-term withdrawal rate from Lake Ontario (in litres per second) and the total quantity of water stored in fire protection system components (in litres). Table 1 also compares the maximum withdrawal rate (in litres per second) from the municipal water supply for use in the demineralised water system and for potable water and sanitary supply systems.

**Table 1: Comparison of fire protection system and water supply system parameters between the EA and the BWRX-300 reactors**

System and Parameter	Fire Protection System		Demineralised Water System	Potable Water/Sanitary Waste
	Maximum short-term withdrawal rate (L/s)	Total quantity stored (Litres)	Maximum use (L/s)	Maximum use (L/s)
<b>EA</b>	158	2.93E+06	136	17.5
<b>BWRX-300</b>	508	4.0E+06	34.0	4.38

OPG states that while the maximum withdrawal rate and volume of water stored for fire protection purposes would exceed the values stated in the EA, the overall combined draw of water from the municipal supply—for the potable water, sanitary waste, demineralized water supply, and fire protection systems—would be lower than that considered in the PPE. Correspondingly, there would be a lower amount of wastewater discharged back into the municipal system, and OPG has determined that the overall effect is less than assessed in the EA.

CNSC staff reviewed OPG's submission as it relates to the firewater system and raw water supply parameters, and concluded that although these parameters are outside the PPE, the overall effect of water usage and discharge into the municipal supply is less and does not impact the conclusion of the EA.

### 2.1.2.2 Depth of BWRX-300

The PPE defines the foundation embedment parameter as the depth from the finished grade to the bottom of the basement of the most deeply-embedded powerblock structure.

The EA established foundation embedments of 18.04 metres, 13.5 metres, or 20.2 metres below the finished grade for the PWR, PHWR and BWR designs respectively. OPG's submission states that the BWRX-300 foundation embedment is 38.0 meters below grade and therefore deeper than those assessed

in the EA. In the EIS Review, OPG assessed potential environmental effects from the excavation and grading activities.

In its submission, OPG conducted a study of the effect of the deeper foundation embedment on groundwater flow, and this study confirmed the effect of constructing up to four BWRX-300 reactors would have a temporary impact on groundwater flow. Further, OPG states that the long-term effect on groundwater flow from this deeper foundation following the cessation of construction activities and associated dewatering, would be negligible.

CNSC staff have reviewed OPG's submission and supporting groundwater modelling against the predicted effects of a deeper foundation embedment. CNSC staff note that although there is a difference in the groundwater flow effects due to dewatering to a deeper foundation depth than assessed in the EA, these effects are appropriately mitigated by the mitigation measures from the EA, and therefore the conclusion remains valid.

Subsection *2.2.2.3 – Geological and Hydrogeological Environment*, of this CMD provides further discussion on the effects of the deeper embedment of the BWRX-300 deployment on groundwater flow, groundwater quality, soil quality, and construction-related dewatering.

Subsection *2.2.2.1 – Atmospheric Environment*, of this CMD provides further discussion on the effects on air quality and noise due to excavation and blasting activities for up to four BWRX-300 reactors.

### **2.1.2.3 Airborne Releases**

In its submission, OPG identified two (2) parameters, related to gaseous effluents, as outside of the bounds of the parameters assessed in the EA:

- Release Point Elevation (Normal Operation)
- Gaseous Releases (Normal Operation) Source Term

The PPE defines the normal operations minimum release height to be the “elevation above finished grade for routine operational releases,” and identified the limiting value for the reactors assessed in the EIS to be 48.8 metres. In its submission, OPG identified the minimum release height to be lower at 35.0 metres.

The PPE also defines the gaseous source term to be the “expected annual activity, by radionuclide, contained in routine plant airborne effluent streams, excluding tritium,” respectively. In its submission, OPG states that releases to the atmosphere from normal operation of up to four BWRX-300 reactors is outside of the bounds of the respective source term parameter in the PPE. Specifically, these releases contain the same radionuclides as identified in the PPE, although in slightly different proportions.

OPG presented the differences in radiological releases between the bounding scenario and those estimated from the BWRX-300, calculated for a single-unit deployment and prorated for up to four reactors. The inventory of radionuclides contained within the source terms has been grouped consistent with the approach

taken in the EA. These radionuclides include carbon-14, noble gases, radioiodines, beta-gamma particulates, and tritium.

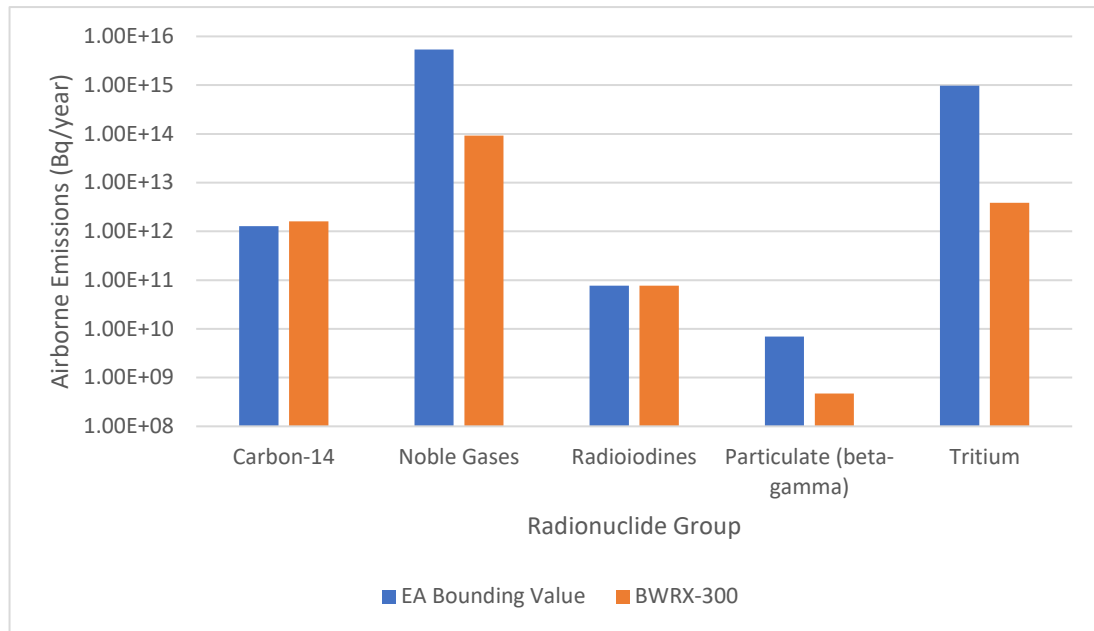
Tritium, particulates, and noble gas airborne radiological emissions from the BWRX-300 were estimated to be lower than the predictions in the EA; however, the prediction for BWRX-300 radioiodine and carbon-14 emissions are slightly higher. For the deployment of the BWRX-300 reactors, all other airborne radiological release parameters were found to be within the PPE. Table 2 below shows the estimated airborne emissions of these groups of radionuclides predicted from the BWRX-300 and compares these estimates to the bounding value presented in the EA for normal operations.

Figure 1 provides a comparison between airborne releases to the environment documented in the EA and estimated for the four-unit deployment of the BWRX-300 reactors.

**Table 2: Estimated airborne releases for radionuclides from the BWRX-300 reactor, compared against the bounding value from the EA for four BWRX-300 reactors during normal operations**

Isotope	EA bounding value (Bq/year)	BWRX-300 (Bq/year)	Relative change between the BWRX-300 and the EA
Carbon-14	1.28E+12 (1.28 TBq)	1.60E+12 (1.60 TBq)	1.25
Noble Gases	5.34E+15 (5340 TBq)	9.22E+13 (92.2 TBq)	0.02
Radioiodines	7.68E+10 (76.8 GBq)	7.73E+10 (77.3 GBq)	1.01
Particulates	7.00E+09 (7.00 GBq)	4.69E+08 (0.469 GBq)	0.07
Tritium	9.80E+14 (980 TBq)	3.88E+12 (3.88 TBq)	0.004
<b>Total</b>	<b>6.32E+15 (6321 TBq)</b>	<b>9.78E+13 (97.8 TBq)</b>	<b>0.015</b>

**Figure 1: Comparison between the EA bounding reactor scenario and estimated BWRX-300 radiological emissions to atmosphere for a four-unit deployment (airborne releases)**



OPG conducted a study to compare the effect of these release parameters to those assessed in the EA, and to determine whether the change in emission values (e.g., those for airborne radioiodines) remained within the bounding dose to a member of the public assessed in the EA. OPG calculated radiological doses to members of the public [13] using modelling consistent with the existing nuclear facilities, including the default parameters identified in CSA standard N288.1 – *Guidelines for Modelling Radionuclide Environmental Transport, Fate, and Exposure Associated with the Normal Operation of Nuclear Facilities* (2020 edition) [14].

CNSC staff provide further discussion on expected dose to members of the public from these releases in subsection [2.2.2.9.1 – Physical Well-Being](#) of this CMD.

CNSC staff have reviewed OPG’s assessment and conclude that although these airborne release parameters fall outside of the bounds of the PPE, the total release is lower and does not alter the conclusions of the EA.

#### 2.1.2.4 Solid Radioactive Waste Volumetric Activity and Spent Fuel Cask Weight

The PPE defines the solid radioactive waste volumetric activity parameter as the “annual activity, by radionuclide, contained in solid radioactive wastes generated during routine plant operations,” which is expressed in units of Becquerels per cubic metre (Bq/m<sup>3</sup>) and is the specific beta-gamma activity of solid radioactive waste used to compare reactor technologies.

OPG identified that the solid waste volumetric activity for certain radionuclides generated through the routine operation of the BWRX-300 are outside the values assessed in the EA. While the radionuclides contained within the solid radioactive

waste are the same as those assessed in the EA, their proportion of the volumetric activity ( $\text{Bq/m}^3$ ) value has changed.

OPG compared the values for volume of waste expected and total activity for BWRs and determined that alpha and beta-gamma activity per cubic metre, in general, were higher than for PWR and PHWR technologies. Correspondingly, the production rates of tritium and carbon-14 in BWRs are lower than for PWR and PHWR technologies, and therefore were determined to have considerably lower anticipated volumetric activity for the BWRX-300 resulting in a lower total solid radioactive waste volumetric activity than the EA bounding scenario.

CNSC staff note that although radionuclides are generated in different proportions for the BWRX-300, requiring a different approach to managing waste, the change in solid radioactive waste volumetric activity itself does not affect the conclusion of the EA.

The second related parameter outside of the PPE is the weight of the spent fuel cask used to transport the spent fuel from the DNNP to a planned future waste management facility.

The assumed weight of the transport cask in the EA was 100 tonnes, whereas the assumed weight of the cask to transport BWRX-300 spent fuel is 113 tonnes. While this is an increase from the weight assumed in the EA, OPG has identified that the weight capacity of the on-site hauling roads will require upgrading.

CNSC staff determined that the upgrade in on-site hauling road capacity is acceptable and feasible and therefore does not impact the conclusions of the EA.

### 2.1.2.5 Importance Factor for Wind Loads

The PPE defines the importance factor for wind load as a “multiplication factor (as defined in American National Standards Institute (ANSI) A58 1-1982) applied to the basic wind speed to develop the plant design.”

The selection of wind load importance factors is a design requirement for safety-related and non-safety-related structures and is dependent on the maps of wind speed hazards at a particular location. Importance factors are also based on the maximum wind speed to which facility structures are designed. Safety-related structures are designed for extreme wind speeds in addition to the maximum wind speed recorded at the site, which OPG identifies in its PPE [8] as 154 km/hr within 180 km of the Darlington Nuclear site. The bounding value for maximum wind speed is 232 km/hr. Non-safety-related structures are subject to the requirements of the *National Building Code of Canada* (NBCC) [15].

Extreme wind events for safety-related structures include consideration of a three (3) second wind gust of 322 km/h having an annual probability of  $10^{-7}$ , and consideration of a design-basis hurricane missile.

The 2005 edition of the *National Building Code of Canada*, subsection 4.1.7, *Wind Load* was used in the original PPE [8] to determine the importance factor. The value of 1.15 was used to calculate the specific external pressure due to wind on the surface of the building.

The importance factor is based on a methodology that has been replaced with a classification and importance factor of 1.0. The selection of this factor corresponds to the seismic classification and risk category of buildings, consistent with building design standards put in place by the American Society of Civil Engineers (ASCE) and the United States Nuclear Regulatory Commission (USNRC).

OPG concluded that the selection of an importance factor of 1.0, based on the Darlington specific wind speed maps and building classification according to risk categories identified in ASCE 7 – *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, is consistent with the target strength as the methodology described in the original PPE. OPG concludes the revised importance factor does not impact the conclusions made regarding the design of the buildings for high wind events.

CNSC staff concur with OPG's conclusion that the change in importance factors does not impact the conclusion in the EA. However, further verification is required to confirm that the DNNP design includes wind loads that envelope NBCC factored wind loads. This verification will be required to support CNSC staff's review of the LTC application.

## **2.2 The Environmental Impact Statement (EIS)**

This section of the CMD presents an overview of the effects on the environment predicted in the EIS [16], as well as CNSC staff's assessment of both OPG's 2022 EIS Review [7][17] and the revised 2023 EIS Review [12][18].

Throughout this subsection, the term "EIS" refers to conclusions and predictions described in the EIS, and the term "EIS Review" refers to OPG's review of the EIS against the BWRX-300 technology.

### **2.2.1 General Overview of the EIS**

The EIS [16] described the existing environment, and systematically analysed and identified potential environmental effects of the DNNP.

The existing environment surrounding the Darlington Nuclear site was studied in three areas: the site study area consisting of the DNNP project lands, the local study area consisting of the Darlington Nuclear site and the area of Clarington closest to the site, and the regional study area consisting of the site study, local study areas, and other lands, communities, and portions of Lake Ontario relevant to assessment of effects of the DNNP.

The environment in these study areas was characterised and described within biophysical and socio-economic environmental components. The components were selected considering the likely interfaces between the project and individual aspects of the environment, shown in Table 3 below.

**Table 3: Environmental components and sub-components assessed in the Environmental Assessment**

<b>Environmental component</b>	<b>Applicable sub-component(s)</b>
Atmospheric	Air Quality Noise
Aquatic	Aquatic Biota Aquatic Habitat
Geological and Hydrogeological	Soil Quality Groundwater Flow Groundwater Quality
Radiation and Radioactivity	Radioactivity in the Atmospheric Environment Radioactivity in the Surface Water Environment Radioactivity in the Aquatic Environment Radioactivity in the Terrestrial Environment Radioactivity in the Geological and Hydrogeological Environment Radioactivity in Humans
Surface Water	Lake Circulation Lake Water Temperature Site Drainage and Water Quality Shoreline Processes
Terrestrial	Vegetation Communities and Species Insects Bird Communities and Species Amphibians and Reptiles Mammal Communities and Species Landscape Connectivity
Land Use	Land Use Landscape and Visual Setting
Traffic and Transportation	Transportation System Operations (Road, Rail, Marine) Transportation System Safety (Road, Rail, Marine)
Physical and Cultural Heritage Resources	Archaeology Built Heritage and Cultural Landscapes
Socio-Economic	Human Assets Financial Assets Physical Assets Social Assets Natural Assets
Human Health	Health and Well-Being of the General Public Health and Safety of Workers



Environmental component	Applicable sub-component(s)
Health of Non-Human Biota	Terrestrial Biota Aquatic Biota

The identification of the environmental components also included the identification of representative valued ecosystem components (VEC), which are features of each component selected to be the focus of the study because of their value to the community and their potential vulnerability to effects of the DNNP.

As part of OPG's EA, effects identified in the supporting environmental studies were assessed for whether that effect will impact a VEC within the environmental component. In the case where an effect is likely to impact a VEC, the EA identified strategies to mitigate the effect of the project on that environmental component.

In the event where an adverse environmental effect remains, after consideration of mitigation measures, the effect was considered a "residual adverse environmental effect" of the project on the environment. These residual effects were subsequently assessed for their significance following accepted criteria.

### 2.2.2 CNSC Staff Review of the EIS Review Report

OPG's EIS Review examined the environmental conditions on-site and near the DNNP to determine whether the deployment of up to four BWRX-300 reactors is within the bounds of the EA, as well as to evaluate existing environmental conditions and changes that have occurred since the completion of the EIS. The EIS Review documented changes in baseline conditions, including changes in conservation status, reviewed the effects on VECs, and documented the existence of new receptors as appropriate.

CNSC staff reviewed OPG's EIS Review for each of the environmental components presented in Table 3 above, within its mandate. Components such as Physical and Cultural Heritage Resources, Socio-Economic Environment, and Traffic and Transportation are outside of the mandate of the CNSC, and staff have deferred to the expertise of relevant federal and provincial regulatory bodies, where appropriate.

The following subsections will provide a brief overview of likely effects on VECs, a summary of CNSC staff's review of OPG's EIS Review and CNSC staff's conclusion concerning whether the EA is applicable to the deployment of four BWRX-300 reactors.

## 2.2.2.1 Atmospheric Environment

### 2.2.2.1.1 Effect on Air Quality

#### Summarised Results from the EA

The EA predicted no residual adverse effects on air quality because the evaluated concentrations of modelled non-radiological contaminants in air were below the respective regulatory criteria. Although exceedances of the applicable regulatory criteria were not predicted at the time, the EA did identify potentially measurable increases in concentrations of contaminants in the atmosphere at on-site and off-site receptor locations.

Air concentrations due to DNNP for most contaminants of potential concern (COPC) were expected to infrequently exceed [Canadian Ambient Air Quality Standards](#) (CAAQS) at the residential receptors nearest the site during site preparation activities, and to a lesser extent during construction and operations activities.

The predicted maximum 24-hour concentrations [16] of suspended particulate matter (SPM) and 10-micron particulate matter (PM<sub>10</sub>) were below the CAAQS, with some exceedances noted at four receptors.

Nitrogen dioxide (NO<sub>2</sub>) concentrations were also predicted to be below the 1-hour CAAQS at most receptors, except for two locations, which were determined to be very infrequent. The predicted exceedances of these contaminants were attributed to site preparation activities (e.g., excavation and grading, workforce traffic) as well as background traffic from local roads and Highway 401, for a two-year period.

The EA predicted potentially measurable increases of PM<sub>10</sub> at residential receptors during site preparation activities; however, the predicted maximum PM<sub>10</sub> concentrations were predicted to be below the 24-hour criterion. Additionally, the maximum predicted PM<sub>2.5</sub> concentrations were below the 24-hour Canada-wide standard, with a single receptor location experiencing a slight exceedance over the standard.

With respect to greenhouse gases (GHG), the EA predicted most emissions to occur during the site preparation and construction phases, with a total estimated emission of 12 900 CO<sub>2</sub>-equivalent tonnes. This value represents < 0.01% of the CO<sub>2</sub>-eq [emissions from the province of Ontario in 2005](#) [19] and was therefore concluded to provide a negligible contribution to total GHG emissions.

The modelled exceedances of SPM, PM<sub>10</sub>, and PM<sub>2.5</sub> at these selected locations during the site preparation and construction phases of DNNP were identified using conservative bounding assessment criteria in the EA. In consideration of the mitigation measures and the results of the studies, the EA determined that changes in air quality were not considered to represent an adverse effect in the atmospheric environment.

### CNSC Staff Review of OPG's EIS Review

OPG has continued to monitor environmental conditions throughout the ten-year site preparation licensing period [7]. OPG's EIS Review states:

“Baseline air quality is considered to have generally improved, or to be within the natural variability experience in the area as compared to conditions documented in the EIS. No significant differences in meteorological conditions have been identified compared to that of the EIS.”

Compared to the air quality conditions studied in the EA, there has been substantial improvements to Ontario's ambient air quality with the provincial cessation of coal-fired electricity generation. This has resulted in a reduction in the average NO<sub>2</sub> and sulphur dioxide (SO<sub>2</sub>) concentrations, and the 24-hour ambient PM<sub>2.5</sub> concentrations. The 24-hour PM<sub>10</sub> and total SPM concentrations have remained consistent with those documented in the EA.

Since the completion of the EA, there have been changes made to applicable ambient air quality evaluation criteria at both the provincial and federal level, with changes to certain criteria values effective in 2025. Table 4 below summarises the upcoming changes to CAAQS for the air quality criteria applicable to the DNNP. CNSC staff's review of OPG's EIS Review identified the following:

- The lowering of the CAAQS concentration limit for PM<sub>2.5</sub> would result in a slightly higher frequency of predicted exceedances at the two most affected residential receptors identified in the EA. The remaining receptors are predicted to remain below the revised PM<sub>2.5</sub> 24-hour limit. CNSC staff conclude that changes to the annual PM<sub>2.5</sub> CAAQS are not expected to alter the conclusions of the EA.
- Changes to NO<sub>x</sub> CAAQS will come into effect in 2025. The reduction in the annual and 1-hour CAAQS for NO<sub>2</sub> would result in the maximum 1-hour NO<sub>2</sub> average concentrations to remain slightly above criteria at the two residential receptors, as predicted in the EIS during site preparation activities. These exceedances are predicted to remain infrequent. The change to the 1-hour NO<sub>2</sub> criteria would result in an increase in the number of receptors exposed to short-term concentration exceedances during site preparation, with modelled receptors expected to exceed both the 2020 and 2025 1-hour NO<sub>2</sub> CAAQS. Annual NO<sub>2</sub> concentrations are predicted to remain below the 2020 criteria at all but one receptor locations, and all receptor locations are predicted to exceed the 2025 criteria. CNSC staff conclude that these changes to NO<sub>2</sub> criteria and predicted exceedances of the 2025 CAAQS criteria do not impact the conclusions of the EA.

- Changes to SO<sub>2</sub> CAAQS will also come into effect in 2025. In particular, the reduction in the 1-hour standard would result in an increase in the number of receptors that would be exposed to short-term concentrations that exceed the updated criteria, during site preparation activities. All modelled receptors, except for a single receptor, are expected to exceed both the 2020 and 2025 SO<sub>2</sub> 1-hour CAAQS. Annual SO<sub>2</sub> concentrations, however, are expected to remain below both the 2020 and 2025 criteria at all modelled receptors.
- CO<sub>2</sub> emissions across Ontario have decreased to 151 Megatonnes CO<sub>2</sub>(eq), a decrease from emissions of 200 Megatonnes in 2005 [19]. The scope of the BWRX-300 deployment is reduced as compared to the technologies assessed in the EA and, as a result, project emissions are expected to be less than originally assessed. The site preparation and construction phases are predicted to constitute the majority of NO<sub>2</sub>, SO<sub>2</sub>, and CO<sub>2</sub> emissions from the DNNP; however, emissions at the maximum accepted levels from the EA would continue to constitute a fraction of annual emissions across Ontario.

**Table 4: Summary of changes to Canadian Ambient Air Quality Standards (CAAQS)**

Contaminant	Averaging Period	Previous Ambient Air Quality Criterion (AAQC)	CAAQS	
			Applies in 2020	Applies in 2025
PM <sub>2.5</sub>	24-hour	30 µg/m <sup>3</sup>	27 µg/m <sup>3</sup>	No change
	Annual	N/A	8.8 µg/m <sup>3</sup>	No change
NO <sub>2</sub>	1-hour	400 ppb	60 ppb	42 ppb
	Annual	100 ppb	17 ppb	12 ppb
SO <sub>2</sub>	1-hour	690 ppb	70 ppb	65 ppb
	Annual	60 ppb	5 ppb	4 ppb

To mitigate the effect of elevated concentrations of particulate matter on the environment during site preparation and construction activities, OPG was required to put in place a dust management and nuisance effects plan. DNNP commitment D-P-3.2, *Nuisance Effects (Dust and Noise) Plan/Procedure* [10] required OPG to implement a dust management plan. CNSC staff reviewed OPG's dust management plan, determined it was acceptable, met the closure criteria and intention of JRP Recommendation #9, and closed the deliverable in August 2022.

OPG has completed an assessment of expected changes to emissions of non-radiological contaminants of concern during the site preparation and construction phases. Table 5 below shows a comparison of the predicted emission rates in grams per second during construction activities for the deployment of the BWRX-300 reactors and the bounding value from the EA. CNSC staff reviewed these results and concur with OPG's assessment that these values remain within the bounds of the EA.

**Table 5: Comparison of predicted emission rates for non-radiological contaminants of potential concern**

	Maximum emission rate (g/s)						
	SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	Acrolein
<b>EA bounding value</b>	24.32	5.90	1.29	15.02	10.21	60.42	0.06
<b>BWRX-300</b>	6.054	2.19	0.826	11.051	2.182	12.29	0.058

#### 2.2.2.1.2 Noise

##### Summarised Results from the EA

The EIS predicted no residual effects due to noise conditions in the atmospheric environment because of the DNNP. Ambient noise conditions at the Darlington site were due primarily to background traffic from the adjacent provincial highway 401 as well as from normal operations at St Marys Cement.

The EA predicted some measurable increases to existing noise levels at select off-site locations during site preparation activities, including some residential locations nearest the Darlington site. The EIS found that the predicted increases in sound at other residential locations were negligible during the site preparation, construction, and operation of the DNNP.

The minimum daytime background noise level was measured to be 51.7 a-weighted decibels (dBA), and the maximum 1-hour daytime sound level during site preparation activities was predicted to be 9.5 dB higher than the background level. The average daytime sound level was predicted to increase to 61.4 dB, an increase of 8.1 dB over background.

The maximum 1-hour increase of perceptible changes in noise conditions (i.e., greater than 3 dB) in sound during both day and night-times was predicted to occur at three residential locations, during both site preparation and construction activities. However, this increase was predicted under the assumption that the entire worker shift change would occur during this period, which was noted to be unlikely to occur. Therefore, the EA predicted that the average daytime and night-

time periods that the sound level increases would not be perceptible, that is, an average increase in sound levels less than 3 dB.

Further, the EA predicted that, during routine operations of four reactors, the most affected residential location would experience a night-time maximum 1-hour increase of approximately 3.3 dB, which the EA concluded would not be perceptible.

The EA identified in-design mitigation measures including the development of a noise management plan during site preparation and construction, which would include measures to control sound generation at source, alerting residents when specific noise generating activities were occurring (e.g., blasting), maintaining equipment in proper mechanical condition, and complying with applicable noise standards and regulations.

### **CNSC Staff Review of OPG's EIS Review**

OPG's EIS Review stated that additional baseline noise characterisation conducted between 2018 and 2019 found that ambient noise levels surrounding the Darlington site continued to be due primarily to traffic on highway 401.

In 2017, Health Canada issued new guidance for assessing noise impact on human health, entitled [\*Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise\*](#). This guidance outlines a revised calculation method to approximate the percentage of a population that would experience irritation resulting from exposure to sounds with different intensities and characteristics. Health Canada's guidance suggests that a "significant noise impact" occurs when an activity causes an increase in the 'percent highly annoyed' population of +6.5%, subsequently requiring an evaluation of noise control measures. OPG has incorporated this guidance into the atmospheric environment EA follow-up program, as well as its noise and dust management plan.

Ontario Ministry of Environment, Climate, and Parks (OMECP) Publication NPC-205 was used in the EA, which was replaced by [\*Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning\*](#) in 2013. In both cases, the criteria applied at the receptor location is either the higher of the background noise from sources not associated with the DNNP, or the OMECP minimum exclusion criteria, which remains consistent with the effects predicted in the EA.

CNSC staff note that given the smaller physical footprint of the BWRX-300, the reduction in the overall quantity of material excavation and subsequent heavy equipment use would be expected to lower overall noise emissions. An overall reduction in workforce vehicle traffic, as compared to the assessment in the EA, is also expected to contribute to lower overall noise levels.

The blasting methods and frequencies proposed for BWRX-300 construction are similar to those assessed in the EA, and noise emissions from blasting activities for BWRX-300 construction are expected to be comparable to the EA.

### 2.2.2.1.3 Summary and Conclusions – Atmospheric Environment

CNSC staff have reviewed the EA, OPG's EIS Review and supporting documentation and conclude that no new air quality-related project-environment interactions are expected. CNSC staff also conclude that changes to air quality assessments have been adequately assessed and these changes do not alter the conclusion from the EIS, which found no residual adverse environmental effects, provided the identified mitigation measures are implemented.

CNSC staff conclude that no new project-environment interactions are expected as it relates to noise, and that the changes to the noise assessment from the EA have been adequately assessed. These changes do not alter the conclusion from the EA, which found no adverse environmental effects due to noise, provided the identified mitigation measures are implemented.

Regarding the atmospheric environment, CNSC staff conclude that OPG has adequately assessed changes to the atmospheric environment since the EA, and that these changes do not alter the conclusions of the EA which found no significant adverse environmental effects, provided the identified mitigation measures and follow-up program are implemented.

### 2.2.2.2 Aquatic Environment

#### 2.2.2.2.1 Aquatic Habitat

##### Summarised Results from the EA

The EA predicted that the primary effects on aquatic habitats would be due to direct losses associated with the physical development of the Darlington site, and the construction and operation of the cooling and service water intake and discharge structures.

The EA assumed that the existing on-site ponds would be permanently removed because of the development of the site for the multi-unit station of the reactors assessed in the bounding scenario. Studies of the ponds revealed they did not appear to measurably contribute to fish habitat and would not require fish habitat compensation, and that the loss of these ponds would result in a loss of low-sensitivity habitat that could be recreated elsewhere on-site to offset the potential loss of biodiversity.

The relocation and expansion of Maple Grove Road into a site access route was studied and found to potentially include a crossing of the Darlington Creek at the northeast corner of the site. Construction of the crossing had the potential to result in loss of a portion of stream habitat, as well as the potential for deposition of sediments in the Creek due to construction. These effects could constitute harmful alterations, disruptions, or destruction of the habitat and would require authorisation under the [Fisheries Act](#) [20].

The EA also predicted that the DNNP would remove approximately 400 metres of two intermittent tributaries to Darlington Creek, located in the proposed northeast landfill area and south of the Canadian National Railway (CN) line. Realignment

and incorporation of improved drainage, as well as adequate stormwater management facilities within the northeast landfill area would help maintain the contribution of flow into the Creek. These tributaries do not directly support fish or aquatic invertebrates but do support aquatic habitats downstream; however, the removal of the upper sections was considered to have an indirect effect on downstream aquatic habitats.

#### Intake and Discharge Structures and the Thermal Plume

The intake structure for once-through lake water cooling would be placed at a 10-metre water depth to minimise interactions with aquatic biota. The area where the intake would be placed away from the highest concentrations of fish, but inshore of the highest concentrations of freshwater shrimp. The construction of the intake structure, as well as the discharge diffuser ports, were estimated to result in a loss of aquatic habitat of less than two hectares.

The siting of the intake and discharge structures was selected to minimise the predicted interaction with aquatic habitats by avoiding shallower, warmer, water and nearshore spawning areas. Though the area of habitat affected by these structures is two hectares, the overall effect is predicted to be minimal when considering the total habitat availability for these species. Construction of these structures would require a *Fisheries Act* authorisation as well as a fish habitat compensation plan to offset the loss of habitat.

A once-through cooling water discharge system was assumed in the EA to be similar to the discharge structure deployed for the existing DNGS. Through a series of diffusers, this discharge system prevents the dispersion of heated water at temperatures greater than 2°C above ambient lake temperature beyond the initial mixing zone, resulting in discharge of cooling water without an extensive thermal plume.

The diffuser deployed with the DNNP would be situated in deeper water than the DNGS' diffuser, ranging from a depth of 10 to 20 metres due to the difference in lakebed depth between the sites, with similar or better mixing performance than the DNGS diffuser. As a result, the EA predicted that there would be no measurable increase in water temperature above ambient beyond the turbulent mixing zone 50 metres east or west of the discharge line.

No residual adverse effect of the thermal discharge on aquatic habitat were predicted in the EA, and effects on aquatic habitats are limited to moderate water temperature increases in the turbulent mixing zone surrounding the diffuser.

#### **CNSC Staff Review of OPG's EIS Review**

For a four-unit deployment of BWRX-300 reactors, OPG's EIS Review identified changes from the EA that lessen the impacts to the aquatic environment. For example, the EIS predicted excavation of approximately 12.4 million cubic metres of earth; whereas the deployment of the BWRX-300 reactors require excavation of an estimated 3.3 million cubic metres of earth [17].

Given the reduced volume of excavated earth, the removal of the three on-site ponds would not be required. Though these ponds would not be removed, and



compensation for the loss of habitat under the *Fisheries Act* would not be required, OPG is still required to put in place mitigation measures for deposition of sediments and other contaminants into these habitats.

The deployment of four BWRX-300 reactors would also not require construction of a box culvert crossing over the Darlington Creek at Maple Grove Road, meaning that no destruction of fish habitat would occur.

The EA also states that, though the upper reaches of an intermittent Lake Ontario tributary are outside of the proposed footprint for soil placement into the Northwest Landfill area, it was possible that the watercourse could be affected by soil placement activities. The BWRX-300 reactors no longer require placement of soil in the Northwest Landfill area, and therefore this predicted effect would not occur.

OPG performed surface water hydrology assessments to support the BWRX-300 deployment, where OPG has estimated monthly water balances for the ponds and tributaries [21]. CNSC staff's review noted that the changes described were relatively minor; however, significant increases in monthly flows during the summer months can be expected for water features south of the CN Rail line (i.e., the Southeast Wetland and the Darlington Creek Tributary 'E'). OPG has confirmed that these features are generally 'flow-through,' and would not be significantly affected by an increase in summer flows. Adverse effects to these tributaries were not anticipated and mitigation measures are not required.

As the smaller physical footprint of the deployment of four BWRX-300 reactors does not require infilling of Lake Ontario, the nearshore effects on the loss of aquatic habitat predicted in the EA from lake in-fill activity would not occur. The BWRX-300 units 2, 3 and 4 would require OPG to conduct in-water activities to stabilise the shoreline, which would require OPG to implement a monitoring plan for potential effects on aquatic habitats when conducting shoreline protection activities. The effect of shoreline stabilisation activities on the habitat and nesting grounds of bird species, including species at risk, is described further in subsection 2.2.2.6.3 – *Bird Communities and Species* of this CMD.

To protect aquatic habitat, the EA identified mitigation measures associated with the intake and discharge structures, including development and implementation of an appropriate Fish Habitat Compensation Plan to satisfy the requirements of subsection 35(2) of the *Fisheries Act*. In addition, the location of the cooling water intake and discharge structures should be in less-sensitive habitats, removed from productive nearshore habitats and spawning areas. As discussed in subsection 2.2.2.5.2 – *Lake Water Temperature* of this CMD, the effects of the thermal plume on aquatic habitat with the BWRX-300 deployment are similar to those assessed in the EA.

The BWRX-300 is intended to be a zero radiological liquid release facility, with the Liquid Waste Management system intended to collect liquids during normal operations, filter this water to remove radioactive contaminants, and recycle the filtered water for use by plant systems. Discharges of radioactive effluent to the environment are expected in the event where the plant inventory does not allow

for recycling of the water and is not anticipated to occur during normal operations.

Discharges of any radioactive effluent are expected to be significantly less than assessed in the EA and must comply with regulatory requirements for surface water discharges including REGDOC-2.9.1 – *Environmental Principles: Assessments and Protection Measures*, and within release limits calculated based on CSA N288.1 – *Guidelines for Modelling Radionuclide Environmental Transport, Fate, and Exposure associated with the Normal Operation of Nuclear Facilities*.

#### **2.2.2.2.2 Aquatic Biota**

##### **Summarised Results from the EA**

The EA predicted a localised loss of some indicator species, such as benthic invertebrates and round goby fish, within the construction area footprints of the lake infill as well as the cooling water intake and discharge structures.

The EA considered a loss of aquatic biota during construction of the cooling water intake and discharge structures due to limited underwater blasting. This would require a *Fisheries Act* authorisation due to the death of fish by means other than fishing. OPG would be required to implement mitigation measures associated with underwater blasting, to comply with updated guidance to minimise incidental mortality of aquatic species.

The EA also identified the Deepwater Sculpin, Lake Sturgeon, Atlantic Salmon, and American Eel as fish species of conservation concern; however, subsequent studies determined that the nearshore area does not contain a critical habitat for any of these species [22].

As there would be adverse effects on aquatic biota due to the DNNP, the EA identified several mitigation measures to address effects from fish impingement and entrainment, including:

- Capture and release of fish from in-water work areas during work activities,
- Incorporation of intake and discharge design features to minimise the water intake velocity, similar in design to the existing DNGS structures but sized to necessary volumes. The intake structure is to be designed to limit the velocity of intake water to minimise impingement of fish and the effects of localised currents,
- Implementation of an Adaptive Management Strategy to address changes to the environment associated with aquatic systems over time, and
- Implementation of impingement and entrainment measures in the Fish Habitat Compensation Plan.

### **CNSC Staff Review of OPG's EIS Review**

Since the completion of the EA, OPG has conducted baseline studies for aquatic biota, including benthic invertebrates, fish impingement and entrainment, fish community and population, fish habitat, and the thermal plume [23]. OPG concluded that these follow-up studies demonstrated similar findings to those identified in the EA. CNSC staff reviewed these studies and concurred with OPG's conclusions.

BWRX-300 deployment would also require some limited underwater blasting during construction of the intake and discharge structures, and therefore this effect is similar to that assessed in the EA. OPG would be required to conduct blasting activities in a manner that it limits incidental mortality of aquatic species, consistent with the mitigation measures identified in the EA.

The proposed intake structure design of the BWRX-300 has features to prevent impingement and entrainment of fish, similar to the current DNGS intake structure, with a maximum intake velocity of 0.12 m/s (12 cm/s). The impingement and entrainment effects of the BWRX-300 are consistent with the EA. In addition, as described in subsection [2.2.2.5.1 – Lake Circulation](#) of this CMD, the maximum flowrate of the BWRX-300 is significantly lower than assessed in the EA, lessening the overall impact on aquatic biota.

Although the EA identified Deepwater Sculpin as a fish species of conservation concern, and entrainment of Sculpin has been identified at the existing DNGS, subsequent monitoring studies performed by OPG, and reviewed and accepted by CNSC staff, have not detected significant interactions with the DNGS intake structures. This conclusion is expected to remain applicable to the intake and discharge structures for the DNNP. OPG would be required to implement fish protection or adapt mitigation measures to continue to ensure that DNNP activities do not introduce significant environmental effects to aquatic biota.

CNSC staff note that two fish species have been listed under the Province of Ontario's [Endangered Species Act](#) [24], the Lake Sturgeon and the American Eel, since the completion of the EA. OPG would be required to obtain permits from the OMECP prior to commencing in-water work. For species that are listed as Endangered or Threatened under Schedule 1 of the federal [Species at Risk Act](#) [25], OPG is required to obtain permits from DFO prior to commencing any work, and would be required to comply with direction from those regulatory authorities.

CNSC staff concluded that the identification of the above fish species for conservation concern remains within the determination of the significance of residual adverse effects documented in the EA.

#### **2.2.2.2.3 Summary and Conclusions – Aquatic Environment**

CNSC staff reviewed the EA, OPG's EIS Review, and supporting documentation and conclude that no new aquatic environment related project-environment interactions are expected. CNSC staff also conclude that changes to aquatic habitat and aquatic biota assessments have been adequately documented and

assessed and these changes do not alter the conclusion from the EIS, which found no residual adverse environmental effects, provided the identified mitigation measures are implemented.

Regarding the aquatic environment, CNSC staff conclude that OPG has adequately assessed changes to the aquatic environment since the completion of the EA, and that these changes do not alter the conclusions from the EA which found no significant adverse environmental effects, provided the identified mitigation measures and follow-up program are implemented.

### **2.2.2.3 Geological and Hydrogeological Environment**

#### **2.2.2.3.1 Soil Quality**

##### **Summarised Results from the EA**

The EA stated that the likely effects on soil quality will be due primarily to the management of stormwater. The mitigation measure to reduce adverse environmental effects was the implementation of effective stormwater management practices during all phases of the DNNP. CNSC staff note that typically these measures would include sediment control, stormwater conveyance systems, and conventional stormwater treatment methods (e.g., stormwater management ponds, and oil/grit separators). The EA concluded that no adverse effects were predicted for soil quality, if stormwater management practices were implemented.

##### **CNSC Staff Review of OPG's EIS Review**

CNSC staff have reviewed the EA, OPG's EIS Review and supporting documentation, and have concluded that the BWRX-300 deployment would be required to operate within the framework of the existing environmental regulations, and to implement the identified mitigation measures, and therefore any changes to soil quality have been adequately assessed and will not impact the conclusion of the EA.

#### **2.2.2.3.2 Groundwater Quality**

##### **Summarised Results from the EA**

The EA predicted no residual adverse effects on groundwater quality because of the DNNP. The consequences of anticipated climate change effects were estimated as likely to impact groundwater quantity through lowering of the groundwater table due to reduced precipitation and runoff rates. The EA concluded that mitigation measures would be effective in addressing lower groundwater tables, and that climate change effects are unlikely to exacerbate the environmental effects of DNNP on groundwater quality.

##### **CNSC Staff Review of OPG's EIS Review**

The likely effects of the BWRX-300 on groundwater quality will be primarily due to the management of stormwater, as well as the active ventilation systems during the operations phase. CNSC staff note that groundwater at the Darlington Nuclear

site flows from the north to the south discharging into Lake Ontario, is not a potable water source and not used for drinking water purposes. Impacts associated with the management of stormwater are independent of reactor technology, and the EA predicted no consequential adverse effects for groundwater quality, provided that the mitigation measure (i.e., standard industry stormwater management practices) is implemented.

The EIS Review also considered the potential effect of washout and infiltration of contaminants to the groundwater from the DNNP active ventilation system. The EA determined that residual adverse environmental effects associated with radioactivity in groundwater were not anticipated as part of DNNP. Tritium was considered as the dominant radionuclide affecting groundwater, with transfer factors to groundwater for other radionuclides during normal operations being orders of magnitude lower [26].

Airborne releases of noble gases, particulates, and tritium from anticipated operational occurrences are expected to remain lower than the bounding scenario identified in the EA. Although the predicted airborne radioiodine emissions are slightly higher than predicted in the EA (see [subsection 2.1.2.3](#)), its contribution to overall dose through the groundwater pathway was negligible, contributing < 0.15% of the total dose [13]. Therefore, radioiodine emissions were not considered significant in the context of groundwater quality for the EIS Review.

The EIS Review considered deposition of tritium onto soil and transfer into groundwater, and conservatively estimated this would result in a maximum of 12% increase in tritium concentrations in on-site groundwater and a < 2% increase in nearby off-site wells from the estimates in the EA.

Current proportions of tritium in monitoring wells outside of the Darlington Nuclear site are less than 10% of the [Ontario Drinking Water Standard](#) [27], and therefore CNSC staff conclude that these predicted increases from the EIS Review would not result in adverse effects on groundwater quality. As shown in Table 6, predicted emissions of tritium from the BWRX-300 are significantly lower than the tritium emissions of the bounding scenario reactor assessed in the EA.

**Table 6 – Summary of tritium airborne emissions (Bq/year) during normal operation for the single-unit and prorated multi-unit number of reactors**

Radionuclide	Reactors assessed in the EA			EIS Review
	ACR-1000	EPR	AP1000	BWRX-300
Tritium (Single-Unit)	1.20E+14	6.67E+12	1.30E+13	9.70E+11
Tritium (Multi-Unit)	4.80E+14	2.00E+13	5.18E+13	3.88E+12

CNSC staff reviewed the EA, the EIS Review, and its supporting documentation, and conclude that any changes to groundwater quality have been adequately assessed and will not impact the conclusion from the EA. CNSC staff note that OPG would be required to operate the BWRX-300 within the framework of the existing environmental regulations and implement the identified mitigation measures.

### **2.2.2.3.3 Groundwater Flow**

#### **Summarised Results from the EA**

The greatest potential change to groundwater flow would be due to dewatering to allow for excavation and site grading activities, with dewatering expected to lower the water table by 14 metres in the area of the reactor construction. This would permanently change the groundwater flow at the Darlington Nuclear site. The EA further specifies that:

“Groundwater flow conditions will be changed permanently by the [DNNP]. The most significant change will result from permanent dewatering necessary to facilitate the excavation and grading activities.

“Changes will also result from alterations to the topography and from new drainage system[s] associated with the facility. These changes will result in consequential changes to existing flow and recharge characteristics. Some consequential changes will be beneficial in that they will serve to offset changes brought about by dewatering (e.g., increased recharge associated with the newly created Northeast Landfill area) will add new baseflow to Darlington Creek, some of which will have been lost as a result of dewatering.”

The EA concludes that no residual adverse effects on groundwater flow were predicted as a result of DNNP:

“Although groundwater flow patterns will change, the ultimate flow direction and discharge point will remain to be Lake Ontario, as is currently the case. As such changes in groundwater flow as a result of the Project are not considered to represent an adverse effect.”

The EA assumed appropriate design features would be incorporated into the DNNP to mitigate possible environmental effects. Mitigation measures include the incorporation of stormwater management to optimise opportunities to recharge groundwater with surface water runoff through the design of stormwater ditches and retention ponds.

The EA identified that various activities associated with the DNNP could influence the quantity of the groundwater within the Darlington Nuclear site. These activities include mobilisation and site preparation works, dewatering associated with excavation and grading, marine and shoreline works associated with excavation and grading, the management of stormwater, operation of the cooling system, as well as the presence of the reactors.

To address these interactions, a mitigation measure for the management of stormwater throughout all phases of DNNP was proposed. The EA concluded that anticipated effects on groundwater flow with the bounding scenario reactors were not expected to be significant, provided that the identified mitigation measure is implemented.

### **CNSC Staff Review of OPG's EIS Review**

OPG's EIS Review states that the development of roads and surface infrastructure for the deployment of the four BWRX-300 reactors remains consistent with the EA, and that the overall site footprint is smaller which minimises the potential for groundwater disruption. Further, OPG completed a groundwater modelling study as part of the EIS Review [28], which considered the impact of infrastructure on infiltration rates associated with BWRX-300 deployment. This study found no significant impacts on groundwater quantity or flow upon the cessation of dewatering activities following the construction phase. No adverse effects on groundwater quantity are expected from site mobilisation and preparatory works.

#### Excavation and Grading (Dewatering) and Physical Presence of the Station

As described in subsection [2.1.2.2 – Depth of BWRX-300](#), the BWRX-300 has a deeper foundation embedment (at 38.0 metres below finished grade) than the depths assessed in the EA (which varied from 13.5 to 20.2 metres below grade). Though the excavation is deeper, the smaller physical size and footprint of the reactor building structures is expected to generate a lower overall volume of excavated material.

OPG simulated the effects associated with dewatering activities to support the deeper reactor foundation embedment using a calibrated 3D groundwater flow model of the Darlington Nuclear site. This study considered the implementation of mitigation measures including implementation of low-permeability cut-off walls and pressure grouting in bedrock. This study also considered that dewatering activities are required only during construction, whereas the EA considered permanent dewatering of the area. The study concluded that the effect on groundwater conditions in the deployment of the BWRX-300 following construction dewatering would be negligible.

OPG's findings indicate that, although the magnitude of groundwater drawdown will be greater during construction due to the deeper excavation, the amount of groundwater inflow during construction will be less due to OPG's proposed mitigation measures (i.e., cut-off walls in overburden and pressure grouting in bedrock). Further, the influence area of groundwater drawdown is comparable to, or smaller, than what was originally assessed in the EA. CNSC staff reviewed OPG's groundwater modelling study and concur with OPG's findings.

Completed groundwater flow modelling indicates that the four BWRX-300 reactors will have negligible impact on groundwater flow and quantity. Consistent with the conclusions from the EA, the EIS Review identified that construction-related effects on groundwater quantity associated with dewatering, as well as the

physical presence of the reactor, are localised to the site and not considered to be significant provided the identified mitigating measures are implemented.

#### Excavation and Grading (Marine and Shoreline Works)

The EA considered changes to the groundwater flow system resulting from the construction of the Northeast Landfill Area, lake infilling at the Lake Ontario shoreline, as well as the placement of soil in the Northwest Landfill Area.

Given that the deployment of the BWRX-300 reactors does not require lake infill, and that the amount of excavated material no longer requires the placement of additional soil in the Northwest Landfill Area, effects on groundwater flow from these activities are no longer applicable. However, the construction of the Northeast Landfill and consequent emplacement of excavated soil, overburden, and rock is still required, and the effect on groundwater flows from this activity remains applicable.

The EA also noted that the proposed emplacement of soil in the Northeast Landfill would have a likely beneficial effect on groundwater flow, by promoting increased local recharge.

The effects on groundwater flow and quantity associated with marine and shoreline works during excavation and grading activities for the deployment of the four BWRX-300 reactors are consistent with the conclusions of the EA.

#### Operation of the Condenser Circulating Water (CCW) System

The EA considered changes to groundwater quantity and flow system associated with the operation of the Condenser Cooling Water (CCW) system, as the forebay channel required for the CCW system will collect groundwater that would discharge to Lake Ontario under existing conditions. However, the EA stated that since the discharge location and discharge rates for groundwater remain similar to existing conditions, adverse effects on groundwater flow are unlikely. Anticipated effects on groundwater quantity with the deployment of BWRX-300 and the operation of the CCW system are unchanged, as the BWRX-300 would require similar structures to those assessed in the EA.

### **2.2.2.3.4 Summary and Conclusion – Geological and Hydrogeological Environment**

CNSC staff have reviewed the EA, the EIS Review, and its supporting documentation. Although groundwater flow patterns are expected to change with the deployment of the BWRX-300, impacts are localised to the Darlington Nuclear site with the flow direction ultimately discharging into Lake Ontario, consistent with the EA.

The excavation depth for the BWRX-300 reactors is deeper than that assessed for the bounding scenario in the EA, and consequently the EIS Review identified mitigation measures for dewatering activities which include low-permeability cut-off walls, pressure grouting, and completion of the reactor foundation as a waterproof structure. In addition, dewatering activities for the BWRX-300 deployment are temporary, whereas the EA considered permanent dewatering.



Regarding the geological and hydrogeological environment, CNSC staff conclude that OPG has adequately assessed changes to the Geological and Hydrogeological Environment since the completion of the EA, and that these changes do not alter the conclusions from the EA which found no significant adverse environmental effects, provided the identified mitigation measures and follow-up program are implemented. Therefore, the conclusions of the EA remain valid.

#### 2.2.2.4 Radiation and Radioactivity Environment

The Radiation and Radioactivity environment component of the EA evaluates the effects of the DNNP on other environmental components and consists of five subcomponents: radioactivity in the atmospheric environment, radioactivity in the surface water and aquatic environments, radioactivity in the terrestrial environment, in the geological and hydrogeological environments, as well as radioactivity in humans.

The EA concluded that the reactors assessed for the DNNP would contribute to a radiation dose to members of the public, though the predicted radiation doses were a fraction of the natural background radiation and well below the regulatory dose limit of 1.0 mSv/year as defined in the [Radiation Protection Regulations](#). As a result, radiation doses to members of the public were not considered to be an adverse effect of the DNNP in the Radiation and Radioactivity component.

The EA also concluded that the reactors would contribute to radiation doses to workers, although the predicted radiation doses were also well below the regulatory dose limit for workers of 50 mSv per year and 100 mSv per 5-year period. Radiation doses to workers was also not considered to be an adverse effect of the DNNP in the Radiation and Radioactivity component.

Subsection [2.1.2.3 – Airborne Releases](#) of this CMD provides an overview of the estimated airborne radiological releases from normal operations of four BWRX-300 reactors. Further discussion of radiation doses to workers and members of the general public from these airborne emissions was considered in the Human Health environmental component, and is provided in subsection [2.2.2.9 – Human Health](#) of this CMD.

The EA concluded that operation of the reactors would result in the emission of radionuclides to the environment. Further discussion of the effects of radiological releases to the environment and non-human biota is provided in subsection [2.2.2.10 – Health of Non-Human Biota](#) of this CMD.

As there were no adverse effects predicted to members of the public or to workers in the EA, there were no residual adverse effects within the Radiation and Radioactivity environmental component. Therefore, the conclusions of the EA remain valid.

## 2.2.2.5 Surface Water Environment

### 2.2.2.5.1 Lake Circulation

#### **Summarised Results from the EA**

The EA predicted two likely environmental effects resulting from changing lake circulation patterns, due primarily to specific work and activities occurring in the lake. As described in the EA, the infilling of Lake Ontario and the stabilisation of the shoreline in the Darlington Nuclear site was to create an embayment between the infill area and the St Marys Cement property, which would result in a further increased sheltered area from long-fetch waves. The EA predicted that, due to the increased sheltering area, the current velocity and exchange of lake water between offshore and near-shore waters would be reduced.

A deflection of onshore currents from the operation of the existing DNGS intake and diffuser has been previously established, studied, and documented in 2008. The EA expected that a similar phenomenon would occur from operation of the DNNP intake and diffuser. Given the distance between the proposed intakes and discharge points between the DNNP and DNGS, the EA predicted minimal interaction between the two thermal plumes.

The likely changes in lake circulation patterns in the local study area would result from the infill of the lake as well as the deflection of onshore currents from the discharge diffuser; however, considering the distance between the discharge structures of the existing DNGS and DNNP, these changes were not likely to cause an adverse environmental effect. However, these changes were evaluated for consequential effects on lake water temperature, water quality, and shoreline processes.

No residual adverse effects on the environment as a result of the DNNP were predicted specifically for the lake circulation sub-component.

#### **CNSC Staff Review of OPG's EIS Review**

The BWRX-300 design uses a once-through cooling water circulation system. The EA assumed that the DNNP site would use a scaled-up version of the existing DNGS intake to accommodate the amount of heat discharged from the reactors. The design of the BWRX-300 is such that the flowrate of water through the condenser cooling water system is substantially lower than that assessed in the EA; operation of the multi-unit station with four reactors would result in a required cooling water flowrate between 36 to 68 m<sup>3</sup>/s, compared to the 250 m<sup>3</sup>/s flowrate assessed in the EA.

The condenser cooling water system does not interact with any system that contains radioactive substances, and the water quality in the cooling water discharge flow is expected to be consistent with the intake water quality.

No adverse effects on lake circulation were predicted in the EA, and there were no mitigation measures identified as a result. The predicted effects on lake circulation described in the EA from the operation of the once-through water cooling system, as well as maintenance and replacement of its major components,

remain applicable to the BWRX-300 deployment. Therefore, the conclusions of the EA remain valid.

### 2.2.2.5.2 Lake Water Temperature

#### Summarised Results from the EA

The EA predicted that warmer water temperatures in Darlington Creek would result from a potential artificial embayment between the lake infill and St Marys Cement, due to a reduction in lake water exchange with offshore waters and atmospheric heat exchange.

With the once-through cooling option, the expected increase in maximum temperature at the edge of the mixing zone is less than 0.7 °C, with the maximum temperature rise above ambient of the discharge jet centreline expected to be approximately 1.3 °C.

The EA concluded that thermal discharges associated with the operation of both the service water and cooling water systems will result in a measurable change in water temperatures in the mixing zone of the discharge diffuser. The increase in temperature above ambient was predicted to extend to approximately 50 metres east and west from the diffuser. The temperature increase by itself was not determined to be an adverse environmental effect.

#### CNSC Staff Review of OPG's EIS Review

The BWRX-300 deployment would not require infilling of the lake and would not require the creation of an artificial embayment, and the predicted effect on lake temperatures due to the embayment would not occur.

OPG's EIS Review identified that the likely effects on lake water temperature due to the once-through cooling system were similar to those assessed in the EA, considering the similarities with intake and diffuser designs and the reduced waste heat load. CNSC staff reviewed the original *Aquatic Environment Assessment Technical Support Document* [29] and noted the thermal effect of the once-through cooling option, with a discharge temperature of 9 °C above ambient, had a negligible residual effect. However, this was contingent on the assumption that a discharge diffuser was installed to enhance mixing of thermal discharge with lake water and limit the development of the overall thermal plume. This was assumed to prevent the dispersion of heated water greater than 2 degrees above ambient beyond the mixing zone along the diffuser.

The design of the BWRX-300 is such that it is designed for a 9 °C temperature rise at the discharge point with a maximum flowrate of 68 m<sup>3</sup>/s. OPG has committed in DNNP Commitment D-C-1.2 [10], "EPC Condenser Cooling Water Design," that the design of the discharge diffuser would mitigate potential environmental effects, including those associated with a thermal plume. The design of the discharge diffuser is undergoing review as part of the LTC application. CNSC staff note that in 2014 the CANDU Owner's Group (COG) determined that a net increase of 2.9-3.4 °C above ambient temperatures beyond the mixing zone was protective of the aquatic environment. OPG has concluded

that the deployment of the BWRX-300 would be able to meet this criteria, and the effects on lake water temperature are expected to be consistent with those assessed in the EA.

#### **2.2.2.5.3 Site Drainage and Water Quality**

The EA predicted three likely effects in the Site Drainage and Water Quality environmental sub-component. One of these effects is on the quality of water ultimately discharged into Lake Ontario, from chemicals added to cooling tower process water to meet performance expectations. As the BWRX-300 uses a once-through cooling system, the extent of this effect is limited. Nevertheless, the once-through cooling system would require addition of chemicals (e.g., anti-scaling, corrosion inhibitors) to maintain the performance of the system. These chemicals were considered in CNSC staff's review.

The EA also predicted effects on water quality due to other activities such as lake infilling creating localised conditions favouring formation of algae blooms, the suspension of sediment due to construction of the intake and discharge structures, as well as effluent discharges from other plant processes (i.e., chemicals added for chemistry control of the reactor cooling water). The likely effects from the construction of the intake and discharge structures would be applicable for BWRX-300 deployment, as the design of these structures would be consistent with that assessed in the EA. In addition, the effect from discharge of any effluents also remain applicable for the BWRX-300.

To address these project-environment interactions, the EA proposed in-design mitigation measures, such as dust and sediment control measures and treatment of wastewaters to meet applicable regulatory requirements. With the implementation of these mitigation measures, the EA concluded there were no adverse effects predicted for water quality.

Stormwater drainage into Lake Ontario or into surface water bodies can contain contaminants that pose a hazard to the aquatic environment, to human health, or to the health of non-human biota. For the deployment of the BWRX-300 reactors, OPG has submitted a Stormwater Management Plan that outlines the management of naturally occurring water from winter snow melt, rain events, as well as groundwater from deep excavations. Treatment and mitigation measures would be implemented, consistent with measures identified in the EA, before stormwater is discharged to ensure release criteria and regulatory requirements are met, and no adverse effects in the receiving environment occur.

CNSC staff reviewed OPG's EIS Review and supporting documentation and concluded these mitigation measures remain applicable to the BWRX-300 deployment, and the conclusions of the EA remain valid.

#### **2.2.2.5.4 Shoreline Processes**

##### **CNSC Staff Review of OPG's 2022 EIS Review**

The BWRX-300 does not require any infilling of Lake Ontario, and therefore the adverse effects on the environment due to lake infilling would not occur.

The proposed site layout for up to four BWRX-300 reactors would require shoreline stabilisation and protection measures, although to a lesser extent than assessed in the EA. Construction of more than one BWRX-300 reactor would require implementation of stabilisation measures, resulting in the bluffs becoming unsuitable for Bank Swallows to inhabit. CNSC staff's assessment of the effects of the shoreline stabilisation work on the Bank Swallows habitat, as a result of the deployment of four BWRX-300 reactors, is described in subsection [2.2.2.6.3 – Bird Communities and Species](#) of this CMD.

CNSC staff note these impacts are consistent with the effects assessed in the EA. OPG would be required to implement existing mitigation measures for in-water and shoreline stabilisation work, from the respective EA Follow-Up programs, and subject to a [Fisheries Act](#) authorisation.

#### **2.2.2.5.5 Summary and Conclusion – Surface Water Environment**

CNSC staff have reviewed the EA, OPG's EIS Review, and supporting documentation and conclude no new surface water project-environment interactions are expected. CNSC staff also conclude that changes to surface water have been adequately assessed. These changes do not impact the conclusion from the EA, which found no residual adverse environmental effects, provided the identified mitigation measures are implemented.

Regarding the surface water environment, CNSC staff conclude that OPG has adequately assessed changes to the Surface Water Environment since the completion of the EA, and that these changes do not introduce residual adverse environmental effects provided the identified mitigation measures from the EA and the follow-up monitoring program are implemented.

#### **2.2.2.6 Terrestrial Environment**

OPG conducted a review of project-environment interactions, mitigation measures identified in the EA, and an assessment of any residual effects in the Terrestrial Environment component. This component includes six subcomponents: Vegetation Communities and Species, Insects, Bird Communities and Species, Amphibians and Reptiles, Mammal Communities and Species, and Landscape Connectivity.

Overall, baseline terrestrial environment characteristics remain similar to those described in the EA, with the exception of several changes to species at risk (SAR) under the federal *Species at Risk Act* [25] or the province of Ontario's *Endangered Species Act* [24]. OPG has collected additional terrestrial baseline data [30] to document several changes, including:

- Updates to vegetation, pond biodiversity, soil, breeding birds, insects, amphibians and reptiles, mammals, landscape connectivity, and species at risk. Specific to SAR, baseline updates included the Eastern Meadowlark, Bobolink, Barn Swallow, Bank Swallow, Least Bittern, and Bats.

- Six breeding bird species with habitats in the DNNP site became listed under the *Species at Risk Act*: the Bank Swallow, Barn Swallow, Eastern Wood Pewee, Wood Thrush, Bobolink, and Eastern Meadowlark.
- Six migrant bird species also became listed under the *Species at Risk Act*: the Olive-sided flycatcher, Common Nighthawk, Eastern Whip-Poor-Will, Canada Warbler, Rusty Blackbird, and the Least Bittern.
- One species of breeding turtle with a habitat in the DNNP site became listed as a SAR.
- Eight bat species use the DNNP site for foraging or roosting habitats, four of which became listed as SAR since the EA: Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, and the Tri-coloured Bat.
- A new retainable Butternut tree sapling was found in 2018, whereas the EA identified the existing Butternut tree as non-retainable due to being affected by the Butternut Canker disease.

Because several species of bats were identified as SAR, bats were added to the list of VECs and assessed for potential environmental impacts, whereas other SAR species were assessed using surrogate species.

CNSC staff reviewed the biodiversity monitoring program report covering 2019-2021 [31], and found that OPG has continued to monitor, document, and maintain or enhance biodiversity at the site through its biodiversity program. CNSC staff note that information about OPG's biodiversity protection efforts is published at regular intervals to provide information to CNSC staff and members of the public on OPG's [biodiversity website](#).

In an analysis of potential project-environment interactions, all work activities were considered to determine if there were any potential interaction mechanisms with individual subcomponents of the terrestrial environment. With the BWRX-300 deployment, the scope and extent of some activities differ from those considered in the EA due to the smaller physical footprint.

Given the reduction in the extent of earthworks and volume of material excavated, as well as work required to stabilise the shoreline, there is the potential to conserve some vegetation communities such as the meadow and thicket as well as the species and associated ecosystem functions.

The smaller footprint also enables potential opportunities to retain other terrestrial features including on-site wetlands and woodlands that were predicted to be removed in the EA. CNSC staff also note that OPG's updated terrestrial baseline studies have identified an 11 hectare (0.11 km<sup>2</sup>) increase in the wetland area in the DNNP site.

#### 2.2.2.6.1 Vegetation Communities and Species

The EA identified the Cultural Meadow and Thicket ecosystem, Shrub Bluff ecosystem, Wetland ecosystem, and Woodland ecosystem as VECs. Effects on these VECs will be due primarily to the direct losses from activities associated

with the Site Preparation and Construction Phase; specifically, from clearing and grubbing vegetation on the site as well as from excavation and grading.

The EA noted that although these mitigation measures would be effective in addressing most likely effects of the DNNP on vegetation communities, the direct loss of the 0.40 to 0.50 km<sup>2</sup> of the Cultural Meadow Ecosystem was considered to be a residual adverse effect.

Specific mitigation measures were identified in the EA to reduce the likely impact of Site Preparation and Construction activities on vegetation species, including:

- The replanting of 0.40 to 0.50 km<sup>2</sup> of Cultural Meadow including native forb seeds in the seed mixture, and between 0.15 to 0.20 km<sup>2</sup> of Cultural Thicket with native shrubs, and Sugar Maple.

The deployment of the BWRX-300 reactors would result in the removal of some vegetation communities, but less than was assessed in the bounding scenario of the EA. Given the smaller physical footprint of the BWRX-300, sensitive vegetation communities are likely to be retained, including wetlands and woodlands, which under the EA were assumed to be removed.

### **Dust**

OPG completed dust modelling [32] to support the EIS Review considering suspended particulate matter (SPM) modelling, with a focus on specific terrestrial receptor locations across the Darlington Nuclear site and an assessment of potential impacts cascading to other terrestrial indicators.

OPG's modelling predicted a daily incremental deposition rate at terrestrial receptors between 0.1 to 0.4 g/m<sup>2</sup>/day, with concentrations above the 24-hour SPM criteria at three on-site ponds northeast of the DNNP site. These receptor locations are the only predicted dust deposition exceedances above the criteria. The results of OPG's modelling are consistent with the conclusions of the EA, in that due to the short deposition period and the concentrations of dust deposited, measurable effects on vegetation communities are not likely to occur. CNSC staff reviewed OPG's modelling and concur with the assessment.

As outlined in the EA, OPG will be required to implement its dust and noise management plan throughout the site preparation and construction phases, which outlines mitigation measures intended to reduce or eliminate effects due to dust deposition and noise. CNSC staff have reviewed and accepted OPG's dust management plan in August 2022 (see [subsection 2.2.2.1.1](#)).

### **2.2.2.6.2 Insects**

Effects on insects were also determined to result from the loss of habitat due to the various work activities during site preparation and construction. The most sensitive insect receptors were identified as Dragonflies, Damselflies, and Butterflies (including the Monarch Butterfly) because of their vital role in the ecosystem.

The EA determined that site preparation and construction activities would result in the loss of Treefrog Pond, an adverse effect as the pond is only known location of a rare Dragonfly species habitat on the Darlington Nuclear site. Additionally, the clearing of the DNNP lands would result in the direct loss of an estimated 0.74 km<sup>2</sup> of Butterfly habitat, including those of the Monarch Butterfly.

Mitigation measures intended to address adverse effects under the Vegetation Communities and Species sub-component, including the replanting of the Cultural Meadow and Thicket, were considered as beneficial mitigation measures to reduce the effect on insect fauna from DNNP.

As the physical footprint of the BWRX-300 is smaller than for the bounding reactor scenario under the EA, it is expected to result in a lesser loss of habitat for insect species than described in the EA including those assessed as the most sensitive receptor species. Furthermore, the three on-site ponds (i.e., the Treefrog Pond, Polliwog Pond, and the Dragonfly Pond) would be retained.

OPG has also completed modelling of dust deposition in these ponds [32], as well as assessing the impact on insect fauna, and concluded that potential effects from dust deposition in these ponds are anticipated to be minor. CNSC staff reviewed OPG's submissions and concur with OPG's conclusion.

### 2.2.2.6.3 Bird Communities and Species

#### Breeding Birds

The EA determined that the clearing of the site would reduce habitat and have an impact on the breeding population of two indicator species: the Yellow Warbler and the Red-eyed Vireo. The EA determined that the decrease in the population of these breeding birds at the DNNP site is a residual adverse effect that would remain despite implementation of mitigation measures.

Deployment of the BWRX-300 reactors would allow for some breeding bird habitat to be retained that was considered removed in the EA. OPG assessed [32] the environmental impacts from dust deposition or changes to the hydrogeology on these habitats. CNSC staff have reviewed these studies (see subsection [2.2.2.6.1– Vegetation Communities and Species](#)) and conclude the impacts on breeding birds from dust deposition are minimal.

OPG also conducted noise modelling studies [32] to determine the effect of noise on any retained breeding bird habitat with the deployment of the BWRX-300 reactors. ECCC [guidance on noise disturbances to nesting birds](#) indicates that loud noise emissions “[...] exceeding 10 dB above ambient in natural areas[, or noise] greater than about 50 dB have a higher risk of disturbing nesting birds.” OPG's noise model identified the primary sources of ambient noise to be the existing DNGS, the CN railway, St Marys Cement, and Highway 401, with an ambient sound level of 54.2 dBA [32]. All locations assessed in OPG's noise modelling study showed incremental increases above ambient of less than 10 dBA, except for a single on-site location directly adjacent to the excavation footprint for a single-unit BWRX-300 deployment. For a multi-unit deployment of four BWRX-



300 reactors, the habitat at this location is assumed to be removed and is not included in the noise model.

OPG concludes that noise modelling indicates the bird communities are subjected to the existing elevated ambient noise level, and additional incremental noise for the deployment of the BWRX-300 reactors would not result in a measurable effect to bird communities and species.

CNSC staff have reviewed OPG's noise and dust modelling studies and concur with OPG's conclusion.

### **Waterfowl Staging Areas**

The shoreline area nearest the DNNP site supports a large number of waterfowl, due in part to the staging and loafing areas provided by the existing DNGS structures and the St. Marys Cement wharf. The EA determined that project-related works in Lake Ontario have the potential to disrupt this staging area, as waterfowl use this area throughout the year; however, this effect was determined to be transitory, with a likelihood that waterfowl will return to this area once project-related activities cease.

Coot's Pond continues to be a staging area and habitat for waterfowl and is unlikely to be affected by project-related activities; waterfowl staging is expected to continue at Coot's Pond throughout DNNP activities.

OPG states that the effects of the deployment of the BWRX-300 on the waterfowl staging areas are consistent with those identified in the EA, as there is no change anticipated to the use of the site by staging waterfowl at Coot's Pond. CNSC staff agree with OPG's assessment.

### **Migrant Songbirds and their Habitat**

As identified in the EA, the DNNP will result in a loss of 0.74 km<sup>2</sup> of woody vegetation, which provides for a habitat for migrant songbirds. The smaller physical footprint of the BWRX-300 provides an opportunity to retain a portion of this woody vegetation and habitat, and consequently reduce the impact to migrant songbirds.

CNSC staff note the EA did not consider the potential effects on these species from dust and noise, which has the potential to impact foraging due to dust covering the vegetation, as well as sensory disturbances to these birds cause by noise. However, OPG's recent air quality and noise modelling [32] assessed the effects experienced by migrant birds and determined the effects to be minor. CNSC staff have reviewed OPG's noise and dust modelling studies and concur with OPG's conclusion.

### **Bird Strikes**

The EA identified the potential for bird strikes as the killing or injury of birds, occurring due to collisions with cooling towers, structures or buildings, or entanglement in security fencing.

The BWRX-300 reactors, employing once-through cooling systems, do not require construction of cooling towers and therefore this major contributing factor to bird strikes has been eliminated. CNSC staff note that the overall risk potential for bird strikes cannot truly be eliminated, as collisions with other buildings or structures, as well as due to entanglement in fencing, remain distinct possibilities.

The EA identified two mitigation measures to reduce the potential for bird strikes and consequent injuries to birds. These measures would continue to apply to the deployment of the BWRX-300 reactors:

- Implementing design and development features in site lighting systems and structures to reduce incidences of bird strikes, while maintaining site security and navigation safety.
- Implementing design features in the design of security fencing to reduce incidences of bird entanglement and entrapment, while maintaining adherence to security requirements.

### **Winter Raptor Feeding and Roosting Areas**

The EA identified two primary winter raptor feeding and roosting areas on the DNNP site, primarily related to Cultural Meadow, and related to historical owl roosts used as winter foraging habitats.

One of the primary owl roosts is located on the DNNP site near the area where Site Preparation and Construction activities would occur, with the other primary roost remaining alongside the Waterfront Trail east of the Northwest Landfill Area. The loss of one of the primary roost and approximately 50% of the suitable winter foraging habitat was considered as an adverse effect in the EA.

The smaller physical footprint of the BWRX-300 deployment provides an opportunity to retain the vegetation, and a portion of the foraging habitat, that was considered removed under the bounding scenario described in the EA.

Additionally, OPG's air quality and noise modelling [32] determined whether there would be any disturbance or other effect on the foraging and roosting habitats and found that any effects would be minor. CNSC staff have reviewed OPG's noise and dust modelling studies and concur with OPG's conclusion.

### **Bank Swallows**

The EA documented the removal of the shoreline bluffs in the development area of the DNNP site, which was as a significant Bank Swallows habitat. The removal of these bluffs would result in a decrease in the area available for the nesting habitat, supporting nearly 1,300 burrows, and an overall reduction in the Bank Swallows population. This was considered an adverse effect of DNNP and was evaluated further for mitigation measures and determination of residual effects. Nevertheless, following implementation of mitigation measures, the EA determined that the loss of approximately 1,000 active nesting burrows was a residual adverse effect of DNNP.

The JRP directed OPG to complete additional studies on the habitat, population biology, and conservation of this species, including conducting active monitoring

studies. Since the completion of the EA, CNSC staff note OPG has continued to support research on the Bank Swallows, including the creation of artificial nesting habitats at the Darlington Nuclear site and Pickering Generating Station.

The Bank Swallow population and its habitat was not considered in the EA as a receptor for interaction with DNNP, as the entirety of the habitat was anticipated to be removed. OPG has completed modelling studies assessing the potential for disturbances or impacts on the Bank Swallow population related to dust, noise, hydrogeology, blasting vibrations, and shoreline stabilisation work [32]. Results from these models indicated that the adverse effects on Bank Swallows, following the implementation of mitigation measures identified in the EA, are anticipated to be minor.

Table 7 below summarises OPG's assessment of the effects on the Bank Swallow population and its habitat, resulting from the deployment of the BWRX-300.

**Table 7: Potential effects on bank swallows habitat associated with the deployment of four BWRX-300 reactors**

Potential Effect	Assessment with BWRX-300 Deployment
Dust	<ul style="list-style-type: none"> <li>Minor potential disturbance prior to shoreline stabilisation work, or activities resulting in a change to groundwater contribution to the Bluffs.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>Assessments of noise effects on the habitat determined the effects are anticipated to be minor.</li> </ul>
Hydrogeology	<ul style="list-style-type: none"> <li>Multi-unit deployment can induce appreciable temporary changes to groundwater contributions to the Bluffs.</li> <li>Impacts to Bank Swallow habitat can be minimised or not realised depending on the timing of shoreline stabilisation activities.</li> </ul>
Vibration	<ul style="list-style-type: none"> <li>Effects on Bank Swallows and the habitat due to DNNP are minimal, as the habitat is anticipated to be subject to blasting velocity magnitudes less than those generated by St Marys Cement blasting operations [33].</li> </ul>
Shoreline Stabilisation	<ul style="list-style-type: none"> <li>Effect during construction of a multi-unit deployment (requiring shoreline stabilisation measures) but is consistent with the EA assumption that shoreline stabilisation measures would extend to the eastern boundary of the Darlington Nuclear site.</li> </ul>

Following the completion of the EA, the Bank Swallow and its habitat has been listed as Threatened under both the federal *Species at Risk Act* [25] and the Ontario *Endangered Species Act* [24]. Project activities that have an adverse effect on the Bank Swallow population or habitat (e.g., shoreline stabilisation) would require approvals and implementation of appropriate compensatory

measures from both ECCC and the Ontario Ministry of the Environment, Climate, and Parks (MOECP).

CNSC staff have reviewed OPG's EIS Review and concur that additional impacts on bird communities and species are not anticipated. Furthermore, CNSC staff concur with OPG's conclusions that the anticipated effects on Bank Swallows from the deployment of four BWRX-300 reactors, given the identified mitigation measures and with continuous monitoring, remains within the conclusions of the EA.

#### **2.2.2.6.4 Amphibians and Reptiles**

The EA determined that the likely effects on amphibians and reptiles was bounded by the direct loss of their respective habitats due to project activities. The three amphibian breeding areas (i.e., the Treefrog, Polliwog, and Dragonfly Ponds) were assumed to be completely removed during site preparation activities and therefore not assessed as a receptor for project interaction in the EA.

The EA also determined that the mitigation measures associated with the effects on Vegetation Communities (see subsection [2.2.2.6.1 – Vegetation Communities and Species](#)) would benefit amphibian and reptile habitats, and no other mitigation measures were proposed.

The deployment of the BWRX-300 would not result in the removal of the amphibian breeding areas, and subsequent hydrology [21] and hydrogeology assessments determined that with adequate delivery of water to these ponds, appreciable effects to amphibians are not anticipated. CNSC staff reviewed OPG's EIS Review and concur with the conclusion that effects on amphibians and reptiles are not anticipated.

#### **2.2.2.6.5 Mammal Communities and Species**

The EA determined that likely effects on mammal communities and species would result from the direct loss of habitat and disruption from activities occurring during the site preparation and construction phase.

It was concluded that although some mammals are already exposed to elevated noise levels and are habituated to noise at the Darlington Nuclear site, potential adverse effects caused by atmospheric deposition of dust on vegetation and collisions with DNNP-related traffic were likely. The EA identified mitigation measures for effects on vegetation communities (see subsection [2.2.2.6.1 – Vegetation Communities and Species](#)), which would also be applicable and beneficial for breeding mammals at the DNNP site.

The reduced physical footprint of the BWRX-300 provides the opportunity to retain mammalian habitat within the construction area assumed to be completely removed by the EA. Additionally, OPG's air quality and noise modelling [32] assessed whether there would be any disturbance or other effect on the mammalian population and their habitat and found that any effects would be minor. CNSC staff have reviewed OPG's noise and dust modelling studies and concur with OPG's conclusion.

## Bats

In the EA, bats were not considered a receptor or indicator species. However, as documented in the EIS Review [7][12], OPG has completed extensive bat monitoring studies [31][34][35][36] which documented eight distinct species on the DNNP site.

The Little Brown Myotis, the Northern Myotis, and the Tri-coloured Bat, as well as their habitat, are listed as endangered species under the Ontario *Endangered Species Act*. Project activities that have an adverse effect on the endangered Bat population or their habitat would require approvals and implementation of appropriate compensatory measures from the Ontario MOECP.

The smaller physical footprint of the deployment of the BWRX-300 reactors would not completely remove the woodland area, which also functions as bat habitat, and therefore potential project-environment interactions during all project phases may occur.

Potential impacts or disturbances on the bat population from interaction pathways related to dust and noise, changes in hydrogeology, and on-site illumination (e.g., security lighting) have been assessed by OPG, and effects were concluded as likely to be minor. Table 8 below summarises the potential effects on bat species and bat habitats predicted in OPG's assessments.

On-site illumination was assessed to provide the greatest impact to bat species, and an additional design mitigation measure has been proposed to reduce the impact on bats due to lighting while maintaining site security requirements.

**Table 8: Summary of potential effects to breeding mammals (bats) with the deployment of up to four BWRX-300 reactors**

Potential Effect	Assessment with BWRX-300 Deployment
Lighting	<ul style="list-style-type: none"> <li>• Potential abandonment of roosting areas, altering nightly emergence timing and foraging opportunities, increased risk of predation, severing key flight paths between critical habitats, and changing distribution of insects.</li> <li>• Greater effect on slower-flying bat species (e.g., Myotis species) as these species avoid lit areas.</li> <li>• Mitigation measures to limit the effect on bats and bat habitat include avoiding lighting on key habitat features, implementing dark buffer zones and limits on illumination surrounding habitats, implementing lighting specifications that minimise impact on bats (e.g., no ultraviolet and reduced blue-light components), and others.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Earthworks and grading activities during site preparation are anticipated to generate elevated noise</li> </ul>

Potential Effect	Assessment with BWRX-300 Deployment
	<p>levels during daylight throughout the active roosting season. These activities will occur in the northern portion of DNNP lands which likely supports Little Brown Myotis roosting. Most studies have identified reduction in activity due to elevated noise levels; however, these studies concentrated mainly on effects during nighttime and not during daylight hours.</p> <ul style="list-style-type: none"> <li>Existing ambient noise levels (see <a href="#">subsection 2.2.2.6.3 – Bird Communities and Species</a>) were measured around 54.2 dBA [32]. The greatest effect was measured within the potential Little Brown Myotis roost, where noise levels were predicted to reach 62.4 dBA, an incremental increase of 8.2 dBA over ambient.</li> </ul>
Dust Deposition in Woodlands and Swamp Habitats	<ul style="list-style-type: none"> <li>OPG has assessed the potential for adverse effects on bat habitats due to dust deposition, and found adverse effects are not anticipated (see <a href="#">subsection 2.2.2.6.1</a>).</li> </ul>
Hydrogeology and Hydrology	<ul style="list-style-type: none"> <li>OPG has assessed the potential for adverse effects on bats due to changes in hydrogeology and hydrology, and found adverse effects are not anticipated (see <a href="#">subsection 2.2.2.6.1</a>).</li> </ul>

CNSC staff reviewed the studies and supporting documentation provided by OPG on bat species, bat habitats, and the measures proposed to mitigate the effect on bat species and determined these measures to be adequate.

#### 2.2.2.6.6 Landscape Connectivity

In the EA, landscape connectivity describes the degree to which the landscape facilitates or impedes wildlife movement across the Darlington Nuclear site. The EA determined that likely effects on Landscape Connectivity are a result of physical disruptions associated with project activities during the Site Preparation and Construction phase. There are no regional connective pathways with the Darlington Nuclear site, and the local shoreline corridor is not continuous as it is interrupted due to the presence of the DNGS and St Marys Cement. The EA concluded that there will be some disruption to the east-west wildlife corridor during the Site Preparation and Construction phases, although movement of wildlife during this period is expected to be minimal.

However, the interruption of wildlife travel along the east-west corridor across the Darlington Nuclear site was considered an adverse effect of the DNNP, and the EA identified incorporating, to the extent practicable, design measures to maintain access for wildlife travel on the east-west wildlife corridor during construction activities, and to enhance the function of the corridor for the long term as a mitigation measure.

OPG has conducted annual biodiversity monitoring on the Darlington Nuclear site [31], including monitoring of wildlife traffic along the east-west corridor, and has noted the presence of wildlife despite roads and other major disturbances on the site. The mitigation measures identified in the EA would continue to address adverse effects on landscape connectivity and would apply to the deployment of the BWRX-300 reactors.

#### **2.2.2.6.7 Summary and Conclusion – Terrestrial Environment**

CNSC staff have reviewed the EA, OPG's EIS Review, as well as its supporting documentation, and conclude that the terrestrial environment project-environment interactions assessed within the Bird Communities and Species and Mammal Communities and Species subcomponents have been adequately assessed.

Taking into consideration updates from OPG's EIS Review, CNSC staff's review found that these changes do not alter the conclusion from the EA, which found no significant adverse environmental effects, provided the identified mitigation measures and follow-up program are implemented.

#### **2.2.2.7 Land Use Environment**

##### **2.2.2.7.1 Land Use**

The EA predicted two likely effects on land use VECs: a negative effect based on the aesthetics of the use of cooling towers, as well as the introduction of changes to development patterns as construction and operation activities on the DNNP site increase during the construction and operation project phases.

The EA predicted that as the DNNP commences through site construction and operation, there would be an increased intensity of activity on the DNNP site that would introduce changes to land use and development patterns. The EA concluded that any new land use surrounding the DNNP site would transition to industrial uses, and that for emergency planning purposes any new sensitive land uses are to be directed away from the site, resulting in a change to the development patterns away from those that would otherwise exist.

To mitigate the effect of new nuclear development and operation at the DNNP site, OPG was directed to monitor land use activity and development within a ten-kilometre land use assessment zone and consult with both the Municipality of Clarington and the Region of Durham on proposed land use changes within that zone.

OPG was also directed to continue to engage with the Region of Durham to implement the Growing Durham Study, the Preferred Growth Scenario, and monitor proposed future land uses in the primary and contiguous zones surrounding the site.

In its EIS Review, OPG reviewed the Municipality of Clarington current development plans and proposals to confirm that the surrounding region continues to be subject to increased population and economic growth. OPG stated the measures identified in the EA continue to be sufficient to mitigate any adverse

effects on land use planning and development in the area surrounding the DNNP site from the construction and operation of the BWRX-300 reactors.

CNSC staff have been engaged in land use planning and development discussions with OPG, the Municipality of Clarington, and the Region of Durham throughout the licensing period. As required by licence condition 3.2 of PRSL 18.00/2031 [3][6], OPG has provided staff with an annual report on activities conducted under the LTPS, including updated information on land use planning and potential sensitive use developments.

CNSC staff have reviewed these reports and concur with OPG's conclusions. CNSC staff continue to engage with OPG, the Municipality, and the Region in these discussions on a routine basis.

#### **2.2.2.7.2 Visual Setting**

The EA concluded that the visual aesthetic of the Darlington Nuclear site would be permanently altered in several aspects with new nuclear construction, although the existence and operation of cooling towers would provide the most dominant effect in the surrounding landscape. The visual dominance of the cooling towers and their vapour plume was considered an adverse effect on the environment. The EA identified several mitigation measures to reduce the adverse effects on aesthetics and socio-economic impacts; however, the visual effects of cooling towers from off-site locations were difficult to effectively mitigate, and the EA concluded the use of cooling towers would contribute a residual adverse effect.

OPG has selected the use of a once-through cooling system and the BWRX-300 design does not require the use of cooling towers.

In its submission, OPG states that the residual effect of DNNP on the visual aesthetics of the surrounding landscape, and as described in the visual setting environmental subcomponent, would be less prevalent than the effects assessed in the EA. CNSC staff agreed with OPG's conclusion that the mitigating measures regarding visual setting are no longer applicable.

#### **2.2.2.7.3 Summary and Conclusion – Land Use Environment**

CNSC staff continue to review OPG's annual Licence to Prepare Site activity reports, submitted as required by licence condition 3.2 of PRSL 18.00/2031. These reports continue to provide a summary of OPG's engagement efforts with the Municipality of Clarington and the Region of Durham regarding land use planning and proposals for sensitive use development in the area surrounding the Darlington nuclear site. In addition, CNSC staff often participate in meetings and discussions with OPG, the Municipality, and the Region on these matters.

CNSC staff reviewed the EA, OPG's EIS Review, and supporting documentation and conclude that no new land use related project-environment interactions are expected. CNSC staff also conclude that any changes to land use have been adequately assessed and documented. These changes do not alter the conclusion from the EA, which found no residual adverse environmental effects provided the identified mitigation measures are implemented.



Regarding the land use environment, CNSC staff conclude that OPG has adequately assessed changes since the completion of the EA, and that these changes do not alter the conclusions from the EA which found no significant adverse environmental effects, provided the identified mitigation measures and follow-up program are implemented.

### **2.2.2.8 Traffic and Transportation**

#### **2.2.2.8.1 Transportation System Operation**

##### **Summarised Results from the EA**

The single VEC for this sub-component is transportation system efficiency relative to transportation demand. The EA predicted that there will be certain intersections of Highway 401 that will experience decreased service capacity because of construction-related traffic. The EA predicted that the Highway 401 intersections at Courtice Road and Bowmanville Road (formerly known as Waverly Road) in Bowmanville, and the road network south of the Highway between these intersections, will experience decreased capacity. This was considered an adverse effect of DNNP.

The EA assumed substantial redevelopment work would occur on Highway 401 as a function of population and economic growth in the region, unrelated to the DNNP (e.g., the widening of the Highway throughout the area and at Holt Road, the addition of an interchange at Highway 401 and Holt Road, and the addition of traffic signals at key intersections). However, the EA determined there would remain a decrease in transportation system performance because of DNNP, after accounting for these improvements.

The EA did not identify adverse effects of DNNP on rail or marine transportation system operations and did not identify any mitigation measures.

##### **CNSC Staff Review of OPG's EIS Review**

In its EIS Review, OPG stated the BWRX-300 was expected to have a less workers present at each DNNP lifecycle stage compared to the EA. OPG states that during peak construction, BWRX-300 deployment would result in approximately 2,100 people on-site compared to 4,200 people predicted in the EA. The operational workforce for operation of a single BWRX-300 is estimated at 150 people, or approximately 600 people for operation of four reactors, compared to an estimated workforce of 1,400 for the reactors assessed in the EA.

The CN Railway corridor is expected to remain in service throughout the lifecycle of the DNNP, and rail service through the existing railway easement would not be affected by the DNNP. OPG states in its EIS Review that this assumption remains applicable and is consistent with the assessment of effects outlined in the EA.

The EA also assumed that there was potential to ship or transport oversized operating components to the DNNP site by marine transport. OPG states that this possibility remains with the selection of the BWRX-300. Therefore, CNSC staff

conclude the effects on the environment associated with marine transportation of components are consistent with the assessment in the EA.

### **2.2.2.8.2 Transportation System Safety**

#### **Summarised Results from the EA**

The single VEC for the Transportation System Safety sub-component is the safety of the transportation system. The EA predicted two potential effects on the safety of the transportation system as a result of the DNNP.

The EA predicted a potential for an increase in occurrence of collisions along the major roadways within the area surrounding the Darlington Nuclear site. The studies conducted identified issues encountered in traffic and road safety studies in similar study areas. The more prevalent concerns identified in this study included the condition of paved roads, the configuration of vehicle approaches to intersections, inadequate pedestrian accommodations, and deficiencies in vehicle sightlines. The EA concluded that as the volume of traffic would increase due to activity at the Darlington Nuclear site, the increased volume of traffic would add to the degradation of the roads and increase the potential for collisions or other vehicle incidents.

The EA also considered that an unknown quantity of excavated material could be removed from the Darlington Nuclear site and sent for disposal. This potential disposal location was unknown at the time of the EA, and the specific routes by which vehicles would remove this soil were also unknown. However, the study identified three northbound roads leaving the Darlington Nuclear site: Holt Road, Bowmanville Road (formerly known as Waverly Road), and Courtice Road as potential vehicle routes.

The study identified that the level crossing at Holt Road, with an unknown quantity of excavated material removed from the site for disposal, had the potential to contribute to an increased frequency of collisions between trucks and trains.

The EA concluded mitigating measures applied to the adverse effects to the environment identified in the Transportation System Operations sub-component would also address the effects on road-based Transportation System Safety, and no residual adverse effects were predicted.

#### **CNSC Staff Review of OPG's EIS Review**

In its EIS Review, OPG stated that BWRX-300 deployment is not anticipated to introduce changes in either marine or rail transport such that the safety of the transportation system would be affected.

CNSC staff have reviewed OPG's submission and have noted that the reduced physical footprint of the BWRX-300 deployment is estimated to result in a substantially lower volume of material to be excavated. Further, this estimated amount of material may likely be contained within the available volume in on-site disposal areas, potentially not requiring soil to be transported off the Darlington Nuclear site. As the potential for transporting excavated materials off-site across

railway level crossings was determined to contribute to an increased frequency of truck and train collisions, the ability to retain this material on-site further mitigates the adverse effect on Transportation System Safety identified in the EA. Therefore, CNSC staff concur that the conclusions of the EA remain valid.

### **2.2.2.8.3 Summary and Conclusion – Traffic and Transportation**

The EA predicted decreased service capacity of the transportation system and increased surface road traffic on Highway 401 between the Courtice and Bowmanville Road interchanges due to the DNNP. However, in its EIS Review OPG projects a decrease in vehicle traffic throughout the BWRX-300 lifecycle due to the reduction in the workforce required at each phase. OPG also states that the reduced footprint of the BWRX-300, and reduction in excavated material, results in a lower number of vehicles required to remove the material as compared to the EA.

OPG was required to put in place a Traffic Management Plan as a mitigating measure to reduce any adverse effect on the operation and safety of the transportation system during the site preparation and construction phases of DNNP. This submission was tracked as DNNP Commitment D-P-10.1. CNSC staff reviewed OPG's submission and concluded the plan was acceptable in April 2022.

OPG concludes that adverse effects to traffic and transportation system operation and safety, both on- and off-site, are anticipated to be less than the effects assessed in the EA. CNSC staff have reviewed OPG's submissions and concur with OPG's conclusions that the deployment of four BWRX-300 reactors would not introduce changes to rail or marine transport that could affect the safety of the transportation system. Therefore, CNSC staff concur that the conclusions of the EA remain valid.

### **2.2.2.9 Human Health**

OPG conducted a review of project-environment interactions, mitigation measures identified in the EA, and an assessment of any residual effects in the Human Health component. This component includes two subcomponents: Health and Well-being of the General Public, and Health and Safety of Workers.

Human health is defined by the World Health Organisation as a “*state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity,*” and OPG's review considered the original context of human health studies conducted in the EA, which focused on the areas of physical, mental, and social well-being.

#### **2.2.2.9.1 Physical Well-Being**

Physical well-being was found to be influenced by radiation and radioactivity, conventional worker health and safety, the atmospheric environmental conditions, surface water, and groundwater quality, as well as socio-economic conditions.

### **Radiation and Radioactivity: Health of Members of the Public**

The EA reported the annual dose due to radiological release to the environment for four different reactor technologies. The maximum annual effective dose to a member of the public, was determined to be 4.0  $\mu\text{Sv}$  (0.004 mSv) per year resulting from normal operations, well below the regulatory dose limit for members of the public specified in the [Radiation Protection Regulations](#). CNSC staff note that this maximum annual dose calculation was a conservative estimate to an individual residing at a dairy farm located approximately 6.8 km northwest of the DNNP site [16].

OPG completed a revised dose assessment [13] to consider releases from a single-unit and multi-unit deployment consisting of up to four BWRX-300 reactors, using a methodology consistent with the most recent Darlington Nuclear site environmental risk assessment. The assessment ascertained the doses to nine different groups of persons off-site (receptors) during normal operation of the BWRX-300, taking into consideration the reactor-specific source term. The receptors used by OPG in its EIS Review were the same as those used for the EA. All relevant exposure pathways and COPCs – in this case, nuclear substances expected to be released to atmosphere – were considered for normal operations, as well as during anticipated operational occurrences (AOO).

The receptor receiving the greatest dose is an infant residing at a dairy farm located approximately 6.8 km north-west of the DNNP site and assumed to reside at that location full time. For a four-unit BWRX-300 deployment, the estimated dose during normal operations to this receptor is 1.20  $\mu\text{Sv}/\text{year}$ .

Atmospheric releases of carbon-14 are estimated to contribute approximately 53% of the annual dose from normal operations, while atmospheric releases of iodine-131 are estimated to contribute approximately 41%. Table 2 in subsection [2.1.2.3 – Airborne Releases](#) provides the estimated releases from normal operations of the four-unit BWRX-300 station. CNSC staff review of OPG's estimates of airborne emissions from four BWRX-300 reactors concluded that the total releases are below the emissions estimated in the EA.

For normal operations, radiological doses to all receptor groups are approximately 30% of the bounding dose assessed in the EA, and all are significantly below the regulatory dose limit of 1 mSv per calendar year to a member of the public. The annual radiological dose to a member of the public for the normal operation of a multi-unit BWRX-300 deployment is within the bounds of the EA.

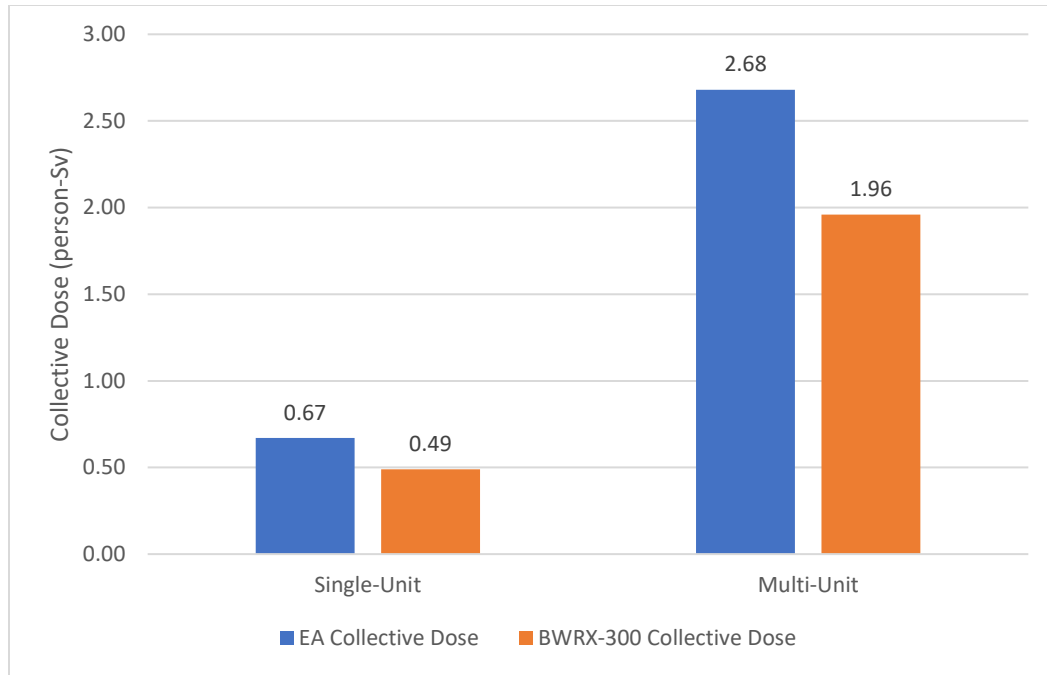
### **Dose to Workers**

The EA predicted a bounding annual collective dose for Nuclear Energy Workers (NEW) of 0.67 person-Sv per unit during normal operations and routine maintenance outages, for a total of 2.68 person-Sv for a multi-unit deployment of up to four reactors.

For the deployment of the BWRX-300, a preliminary occupational dose assessment [37] conducted by OPG predicts an annual collective dose of 0.49 person-Sv per unit for normal operations and routine outage maintenance

activities, for a total collective dose of 1.96 person-Sv for a multi-unit deployment of four BWRX-300 reactors.

Figure 2 below provides a comparison of occupational exposure to NEWs between the bounding scenario assessed in the EA and the deployment of the BWRX-300 reactors, for both a single-unit and up to four reactors.



**Figure 2: Comparison of occupational radiation dose to NEWs from the deployment of a single-unit and multi-unit BWRX-300 and the dose assessed in the EA**

Radiological doses to NEWs from a multi-unit BWRX-300 deployment are predicted to be within the regulatory dose limits in sections 13 and 14 of the *Radiation Protection Regulations* during normal operations and maintenance outages, and controlled consistent with subsection 4(1) of the *Radiation Protection Regulations*. This prediction continues to be within the bounds of the EA.

### Non-Radiological Human Health

The EA assessed releases of non-radiological contaminants of potential concern (COPC) to atmosphere and water. These bounding release values were assessed as posing a negligible risk to human health.

For the multi-unit deployment of four BWRX-300 reactors, maximum emission rates of non-radiological COPCs (see subsection [2.2.2.1.1 – Effect on Air Quality](#)) were estimated throughout the site preparation and construction phase, and determined to be lower than the rates assessed in the EA. The number of potential sources of airborne non-radiological emissions during the operations phase, including the number of staff vehicles, would also be lower than that assessed in the EA.

OPG concludes that the risks to human health from emissions of non-radiological COPCs would be negligible. CNSC staff have reviewed OPG's analyses and supporting information and concur with OPG's assessment.

### **Occupational Health and Safety of Workers**

The EA credited OPG with its Occupational Health and Safety program, which is designed to ensure workers can work safely and in a healthy and injury-free workplace. OPG's workplace, including the nuclear generating stations, is subject to the province of Ontario's *Occupational Health and Safety Act*, and is regulated by the Ontario Ministry of Labour.

The deployment of the BWRX-300 is subject to the same occupational health and safety program, work practices, procedures, and regulatory requirements, as the DNGS. CNSC staff have concluded this is consistent with the EA.

#### **2.2.2.9.2 Mental Well-Being**

The EA describes the effects of DNNP on Mental Well-being, as it relates to the population's feelings of personal health and safety, their satisfaction with the community, and the effects of traffic.

#### **Feelings of Personal Health and Safety**

Public attitudes research was conducted in the EA, indicating that community interaction is a significant determinant for the population's feelings of personal health, to which opportunities for recreation, community spirit, and access to services that safeguard and protect physical health contribute substantially. OPG conducted follow-up studies measuring public attitudes, with the most recent study completed in 2019 [38] for the renewal of the Site Preparation licence. These studies indicated that area residents have expressed higher ratings of personal feelings of health, safety, and confidence than originally assessed in 2009 with the EA.

OPG concludes that the deployment of the BWRX-300 reactors is unlikely to change local attitudes regarding the Darlington Nuclear site. CNSC staff note that OPG continues to conduct public outreach to build and maintain trust in the communities surrounding the Darlington site.

#### **Satisfaction with the Community**

The public attitude research conducted for the EA identified that nearly all respondents were either "very satisfied" or "somewhat satisfied" with living in their community; however, the research showed that the population's satisfaction with the community would decrease if cooling towers were pursued as an option for the DNNP.

The deployment of the BWRX-300 reactors would not require construction or operation of cooling towers, and OPG concludes that the high levels of community satisfaction would remain.

### **Effects of Traffic**

A more detailed discussion of the effect of increased volume of traffic, both on and in the surrounding areas of the DNNP site, is provided in subsection [2.2.2.8 – Traffic and Transportation](#) of this CMD.

The EA concluded that there were no residual adverse effects on the transportation system due to the DNNP. The deployment of the BWRX-300 would have a lower volume of on-site traffic, and therefore is unlikely to negatively affect the mental well-being of members of the public.

#### **2.2.2.9.3 Social Well-Being**

The EA described the effects of the DNNP on social well-being, identifying the following influencing aspects: employment, income level, availability of community recreational facilities and programs, as well as community cohesion.

##### **Employment and Income**

The EA concluded that the DNNP will result in the creation of new direct, indirect, and induced employment opportunities and, with these opportunities, the associated beneficial effects on household incomes. Development of the DNNP was predicted to positively influence employment growth in the Region of Durham as well as surrounding local communities.

OPG concluded that these beneficial effects on employment and associated household income would also apply to enhance social well-being with the deployment of the BWRX-300, albeit at a smaller magnitude than estimated in the EA.

##### **Community Recreational Facilities and Programs**

The EA concluded that the development of the DNNP could require the removal of the soccer fields and a portion of the Waterfront Trail that are currently located on the Darlington Nuclear site. This would result in a direct loss to the public who use these facilities for recreational purposes.

With the smaller physical footprint of the BWRX-300 deployment, OPG notes that there is potential to plan the deployment in such a manner as to avoid some of the effect of the loss of recreational facilities.

##### **Community Cohesion**

Public attitude research conducted for the EA identified that residents felt a strong sense of belonging in their communities, regardless of the distance from the Darlington site. The research also indicated that most respondents (~81%) did not anticipate that the DNNP project would affect the cohesion of their community.

Given the very few adverse effects of the BWRX-300 deployment on socio-economic components, it is anticipated that this level of community cohesiveness would remain.

### **Social Well-Being of Workers**

The EA concluded that both OPG and the Darlington Nuclear site are one of the major contributors to overall community and social well-being. It is anticipated that much of the BWRX-300 workforce, particularly those associated with the Operations and Maintenance phase of DNNP, would reside in one of the several local surrounding communities.

OPG concluded that since the BWRX-300 workforce would likely reside in communities surrounding the DNNP site, those workers would experience the same sense of social well-being and community satisfaction as those currently living in these communities.

#### **2.2.2.9.4 Summary and Conclusion – Human Health**

CNSC staff conclude that deployment of up to four BWRX-300 reactors would result in a radiological dose to the most exposed human receptor estimated to be 1.20  $\mu\text{Sv}/\text{year}$ . This estimated dose is lower than the dose estimated in the EA and consequently poses a negligible radiological risk to human health. Doses to workers onsite due to operation of the BWRX-300 reactors are anticipated to be well below the regulatory limits for NEWs, consistent with the ALARA principle specified in the *Radiation Protection Regulations*.

CNSC staff have reviewed the EA, OPG's EIS Review, as well as its supporting documentation, and conclude that there are no new Human Health project-environment interactions expected. CNSC staff also conclude that changes to human health assessments have been adequately assessed, and that these changes do not alter the conclusion from the EA which found no residual adverse environmental effects, provided the identified mitigation measures are implemented.

#### **2.2.2.10 Health of Non-Human Biota**

OPG conducted a review of project-environment interactions, mitigation measures identified in the EA, and an assessment of any residual effects in the Health of Non-Human Biota component. This component assessed the likely radiological effects on aquatic and terrestrial non-human biota resulting from radiological releases from the DNNP.

A bounding scenario dose to non-human biota was calculated in the EA using modelled emissions to be 0.30  $\mu\text{Gy}/\text{day}$  and 4.7  $\mu\text{Gy}/\text{day}$  for aquatic and terrestrial biota, respectively. CNSC staff note that both these dose estimates were well below the radiological benchmark values of 9.6 mGy/day (9 600  $\mu\text{Gy}/\text{day}$ ) and 2.4 mGy/day (2 400  $\mu\text{Gy}/\text{day}$ ), respectively, outlined in CSA N288.6 – *Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills* [39].

OPG also calculated dose to non-human biota resulting from the BWRX-300, using a methodology consistent with the recent Darlington nuclear site environmental risk assessment. Grasses were identified as critical receptor within the terrestrial environment.



For a multi-unit deployment of four BWRX-300 reactors, the highest dose to the grass was estimated to be 61.6 nGy/day (6.16E-05 mGy/day). Table 9 below shows the absorbed dose to grasses.

**Table 9: Absorbed dose to the most-affected non-human receptor from BWRX-300 emissions as compared to the bounding scenario from the EA**

	<b>Critical Receptor Name</b>	<b>Bounding Scenario Dose from EA (Multi-Unit, mGy/day)</b>	<b>Dose from a Multi-Unit BWRX-300 (mGy/day)</b>
Terrestrial Receptor	Grasses	4.7E-03	6.16E-05

### **Summary and Conclusions – Health of Non-Human Biota**

CNSC staff have reviewed the EA, OPG’s EIS Review, as well as its supporting documentation, and conclude that no new project-environment interactions in the health of non-human biota are expected. CNSC staff also conclude that changes to supporting assessments related to the health of non-human biota have been adequately assessed, documented, and therefore the conclusions of the EA remain valid.

#### **2.2.2.11 Malfunctions, Accidents, and Malevolent Acts**

OPG’s EIS Review compared the safety of the BWRX-300 reactor and the potential effects of anticipated malfunctions and accidents with the assessments conducted as part of the EA.

This subsection focuses on CNSC staff’s review of OPG’s submission concerning the BWRX-300 Probabilistic Safety Analysis (PSA). CNSC staff focused its review on nuclear accidents leading to a potential radiological release to the environment. In this context, a nuclear accident is defined as a radiological accident that may be caused by damage to the reactor core, or from other radioactive sources.

A hazards screening analysis, where credible hazards are identified and described, is one of the preliminary steps in the process to identify malfunctions and accidents. This would include internal hazards (such as pipe whips, turbine-generated missiles, etc.), as well as external hazards (such as earthquakes, flooding), and non-malevolent human-induced events (such as aircraft crashes or other transportation hazards).

Potential combinations of external hazards and any interaction of internal and external hazards are also considered. A qualitative assessment, based on the consequence of the events, and a quantitative assessment, based on the likelihood of the event occurring, are performed to screen these potential hazards. CNSC staff note that hazards that do not pass screening are typically carried forward for assessment in one of several PSA studies; however, it is possible to bypass the screening analysis and complete a PSA study for a particular hazard.

The screening assessment concluded there are no major hazards that cannot be screened out (i.e., no hazards that cannot be suitably mitigated). Nevertheless, OPG elected to bypass the screening analysis and conduct a PSA study for seismic, high wind, and internal fire hazards [40].

CNSC staff reviewed the BWRX-300 PSA results, based on the design completion to date [41], and noted the following:

- The estimated core damage frequency from all hazards is 9.62E-08 events per reactor year, which is two orders of magnitude lower than the regulatory safety goal of 1.0E-05 events/year, specified in REGDOC-2.5.2 – *Design of Reactor Facilities* [42].
- The estimated small release frequency for all hazards is 8.28E-08 events/reactor year, which is two orders of magnitude lower than the corresponding small release safety goal of 1.0E-05/year required by REGDOC-2.5.2. CNSC staff also noted that the accident sequence resulting in a small release also meets the threshold for a large release—that is, an accident that releases quantities of iodine-131 that meet the threshold for a small release will also release quantities of caesium-137 that meets the threshold for a large release.
- The estimated large release frequency for all hazards is also 8.28E-08 events/reactor year, which is a single order of magnitude lower than the corresponding large release safety goal of 1.0E-06/year required by REGDOC-2.5.2.

Table 10 below summarises the BWRX-300 PSA results to date and compares these results with the regulatory safety goals required by REGDOC-2.5.2.

**Table 10: Comparison of BWRX-300 PSA results against regulatory criteria from REGDOC-2.5.2**

Safety Goal (REGDOC-2.5.2 / RD-337)	Limit (Events per reactor year)	BWRX-300 All-Hazard Estimate (Events per reactor year)
Core damage frequency	< 1.0E-05	9.62E-08
Small release frequency	< 1.0E-05	8.28E-08
Large release frequency	< 1.0E-06	8.28E-08

CNSC staff's review of OPG's submissions to date [41] have demonstrated that the design of the BWRX-300 meets the safety goals included in REGDOC-2.5.2.

CNSC staff note that OPG is finalising the methodologies governing severe accidents and the bounding cases corresponding to releases of iodine-131 in an amount greater than 1 PBq (1E10+15 Bq) and caesium-137 in an amount greater

than 100 TBq ( $1E+14$  Bq). In subsequent PSA submissions for future licensing phases, OPG has committed to demonstrate that there are no accident sequences that exceed the threshold for small and large release frequencies. CNSC staff will review these submissions to confirm that the remaining credible accident sequences have source terms below the thresholds required by REGDOC-2.5.2 for small and large releases.

CNSC staff have reviewed the EA, OPG's EIS Review, as well as OPG's submissions to date and concur that the conclusions from the EA remain valid.

### **Radiological and Transportation Accidents and Malfunctions**

In the EA, radiological and transportation accidents and malfunctions assessed consist of a bounding accident scenario of a "pool fire" for low- and intermediate-level waste, and a dropped spent fuel dry storage canister causing damage to 30% of the contained fuel assemblies [17][18].

The "pool fire" accident scenario consists of a spill of gasoline or diesel fuel from a material handling vehicle that is assumed to catch fire adjacent to a stack of waste containers. The estimated dose to workers and members of the public from this accident scenario, for low-level wastes are 0.3% of the dose for the equivalent scenario estimated in the EA. This reduction is attributed to a decrease in expected releases of tritium and carbon-14 from the BWRX-300 reactors.

The estimated dose to workers and members of the public for this accident involving intermediate-level waste is approximately 10 times greater than the dose for the equivalent scenario estimated in the EA. The change in dose estimates for an intermediate-level waste accident is attributed to an increase in the BWRX-300 source term for alpha emitting radionuclides.

CNSC staff reviewed OPG's assessment for an accident involving used fuel, in which a fuel dry storage canister is dropped causing damage to a portion of the stored fuel assemblies. Although a BWRX-300 fuel assembly contains approximately 40% less krypton-85 radioactivity as compared to the source terms for the reactors assessed in the EA, it consists of a larger number of assemblies (89) per storage container than those assessed in the EA (40). The krypton-85 activity released in this accident scenario is therefore expected to be slightly higher, and the resulting dose to workers is approximately 28% higher than the dose for the same scenario assessed in the EA. Similarly, the dose to the public is 54% higher than predicted in the EA for this same scenario.

The doses estimated to workers and members of the public are provided in Table 11 below for comparison.

**Table 11: Dose estimates to members of the public and critically affected workers from radiological accidents with the BWRX-300 and the bounding scenario from the EA**

Bounding Scenario	Dose Estimate from the EA		Dose Estimate for the BWRX-300	
	Member of the Public	Worker	Member of the Public	Worker
LLW (pool fire)	0.014 mSv	14.2 mSv	4.0E-05 mSv	0.04 mSv
ILW (pool fire)	0.083 mSv	1.43 mSv	0.80 mSv	13.8 mSv
Dry Spent Fuel Storage Container drop	0.24 mSv	33.9 mSv	0.37 mSv	45.0 mSv

CNSC staff note that the EA identified the regulatory dose limits for workers and members of the public in the *Radiation Protection Regulations* as evaluation criteria for workers and for members of the public. These evaluation criteria were concluded to remain applicable to the BWRX-300.

CNSC staff note that accidents and malfunction scenarios for refurbishment wastes assessed in the EA were determined to not be relevant to the BWRX-300 deployment, as these scenarios involved a retube waste container and steam generator from the refurbishment of a CANDU reactor, as well as the drop of a CANDU steam generator. As the design of the BWRX-300 reactor does not contain pressure tubes or steam generators, neither of these scenarios are applicable to the BWRX-300. Additionally, the life of the reactor is 60 years and, while there may be replacement of major components at that time, no mid-life refurbishment is expected. No other scenarios specific to the BWRX-300 were identified.

### Summary and Conclusion

For radiological accidents and malfunctions, the estimated dose to workers and members of the public were below the bounding scenario for the low-level waste pool fire. For all other scenarios, the estimated doses to workers and members of the public increased from the estimates in the EA, as noted in Table 11. While these doses are higher than the original EA estimates, CNSC staff conclude that these increased dose estimates remain consistent with the evaluation criteria from the EA, for both workers and members of the public, as the estimated doses are lower than the regulatory dose limits from the *Radiation Protection Regulations*. OPG will be expected to put compensatory measures in place to maintain doses to workers ALARA throughout the lifecycle of the facility.

CNSC staff conclude that these dose estimates remain consistent with the evaluation criteria from the EA for both workers and members of the public, and the conclusions of the EA remain valid.

### 2.2.2.12 Assessment of Other Likely Effects

The EA considered the effects of DNNP on overall sustainability, as well as the likely effects of the environment on DNNP. The EA considered the following environmental effects on the nuclear facility: flooding, severe weather, seismicity, biophysical environment, and anticipated effects due to climate change.

OPG's EIS review indicated that seven updated environmental standards were identified, and that application of these updated standards to baseline data does not alter the conclusions in the EA.

CNSC staff's assessment of each aspect is discussed below.

#### 2.2.2.12.1 Flooding and Severe Weather

The EA flooding assessment included three sources of potential flood risk to the Darlington Nuclear site: coastal flooding, on-site or near-by watercourse flooding, and direct surface runoff. Other potential flooding hazards such as lake ice, river ice/debris jamming, landslides or avalanche, and combined events were also evaluated. For this purpose, OPG conducted a flood hazard assessment for the Darlington Nuclear site that meet the requirements of IAEA Specific Safety Guide (SSG) SSG-18 [Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations](#) [43] and CNSC [REGDOC-1.1.1 – Site Evaluation and Site Preparation for New Reactor Facilities](#) [44]. OPG's flood hazard assessment concluded that no significant effects from BWRX-300 deployment are anticipated once design and contingency features are considered.

CNSC staff note the original 2009 flood hazard assessment [45] was updated in 2022 [46], and CNSC staff concluded that it meets the requirements of IAEA SSG-18 and CNSC REGDOC-1.1.1. The probable maximum precipitation (PMP) values used for the assessment of flood hazards due to surface runoff are based on the Ontario Ministry of Natural Resources *Lakes and Rivers Improvement Technical Guidelines*, published in 2004 [47]. ECCC staff conducted an independent calculation of the PMP values for the DNNP site, based on the latest available information, to validate the applicability of these values to the 2022 flood hazard assessment. CNSC staff note that ECCC's calculation accounts for potential changes in extreme precipitation events due to climate change, resulting in PMP estimates slightly lower than the PMP values used in the updated flood hazard assessment [46].

CNSC staff have reviewed the EA, EIS Review, 2022 flood hazard assessment, and other supporting documentation, and concluded that the deployment of the BWRX-300 reactors would not impact the conclusion of no significant residual adverse effects due to a flood.

#### Severe Weather

The EA severe weather assessment included meteorological hazards such as tornadoes, tropical cyclones, thunderstorms and hailstorms, and freezing rain. For this purpose, OPG evaluated of meteorological events meeting the requirements of IAEA SSG-18. The EA assessment stated that the structures associated with the DNNP were to be designed and constructed such that the structures can resist damage resulting from severe weather-related events.

OPG's EIS Review concluded that the BWRX-300 deployment is consistent with the assessment of the risk of severe weather conducted in the EA. Design requirements and mitigation measures related to severe weather are noted in the OPG Commitment Report [10].

CNSC staff have reviewed the EA, EIS Review and supporting documentation and concluded that the BWRX-300 deployment would not impact the conclusion of no significant residual adverse effects due to severe weather.

#### **2.2.2.12.2 Seismicity**

The EA seismic hazard assessment and related studies carried out for DNNP identified no seismicity-related issues that would render the DNNP site unsuitable for construction of new nuclear facilities. It stated that potential effects of seismicity and related phenomena will be addressed through a rigorous, conservative, and regulated design and construction process, such that key systems which are critical to the safe shutdown of the station will function as planned in the event of a seismic or related natural event during operation of the station. The EA further states that during implementation of DNNP, detailed site geotechnical evaluations will be performed to provide definitive dynamic properties of site rock and soil for plant design purposes. Furthermore, as part of the plant licensing process, the selected vendor will verify that the plant design is capable of safely withstanding the potential effects associated with the site-specific seismic hazard.

OPG conducted a comprehensive geotechnical investigation on the onshore power block, which provides necessary site-specific information for a seismic hazard assessment and developed a site-specific probabilistic seismic hazard assessment (PSHA), which presents the seismic hazard characterization for the deeply-embedded BWRX-300. CNSC staff's review of the assessment noted that it follows the guidance provided in CNSC REGDOC-2.5.2 and CSA N289 Series.

OPG's EIS Review concluded that no seismicity related issues would render the DNNP site unsuitable for construction of new nuclear facilities, provided that the BWRX-300 deployment meets all site-specific geotechnical and seismic requirements described in the DNNP Commitments Report. CNSC staff have reviewed information in the detailed geotechnical investigation report and the site-specific PSHA and concur with OPG's conclusion in the EIS Review. Therefore, the conclusions of the EA remain valid.

### 2.2.2.12.3 Biophysical Environment

The EA included an assessment of biophysical effects that assessed the effects of zebra and quagga mussels, attached algae, fish, ice, and silt on DNNP. The EA concluded that mussel management strategies in place were adequate, and that no further contingency measures were required to supplement the existing design and mitigation features that will be in place to resist fouling. With respect to attached algae, it was concluded that effects are adequately addressed through design and contingency measures such as routine cleaning and maintenance of the intake structures. Impingement of fish at the CCW intake is not expected to affect the operation of the new nuclear station. Mitigation measures are available to minimize the occurrence of frazil ice formation. OPG assessed silt accumulation near the CCW intake structure and determined it was unlikely to affect the station.

OPG's EIS Review concluded that the BWRX-300 deployment is consistent with the assessment of the risk of biophysical effects conducted in the EA, since these are characteristics inherent to the Darlington Nuclear site and will exist regardless of reactor technology. OPG's updated assessment concluded that the effects of mussels, attached algae, fish impingement, ice, and silt at the Darlington Nuclear site are bounded by the EA. Design requirements and mitigation measures related to biophysical effects are noted in the OPG Commitment Report.

CNSC staff have reviewed the EA, EIS Review, and supporting documentation and conclude that any changes to the biophysical effects assessment due to BWRX-300 deployment have been adequately assessed and would not impact the conclusion of no adverse effects.

### 2.2.2.12.4 Effects of Climate Change

The EA evaluated proposed DNNP physical structures and systems against climate parameters (i.e., precipitation, frequency and severity of extreme weather events, and Lake Ontario effects). Sensitivity to potential changes in climate was assessed following the 2003 guidance document [\*Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners\*](#) by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. The guidance outlines a procedure for assessing whether a proposed project may contribute to GHG emissions, and whether climate change may have an impact on a project.

The EA analysed the potential impact of climate change over the next 100 years and indicated that the magnitude and frequency of extreme weather events (such as high intensity precipitation) could increase over time. It concluded that despite possible changes to the climate in the future, there were no climate parameters that would influence the proposed physical structures or systems of the DNNP, resulting in a risk to either the public or the environment. No medium or high-risk interactions between climate change parameters and DNNP were identified due to the mitigations that will be incorporated into the design, such as enhanced ability to deal with extreme weather events.

OPG's EIS Review assessed the effects of climate change on the BWRX-300 deployment and effects of the DNNP on climate change and concluded that BWRX-300 deployment does not change the conclusion of the EA.

CNSC staff have reviewed the EA, EIS Review and supporting documentation and concluded that the BWRX-300 deployment would not impact the conclusion of no significant residual adverse effects due to climate change.

#### **2.2.2.12.5 Assessment of Cumulative Environmental Effects**

CNSC staff have reviewed the EA and OPG's EIS Review to determine if the BWRX-300 deployment might result in residual significant adverse cumulative effects which would require additional mitigation.

The assessment of cumulative environmental effects in the EA is focused on past, present, and future projects within surrounding regional area that have potential to act cumulatively (i.e., coincide or overlap) with the DNNP. The EA concluded that there was only one residual cumulative adverse effect: the combined visual and related community effects related to the use of cooling towers and other tall structures existing and foreseeable in the area surrounding the Darlington Nuclear site.

OPG's EIS Review described the updated status of other projects identified in the EA, and an updated assessment of cumulative effects on VECs within the aquatic environment, terrestrial environment, land use and visual settings, and socio-economic conditions.

OPG found no new adverse effects from the BWRX-300 deployment on these receptors or other environmental components that require further consideration in the cumulative effects assessment. Due primarily to a smaller footprint of the BWRX-300, it is expected that residual cumulative effects with an equal or lesser overall effect on other on-site and off-site projects have potential to occur and cooling towers would be no longer required.

CNSC staff reviewed OPG's EIS Review and supporting documents and conclude that changes to the original assessment of cumulative environmental effects for the DNNP have been adequately assessed in the EIS Review. CNSC staff concur with OPG's assessment that residual significant adverse cumulative effects associated with the proposed deployment of BWRX-300 are not likely to occur. Therefore, CNSC staff determined that the conclusions of the EA remain valid.

#### **2.2.3 Responsible Authority Review of OPG's Environmental Impact Statement Review Report**

As required by the GOC's response to the JRP EA report, CNSC staff sought review and advice from other responsible authorities on OPG's submission. Representatives from DFO and Transport Canada provided assessments of OPG's EIS Review within their areas of expertise. The following subsections present an overview of the determinations from each of the responsible authorities.



### 2.2.3.1 Transport Canada

Transport Canada is considered a responsible authority required to provide regulatory approval for several aspects of the DNNP considered at the time of the EA:

- Shoreline protection works,
- Construction of the intake, outfall, and diffuser system, and
- Infilling of Lake Ontario.

Transport Canada is responsible for administration of the *Canadian Navigable Waters Act* (CNWA), which prohibits any activities that affect a navigable waterway without ensuring compliance with the CNWA. Pursuant to the CNWA, Transport Canada has defined criteria for projects (e.g., erosion protection and outfalls and water intake projects) that may be classified as “minor works,” under which Transport Canada approval may not be required. OPG would be required to publish a “notification of work” for all “minor works” projects through Transport Canada; however, the scope of work must meet these defined project criteria.

Transport Canada is also responsible for administration of the *Vehicle Operation Restriction Regulations* (VORR). Currently, the VORR in place at the Darlington Nuclear site prohibits waterborne vehicle traffic in the area surrounding the existing DNGS intake and outfall structures. OPG would require an amendment to the VORR to extend its coordinates to include the intake and outfall structures for the DNNP, to which Transport Canada holds regulatory authority.

Transport Canada concluded [48] that, within its areas of responsibility and authority, OPG’s selection of the BWRX-300 reactor technology does not introduce a fundamental difference that would affect its role as a regulatory authority.

### 2.2.3.2 Fisheries and Oceans Canada

DFO is considered a responsible authority required to provide regulatory approval for several aspects of the DNNP considered at the time of the EA:

- Shoreline protection works affecting aquatic habitat and species,
- Construction of the intake, outfall, and diffuser system as it affects aquatic habitat and species, and
- Infilling of 0.40 km<sup>2</sup> (40 hectares) of Lake Ontario affecting aquatic habitat and species.

DFO is responsible for the administration of the *Fisheries Act*, which prohibits the carrying out of any work, undertaking, or any activities that cause death of fish or harmful alteration, disruption, or destruction of fish habitat.

Certain licensed activities during site preparation and construction could result in harmful alteration, disruption, or destruction of fish habitat and may require an authorisation under the *Fisheries Act*. OPG may require an authorisation for any

in-water work to stabilise the Lake Ontario shoreline, or to construct the DNNP intake and outfall structures, to which DFO holds regulatory authority.

Fisheries and Oceans concluded that, within its areas of responsibility and authority, OPG's selection of the BWRX-300 reactor technology does not introduce a fundamental difference that would affect its role as a regulatory authority.

### **3 INDIGENOUS AND PUBLIC CONSULTATION AND ENGAGEMENT**

This section of the CMD will provide an overview of the engagement activities CNSC staff have conducted or participated in with respect to the review of the EIS and PPE documents.

#### **3.1 Indigenous Consultation and Engagement**

The common-law duty to consult with Indigenous Nations and communities applies when the Crown contemplates actions that may adversely affect potential or established Indigenous and/or treaty rights. The CNSC, as an agent of the Crown, ensures that all licence decisions under the NSCA and decisions under other applicable legislation, uphold the honour of the Crown and consider Indigenous peoples' potential or established Indigenous and/or treaty rights, pursuant to section 35 of the *Constitution Act, 1982*.

CNSC staff remain committed to building long-term relationships with Indigenous Nations and communities who have interest in CNSC-regulated facilities within their traditional and/or treaty territories. The CNSC's Indigenous engagement practices include sharing information, discussing topics of interest, seeking feedback and input on CNSC processes, and providing opportunities to participate in environmental monitoring programs. The CNSC also provides funding support, through its Participant Funding Program, for Indigenous peoples to meaningfully participate in Commission proceedings and ongoing regulatory activities.

CNSC staff identified the following Indigenous Nations and communities who have Indigenous and/or Treaty rights in the area where the DNNP is proposed:

- Alderville First Nation
- Curve Lake First Nation (CLFN)
- Hiawatha First Nation (HFN)
- Mississaugas of Scugog Island First Nation (MSIFN)
- Chippewas of Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation

In addition, CNSC staff have identified the following Indigenous Nations and communities that have expressed an interest in the DNNP:

- Saugeen Ojibway Nation (SON)
- Mohawks of the Bay of Quinte
- Métis Nation of Ontario (MNO)
- Six Nations of the Grand River

CNSC staff have been engaging with the identified Indigenous Nations and communities on an ongoing basis concerning nuclear projects at the Darlington site and have Terms of Reference in place for long-term engagement with several of the identified Indigenous Nations and communities — including with HFN, CLFN, MSIFN, MNO, and the SON. The Terms of References provide a forum for collaboration and a structure for regular meetings to address areas of interest regarding CNSC-regulated facilities and activities, including the DNNP.

During these recurring meetings, CNSC staff provided updates specific to the DNNP, reminders of upcoming engagement activities and contribution deadlines. CNSC staff have offered to have DNNP specific meetings to discuss issues of concern, and to collaborate proactively on an approach to consultation and engagement for the DNNP regulatory process, including on the applicability of the DNNP EA and PPE to the BWRX-300 reactor technology. CNSC staff have also provided multiple opportunities to apply for participant funding to support participation in the DNNP regulatory process for all identified Indigenous Nations and communities.

### **3.1.1 Background on Indigenous Consultation during the 2009 Environmental Assessment**

Throughout the EA process for the DNNP, both the CNSC and the CEAA consulted with potentially impacted or interested Indigenous Nations and communities. Consultation efforts during this process included letters, emails, telephone calls, and meetings at key points, including an invitation to review and provide comments on OPG's EA and licence to prepare site application in 2009.

CNSC staff encouraged Indigenous Nations and communities to submit information to the JRP and to participate in the public hearings. Funding to participate in the review of DNNP was also made available. The JRP EA report indicated that CNSC and CEAA staff concluded that the DNNP was not likely to result in significant adverse effects on the current use of land and resources for traditional purposes by Indigenous peoples. Additional information about consultation activities related to the EA process can be found in the JRP EA report [4].

Throughout the EA process, the importance of ongoing engagement and opportunities for Indigenous Nations and communities to be involved during DNNP's lifecycle was highlighted. CNSC staff have continued to implement this practice through ongoing engagement with Indigenous Nations and communities

on key topics of interest, the renewal of the LTPS in 2021, as well as the current EIS Review process.

CNSC staff acknowledge that consultation and engagement requirements and expectations have evolved since the EA was conducted, including the Government of Canada's commitment to reconciliation. In 2018 the Williams Treaties Settlement Agreement was signed, which recognised the pre-existing Treaty harvesting rights and included an apology from the Honourable Carolyn Bennet, then Minister of Crown-Indigenous Relations, on behalf of the Government of Canada for the negative impacts of the 1923 Williams Treaties on the Williams Treaties First Nations.

The CNSC has ensured that the consultation and engagement process, as described in this CMD for the applicability of the EA, as well as the larger licence to construct application, has taken into consideration the recent changes and the evolution of best practices. The CNSC remains committed to continuous improvement of its consultation and engagement processes.

### 3.1.2 Consultation and Engagement Activities in Relation to the Applicability of the BWRX-300 Reactor to the DNNP Environmental Assessment

CNSC staff provided regular updates and information about opportunities for involvement in the DNNP regulatory process to date. CNSC staff have frequently offered to discuss how each Indigenous Nation or community would like to be consulted, engaged, and receive information for the DNNP regulatory process. Follow-up emails and/or phone calls were conducted for the correspondence listed below to confirm receipt, reiterate the information provided, and answer any follow-up questions. Table 12 provides a summary of key correspondence sent to date.

**Table 12: Key Correspondence with Indigenous Nations and communities**

Date	Indigenous Nation or community	Correspondence
May 2022	Alderville First Nation CLFN HFN MSIFN Chippewas of Beausoleil First Nation Chippewas of Georgina Island First Nation Chippewas of Rama First Nation Mohawks of the Bay	CNSC staff sent email correspondence providing advance notice of OPG's expected Licence to Construct application and provided information about ongoing engagement opportunities.

Date	Indigenous Nation or community	Correspondence
	of Quinte MNO	
November 2022	All identified Indigenous Nations and communities	CNSC staff sent letters indicating that OPG had submitted an application for a Licence to Construct for the DNNP. These letters provided information about the Environmental Assessment process, the requirement for OPG to demonstrate how the selected technology (BWRX-300) fits within the bounds of the approved EA, as well as participant funding offered to review OPG's documents.
November 2022	Alderville First Nation	In response to the notification letter, Alderville First Nation raised concerns about how fuel bundles will be stored and kept in a safe place away from the possibility of contamination. CNSC staff provided information regarding the requirement for OPG to submit a waste management plan and offered to meet with the Nation to discuss their concerns, the DNNP, and CNSCs regulatory process in more detail. CNSC staff did not receive a response.
December 2022	All identified Indigenous Nations and communities	CNSC staff sent an email notification that OPG's PPE and EIS Review documents were available for review and comment on the "Let's Talk Nuclear Safety" website, and included an offer for each Nation to meet with CNSC staff.
February 2023	All identified Indigenous Nations and communities	CNSC staff sent email invitations to attend the April 4, 2023 DNNP workshop
March and April 2023	MSIFN HFN SON	CNSC staff received comments on OPG's PPE and EIS Review documents. CNSC staff offered to meet with the MSIFN, HFN, SON to discuss their

Date	Indigenous Nation or community	Correspondence
		concerns and comments further, and address the concerns to the extent possible.
April 2023	CLFN HFN MSIFN Six Nations of the Grand River	CNSC staff sent emails after the workshop thanking the Indigenous Nations and communities for their participation and perspectives. CNSC staff also extended an offer for subsequent meetings to continue discussing the comments and concerns raised during the workshop and in their written submissions.
April 2023	All identified Indigenous Nations and communities	CNSC staff sent email notifications that participant funding was available to support the review of CNSC staff's and OPG's CMD documentation, and support participation at the January 2024 hearing.
May 2023	All identified Indigenous Nations and communities	CNSC staff sent email notification of June 22, 2023 webinar on the DNNP.

All identified Indigenous Nations and communities have been encouraged to participate in the regulatory review process, as well as the public hearing process, to advise the Commission of any concerns they may have with respect to the DNNP. CNSC staff continue to consult and engage with identified Indigenous Nations and communities.

CNSC staff invited all identified Indigenous Nations and communities to attend public workshops and webinars and, in addition, have provided multiple opportunities to meet directly with CNSC staff throughout the review process to discuss DNNP and address any issues, items of concern, questions, or comments. The DNNP has also been discussed during regularly-scheduled meetings with Indigenous Nations and communities that have Terms of Reference for long-term engagement activities with the CNSC (i.e., MNO, MSIFN, SON, CLFN, and HFN). Information about key meetings, workshops, and webinars that CNSC staff have held with Indigenous Nations and communities is provided in Table 13 below.

**Table 13: Key meetings, workshops, and webinars with Indigenous Nations and communities**

Date	Indigenous Nation or community	Activity
June 2022	MSIFN	Meeting to provide an update on the DNNP. Questions and concerns raised included requests for information on opportunities to participate in OPG's review of the Environmental Impact Statement, the Environmental Assessment process, potential impacts on land, fish, and water, as well as how waste would be stored at the facility.
August 2022	MNO	Meeting to provide an update on the DNNP. Questions and concerns raised included timelines for construction and the environmental assessment process.
January 2023	MSIFN HFN MNO SON Six Nations of the Grand River	Participant funding was awarded to review the EIS Review and PPE documents, to meet with CNSC staff, and to participate in a planned workshop.
March 2023	Six Nations of the Grand River	Meetings to provide information on the history of the EA, a DNNP licensing review update, and an overview of OPG's EIS and PPE review findings. Initial comments and concerns were raised by the Indigenous Nations and communities, and CNSC staff and the Nations had productive discussions related to the EIS review and PPE documents.
	CLFN HFN (OPG also in attendance)	
	MNO	
	MSIFN	
April 2023	MSIFN CLFN HFN Six Nations of the Grand River	CNSC hosted a workshop with Indigenous Nations and communities, members of the public, environmental non-governmental organisations, and stakeholders to discuss the two documents submitted as part of OPG's DNNP Licence to Construct application, and to listen and learn about issues and concerns.  Additional details regarding the comments raised, and CNSC's approach

Date	Indigenous Nation or community	Activity
		to responding is provided in the subsection below.
June 2023	CLFN HFN	CNSC staff hosted a webinar to provide information on OPG's licence to construct application, an update on the CNSC's technical review, including the review of OPG's EIS and PPE and how to participate in the January 2024 hearing.
June 2023	MSIFN HFN MNO SON	Participant funding was awarded to review CNSC staff's and OPG's submissions to the Commission, and participate in, the Commission's public hearing

### 3.1.3 Issues, Items of Concern, and Summary of Comments Received from Indigenous Nations and communities Related to the Applicability of the BWRX-300 Reactor Technology to the DNNP PPE and EA

CNSC staff acknowledge that issues and concerns related to the Licence to Construct application, and the DNNP in general, have been raised to date—including long-term waste management, the safety assessment and design of the BWRX-300 reactors, the implementation of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the regulation of SMRs, impacts from construction on the environment, as well as impacts from permitted work on Indigenous and/or Treaty Rights. CNSC staff remain committed to discuss these issues and concerns, and to working to address them to the extent possible. These issues and concerns, related to the applicability of the EA to the BWRX-300, are summarised below. These concerns have been discussed and responded to, as outlined in subsection 3.1.4 below.

Hiawatha First Nation commented that since the EA was completed, a number of species were newly added to the provincial *Endangered Species Act* [24] and federal *Species at Risk Act* [25] (e.g., bats and bank swallows, respectively). HFN raised concerns about whether the proposed mitigation measures identified in the EA remain sufficient to address effects to these species at risk. Both HFN and Curve Lake First Nation commented on the importance of OPG considering Indigenous worldviews and cultural keystone species when making concluding statements about negligible or reduced impact to species in their EIS Review and PPE documents.

Mississaugas of Scugog Island First Nation commented that regardless of whether OPG concludes the effects would be reduced compared to the findings in the EA, there would likely be effects which remain of concern to MSIFN. MSIFN raised concerns about the applicability of the PPE approach, rather than conducting an



assessment once the reactor technology was chosen, as well as what is considered a fundamental difference. MSIFN raised the concern that the solid radioactive waste and radioiodine emissions anticipated by the BWRX-300 technology are higher than assessed in the EA. MSIFN also questioned how species listed under Ontario's *Endangered Species Act* would be protected, and what offsetting would be done. MSIFN also commented in general that the natural environment and surrounding land use has changed significantly, and that such changes must be considered.

Saugeen Ojibway Nation commented that the EA fails to capture the implications of DNNP as the first SMR in Canada and are of the opinion that a strategic and regional assessment under the *Impact Assessment Act* is required to comprehensively characterise the potential impacts of the BWRX-300 reactors. The SON also raised concerns that the EA did not consider the transportation of wastes to the Western Waste Management Facility located in their territory, nor did it consider the impacts of new sources of waste to their territory.

Six Nations of the Grand River commented that although the chosen technology is smaller than what was assessed in the EA, it appears as though the selected reactor technology is fundamentally different, and that the environment has likely changed since 2009.

CNSC staff note that not all identified Indigenous Nations and communities have responded to correspondence or have raised concerns to date. However, CNSC staff remain committed to continuing to provide opportunities for ongoing consultation and engagement related to the DNNP with all identified Indigenous Nations and communities.

#### **3.1.4 CNSC Staff Response to Issues, Items of Concern, and Summary of Comments Received from Indigenous Nations and communities Related to the Applicability of the BWRX-300 Reactor Technology to the DNNP PPE and EA**

CNSC staff discussed these issues and concerns at the public workshop held in April 2023. CNSC staff have also met and/or offered to meet with each interested Indigenous Nation and community to continue to discuss their concerns, answer any questions they have, and work to address the concerns to the extent possible. In addition, all comments received were provided to CNSC's subject matter experts to consider during their technical review. All comments received were also shared with OPG, and OPG was encouraged to have discussions regarding these comments in their engagement activities with Indigenous Nations and communities.

CNSC staff's position on these key concerns are outlined and discussed in the following sections of this CMD:

- Subsection [1.5.2 – CNSC Staff Methodology for Assessing OPG's PPE and EIS Reviews](#) addresses the criteria CNSC staff developed and used in the analysis of OPG's PPE and EIS Review documents, as it relates to a "fundamental difference."

- Subsection [2.1.2.4 – Solid Radioactive Waste Volumetric Activity](#) discusses the solid radioactive waste inventory of BWRX-300 fuel and addresses the transportation and storage of the fuel.
- Effects of the DNNP on species identified as at-risk or endangered under provincial or federal legislation, including those species newly-listed since the completion of the EA, is addressed in subsection [2.2.2.6.3 – Bird Communities and Species](#).
- Subsection [2.1.2.3 – Airborne Releases](#) addresses the airborne release of radioiodines and other radionuclides from normal operations of the BWRX-300 reactors, and subsection [2.2.2.9.1 – Physical Well-Being](#) addresses the anticipated effect of these releases on the radiological dose to members of the public.
- Subsection [3.1.5 – OPG’s Engagement Activities](#) provides information about the applicability of REGDOC-3.2.2 and CNSC staff’s perspective on OPG’s Indigenous Engagement activities to date.

CNSC staff take these concerns seriously and have followed up with each Indigenous Nation and community who raised concerns to work to address these issues and provide CNSC staff’s position on these topics. CNSC staff remain open to having additional, ongoing, discussions with each Indigenous Nation and community, as appropriate.

### **3.1.5 OPG’s Engagement Activities**

REGDOC-3.2.2 – [Indigenous Engagement](#) sets out requirements and guidance for licensees whose projects may raise the Crown’s duty to consult. To date, OPG has been following the requirements and guidance of REGDOC-3.2.2, including the submission of an Indigenous Engagement Report. CNSC staff have reviewed this report and will continue to monitor and assess OPG’s engagement activities throughout the regulatory review process.

CNSC staff note that OPG has been engaging the identified Indigenous Nations and communities by holding meetings, hosting open houses, conducting workshops, site visits and ceremonies, sharing newsletters, and discussing issues. OPG has offered capacity funding agreements to assist Indigenous Nations and communities in their engagement with OPG, where appropriate. CNSC staff recognise that OPG has long-standing relationships with many of the identified Indigenous Nations and communities.

OPG has demonstrated a flexible and adaptive approach to engagement and has worked to build relationships and meet the needs and expectations of interested Indigenous Nations and communities. As a part of their engagement process for the DNNP, OPG has implemented a number of best practices, including early engagement on the technology selection process and on the EIS Review prior to its submission to the CNSC.

OPG received comments on the EIS Review from CLFN and MSIFN. OPG has responded to the comments and incorporated the feedback provided into the

report. OPG has been discussing comment themes with Indigenous Nations and communities that were raised in their submissions to the CNSC. CNSC staff note that OPG is actively working to propose solutions and find a path forward to address the concerns raised to date.

OPG provides regular updates to CNSC staff regarding its engagement activities and has sought to include the CNSC in its engagement activities, where appropriate and agreed by each Indigenous Nation or Community. CNSC staff acknowledge that Indigenous Nations and communities have raised concerns through OPG's engagement process about the DNNP in general, including the potential impacts on hunting, fishing, and harvesting in the areas surrounding the site, as well as the need to involve Indigenous Nations and communities in environmental monitoring programs. CNSC staff note that based on comments received from Indigenous Nations and communities, OPG has committed to developing a monitoring plan for bats, including an assessment of noise and dust effects on their habitat, to provide an opportunity to harvest butternuts prior to tree removal, and involving the interested Williams Treaties First Nations in developing ongoing monitoring and restoration plans. CNSC staff have not been made aware of any specific view from Indigenous Nations and communities, through OPG's engagement activities to date, on whether the environmental assessment is applicable to the chosen reactor technology.

CNSC staff also acknowledge that OPG is conducting thorough engagement activities with Indigenous Nations and communities on DNNP topics that are outside of the scope of this CMD, including discussions on mitigation measures identified in provincial permits for land clearing work, the Licence to Construct application, as well as ongoing collaboration in environmental monitoring activities.

CNSC staff note that OPG has a well-established Indigenous engagement program that meets all requirements and follows guidance specified in REGDOC-3.2.2, by engaging and responding to the identified Indigenous Nations and communities. OPG continues to work to support and maintain relationships with Indigenous Nations and communities and is working to address items of concern and requests related to the DNNP.

CNSC staff encourage OPG to continue to discuss issues and concerns raised by Indigenous Nations and communities, including the proposed mitigation measures, to address any potential impacts to Indigenous and/or Treaty rights, as appropriate.

#### **3.1.5.1 Feedback Received by Indigenous Nations and communities on OPG's Indigenous Engagement Activities related to the DNNP**

CNSC staff sought feedback from CLFN, HFN, and MSIFN on their perspectives of OPG's engagement with their Nations, as related to the DNNP. CNSC staff sought feedback from these Indigenous Nations and communities as they have Indigenous and/or Treaty rights in the area where the DNNP is proposed, have actively been participating in the DNNP regulatory review process to date, as well

as have previously requested CNSC staff to reflect their perspectives on the licensee's engagement activities in CNSC documentation.

Feedback from Curve Lake First Nation, Hiawatha First Nation, and the Mississaugas of Scugog Island First Nation is provided below.

#### Curve Lake First Nation and Hiawatha First Nation

Engagement on the DNNP started in 2020. CLFN and Hiawatha First Nation have been among the most active communities in the DNNP, giving feedback on information provided, contributing to the decision-making processes, identifying areas we wanted more information on and would like to see addressed, and seeking opportunities related to the project and OPG's operations. In doing so, we continue to help guide OPG's priorities and future interactions with us.

For the past two years, OPG provided support for CLFN and HFN consultation staff, archaeological, and environmental capacity. This support allows for overall participation and provides a framework and a consistent approach on how both parties will work together. OPG provides CLFN and HFN opportunities to visit the DNNP site and the existing facilities. We have reciprocally invited OPG and CNSC staff to visit both CLFN and HFN.

OPG, CLFN, and HFN have monthly meetings as part of a wider forum including other members of the Williams Treaties First Nations. Through these routine meetings, OPG has shared information the DNNP such as the ESA permit, archaeological work, Bank Swallow assessments, early works at the site, SF6 draining, the EIS Review report, and information on the Condenser Cooling Water system. All information exchanged has been reviewed by CLFN and HFN, and comments will be integrated by OPG as part of their ongoing programs and improvement initiatives.

An issue that has arisen from these multiple matters of importance to CLFN and HFN is the volume of information being conveyed or needed to be conveyed, which is often too much to absorb in a single meeting and in real-time. Time to absorb the information, to contemplate, to assess impacts, and to then ask questions is a challenge. Through this issue, OPG has demonstrated the willingness to work within constraints while seeking ways to demonstrate flexibility with the process, since this can lead to more fruitful outcomes. The overarching goal is overall relationship building and this is not driven only by the completion of project deadlines and milestones, but also by the need to foster meaningful interactions.

#### Mississaugas of Scugog Island First Nation

OPG has maintained open lines of communication through monthly updates on the DNNP and commitments of funding to assist in the consultation process. While OPG has allowed for the opportunity to engage, they have not provided all of the necessary accommodations to ensure the protection of Williams Treaties rights.

In order to develop the DNNP site, OPG required a permit to destroy species at risk habitat. This habitat is located within the Williams Treaties lands and at one

time provided a space for Williams Treaties Nation members to harvest. MSIFN outlined three actions that could provide appropriate accommodations, including:

1. Ensure that newly-created SAR habitat is protected for the long-term through a conservation easement, to ensure that this new habitat cannot be disturbed for future development.
2. Commit to providing funding for offsite restoration of lands outside of the DNNP site control, to ensure that Williams Treaties First Nations have access to lands that can be used to practice Treaty rights.
3. Provide funding to ensure that Williams Treaties First Nations can complete a comprehensive review and safety case for waste management facilities. MSIFN wishes to compare best practices in nuclear storage facilities outside of Canada.

Section 3.16 of REGDOC-3.2.2 states “the CNSC, as an agent of the Crown, is responsible for fulfilling Canada’s legal duty to consult and, where appropriate, accommodate Indigenous peoples, when the CNSC’s decisions may have adverse effects on potential or established Indigenous and/or Treaty rights.” As this project will directly impact Williams Treaties First Nations’ rights and interest, it is appropriate that CNSC encourage OPG to meet the accommodations outlined above.

### **3.1.6 Conclusions and Next Steps**

CNSC staff have conducted early and ongoing consultation and engagement activities with the identified Indigenous Nations and communities, to encourage their full participation in the licensing regulatory processes, and as related to the applicability of the DNNP EA to the BWRX-300 reactor technology. CNSC staff have actively sought feedback on OPG’s PPE and EIS Review, and have worked to ensure concerns were heard, considered, and addressed by OPG and CNSC staff in a meaningful way.

CNSC staff’s view is that the ongoing consultation and engagement activities have been thorough, responsive, and flexible to date. CNSC staff are committed to continuing to consult and engage with the identified Indigenous Nations and communities in relation to the DNNP, including in advance of a potential Commission proceeding in relation to OPG’s application for a Licence to Construct. These activities may include meetings, webinars, open houses, further discussions on issues and concerns and addressing them to the extent possible, collaborative Rights Impact Assessments, and co-drafting relevant sections of the CMD with the most directly impacted Indigenous Nations and communities, as appropriate.

## **3.2 Public Engagement**

CNSC staff have held several public information sessions, webinars, and workshops to provide updates on the DNNP licensing review process.

CNSC staff informed the public of the submission of OPG's PPE and EIS Review documents and invited comments on these documents from members of the public and stakeholders through the online "Let's Talk Nuclear Safety" consultation platform. This opportunity for comment was open from November 2022 to March 2023.

In accordance with section 17 of the *Canadian Nuclear Safety Commission Rules of Procedure*, a [Notice of Public Hearing](#) was issued and posted on the CNSC website, inviting written comments and requests for appearances before the Commission. The CNSC also communicated information about the regulatory process to the public and interested stakeholders through various methods including graphics on the CNSC website, public webinars, and through social media.

### 3.3 Participant Funding Program

To date, the CNSC has offered two stages of participant funding to support Indigenous Nations and communities, members of the public, and stakeholder participation in the regulatory process for the DNNP.

#### **Stage 1: Participant Funding to Review the Environmental Impact Statement and Plant Parameter Envelope for Ontario Power Generation's Darlington New Nuclear Project**

The CNSC made \$150 000 in participant funding available to assist members of the public, Indigenous Nations and communities, and stakeholders in their review of OPG's EIS Review [7] and PPE [8] documents. This funding was also intended to support participation in workshops and meetings with CNSC staff regarding the DNNP, and for submission of review comments to the CNSC.

Based on recommendations from the Funding Review Committee, the CNSC awarded a total of \$157,594 in participant funding to the following recipients:

- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Saugeen Ojibway Nation
- Six Nations of the Grand River
- Metis Nation of Ontario
- Canadian Coalition for Nuclear Responsibility
- Canadian Environmental Law Association
- Radiation Safety Institute of Canada
- Nuclear Transparency Project
- Northwatch

PFM recipients provided written submissions to CNSC staff and were given the opportunity to discuss their submissions with CNSC staff at a workshop held on

April 04, 2023. CNSC staff have since published a “What We Heard” report [49], highlighting some of the key comment themes discussed at the workshop.

### **Stage 2: Participant Funding for the Applicability of the DNNP Environmental Assessment and Plant Parameter Envelope to the BWRX-300**

The CNSC has made an additional source of funding available in a second round of participant funding to assist members of the public, Indigenous Nations and communities, and stakeholders in providing value-added information to the Commission through informed and topic-specific interventions. This funding was offered to provide an opportunity to review CNSC staff’s and OPG’s submissions to the Commission, as well as to allow for participation in the Commission public proceeding.

Based on recommendations from the Funding Review Committee, the CNSC awarded a total of \$106, 290.63 in participant funding to the following recipients:

- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Saugeen Ojibway Nation
- Métis Nation of Ontario
- Canadian Coalition for Nuclear Responsibility
- Canadian Environmental Law Association
- Radiation Safety Institute of Canada
- Nuclear Transparency Project
- Northwatch

### **Conclusion**

The CNSC has offered support to interested members of the public, Indigenous Nations and communities, and other stakeholders, through the PFP, to prepare for and participate in the regulatory process and Commission proceeding(s) for the DNNP.

## **4 OVERALL CONCLUSIONS AND RECOMMENDATIONS**

CNSC staff have reviewed the EA, OPG’s EIS Review, the updated PPE, as well as relevant supporting documentation. CNSC staff note that the majority of the parameters assessed in the EIS Review fall within the scope of the impacts assessed and accepted in the EA, or are not applicable due either to the design of the BWRX-300 reactor, and/or due to OPG’s approach to the design.

Consequently, CNSC staff expect no significant residual adverse environmental effects from the deployment of up to four BWRX-300 reactors, provided the mitigation measures identified in the EA are implemented, as required by OPG’s EA follow-up program.

For the eight parameters outside of the bounding scenario in the EA, CNSC staff have concluded that OPG has adequately assessed the parameters, and that the mitigation measures identified in the EA are adequate to ensure there are no residual adverse environmental effects from the deployment of the BWRX-300 reactors. CNSC staff also conclude that OPG has adequately assessed changes to baseline environmental conditions for environmental components assessed in the EA.

CNSC staff, in conjunction with Transport Canada and Fisheries and Oceans Canada (see subsection 2.2.3), conclude that, based on a review of information presented in this CMD, OPG's selection of the BWRX-300 reactor technology is bounded by the EA, and the EA remains applicable for this reactor technology.

Based on the above conclusions, CNSC staff recommend that the Commission:

Determine, in accordance with JRP recommendation # 1, that the BWRX-300 technology selected by OPG is within the bounds of the JRP EA



## REFERENCES

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7. OPG submission, *Darlington New Nuclear Project Report for the Review of the Environmental Impact Statement for Small Modular Reactor BWRX-300*, revision 0, NK054-REP-07730-00055, dated 05 October 2022.
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15. Canadian standard, *National Building Code of Canada*, 2020 edition.
16. OPG report, NK054-REP-07730-00029 – *Environmental Impact Statement: New Nuclear – Darlington Environmental Assessment*, dated 30 September 2009.
17. OPG report, *Darlington New Nuclear Project Supporting Document for Comprehensive Review of EIS for BWRX-300*, NK054-REP-07730-00058, revision 0, dated 31 December 2022.
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23. OPG report, *Darlington New Nuclear Project Supporting Environment Studies – Environment*, OPG document number NK054-REP-01210-0001, revision 1, dated 16 December 2022.
24. Province of Ontario [Endangered Species Act \(ESA\) 2007](#)
25. Statutes of Canada, 2002, c. 29, [Species at Risk Act](#), last amended on 03 February 2023.
26. OPG report, *Deposition of Tritium onto Soil and Groundwater to Support Activities for Darlington New Nuclear Project*, NK054-REP-07730-00062, revision 0, dated November 2022.
27. Ontario Regulations, [O. Reg 169/03 – Ontario Drinking Water Quality Standards](#)
28. WSP Golder report, *Groundwater Modelling to Assess Effects from Construction-Related Dewatering for Darlington New Nuclear Project*, provided as Calian Group Nuclear Report number OPG-0035-04, revision 2, dated 14 September 2022.
29. OPG report, *Aquatic Environment Assessment of Environmental Effects Technical Supporting Document: New Nuclear – Darlington Environmental Assessment*, document NK054-REP-07730-00013, dated September 2009.
30. Beacon Environmental report, *Darlington New Nuclear Project Terrestrial Environment Existing Conditions 2010-2019 Baseline Update*, OPG document NK054-REP-07730-0801575.

31. OPG report, *Darlington Nuclear Site Biodiversity Monitoring Program Three Year Report (2019-2021)*, D-REP-07811-0982780, dated January 2022.
32. IEC report, *Air and Noise Modelling for Terrestrial Receptors for the Darlington New Nuclear Project – Calian Nuclear Report OPG-0035-08 Version 2.0*, OPG document number NK054-REP-07730-00066, revision 0, dated December 2022.
33. ITASCA report, *Analysis of Blasting-Induced Ground Shaking at Bank Swallow Habitat*, OPG document number NK054-REP-07730-00063, revision 0, dated January 2023.
34. Beacon Environmental report, *Habitat Assessment for Endangered Bats, Darlington New Nuclear Project – Darlington Nuclear Site*, OPG document NK054-CORR-07730-0912658, dated 2021.
35. Beacon Environmental report, *Acoustic Bat Monitoring Report – Darlington New Nuclear Project*, OPG document NK054-REP-07730-0948470, dated 2021.
36. Beacon Environmental report, *Darlington New Nuclear Project Bat and Breeding Bird Data Analysis Report*, OPG document number NK054-REP-07730-0728765, dated 2018.
37. OPG report, *BWRX-300 Occupational Dose Assessment Report*, OPG document number NK054-REP-03420-00001, revision 1.
38. OPG report, *DNNP Site Preparation License Renewal – Socio-Economic Effects Review (2019)*, OPG document number NK054-REP-07730-0802829, revision 0.
39. CSA Group standard, N288.6 – *Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills*.
40. OPG report, *BWRX-300 Darlington New Nuclear Project (DNNP) Hazard Analysis Results*
41. OPG report, *BWRX-300 Darlington New Nuclear Project (DNNP) Probabilistic Safety Assessment Summary*
42. CNSC Regulatory Document, [REGDOC-2.5.2 – Design of Reactor Facilities](#), version 2, published April 2023
43. IAEA safety guide, SSG-18 – [Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations](#).
44. CNSC Regulatory Document, [REGDOC-1.1.1 – Site Evaluation and Site Preparation for New Reactor Facilities](#), version 1.2, published July 2022
45. OPG report, *Site Evaluation of the OPG New Nuclear at Darlington – Part 5: Flood Hazard Assessment*, NK054-REP-01210-00012, revision 1, dated 11 September 2009.
46. OPG report, *BWRX-300 DNNP Development – Flood Hazard Assessment*, NK054-REP-02730-00001, dated 30 November 2022.
47. Ontario Ministry of Natural Resources, *Lakes and Rivers Improvement Act Technical Guidelines*, dated June 2004

48. Transport Canada, *Transport Canada: DNNP – Responsible Authority Determination Required*, dated 21 June 2023.
49. CNSC public document, *DNNP Workshop Summary Report*
50. CNSC letter to M. Knutson (OPG), *Canadian Nuclear Safety Commission (CNSC) Acceptance of Ontario Power Generation Request for Closure of Commitment D-P-12.1*, dated 27 April 2022.
51. CNSC letter to M. Knutson, *Canadian Nuclear Safety Commission Response to Darlington New Nuclear Project Environmental Assessment Follow-Up Monitoring Plans / Methodology Reports and Request for Acceptance and Closure of their Respective Commitments under D-P-12*, dated 19 August 2022.

## GLOSSARY

For definitions of terms used in this document, see [REGDOC-3.6, Glossary of CNSC Terminology](#), which includes terms and definitions used in the Nuclear Safety and Control Act and the Regulations made under it, and in CNSC regulatory documents and other publications.

Additional terms and acronyms used in this CMD are listed below.

AAQC	Ambient Air Quality Criterion
AOO	Anticipated Operational Occurrences
BWR	Boiling Water Reactor
BWRX	Boiling Water Reactor “Tenth Generation”
CAAQS	Canada Ambient Air Quality Standard
CANDU	Canada Deuterium Uranium Reactor
CCW	Condenser Cooling Water
CEAA	<i>Canadian Environmental Assessment Act (1992)</i>
COPC	Contaminant of Potential Concern
DFO	Fisheries and Oceans Canada
DNGS	Darlington Nuclear Generating Station
DNNP	Darlington New Nuclear Project
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMEAF	Environmental Monitoring and Environmental Assessment Follow-Up
ERA	Environmental Risk Assessment
ESA	<i>Endangered Species Act (Ontario)</i>
ESBWR	Economic Simplified Boiling Water Reactor
GEH	General Electric Hitachi
GOC	Government of Canada
IAA	<i>Impact Assessment Act (2019)</i>
IAAC	Impact Assessment Agency of Canada
LTC	Licence to Construct
LTPS	Licence to Prepare Site
MOECP	Ministry of the Environment, Climate, and Parks (Government of Ontario)

NEI	Nuclear Energy Institute (United States)
JRP	Joint Review Panel
OPG	Ontario Power Generation
PFP	Participant Funding Program
PM2.5	Particulate Matter with aerodynamic diameter of less than 2.5 micrometres
PM10	Particulate Matter with aerodynamic diameter of less than 10 micrometres
PMP	Probable Maximum Precipitation
PPE	Plant Parameter Envelope
PRSL	Power Reactor Site Preparation Licence
SAR	Species at Risk
SARA	<i>Species at Risk Act</i> (Canada)
SPM	Suspended Particulate Matter
TC	Transport Canada
USNRC	United States Nuclear Regulatory Commission
VEC	Valued Ecosystem Component

## Appendix A BASIS FOR THE RECOMMENDATION(S)

### A.1 REGULATORY BASIS

The recommendation presented in this Commission Member Document is based on expectations and regulatory objectives associated with Environmental Assessments. The regulatory basis for the matters under consideration to this CMD are as follows.

#### The Plant Parameter Envelope

The applicable regulatory basis for the Plant Parameter Envelope includes:

- *General Nuclear Safety and Control Regulations*, paragraph 3(1)(d)

#### The Environmental Assessment

The applicable regulatory basis for the Environmental Assessment includes:

- *Canadian Environmental Assessment Act (1992)*
- REGDOC-1.1.1, *Site Evaluation and Site Preparation for New Reactor Facilities*
- *General Nuclear Safety and Control Regulations*, paragraphs 12(1)(c) and 12(1)(f)
- *Class I Nuclear Facilities Regulations*, paragraphs 3(a), 3(b), 3(c), 3(e), 3(g), 3(h), 3(j), 4(a), 4(b), 4(c), 4(d), and 4(e)
- *Radiation Protection Regulations*, paragraph 4(b), subsections 13(1), 14(1)

#### Indigenous Nations and Community Engagement

When the applicant determines that the activity requires authorisation from the Commission, that could adversely affect potential or established Indigenous and/or Treaty rights, they shall:

- Identify and engage with potentially affected Indigenous groups
- Submit an Indigenous engagement report
- Submit material change updates to the Indigenous engagement report
- Include a summary of Indigenous engagement activities in their licence application and any submissions to the Commission.

The applicable regulatory basis includes:

- REGDOC-3.2.2, *Indigenous Engagement (Version 1.2)*

## Appendix B SUPPORTING DETAILS

### B.1 STATUS OF JOINT REVIEW PANEL RECOMMENDATIONS TO DATE

JRP Recommendations directed to OPG are documented and managed through the OPG DNNP Commitments Report [10]. The corresponding DNNP Commitments Report reference numbers are included in the table below, where applicable. Where a JRP Recommendation is not directed to OPG, the Commitments Report column indicates this number is not applicable.

The JRP Recommendations span the lifecycle of the DNNP, with some Recommendations applicable at the site preparation, construction, and operation licence phases. All JRP Recommendations not directed to OPG are managed under the CNSC's regulatory program for DNNP.

For all JRP Recommendations, the GOC Response sets the criteria for how to meet the recommendations and by which accountable organisation. The GOC either accepted the recommendation as-is, or accepted the intent of the recommendation with clarifications in their response. In some instances, the GOC response noted where recommendations were directed to other levels of government or clarified where statutory authority and powers rest.

**Table 14 – Status of Joint Review Panel Recommendations**

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
1	The Panel understands that prior to construction, the Canadian Nuclear Safety Commission will determine whether this environmental assessment is applicable to the reactor technology selected by the Government of Ontario for the Project. Nevertheless, if the selected reactor technology is fundamentally different from the specific reactor technologies bounded by the Plant Parameter Envelope, the Panel recommends that a new environmental assessment be conducted.	The Government of Canada accepts the intent of this recommendation, but acknowledges that any RA under the CEAA will need to determine whether the future proposal by the proponent is fundamentally different from the specific reactor technologies assessed by the JRP and if a new EA is required under the CEAA.	N/A	Initiated



#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
2	<p>The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission require OPG to conduct a comprehensive soils characterization program. In particular, the potentially impacted soils in the areas OPG identifies as the spoils disposal area, cement plant area and asphalt storage area must be sampled to identify the nature and extent of potential contamination.</p>	<p>The Government of Canada accepts the recommendation to require OPG to conduct a comprehensive soils characterization program. The Government of Canada also notes that the recommended soils characterization program could also support future ecological risk assessment activities by OPG. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.</p>	D-P-3.6	Closed
3	<p>The Panel recommends that the Canadian Nuclear Safety Commission require that as part of the Application for a Licence to Construct a reactor, OPG must undertake a formal quantitative cost-benefit analysis for cooling tower and once-through condenser cooling water systems, applying the principle of best available technology economically achievable. This analysis must take into account the fact that lake infill should not go beyond the two-metre depth contour and should include cooling tower plume abatement technology.</p>	<p>The Government of Canada accepts the intent of this recommendation to require OPG to conduct a formal quantitative cost-benefit analysis for cooling tower and once-through condenser cooling water systems, as recommended, but acknowledges that this analysis may be required earlier than indicated in the recommendation given the relationship between site layout and the choice of condenser cooling technology. Fisheries and Oceans Canada and Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The Government of Canada further acknowledges the connection of this Recommendation with Panel Recommendation #31 and as such notes that Fisheries and Oceans Canada will work with OPG to ensure through its regulatory process and conditions of authorization under the Fisheries Act that any Harmful Alteration, Disruption and Destruction (HADD) is limited to the 2 metre depth contour of Lake Ontario.</p>	D-C-1.1	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
4	The Panel recommends that the Canadian Nuclear Safety Commission exercise regulatory oversight to ensure that OPG complies with all municipal and provincial requirements and standards over the life of the Project. This is of particular importance because the conclusions of the Panel are based on the assumption that OPG will follow applicable laws and regulations at all jurisdictional levels.	The Government of Canada accepts this recommendation, however recognizes that it is the responsibility of provincial and municipal officials to ensure compliance with their own requirements and standards over the life of the Project.	N/A	Closed
5	To avoid any unnecessary environmental damage to the bluff at Raby Head and fish habitat, the Panel recommends that no bluff removal or lake infill occur during the site preparation stage, unless a reactor technology has been selected and there is certainty that the Project will proceed.	The Government of Canada accepts this recommendation to avoid any unnecessary environmental damage to the bluff at Raby Head and fish habitat as recommended. Fisheries and Oceans Canada and Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The Government of Canada further notes that authorization under the Fisheries Act will be required prior to any lake infill taking place, and confirms that Fisheries and Oceans Canada will work with OPG to ensure that as a condition of that authorization, that no lake infill occurs unless there is certainty that the Project will proceed and appropriate mitigation measures and habitat compensation have been implemented.	D-P-14.1	Open
			D-P-16.1	Open
			D-P-3.8	Open
6	The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission require OPG to update its preliminary decommissioning plan for site preparation in accordance with the requirements of Canadian Standards Association (CSA) Standard N294-09. The OPG preliminary decommissioning plan for site preparation must incorporate the rehabilitation of the site to reflect the existing biodiversity in the event that the Project does not proceed beyond the site preparation phase. OPG shall prepare a detailed preliminary	The Government of Canada accepts the intent of the recommendation to require OPG to maintain a preliminary decommissioning plan for site preparation in accordance with the requirements of CSA Standard N294-09, which provides direction on the decommissioning of licensed facilities and activities consistent with Canadian and international recommendations. The Government of Canada accepts the recommendation to require OPG to revise the preliminary decommissioning plan once a reactor technology is selected.	D-P-13.1	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	decommissioning plan once a reactor technology is chosen, to be updated as required by the Canadian Nuclear Safety Commission.			
7	The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission require that OPG establish a decommissioning financial guarantee to be reviewed as required by the Canadian Nuclear Safety Commission. Regarding the decommissioning financial guarantee for the site preparation stage, the Panel recommends that this financial guarantee contain sufficient funds for the rehabilitation of the site in the event the Project does not proceed beyond the site preparation stage.	The Government of Canada accepts the intent of this recommendation to require OPG to establish a financial guarantee for the site preparation stage, however, notes that the financial guarantee must be sufficient to cover the cost of decommissioning work outlined in the preliminary decommissioning plan referenced in Recommendation #6.	D-P-13.2	Closed
8	The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission require OPG to develop a follow-up and adaptive management program for air contaminants such as Acrolein, NO <sub>2</sub> , SO <sub>2</sub> , SPM, PM <sub>2.5</sub> and PM <sub>10</sub> , to the satisfaction of the Canadian Nuclear Safety Commission, Health Canada and Environment Canada. Additionally, the Canadian Nuclear Safety Commission must require OPG to develop an action plan acceptable to Health Canada for days when there are air quality or smog alerts.	The Government of Canada accepts this recommendation to require OPG to develop a follow-up and adaptive management program for air contaminants and a smog alert action plan. Health Canada and Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, to assist in the implementation of this recommendation.	D-P-12.2	Closed
			D-P-3.10	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
9	<p>The Panel recommends that the Canadian Nuclear Safety Commission, in collaboration with Health Canada, require OPG to develop and implement a detailed acoustic assessment for all scenarios evaluated. The predictions must be shared with potentially affected members of the public. The OPG Nuisance Effects Management Plan must include noise monitoring, a noise complaint response mechanism and best practices for activities that may occur outside of municipal noise curfew hours to reduce annoyance that the public may experience.</p>	<p>The Government of Canada accepts this recommendation to require OPG to develop and implement a detailed acoustic assessment. Health Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, to assist in the implementation of this recommendation.</p>	D-P-3.2	Closed
10	<p>The Panel recommends that the Canadian Nuclear Safety Commission require OPG to undertake a detailed site geotechnical investigation prior to commencing site preparation activities. The geologic elements of this investigation should include, but not be limited to:</p> <ul style="list-style-type: none"> <li>• collection of site-wide information on soil physical properties;</li> <li>• determining the mechanical and dynamic properties of overburden material across the site;</li> <li>• mapping of geological structures to improve the understanding of the site geological structure model;</li> <li>• confirming the lack of karstic features in the local bedrock at the site; and</li> <li>• confirming the conclusions reached concerning the liquefaction potential in underlying granular materials.</li> </ul>	<p>The Government of Canada accepts the intent of this recommendation to require OPG to undertake a detailed site geotechnical investigation, however, notes that this investigation may be performed concurrently with site preparation activities. Natural Resources Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.</p>	D-P-9.1	Closed
			D-P-9.2	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
11	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to develop and implement a follow-up program for soil quality during all stages of the Project.	The Government of Canada accepts this recommendation to require OPG to develop and implement a follow-up program for soil quality. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-12.6	Closed
12	The Panel recommends that before in-water works are initiated, the Canadian Nuclear Safety Commission require OPG to collect water and sediment quality data for any future embayment area that may be formed as a consequence of shoreline modifications in the vicinity of the outlet of Darlington Creek. This data should serve as the reference information for the proponent's post-construction commitment to conduct water and sediment quality monitoring of the embayment area.	The Government of Canada accepts this recommendation to require OPG to collect water and sediment quality data for any future embayment area. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The Government of Canada notes that authorization under the Fisheries Act will be required prior to in-water works. Prior to the issuance of an authorization, Fisheries and Oceans Canada will require a water and sediment quality monitoring program. This program is required to assess whether OPG continues to meet the intent of section 36 of the Fisheries Act.	D-P-12.3	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
13	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to collect and assess water quality data for a comprehensive number of shoreline and offshore locations in the site study area prior to commencing in-water works. This data should be used to establish a reference for follow-up monitoring.	The Government of Canada accepts the intent of this recommendation to require OPG to collect and assess water quality data for a comprehensive number of shoreline and offshore locations in the site study area prior to commencing in-water works, and would further support the collection of sediment quality data as part of a comprehensive program. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The Government of Canada notes that authorization under the Fisheries Act will be required prior to in-water works. Prior to the issuance of an authorization, Fisheries and Oceans Canada will require a water and sediment quality monitoring program. This program is required to assess whether OPG continues to meet the intent of section 36 of the Fisheries Act.	D-P-12.3	Open
14	The Panel recommends that following the selection of a reactor technology for the Project, the Canadian Nuclear Safety Commission require OPG to conduct a detailed assessment of predicted effluent releases from the Project. The assessment should include but not be limited to effluent quantity, concentration, points of release and a description of effluent treatment, including demonstration that the chosen option has been designed to achieve best available treatment technology and techniques economically achievable. The Canadian Nuclear Safety Commission shall also require OPG to conduct a risk assessment on the proposed residual releases to determine whether additional mitigation measures may be necessary.	The Government of Canada accepts this recommendation to require OPG to conduct a detailed assessment of predicted effluent releases from the Project, as recommended. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-2.1	Open
			D-C-4.1	Open
			D-P-12.9	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
15	The Panel recommends that following the start of operation of the reactors, the Canadian Nuclear Safety Commission require OPG to conduct monitoring of ambient water and sediment quality in the receiving waters to ensure that effects from effluent discharges are consistent with predictions made in the environmental impact statement and with those made during the detailed design phase.	The Government of Canada accepts this recommendation to require OPG to conduct monitoring of ambient water and sediment quality in the receiving waters as recommended. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The Government of Canada notes that authorization under the Fisheries Act will be required prior to in-water works. Prior to the issuance of an authorization, Fisheries and Oceans Canada will require a water and sediment quality monitoring program. This program is required to assess whether OPG continues to meet the intent of section 36 of the Fisheries Act.	D-P-12.3	Open
16	The Panel recommends that prior to the start of construction, the Canadian Nuclear Safety Commission require the proponent to establish toxicity testing criteria and provide the test methodology and test frequency that will be used to confirm that stormwater discharges from the new nuclear site comply with requirements in the Fisheries Act.	The Government of Canada accepts the intent of this recommendation to require the proponent to establish toxicity testing criteria and provide the test methodology and test frequency for stormwater. The Government of Canada would additionally support the application of this recommended testing for process effluents. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-2.1	Open
			D-P-3.4	Closed
17	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to provide an assessment of the ingress and transport of contaminants in groundwater on site during successive phases of the Project as part of the Application for a Licence to Construct. This assessment shall include consideration of the impact of wet and dry deposition of all contaminants of potential concern and gaseous emissions on groundwater quality. OPG shall conduct enhanced groundwater and contaminant transport modelling for	The Government of Canada accepts this recommendation to require OPG to provide an assessment of the ingress and transport of contaminants in groundwater on site during successive phases of the Project as recommended. For clarity, the Government of Canada would support enhanced groundwater and contaminant transport modelling extending to appropriate model boundaries, which may not necessarily be site boundaries. Natural Resources Canada and Environment Canada can provide available scientific and technical expertise	D-C-2.1	Open
			D-C-4.1	Open
			D-C-5.1	Open
			D-C-6.1	Open
			D-P-12.6	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	the assessment and expand the modelling to cover the effects of future dewatering and expansion activities at the St. Marys Cement quarry on the Project.	to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.		
18	The Panel recommends that based on the groundwater and contaminant transport modelling results, the Canadian Nuclear Safety Commission require OPG to expand the Radiological Environmental Monitoring Program. This program shall include relevant residential and private groundwater well quality data in the local study area that are not captured by the current program, especially where the modelling results identify potential critical groups based on current or future potential use of groundwater.	The Government of Canada accepts this recommendation to require OPG to update the Radiological Environmental Monitoring Program, based on the groundwater and contaminant transport modelling results. Natural Resources Canada and Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-6.1	Open
19	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to expand the scope of the groundwater monitoring program to monitor transitions in groundwater flows that may arise as a consequence of grade changes during the site preparation and construction phases of the Project. The design of the grade changes should guide the determination of the required monitoring locations, frequency of monitoring and the required duration of the program for the period of transition to stable conditions following the completion of construction and the initial period of operation.	The Government of Canada accepts this recommendation to require OPG to expand the scope of the groundwater monitoring program to monitor transitions in groundwater flows that may arise as a consequence of grade changes during the site preparation and construction phases of the Project. Natural Resources Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-12.6	Closed
20	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial and aquatic environments and maximize the opportunity for quality terrestrial habitat rehabilitation.	The Government of Canada accepts this recommendation to require OPG to perform a thorough evaluation of site layout opportunities before site preparation activities begin, as recommended. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-14.1	Open
			D-P-3.7	Closed



#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
		As part of the conditions of authorization under the Fisheries Act, Fisheries and Oceans Canada also commits to working with OPG to ensure overall impacts to aquatic habitat are minimized with appropriate mitigation and habitat compensation.		
21	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to compensate for the loss of ponds, like-for-like, preferably in the site study area. The Panel also recommends that the Canadian Nuclear Safety Commission require OPG to use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases.	The Government of Canada accepts the recommendation to require OPG to use best management practices to prevent or minimize the potential runoff of sediment and other contaminants. The Government of Canada accepts the intent of compensating for the loss of ponds, but would also support the Canadian Nuclear Safety Commission requiring OPG to design compensation ponds that maximize ecological function, and not necessarily limited to "like-for-like". Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-3.7	Closed
22	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to develop a follow-up program for insects, amphibians and reptiles, and mammal species and communities to ensure that proposed mitigation measures are effective.	The Government of Canada accepts the intent of this recommendation to require OPG to develop a follow-up program for insects, amphibians and reptiles, and mammal species and communities as appropriate, and would support a focus for this follow-up program on species at risk and the use of this follow-up program to verify the conclusions of the Ecological Risk Assessment. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-12.5	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
23	The Panel recommends that Environment Canada collaborate with OPG to develop and implement a follow-up program to confirm the effectiveness of OPG's proposed mitigation measures for bird communities should natural draft cooling towers be chosen for the condenser cooling system.	The Government of Canada accepts the intent of this recommendation to collaborate with OPG to develop such a follow-up program for bird communities, and would further support the consideration of potential impacts from habitat disturbance, as well as from bird collision impacts, in the scope of that program. The Government of Canada acknowledges that the Canadian Nuclear Safety Commission has the statutory authority and powers to ensure such a follow-up program is implemented through future licensing under the Nuclear Safety and Control Act. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-12.5	Closed
24	The Panel recommends that during the site preparation stage, Environment Canada shall ensure that OPG not undertake habitat destruction or disruption between the period of May 1 and July 31 of any year to minimize effects to breeding migratory birds.	The Government of Canada accepts the intent of this recommendation to avoid habitat destruction or disruption between the period of May 1 and July 31 of any year to protect most bird species' nesting activities. However, Environment Canada does not have the ability to ensure that OPG conducts all of its land clearing activities when migratory bird nests are not active since the department does not have a regulatory permitting ability to bind the proponent. The Government of Canada acknowledges that the Canadian Nuclear Safety Commission has the statutory authority and powers to address this recommendation through future licensing under the Nuclear Safety and Control Act. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-3.7	Closed
25	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to conduct more sampling to confirm the presence of Least Bittern before site preparation activities begin. The Panel recommends that the Canadian Nuclear	The Government of Canada accepts this recommendation to require OPG to conduct more sampling to confirm the presence of Least Bittern and to develop and implement a management plan for species at risk, as may be appropriate. Environment Canada can provide available scientific and technical expertise	D-P-12.5	Closed
			D-P-3.7	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	Safety Commission require OPG to develop and implement a management plan for the species at risk that are known to occur on site. The plan should consider the resilience of some of the species and the possibility of off-site compensation.	to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.		
26	The Panel recommends that the Canadian Nuclear Safety Commission require OPG to develop a comprehensive assessment of hazardous substance releases and the required management practices for hazardous chemicals on site, in accordance with the Canadian Environmental Protection Act, once a reactor technology has been chosen.	The Government of Canada accepts this recommendation to require OPG to develop a comprehensive assessment of hazardous substance releases and the required management practices for hazardous chemicals on site once a reactor technology has been chosen. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-2.1	Open
			D-C-5.1	Open
			D-P-12.9	Open
			D-P-3.6	Closed
27	<p>The Panel recommends that prior to any destruction of the Bank Swallow habitat, the Canadian Nuclear Safety Commission require OPG to implement all of its proposed Bank Swallow mitigation options, including:</p> <ul style="list-style-type: none"> <li>the acquisition of off-site nesting habitat;</li> <li>the construction of artificial Bank Swallow nest habitat with the capacity to maintain a population which is at least equal to the number of breeding pairs currently supported by the bluff and as close to the original bluff site as possible; and</li> <li>the implementation of an adaptive management approach in the Bank Swallow mitigation plan, with the inclusion of a threshold of loss to be established in consultation with all stakeholders before any habitat destruction takes place.</li> </ul>	The Government of Canada accepts the intent of this recommendation to require OPG to implement the identified Bank Swallow mitigation measures using an adaptive management approach, and would support determining required mitigation based on reasonable estimates of actual burrow loss. The Government of Canada expects that the acquisition of offsite nesting habitat should only be necessary if follow-up monitoring shows that onsite mitigation is unsuccessful, and notes that onsite mitigation may also include the enhancement of potential natural nesting sites within the Site Study Area. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-3.8	Open
28			D-P-12.4	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	<p>The Panel recommends that Fisheries and Oceans Canada require OPG to continue conducting adult fish community surveys in the site study area and reference locations on an ongoing basis. These surveys shall be used to confirm that the results of 2009 gillnetting and 1998 shoreline electrofishing reported by OPG, and the additional data collected in 2010 and 2011, are representative of existing conditions, taking into account natural year-to-year variability.</p> <p>Specific attention should be paid to baseline gillnetting monitoring in spring to verify the findings on fish spatial distribution and relatively high native fish species abundance in the embayment area, such as white sucker and round whitefish. The shoreline electrofishing habitat use study is needed to establish the contemporary baseline for later use to test for effects of lake infill armouring, if employed, and the effectiveness of mitigation.</p>	<p>The Government of Canada accepts this recommendation. Fisheries and Oceans Canada will work with Environment Canada, the Canadian Nuclear Safety Commission, the Ontario Ministry of Natural Resources and OPG to develop the details of an ongoing fisheries monitoring program which will be included as a condition of a Fisheries Act authorization.</p>	D-P-15.1	Closed
29	<p>The Panel recommends that Fisheries and Oceans Canada require OPG to continue the research element of the proposed Round Whitefish Action Plan for the specific purpose of better defining the baseline condition, including the population structure, genome and geographic distribution of the round whitefish population as a basis from which to develop testable predictions of effects, including cumulative effects.</p>	<p>The Government of Canada accepts this recommendation. Fisheries and Oceans Canada will work with Environment Canada, Canadian Nuclear Safety Commission, Ontario Ministry of Natural Resources and OPG to develop and finalize the Round Whitefish Action Plan. This plan, as a condition of a Fisheries Act authorization, will form part of the ongoing monitoring program and feed into an adaptive management plan to protect the round whitefish population into the future.</p>	D-P-12.4	Open
			D-P-15.1	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
30	<p>In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that prior to the construction of in-water structures, Fisheries and Oceans Canada require OPG to conduct:</p> <ul style="list-style-type: none"> <li>• additional impingement sampling at the existing Darlington Nuclear Generating Station to verify the 2007 results and deal with inter-year fish abundance variability and sample design inadequacies; and</li> <li>• additional entrainment sampling at the existing Darlington Nuclear Generating Station to better establish the current conditions. The program should be designed to guard against a detection limit bias by including in the analysis of entrainment losses those fish species whose larvae and eggs are captured in larval tow surveys for the seasonal period of the year in which they occur. A statistical optimization analysis will be needed to determine if there is a cost-effective entrainment survey design for round whitefish larvae.</li> </ul>	<p>The Government of Canada accepts this recommendation. Fisheries and Oceans Canada will work with the Canadian Nuclear Safety Commission, and the Ontario Ministry of Natural Resources to develop an impingement and entrainment sampling program. The Government of Canada would also like to note that authorization under the Fisheries Act will be required prior to any lake infill taking place and commits that Fisheries and Oceans Canada will work with OPG to ensure that the impingement and entrainment sampling program is developed and implemented as a condition of that authorization.</p>	D-C-1.2	Open
			D-P-12.4	Open
			D-P-15.1	Closed
31	<p>Irrespective of the condenser cooling system chosen for the Project, the Panel recommends that Fisheries and Oceans Canada not permit OPG to infill beyond the two-metre depth contour in Lake Ontario.</p>	<p>The Government of Canada accepts the intent of this recommendation. Fisheries and Oceans Canada will work with OPG to ensure that the HADD of fish habitat associated with the proposed lake infill is limited to the area within the two-metre depth contour of Lake Ontario. The extent of the HADD as well as appropriate mitigation and habitat compensation will be included in the conditions of authorization under the Fisheries Act.</p>	D-C-1.1	Closed
			D-P-14.1	Open
			D-P-16.1	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
32	In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that Fisheries and Oceans Canada require OPG to mitigate the risk of adverse effects from operation, including impingement, entrainment and thermal excursions and plumes, by locating the system intake and diffuser structures in water beyond the nearshore habitat zone. Furthermore, OPG must evaluate other mitigative technologies for the system intake, such as live fish return systems and acoustic deterrents.	The Government of Canada accepts this recommendation. Fisheries and Oceans Canada will work with Environment Canada and the Canadian Nuclear Safety Commission to determine the appropriate location for the intake and diffuser structures, and to evaluate other mitigation options for both the intake and the diffuser structures, in order to mitigate adverse effects. Fisheries and Oceans Canada will work with OPG to ensure implementation through its regulatory process and conditions of authorization under the Fisheries Act.	D-C-1.2	Open
33	The Panel recommends that Fisheries and Oceans Canada require OPG to conduct an impingement and entrainment follow-up program at the existing Darlington Nuclear Generating Station and the Project site to confirm the prediction of adverse effects, including cumulative effects, and the effectiveness of mitigation. For future entrainment sampling for round whitefish, a statistical probability analysis will be needed to determine if unbiased and precise sample results can be produced.	The Government of Canada accepts this recommendation. Fisheries and Oceans Canada will work with the Canadian Nuclear Safety Commission and Ontario Power Generation to develop an impingement and entrainment study on the existing Darlington Nuclear Generating Station and at the proposed Project site to confirm predicted adverse effects and will further ensure implementation through its regulatory process and conditions of authorization under the Fisheries Act.	D-P-12.4	Open
34	In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that prior to construction, Environment Canada ensure that enhanced resolution thermal plume modeling is conducted by OPG, taking into account possible future climate change effects. Fisheries and Oceans Canada shall ensure that the results of the modeling are incorporated into the design of the outfall diffuser and the evaluation of alternative locations for the placement of the intake	The Government of Canada accepts the intent of this recommendation. Environment Canada is committed to reviewing the information provided by OPG, and will rely on Fisheries and Oceans Canada authorization for a HADD associated with the intake or outfall to ensure that OPG undertakes this modelling. Fisheries and Oceans Canada will work with Environment Canada, and the Canadian Nuclear Safety Commission to incorporate the results from the thermal plume modeling into the determination of the appropriate location for the intake and diffuser structures to mitigate adverse effects. Fisheries and	D-C-1.2	Open
			D-P-12.4	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	and the diffuser of the proposed condenser cooling water system.	Oceans Canada will ensure implementation through conditions of a Fisheries Act authorization.		
35	<p>In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that prior to operation, the Canadian Nuclear Safety Commission require OPG to include the following in the surface water risk assessment:</p> <ul style="list-style-type: none"> <li>the surface combined thermal and contaminant plume; and</li> <li>the physical displacement effect of altered lake currents as a hazardous pulse exposure to fish species whose larvae passively drift through the area, such as lake herring, lake whitefish, emerald shiner and yellow perch.</li> </ul> <p>If the risk assessment result predicts a potential hazard then the Canadian Nuclear Safety Commission shall convene a follow-up monitoring scoping workshop with Environment Canada, Fisheries and Oceans Canada and any other relevant authorities to develop an action plan.</p>	<p>The Government of Canada accepts this recommendation to require OPG to update a comprehensive surface water risk assessment as recommended, however would clarify that an assessment of the combined thermal and contaminant plume should consider not only the surface area of the plume, but its vertical extent as well. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the design of the surface water risk assessment and any subsequent action plan development.</p>	D-C-1.2	Open
			D-P-12.3	Open
			D-P-12.4	Open
36	<p>In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that during operation, the Canadian Nuclear Safety Commission require OPG to undertake adult fish monitoring of large-bodied and small-bodied fish to confirm the effectiveness of mitigation measures and verify the predictions of no adverse thermal and physical diffuser jet effects.</p>	<p>The Government of Canada accepts this recommendation to require OPG to undertake adult fish monitoring to confirm the effectiveness of mitigation measures and effect predictions. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. Fisheries and Oceans Canada is committed to working with OPG to develop their fish and fish habitat monitoring and follow-up program and ensuring implementation through conditions of authorization under the Fisheries Act.</p>	D-C-1.2	Open
			D-P-12.4	Open
37			D-C-1.2	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	<p>In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to determine the total area of permanent aquatic effects from the following, to properly scale mitigation and scope follow-up monitoring:</p> <ul style="list-style-type: none"> <li>• § the thermal plume + 2°C above ambient temperature;</li> <li>• § the mixing zone and surface plume contaminants;</li> <li>• physical displacements from altered lake currents; and</li> <li>• infill and construction losses and modifications.</li> </ul>	<p>The Government of Canada accepts the intent of this recommendation to require OPG to determine the total area of permanent aquatic effects from identified impacts. The Government of Canada would further support inclusion of cumulative effects assessment in this assessment, including the effects of impingement and entrainment and climate change. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. Further, Fisheries and Oceans Canada is committed to working with the Canadian Nuclear Safety Commission and OPG to ensure that any permanent aquatic habitat effects are mitigated and appropriate habitat compensation is developed and implemented as a condition of any Fisheries Act authorization.</p>	D-P-12.4	Open
38	<p>The Panel recommends that the Canadian Nuclear Safety Commission require that the geotechnical and seismic hazard elements of the detailed site geotechnical investigation to be performed by OPG include, but not be limited to:</p> <ul style="list-style-type: none"> <li>• Prior to site preparation: <ul style="list-style-type: none"> <li>○ demonstration that there are no undesirable subsurface conditions at the Project site. The overall site liquefaction potential shall be assessed with the site investigation data; and</li> <li>○ confirmation of the absence of paleoseismologic features at the site and, if present, further assessment to reduce the overall uncertainty in the seismic hazard assessment during the design of the Project must be conducted.</li> </ul> </li> <li>• During site preparation and/or prior to construction:</li> </ul>	<p>The Government of Canada accepts the intent of this recommendation to require OPG's detailed site investigation to include the noted geotechnical and seismic hazard elements, however, notes that this investigation may be performed concurrently with site preparation activities. Natural Resources Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.</p>	D-O-3.1 D-P-9.1 D-P-9.3 D-P-9.4 D-P-9.5	Open Closed Open Open Open



#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	<ul style="list-style-type: none"> <li>○ verification and confirmation of the absence of surface faulting in the overburden and bedrock at the site.</li> <li>● Prior to construction:               <ul style="list-style-type: none"> <li>○ verification of the stability of the cut slopes and dyke slopes under both static and dynamic loads with site/Project-specific data during the design of the cut slopes and dykes or before their construction;</li> <li>○ assessment of potential liquefaction of the northeast waste stockpile by using the data obtained from the pile itself upon completion of site preparation;</li> <li>○ measurement of the shear strength of the overburden materials and the dynamic properties of both overburden and sedimentary rocks to confirm the site conditions and to perform soil-structure interaction analysis if necessary;</li> <li>○ assessment of the potential settlement in the quaternary deposits due to the groundwater drawdown caused by future St. Marys Cement quarry activities; and</li> <li>○ assessment of the effect of the potential settlement on buried infrastructures in the deposits during the design of these infrastructures.</li> </ul> </li> <li>● Prior to operation:               <ul style="list-style-type: none"> <li>○ development and implementation of a monitoring program for the Phase 4 St. Marys Cement blasting operations to confirm that the maximum peak ground velocity at the boundary between the Darlington and St.</li> </ul> </li> </ul>			

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	Marys Cement properties is below the proposed limit of three millimetres per second (mm/s).			
39	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to prepare a contingency plan for the construction, operation and decommissioning Project stages to account for uncertainties associated with flooding and other extreme weather hazards. OPG shall conduct localized climate change modelling to confirm its conclusion of a low impact of climate change. A margin/bound of changes to key parameters, such as intensity of extreme weather events, needs to be established to the satisfaction of the Canadian Nuclear Safety Commission. These parameters can be incorporated into hydrological designs leading up to an application to construct a reactor, as well as measures for flood protection. OPG must also conduct a drought analysis and incorporate any additional required mitigation/design modifications, to the satisfaction of the Canadian Nuclear Safety Commission, as part of a Licence to Construct a reactor.	The Government of Canada accepts this recommendation to require OPG to prepare a contingency plan to account for uncertainties associated with flooding, drought and other extreme weather hazards, as recommended. The Government of Canada accepts the intent of the recommendation to conduct localized climate change modelling; however, if OPG uses reputable published studies to evaluate the anticipated impact of climate change for the Project area, localized climate change modelling may not be necessary. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-7.1	Open
40	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to: <ul style="list-style-type: none"> <li>• establish an adaptive management program for algal hazard to the Project cooling water system intake that includes the setup of thresholds for further actions; and</li> <li>• factor the algal hazard assessment into a more detailed biological evaluation of moving the intake and diffuser deeper offshore as part of the</li> </ul>	The Government of Canada accepts this recommendation to require OPG to establish an adaptive management program for algal hazards to the cooling water system intake, and factor that assessment into planned siting studies and cost-benefit analyses. Fisheries and Oceans Canada and Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-1.2	Open
			D-P-12.4	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	detailed siting studies and the cost-benefit analysis of the cooling system.			
41	The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission coordinate discussions with OPG and key stakeholders on the effects of the Project on housing supply and demand, community recreational facilities and programs, services and infrastructure as well as additional measures to help deal with the pressures on these community assets.	The Government of Canada accepts the intent of this recommendation for the CNSC to initiate discussions with OPG and key stakeholders, however, notes that these discussions may occur concurrently with site preparation activities.	D-P-17.1	Closed
42	The Panel recommends that on an ongoing basis, OPG pursue its strategy to ensure that Aboriginal students can benefit from the permanent job opportunities that will be available during the lifetime of the Project. In this regard, OPG should collaborate with various secondary and post-secondary education institutions as well as Aboriginal groups to ensure that such programs would be successful.	The Government of Canada supports this proposal and notes that such programs are consistent with OPG's presentation to the Panel on Aboriginal Interests on March 28, 2011 and with OPG's Aboriginal Relations Policy.	D-P-17.1	Closed
43	The Panel recommends that the Canadian Nuclear Safety Commission engage appropriate stakeholders, including OPG, Emergency Management Ontario, municipal governments and the Government of Ontario to develop a policy for land use around nuclear generating stations.	The Government of Canada accepts this recommendation for the Canadian Nuclear Safety Commission to engage appropriate stakeholders in developing policy for land use around nuclear generating stations.	D-P-17.1	Closed
44	The Panel recommends that the Government of Ontario take appropriate measures to prevent sensitive and residential development within three kilometres of the site boundary.	This recommendation was directed to the Government of Ontario.	N/A	Closed
45	The Panel recommends that the Municipality of Clarington prevent, for the lifetime of the nuclear facility, the establishment of sensitive public facilities such as school, hospitals and residences for vulnerable	This recommendation was directed to the Municipality of Clarington.	N/A	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	clienteles within the three kilometre zone around the site boundary.			
46	Given that a severe accident may have consequences beyond the three and 10-kilometre zones evaluated by OPG, the Panel recommends that the Government of Ontario, on an ongoing basis, review the emergency planning zones and the emergency preparedness and response measures, as defined in the Provincial Nuclear Emergency Response Plan (PNERP), to protect human health and safety.	This recommendation was directed to the Government of Ontario.	N/A	Closed
47	<p>The Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission ensure the OPG Traffic Management Plan addresses the following:</p> <ul style="list-style-type: none"> <li>• contingency plans to address the possibility that the assumed road improvements do not occur;</li> <li>• consideration of the effect of truck traffic associated with excavated material disposal on traffic operations and safety;</li> <li>• further analysis of queuing potential onto Highway 401; and</li> <li>• consideration of a wider range of mitigation measures, such as transportation-demand management, transit service provisions and geometric improvements at the Highway 401/Waverley Road interchange.</li> </ul>	The Government of Canada accepts this recommendation to require that OPG's Traffic Management Plan consider elements related to contingency plans, truck traffic, queuing potential on Highway 401 and additional mitigation measures.	D-P-10.1	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
48	In consideration of public safety, the Panel recommends that prior to site preparation, the Canadian Nuclear Safety Commission coordinate a committee of federal, provincial and municipal transport authorities to review the need for road development and modifications.	The Government of Canada accepts the intent of this recommendation to support a federal, provincial and municipal review of the need for road development and modifications, however, notes that this review may be performed concurrently with site preparation activities.	N/A	Not Initiated
49	The Panel recommends that prior to construction, Transport Canada ensure that OPG undertake additional quantitative analysis, including collision frequencies and rail crossing exposure indices, and monitor the potential effects and need for mitigation associated with the Project.	The Government of Canada accepts the intent of this recommendation to require OPG to undertake additional rail safety studies, monitor the potential effects and determine the need for mitigation. The Railway Safety Act (RSA) places crossing safety responsibilities on the Railways and the Road Authorities. This policy reflects the objectives of Section 3 of the RSA. Ultimately, the Railway and the Road Authority must take the responsibility of performing the crossing assessment. Transport Canada is committed to provide assistance and expertise to the interested parties if required during the risk assessment and in the evaluation of any proposed mitigation measures.	D-C-3.1	Open
50	The Panel recommends that prior to construction, Transport Canada require OPG to conduct a risk assessment, jointly with Canadian National Railway, that includes: <ul style="list-style-type: none"> <li>• an assessment of the risks associated with a derailment or other rail incident that could affect the Project;</li> <li>• an analysis of the risks associated with a security threat, such as a bomb being placed on a train running on the tracks that bisect the Project;</li> <li>• a comparative evaluation of the effectiveness of various mitigation measures or combination of measures (e.g., blast wall, retaining wall,</li> </ul>	The Government of Canada recognizes that the CNSC has the statutory authority and powers to address this recommendation through future regulatory activities under the Nuclear Safety and Control Act. Transport Canada is committed to provide assistance and expertise to the Canadian Nuclear Safety Commission and other parties if required during the risk assessment and in the evaluation of any proposed mitigation measures.	D-C-3.1	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	<p>recessed tracks, berm and railway speed restrictions within the vicinity of the site);</p> <ul style="list-style-type: none"> <li>• a determination of the design criteria necessary to ensure the effectiveness of these measures (e.g., the appropriate height, strength, material and design of a blast wall); and</li> <li>• a critical analysis to confirm that these measures, when properly designed and implemented, would be sufficient to provide protection to the Project site in the event of a derailment at full speed or other adverse event.</li> </ul>			
51	<p>In the event that a once-through condenser cooling system is chosen for the Project, the Panel recommends that prior to construction, Transport Canada work with OPG to develop a follow-up program to verify the accuracy of the prediction of no significant adverse effects to boating safety from the establishment of an increased prohibitive zone. OPG must also develop an adaptive management program, if required, to mitigate potential effects to small watercraft.</p>	<p>The Government of Canada accepts the intent of this recommendation. Transport Canada will provide guidance and support to OPG to assist in their development of a follow-up program to confirm that boating safety will not be significantly adversely affected. If an adaptive management program is required, Transport Canada can provide support and expertise to OPG in its development.</p>	D-P-12.8	Closed
52	<p>The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to make provisions for on-site storage of all used fuel for the duration of the Project, in the event that a suitable off-site solution for the long-term management for used fuel waste is not found.</p>	<p>The Government of Canada accepts the intent of this recommendation to the extent that it is the responsibility of waste owners for managing and funding the safe and secure operation of their own wastes. Canada's 1996 Radioactive Waste Policy Framework states that the owners of radioactive waste are responsible for developing and implementing solutions, including all costs associated with safely and securely managing their wastes.</p>	D-C-9.1	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
53	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to make provisions for on-site storage of all of low and intermediate-level radioactive waste for the duration of the Project, in the event that a suitable off-site solution for the long-term management for this waste is not approved.	The Government of Canada accepts the intent of this recommendation to the extent that it is the responsibility of waste owners for managing and funding the safe and secure operation of their own wastes, in accordance with CNSC's regulatory requirements. Canada's 1996 Radioactive Waste Policy Framework states that the owners of radioactive waste are responsible for developing and implementing solutions, including all costs associated with safely and securely managing their wastes.	D-C-9.1	Open
54	The Panel recommends that during operation, the Canadian Nuclear Safety Commission require OPG to implement measures to manage releases from the Project to avoid tritium in drinking water levels exceeding a running annual average of 20 Becquerels per litre at drinking water supply plants in the regional study area.	<p>The Government of Canada accepts the intent of this recommendation to safeguard drinking water; however, it notes that any proposed limits should be consistent with the tritium standards put in place by the relevant regulatory authorities. Health Canada's Guidelines for Canadian Drinking Water Quality, based on the recommendations of the International Commission on Radiological Protection and the World Health Organization, establish a safe consumption guideline limit of 7,000 Bq/L for tritium in drinking water. This limit has been accepted as a standard by the Province of Ontario. Since water quality is primarily a provincial responsibility in Canada, the provinces may adopt federal guidelines, or may establish their own criteria.</p> <p>The Government of Canada further notes that the Canadian Nuclear Safety Commission regulates potential releases of tritium to the environment from nuclear facilities by imposing regulatory limits as well as precautionary action levels for tritium releases into air or water on a licence-specific basis. These limits are set with a goal to protect human health. The Canadian Nuclear Safety Commission's Radiation Protection Regulations require that releases are kept "As Low As Reasonably Achievable" (ALARA), social and economic factors taken into account.</p>	D-C-4.1	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
55	The Panel recommends that Health Canada and the Canadian Nuclear Safety Commission continue to participate in international studies seeking to identify long-term health effects of low-level radiation exposures, and to identify if there is a need for revision of limits specified in the Radiation Protection Regulations.	The Government of Canada accepts the recommendation to continue its participation in international studies seeking to identify long-term health effects of low-level radiation exposures. The Government of Canada accepts the intent of the recommendation to identify if there is a need for revision of limits specified in the Radiation Protection Regulations based on the results of international studies. Health Canada and the Canadian Nuclear Safety Commission will continue to participate in international studies dealing with long-term health effects of low-level radiation exposures; participate in committees/working groups with relevant international organizations; and, regularly review the reports published by these international groups for developments in radiation protection. Health Canada can provide expertise to the Canadian Nuclear Safety Commission, upon request, in support of the review of limits specified in the Radiation Protection Regulations.	N/A	Closed
56	The Panel recommends that over the life of the Project, the Canadian Nuclear Safety Commission require OPG to conduct ambient air monitoring in the local study area on an ongoing basis to ensure that air quality remains at levels that are not likely to cause adverse effects to human health.	The Government of Canada accepts this recommendation to require OPG to conduct ambient air monitoring to ensure that air quality is not likely to cause adverse effects to human health. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-P-12.2	Closed
57	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to undertake an assessment of the off-site effects of a severe accident. The assessment should determine if the off-site health and environmental effects considered in this environmental assessment bound	The Government of Canada accepts this recommendation to require OPG to undertake an assessment of the off-site effects of a severe accident. Environment Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation.	D-C-3.1	Open



#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
	the effects that could arise in the case of the selected reactor technology.			
58	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission confirm that dose acceptance criteria specified in RD-337 at the reactor site boundary—in the cases of design basis accidents for the Project's selected reactor technology—will be met.	The Government of Canada accepts this recommendation to ask the Canadian Nuclear Safety Commission to confirm that dose acceptance criteria specified in RD-337 will be met.	D-C-3.1	Open
59	The Panel recommends that the Municipality of Clarington manage development in the vicinity of the Project site to ensure that there is no deterioration in the capacity to evacuate members of the public for the protection of human health and safety.	This recommendation was directed to the Municipality of Clarington.	N/A	Closed
60	The Panel recommends that prior to construction, the Government of Canada review the adequacy of the provisions for nuclear liability insurance. This review must include information from OPG and the Region of Durham regarding the likely economic effects of a severe accident at the Darlington Nuclear site where there is a requirement for relocation, restriction of use and remediation of a sector of the regional study area.	The Government of Canada accepts the intent of this recommendation, that the Government of Canada review the adequacy of the provisions for nuclear liability insurance. In bringing forward modernized nuclear civil liability legislation to replace the current Nuclear Liability Act, the Government of Canada will continue to review the adequacy of the provisions for nuclear liability insurance, taking into consideration the risk of Canadian nuclear installations and other relevant factors.	N/A	Closed

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
61	The Panel recommends that during operation, the Canadian Nuclear Safety Commission require OPG to monitor aquatic habitat and biota for potential cumulative effects from the thermal loading and contaminant plume of the discharge structures of the existing Darlington Nuclear Generating Station and the Project.	The Government of Canada accepts this recommendation to require OPG to monitor aquatic habitat and biota for potential cumulative effects from the thermal loading and contaminant plume. Environment Canada and Fisheries and Oceans Canada can provide available scientific and technical expertise to the Canadian Nuclear Safety Commission, upon request, to assist in the implementation of this recommendation. The proponent will also be required to undertake an aquatic monitoring program as a condition of any Fisheries Act authorization.	D-P-12.4	Open
62	The Panel recommends that prior to site preparation, Environment Canada evaluate the need for additional air quality monitoring stations in the local study area to monitor cumulative effects on air quality.	The Government of Canada accepts this recommendation to evaluate the need for additional air quality monitoring stations in the local study area to monitor cumulative effects on air quality. If this evaluation finds that additional air quality monitoring stations in the local study area are required, the Government of Canada acknowledges that the Canadian Nuclear Safety Commission has the statutory authority and powers to address the findings of this recommendation through future licensing under the Nuclear Safety and Control Act.	N/A	Closed
63	The Panel recommends that prior to construction, the Canadian Nuclear Safety Commission require OPG to evaluate the cumulative effect of a common-cause severe accident involving all of the nuclear reactors in the site study area to determine if further emergency planning measures are required.	The Government of Canada accepts the intent of this recommendation to require OPG to evaluate the cumulative effect of a common-cause severe accident in the site study area. The Government of Canada notes that the CNSC has established a task force to examine the lessons learned from the Japan Earthquake and will evaluate the operational, technical and regulatory implications of the nuclear event in Japan in relation to Canadian nuclear power plants.	D-C-3.1	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
64	The Panel recommends that the Canadian Environmental Assessment Agency revise the Canadian Environmental Assessment Agency Cumulative Effects Practitioner's Guide to specifically include consideration of accident and malfunction scenarios.	The Government of Canada accepts this recommendation. The Canadian Environmental Assessment Agency is in the process of updating its suite of instruments in support of cumulative effects assessment under the CEAA. An operational policy statement, scheduled for completion by December 2012, will provide core guidance to practitioners and include the consideration of accidents and malfunctions.	N/A	Closed
65	The Panel recommends that the Government of Canada make it a priority to invest in developing solutions for long-term management of used nuclear fuel, including storage, disposal, reprocessing and re-use.	The Government of Canada accepts the intent of this recommendation that priority be given to invest in solutions for the long-term management of used nuclear fuel. It is the responsibility of waste owners to fund and manage the safe and secure operation of their wastes. The Nuclear Waste Management Organization, established by the nuclear energy corporations, is responsible for implementing the government-selected plan for managing nuclear fuel waste over the long-term. The Government of Canada is committed to ensuring that an appropriate and properly funded long-term safe and secure solution is in place for the managing nuclear fuel waste over long term.	N/A	Closed
66	The Panel recommends that the Government of Canada update the Nuclear Liability and Compensation Act or its equivalent to reflect the consequences of a nuclear accident. The revisions must address damage from any ionizing radiation and from any initiating event and should be aligned with the polluter pays principle. The revised Nuclear Liability and Compensation Act, or its equivalent, must be in force before the Project can proceed to the construction phase.	The Government of Canada accepts the intent of this recommendation, that the Government of Canada update the Nuclear Liability and Compensation Act or its equivalent to reflect the consequences of a nuclear accident. The Government of Canada recognizes the importance of bringing forward modernized nuclear civil liability legislation to bring compensation in line with internationally-accepted levels, and will decide on the timing of the next introduction of the Nuclear Liability and Compensation Act bill in Parliament.	N/A	Open

#	JRP Recommendation	Government of Canada Response	OPG Commitment Reference	Status
67	The Panel recommends that the Government of Canada provide clear and practical direction to the application of sustainability assessment in environmental assessments for future nuclear projects.	The Government of Canada accepts the intent of this recommendation. However, the scope of the assessment and the factors to be considered in future EAs for nuclear projects are decisions that should be taken on a project-by-project basis by future Responsible Authorities. Recognizing that sustainable development is a principle of the Canadian Environmental Assessment Act, should a separate sustainability assessment be required by Responsible Authorities for future nuclear projects, the Government of Canada agrees that it would be desirable for those Responsible Authorities to provide clear and practical direction to proponents and the public on how a sustainability assessment should be conducted.	N/A	Closed

## Appendix C STATUS OF THE ENVIRONMENTAL ASSESSMENT FOLLOW-UP PROGRAM

To align with the JRP Recommendations describing follow-up monitoring, OPG's EA follow-up program is described in several "Methodology Reports for Environmental Monitoring and Environmental Assessment Follow-Up," specific to environmental components related to the JRP Recommendations. These plans are tracked through DNNP Deliverables D-P-12.2 through to D-P-12.9.

Table 15 below provides a brief description of each of these follow-up methodology reports. Where a JRP Recommendation is not linked to a methodology report, the JRP Recommendations column indicates this is not applicable.

CNSC staff reviewed OPG's submitted EMEAF Plan under deliverable D-P-12.1 and in April 2022 [50], as well as several associated deliverables [51], and determined that OPG's submissions were sufficient to close the deliverable. OPG has since revised the EMEAF Plan to incorporate updated environmental data and feedback received from Indigenous Nations and communities.

**Table 15: Status of DNNP Deliverables under the Environmental Assessment Follow-Up Program**

<b>DNNP Deliverable</b>	<b>Commitment Title</b>	<b>Purpose</b>	<b>Linked to JRP Recommendation(s)</b>	<b>Current Status</b>
D-P-12.1	Environmental Monitoring and Environmental Assessment Follow-Up (EMEAF) Plan	Outlines the methodology of the EMEAF program, to ensure licensed activities and mitigation measures conform with the outcome of the EA.	N/A	Closed. CNSC staff reviewed and accepted OPG's submissions [50].
D-P-12.1(a)	Environmental Impact Statement Review	OPG to comprehensively review the EIS to ensure that the results of the EIS remain valid.	1	Open. OPG's submissions to address this Deliverable are the subject of this CMD.
D-P-12.2	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Atmospheric Environment	Outlines the basis for selection of Contaminants of Potential Concern (COPC) subject to the Air Quality EA Follow-Up Monitoring Program. Outlines the activities performed to monitor noise levels during site preparation and construction, to confirm effectiveness of the Noise Management Plan.	8, 56	Closed. CNSC staff reviewed and accepted OPG's submissions [51].

<b>DNNP Deliverable</b>	<b>Commitment Title</b>	<b>Purpose</b>	<b>Linked to JRP Recommendation(s)</b>	<b>Current Status</b>
D-P-12.3	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Surface Water Environment	Outlines the activities for follow-up monitoring during site preparation activities and inform the Surface Water monitoring program.	12, 13, 15, 35	Open. OPG must submit this methodology report for CNSC staff acceptance at least 90 days prior to undertaking these activities.
D-P-12.4	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Aquatic Environment	Outlines the activities for follow-up monitoring during site preparation activities and inform the Aquatic Environment monitoring program.	28, 29, 30, 35, 36, 37, 40, 61	Open. OPG must submit this methodology report for CNSC staff acceptance at least 90 days prior to undertaking these activities.
D-P-12.5	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Terrestrial Environment	Outlines the activities for follow-up monitoring during site preparation activities and inform the Terrestrial Environment monitoring program.	22, 23, 25	Closed. CNSC staff reviewed and accepted OPG's submissions [51].
D-P-12.6	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Geological and Hydrogeological Environment	Outlines the activities for follow-up monitoring during site preparation activities and inform the soil and groundwater monitoring programs.	11, 17, 19	Closed. CNSC staff reviewed and accepted OPG's submissions [51].
D-P-12.7	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Land Use	Describe the methodologies to collect and monitor land use data within a 10 km radius from the Darlington site.	N/A	Closed. CNSC staff reviewed and accepted OPG's submissions [51].
D-P-12.8	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Traffic and Transportation	Outlines the activities for follow-up monitoring during site preparation and construction related to traffic management.	51	Closed. CNSC staff reviewed and accepted OPG's submissions [51].

<b>DNNP Deliverable</b>	<b>Commitment Title</b>	<b>Purpose</b>	<b>Linked to JRP Recommendation(s)</b>	<b>Current Status</b>
D-P-12.9	Methodology Reports for Environmental Monitoring and EA Follow-Up for: Non-Human Biota and Human Health	Outlines the activities for follow-up monitoring during site preparation and construction activities and inform the Radiological and Non-Radiological Environmental Monitoring program.	14, 26	Open. OPG must submit this methodology report for CNSC staff acceptance at least 90 days prior to undertaking construction.