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ONTARIOPOWER GENERATION

Title:
DARLINGTON NEW NUCLEAR PROJECT SUPPORTING DOCUMENT FOR COMPREHENSIVE REVIEW OF EIS FOR BWRX-300

DARLINGTON NEW NUCLEAR PROJECT SUPPORTING DOCUMENT FOR COMPREHENSIVE REVIEW OF EIS FOR BWRX-300

NK054-REP-07730-00058-R001

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DARLINGTON NEW NUCLEAR PROJECT SUPPORTING DOCUMENT
FOR COMPREHENSIVE REVIEW OF EIS FOR BWRX-300
NK054-REP-07730-00058 R001

Submitted To:

Ontario Power Generation Inc.

Prepared By:

Calian Nuclear

July 2023

Darlington New Nuclear Project Supporting Document for Comprehensive Review of EIS for BWRX-300

EA Consulting Team

CALIAN Group Ltd.	Calian Group	Coordination of Supporting Document
SLR	SLR Consulting	Edit of Supporting Document
Ecometrix	Ecometrix	Prepared calculation of dose for normal operation.
IEC	Independent Environmental Consultants	Edit of Supporting Document, Prepared Support Report - Atmospheric Environment (dust, noise)
Golder Associates	Golder Associates Limited	Prepared Support Reports - Surface Water Environment (hydrology) and Groundwater Environment
BEACON ENVIRONMENTAL	Beacon Environmental	Prepared Support Report - Terrestrial Environment

List of updates to the EIS review

This Revision 001 reflects the following four key changes to the EIS Review:

A. General update,
B. Incorporating zero radiological liquid release during normal operations,
C. Incorporating results of additional studies on opportunities to retain habitat features on the DNNP site, and
D. Providing more representative estimates of solid waste activity and volume during the normal operation of a BWRX-300.

These four changes are denoted as A, B, C and D respectively as indicated in column of "Key Change" below.

Revision	Revision Date	Revision Description	Key Change	Page No.
001	June 2023	EDITED Darlington Land Acknowledgement and ADDED "2018 Reaffirmation of Treaty Rights"	A	xiii
		ADDED a new bullet "V" to reflect "zero radiological liquid release" under "Findings"	B	xvi
		MODFIED description of acronym "DWMF" to add "NSS-DWMF" as a current name for the facility	A	xxii
		MODFIED description of acronym "WWMF" to add "NSS-WWMF" as a current name for the facility	A	xxv
		DELETED "original" when describing the existing EA	A	3
		CHANGED "BWR" to "BWRX"" in the first sentence of Section 3.1.1	A	7
		MODIFIED the third paragraph under Figure 3-1 to reflect "zero radiological liquid release"	B	9
		MODIFIED the fourth paragraph under Figure 3-1 to reflect the updated airborne source term, in which carbon-14 emissions are now slightly higher for the BWRX-300	A	9
		MODIFIED the "Condensate Storage and Transfer System" bullet points under Section 3.1.2 to reflect "zero radiological liquid release"	B	12
		MODIFIED the "Radioactive Waste Management Systems" bullet point for the liquid waste management system under Section 3.1.2 to reflect "zero radiological liquid release"	B	12
		MODIFIED the "A Radwaste Building" bullet point under Section 3.1.3 to reflect "zero radiological liquid release"	B	14
		ADDED final paragraph in Section 3.2.1 to provide	A	19

Revision	Revision Date	Revision Description	Key Change	Page No.
		additional context with how the site preparation phase for the BWRX-300 compares to the EIS		
		ADDED "BWR" before reactor for the second bullet point under Section 5.2.3 to provide enhanced detail	A	25
		MODIFIED the BWRX-300 description for the second row of "Table 5-1: Comparison of How Energy is Produced" to reflect "zero radiological liquid release"	B	26
		CHANGED the date for the used fuel dry storage facility from 2032 to 2035	A	29
		ADDED new row to "Table 5-3: Review of DNNP Works and Activities (Operations and Maintenance)" for the radioactive liquid waste management system (RLWMS) to reflect "zero radiological liquid release" and removed mention of the RLWMS from the third row discussing the RGWMS.	B	37
		MODIFIED the second bullet at the end of Section 5.2.6 to reflect "zero radiological liquid release"	B	40
		MODIFIED the fourth bullet at the end of Section 5.2.6 to reflect "more representative estimates of solid waste activity and volume during the normal operation of a BWRX-300."	D	40
		ADDED two new bullet points to the end of Section 5.4.4 to discuss additional updates not included in the 2020 DNNP Supporting Studies	A	43
		ADDED new section "5.4.4.1 - 2018 and 2019 Aquatic Community Characterization for Siting of the Intake and Discharge Structure"	A	43
		CHANGED "These refinements are **likely**…" to "These refinements are **assessed**…" in the second bullet under "Site Footprint" in Section 5.5.1	C	51
		MODIFIED the third bullet under "Emissions" in Section 5.5.1 to reflect "zero radiological liquid release"	B	52
		MODIFIED the third bullet under "Waste Management" in Section 5.5.1 to reflect more representative estimates of solid waste activity and volume during the normal operation of a BWRX-300.	D	53
		MODIFIED bullet on excavation requirements for 4-reactor deployment with editorial corrections.	A	59
		MODIFIED the BWRX-300 description for the first row under the section "operation and maintenance phase" of "Table 5-6: Comparison of DNNP Works and Activities Likely to Measurably Change the Surface Water Environment Identified in the EIS to the BWRX 300	B	63

Revision	Revision Date	Revision Description	Key Change	Page No.
		Deployment" to reflect "zero radiological liquid release"		
		DELETED the second bullet point of #3 under Section 5.5.3.2 and MODIFIED the first bullet point to update information regarding the diffuser depth	A	64
		MODIFIED the text under "Characterisation of Plant Effluents" in Section 5.5.3.2 to reflect "zero radiological liquid release"	B	65
		MODIFIED the BWRX-300 description for the first row under the section "operation and maintenance phase" of "Table 5-7: Comparison of DNNP Works and Activities Likely to Measurably Change the Aquatic Environment Identified in the EIS to the BWRX 300 Deployment" to reflect "zero radiological liquid release"	B	72
		ADDED "hydrogeology" and REMOVED noise from description of studies relevant to aquatic environment.	A	76
		DELETED "positive outcome" from the fourth paragraph of Section 5.5.5.1 when describing potential opportunity to retain Terrestrial environment features	A	78
		MODIFIED the "Excavation and Grading" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	79
		MODIFIED the "Construction of Power Block" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	79
		MODIFIED the "Construction of Intake and Discharge Structures" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	79
		MODIFIED the "Supply of Construction Equipment Material and Operating Plant Components" row of Table 5 8: Comparison of DNNP Works and Activities Likely to	C	80

Revision	Revision Date	Revision Description	Key Change	Page No.
		Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results		
		MODIFIED the "Workforce, Payroll, and Purchasing" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	80
		MODIFIED the "Operation of Electrical Power Systems" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	80
		MODIFIED the "Administration, Payroll, and Purchasing" row of Table 5 8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment" to explain that air and noise modelling has been completed, referencing to the relevant sections explaining the results and DELETING statement concluding minor effect	C	80
		DELETED the list of examples of criteria in Section 5.5.5.3 that were used to evaluate the DNNP to predict changes to the Terrestrial Environment	A	81
		DELETED discussion of Bank Swallow and Bats in Section 5.5.3 and cross referenced to their discussion elsewhere	A	81
		ADDED four additional bullet points under Section 5.5.5.4 describing additional mitigation measures identified in the EIS to address effects on Vegetation Communities and Species	A	82
		ADDED new paragraph beneath the bullet points describing mitigation measures identified in the EIS to explain that some may not be required for the BWRX-300 deployment	A	82
		DELETED preliminary statement that "effects are anticipated to be minor" and ADDED detailed and updated description of the results of the additional studies for	C	83

Revision	Revision Date	Revision Description	Key Change	Page No.
		"dust" under Section 5.5.5.4		
		DELETED and REVISED previous text for "Hydrogeology (Groundwater)" to provide detailed and updated description of the results of the additional studies for groundwater under Section 5.5.5.4	C	84
		DELETED list of commitments that are no longer relevant or should be scaled down for the DNNP from the end of Section 5.5.4 for "Hydrology"	A	85
		MODIFIED the final paragraph of Section 5.5.5.5 to remove preliminary statement that effects are not anticipated and ADDED text that the studies are complete, cross referencing to the discussion of results	C	86
		CHANGED wording "impacts" to "effects" in the final sentence of the final paragraph of Section 5.5.5.5	A	86
		MODIFIED the sub-section "Breeding Birds" in Section 5.5.5.6 to provide an updated description of what was assessed in the EIS and ADDED text on the additional studies that have been completed	C	86
		ADDED new sub-section for "noise" in Section 5.5.5.6 to describe the additional studies that have been completed for noise	C	87
		ADDED new sentence to the end of the final paragraph of the sub-section "Waterfowl Staging Area" in Section 5.5.5.6 to discuss the assessment and results of the additional studies for noise	C	87
		MODIFIED the sub-section "Migrant Songbirds and their Habitat" in Section 5.5.5.6 to discuss the assessment and results of the additional studies for noise	C	88
		MODIFIED the final paragraph of sub-section "Winter Raptor Feeding and Roosting Areas" in Section 5.5.5.6 to discuss the assessment and results of the additional studies for noise	C	89
		DELETED text from the "vibration" bullet point under the sub-section "Bank Swallow" in Section 5.5.5.6 that discussed assumptions for the assessment related to blasting at St. Marys Cement	C	90
		MODIFIED the "Dust and Noise" sub-section in Section 5.5.5.6 to only discuss noise and ADDED results of the noise modelling	C	91
		MODIFIED the BWRX-300 description of the "Noise Disturbance to Bank Swallow" row in "Table 5-9: Summary of the Potential Effects to Bank Swallows" to discuss results of the additional noise study completed.	C	92

Revision	Revision Date	Revision Description	Key Change	Page No.
		MODIFIED the BWRX-300 description of the "Dust Disturbance to Habitat" row in "Table 5-9: Summary of the Potential Effects to Bank Swallows" to discuss results of the additional study completed.	C	92
		CHANGED the BWRX-300 description of the "Vibration effects to the Bank Swallow burrows and bluff habitat from blasting" row in "Table 5-9: Summary of the Potential Effects to Bank Swallows" to state the blasting magnitudes for DNNP are similar to those at St. Marys	C	92
		DELETED sentence from the sub-section "Breeding Mammals" in Section 5.5.5.8 stating that "The EIS did not consider the potential adverse effect caused by atmospheric deposition of dust on vegetation that is habitat for mammals anywhere on the DN site."	A	94
		MODIFIED the final paragraph of the sub-section "Breeding Mammals" in Section 5.5.5.8 to reflect the completion of additional studies	C	94
		ADDED new sub-section for "noise" for "Bats" in Section 5.5.5.8 to describe the additional studies that have been completed	C	97
		MODIFIED the sub-section "Dust and Noise" for "Bats" in Section 5.5.5.8 to separate the discussions for dust and noise	C	97
		MODIFIED the sub-section "Dust" for "Bats" in Section 5.5.5.8 to remove statement that effects are anticipated to be minor and to add a cross reference to the discussion of assessment results	C	97
		MODIFIED the row "Increased Lighting" of "Table 5-11: Summary of the Potential Effects to Breeding Mammals" to update discussion of lighting assessment results	C	98
		MODIFIED the row "Noise Disturbance to Bats" of "Table 5-11: Summary of the Potential Effects to Breeding Mammals" to update discussion of noise assessment results	C	98
		MODIFIED the row "Dust Disturbance to Woodlands and Treed Swamp Habitats" of "Table 5-11: Summary of the Potential Effects to Breeding Mammals" to update discussion of dust assessment results	C	98
		MODIFIED the row "Changes in Groundwater and/or Surface water inputs to treed wetlands" of "Table 5-11: Summary of the Potential Effects to Breeding Mammals" to update discussion of hydrology assessment results	C	98
		MODIFIED text in the second and third sentences of the of	A	99

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		the second paragraph of Section 5.5.5.10 to better clarify the baseline data collection and surveys completed.		
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.5 – Insects” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	100
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.6 – Bird Communities and Species (Breeding Birds)” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	100
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.6 – Bird Communities and Species (Migrant Songbirds and their Habitat)” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	101
		DELETED sentence from the EIS description of row “EIS Section 5.5.6 – Bird Communities and Species (Migrant Songbirds and their Habitat)” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 stating “The EIS did not contemplate the potential effects on migrant bird habitat from dust covering vegetation that could affect foraging, nor the disturbance to migrant birds resulting from noise.”	A	101
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.6 – Bird Communities and Species (Winter Raptor Feeding and Roosting Areas)” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	102
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.6 – Bird Communities and Species (Bank Swallow)” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	102
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.7 – Amphibians and Reptiles” in “Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment” in Section 5.5.5.10 to update discussion on the additional studies completed	C	103
		MODIFIED the BWRX-300 description of row “EIS Section 5.5.8 – Mammal Communities and Species (Breeding	C	103

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		Mammals)" in "Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment" in Section 5.5.5.10 to remove discussion on the additional studies		
		MODIFIED the BWRX-300 description of row "EIS Section 5.5.8 – Mammal Communities and Species (Bats)" in "Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment" in Section 5.5.5.10 to update discussion on the additional studies	C	103
		DELETED text from the EIS description of row "EIS Section 5.5.8 – Mammal Communities and Species (Bats)" in "Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment" in Section 5.5.5.10 to simplify the discussion on how bats were addressed in the EIS	A	103
		MODIFIED the BWRX-300 tritium airborne emissions based on revised source term information.	C	109
		ADDED sentence to Section 5.5.7.1 to reflect "zero radiological liquid release"	B	113
		MODIFIED the "BWRX-300" and "Ratio BWRX/BV" values in Table 5-16 and 5-17 to reflect the updated BWRX-300 airborne source term, and ADDED "EC6" as an EIS reactor	C	114
		MODIFIED EIS reactor values in Table 5-17 to reflect more accurate values, to the decimal point, from the EIS	A	114
		DELETED Table 5-18 and Table 5-19 from Section 5.5.7.4 which summarized bounding liquid emissions during normal operations for 1 and 4 reactors and ADDED sentence to reflect "zero radiological liquid release"	B	115
		MODIFIED the second last paragraph of Section 5.5.7.4 to reflect higher carbon-14 emissions for the BWRX-300 due to the updated airborne source term	A	115
		MODIFIED the second last paragraph for "Doses to the General Public" in Section 5.5.7.5 to reflect "zero radiological liquid release"	B	115
		CHANGED the bounding airborne dose to a receptor for four BWRX-300 reactors in the final paragraph for "Doses to the General Public" based on the updated dose assessment	C	115
		MODIFIED the final sentence of the second paragraph in Section 5.5.7.6 to reflect "zero radiological liquid release"	B	117
		MODIFIED the second sentence of the third paragraph in Section 5.5.7.6 to reflect "zero radiological liquid release"	B	117
		MODIFIED the first sentence of the last paragraph in Section 5.5.13.5 for clarity	A	142
		ADDED "non-radioactive effluent" to the final bullet point	B	143

Revision	Revision Date	Revision Description	Key Change	Page No.
		for “Chemical Releases to Air and Water” in Section 5.5.14.4 to reflect “zero radiological liquid release”		
		CHANGED the maximum dose to terrestrial and aquatic receptors for 1 and 4 BWRX-300 reactors based on the updated dose assessment	C	144
		MODIFIED the description of the “green” colour coding in Section 5.5.15 to remove text “…and therefore it was determined there was No Residual Adverse Effect, as in the EIS.”	A	145
		MODIFIED the description of “pink shades”, “grey shades” and “white shades” under Section 5.5.15 to align with EIS review report.	A	145
		ADDED note to the BWRX-300 description in the “Atmospheric Environment” row of “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” to explain that dust and noise effects will be discussed appropriately throughout the table	C	146
		CHANGED BWRX-300 description for the relevant VEC “Aquatic Habitat” for row “Aquatic Environment” in “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” in Section 5.5.15 to state “Less effect anticipated” rather than “Less effect than outlined in the EIS”	A	146
		CHANGED BWRX-300 description for the relevant VEC “Benthic invertebrates and VEC fish species” for row “Aquatic Environment” in “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” in Section 5.5.15 to state “Less effect anticipated” rather than “Less effect than outlined in the EIS”	A	146
		MODIFIED BWRX-300 description for the relevant VEC “On-site aquatic habitat” for row “Aquatic Environment” in “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” in Section 5.5.15 to update text based on completed additional studies	C	147
		MODIFIED BWRX-300 description for the relevant VEC “Cultural meadow and thicket ecosystem” for row “Terrestrial Environment” in “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” in Section 5.5.15 to update text based on completed additional studies	C	147
		MODIFIED BWRX-300 description for the relevant VEC “Wetland ecosystem” for row “Terrestrial Environment” in “Table 5-18: Summary of Residual Adverse Effects and Relevant VECs” in Section 5.5.15 to update text based on	C	148

Revision	Revision Date	Revision Description	Key Change	Page No.
		completed additional studies		
		MODIFIED BWRX-300 description for the relevant VEC "Woodland ecosystems" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	148
		MODIFIED BWRX-300 description for the relevant VEC "Rare plant species" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	148
		MODIFIED BWRX-300 description for the relevant VEC "Amphibians and reptiles" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	149
		MODIFIED BWRX-300 description for the relevant VEC "Insects – Migrant butterfly stopover areas" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	150
		MODIFIED BWRX-300 description for the relevant VEC "Insects – Dragonflies and Damselflies" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	150
		MODIFIED BWRX-300 description for the relevant VEC "Migrant songbirds, and their habitat, winter raptor feeding and roosting" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	151
		MODIFIED BWRX-300 description for the relevant VEC "Breeding birds" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies, for both 1 and 4 reactors	C	151
		REMOVED statement related to one reactor deployment from row on four-reactor scenario.	A	151
		MODIFIED BWRX-300 description for the relevant VEC "Mammal communities and species" for row "Terrestrial	C	152

Revision	Revision Date	Revision Description	Key Change	Page No.
		Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies		
		MODIFIED BWRX-300 description for the relevant VEC "bats" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to update text based on completed additional studies	C	152
		CHANGED BWRX-300 description for the relevant VEC "Landscape connectivity" for row "Terrestrial Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to state "Less effect anticipated" rather than "Less effect than outlined in the EIS"	A	153
		CHANGED BWRX-300 description for the relevant VEC "Community and recreational facilities" for row "Socio-economic Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to state "Less effect anticipated" rather than "Less effect than outlined in the EIS"	A	154
		CHANGED BWRX-300 description for the relevant VEC "use and enjoyment of property" for row "Socio-economic Environment" in "Table 5-18: Summary of Residual Adverse Effects and Relevant VECs" in Section 5.5.15 to state "Less effect anticipated" rather than "Less effect than outlined in the EIS"	A	154
		MODIFIED text throughout Section 5.7.3.1, including activity values in Table 5-22, Table 5-23, and Table 5-24, based on more representative estimates of solid waste activity and volume during the normal operation of a BWRX-300, and the revised solid waste accident calculations performed for the BWRX-300 for LLW, ILW, and Spent fuel.	D	168-175
		ADDED text informing that radiation and radioactivity and community concerns were considered in the cumulative effects assessment in the second last paragraph of Section 5.8	C	182
		ADDED new section "5.8.5 Effect of Radiation and Radioactivity on Human Health" for the results of the cumulative effects assessment	C	184
		ADDED new section "5.8.6 Community Concerns Regarding Concentration of Projects and Activities" for the results of the cumulative effects assessment	C	184

Revision	Revision Date	Revision Description	Key Change	Page No.
		DELETED "…advanced for significance assessment" after "No residual adverse effect…" in the first column of "Table 5-29: Determination of Significance of Residual Adverse Effects" in Section 5.9 (multiple deletions throughout Table 5-29)	A	186-197
		MODIFIED the description of "pink shades", "grey shades" and "white shades" under Section 5.9 to align with EIS review report.		185
		ADDED "For the four-reactor scenario…" and "For the one reactor deployment…" to clarify the BWRX-300 description for the third row under "Terrestrial Environment" in "Table 5-29: Determination of Significance of Residual Adverse Effects" in Section 5.9	A	190-191
		DELETED "Same as in EIS" after "No residual adverse effects" for the BWRX-300 description for rows "Geological and Hydrogeological Environment" and "Radiation and Radioactivity Environment" in "Table 5-29: Determination of Significance of Residual Adverse Effects" in Section 5.9	A	193
		DELETED sentence in the third bullet point after Table 5-29 that stated the noise and dust assessment is still in progress	C	198
		MODIFIED the last sentence in the first paragraph in the last column for the row "Bird communities and species" in "Table 5-30: EA Follow-Up Program Recommended Refinements" in Section 5.11 to reflect the updated vibration assessment	C	202

DARLINGTON LANDS ACKNOWLEDGEMENT

The lands and waters on which the Darlington New Nuclear Project (DNNP) is situated are within the traditional and treaty territory of the Williams Treaties First Nations, which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation.

The DNNP is within the territory of the Gunshot Treaty and the Williams Treaties of 1923. These Treaty Rights were re-affirmed in 2018 in a settlement with Canada and the Province of Ontario.

To acknowledge the traditional territory is to recognize the rights of the First Nations. It is to recognize the history of the land predating the establishment of the earliest European colonies. It is also to acknowledge the significance for the Indigenous peoples who lived and continue to live upon it, to acknowledge the people whose practices and spiritualties are tied to the land and water and continue to develop in relation to the territory and its other inhabitants today.

EXECUTIVE SUMMARY

This supporting document entitled "Darlington New Nuclear Project Supporting Document for Comprehensive Review of EIS for BWRX-300" is a comprehensive chapter by chapter review of the 2009 Environmental Impact Statement, hereafter referred to as EIS, to determine if, in deploying the BWRX-300 small modular reactor (SMR) on the Darlington New Nuclear Project (DNNP) site, the results of the EIS remain valid.

The DNNP is a proposed new nuclear power plant on the north shore of Lake Ontario in the Municipality of Clarington, within the Regional Municipality of Durham. More precisely, the DNNP is located on the existing Darlington Nuclear (DN) site of Ontario Power Generation (OPG), about 70 km east of Toronto. The lands and waters on which the DNNP is situated are the traditional and treaty territory of the Williams Treaties First Nations, which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation. It is also the traditional territory of other indigenous peoples.

The DNNP was subject to an environmental assessment (EA) under the *Canadian Environmental Assessment Act* (CEAA). The scope for the assessment included the site preparation, construction, operation, and decommissioning of up to four new nuclear power reactors to produce up to 4,800 megawatts of electrical generating capacity.

At the time the EIS was conducted, no specific reactor technology was selected; rather, the EIS considered a bounding scenario as the basis for the environmental assessment. More specifically, the bounding scenario was developed based on the bounding parameters for four different types of reactors that were considered at that time, and it was identified that these parameters may need to be modified when the specific reactor technology was selected.

For the DNNP, a federal joint review panel (JRP) conducted a review of the EA and considered the licence application to prepare the site for the DNNP. The JRP concluded that "the DNNP is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review, and the JRP's recommendations are implemented." In May 2012, the Government of Canada (GOC) accepted the JRP's conclusions for the DNNP's EA as well as the JRP's recommendations for the DNNP. Following that, the Canadian Nuclear Safety Commission (CNSC) issued a 10-year Power Reactor Site Preparation Licence (PRSL 18.00/2022) for the DNNP. The JRP's recommendations that the GOC assigned to OPG and commitments that OPG made during the EA process were consolidated in the DNNP Commitments Report [1].

Following OPG's application to renew the PRSL in 2020, the CNSC renewed the PRSL for another 10 years in 2021. For this licence renewal application, the DNNP scope remained unchanged from that approved by JRP, GOC, and the Minister in 2012. Since that time, OPG had not initiated any licensed activities nor had OPG selected a reactor technology for DNNP. CNSC staff confirmed during the PRSL renewal public hearing that the EA accepted by the JRP and the GOC is still valid. There is no expiry on an EA decision as long as the scope of that project remains within the scope of the original EA.

One of the commitments listed in the DNNP Commitments report is D-P-12.1(a) - Comprehensive Environmental Impact Statement Review states that *"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."*

In December 2021, OPG selected the BWRX-300 for deployment at the DNNP site. OPG has been working with the vendor, GE Hitachi Nuclear Energy (GEH), to progress the design of the BWRX-300 and develop sufficient information to compare the BWRX-300 with the EIS to ensure that the results of the EIS remain valid. The comprehensive chapter-by-chapter review of the EIS and determination of how the BWRX-300 meets the EIS requirements is presented in this supporting document.

The GEH BWRX-300 reactor is a SMR using boiling water reactor (BWR) technology. The electrical power output for each reactor is about 300 MWe and its design life is 60 years. The BWRX-300 is a smaller reactor when compared to the bounding scenario reactors in the EIS as well as with the currently operating reactors at the DN site, both in electrical production and in physical size.

Approach

For this supporting document, the deployment of four BWRX-300 reactors is considered as the DNNP, which is consistent with what was defined and assessed in the EIS.

The fundamental elements of the EIS were examined and compared to those resulting from the deployment of four BWRX-300 reactors at the DNNP site to confirm the EIS conclusion remains valid. This included the review of:

- Existing environmental conditions, including the identification of new Valued Ecosystem Components (VECs) and receptors, and changes in the conservation status of species on the DNNP site,
- DNNP works and activities for each phase (i.e., site preparation, construction, operation, and decommissioning),
- Effects on VECs and new receptors, including cumulative effects,
- The significance of environmental effects, taking into consideration the availability of mitigation measures,
- Effects of the Environment on the DNNP (i.e., flooding, severe weather, biophysical effects, seismicity, and climate change),

- Malfunctions, Accidents, and Malevolent Acts (i.e., conventional and transportation accidents, nuclear and criticality accidents and malevolent acts and their effects on the human health and the health of non-human biota),
- Follow-up and monitoring programs to verify predictions of environmental effects identified in the EIS, and to determine the effectiveness of mitigation measures,
- The communications and consultation program developed for DNNP, and
- The guidelines for the Preliminary Decommissioning Plan for the DNNP site provided by EIS.

Findings

In comparison to the environmental conditions described in the EIS, prevailing conditions are largely similar, but have not been static over the years. For example, since 2009, several bat species now inhabit areas of the DNNP site. Durham Region and its area municipalities have also continued to change due to population growth, urbanization, and economic development.

The BWRX-300 deployment is expected to involve works and activities that are essentially the same as those evaluated in the EIS. Compared to the reactors considered in the EIS, the BWRX-300 reactors are smaller in physical size and electrical power. As a result, the effects of the BWRX-300 deployment on the environment are generally less than those examined in the EIS. In addition, there are opportunities with the BWRX-300 deployment to retain some terrestrial habitats on the DNNP site. This opportunity would be explored further during the finalization of the DNNP plant layout and the construction plan.

The project works and activities are the same as those evaluated in the EIS with the exception of some key refinements:

I. the primary and secondary heat transport systems are combined,
II. cooling towers will not be used for the BWRX-300 for either normal operation or for the ultimate plant heat sink, Therefore, the adverse effects associated with them (e.g., effects on the visual landscape and socio-economic conditions) are no longer applicable,
III. lake infilling is not required,
IV. the timeline of the project is similar, although it will start much later than projected in the initial plan,
V. the BWRX-300 is designed to be a zero radioactive liquid effluent release facility, there are no waterborne releases of radioactivity during normal operation, and
VI. the BWRX-300 reactors are smaller in physical size and electrical power production.

Environmental effects (including effects from accidents, malfunctions and malevolent acts, effects of the environment on the DNNP, and cumulative effects) from the BWRX-300 are expected to be less than those assessed in the EIS. Therefore, the determinations regarding the significance of residual adverse effects made in the EIS remain valid.

As part of the EIS, OPG made a commitment to have an environmental monitoring and EA follow-up program in place to verify predictions of environmental effects identified in the environmental assessment, and to determine the effectiveness of mitigation measures. This EIS Review determined that the EA follow-up and monitoring programs remain suitable for BWRX-300 deployment.

The residual cumulative adverse effect related to combined visual and related community effects due to cooling towers and other tall structures identified in the EIS no longer exist, given that the BWRX-300 deployment does not include cooling towers.

The BWRX-300 deployment was found to be consistent with the Preliminary Decommissioning Plan presented in the EIS, apart from EIS Section 12.10.3. The EIS Section 12.10.3 involved discussion on the Assessment of Environmental Effects from Future Decommissioning. Due to the reduced scale of the BWRX-300 deployment, parts of the terrestrial habitat that were previously expected to be removed may have the opportunity to be retained for the BWRX-300 deployment.

Overall, the comprehensive chapter-by-chapter review has shown that since the BWRX-300 is smaller in size and requires less footprint, the effects on the environment would be less than those assessed in the EIS. Therefore, the determinations regarding the significance of residual adverse effects made in the EIS remain valid. The DNNP, considering the mitigation measures identified, will not result in significant adverse environmental effects, including effects from accidents, malfunctions and malevolent acts, effects of the environment on the DNNP, and cumulative effects.

OPG recognizes that while the assessment of environmental effects from DNNP has been satisfied from the Western perspective, it may not fully address the impact of the DNNP on Indigenous inherent and treaty rights as they are understood today. OPG endeavors to continue to work with Indigenous Nations and communities to appropriately identify the rights impacted by the DNNP and to achieve feasible mitigation measures and/or accommodation.

Overall, the comprehensive review outlined in this supporting document confirms that the results of the EIS remain valid with the BWRX-300 deployment at the DNNP site. A positive outcome with the BWRX-300 deployment is that with its smaller footprint, there may be an opportunity to retain some terrestrial habitats on the DNNP site that were previously expected to be removed in the EIS.

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Acronym	Description
AAQC	Ambient Air Quality Criteria
ACR	Advanced CANDU Reactor
AECL	Atomic Energy of Canada Limited
ALWMS	Active Liquid Waste Management System
ASCE	American Society of Civil Engineers.
BaP	Benzo(a)pyrene
BIS	Boron Injection System
BWR	Boiling Water Reactor
CAAQS	Canadian Ambient Air Quality Standards
CANDU	Canada Deuterium Uranium
CB	Control Building
CCME	Canadian Council of Ministers of the Environment
CCW	Condenser Circulating Water
CEAA	Canadian Environmental Assessment Act
CMD	Commission Member Document
CN	Canadian National (rail)
CNSC	Canadian Nuclear Safety Commission
C of A	Certificates of Approval
COPC	Contaminant of Potential Concern
CSA	Canadian Standards Association
CST	Condensate Storage Tank
CSTS	Condensate Storage and Transfer System
CWS	Chilled Water System
CWQGs	Canadian Water Quality Guidelines
DCIS	Distributed Control and Information Systems
DDP	Detailed Decommissioning Plan
DN	Darlington Nuclear
DNGS	Darlington Nuclear Generating Station
DNNP	Darlington New Nuclear Project
DSC	Dry Storage Containers
DWMF	Darlington Waste Management Facility (now known as Nuclear Sustainability Services – NSS-DWMF)
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EC6	Enhanced CANDU 6
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
EMP	Environmental Monitoring Program
EPR	Evolutionary Pressurized-Water Reactor
EPZ	Emergency Planning Zone
ESA	Endangered Species Act (Ontario)
ESBWR	Economic Simplified Boiling Water Reactor

Acronym	Description
FPC	Fuel Pool Cooling and Cleanup
GEH	GE-Hitachi or General Electric Hitachi
GHG	Greenhouse Gases
GNF	Global Nuclear Fuel
GOC	Government of Canada
GWe	Gigawatt (electrical)
ha	Hectares
HA	Highly Annoyed (by sound level)
HADD	Harmful Alteration, Disruption or Destruction (of fish habitat)
HX	Heat Exchanger
HVAC	Heating, Ventilation and Air Conditioning System
I&C	Instrumentation & Control
IAEA	International Atomic Energy Agency
I&C	Instrumentation and Control
ICPCCS	Isolation Condenser Pool Cooling and Cleanup System
ICS	Isolation Condenser System
IR	Information Request
ISFSI	Independent Spent Fuel Storage Installation
JRP	Joint Review Panel
L&ILW	Low & Intermediate Level Waste
LCH	Licence Conditions Handbook
Ldn	Day-night Sound Level
LLW	Low Level Waste
LOCA	Loss of Coolant Accident
LSA	Local Study Area
LTC	Licence to Construct
LWMS	Liquid Waste Management System
LWR	Light Water Reactor
masl	Metres Above Sea Level
MCR	Main Control Room
MECP	Ministry of the Environment, Conservation and Parks
MTCS	Ministry of Tourism, Culture and Sport's
MTCS	Ministry of Tourism, Culture, and Sports
MTO	Ministry of Transportation Ontario
MW	Megawatt
MWe	Megawatt (electrical)
MWS	Makeup Water System
MWth	Megawatt (thermal)
NEW	Nuclear Energy Worker
NFWA	Nuclear Fuel Waste Act
NHIC	Natural Heritage Information Centre (Ontario)
NND	New Nuclear Darlington
NOx	Nitrogen Oxides
NRC	Nuclear Regulatory Commission
NSCA	Nuclear Safety and Control Act

Acronym	Description
NWMO	Nuclear Waste Management Organization
ODWS	Ontario Drinking Water Standards
OGS	Off-Gas System
OPG	Ontario Power Generation Inc.
OTC	Once-Through Cooling
PAH	Polycyclic Aromatic Hydrocarbons
PAR	Public Attitude Research
PCCS	Passive Containment Cooling System
PCV	Primary Containment Vessel
PDP	Preliminary Decommissioning Plan
PHR	Pressurized Hybrid Reactor
PNERP	Provincial Nuclear Emergency Response Plan
PRSL	Power Reactor Site Preparation Licence
PSA	Probabilistic Safety Assessment
PSW	Provincially Significant Wetlands
PSWS	Plant Service Water System
PWQO	Provincial Water Quality Objectives
PWR	Pressurized Water Reactor
RB	Reactor Building
RCCWS	Reactor Closed Cooling Water System
RCPB	Reactor Core Pressure Boundary
REGDOC	Regulatory Document
RGWMS	Radioactive Gaseous Waste Management System
RLWMS	Radioactive Liquid Waste Management System
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
RSA	Regional Study Area
RWAP	Round Whitefish Action Plan
RWB	Radwaste Building
RWCU	Reactor Water Cleanup System
SAR	Species at Risk
SARA	Species at Risk Act
SC	Steel-plate Composite
SCCV	Steel-plate Composite Containment Vessel
SCR	Secondary Control Room
SDC	Shutdown Cooling System
SFP	Spent Fuel Pool
SMR	Small Modular Reactor
SPM	Suspended Particulate Matter
SSA	Site Study Area
SSC	Systems, Structures, and Components
Sv	sievert
SWMS	Solid Waste Management System
TB	Turbine Building
TCCWS	Turbine Closed Cooling Water System

Acronym	Description
TSD	Technical Support Document
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
U-235	Isotope 235 of Uranium
UHS	Ultimate Heat Sink
UO_2	Uranium Dioxide
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound
WTFN	Williams Treaties First Nations
WWMF	Western Waste Management Facility (now known as Nuclear Sustainability Services – NSS-WWMF)

TERMINOLOGY

Term	Description
Bounding scenario reactors	Reactors that were considered for the purpose of developing the bounding scenario, which were the EPR, ACR-1000, AP1000. The EC6 was added to the bounding scenario after the EIS was issued, but before the JRP issued its decision.
BWRX-300 deployment	Refers to the implementation (i.e., site preparation, construction, operation, decommissioning) of four BWRX-300 reactors on the DNNP site, and all information pertaining to it.
CNSC	The Canadian Nuclear Safety Commission. The organization that regulates the use of nuclear energy and materials to protect health, safety, security, and the environment.
CNSC staff	CNSC's commission members are supported by professional staff who undertake the day-to-day activities of the organization and make recommendations to commission members.
Commission members	Members of the CNSC (i.e., Commission members) are appointed by Canada's federal government to make regulatory decisions regarding nuclear energy and materials and the protection of health, safety, security and the environment.
Darlington New Nuclear Project (DNNP)	Current Project name.
Darlington New Nuclear Project site (DNNP site)	The term DNNP site is used to describe the easterly one-third (approximately) of the overall DN site. It is bordered by the DN site property limits on the east and north boundaries, by Lake Ontario to the south, and by Holt Road (including its southerly projection to Lake Ontario) on the west.
Darlington Nuclear Generating Station (DNGS)	The term used when describing the currently operating Darlington Nuclear Generating Station.
Darlington Nuclear site (DN site)	The term DN site is used when describing the whole Darlington site, including the DNGS site and the DNNP site.
EIS	The Environmental Impact Statement submitted by OPG in 2009 and accepted by the CNSC, Joint Review Panel and Government of Canada.

Term	Description
EIS Review Report	A report which reviews the EIS in light of the BWRX-300 SMR.
Supporting document	This document. A companion document to the EIS Review Report, the "Darlington New Nuclear Project Supporting Document for Comprehensive Review of EIS for BWRX-300" that comprehensively reviews the EIS, chapter-by-chapter, as it relates to the BWRX-300.
NND Project (New Nuclear Darlington Project)	Former name of Darlington New Nuclear Project (DNNP). It is used in this supporting document only when directly quoting from the EIS.
Province	The Province of Ontario, as the sole shareholder of Ontario Power Generation (OPG), is the sponsor for the DNNP.
Used fuel	Fuel that has been irradiated in a reactor.

1. INTRODUCTION

1.1 Purpose

This report entitled "Darlington New Nuclear Project supporting document for Comprehensive Review of EIS for BWRX-300" documents a comprehensive chapter by chapter review of the 2009 Environmental Impact Statement, hereafter referred to as EIS, to determine if, in deploying the BWRX-300 small modular reactor (SMR) as the selected reactor technology to be built at the Darlington New Nuclear Project (DNNP) site, the results of the EIS remain valid. This report, hereafter referred to as the supporting document, provides technical details to support the Darlington New Nuclear Project Environmental Impact Statement Review Report for BWRX-300, NK054-REP-07730-00055 R000. The review fulfills OPG commitment D-P-12.1(a) - Comprehensive Environmental Impact Statement Review as documented in Darlington New Nuclear Project Commitments Report [1].

1.2 Background of Darlington New Nuclear Project

The Ontario Power Generation (OPG) DNNP, formerly referred to as the New Nuclear Darlington (NND) Project, consists of the site preparation, construction, operation, and decommissioning of up to four nuclear power reactors and up to 4,800 megawatts of electrical generating capacity for supply to the Ontario grid. The DNNP is situated at the existing Darlington Nuclear (DN) site which is located on the north shore of Lake Ontario in the Municipality of Clarington, within the Regional Municipality of Durham, about 70 km east of Toronto (Figure 1-1). The DNNP is located on the eastern third of the DN site.

Figure 1-1: Map with Darlington Nuclear Site Location.

The lands and waters on which the DNNP is situated are the traditional and treaty territory of the Williams Treaties First Nations, which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation. It is also within the traditional territory of other First Nations peoples as shown in Figure 1-2.

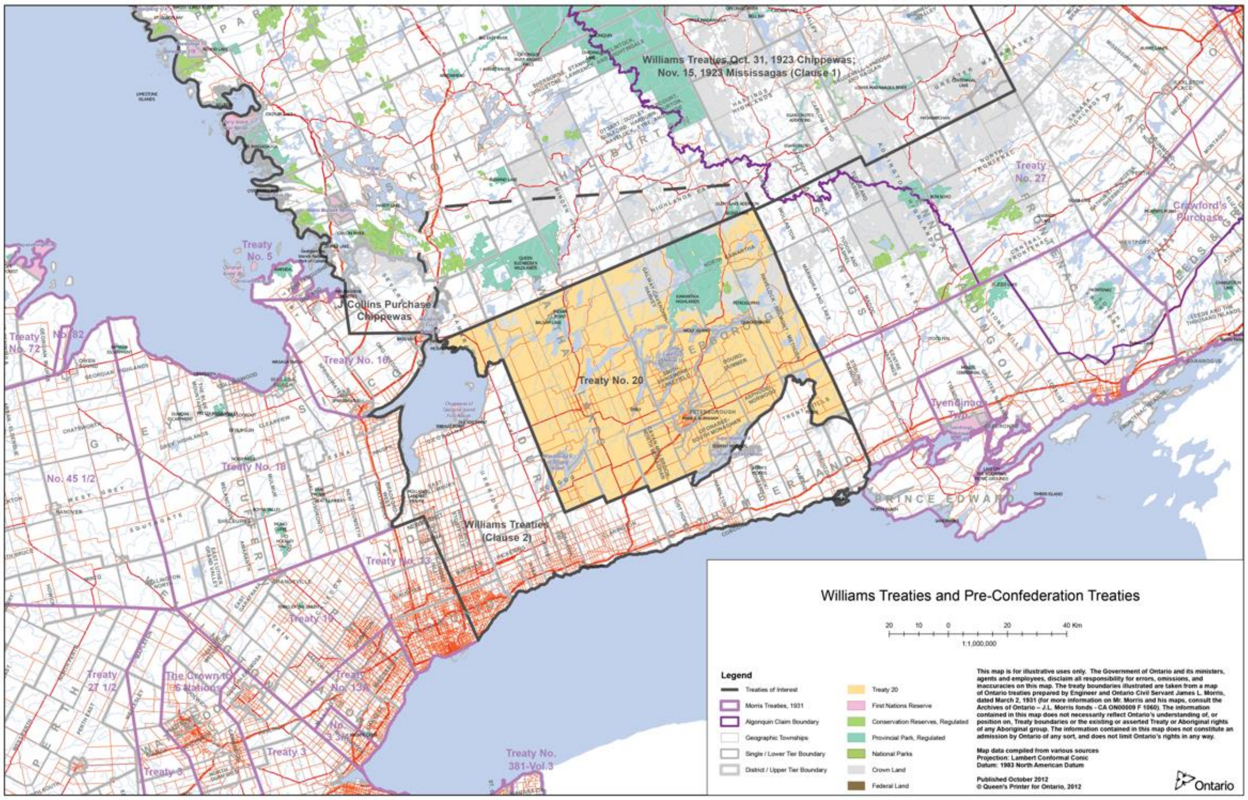


Figure 1-2: Williams Treaties and Pre-Confederation Treaties

OPG submitted in September 2006, a preliminary Licence to Prepare Site Application to the Canadian Nuclear Safety Commission (CNSC). The CNSC confirmed that a federal environmental assessment (EA) was required, and the federal Minister of the Environment determined that a Joint Review Panel (JRP) would be established to review the EA and the Licence Application.

The DNNP underwent an EA in accordance with the *Canadian Environmental Assessment Act (CEAA),* and in September 2009 OPG submitted the EIS [3] and a Licence to Prepare Site Application to the JRP. At the time the EIS was conducted, no specific reactor technology was selected; rather, the EIS considered a Bounding Scenario [4] as the basis for the environmental assessment. More specifically, the Bounding Scenario was developed based on the bounding parameters for four different types of reactors that were considered at that time, and it was identified that these parameters may need to be modified when the specific reactor technology was selected.

Following the completion of a JRP process, which included a 17-day public hearing, the JRP concluded that "the DNNP is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review, and the JRP's recommendations are implemented." In May 2012, the Government of Canada (GOC) accepted the JRP's conclusions for the DNNP's EA as well as the JRP's recommendations. Inn accordance with the GOC response, and in accordance with paragraph 37(1.1) (c) of the CEAA, the GOC indicated that the Responsible Authorities (including the CNSC) may exercise any power or perform any duty or function conferred on them by or under any Act of Parliament that would permit the DNNP to be carried out in whole or in part. This determination was made on the basis that the DNNP would not cause significant adverse environmental effects provided that OPG implements the mitigation measures proposed and commitments made during the review as well as other recommendations. Following that, the CNSC issued the Power Reactor Site Preparation Licence (PRSL 18.00/2022) for the DNNP.

In June 2020, OPG applied to the CNSC for a PRSL renewal. The CNSC renewed the PRSL in October 2021, for a duration of 10 years after a two-day public hearing. For this licence renewal application OPG had not initiated any licensed activities nor had OPG selected a reactor technology for DNNP and the DNNP scope assessed by the CNSC in 2012 remained unchanged. CNSC staff confirmed during the PRSL renewal public hearing that the EA accepted by the JRP in 2011 is still valid. There is no expiry on an EA decision as long as the scope of that project remains within the scope of the EA [2].

In December 2021, OPG selected the BWRX-300 for deployment at the DNNP site and started working with the vendor, GE Hitachi Nuclear Energy, to progress the design of the BWRX-300 and develop the required documents in support of the Licence to Construct (LTC) Application.

1.3 Basis and Considerations

1.3.1 Overall Basis

While OPG's 2022 application for the LTC is for one BWRX-300 reactor, the DNNP considers a build out of up to four BWRX-300 reactors on the DNNP site. As such, for the purpose of this supporting document, the deployment of four BWRX-300 reactors is considered as the DNNP. The deployment of four reactors is consistent with the DNNP that was defined and assessed in the EIS. The EIS review also considers refinements related to the selected reactor technology, regulatory requirements, and the prevailing site conditions. Within this context, the supporting document examines the effects of locating four BWRX-300 reactors on the DNNP site in relation to the EIS, and the bounding scenario which was used as the basis for the EIS.

1.3.2 Applicable Regulatory Requirements

CNSC regulatory document REGDOC 1.1.1 "*Site Evaluation and Site Preparation for New Reactor Facilities*" is followed for the EIS Review per CNSC expectation as indicated in the following document:

Licence Condition 4.1 of the 2022 Licence Conditions Handbook [5] associated with the renewed PRSL 18.00/2031 indicates that:

> *"OPG shall demonstrate 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."*

1.3.3 Baseline Data

This EIS review leveraged the updated information from the review of the DNNP site evaluation that OPG conducted to support the PRSL renewal. The review was to demonstrate that the DNNP site remains suitable for the construction and operation of a new nuclear power plant and included the following:

- A compliance review with the CNSC Regulatory Document REGDOC-1.1.1 baseline data where required or applicable, and a review of the current codes, standards, and practices in accordance with *Darlington New Nuclear Project Power Reactor Site Preparation Licence Renewal Plan* [6].
- An updated collection of baseline data in accordance with REGDOC-1.1.1.
- OPG also conducted various environmental studies, focused on DNNP commitments that require long lead time or additional baseline monitoring that could be advanced independently from a reactor technology selection.
- General site evaluation areas reviewed included:
    - An evaluation against the CNSC safety goals,
    - Natural and human induced factors,
    - Hazards associated with external events (natural and human induced),
    - Potential effects of the DNNP on the environment,
    - Demographics and emergency planning,
    - Consideration of future life extension of DNNP, and
    - Security threats and issues presented by the geographical location/characteristics of the DNNP site.

The EIS Review also includes examining baseline data collected following the PRSL renewal.

2. SCOPE AND METHODOLOGY

2.1 Scope

Based on the commitments and basis and considerations described in the Section 1.3, this supporting document provides a comprehensive chapter-by-chapter review of the EIS using a systematic methodology to identify refinements related to BWRX-300 that could have an effect on the significance analysis of the EIS. Any additions to the environment effects identified in the EIS, and whether the results of its review would lead to any refinements in the EA follow-up program, are documented.

The supporting document and its associated studies cover the deployment of four BWRX-300 reactors on the DNNP site and consider all phases of the DNNP from site preparation, construction, operation, and decommissioning.

This supporting document summarizes the results of these reviews and examines whether the BWRX-300 deployment would result in any significant residual adverse effects as well as any opportunities for improvements.

2.2 Methodology

Each chapter of the EIS is reviewed using the following eight aspects where applicable:

1. **Identification**: Identify activities and design information pertinent to the deployment of BWRX-300 on the DNNP site, hereafter referred to as "BWRX-300 deployment information".
2. **Comparison**: Compare BWRX-300 deployment information to information in the EIS to identify if any associated impacts need to be reviewed.
3. **Qualitative Assessment**: Complete a qualitative assessment of whether conclusions of the EIS remain valid with BWRX-300 deployment.
4. **Quantitative Assessment**: If conclusions cannot be drawn qualitatively, additional assessment is performed.
5. **Analysis of Results**: The results of the assessments are compared to those predicted in the EIS.
6. **Analysis of Residual Effects**: If the results of Step 5 indicate a condition not consistent with the EIS, identify any residual effects after considering mitigation measures identified in the EIS and Commitments Report and determine their significance. If required, identify any necessary additional studies and/or mitigation options.
7. **Summary:** Document the above steps and review findings.
8. **Conclusion:** Provide a summary statement of the results of the determination of significance of residual adverse effects and whether EIS conclusions remain valid. Recommended additional studies and/or mitigation options are re-stated where applicable.

A flow chart of the steps to complete the aspects described above is depicted in Figure 2-1.

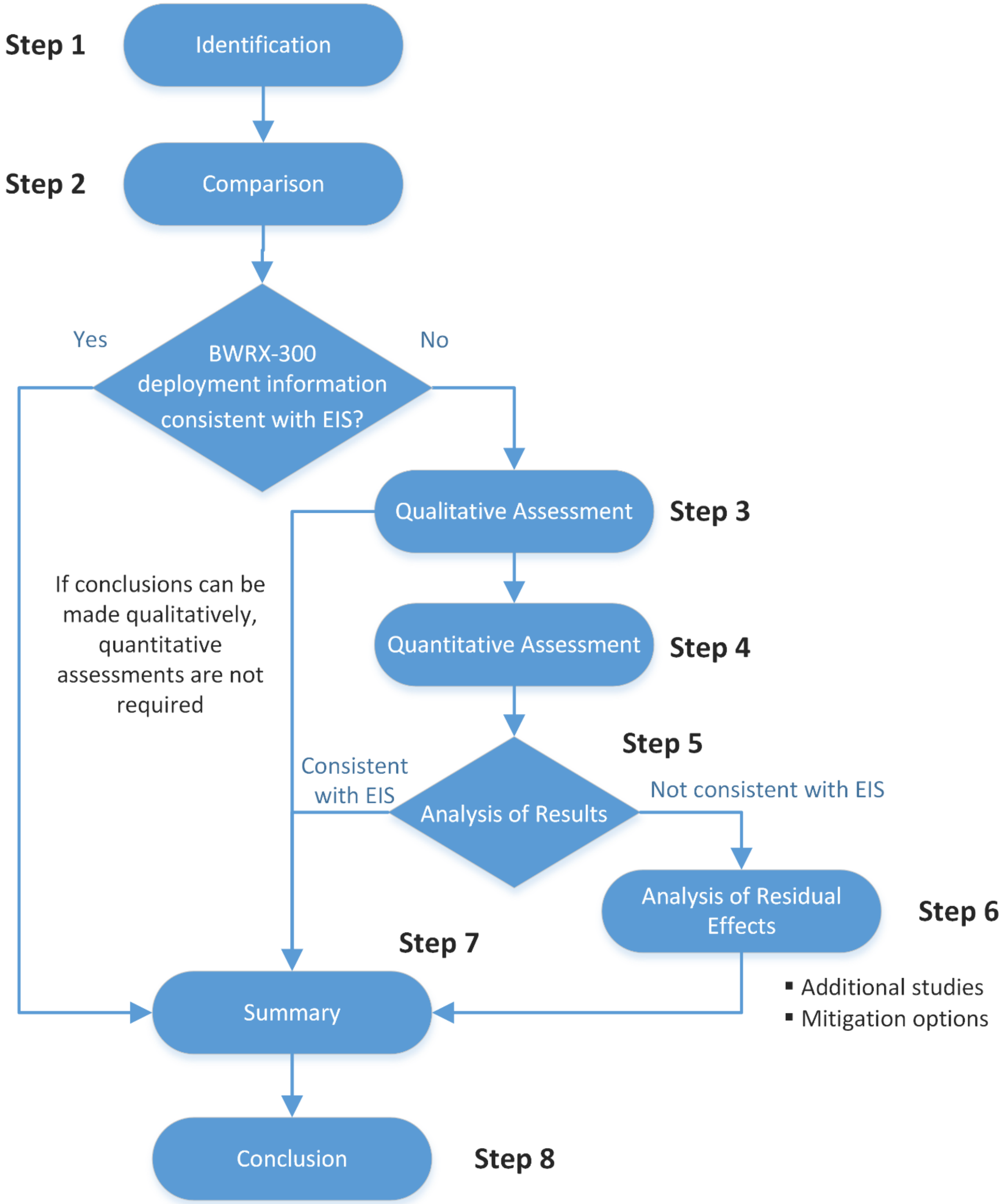


Figure 2-1: Comprehensive Review Methodology

3. DESCRIPTION OF THE BWRX-300

This section provides a description of the selected reactor design and identifies activities, design information, refinements and opportunities for improvements pertinent to the deployment of BWRX-300 on the DNNP site.

3.1 Selected Reactor Design- BWRX-300

The reactor selected by OPG is the GEH BWRX-300, a SMR of the Boiling Water Reactor (BWR) technology. The plant electrical power output is approximately 300 MWe and its design life is 60 years. The BWRX-300 implements enhanced safety features, such as the passive Isolation Condenser System (ICS) to remove decay heat from the reactor when the normal heat removal system is unavailable. Passive safety systems enable simplifications that improve safety. As the tenth-generation evolution of the BWR, the BWRX-300 represents the simplest BWR design since GE began developing nuclear reactors in 1955. It is a water-cooled, natural circulation SMR utilizing simple, natural phenomena-driven safety systems. The BWRX-300 builds upon lessons learned and improvements from previous generations. The BWRX-300 is an evolution of the 1,520 MWe Economic Simplified Boiling Water Reactor (ESBWR) which has received design certification by the U.S. Nuclear Regulatory Commission (NRC).

The BWRX-300 belongs to the same Light Water Reactor (LWR) family as the Pressurized Water Reactor (PWR) which was included as one of the bounding scenario reactors. Its nuclear fuel has similar U-235 enrichment, up to 5%. Light water is used as coolant and moderator. The shape of the reactor core, a vertical arrangement of fuel assemblies, and the means of shutting down the nuclear reaction are the same: neutron absorbing control rods and injection of a liquid solution of boron. The turbine-generator of the BWRX-300 is similar to the equipment used in a PWR. In terms of ancillary equipment, the BWR does not require the steam generators that are included in the PWR design.

BWR technology was considered during the development of the EIS; however, insufficient information was submitted by the vendor to allow it to be included in the EIS. The JRP indicated in its EA report:

> *"OPG noted that should the Government of Ontario decide to include boiling water-type reactors in its procurement process, the plant parameter envelope* (bounding scenario) *would be updated accordingly."*

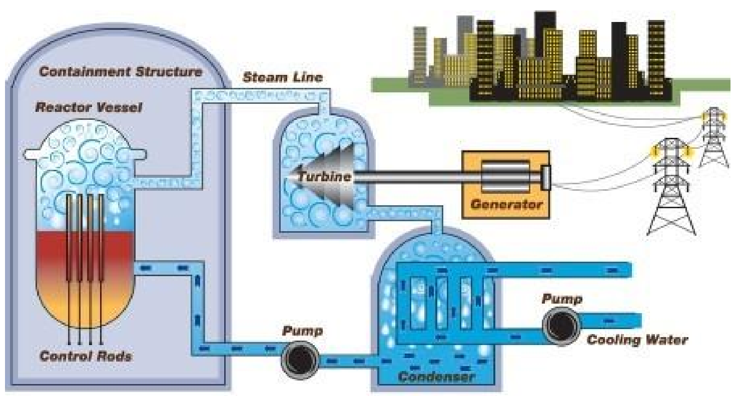
3.1.1 How Nuclear Energy is Produced in BWRX-300

BWRX-300 uses demineralized light water as a coolant and neutron moderator in a closed loop. Heat produced by nuclear fission in the reactor core boils the water and produces steam. In a boiling water reactor, the steam produced in the reactor is sent directly to drive a turbine coupled to a generator which produces electric energy.

After the steam passes through the turbine, it is cooled and converted to water in the condensers. This water is then returned to the reactor core as feedwater, completing the loop.

The condensers are cooled by another separate flow of water that travels through the condenser tubes. The feedwater and the cooling water do not mix. The condenser cooling water is a once-through system.

Conceptually, a BWRX-300 and a PWR are very similar with one main difference. In the BWRX-300, heat produced by nuclear fission in the core heats up the surrounding cooling water creating steam, which is directly used to drive a turbine, while in a PWR, the reactor cooling circuit (primary cooling) is separate from the turbine circuit (secondary cooling). A schematic showing the similarities and difference between the PWR and BWR reactor technologies is illustrated in Figure 3-1.



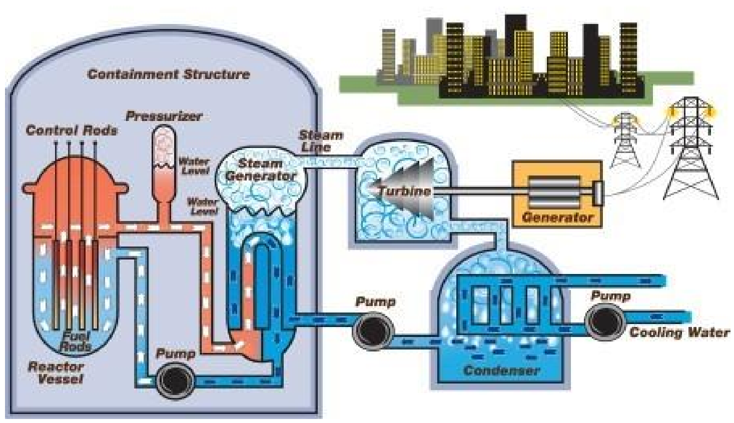


Figure 3-1: Simplified Schematics for Nuclear Power Reactors. (Top) Boiling Water Reactor such as BWRX-300. (Bottom) Pressurized Water Reactor

Combining the primary and secondary circuits is a major simplification that reduces the number of nuclear components. There are no steam generators, nor pressurizer in the BWRX-300. The

Safety Relief Valves (SRV) have been eliminated from the BWRX-300 design since the large capacity Isolation Condenser System (ICS) provides overpressure protection. The BWRX-300 design is similar to that of the operating BWRs, except that the recirculation pumps and associated piping are eliminated. Circulation of the reactor coolant through the BWRX-300 core is accomplished via natural circulation. Overall, the safety of the BWRX-300 reactor is improved by having fewer components that can malfunction. This is reflected in the core damage frequency, which exceeds the safety goals specified by the CNSC (Section 5.7.3.2).

The absence of steam generators reduces the quantity of waste since steam generators are large pieces of equipment that may need to be replaced.

From an environmental effect point of view, the BWRX-300 has zero radioactive liquid emissions during normal operations. Liquid waste generated during the operation of the plant is filtered and recycled instead of being released to surface water like other plants.

The emissions of tritium, particulates, and noble gases to the atmosphere are lower, while the emissions for iodine and carbon-14 are slightly higher (Table 5-16 and Table 5-17), so overall the BWRX-300 results in lower doses than the bounding scenario reactors.

Overall, the BWRX-300 has lesser impact on the environment. This is partly due to the BWR technology and partly because of its smaller generation capacity.

The EIS and the JRP EA report both indicated that the bounding scenario reactors consist of up to four reactors and a maximum of 4800 MWe. For the purpose of the EIS Review, the DNNP consisting of four BWRX-300 reactors will provide up to approximately 1200 MWe, with each individual BWRX-300 reactor having a much smaller power output (approximately 300 MWe) than the bounding scenario reactors (up to 1580 MWe).

Therefore, the DNNP with its four BWRX-300 reactors will not exceed the total electrical output as it falls well within the maximum electrical output of 4800 MWe assessed in the EIS.

3.1.2 Major Systems, Structures, and Components of BWRX-300

The primary functions of the major systems, structures, and components of the BWRX-300 are briefly described below and shown in Figure 3-2:

- Nuclear Boiler System:
    - Create steam through nuclear fission in the Reactor Pressure Vessel (RPV) and deliver the steam from the RPV to the turbine main steam system.
    - Deliver feedwater from the condensate and feedwater system to the RPV.
    - Provide overpressure protection of the Reactor Core Pressure Boundary (RCPB).
    - Provide the instrumentation necessary for monitoring RPV pressure, steam flow, core flow, water level, and temperature.
- Control Rod Drive System:

  - Provide electric-motor-driven positioning of the control rods into and out of the reactor core for reactivity and shutdown control.
  - In response to manual or automatic signals from the Reactor Protection System, the control rods can also be rapidly inserted into the core hydraulically using stored energy in accumulators.
- Isolation Condenser System (ICS):
  - Remove decay heat after any reactor isolation and shutdown event during power operations.
  - Limit increases in steam pressure and maintains the RPV pressure at an acceptable level. The ICS consists of three independent loops that each contain a Heat Exchanger (HX) which can remove all the decay heat on its own.
- Reactor Protection System (RPS):
  - Provide for control of reactivity in various postulated events. RPS is a system of instrument channels, trip logic, trip actuators, manual controls, and shutdown logic circuitry that initiates the rapid insertion of control rods by hydraulic force to shut down the reactor when unsafe conditions are detected.
- Containment:
  - Enclose the RPV and some of its related systems and components. The primary containment vessel (PCV) is dry, leak tight, and located mostly below grade.
  - Provide confinement of radioactive fission products, steam, and water released in the unlikely event of a failure of the RCPB.
- Passive Containment Cooling System (PCCS):
  - Provide a passive containment heat removal system that maintains the containment within its pressure and temperature limits for off normal operation. It consists of several HXs that transfer heat from containment to the reactor cavity pool. PCCS operation requires no sensing, control, logic, or power actuated devices for operation.
- Boron Injection System (BIS):
  - Provide an independent means of reactor shutdown by incorporating an additional layer of defense.
  - Provides an additional means of reactivity control for extremely low probability events where the control rod insertion (hydraulic or motor) is not successful.
- Reactor Water Cleanup (RWCU) System:
  - Provide a cleanup flow path from the RPV to the filter/demineralizers during most reactor operating modes. The cleanup or filtration function and ion removal function is performed by the condensate system.
- Shutdown Cooling (SDC) System:
  - Support RPV startup and shutdown/cooldown operations by providing cooling during the shutdown operations and RPV water level management during startup operations.
- Isolation Condenser Pool Cooling and Cleanup System (ICPCCS):
  - Ensure the ICS pools are continuously cleaned and maintained at proper temperatures.
- Fuel Pool Cooling and Cleanup (FPC) System:

- Maintain the used fuel pool temperature below specified values.
- Maintain water quality in the used fuel pool, reactor cavity pool, and cask pit.
- Control the used fuel pool, reactor cavity pool, and cask pit water levels.

- Containment Inerting System:
  - Establish and maintain an inert atmosphere within containment during certain nuclear facility operating modes.
  - Maintain a slightly positive pressure in containment to prevent air (oxygen) in-leakage into the inerted spaces from the reactor building. This system is intended to preclude the combustion of hydrogen and prevent damage to essential equipment and structures.
- Fuel and Fuel Cycle:
  - The core design uses a 240-bundle core configuration with Global Nuclear Fuel's GNF2 because of its low hydraulic resistance, which is beneficial for natural circulation. GNF2 primarily utilizes ceramic uranium dioxide fuel pellets with an assembly-average enrichment of less than 5 percent U-235. The fuel cycle duration for the BWRX-300 can be between 12-24 months, after which the reactor is shutdown for a brief period for refueling.
- Instrumentation and Control (I&C) Systems (also referred to as the Distributed Control and Information Systems (DCIS)):
  - Provide a completely integrated control and monitoring system for the nuclear facility with control, monitoring, alarming, and recording functions.
  - Be responsible for important safety functions that include reactor shutdown, isolation of the reactor vessel and containment, initiation of heat removal, vessel injection and control and monitoring. These safety systems are generally autonomous, but can be initiated manually, and monitoring is required.
- Electrical Systems:
  - Provide a completely integrated power supply and transmission system for the nuclear facility. It is divided into subsystems based on safety classification. Each subsystem has appropriate levels of hardware and software quality (corresponding to the systems they power).
  - Provide reliable power to various nuclear facility electrical loads, and a transmission path for the main generator to the utility switchyard/grid.
- Steam and Power Conversion System:
  - Use existing design Balance of Plant equipment for its power conversion systems. The steam turbine generator will consist of a multi-extraction single casing high pressure section, nuclear moisture separators, and 2-stage reheaters with multiple double flow low-pressure turbine sections.
- Reactor Closed Cooling Water System (RCCWS) and Turbine Closed Cooling Water System (TCCWS):
  - Continuously circulate cooling water through various auxiliary equipment heat exchangers and reject heat to the Plant Service Water System (PSWS).
- Plant Service Water System (PSWS): The primary functions are to
  - Continuously circulate water from Lake Ontario through the RCCWS and TCCWS HXs and back to the lake.

- Makeup Water System (MWS):
  - Provide the storage and transfer of demineralized water for the needs of the plant.
- Condensate Storage and Transfer System (CSTS):
  - Take suction from the Condensate Storage Tank (CST) and provide water to interface systems as required.
  - Provide storage capacity for three liquid streams during system maintenance outages: 1) condensate rejected from the Condensate and Feedwater System, 2) Liquid Waste Management System non-radioactive effluent during normal operation, and 3) Condensate and Feedwater System and condenser hot well inventory.
- Chilled Water System (CWS):
  - Provide chilled water to the cooling coils of air handling units and other coolers in various nuclear facility buildings. The chilled water absorbs the rejected heat from these coolers and is pumped through the refrigerant chillers where the heat is transferred to RCCWS and TCCWS.
- Radioactive Waste Management Systems:
  - Liquid Waste Management System (LWMS) to control, collect, process, handle, and store radioactive liquid waste generated as the result of normal nuclear facility operation.
  - Solid Waste Management System (SWMS) to collect, monitor, process, handle, package, and temporarily store wet and dry solid radioactive waste prior to shipment.
  - The Off-Gas System provides steam condensation and maintains main condenser vacuum. It also recombines hydrogen and oxygen which was separated in the reactor vessel by the radiolysis process, back into water vapor. It also serves to reduce the airborne radioactive emissions from the nuclear facility to the environment.

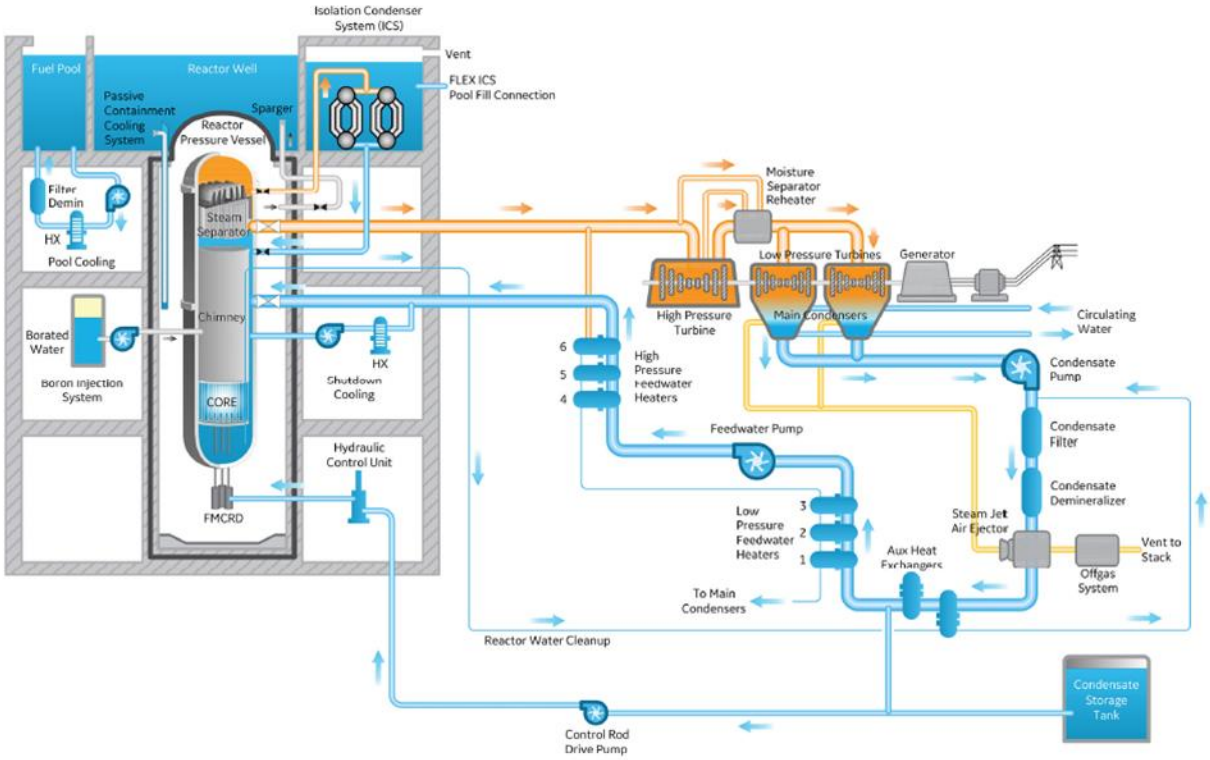


Figure 3-2: BWRX-300 Major Systems, Structures, and Components

3.1.3 Components of a BWRX-300 Power Plant

The DNNP with BWRX-300 deployment will consist of the following components:

- A Reactor Building (RB) - A shear wall building made of reinforced concrete, steel, or steel-plate composite (SC) floors and walls. A vertical cylindrical portion of the RB extends below grade where the Steel-plate Composite Containment Vessel (SCCV) and the Reactor Pressure Vessel (RPV) mostly reside. The below-grade portion also houses reactor support and safety class systems and most essential power supplies and equipment. The underground construction of the Reactor Building reduces concrete use yet provides protection for important safety class systems and components to mitigate the effects of external events, including aircraft impact, severe weather, flooding, fire and earthquakes. The Secondary Control Room (SCR) is in the RB from which the nuclear facility can be placed and kept in a safe shutdown state if the ability to perform safety functions from the Main Control Room (MCR) is lost. Fuel handling equipment and pools containing water needed for the BWRX-300 passive safety class cooling systems are in the above-grade portion of the RB.
- A Control Building (CB) - Houses the Main Control Room and some electrical, control and instrumentation equipment. It is also the entrance and exit for the BWRX-300 power block during normal operations.

- A Turbine Building (TB) – Houses the steam turbine generator, standby diesel generators, main condenser, condensate and feedwater systems, condensate purification system, turbine-generator support systems, bridge crane, and parts of the off-gas system.
- A Radwaste Building (RWB) – Houses equipment associated with the handling, processing, and packaging of radioactive solid waste or liquid waste generated by the nuclear facility. The Radwaste Building is used to house equipment and processes that package waste into approved containers.
- A Power Block Annex – A warehouse that runs alongside the length of the nuclear facility which provides an area for maintenance and storage.
- A Security building – Controls access to the Protected Area and includes a vehicle inspection area.
- An Administration Building and Warehouse – Houses workstations, training facilities, and storage space for parts and equipment.
- Lake Water Intake/Discharge Structures - The facility will utilize a once-through lake water cooling system. The water intake will be supplied from Lake Ontario to circulate through the condenser and then discharge to the lake through a discharge duct and outfall structure. Additionally, the shoreline of the lake will include shoreline protection to control potential flood hazards and erosion.
- A Cooling Water System Pump House – Contains the cooling water system pumps and auxiliary equipment needed to cool various equipment of the nuclear facility.
- A Switchyard – A new switchyard will be built on the north side of the nuclear facility for electrical distribution to the Ontario grid.

The DNNP may share some infrastructure with the existing DNGS. An independent used fuel storage installation, which will provide a location for dry used fuel storage in casks, is expected to be constructed on site.

Figure 3-3 shows BWRX-300 reactor, control, and turbine buildings.

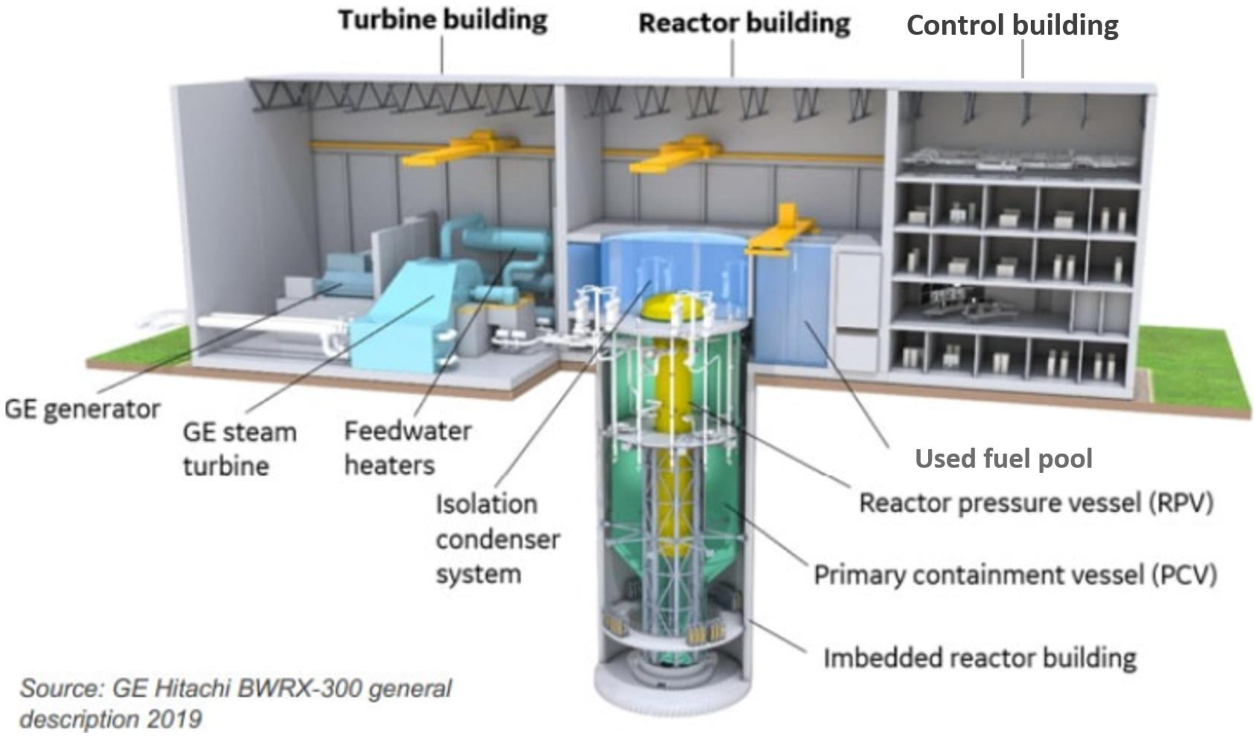


Figure 3-3: BWRX-300 Reactor, Control, and Turbine Buildings

3.1.4 Conceptual Plant Layout for BWRX-300

The conceptual plant layout for the construction of four BWRX-300 reactors is shown in Figure 3-4.

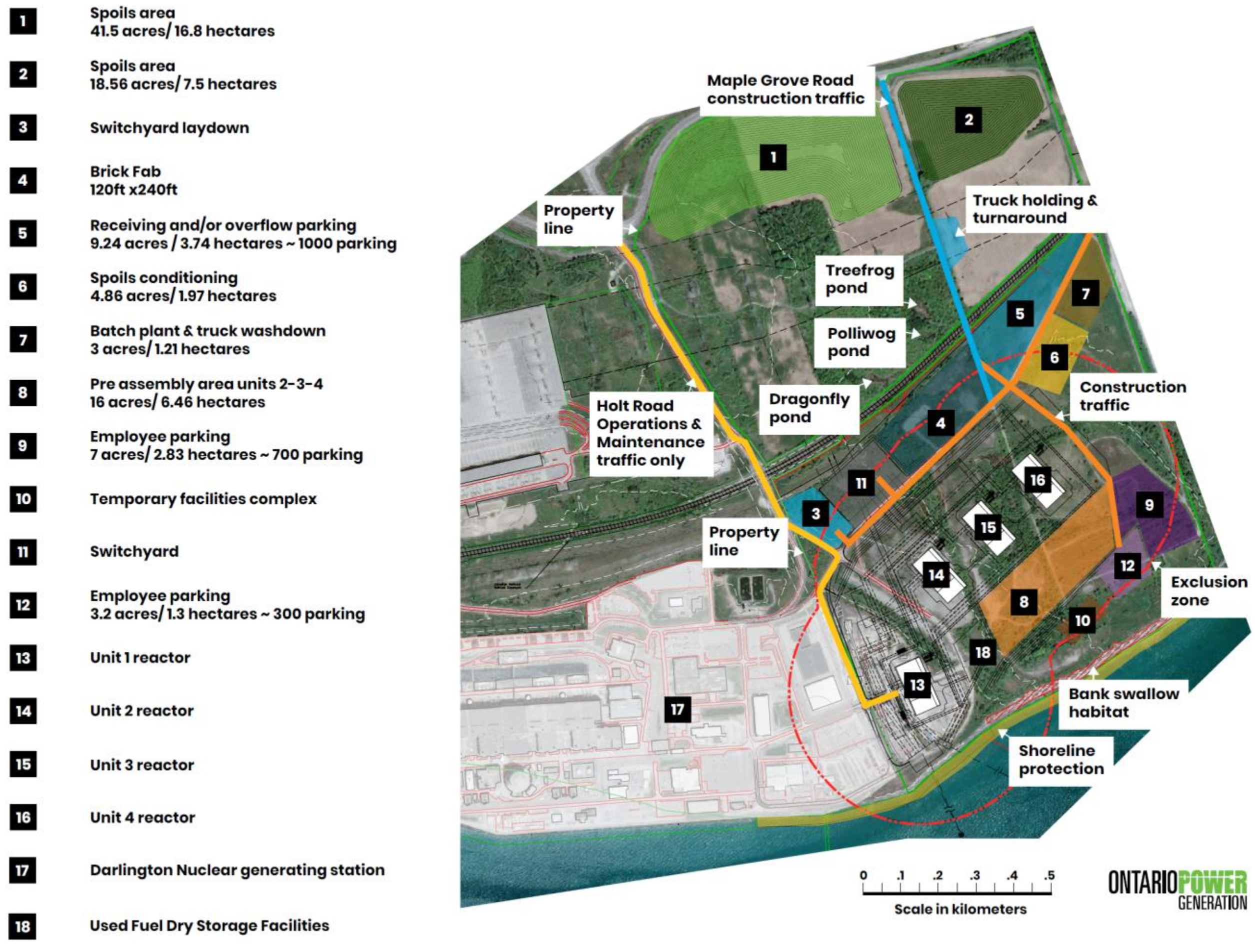


Figure 3-4: Conceptual Plant Layout for Construction of Four BWRX-300 Reactors

The BWRX-300 conceptual plant layout will not require lake infilling. In addition, the smaller area required for the proposed BWRX-300 deployment provides for the following opportunities:

- The EIS assumed that all habitat within the DNNP site footprint would be removed to allow for site preparation and construction. The smaller footprint for the BWRX-300 may provide an opportunity to retain some terrestrial habitats on the DNNP site.
- The conceptual site layout for the first BWRX-300 reactor provides an opportunity to preserve the Bank Swallow nesting habitat along the Lake Ontario shoreline in the short term. However, the site layout for four BWRX-300 reactors will likely require some shoreline protection measures which may cause the bank to become unsuitable for Bank Swallows to inhabit.

In general, the BWRX-300 deployment has reduced volume of soil and rock excavation, smaller laydown areas, less construction traffic, all of which results in lower air emissions and noise during site preparation and construction than what was predicted in the EIS.

3.1.5 Conceptual Switchyard Location

The location of the switchyard considered in the EIS (West of Holt Road, north of the CN rail) is highlighted in blue and shown in Figure 3-5. Figure 3-6 displays the currently proposed switchyard location (highlighted in blue) for the deployment of the BWRX-300.

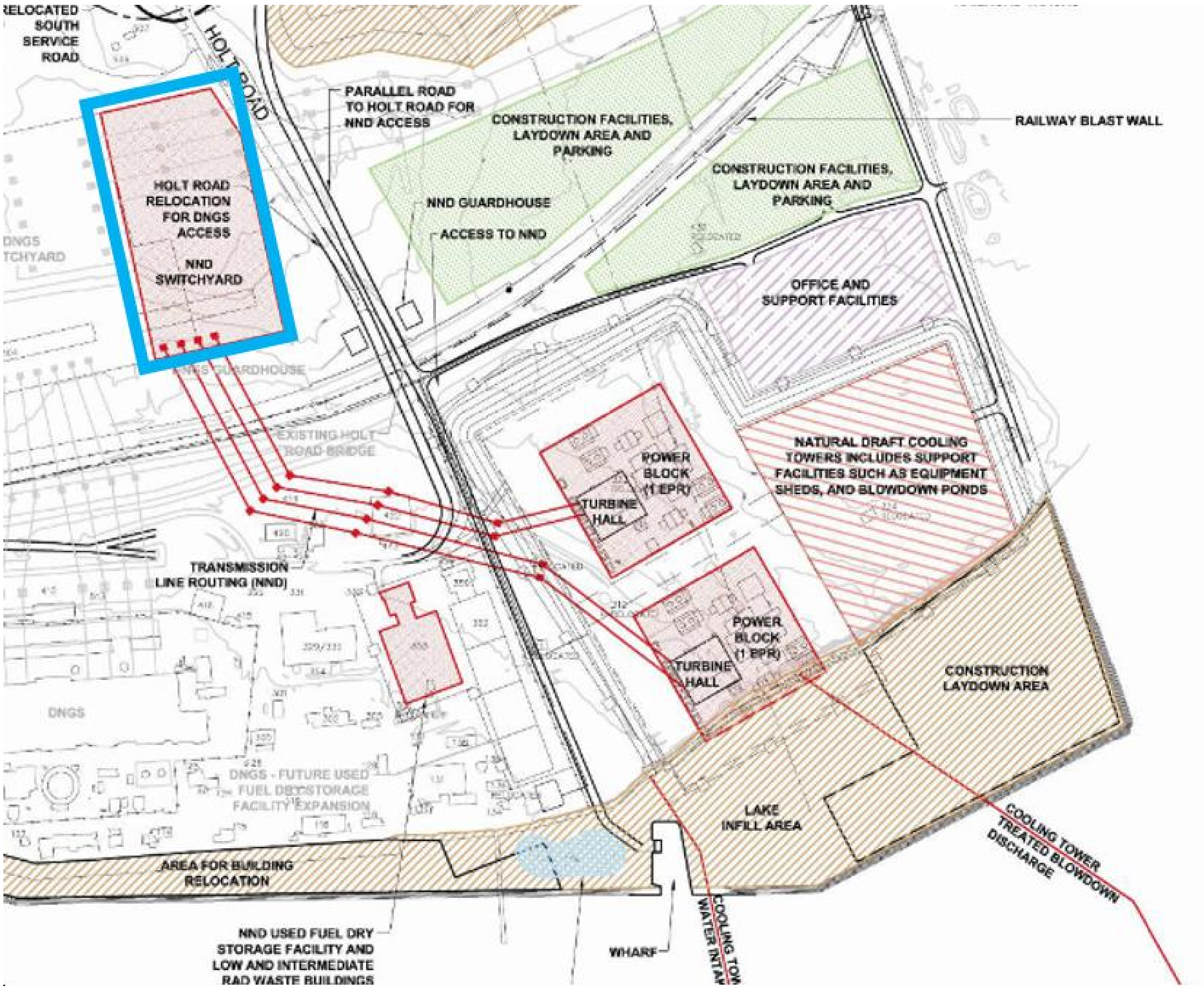


Figure 3-5: Switchyard Location from the EIS

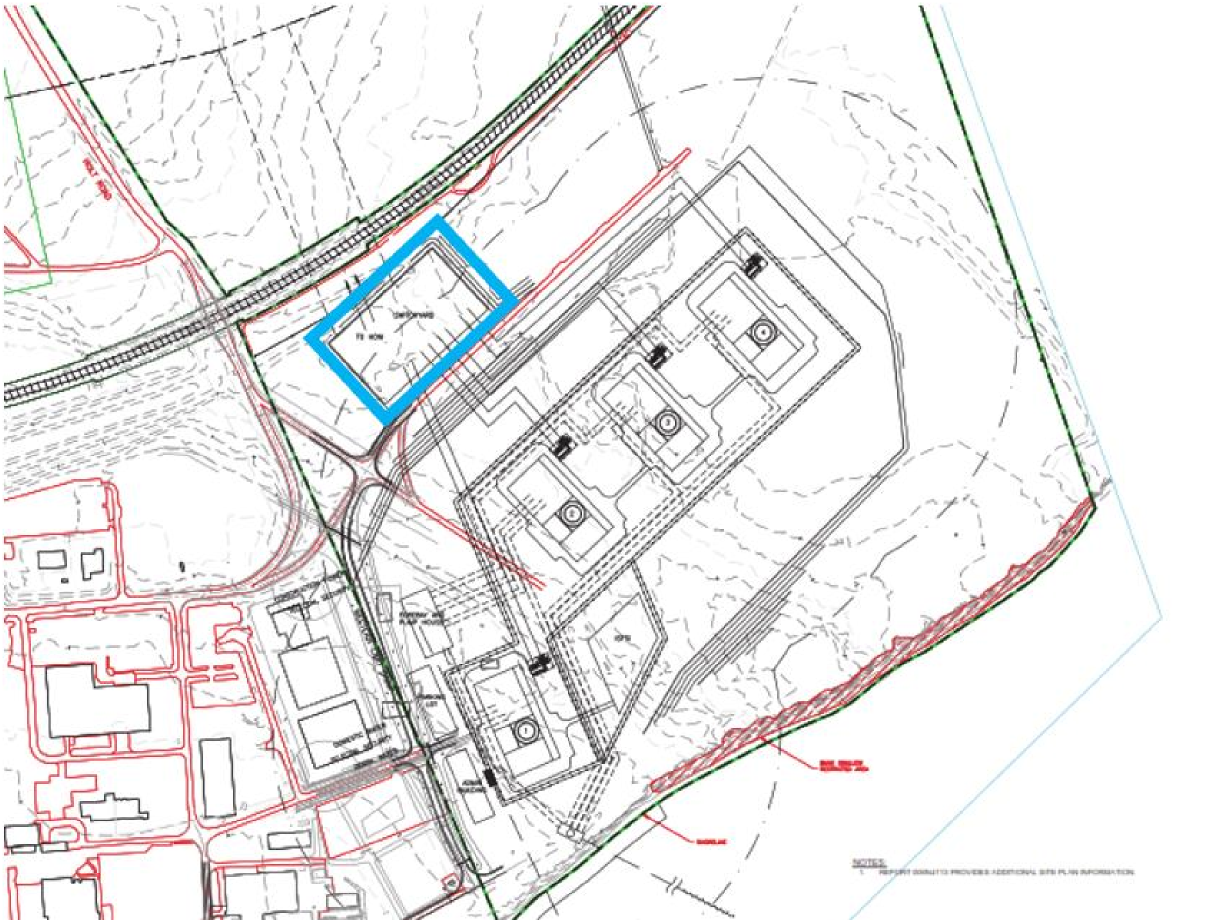


Figure 3-6: Conceptual Switchyard Location - BWRX-300

3.2 DNNP Works and Activities

Based on the Project Description in the EIS, the BWRX-300 deployment is expected to be undertaken in three phases with their associated works and activities described in the following section.

3.2.1 Site Preparation and Construction Phase

Works and activities associated with Site Preparation and Construction Phase are:

- Mobilization and Preparatory works (e.g., clearing and grubbing, services and utilities, and on-site roads and related infrastructure)
- Excavation and Grading (e.g., on-land earthmoving and grading, rock excavation, and development of construction laydown areas)
- Marine and Shoreline Works (e.g., shoreline protection and some minor lake bottom dredging)

- Development of Administration and Physical Support Facilities (e.g., offices, workshops, maintenance, storage and perimeter security buildings and utilities operating centres)
- Construction of the Power Block (e.g., reactor buildings, turbine-generator buildings, and related structures)
- Construction of Intake and Discharge Structures (e.g., offshore submerged intake and discharge structures for the once-through lake water cooling)
- Construction of Ancillary Facilities (e.g., switchyard)
- Construction of Radioactive Waste Storage Facilities (e.g., facilities for dry storage of used fuel, following initial wet storage in bays within the Power Block, and facilities for storage of Low & Intermediate Level Waste (L&ILW))
- Management of Stormwater (e.g., ditches, swales, and ponds)
- Supply of Construction Equipment, Material and Operating Plant Components (e.g., to the work site)
- Management of Construction Waste, Hazardous Materials, Fuels and Lubricants
- Workforce, Purchasing, and Payroll (e.g., workers during construction)

For the BWRX-300 deployment, the activities during this phase will be generally consistent with the description in the EIS, except for the date when the facility for dry storage of used fuel will be required (2035 for the BWRX-300 instead of 2025 in EIS). For the L&IL waste management activities, the waste will be shipped to an OPG licensed facility, which is consistent with the EIS.

3.2.2 Operation and Maintenance Phase

Works and activities associated with operation and maintenance phase are:

- Operation of the Reactor Core (e.g., first fuel load and commissioning, start-up, reactivity control/operation and shutdown activities)
- Operation of the Heat Transport System
- Operation of Active Ventilation and Radioactive Liquid Waste Management Systems
- Operation of Safety and Related Systems (e.g., such that fundamental safety functions are ensured)
- Operation of Fuel and Fuel Handling Systems (e.g., receipt and storage of new fuel, fuelling / refuelling the reactors and transfer of used fuel from the reactors to wet storage)
- Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems (e.g., once-through lake water cooling system)
- Operation of Electrical Power Systems (e.g., main transformers and emergency/standby power facilities)
- Operation of site services and utilities (e.g., sewage, stormwater, domestic water)
- Management of operational low and intermediate-level waste (e.g., including off-site transportation if applicable)
- Dry storage of Used Fuel (e.g., at an on-site facility pending eventual transfer to a long-term management facility)
- Management of Conventional Waste (e.g., including reuse and recycling)

- Replacement/Maintenance of Major Components and Systems (e.g., including possible refurbishment of major components)
- Physical Presence of the Station
- Administration, Purchasing and Payroll (e.g., workers during operations and maintenance)

3.2.3 Decommissioning Phase

Works and activities associated with decommissioning phase are:

- Transition from operations to a safe shutdown state (including transfer of used fuel to dry storage and eventual transfer to a long-term management facility)
- A period of storage with surveillance to allow for decay to decrease the radioactive hazard (inspection and maintenance of the facility is ongoing during this period)
- Preparation for dismantling (development of dismantling plans, decontamination as needed, acquisition of dismantling resources such as personnel, equipment, etc.)
- Dismantling, demolition, and site restoration (removal of all contaminated SSCs and restoration of the site to be available for other OPG uses)
- Release from regulatory control

3.3 Project Timeline

The conceptual timeline for the BWRX-300 deployment is presented in Table 3-1 with a start in 2022, approximately 12 years later than the original date.

For the BWRX-300 deployment, the site preparation activities for the first reactor started in Q4 2022 and is approximately two years in advance of the anticipated construction date. The site preparation activities for the next three reactors, should they occur, are expected to start in 2027. The required time for construction is estimated to be four years per reactor. The construction and operation of reactors 2 – 4 is offset by one year.

The end of operating life stages includes the transition from operations to decommissioning, storage with surveillance, dismantling, and site restoration. If a BWRX-300 reactor is operating by 2029, the reactor will operate for 60 years until 2089. It is assumed 30 years will be required for decommissioning with a timeframe of 2089-2119. A delay of 12 years to start a project of this duration will not have an adverse effect on the environment.

Table 3-1: Proposed Project Timeline

Single Project Phase	Start	Finish
Reactor 1 - Site Preparation	2022	2024 (2 years)
Reactor 1 - Construction	2025	2028 (4 years)
Reactor 1 - Operation and Maintenance	2029	2089 (60 years)
Reactor 1 - Decommissioning	2089	2119 (30 years)
Reactor 2, 3 and 4 - Site Preparation	2027	2029 (2 years)
Reactor 2 - Construction	2029	2033 (4 years)
Reactor 2 - Operation and Maintenance	2033	2093 (60 Years)
Reactor 2 - Decommissioning	2093	2123 (30 years)
Reactor 3 - Construction	2030	2034 (4 years)
Reactor 3 - Operation and Maintenance	2034	2094 (60 year)
Reactor 3 - Decommissioning	2094	2124 (30 years)
Reactor 4 - Construction	2031	2035 (4 years)
Reactor 4 - Operation and Maintenance	2035	2095 (60 years)
Reactor 4 - Decommissioning	2095	2125 (30 years)

4. COMPARISON OF THE BOUNDING SCENARIO REACTORS WITH THE BWRX-300

As noted in Section 1.2, when the EIS was submitted, OPG had not selected a particular nuclear technology. The DNNP was defined and described in the EIS in a manner to provide an assessment of effects in a bounding scenario that bounded a range of reactor technologies, as well as a number of reactors considered feasible for the DNNP site. Furthermore, when the JRP held its hearings for the DNNP and the GOC decided that the CNSC and other Responsible Authorities may exercise their powers or perform their duties that would permit the DNNP to be carried out, the technology still had not been selected.

In the EIS, the "Project for EA Purposes" was defined within a bounding framework that incorporated three reactor vendors under consideration at the time of the EIS (ACR-1000, AP1000, and the US EPR) and a fourth vendor (AECL EC6) that was added prior to the JRP hearings.

Since the bounding scenario encompasses design parameters that define the characteristics of the bounding scenario reactors, a comparison the BWRX-300 design parameters with the bounding scenario parameters is required. Where BWRX-300 parameters do not fit within the bounding scenario parameters, further assessment was required to determine whether the conclusions of the EIS remain valid or if additional mitigation is needed.

Table 4-1 provides an overall comparison of the bounding scenario reactors, which served as a basis for the EIS, with the BWRX-300 reactor that was selected for the DNNP.

Table 4-1: Comparison of Bounding Scenario Reactors with BWRX-300 Reactor

Reactor Design	Bounding Scenario Reactors				GEH (BWRX 300)
	AREVA (EPR)	Westinghouse (AP1000)	AECL (ACR 1000)	AECL (EC6)	
Number of reactors on site	3	4	4	4	4
Reactor design	Pressurized light water	Pressurized light water	Pressurized hybrid (heavy and light water)	Pressurized heavy water	Boiling light water
Net electric power in MWe (per reactor)	1,580	1,037	1,085	740	300
Thermal power in MWth (per reactor)	4,500	3,415	3,200	2,084	870
Depth of foundation embedment	maximum 13.5 m below ground level	maximum 13.5 m below ground level	maximum 13.5 m below ground level	maximum 13.5 m below ground level	38 m below ground level

Reactor Design	Bounding Scenario Reactors				GEH (BWRX 300)
	AREVA (EPR)	Westinghouse (AP1000)	AECL (ACR 1000)	AECL (EC6)	
Fuel in assembly or bundle	5% U-235 enriched fuel in fuel assembly	2.35 to 4.8% U-235 enriched 17x17 XL Robust fuel assembly	2.4% U-235 enriched CANFLEX-ACR® fuel bundle	Natural uranium (0.7% U-235) 37-element fuel bundle	[redacted] U-235 enriched GNF2 fuel assembly
Primary cooling system	Pressurized light water	Pressurized light water	Pressurized light water	Pressurized heavy water	Boiling light water
Secondary cooling system	Boiling light water	Boiling light water	Boiling light water	Boiling light water	Primary and Secondary cooling are combined in a single circuit
Moderator	Light Water	Light water	Heavy water	Heavy water	Light water
Plant life	60 years (with replacement of components)	60 years (with replacement of components)	60 years (with midlife refurbishment)	60 years (with midlife refurbishment)	60 years (with replacement of components)
Normal operation cooling system	Once through lake water cooling or natural draft, mechanical or fan-assisted natural draft cooling tower	Once through lake water cooling; or natural draft, mechanical or fan-assisted natural draft cooling tower	Once through lake water cooling; or natural draft, mechanical or fan-assisted natural draft cooling tower	Once through lake water cooling; or natural draft, mechanical or fan-assisted natural draft cooling tower	Once through lake water cooling
Emergency cooling system	Borated water emergency core cooling, containment cooling and core melt cooling using in-containment refueling water storage tank	Passive Core Cooling System and Passive Containment Cooling System using in-containment refueling water storage tank	Emergency Core Cooling System using water from safety injection system	Emergency Core Cooling System to supply water to the heat transport system from the reserve water tank	Passive Isolation Condenser System (ICS)

A more detailed comparison of the BWRX-300 technology is provided in sections 5.2.3 and 5.2.4.

5. THE 2009 EIS CHAPTER BY CHAPTER REVIEW

Section 5 of this supporting document covers:

- The relevant information or refinements identified from the comparison of the BWRX-300 deployment with the EIS, including substantial changes in the environment, and the new or updated DNNP information that is not specific to a reactor technology. The comparison was conducted by a comprehensive review of each EIS chapter with the BWRX-300 information described in Section 3.
- Discussion and results of qualitative assessments of relevant information or refinements identified above to confirm if the EIS conclusion remains valid. Quantitative assessment results are also discussed where qualitative results need to be further refined.
- Discussion of the significance of residual adverse effects for conditions, if any, that are not consistent with the EIS as well as additional studies and/or mitigation options, if required.

5.1 EIS Chapter 1 - Introduction

The information in Chapter 1 of the EIS is independent of the selected technology. It includes an introduction to DNNP, its location, alternatives to the DNNP, timeframe, applicable regulatory requirements, application of CEAA, scope of the DNNP and assessment, and environmental assessment documentation.

The timeframe of the DNNP has been updated as shown in Table 3-1 and discussed further in Section 3.3 of this supporting document.

5.2 EIS Chapter 2 - The Project for EA Purposes

5.2.1 EIS Section 2.1 – Introduction

EIS Section 2.1 describes:

- The proposed DNNP, which involves the site preparation and construction of up to four nuclear reactors with a combined generating capacity of up to 4,800 MWe of electricity, the operation and maintenance of the reactors through to approximately 60 years followed by decommissioning of reactors and associated facilities (EIS Section 2.1.1).
- The original selection and acquisition of the DN site in the 1970s, the early vision of development capacity of the site, development of the site to date and rationale for its selection for further nuclear power development (EIS Section 2.1.2).

Section 2.1 of the EIS, specifically Section 2.1.2 provides a brief review of the selection of the DN site in the 1970s for nuclear power generation, its suitability for the construction and operation of a new nuclear power plant, and rationale for its selection as the location for the proposed

DNNP. As part of the PRSL renewal application in 2020, OPG conducted a review and confirmed that the site remains suitable for a new nuclear power plant.

The selection of the BWRX-300 does not change the conclusions on the suitability of the site for the DNNP.

5.2.2 EIS Section 2.2 – OPG and Nuclear Power Generation

This section of the EIS provides a general overview of OPG and its Power Generation System (EIS Section 2.2.1), and OPG Commitment to Nuclear Excellence, Safety and Sustainable Development (EIS Section 2.2.2).

This section of the EIS also presents OPG's employee numbers and generating portfolio. Due to the passage of time, these numbers are now out of date. Updated numbers are provided below:

- The number of employees in OPG's 2021 Annual Financial Report [7] is 9,325 and is lower than the value stated in the EIS of 12,000 people.

- OPG's electricity generating portfolio has also decreased from 21,000 MWe reported in the EIS to 18,958 MWe [7].

This information is not specific to any reactor technology as changes in OPG's collective electricity generation would not alter DNNP's effects on the environment.

5.2.3 EIS Section 2.3 – Overview of a Nuclear Power Plant

The comparison of the information in this section of the EIS and the BWRX-300 technology and its operation discussed in Sections 3.1 and 4 of this supporting document shows that the BWRX-300 design, and the associated components, are simpler than the reactors that were assessed in the EIS. The main differences specific to EIS Section 2.3 include:

- The design of the reactor, which is a BWR as opposed to a PWR or Pressurized Hybrid Reactor (PHR), eliminates the need for a steam generator.
- The scale of the BWR reactor, which is smaller and more compact compared to those previously considered in the EIS.

Table 5-1 below provides a comparison regarding basic reactor design features and how energy is produced for the bounding scenario reactors and for the BWRX-300 reactor.

For clarity, the following color coding is used for this table:
- Blue: the design feature is consistent with the bounding scenario reactors.
- Green: a process or design feature related to the BWRX-300 reactor is similar, but not fully consistent to the design features for the bounding scenario reactors.

Table 5-1: Comparison of How Energy is Produced

Description in the EIS	BWRX 300	Consistency with EIS Description
In the reactor core, heat is produced when a neutron strikes an atom of uranium in the fuel, causing it to split into lighter atoms. In addition to heat, this fission reaction releases additional neutrons that can split other uranium atoms in a chain reaction.	The BWRX-300 produces heat through a fission process that takes place in a reactor core.	Consistent.
To slow down the neutrons and control the fission process, the reactor contains a moderator (which may be light or heavy water).	The BWRX-300 uses light water for the moderator and coolant [8].	Consistent.
Water is passed over the fuel and through a series of pipes to transfer the heat to a set of steam generators (i.e., boilers). This water is the reactor coolant, and the system is collectively the Primary Heat Transport System (also known as the Reactor Coolant System). The heated reactor coolant water enters the tubes of the steam generators (i.e., the primary side of the steam generators). The heat is conducted across the tubes of the steam generator, resulting (i.e., the secondary side of the steam generators). The tubes in the steam generator prevent mixing of reactor coolant water from the primary heat transport system with the feedwater steam on the shell side of the steam generators. The steam produced in the shell side of the steam generators is transferred through a system of pipes that form a second closed-loop system (i.e., Secondary Heat Transport System). The steam passes through the turbines, causing the turbine rotors and the attached generator rotor to rotate. The spinning of the generator rotor results in the production of electricity.	The BWRX-300 does not use steam generators as it is a BWR design. Instead, heated cooling water turns into steam which is directly used to drive a turbine which results in the production of electricity.	Similar. The cooling of the fuel is consistent. For the bounding scenario reactors, the EIS assumed that the heated reactor coolant water enters the tubes of the steam generators, resulting in boiling of the feedwater on the shell side of the steam generators. In the BWRX-300, the heated reactor coolant turns directly into steam.
After the steam passes through the turbine, it is cooled and converted to water in the condensers and redirected for steam generation.	In the BWRX-300, steam is condensed after passing through the turbine in the condenser, and condensate is recycled for steam generation.	Consistent.
The condensers are cooled by another separate flow of water (the Condenser Circulating Water – CCW System) that travels through the condenser tubes. The feedwater and the condenser circulating water do not	In the BWRX-300, the condensers are cooled the same way as for the PWR: a separate flow of	Similar. In the EIS, the reactor coolant

Description in the EIS	BWRX 300	Consistency with EIS Description
mix. As with the relationship between the reactor coolant water and the feedwater, the feedwater and the reactor cooling water do not mix.	water (the CCW system) is used. The feedwater and the condenser circulating water do not mix. In the BWRX-300, the reactor coolant water and the feedwater are the same.	water and the feedwater do not mix, the feedwater and the condenser circulating water do not mix. In the BWRX-300, the reactor coolant water and the feedwater are the same. The feedwater and the condenser circulating water do not mix.
The circulating cooling water system may be part of a "once-through" cooling system such as that at DNGS. Alternatively, it may be part of a "closed loop" cooling tower system […]. In both cases, substantial volumes of cool water are cycled through the condensers thereby converting the turbine steam to water.	The BWRX-300 uses a once-through cooling system.	Consistent.
All nuclear generating stations incorporate comprehensive safety features and processes. Fast-acting safety systems and safety-related systems are in place to prevent and mitigate potential accidents. Further, the design and operation of a nuclear generating station incorporates defence in-depth. This concept acknowledges that design flaws, equipment failures and/or mistakes may occur. However, there will be multiple, redundant, independent barriers in place such that no single mistake or failure can cause significant detriment to human health and/or the environment.	The BWRX-300 safety systems are in place to prevent and mitigate potential accidents. The design and operation of the BWRX-300 also incorporates defence-in-depth [8].	Consistent.
Nuclear reactor fuel for typical Generation III reactors is manufactured off-site and delivered to the generating facility in various configurations depending on the reactor type (e.g., fuel rod assemblies or fuel bundles). The three reactors currently being considered by the province all use low enriched uranium fuel (i.e., up to 5% enrichment).	The process described in this EIS applies to the BWRX-300 deployment; the fuel for BWRX-300 will also be manufactured off-site and uses fuel less than 5% enrichment [8].	Consistent.
When removed from the reactor, used fuel is transferred to a water-filled Used Fuel Bay (alternatively known as Irradiated Fuel Bay) where it is contained to cool for a period of several years. Following the period	The process described in this EIS applies to the BWRX-300 deployment; used fuel is also stored	Consistent.

Description in the EIS	BWRX 300	Consistency with EIS Description
of wet storage in the used fuel pool, the used fuel is transferred to dry storage containers and placed into appropriate facilities, also specific for the fuel type. The used fuel from all reactors in Ontario is currently stored in Used Fuel Bays and dry storage facilities at the stations where the fuel was used. The Nuclear Waste Management Organization (NWMO) created under the auspices of the federal Nuclear Fuel Waste Act (NFWA), is charged with development of a long-term management approach for used fuel, which is subject to a separate federal approvals process.	in a used fuel pool (Figure 3-3) before being transferred to on-site dry storage. There is no change to the description of waste management practices in Ontario.	
In addition to used fuel, nuclear generating stations all produce a volume of Low & Intermediate Level Waste (L&ILW) radioactive waste. These waste products will be processed on-site and stored or otherwise managed in appropriate facilities either on-site or shipped to OPG licensed off-site facilities. OPG's Nuclear Sustainability Services – Western Facility (formerly known as the Western Waste Management Facility) currently receives and manages such wastes from existing OPG nuclear generating stations.	The process in this EIS applies to the BWRX-300 deployment; L&ILW will also be produced, and will be processed on-site, and shipped to an off-site OPG licensed facility.	Consistent.

For almost all items, the BWRX-300 design features and the method used to produce energy are consistent with the bounding scenario reactors.

For two items identified in light green in the table (i.e., the reactor cooling system and the condenser cooling system), the functions are similar, but the BWRX-300 design includes simplifications. The condenser cooling system is consistent (i.e., once-through cooling) with the bounding scenario reactors, but the reactor coolant water and the feedwater are combined. The function of the reactor cooling system is largely similar (i.e., use of light water as coolant to cool the fuel) to that of the bounding scenario reactors.

5.2.4 EIS Section 2.4 – Definition of the Project for EA Purposes

This EIS section provides:

- High level execution plan for the site preparation and construction of the DNNP and its operation and maintenance phase of the project.
- The alternative means of carrying out the DNNP that were considered in the EA and the manner in which the alternatives were incorporated into the Description of the Project for EA Purposes, and
- The three bounding site development layouts to ensure the assessment bounds the conditions defined collectively by these model plant layout scenarios.

The new/updated information and refinements of the DNNP are summarized as follows:

- The EIS assumed a duration of fifteen years, from 2010 to 2025, for the site preparation and construction period for four reactors. The site preparation and construction of the BWRX-300 would be sequential with some overlap. The site preparation activities for the first reactor are expected to start two years in advance of its construction date and the site preparation activities for the next three reactors will start at the same time. The construction of the second reactor will start after the first reactor becomes operational, as such the overall duration of the site preparation and construction for all four reactors is expected to be 13 years from 2022 to 2035 as shown in Table 3-1. The operation and decommissioning periods are the same for the BWRX-300 and the bounding scenario reactors. The changes to the construction schedule for the BWRX-300 deployment are assessed in Section 5.2.4.3

- The several years delay in commencement of the DNNP does not, on its own, have an adverse effect on the environment. However, over time some environmental conditions at the DNNP site have changed. The changes in environmental conditions since 2010 are provided in Section 5.4.

- Similarly, over time other projects on or near the DNNP site that might contribute to cumulative effects have been completed, are currently in progress, or have not yet commenced. The cumulative effects from BWRX-300 deployment are summarized in Section 5.8.

- For the BWRX-300 deployment, the used fuel dry storage activities will be generally consistent with the description in the EIS, except for its required date. The BWRX-300 used fuel can be moved from the used fuel pool to dry cask storage between three and five years after their removal from the reactor. As a result, the used fuel dry storage facility will be required by 2035, instead of 2025 as described in the EIS. For the L&IL waste management activities, the waste will be shipped to an OPG licensed facility, which is consistent with the EIS.

5.2.4.1 EIS Section 2.4.1 – Alternative Means of Implementing the Project

The description of the "Project for EA Purposes" in the EIS included alternative means of implementing the DNNP, and as a result, the assessment of environmental effects described in the EIS represents the "full reasonable range of possible ways the DNNP might be implemented". All were determined through the assessment to be acceptable (i.e., will not result in significant residual adverse effects).

Variations on lake infilling: The EIS included a lake infill along the DNNP shoreline in front of the site to create the necessary surface area to accommodate installation of 4 reactors. The lake infill is considered as a bounding condition which would result in the greatest associated effect.

As mentioned in Section 3, the BWRX-300 would require a smaller footprint than the reactor technologies considered in the EIS. No lake infilling is required for the BWRX-300 deployment.

Switchyard location and design: The DNNP will require a switchyard to facilitate the transfer of power from the generating station to the electrical grid. In the EIS, the switchyard was to be added as an extension to the existing DNGS switchyard. The BWRX-300 deployment will place the switchyard east of Holt Road, south of the CN rail on the DNNP site (Figure 3-6). This is in an area that had originally been dedicated to construction facilities, laydown area and parking, and their associated environmental disturbance was assessed in the EIS. The benefits associated with the BWRX-300 location of the switchyard includes shorter length of power lines and elimination of overhead power lines crossing Holt Road or the railway. The connection between the switchyard and the power grid will be executed by Hydro One and is not part of the DNNP. Hydro One will be conducting a provincial EA for this work. The effect of the change of switchyard location is discussed in Section 5.2.5.

Alternative Reactor Designs and Numbers of Units: The EIS allocated up to four reactors with a combined capacity up to 4800 MWe. As indicated in Section 3, the BWRX-300 is a smaller reactor in both size and power output, and four BWRX-300 reactors would produce about 1,200 MWe [9].

Alternatives for Condenser Cooling: The cooling options that were deemed appropriate for the DN site and considered in the EIS include: i) once-through lakewater cooling; ii) natural draft cooling towers; iii) mechanical draft cooling towers; and iv) fan-assisted natural draft cooling towers. OPG has completed a Best Available Technology Economically Achievable (BATEA) assessment for the BWRX-300 condenser cooling water option and once through cooling was found to be the most feasible option. The EIS used a condenser cooling water flow rate of up to 228.4 m^3/s for 4 reactors. The BWRX-300 requires a substantially lower flow rate of [redacted] m^3/s to 68 m^3/s for 4 reactors, resulting in lesser effects.

Alternatives for Management of Low and Intermediate Level Radioactive Waste: The EIS considered two alternative means of managing L&ILW: (1) Management of the waste on the DN site in a new L&ILW management facility and (2) Transport of the L&ILW off the DN site to an appropriately licensed facility elsewhere, such as the OPG's operating Nuclear Sustainability Services – Western Facility (formerly known as the Western Waste Management Facility). Large components (e.g., steam generators resulting from mid-life refurbishment) would likely require on-site storage and management (EIS pg. ES-23 [3]). The BWRX-300 deployment does not include steam generators; however, if any other large components, such as the turbine rotor or condenser tubes, have to be replaced during the life of the plant, they will require a licensed facility for managing L&ILW.

Alternatives for Storage of Used Fuel: In the EIS, the used fuel management process includes the transfer of the used fuel from the reactor to a water-filled storage pool (Used Fuel Bay or Irradiated Fuel Bay) in which the used fuel is stored for a period of decay and cooling, typically over a period of ten years, before being transferred into dry-storage containers and stored on-site in a purpose-built used fuel storage facility. The EIS considered several dry storage technologies including the AECL MACSTOR system and OPG's dry storage containers (DSCs).

For the BWRX-300 reactor, the used fuel will initially be stored in a fuel pool that can hold [redacted] The fuel racks can hold a minimum of an entire reload of fresh fuel. The used fuel can be moved to dry storage after [redacted] of cooling in the pool.

The following steps are used for used fuel canister loading of the BWRX-300, consistent in all major ways with existing CANDU reactors and the bounding scenario reactors:

1. An empty canister is moved into the used fuel cask pit, the gate closed, and the pit flooded with fuel pool grade water. The gate is checked for leaks before the used fuel pool gate is removed leading to the used fuel cask pit. The selected bundles are moved under water from the used fuel racks to the allotted location in the used fuel canister.
2. Once a canister is filled with used fuel, a video recording of the serial numbers is obtained, the canister is evacuated of water, dried, and capped by welding the cap using remote welding techniques to minimize radiation to workers.
3. Once the canister is sealed and shielded it is moved to an area where the canister and shielding is decontaminated. This process is performed until the external surfaces meet the applicable radiation protection criteria.
4. The canister is loaded in a shield bell to serve as a temporary shielded cask for transport. Some vendors design the cask with a permanent shield for direct shipping or local storage. For the purposes of this supporting document, a canister loaded into the shielded transport container is referred to as a cask, an example of which is displayed in Figure 5-1.

Figure 5-1: GEH Transport and Storage Dual Purpose Metal Cask

The number of used fuel bundles loaded into the used fuel canisters varies depending on the canister vendor. Current maximum capacity is 87 – 89 bundles per canister. The transport and storage canister for the BWRX-300 is assumed to contain the maximum number of assemblies (89). The canisters are loaded about every two and a half years. Each cask has a diameter of about 3.6 m with a space of the same distance between each cask.

The used fuel storage systems for the DNNP will be designed to comply with prevailing regulatory requirements and require a CNSC licence for construction and operation. The used fuel management system of the BWRX-300 is consistent with the description in the EIS.

Alternatives for Excavated Material Management: The EIS considered two options for management of the excavated material: (1) On-site use and disposal and (2) Transport of surplus soil to off-site disposal, and the bounding values for excavated material quantities.

The BWRX-300 deployment would have a smaller volume of excavated material than the estimated volume described in the EIS. As a result, there is the potential to dispose of, or redistribute, the total volume of excavated material on site and therefore eliminates the need to transport excavated material to off-site disposal facilities.

In summary the alternatives include:

- Variations on lake infilling - for the BWRX-300 plant configuration, no lake infilling is required.
- Switchyard location and design - switchyard will be within the area for development previously assessed in the EIS.
- Condenser cooling is once-through cooling which is consistent with the EIS, with less volume of cooling water.
- Management of L&ILW is to transport off-site to an OPG licensed facility, which is consistent with the EIS.
- Storage of used fuel is on site, in dry storage casks, which is consistent with the EIS.
- Alternatives for excavated material management.

5.2.4.2 EIS Section 2.4.2 – Bounding Site Development Layout

The EIS considered three scenarios for site development layout and the maximum values of the three scenarios for relevant parameters were adopted throughout the EIS:

- Scenario 1- Maximum power generation capability: Four ACR-1000s with Once-Through Lake Water Cooling and lake infilling. The soil and rock excavation volumes are 9.4 Mm^3 for 4-reactors.
- Scenario 2- Maximum extent of land area requirements for the DNNP: Two ACR-1000s with Mechanical Draft Cooling Towers and lake infilling. The soil and rock excavation volumes are 9.8 Mm^3 for two reactors.
- Scenario 3- Maximum excavation volume: Two EPRs with Natural Draft Cooling Towers and lake infilling. The excavation volume would be 12.4 Mm^3 for two reactors.

Given the size of the excavation and the footprint of the BWRX-300 deployment compared with the EIS plant layout, the bounding site development layout encompasses the BWRX-300 conceptual deployment layout and the estimated 3.3 Mm^3 of excavation volume.

5.2.4.3 EIS Section 2.4.3 – Description of the Project for EA Purposes

The information in this section of the EIS is independent of the selected technology. It is recognized that: i) only one type of reactor will be constructed and operated; and ii) several key elements of the DNNP may be implemented in alternative ways.

5.2.5 EIS Section 2.5 – Site Preparation and Construction Phase

Section 3.2 provides a review of the DNNP work and activities described in the EIS.

Table 5-2 lists the DNNP works and activities associated with bounding scenario reactors and those for the BWRX-300, and a determination as to whether they are consistent. For clarity, the following color coding is used for this table:

- Blue: the activity is consistent with the EIS.
- Green: the activity is either a refinement unique to the BWRX-300 or is no longer required.

Table 5-2: Review of DNNP Works and Activities (Site Preparation and Construction Phase)

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
EIS Section 2.5.1 – Mobilization and Preparatory works (e.g., clearing and grubbing, services and utilities, and on-site roads and related infrastructure)	The BWRX-300 reactor has a footprint of 19 ha. The site area for one reactor will be prepared for construction at the outset of the DNNP, with the additional preparation undertaken if the deployment of four reactors proceeds. For the development of roads and infrastructure, the multi-reactor deployment approach is consistent with the EIS, requiring the same development and upgrades.	Site preparation activities for the deployment of the BWRX-300 reactor are consistent with the clearing and grubbing and installation of services and utilities described in the EIS. Overall, the DNNP site footprint for BWRX-300 deployment is smaller resulting in opportunities to refine locations of on-site roads to

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
		minimize disruption to nearby terrestrial environmental features.
EIS Section 2.5.2 – Excavation of approximating 12.4 Mm^3 and Grading (e.g., on-land earthmoving and grading, rock excavation, and development of construction laydown areas)	The BWRX-300 deployment will require the excavation of approximately 3.3 million cubic metres (Mm^3) of soil and rock for four reactors [10], substantially less than the 12.4 Mm^3 of excavation assessed in the EIS for four reactors. This reduced excavation is a positive outcome as less material will need to be stockpiled, transported, and stored on the DNNP site for the long-term. Off-site transport of excavated materials may also be avoided if all the excavated material can be stored on the DNNP site. The BWRX-300 foundation embedment is 38 m below grade. For excavation and grading, the lowering of the foundation for the BWRX-300 Reactor Building shaft below what was assessed in the EIS means that there is a potential for an effect on groundwater flows that was not fully considered in the EIS. This is discussed in Section 5.5.6.	Deeper foundations required. Smaller excavation volumes anticipated. These refinements are likely to result in lower dust and noise levels during the Site Preparation and Construction phases than anticipated in the EIS. [11]
EIS Section 2.5.3 – Marine and Shoreline Works (e.g., lake infilling, shoreline protection, wharf construction, and some minor lake bottom dredging)	The BWRX-300 deployment will require less marine and shoreline works than what was assessed in the EIS. The EIS anticipated to fill in approximately 40 hectares (ha) of lake bottom, extending to a water depth of 5 m. No lake infilling will occur, nor will a new wharf need to be constructed. The BWRX-300 deployment, however, will still require some shoreline works, such as excavating the existing shoreline to prepare for shoreline protection, which will result in some sediment transport into deeper water. The scale of these shoreline works is smaller than assessed in the EIS.	Less marine and shoreline works. No lake infilling or new wharf.
EIS Section 2.5.4 – Development of Administration and Physical Support Facilities (e.g., offices, workshops, maintenance, storage and perimeter security buildings and utilities operating centres)	The BWRX-300 deployment of the administration and physical support facilities will require less land area than described in the EIS, resulting in a smaller footprint and opportunities to refine locations of on-site roads to minimize disruption to nearby terrestrial environmental features.	Smaller footprint.
EIS Section 2.5.5 – Construction of the Power Block (e.g., reactor buildings, turbine-	The BWRX-300 deployment will utilize the industry best practices and construction methods described in the EIS. The construction method for the Power Block (i.e., reactor building, the generator building/turbine hall, and related structural	The deployment of four BWRX-300 reactors remains consistent with the

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
generator buildings, and related structures)	features) is similar to that described in the EIS, although the scale of these activities is generally smaller than what was assessed in the EIS. Less above ground construction activity may result in reduced dust and noise. The foundations for the BWRX-300 Power Block will be set deeper in the bedrock. This will likely require more below grade drilling and blasting than assessed in the EIS. Nonetheless, the volume of excavated material will be less than what was assessed in the EIS. Deeper foundations may also change groundwater flows. An assessment of the deeper foundation of the BWRX-300, its construction activities, and the determinations made in the EIS regarding significance are summarized in Sections 5.5.6 and 5.9.	construction of the power block for the bounding scenario reactors.
EIS Section 2.5.6 – Construction of Intake and Discharge Structures (e.g., offshore submerged intake and discharge structures similar to those of DNGS for the once-through lake water cooling option; or alternatively, smaller but generally similar structures for the cooling tower options)	The EIS assumed that the once-through cooling water intake and diffuser structures would be similar to the existing structures at DNGS, although appropriately sized to accommodate the required water flow rates. The construction will utilize the industry best practices and construction methods described in the EIS. The water intake and the discharge pipes will be sized for four reactors. The discharge pipe includes a series of diffusers from which the water is discharged to promote rapid thermal mixing in the lake.	Smaller in scale.
EIS Section 2.5.7 – Construction of Ancillary Facilities (e.g., including cooling towers and blow-down ponds, if applicable, and expansion of the existing switchyard)	The BWRX-300 deployment will not require the construction of cooling towers and blow-down ponds, avoiding land use and visual effects that affect socio-economic conditions in the surrounding communities. The BWRX-300 deployment will not expand the DNGS switchyard (Bowmanville Switching Station) as described in the EIS but will establish a new one, adjacent to the reactor buildings. The location of the new switchyard is within the area of disturbance assessed in the EIS. As such, the effects of constructing the new switchyard on the atmospheric and terrestrial environments have been considered in the EIS. Regarding the use of concrete, the BWRX-300 deployment assumes a concrete batch plant will be established on-site, which is consistent with the assumptions in the EIS. The BWRX-300 deployment will use less concrete than assessed in the EIS due to the considerably smaller power block. This means that less	Overall, the construction of ancillary facilities for BWRX-300 deployment is likely to require fewer vehicle movements, resulting in less traffic both on and off the DNNP site. Consistent, except a new switchyard will be provided.

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
	material will need be transported to the DNNP site, stockpiled, processed, and used on the DNNP site. Less processing reduces atmospheric emissions.	
EIS Section 2.5.8 – Construction of Radioactive Waste Storage Facilities (e.g., facilities for dry storage of used fuel, following initial wet storage in bays within the Power Block, and facilities for storage of L&ILW)	The volume of L&ILW and used fuel generated from the BWRX-300 deployment over the 60 years of operation is estimated to be less than for the larger bounding scenario reactors. The BWRX-300 deployment will transport the L&ILW off-site to an OPG licensed facility. For a four reactor BWRX-300 deployment, the land area required for used fuel dry storage is smaller than what was assessed in the EIS.	Smaller in scale. The description of the on-site dry storage facility in the EIS is applicable to the BWRX-300 deployment.
EIS Section 2.5.9 – Management of Stormwater (e.g., ditches, swales, and ponds)	The general approach to stormwater management during site development and operation described in the EIS is applicable to the BWRX-300 deployment.	Consistent.
EIS Section 2.5.10 – Supply of Construction Equipment, Material and Operating Plant Components (e.g., to the work site)	The description of the supply of construction equipment, concrete, manufactured construction materials, and plant operating components in the EIS is applicable to the BWRX-300 deployment.	Consistent.
EIS Section 2.5.11 – Management of Construction Waste, Hazardous Materials, Fuels and Lubricants	The description of the management of construction waste, hazardous materials and lubricants in the EIS is applicable to the BWRX-300 deployment.	Consistent.
EIS Section 2.5.12 – Workforce, Payroll and Purchasing (e.g., up to 3,800 workers during Construction).	Approximately 2,100 workers are expected to be on-site during peak construction. This is also discussed in Section 5.5.9.2.	Workforce is smaller.

5.2.6 EIS Section 2.6 – Operation and Maintenance Phase

The BWRX-300 deployment operation and maintenance works and activities are described in section 3.2.2. In summary, the notable difference between the BWRX-300 and bounding scenario reactors is that in a BWR, the water cooling the fuel turns to steam in the reactor and is used directly to run the turbine.

Table 5-3 lists the DNNP works and activities associated with bounding scenario reactors and those for the BWRX-300, and a determination as to whether they are consistent. For clarity, the following color coding is used for this table:

- Blue: the activity is consistent with the EIS.

- Green: the activity is either a refinement unique to the BWRX-300 or is no longer required.

Table 5-3: Review of DNNP Works and Activities (Operations and Maintenance Phase)

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
EIS Section 2.6.1 – Operation of Reactor Core - The description of the operation of the reactor core for the reactors that were considered in the EIS	The EIS contains a high-level description of the reactor core which is consistent with the BWRX-300.	Consistent.
EIS Section 2.6.2 – Operation of Primary Heat Transport System - The operation of the primary heat transport system that moves heat from the core to the steam generators for the bounding scenario reactors in the EIS.	the BWRX-300 has a reactor cooling system that combines the functions of the primary heat transport system and the secondary heat transport system. The impact of this refinement is explained in Section 3.1.	Consistent.
EIS Section 2.6.3 – Operation of Active Ventilation and Radioactive Liquid Waste Management Systems - The operation of the radioactive gaseous waste management system (RGWMS).	The operation of the BWRX-300 OGS manages the releases of radioactive gases to the atmosphere. The description of this system is consistent with the description in the EIS. The effects of this release is assessed in the review of Chapter 5 (Section 5.5 of this supporting document).	Consistent.
EIS Section 2.6.3 – Operation of Active Ventilation and Radioactive Liquid Waste Management Systems - The operation of the radioactive liquid waste management system (RLWMS).	The RLWMS manages the collection, handling, processing, and storage of the radioactive liquid waste. As BWRX-300 is designed to be a zero radioactive liquid effluent facility, no radioactive liquid waste is discharged to surface water during normal operation.	No radioactive liquid waste is discharged to surface water during normal operation.
EIS Section 2.6.4 – Operation of Safety and Related Systems - The measures to provide a series of level of defence, including measures to prevent accidents and measures to provide protection if that prevention fails as well as the redundant systems used to provide the fundamental safety functions (Control, Cool, Contain, and Monitor) for each of the reactors that were considered in the EIS.	The description of the safety systems for the BWRX-300 deployment cover the same safety functions as those in the EIS.	Consistent.

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
EIS Section 2.6.5 – Operation of Fuel and Fuel Handling Systems - The fuel and fuel handling systems used for the reactors considered in the EIS.	The description of the operation of fuel and fuel handling system for PWR reactors in the EIS is consistent with the fuel handling procedure for the BWRX-300 reactor.	Consistent.
EIS Section 2.6.6 – Operation of Secondary Heat Transport System and Turbine Generators - The Secondary Heat Transport System, which consists of the secondary (shell-side) side of the steam generators, the main steam system, the turbines, condensers, condensate, and feedwater systems.	As described in Section 3.1.1 of this report, the BWRX-300 has a reactor cooling system that combines the functions of the Primary Heat Transport System and the Secondary Heat Transport System. The BWRX-300 does not include steam generators. The operation of the BWRX-300 deployment steam turbine and electricity generation is consistent with the EIS.	The primary heat transport and secondary heat transport systems are combined, but turbines, condensers and generators are consistent.
EIS Section 2.6.7 – Operation of Condenser and Condenser Circulating Water (CCW), Service Water and Cooling Systems - An overview of the CCW system, and the options considered for configuration of the CCW system. The EIS assumed the CCW will be similar to the structures already in place for the Darlington station.	The BWRX-300 deployment will use once-through cooling, which was an option considered and assessed in the EIS. The BWRX-300 deployment once through cooling system is consistent with the EIS.	Consistent.
EIS Section 2.6.8 – Operation of Electrical Power Systems - The electrical power systems required to deliver power to and from the grid, generate emergency power and distribute power throughout the station. The BWRX-300 deployment information is consistent with this information.	The BWRX-300 deployment information is consistent with the description of the operation of the electrical power system in the EIS.	Consistent.
EIS Section 2.6.9 – Operation of Site Services and Utilities - The operation of site services and utilities such as the sewage system, stormwater management, domestic water, compressed air system, heating and ventilation, on-site transportation, and other auxiliary systems.	The information in this EIS section applies to any reactor technology, including the BWRX-300 deployment.	Consistent.
EIS Section 2.6.10 – Management of Operational Low and Intermediate Level Waste - A general overview of L&ILW constituents and the two options under consideration for the management of L&ILW: on-site management, interim storage, in the case of LLW, compaction, and transportation off-site to an appropriately licensed facility. The EIS states "*L&ILW*	The information in this EIS section applies to any reactor technology, including the BWRX-300 deployment.	Consistent.

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
will be managed in a similar manner regardless of the reactor selected." (EIS pg. 257).		
EIS Section 2.6.11 – Transportation of Operational Low and Intermediate Level Waste to a Licensed Off-Site Facility - The transportation of L&ILW off-site to a licensed facility and compliance with applicable regulations.	The information in this EIS section applies to any reactor technology, including the BWRX-300 deployment.	Consistent.
EIS Section 2.6.12 – Dry Storage of Used Fuel - The general approach to dry storage of used fuel as well as the potential systems for dry storage for the bounding scenario reactors.	The BWRX-300 used fuel pool is smaller than assessed in the EIS; however, the difference in capacity is accounted for through the availability to move used fuel earlier with an appropriate cask design. It is assumed that used fuel storage facilities will be available when needed. The dry storage provisions of the BWRX-300 deployment are consistent with the EIS.	Consistent.
EIS Section 2.6.13 – Management of Conventional Waste - The high-level information on the management of conventional waste that applies to any reactor technology, including the BWRX-300.	This EIS high-level information applies to any reactor technology, including the BWRX-300.	Consistent.
EIS Section 2.6.14 – Replacement / Maintenance of Major Components and Systems - The replacement of major components during the 60-year life of the Project. It describes the replacement of the pressure tubes for the ACR-1000, the reactor head for the EPR and AP1000, and of the steam generators for all three reactors considered in the EIS.	The BWRX-300 deployment does not have pressure tubes or steam generators. However, it is possible that the reactor head would have to be replaced, as was assessed in the EIS. Replacing a reactor pressure vessel head from the BWRX-300 is similar to the replacement of the components discussed in the EIS, except the BWRX-300 component(s) are smaller in size.	Consistent.
EIS Section 2.6.15 – Physical Presence of the Station - The expected physical presence of DNNP. The EIS assumes that up to four individual reactors will be developed, which is consistent with the BWRX-300 deployment information.	For the BWRX-300 deployment, once-through cooling is the option that will be implemented and there will not be cooling towers, no visible steam plume. Therefore, the BWRX-300 deployment	Consistent.

Bounding Scenario Reactors	BWRX 300	Consistency with EIS Description
	information is consistent with the EIS.	
EIS Section 2.6.16 – Administration, Payroll and Purchasing - The OPG's expected increase in contribution to taxes, the workforce associated with the Operation and Maintenance phase, and the number of workers onsite required for refurbishment.	The socio-economic impact is discussed in Section 5.5.11 of this supporting document.	Workforce is smaller.

Overall, apart from some small refinements listed below, the deployment of four BWRX-300 reactors is consistent with the EIS:

- The cooling water flow rates and temperatures for the once-through cooling of the BWRX-300 are aligned with the parameters assessed in the EIS.
- For radioactive emissions to the atmosphere, the contaminants are the same, but their proportion has changed. As the BWRX-300 is designed to be a zero radioactive liquid effluent facility, no radioactive liquid effluent is discharged to surface water during normal operation, which is less than assessed in EIS. The effects of releases in terms of the dose to the public and non-human biota are assessed in Section 5.5.7.
- The BWRX-300 used fuel pool is smaller than what was assessed in the EIS; however, the change in capacity is accounted for through the availability to move used fuel earlier. It is planned that used fuel storage facilities will be available once the BWRX-300 starts operation.
- Based on information available at present time, the activity of L&IL solid waste generated per year is less than the bounding activity in the EIS.

5.2.7 EIS Section 2.7 – Management Structure and Organization

This EIS section describes OPG's overall corporate management structure and organization for the life cycle of the project, from the site preparation phase to the decommissioning phase. OPG's overall corporate management structure and organization has not substantially changed since the EIS was completed and it is not affected by the selection of the BWRX-300. The only change is the BWRX-300 deployment will use OPG's existing management system instead of a new DNNP management system as mentioned in the EIS.

This information is not used in this assessment and no further assessment is required for these areas.

5.2.8 EIS Section 2.8 – Security and Safety Programs

This EIS section contains general information on the safety and security programs which includes the following elements:

1. Security and Safeguards
2. Radiation Protection
3. Safety and Health Management System
4. Fire Protection and Emergency Response Systems
5. Nuclear Emergency Plan

These programs are applicable to any selected reactor technology for the DNNP site, including the BWRX-300.

5.2.9 EIS Section 2.9 – Environmental Programs

This EIS section contains high-level information on the Environmental Programs proposed for the DNNP, which incorporates applicable elements of OPG's Environmental Policy, and includes the following elements.

1. Environmental Management Plan
2. Environmental Management System
3. Environmental Monitoring
4. Site Biodiversity Plan

These programs are applicable to any selected reactor technology for the DNNP site, including the BWRX-300.

5.2.10 EIS Section 2.10 – Sustainable Development

This EIS section contains high-level information on OPG's commitment to sustainable development and reporting of environmental performance, social performance, and economic contribution. This applies to any reactor technology, including the BWRX-300.

5.2.11 Summary of EIS Chapter 2 – The Project for EA Purposes

Overall, the works and activities associated with the deployment of the BWRX-300 have a smaller scale, a smaller footprint and require less resources than what was assessed in the EIS.

5.3 EIS Chapter 3 – Methodologies Used in the EIS

This EIS chapter describes the framework and methodology used to prepare the EIS. This methodology is independent of the reactor technology and is applicable to BWRX-300.

5.4 EIS Chapter 4 – Description of the Existing Environment

5.4.1 EIS Section 4.1 – Introduction

This EIS section describes the existing conditions of each environmental component that may potentially change because of the works and activities of the DNNP. The information provided is independent of reactor technologies. To address the passage of time, OPG has reviewed and updated baseline conditions since the EIS was conducted, in accordance with REGDOC 1.1.1 "Site Evaluation and Site Preparation for New Reactor Facilities" as part of the PRSL renewal activities in 2020 [12], and to support the readiness to execute the DNNP.

The environmental components described in the EIS included:

- Atmospheric Environment
- Surface Water Environment
- Aquatic Environment
- Terrestrial Environment
- Geological and Hydrogeological Environment
- Radiation and Radioactivity Environment
- Land Use
- Traffic and Transportation
- Physical and Cultural Heritage Resources
- Socio-Economic Conditions
- Aboriginal Interests
- Health – Human
- Health - Non-Human Biota

A description of the changes to the existing environment for each element assessed in the EIS is presented in the following subsections.

5.4.2 EIS Section 4.2 – Atmospheric Environment

Baseline air quality is considered to have generally improved or to be within the natural variability experienced in the area as compared to conditions documented in the EIS [13]. Improvements to Ontario's ambient air quality resulted from the shut-down of coal-fired power plants as well as other government programs and initiatives. Compared to the conditions documented in the EIS, there has been a major reduction in the mean 1-hour and 24-hour ambient nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) concentrations and 24-hour ambient particulate matter ($PM_{2.5}$) concentrations. The 24-hour ambient total suspended particulate and PM_{10} concentrations have remained relatively stable. Minor differences in air temperature, precipitation, and wind have been noted compared to the conditions documented in the EIS, however, with no major differences in conditions identified.

Additional baseline noise characterization conducted in 2018-2019 indicated that noise levels in the area continue to be dominated by the influence of Highway 401 which is consistent with the EIS.

5.4.3 EIS Section 4.3 – Surface Water Environment

Additional studies that have been conducted [12] since the EIS include lake temperature and thermal plume data collected at the DN site in 2011-12 and 2017-28, lake current data collected in 2011, base flow measurements taken at Darlington Creek in 2019 and additional surface water and sediment samples collected in 2011-12 and 2019 which are summarized in the PRSL renewal application and further detailed in the *2020 DNNP Supporting Studies – Environment* report [12]. Baseline conditions for surface water environment have remained similar to conditions documented in the EIS. Surface water and sediment quality remain within their respective surface water quality and sediment quality guidelines with few exceptions and updated hydrological data is consistent with that presented in the EIS.

5.4.4 EIS Section 4.4 – Aquatic Environment

OPG has conducted a number of baseline studies for the aquatic environment since the completion of the EIS. Aquatic studies were completed for plankton community, benthic invertebrates, fish impingement and entrainment, fish community (adult, juvenile, larvae, and eggs), thermal plume, and fish habitat which are documented in the *2020 DNNP Supporting Studies – Environment* report [12]. These studies demonstrated similar findings as those documented in the EIS and any differences observed are attributed to natural variability.

Since the completion of the EIS, two fish species, Lake Sturgeon and American Eel have become listed provincially as endangered under *Ontario's Endangered Species Act (ESA)*.

Additional updates not presented in the 2020 DNNP Supporting Studies – Environment report [12] but subsequently completed include:

- Studies to support siting of the DNNP intake and discharge (2018 aquatic community characterization and 2019 fish community characterization).
- Fish habitat assessment of a channelized drainage feature traversing the DNNP lands.

5.4.4.1 2018 and 2019 Aquatic Community Characterization for Siting of the Intake and Discharge Structure

In 2018, an aquatic community characterization study was completed to support the siting of the DNNP intake and discharge [14]. The following were sampled in Lake Ontario at the DNNP siting area at depths of 5m, 10m, 15m, 20m, 25m, and 30m, in the spring, summer, and early fall, following a regulator approved methodology: fish community, ichthyoplankton, benthic invertebrates, and macrozooplankton. In 2019, only the fish community sampling portion of the 2018 study was repeated [15].

A comparison of the abundance, biomass, species richness, and diversity of the fish collected in 2018 and 2019 suggested that both large-bodied and small-bodied fish movement though the study area is variable and is likely associated with various factors such as: spawning periods, foraging behaviour, water temperatures, and other life history and habitat considerations [15]. The constant movement of fish among the different depths and substrates indicated that the susceptibility of fish to impingement and entrainment (I&E) is always present within the DNNP intake and discharge siting area. The results suggested that siting the intake and discharge at deeper depths (> 15 m) beyond the nearshore habitat zone, does not offer additional advantage in terms of mitigating the potential effects of I&E. The same is likely true for siting the discharge location to avoid potential thermal effects; however, it was noted that OPG had commitments to conduct thermal studies which would be used to confirm siting of the discharge location and minimize potential thermal effects. The recommendation was to site the intake slightly deeper (i.e., > 10 m) than the DNGS structures but not deeper than 15 m to mitigate the potential entrainment of Round Whitefish and Deepwater Sculpin.

It was noted in the 2019 fish community characterization report [15] that Lake Trout were caught throughout the sampling seasons in the DNNP siting area. The possibility of Lake Trout spawning in the area was suggested given that spawning typically occurs in October, and spawning-ready and spent Lake Trout individuals were collected in the DNNP siting area in mid-October to early November 2012. Still, no Lake Trout eggs/larvae were collected from spring 2013 larval tows in the DNNP siting area. In contrast, in 2018 and 2019, fish community sampling occurred in September which was just outside of the typical Lake Trout spawning period.

There remains uncertainty concerning which environmental characteristics dictate appropriate spawning habitat for Lake Trout. Nevertheless, no Lake Trout eggs or larvae were collected in spring 2018 larval tows conducted in the DNNP siting area nor in spring larval tow studies conducted at the Darlington site in 2009 and 2011. Furthermore, it should be noted that Lake Trout eggs or larvae have never been entrained at the DNGS intake in 2004, 2006, and in the 2015-16 entrainment studies with a robust design over a 12-month period [15].

5.4.4.2 2022 Fish Habitat Assessment of a Channelized Drainage Feature

In 2022, a fish habitat assessment was completed for the channelized drainage feature traversing the DNNP lands west of Old Holt Road to Lake Ontario which provides surface drainage for Hydro One lands north of 2nd Line Road and OPG land south of 2nd Line Road. It concluded that the drainage feature does not meet the definition of fish habitat as defined under subsection 2(1) of the *Fisheries Act* as the drainage feature does not support fish and there is no connectivity to fish bearing waters (e.g., Lake Ontario).

5.4.5 EIS Section 4.5 – Terrestrial Environment

Additional terrestrial baseline data has been collected through a variety of studies conducted since the EIS.

Updates to terrestrial baseline information since the EIS are summarized below.

- Baseline updates were conducted for vegetation, pond biodiversity, soil, breeding birds, insects, amphibians and reptiles, mammals, landscape connectivity, and species-at-risk (SAR). The SAR with baseline updates included Eastern Meadowlark, Bobolink, Barn Swallow, Least Bittern, Bank Swallow and Bats.
- There has been an 11 ha (34 percent) increase in wetland area in the DNNP site.
- Six bird species that breed within the DNNP site became listed as SAR since the EIS (Bank Swallow, Barn Swallow, Eastern Wood Pewee, Wood Thrush, Bobolink, and Eastern Meadowlark).
- There are six migrant bird species that are either new SAR records on the DNNP site or became listed as a SAR since the EIS. These include: Olive-sided Flycatcher, Common Nighthawk, Eastern Whip-Poor-Will, Canada Warbler, Rusty Blackbird and Least Bittern.
- There is one breeding turtle species within the DNNP site that became listed as a SAR.
- There are eight bat species that use the DNNP site as foraging or roosting habitat, four of which have become listed as SAR since the EIS
- A new sapling of an endangered species (Butternut tree) was found within the DNNP site in 2018 which was assessed as retainable whereas the EIS identified a single Butternut tree that was classified as non-retainable due to being affected by Butternut Canker disease.
- A rare plant survey was conducted at the DN site in 2020.

Overall, baseline terrestrial site characteristics remain similar to that described in the EIS, however, changes in conservation status with respect to Bank Swallows and Bats are discussed below.

5.4.5.1 Bank Swallow

In 2017, the Bank Swallow became listed as threatened on the federal *Species at Risk Act (SARA)* and as a threatened species under the provincial *ESA*, which protects both the bird and its habitat. OPG has been conducting annual surveys of the number of Bank Swallow burrows since the implementation of the Bank Swallow monitoring studies in 2008 [16]. In 2010, the peak number of burrows was recorded in the survey area, and there has been variation in the number of burrows recorded annually. In 2012, a decrease in the number of burrows within the survey area began with 2019 being the lowest number of burrows recorded since the inception of the monitoring program. Over the past three breeding seasons (2020, 2021 and 2022) burrow counts have increased but still remain ~ 3% lower than the average number of burrows recorded during the entire monitoring period.

5.4.5.2 Bats

In anticipation of several bat species becoming listed as a species at risk, OPG conducted annual bat monitoring on the DNNP site from 2012 to 2018 and conducted bat monitoring again in 2020. In addition, passive monitoring was conducted in 2018, and snag surveys and acoustic monitoring in 2021. The results of the bat monitoring have provided new information related to the use of habitat on the DNNP site. Several species of bats are using the woodlands on the DNNP site for roosting and foraging activities, which represents a baseline condition that was not previously considered. Four of the species documented (Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, and Tri-colored Bat) are listed provincially under the *ESA* as endangered and three species (Little Brown Myotis, Northern Myotis, and Tri-colored Bat) are listed as endangered on Schedule 1 of the federal *SARA*. Bats have been added to the list of Valued Ecosystem Components (VECs) and are assessed in Section 5.5.5 of this supporting document.

5.4.6 EIS Section 4.6 – Geological and Hydrogeological Environment

An additional geotechnical investigation was conducted for the DNNP's onshore power block area in 2021 and the findings were consistent with the conditions described in the EIS [17]. Areas on DNNP that were potentially contaminated with non-radioactive substances were initially identified by the baseline studies completed in support of the EIS. OPG subsequently conducted characterization and remediation activities for several areas on DNNP site including removal of waste sandblast grit piles, remediation of the former concrete plant area, demolition of the Emergency Vehicle Garage and the removal and remediation of the soil in the "soil disposal area" [18]. A portion of the DNNP site south of the CN rail was temporarily used by the DNGS as a soil staging area. Post decommissioning confirmatory sampling results indicated that use of the soil staging area did not cause any major impacts [18]. More recently, OPG completed a soil characterization program in 2021, in support the preparation of the Hazardous Waste Management Plan/Procedure prior to site preparation. The soil characterization data identified seven impacted areas out of 217 soil samples. The soil exceedances identified at these areas were marginally above the MEPC Table 3 Standards and would be considered as non-hazardous waste. Moreover, these soils are potentially suitable for reuse at the Site. The reported concentrations for all samples collected in the DNNP Lands Northeast Landfill Area met the MECP Table 3 Standards.

Annual groundwater monitoring has occurred across the DNNP site since the completion of the EIS [19]. An examination of groundwater flow and quality data collected as part of OPG's annual groundwater monitoring for the DN site indicated that the findings of these studies were consistent with the hydrogeological conditions described in the EIS. The 2021 geotechnical investigation of the DNNP's onshore power block area examined groundwater flow characteristics of the area and found them to be consistent with the conditions previously described. Groundwater samples were also collected, analyzed and compared with the MECP's Provincial Water Quality Objectives (PWQO) Table 2 – Table of PWQOs and Interim PWQOs, assuming that groundwater pumped during construction or in the long-term will be discharged to the natural environment. The groundwater characterization data will be used in support of the preparation of the Hazardous Waste Management Plan/Procedure.

Overall, the geological and hydrogeological environment remains similar to that described in the EIS.

5.4.7 EIS Section 4.7 – Radiation and Radioactivity Environment

It was determined that radioactivity documented in the EIS for air, soil, groundwater, surface water, sediment, and aquatic and terrestrial communities is similar to current baseline data. Public dose from the operating facilities on the DN site remains essentially unchanged from that reported in the EIS and is less than 1% of the regulatory limit. Public dose is reported through OPG's Environmental Monitoring Program (EMP) for the DN site, the results of which are published annually and made available to the public. Based on the results of the 2021 EMP [20] the annual public dose resulting from the DN site was 0.6 µSv which is < 0.1% of the regulatory limit of 1,000 µSv/year for a member of the public.

5.4.8 EIS Section 4.8 – Land Use Environment

Since 2011, OPG has been actively monitoring land use within 10 km of the DN site, including the review of planning and development applications [21]. These applications consist of official plan amendments, zoning by-law amendments, draft plans of subdivisions and condominiums, and other miscellaneous planning related documents. The focus of the monitoring is to determine whether there are any proposed land uses that would be of concern from the perspective of sensitive land uses located within the vicinity of the DN site.

The monitoring identified major projects in the area such as transit extension projects, industrial development projects, and residential development plans. It also identified changes in the *Ontario Planning Act* that were made in order to improve the planning process. The population in Clarington and Oshawa increased by 10% between 2016 and 2021.

The review and update show that the majority of new development is occurring within existing urban areas (Oshawa, Courtice, Bowmanville, and Newcastle). This pattern of growth and development is consistent with the latest provincial plans, which, representing the most noteworthy changes in land use at a policy level, seek to focus urban growth within existing urban areas, while maintaining limited development with the Greenbelt and Oak Ridges Moraine.

Overall, there have been no substantive changes to the Land Use environment since the 2009 Land Use Effects Assessment was completed.

5.4.9 EIS Section 4.9 – Traffic and Transportation

OPG has completed a review of the DNNP area road network since the EIS and noted improvements in the surrounding road network including Highway 401 ramps at Holt Road, Courtice Road, and Energy Drive (previously South Service Road); the expansion of the 407 East; new roundabout intersection at Energy Drive and Holt Road; and intersection improvements at King Street and Courtice Road, Solina Road, and Maple Grove Road.

5.4.10 EIS Section 4.10 – Physical and Cultural Heritage Resources

Following the completion of the EIS, the two Euro-Canadian archaeological sites, known as the Brady (AlGq-83) and Crumb (AlGq-86) sites, underwent a Stage 4 mitigative excavation in accordance with the terms of the Ministry of Tourism, Culture and Sport's (MTCS) standards and guidelines. No additional physical or cultural heritage resources have been identified since the completion of the EIS.

5.4.11 EIS Section 4.11 – Socio-Economic Environment

Since 2009, the social and economic conditions across Ontario have changed. Durham Region and its area municipalities have also continued to change due to population growth, urbanization, and economic development. Along with the rest of the Greater Golden Horseshoe Area, their populations and economies have experienced extensive growth and are projected to continue to mature, expand and diversify. Since 2009, the immediate area surrounding the DN site has experienced an ongoing transition from the "look and feel" of a rural area to a planned mix of light industrial and commercial uses south of Highway 401 between Darlington Provincial Park and St. Marys Cement and to the north of Highway 401 as well. As in 2009, the current state of Durham Region and its area municipalities can be characterized as having a reasonably healthy balance of Community Assets in terms of skills and labour supply, municipal infrastructure, health and safety services, financial wealth, and a healthy environment. These ingredients of sustainable development are continually being upgraded.

5.4.12 EIS Section 4.12 – Aboriginal Interests

The lands and waters on which the DNNP is situated are the traditional and treaty territory of the Williams Treaties First Nations (WTFN), which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation. It is also within the traditional territory of other First Nations peoples.

The EIS for DNNP was completed in 2009 to assess the environmental impacts of the DNNP. OPG recognizes that the EIS, while accurate in its assessment of environmental impacts, may not fully address the impact of DNNP on Indigenous inherent and treaty rights as they are understood today. This is particularly true in light of the WTFN 2018 settlement agreement with the Governments of Canada and Ontario. While OPG is not privy to the contents of the settlement agreement, OPG recognizes the importance of furthering its knowledge and understanding, in ongoing meaningful engagement with the WTFN. This is further discussed in Section 5.5.12.

5.4.13 EIS Section 4.13 – Health – Human

The EIS described the existing conditions for Human health by addressing two components:

- Physical well-being
- Mental well-being

The sub-components associated with Human Health included the health and well-being of the General Public and the health and safety of the Workers.

The EIS examined the effects of the existing conditions for radiation and radioactivity, atmospheric environment, surface water, groundwater, socio-economic environment, and their impact on the physical wellbeing of the General Public and the Workers. Based on the results of the 2021 EMP [20], the dose to members of the public remains essentially unchanged from that reported in the EIS (section 5.4.7). It found the existing conditions in the region around DNNP consistent with generally good physical health.

The existing conditions for mental well-being were found to be determined by feelings of personal health, a sense of personal safety, satisfactions with the community, and their attitude towards the DN Site. It found that the level of mental well-being was generally good.

The EIS described that the social well-being of the public was determined by population and demographics, employment and income, community and recreational facilities and programs, and social cohesion. Public attitude research found indicators of generally positive attitude for residents of the region around DNNP.

The EIS states that the DN Site and OPG, as a major employer, contribute to the overall community and personal well-being for workers.

The current environmental conditions for human health biota have been reviewed as part of the DN Site Environmental Risk Assessment [22]. There have been no changes to the baseline Human Health since the EIS was completed. This is further covered in section 5.5.12.

5.4.14 EIS Section 4.14 – Health – Non-Human Biota

The EIS focused on the existing conditions for the health of Non-Human Biota in the region around DNNP. It found that the concentration of chemicals and metals were not a concern in the existing aquatic environment. It determined that no adverse effects in amphibian and reptile populations were occurring in Coot’s Pond. No adverse effects for terrestrial ecological receptors associated with strontium and zirconium exposure were identified. Similarly, no potential risks were identified for waterfowl exposed to cadmium, copper, lead or strontium in Lake Ontario, or copper in Coot’s Pond.

The baseline levels of radionuclides in the environment result in only very small doses to non-human biota, indicating that there is no ecological risk from radionuclides to biota at the DN site.

The current environmental conditions for non-human biota have been reviewed as part of the DN Site Environmental Risk Assessment [22]. There have been no changes to the baseline Health of Non-Human Biota since the EIS was completed. This is further covered in section 5.5.14.

5.5 EIS Chapter 5 – Assessment and Mitigation of Likely Environmental Effects

In light of the new/updated information for the DNNP and refinements as results of the BWRX-300 deployment that were identified in Section 5.2 of this supporting document, Chapter 5 of the EIS was reviewed to ensure that the identification of Project-Environment interactions, and the identification and assessment of likely environmental effects of the DNNP remain valid for the deployment of BWRX-300 reactors on the DNNP site throughout each phase (i.e., Site Preparation and Construction, and the Operation and Maintenance). The potential mitigation measures and likely residual effects after mitigation, identified in the EIS Chapter 5 have also been examined to determine if they remain valid or if new studies or further mitigation measures are warranted.

5.5.1 EIS Section 5.1 – Introduction

Application of Assessment Methodology: The methodology used to determine interactions, likely effects, mitigation measures and residual effects was the same as applied in the EIS.

Project-Environment Interactions: The potential interactions between the DNNP and the environment described in the EIS (Table 5.1-1 of the EIS) were reviewed through a comparison of project works and activities for the BWRX-300 and is summarized in Table 5-2 and Table 5-3 of this supporting document.

The Project-Environment interactions likely to result in a measurable change to the environment are provided for each environmental component in Sections 5.5.2 to 5.5.14 of this supporting document. The key Project-Environment interactions associated with the BWRX-300 deployment are summarized below.

Site Footprint

- The scale of the BWRX-300 reactor is smaller and more compact, requiring less physical space and resources. A smaller site footprint for BWRX-300 deployment results in opportunities to refine locations of on-site roads to minimize disruption to nearby terrestrial environmental features.
- The BWRX-300 deployment will require the excavation of approximately 3.3 Mm^3 for four reactors [10], substantially less than the 12.4 Mm^3 of excavation assessed in the EIS for four reactors. This reduced excavation is a positive outcome as less material will need to be moved on-site, stockpiled, and eventually stored on the DNNP site for the long-term. Off-site transport of excavated materials may also be avoided if all the excavated

material can be stored on the DNNP site. These refinements are assessed to result in lower dust and noise levels during the Site Preparation and Construction phase than anticipated in the EIS [11].

- The BWRX-300 deployment will not expand the DNGS switchyard (Bowmanville Switching Station). The BWRX-300 deployment will build a new switchyard within the area for development previously assessed in the EIS, as opposed to expanding the current DNGS switchyard.

Approach to Deployment

- The deployment of the first BWRX-300 will involve the construction of only one reactor, as opposed to two in parallel. The construction of the next three BWRX-300 reactors would be sequential with some overlap.

Lake Infilling

- The BWRX-300 deployment will require no lake infilling, nor will a new wharf need to be constructed. This avoids approximately 40 ha of lake bottom infilling. The BWRX-300 deployment, however, will still require some shoreline works, such as excavating the existing shoreline to prepare for shoreline protection, which will result in some sediment transport into deeper water. The scale of these shoreline works is smaller than assessed in the EIS.

Once-Through Cooling System

- The BWRX-300 deployment will use once-through cooling as the preferred cooling option; therefore, cooling towers will not be constructed. Construction, operation, and decommissioning of cooling towers is not applicable for the BWRX-300 deployment, rendering the effects associated with this site feature not applicable.
- The BWRX-300 water intake and discharge pipes will be sized for four reactors. The discharge pipe includes a series of diffusers from which the water is discharged to promote rapid thermal mixing in the lake. Following industry best practice, the once-through cooling water intake and diffuser structures will be appropriately sized to accommodate the required water flow rates.
- The proposed inflow in the EIS is 228.4 m^3/s for 4-reactors [9]. The BWRX-300 flow will be considerably lower than this, with an inflow of [redacted] m^3/s to 68 m^3/s for 4 reactors, depending on the temperature increase that will be selected for the condenser.

Power Block Foundations

- The BWRX-300 Power Block foundation embedment is deeper into the bedrock. This will likely require more below grade drilling and blasting than assessed in the EIS. However, due to the smaller reactor footprint, the volume of excavated material will be less, but deeper foundations could change groundwater flows.

- The BWRX-300 deployment will use less concrete than assessed in the EIS due to the considerably smaller power block. This means that less material will need be transported to the DNNP site, stockpiled, processed, and used on the DNNP site. Less processing reduces atmospheric emissions. Further, there will be fewer vehicle movements, resulting in less traffic both on and off the DNNP site.

Emissions

- The BWRX-300 technology has some variations in its effluents from those assessed in the EIS.
    - For radioactive emissions to the atmosphere, the contaminants are the same, but their proportion has changed.

For radioactive effluents to water, the BWRX-300 is designed as a zero radioactive liquid effluent plant, there are no waterborne releases of radioactivity during normal operations.

Waste Management

- The volume of L&ILW and used fuel generated from the BWRX-300 deployment over the 60 years of operation is estimated to be less than for the bounding scenario reactors.
- The BWRX-300 used fuel pool is smaller than what was assessed in the EIS. For a four reactor BWRX-300 deployment, the land area required for used fuel dry storage is also smaller than what was assessed in the EIS.
- When compared to the assessment from the EIS [3], the solid waste generated by the operation of the BWRX-300 has less radioactivity annually (Bq/year), and less annual volume (m^3/year) [9]. The solid waste contains different proportions of radionuclides, but there is no impact on the EIS conclusions. Refer to section 5.7.2 for the assessment of the radiological and transportation malfunctions and accidents involving solid waste.
- The weight of the cask to be used to transport spent fuel on site (113 tonnes) is heavier than the cask assessed in the EIS (100 tonnes). This will mean upgrading the hauling roads to accommodate heavier cask weight.

Workforce

The BWRX-300 deployment expects the peak construction workforce to be smaller, with some 2,100 on-site workers compared to the approximately 5,200 people on the DNNP site used in the EIS.

Decommissioning

- As the decommissioning strategy for the BWRX-300 has not been established, it is assumed that the overall approach and principles to be applied for decommissioning of the BWRX-300 reactors are consistent with those described in the EIS. Therefore, their effects are anticipated to be similar to those considered in the EIS. If the decommissioning strategy differs from this assumption, after submission of the PDP, OPG will review the assessment of the effects as part of its licensing commitments.

- These key changes are considered in more detail throughout the review of likely effects of the deployment of the BWRX-300 and in the determination of whether the results of the EIS remain valid.

VECs and Pathways: The information on VECs and pathways of effects presented in the EIS was reviewed for the BWRX-300 deployment and it was determined that bats were added as new VECs and their associated effect pathways were identified.

5.5.2 EIS Section 5.2 – Atmospheric Environment

A review of the Project-Environment Interactions, likely effects, mitigation measures and the residual effects of the DNNP on the Atmospheric Environment considered two sub-components: air quality and noise. The approach used for this review is consistent with that described in the EIS and in the *Atmospheric Environment Environmental Effects TSD* [23].

5.5.2.1 EIS Section 5.2.1 – Potential Project-Environment Interactions

Table 5-4 considers the changes to works and activities assessed in the EIS to determine if there is likely to be changes in the Project-Environment interactions from BWRX-300 deployment that might result in new or measurable effects on the atmospheric environment.

Table 5-4: Comparison of DNNP Works and Activities Likely to Measurably Change the Atmospheric Environment Identified in the EIS to the BWRX 300 Deployment

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Site Preparation and Construction Phase		
Excavation and Grading	Large source of dust, vehicle exhaust and noise releases during the Site Preparation and Construction phase. Excavation of approximating 12.4 Mm^3 of soil and rock to a depth of 13.5 m.	Although deeper foundations are required (38 m) for the reactor building than was assessed in the EIS, the volume of excavated material is smaller (3.3 Mm^3 for four reactors) and less construction equipment is anticipated.
Marine and Shoreline Works	Large source of dust, vehicle exhaust and noise releases during the Site Preparation and Construction phase.	Less marine and shoreline works that might affect the atmospheric environment.
Construction of the Power Block	Large source of dust, vehicle exhaust and noise releases during the Site Preparation and Construction phase.	Generally consistent, but on a smaller scale.
Supply of Construction Equipment and Material and Plant Operating	Source of vehicle emissions and dust from concrete manufacturing. This activity will occur simultaneously with the Construction of the Power Block and Development of Ancillary Facilities.	Generally consistent, however a smaller overall DNNP footprint, reduced volume of excavated material and less construction equipment are anticipated.

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Components.		
Workforce, Payroll and Purchasing	Source of vehicle emissions due to construction workforce traffic. Up to 3,800 workers during Construction	Workforce is reduced (approximately 2,100 workers), and fewer vehicles are anticipated as a result.
Operation and Maintenance Phase		
Operation of Secondary Heat Transport System and Turbine Generator	Steam generator emissions will increase concentrations of steam generator chemicals above baseline and have the potential to change the atmospheric and noise environments.	There is no secondary heat transport system employed. Steam generator chemicals previously considered in the EIS (i.e., acetic acid, ammonia, formic acid, glycolic acid, and hydrazine) are not used in the BWRX-300 and will not have any effects on the atmospheric environment.
Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems	Release of cooling tower treatment chemicals, water vapour, and noise from the cooling towers will increase concentrations above baseline and could change the atmospheric and noise environments.	There is no Project-Environment interaction because once-through Lake water cooling will be employed and therefore no construction, operation, or decommissioning of cooling towers associated with cooling towers will occur for the BWRX-300 deployment.
Operation of Electrical Power Systems	Releases of combustion products from the testing of emergency and stand-by power associated with the operation of DNNP could change the atmospheric and noise environments.	Testing of emergency and stand-by power associated with the operation of BWRX-300 is expected to be similar with the assumptions in the EIS.
Operation of Site Services and Utilities	Ventilation (air and noise) emissions were determined to be negligible. Noise emissions associated with building ventilation at DNNP is anticipated to be similar to DNGS.	Overall site services and utilities are anticipated to be smaller in scale.
Administration, Payroll and Purchasing	Source of vehicle emissions due to workforce traffic.	Smaller overall DNNP footprint and reduced volume of workforce vehicles are anticipated.

5.5.2.2 EIS Section 5.2.2 – Assessment Scenarios

In the EIS, two maximum emission scenarios for the assessment of air quality effects were developed for construction related activities. The implementation of standard dust control measures was assumed for both scenarios.

1. The first emission scenario considered the potential effects during site preparation when soil excavation is taking place. This represented the maximum emission scenario for dust generation (suspended particulate matter – SPM, PM_{10} and $PM_{2.5}$).

2. The second emission scenario considered the potential effects during the construction phase, when the maximum emission from fuel combustion associated with heavy machinery and workforce vehicles (nitrogen oxides – NOx, primarily) would occur.

For the operation and maintenance phase, one assessment scenario for air quality was evaluated. It considered up to four reactors (rated at 4800 MWe) and associated equipment (i.e., emergency generators, auxiliary boilers, steam generators), the regular operation of DNGS and St. Marys Cement facilities, onsite DNGS and DNNP operational staff traffic and off-site road traffic (including increases in traffic volumes from on and off-site sources based on the 2013, 2023 and 2026 periods.

The noise assessment evaluated the maximum operating equipment complement during the year associated with each major phase of the DNNP and increases in traffic volumes for 2011, 2014, 2018, and 2026, and the lowest overall background traffic; thereby providing an estimate of the maximum noise impact at a given receptor.

The EIS identified the sources of atmospheric emissions during each phase of the DNNP. The assessment carried out in the EIS assumed that the first two reactors would be built concurrently. For the BWRX-300 deployment, the construction of the first reactor will take place initially with construction of the remaining reactors starting once the first reactor has started operating, each beginning one year after the other.

A no-build condition (i.e., assuming no Project) was also modelled for each noise assessment scenario to represent the baseline on which incremental effects of the DNNP could be predicted.

5.5.2.3 EIS Section 5.2.3 – Assessment Methods

The EIS used the most current U.S. EPA AERMOD atmospheric dispersion model at the time to estimate air concentrations of Contaminants of Potential Concern (COPCs) for the scenarios described above. Since then, the AERMOD model has been updated with new source codes and other improvements. Similarly, programs used to estimate tailpipe emission factors and emission factors used to calculate dust from paved roads (for particulate only), have also been updated and/or replaced since the completion of the EIS.

5.5.2.4 EIS Section 5.2.4 - Assessment Criteria

Air Quality

The following discussion deals with human receptors. Discussion of the effects on the non-human receptors is presented in Section 5.5.5.

In the EIS, the predicted changes in air quality from the DNNP were evaluated against the applicable Ontario ambient air quality criteria (AAQC) and the Canadian Council of Ministers of the Environment's (CCME) Canada Wide Standards at the time (e.g., Table 5.2-5 (ambient air quality) and Table 5.2-6 (air quality criteria for steam generator treatment chemicals) of the EIS). Since the completion of the EIS, there have been several changes and additions to the applicable air quality criteria, both at the Provincial and Federal level.

In the EIS, the volatile organic compound (VOC), acrolein was used as surrogate for all VOCs and all polycyclic aromatic hydrocarbons (PAHs) combined in the assessment of effects on air quality as this was the most restrictive contaminant overall. In 2018, the 24-hr Ontario AAQC for acrolein was increased from 0.08 µg/m^3 to 0.4 µg/m^3 [24]. As a result, acrolein still remains the most restrictive VOC but it is no longer the most restrictive contaminant for VOCs and PAHs combined. The current AAQC for the PAH benzo(a)pyrene (BaP) is much lower at 0.00005 µg/m^3, which makes this PAH the most restrictive contaminant for PAHs and the most restrictive contaminant overall (i.e., all VOCs and PAHs combined) [24].

These changes are being addressed as part of OPG's follow-up and adaptive management program for air contaminants [1] which will be developed to appropriately address updated standards and will include both acrolein and BaP.

Following the submission of the EIS, the CCME established the Canadian Ambient Air Quality Standards (CAAQS) in May 2013 [25]. The CAAQS were initially established as non-binding target levels for air quality across Canada. Since this time, however, Environment and Climate Change Canada (ECCC) has adopted and begun to enforce these standards. Table 5-5 provides a summary of the key changes to the CAAQS.

Table 5-5: Changes to Canadian Ambient Air Quality Standards (CAAQS)

Contaminants	Averaging Period	Previous AAQC[7]	CAAQS		
			Apply in 2015	Apply in 2020	Apply in 2025
$PM_{2.5}$	24-hour[1]	30 µg/m^3	28 µg/m^3	27 µg/m^3	~
	Annual[2]	NA	10 µg/m^3	8.8 µg/m^3	~
NO_2	1-hour[3]	400 ppb	~	60 ppb	42 ppb
	Annual[4]	100 ppb	~	17 ppb	12 ppb
SO_2	1-hour[5]	690 ppb	~	70 ppb	65 ppb
	Annual[6]	60 ppb		5 ppb	4 ppb

NOTES:
[1] Calculated as the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
[2] Calculated as the 3-year average of the annual average of all 1-hour concentrations
[3] Calculated as the 3-year average of the annual 99th percentile of the SO2 daily maximum 1-hour average concentrations
[4] Calculated as the average over a single calendar year of all 1-hour average SO2 concentrations
[5] Calculated as the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
[6] Calculated as the average over a single calendar year of all 1-hour average concentrations
[7] Ambient air quality criteria used in the previous assessment included Ontario Ministry of the Environment and Environment Canada and Climate Change
[8] CAAQS http://airquality-qualitedelair.ccme.ca/en/

Changes in these assessment criteria will have implications for the effects assessment, The key findings of this EIS Review are:

1. During the site preparation phase, the EIS determined that the maximum $PM_{2.5}$ concentrations were predicted to slightly exceed the 24-hour limit of 30 $\mu g/m^3$ at two residential receptor locations (R15 and R17)[1] with a frequency of exceedances to be less than 0.05% of the time or approximately <1 day per year. The lowering of the CAAQS 24-hour limit for $PM_{2.5}$ will result in a slightly higher frequency of predicted exceedances for $PM_{2.5}$ at these two receptors. All other receptors are expected to remain below the revised CAAQS 24-hour limit for $PM_{2.5}$. Changes to the annual $PM_{2.5}$ CAAQS are not expected to alter the conclusions of the previous analysis.

2. The changes to the CCME's CAAQS for NO_2 that are effective in 2020 and 2025 (particularly the reduction in the 1-hour and annual standards for NO_2) will result in the maximum 1-hour average NO_2 concentrations during site preparation to remain slightly above criteria at two residential receptors (R17 and R20) with exceedances being infrequent, as predicted in the EIS. The shift in the 1-hour NO_2 criteria will result in an increase in the number of receptors that will be exposed to short-term concentrations that exceed these new criteria during site preparation, with all modelled receptors expected to both exceed the 2020 and 2025 1-hour NO_2 CAAQS. The Annual NO_2 concentrations are expected to remain below the 2020 criteria at all but one receptor and all receptors are expected to exceed the 2025 criteria.

3. The changes to the CCME's CAAQS for SO_2 that are effective in 2020 and 2025 (particularly the reduction the reduction in the 1-hour standard for SO_2) will result in an increase in the number of receptors that will be exposed to short-term concentrations that exceed these new criteria during site preparation, with all but one of the modelled receptors expected to exceed the 2020 and 2025 1-hour SO_2 CAAQS. The Annual SO_2 concentrations are expected to remain below the 2020 and 2025 criteria at all receptors.

Overall, the residential receptors assessed by the EIS are still considered to be representative of current conditions. There have been no changes to the closest/most sensitive residential receptors since 2009.

Changes to CAAQS for $PM_{2.5}$ will be factored into the development of the Nuisances Effects Management Plan(s) and Dust Management Plan as outlined in D-P-3.2 and D-P-12.2 of the Commitments Report [1].

Ongoing review and assessment of NO_2 and SO_2 concentrations against these future standards will be required during the implementation of the EA Follow-up Program.

Supplemental mitigation measures may need to be implemented, which should apply a hierarchy of approaches and strategies (i.e., administrative) similar to those outlined in ECCC's guide to *"Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities"* [26]. The best practices outlined in this document offers several specific mitigative

[1] R15 - Nearest Existing Resident (West) on Solina Road.
R17 - Nearest Existing Resident (Northeast) on Maple Grove Road.

techniques that address emissions of particulates and volatile organic compounds, as well as methods to reduce emissions of sulphur oxides, nitrogen oxides and greenhouse gases (GHG). These measures will support/augment the commitments outlined above and in D-P-3.2 of the Commitments Report relating to dust management. Further, they will enhance the specific measures to control releases of NO_2, and SO_2 during Site Preparation, which are only partially addressed under D-P-3.2 (under Noise) and D-P-12.2.

Noise

The following discussion deals with human receptors. Discussion of the effects on the non-human receptors is presented in Section 5.5.5.

MECP Publication NPC-205 [27] was used in the EIS, which was replaced by *Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning* [28] in 2013. In both cases, the criteria applied at the receptor location is the higher of the background noise from sources not associated with the DNNP or the MECP minimum exclusion criteria, which remains consistent.

Since the EIS, Health Canada has issued the *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (2017)* [29], which outlines a new calculation method for approximating the percentage of people that would be "highly annoyed" by exposure to sounds at different levels and with different characteristics. Health Canada suggests that a significant noise impact occurs when an activity causes a change in percent highly annoyed of +6.5%, resulting in a requirement to evaluate noise control.

The metric used to assess sound levels is the day-night sound level (Ldn), which is a 24-hour energy equivalent sound level that penalizes sounds that occur during night-time hours (22:00-07:00) by 10 dB. This penalty is intended to capture a higher potential for annoyance during night-time periods. A dose-response curve is used to identify the percentage of persons that are typically "highly annoyed" by sounds at the calculated levels (%HA). Consideration of noise control is also required when the Ldn exceeds 75 dBA. This guideline was not in force at the time of the EIS and does not affect the comparison of the BWRX-300 deployment to the EIS. The change in guideline should be considered in follow-up noise monitoring.

5.5.2.5 EIS Section 5.2.5 - Assessment of Likely Effects on Air Quality

The EIS predicted that air concentrations due to the DNNP for most COPCs were expected to infrequently exceed AAQC at the nearest residential receptors during site preparation activities and to a lesser extent during construction and operations activities. The predicted maximum 24-hour concentration of SPM and PM_{10} were expected to exceed AAQC at four receptors while $PM_{2.5}$ concentrations were predicted to infrequently exceed the 24-hr Canada Wide Standard at two residential receptor locations (<1 day per year). NO_2 concentrations were also predicted to be below the 1-hour AAQC at most receptors, except for two locations, which were determined to be very infrequent. These predicted exceedances were attributed to the site preparation activities (i.e., excavation and grading, workforce traffic) as well as the contribution from background traffic on local roads and the highway. The 24-hour average concentrations of acrolein were also predicted to exceed their AAQC at the residential receptors during the site preparation and construction phase, which were largely driven by high upwind background concentrations.

Table 5.15-1 in the EIS [3] summarizes the likely effects, mitigation and residual adverse effects of the DNNP and while some measurable increases to existing COPC concentrations were predicted at receptor locations, there were no residual adverse effects. This was because in-design mitigation measures included the development of a dust management plan during site preparation and construction, which would include considerations like the application of dust suppressants; stabilization of completed soil surfaces; and suspension of dust-generation activities during periods of inclement weather that would effectively avoid residual adverse effects.

The various site preparation and construction activities involve earthmoving during excavation and grading, which generate fugitive dust (particulate matter) and gaseous emissions, were assessed in accordance with the scenarios and methods described above and the DNNP project description. For the BWRX-300 deployment, it is anticipated that:

- excavation requirements for the 4-reactors deployment [10] are lower than the estimations provided in the EIS [3].
- fuel consumption for heavy equipment and haul truck usage would be proportional to the total excavated volume, which would be considerably less than assessed in the EIS.
- workforce vehicle use would be appreciably less.
- emissions associated with concrete batching remains consistent with those assessed in the EIS, with 150 m^3/hr of required capacity.

The deeper embedment of the BWRX-300 will require blasting, which was included in the activities assessed in the EIS. Mitigation measures associated with blasting noise are discussed in EIS Section 5.15 and Section 5.5.2.6 of this supporting document). The EIS accounted for blasting a total 0.6 million m^3/year of rock (over 3 years) with a maximum of one 1,000 m^3 blast (2,400 tonnes) occurring per day. While the full extent of required rock blasting for the BWRX-300 is being further defined, it is expected that the overall assumptions used to derive blasting emissions (i.e., emission factors, blasting methods, daily maximum blast volumes, once daily blast frequency, etc.) will be similar to those used in the EIS.

The EIS assumed that all habitat within the DNNP site footprint would be removed to allow for site preparation and construction. The smaller footprint for the BWRX-300 will provide an opportunity to retain some terrestrial habitats on the DNNP site particularly during the period when there is only one reactor on site. Air quality and noise modelling has been completed to evaluate on specific environmental features and species on the DNNP site that were not assessed as part of the EIS to explore this opportunity [11].

The mitigative measures identified in the EIS are available to eliminate or reduce residual adverse effects to a non-significant level for the BWRX-300 deployment. No further mitigation measures are warranted.

5.5.2.6 EIS Section 5.2.6 - Assessment of Likely Effects on Noise

In the EIS, noise effects on residential receptors were largely related to background traffic on local roads and highways and from ongoing St. Marys Cement operations. Detailed information on the development of noise emissions is presented in Appendix F of the *Atmospheric Environment TSD* [23].

While a moderate noise effect was predicted at the closest residence during Site Preparation activities, it was limited in duration and only occurred during daytime hours. The predicted noise increases for the balance of the residential receptors were expected to be negligible during all remaining phases of the DNNP.

In-design mitigation measures included 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. No additional mitigation was recommended.

As with the air quality assumptions, it is anticipated that the same general principles apply in that a smaller footprint and less material excavation and equipment utilization will yield lower emissions of noise from the BWRX-300 deployment. Correspondingly, the overall reduction in workforce vehicle traffic would also be expected to yield lower overall noise levels. The overall blasting methods and blast frequency for the BWRX-300 will be similar to the EIS and noise emissions are expected to be comparable.

The smaller footprint for the BWRX-300 may provide an opportunity to retain some terrestrial habitats on the DNNP site and create new pathways for effects of noise on these terrestrial habitats that were not assessed in the EIS.

5.5.2.7 Summary – Review of EIS Section 5.2 Atmospheric Environment

The EIS determined that no residual effects on air quality or noise conditions were predicted in the Atmospheric Environment as a result of the DNNP. The sources of emissions from BWRX-300 deployment that could affect the atmospheric environment are either consistent with or are expected to result in reduced effects than those predicted in the EIS.

Updates and improvements to the modeling tools have the potential to affect predictions regarding the dispersion and air concentrations of COPCs. However, apart from the actual time periods (i.e., specific time horizons) used in the assessment of effects on the atmospheric environment in the EIS, the assessment scenarios remain valid and conservative for the assessment of effects of BWRX-300 deployment. Changes to air and noise assessment criteria are being addressed as part of OPG's follow-up and adaptive management program for air contaminants. Specifically:

- The Follow-up Program for atmospheric environment (D-P-12.2 [1]) will be developed to appropriately address updated standards and will include both acrolein and BaP.
- Changes to CAAQS for $PM_{2.5}$ will be factored into the development of the Nuisances Effects Management Plan(s) and Dust Management Plan as outlined in D-P-3.2 and D-P-12.2 of the Commitments Report [1].
- Ongoing review and assessment of NO_2 and SO_2 concentrations against these future standards will be required during the implementation of the air quality follow-up program.

Supplemental mitigation measures may need to be implemented, which should apply a hierarchy of approaches and strategies (i.e., administrative) similar to those outlined in ECCC's guide to *"Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities"* [26]. The best practices outlined in this supporting document offers several specific mitigative techniques that address emissions of particulates and volatile organic compounds, as well as methods to reduce emissions of sulphur oxides, nitrogen oxides and greenhouse gases.

The residential receptors assessed by the EIS are still considered to be representative of current conditions. There have been no changes to the closest/most sensitive residential receptors since 2009.

The reduction in excavated materials, associated material handling requirements (i.e., reduced construction equipment usage, reduced truck hauling, etc.), overall workforce, DNNP footprint, and equipment usage are expected to result in reduced effects compared to those assessed in the EIS in terms of emissions of fugitive dust (particulate matter), gaseous emissions, and noise.

Overall, this EIS review has determined that the effects assessment conclusion of the EIS remain valid for the Atmospheric Environment.

5.5.3 EIS Section 5.3 – Surface Water Environment

A review of the Project-Environment Interactions, likely effects, mitigation measures and the residual effects of the DNNP on the Surface Water Environment was undertaken considering four sub-components: Lake Circulation, Lake Water Temperature, Site Drainage and Water Quality, and Shoreline Processes.

5.5.3.1 EIS Section 5.3.1 – Potential Project-Environment Interactions

Table 5-6 considers the changes to works and activities assessed in the EIS to determine if there is likely to be changes in the Project-Environment interactions from BWRX-300 deployment that might result in new or measurable effects on the surface water environment.

Table 5-6: Comparison of DNNP Works and Activities Likely to Measurably Change the Surface Water Environment Identified in the EIS to the BWRX 300 Deployment

Project Works and Activities	EIS rationale	BWRX 300 Deployment
Site Preparation and Construction Phase		
Marine and Shoreline Works	A portion of the bluffs creating the foreshore and contributing an ongoing source of sediments to the nearshore environment will be removed. Rock and soil placement is likely to affect water quality (e.g., turbidity), will cover/remove lake substrates, and will alter local bathymetry and physical characteristics of the shoreline resulting in offshore deflection of currents and sediments. The development of the lake infill area and subsequent formation of an artificial embayment fronting Darlington Creek will potentially increase water temperatures and algae production and entrapment in Lake Ontario near the mouth of the Creek.	For the first BWRX-300 reactor, the bluff will not be removed, and the Bank Swallow habitat will remain. For the 4-reactor BWRX-300 layout it is expected that some shoreline protection would be implemented likely resulting in the bluffs becoming unsuitable for Bank Swallows to inhabit, which is consistent with the effect assessment in the EIS. Rock and soil placement and associated effects from shoreline protection activities are still applicable. No lake infilling will be undertaken for the BWRX-300 deployment. The effects associated with lake infilling are not applicable for the BWRX-300 deployment.
Construction of Intake and Discharge Structures	Rock and soil removal and/or placement are likely to affect water quality (e.g., turbidity) and lake bottom substrates (i.e., disturbance/removal).	Once-through cooling will be used at a smaller scale. Construction of intake and discharge structures and associated potential effects are consistent with those described in the EIS.
Operation and Maintenance Phase		
Operation of Active Ventilation and Radioactive Liquid Waste Management Systems	Operation of the Radioactive Liquid Waste Management System will introduce liquid effluents to receiving waters.	The plant is designed to be a zero radioactive liquid effluent release facility, there are no waterborne releases of radioactivity during normal operations. Therefore, its emissions are less than what was assessed in the EIS.
Operation of Condenser, Condenser Circulating Water, Service Water and	These systems will withdraw and return (at increased temperature) large volumes of water from and to Lake Ontario, thereby altering the existing flow dynamics, thermal regime, and quality characteristics in the Lake.	These systems and associated effects are still applicable. It is noted that the rate of withdrawal from and return to Lake Ontario is expected to be lower than originally assessed.

Project Works and Activities	EIS rationale	BWRX 300 Deployment
Cooling Systems		
Replacement/Maintenance of Major Components and Systems	The periodic chemical cleaning of systems and components (e.g., steam generators) is likely to include discharge of effluent to Lake Ontario that may alter water quality; and periodic shutdown of systems (e.g., condenser circulating water and service water) will change the flow dynamics and thermal regime in the Lake.	Replacement and maintenance of some components and systems are still applicable. The scale of these operations will be smaller due to the smaller size of the reactor. In addition, the BWRX-300 does not have steam generators and pressure tubes that need replacement, whereas these were assumed in the EIS. The reactor internals, turbine rotor and condenser tubes may require replacement during the lifetime of the reactor, consistent with the EIS.

5.5.3.2 EIS Section 5.3.2 – Assessment Scenarios

In the EIS, two scenarios for the assessment of effects on the surface water environment were developed to represent a bounding condition for the condenser circulating water:

1. once-through cooling option and service water systems; and
2. cooling tower option and service water systems.

The once-through colling water option is discussed below and compared to the BWRX-300 deployment. The BWRX-300 deployment will not use cooling towers.

In the EIS, the DNNP once-through lake water cooling system is assumed to be similar to the current DNGS system, with modifications to accommodate the new facility design. The parameters discussed below pertain to the intake, diffuser, and waste heat load.

1. For the DNNP intake, the EIS assumed the intake will be a scaled-up version of the existing DNGS intake to accommodate the amount of waste heat from the new facility. The BWRX-300 flow will be considerably lower than what was assessed in the EIS, with an inflow of [redacted] m^3/s to 68 m^3/s for 4 reactors, dependant on the temperature increase that will be selected for the condenser.
2. The heat rejection rate will be consistent with the EIS. The BWRX-300 deployment can achieve a cooling water temperature rise of 9ºC with a flow rate of less than 68 m^3/s for 4 reactors [9]. Therefore, BWRX-300 deployment information is consistent with the DNNP information assessed in the EIS.
3. The EIS assumes the DNNP diffuser will be similar to the DNGS diffuser in terms of size and configuration. The following design requirements are noted within this EIS Section:

   - The diffuser depth will range from 10 m at the nearshore end to 20 m at the offshore end,

- The diameter of the discharge ports is increased by 40% to account for a higher flow rate,
- The length of the diffuser will be the same as the DNGS diffuser, and
- The DNNP diffuser will be located as far east as possible to minimize the distance to the nearest water intake and maximize the distance between it and the DNGS diffuser.

It is expected that the BWRX-300 deployment will align with these requirements, apart from the diameter of the discharge ports which may decrease in size to account for the lower flow rate.

Characterisation of Plant Effluents

The once-through lake water cooling system does not interact with any system that contains radioactive constituents and therefore, the water quality in the cooling water discharge flow is expected to be generally consistent with the intake water quality. The BWRX-300 is a zero radioactive liquid effluent release facility during normal operations.

5.5.3.3 EIS Section 5.3.3 – Assessment Methods (Modelling)

The evaluation of the potential hydrodynamic, thermal and water quality effects in the EIS was carried out through a few iterative steps. Key methods included:

- Visual Plume modelling was undertaken to simulate surface water jets and plumes. The Visual Plumes modelling was validated by modelling the DNGS diffuser and comparing the results to existing monitoring data and operational performance studies to provide insight into the influence of changes in current speed, depth, temperature, buoyancy and flows.

- The dispersion of potential contaminants was determined using a two-dimensional (2-D) Gaussian plume model. The dispersion model was used to determine dilution factors at drinking water intakes, which is of relevance to the assessment of potential effects on human health.

- Subsequently, a detailed three-dimensional (3-D) hydrodynamic model (MIKE 3) was developed to provide a more thorough representation of the complex hydrodynamics of Lake Ontario near the DNNP site. The 3-D hydrodynamic model was used to verify the assumptions and simplifications of preliminary modelling and complete long-term simulations using a dynamic application of the model.

This iterative approach to modelling of discharges to Lake Ontario remains applicable to the assessment of discharges from BWRX-300 deployment.

5.5.3.4 EIS Section 5.3.4 – Assessment Criteria

Three of the surface water quality guidelines (Ontario PWQO, CCME Canadian Water Quality Guidelines (CWQGs), and Health Canada's Guideline for Canadian Drinking Water Quality) used to assess surface water quality in the EIS have been updated since 2009. However, only two of these guidelines have become more stringent; the CCME CWQGs and Health Canada's Guidelines for Canadian Drinking Water Quality have more stringent guidelines for three and seven parameters, respectively.

Of the lowest selected guideline values used in the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD [30], strontium, zinc, nitrite and E. coli are the only parameters that have become more stringent. Strontium concentrations for surface water at the DNNP site did not exceed the new guideline. Guideline decreases for zinc and nitrite are due to selection of the filtered guideline for zinc and the nitrogen-based guideline for nitrite [25]. The updated CCME CWQG for zinc of 7 µg/L represents the dissolved form while the guideline of 30 µg/L applied in the 2009 application supporting documents was for total zinc. The maximum measured total zinc of 9.4 µg/L in 2007/2008 occurred at Treefrog Pond and exceeded the new dissolved zinc guideline (7 µg/L). This dissolved zinc guideline is overly-conservative for use with total zinc and is not directly comparable to the new guideline. For nitrite, the CCME CWQG applied in the EIS and its supporting documents was expressed as NO_2 (whole molecule). The current CWQG is expressed as nitrite-N. The maximum nitrite measurement in 2007/2008 of 0.07 mg/L as NO_2 at Coot's Pond numerically exceeds the current 0.06 mg/L nitrite-N guideline but does not exceed when expressed in comparable units (i.e., 0.07 mg/L of NO_2 = 0.02 mg/L of NO_2-N). Health Canada drinking water guidelines for E. coli are 'non-detectable' levels. However, considering these are drinking water quality guidelines, they are overly conservative when applied to surface water.

5.5.3.5 EIS Section 5.3.5 – Assessment of Likely Effects on Lake Circulation

The EIS assessed the effects of lake infilling and stabilization of the shoreline on lake circulation. No lake infilling is required with the BWRX-300 deployment, therefore, the effects of lake infilling will not occur. The site layout for four BWRX-300 reactors will likely require some shoreline protection measures. As such, effects from this activity are consistent with those assessed in the EIS.

The BWRX-300 uses once-through cooling. The likely effects from once-through lake water cooling on lake circulation described in the EIS are still applicable and consistent with the BWRX-300 deployment. The EIS determined that changes to Lake Ontario current circulation patterns in the area around the DNNP site "*in and of themselves are not considered an adverse effect of the DNNP in terms of lake circulation*" (EIS pg., 5-29 [3]). The BWRX-300 deployment does not alter this conclusion.

The EIS also determined that any changes in the flow from the discharge diffuser resulting from the shutdown of one or more reactors during the replacement/maintenance of major components and systems would be bounded by the changes to circulation resulting from all reactors in operation (EIS pg. 5-29 [3]). The likely effects of BWRX-300 deployment from replacement/maintenance of major components and systems on lake circulation are consistent with those in the EIS.

Because no adverse effects on Lake Circulation were predicted as a result of the DNNP, no mitigation measures were identified in the EIS for the Surface Water Environment and accordingly, no mitigation measures are identified for the BRWRX-300 deployment.

5.5.3.6 EIS Section 5.3.6 – Assessment of Likely Effects on Lake Water Temperature

Likely effects on lake water temperature were identified in the EIS from lake infilling and the potential formation of an artificial embayment. No lake infilling is required for the BWRX-300 deployment, therefore, these effects will not occur.

The BWRX-300 uses once-through cooling. The likely effects on lake water temperature are expected to be similar to those assessed in the EIS, given the similarities with intake and diffuser designs, and waste heat load. Most importantly, the *Aquatic Environment Assessment TSD* [31], indicates that the once-through cooling scenario with a discharge temperature of 9°C above ambient and a 4-reactor flow rate of 250 m^3/s was found to have negligible residual thermal effects (pg. ES-3 of [31]). The BWRX-300 deployment is designed for a 9ºC temperature rise [9] with a flow rate of less than 68 m^3/s for 4 reactors.

The likely effects from the shutdown of reactors during replacement/maintenance of major components and systems on lake water temperature described in the EIS are consistent with those anticipated for BWRX-300 deployment, given the similarities with intake and diffuser designs, and waste heat load.

The EIS identified the following "in-design" mitigation measures for the effects of the DNNP on Lake Temperature:

- The once-through lake water cooling design will incorporate water intake and discharge structures similar to DNGS but sized to the necessary water volumes.
- The intake structure will be designed to limit the velocity of the water in the vicinity of the intake, minimizing the impingement of fish and effects of local currents.
- The discharge diffuser design of the DNGS limits the temperature increase to minimize effects on the aquatic environment. The design of a discharge for DNNP could be different than that for DNGS but would be designed to mitigate potential environmental effects including those associated with a thermal plume.

The EIS determined that no residual adverse effects on Lake Water Temperature are predicted in the Surface Water Environment as a result of the DNNP. This conclusion remains valid for the deployment of the BWRX-300 as it will use an intake and diffuser structure similar to what was assessed in the EIS and it will incorporate the same "in-design" mitigation measures for the water intake and discharge structures.

5.5.3.7 EIS Section 5.3.7 – Assessment of Likely Effects on Site Drainage and Water Quality

Site Drainage and Water quality will be managed through in-design mitigation measures to ensure all water discharged to the environment will be treated as necessary to meet prevailing regulatory requirements. The key findings regarding effects on site drainage and water quality are:

- Since the BWRX-300 deployment uses once-through cooling, cooling towers will not be constructed. Therefore, the chemical effluents associated with the use of cooling towers as presented in the EIS will not occur.
- The likely effects from the construction of intake and discharge structures on water quality described in the EIS remain valid for the BWRX-300 deployment given the similar design and function of the intake and discharge structures assessed in the EIS.
- The EIS determined that all effluent discharges from the plant will comply with appropriate regulatory requirements for surface water discharges to Lake Ontario, and as a result the discharges will be generally consistent with the intake water quality. This requirement will also be applied to the BWRX-300 deployment.
- The likely effects of a turbidity plume resulting from construction of the new intake and diffuser for the once-through cooling are similar to those anticipated for the BWRX-300 deployment, given the similarities with intake and diffuser designs and discharge volumes and flows.
- The effect of shutdown of the reactors during refurbishment or maintenance activities on Water Quality was assessed in the EIS. The EIS contains the following commitment regarding the effects of replacement/maintenance of major components and systems on the surface water environment. The BWRX-300 deployment will comply with this commitment under D-C-4.1.

    - *If refurbishment or maintenance activities result in the shutdown of one or more reactors and the total loading to the ALWMS[2] and Inactive Drainage Systems remains consistent between normal operating conditions and refurbishment and maintenance activities, the liquid effluents from these systems will be treated and sufficient flow will be maintained through the discharge system to achieve a dilution capacity sufficient to ensure that C of A[3] requirements are met prior to release to the environment* (EIS pg. 5-35).

- Stormwater and inactive liquid effluent systems draining into Lake Ontario or surface water courses may contain contaminants such as blasting agents, posing a hazard to the aquatic environment, human health and the health of non-human biota (Table 5.15-1 of [3]). For the BWRX-300 deployment, a separate Storm Water Management Plan will be prepared to address how to control and manage naturally occurring water from three

[2] Active Liquid Waste Management System
[3] Certificates of Approval

major sources: winter snow melt, serious rain events, and ground water from deep excavations.

- Good Industry Management Practices will be employed during any activities associated with lake dredging and blasting in the lake (for intake and discharge structure construction) to minimize suspended sediment to meet appropriate regulatory requirements for discharge to Lake Ontario.

The EIS determined that no residual adverse effects on Site Drainage and Water Quality are predicted in the Surface Water Environment as a result of the DNNP. This conclusion remains valid for the deployment of the BWRX-300.

5.5.3.8 EIS Section 5.3.8 – Assessment of Likely Effects on Shoreline Processes

The effects on shoreline processes discussed in the EIS were from lake infilling and the construction and operation of the intake and discharge structures. No lake infilling is required with the BWRX-300 deployment, therefore, no adverse effects are anticipated.

The BWRX-300 deployment will still require some shoreline works, such as excavating the existing shoreline to prepare for shoreline protection, which will encourage sediment transport into deeper water. For the single BWRX-300 reactor layout, the works are expected to be less than those assessed in the EIS as the entire shoreline containing Bank Swallow habitat will remain in place. The full length of the shoreline would likely be protected for 4-reactor layout. The Bank Swallow habitat is depicted as the red hashed area in Figure 5-2 (single-reactor layout) and in Figure 5-3 (4-reactor layout).

The assessment of the effects of leaving the Bank Swallow habitat in place is presented in Section 5.5.5.6.

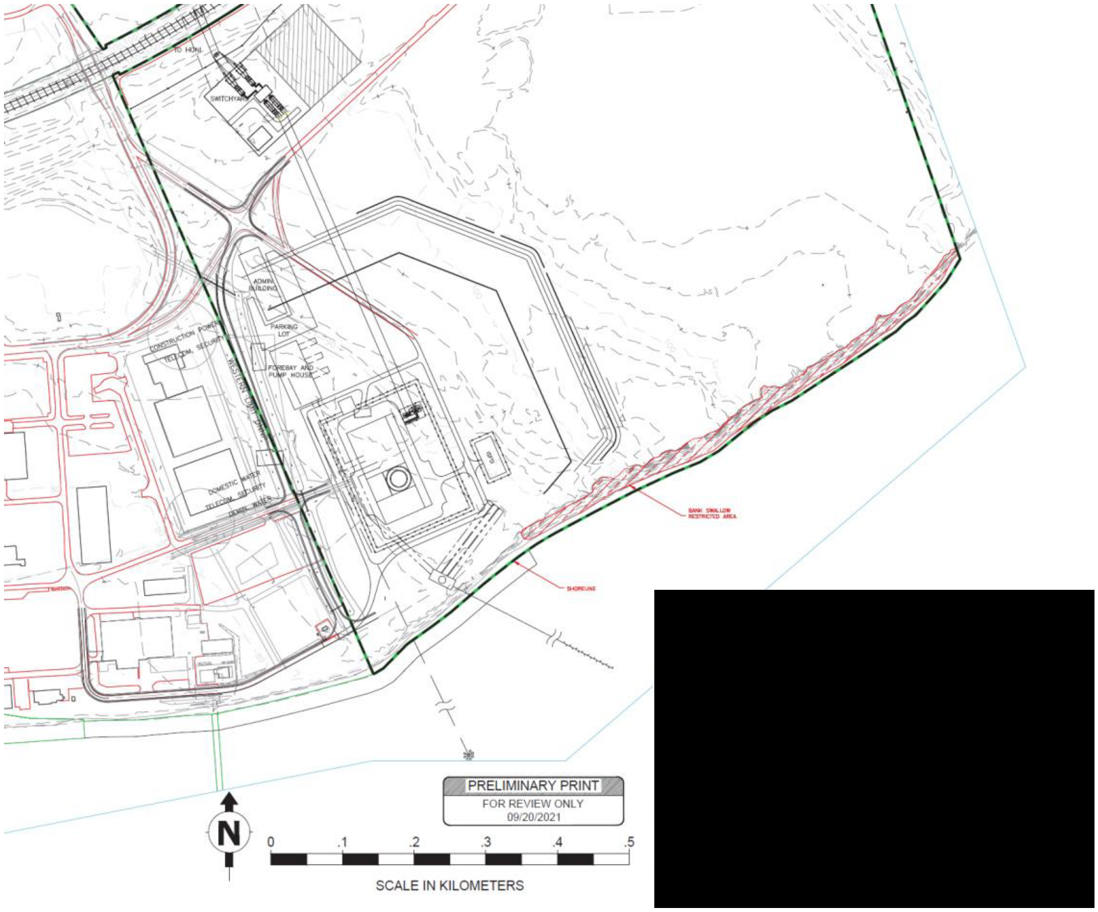


Figure 5-2: Bank Swallow Habitat Areas – BWRX-300 Single Reactor Layout

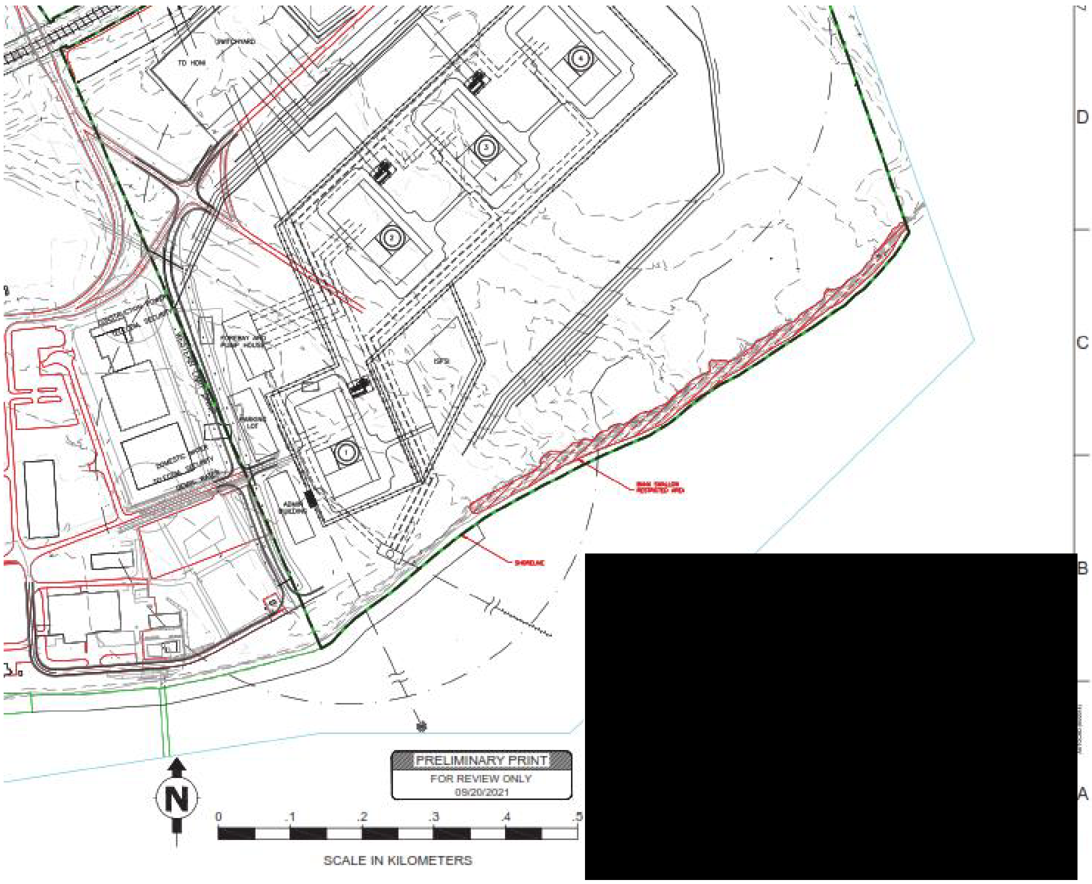


Figure 5-3: Bank Swallow Habitat Areas – BWRX-300 4-reactor Layout

The EIS states that no residual adverse effects on shoreline processes are predicted in the Surface Water Environment as a result of the DNNP. This conclusion remains valid for the deployment of the BWRX-300

5.5.3.9 Summary – EIS Section 5.3 - Surface Water Environment

The BWRX-300 deployment will not require lake infilling, and the effects on Lake Ontario from this activity will not occur. Although no lake infilling is required with the BWRX-300 deployment, the DNNP will still require shoreline works. These works are expected to be less than those assessed in the EIS as the entire shoreline containing Bank Swallow habitat would remain in place for the 1-reactor layout. Shoreline protection for a 4-reactor deployment will result in the nesting habitat becoming unsuitable for Bank Swallows to inhabit, which is consistent with the assessment undertaken in the EIS.

The effects of the BWRX-300 condenser circulating water, service water and cooling systems as well as the replacement/maintenance of major components and systems on lake water temperature are expected to be similar to those assessed in the EIS. No residual adverse effects on Lake Water Temperature are predicted in the Surface Water Environment as a result of the BWRX-300 deployment.

The assessment of the surface water hydrology confirmed that the BWRX-300 deployment will have no residual adverse effects on site drainage and water quality as described in Section 5.5.3.7. The assessment identified minor changes in flows and the number of days per year that an area of land is wet can be mitigated using best industry practices.

Overall, the EIS conclusions regarding the effects on the site drainage and water quality, lake circulation and water temperature, and shoreline processes remain valid for the BWRX-300 deployment.

5.5.4 EIS Section 5.4 – Aquatic Environment

A review of the Project-Environment interactions, likely effects, mitigation measures and the residual effects of the DNNP on the Aquatic Environment considered to two sub-components: Aquatic Habitat and Aquatic Biota. The assessment addressed two primary effects pathways: physical changes to aquatic habitat and organism-level effects involving intake losses and thermal discharge.

5.5.4.1 EIS Section 5.4.1 – Potential Project-Environment Interactions

Table 5-7 presents a comparison of the identified works and activities to the BWRX-300 deployment.

Table 5-7: Comparison of DNNP Works and Activities Likely to Measurably Change the Aquatic Environment Identified in the EIS to the BWRX-300 Deployment

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Site Preparation and Construction Phase		
Mobilization and Preparatory Works	Preparatory works will involve the removal and/or alteration of on-site ponds, a portion of two intermittent tributaries to Darlington Creek and intermittent portions of a tributary to Lake Ontario; road crossing of Darlington Creek and other physical works in proximity to the creek.	Development is smaller in scale and will require less land development. As a result, there will be no alteration of on-site ponds previously assessed to be removed in the EIS. The Darlington Creek tributary will not be impacted for the first BWRX-300, but would be impacted once the others are constructed. There will be no crossing of Darlington Creek required.
Marine and Shoreline Works	Changes in Aquatic Environment may result from eroded sediment in surface water discharges to Lake Ontario (surface water quality as a pathway to Aquatic Environment is considered in Surface Water Environment). Placement of lake infill and related structures will alter conditions in the	Marine and shoreline works are still expected, but not to the same extent; no lake infilling is required. The associated effects with lake infilling will not occur. Some shoreline development is required.

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
	Aquatic Environment.	
Construction of Intake and Discharge Structures	Construction of intake and discharge structures will affect existing lake bottom conditions within a construction footprint and with the installation of permanent structures.	Construction of intake and discharge structures and associated effects are still applicable.
Operation and Maintenance Phase		
Operation of Active Ventilation and Radioactive Liquid Waste Management Systems	Aquatic habitat and biota may be subject to effects of liquid effluents. Changes to surface water quality are considered in Surface Water Environment.	The plant is designed to be a zero radioactive liquid effluent release facility, with no discharges of radioactive liquid effluent into the receiving water body during normal operation.
Operation of Condenser, Condenser Circulating Water, Service Water and Cooling Systems	Habitat and population effects due to cooling water circulation may be related to alteration of existing flow dynamics, thermal regime and water quality characteristics in the immediate areas surrounding the intake and diffuser. The physical and chemical changes are considered in Surface Water Environment. Aquatic biota will be impinged and entrained as a result of cooling and service water intake.	These systems and associated effects are still applicable. The rate of withdrawal from and return to the water source is expected to be lower than originally assessed. (The cooling water temperature rise for the BWRX-300 deployment is consistent with the EIS value of 9 ºC with flow rates of less than 68 m^3/s for 4 reactors [9]).
Replacement/ Maintenance of Major Components and Systems	The periodic chemical cleaning of systems and components (e.g., steam generators) is likely to include discharge of Replacement/Maintenance of Major Components effluent to Lake Ontario that may alter water quality and periodic shutdown of systems (e.g., condenser circulating water and service water) will change the flow dynamics and thermal regime in the Lake (surface water quality and circulation as pathways to the Aquatic Environment are considered in the Surface Water Environment).	Deployment will require replacement and maintenance of some components and systems; these processes and associated effects are still applicable. The scale of these operations will be smaller due to the smaller size of the reactor. In addition, the BWRX-300 does not have steam generators and pressure tubes that need chemical cleaning and replacement, whereas these were assumed in the EIS. The reactor internals, turbine rotor and condenser tubes may require replacement during the lifetime of the reactor, consistent with the EIS.

5.5.4.2 *EIS Section 5.4.2 – Effects Assessment Scenario*

For site preparation and construction, the bounding site development layout is based on the entire area of the DN site east of Holt Road being disturbed by DNNP activities. The assessment scenario considered in the EIS was for an estimated excavation requirement of approximately 12.4 Mm^3 for 4 reactors.

In contrast, the BWRX-300 deployment will require far less land development and will generate an estimated excavation requirement of approximately 3.3 Mm^3 for 4 reactors [10].

As a result of the smaller amount of land development and reduction in scale of site preparation work required for the deployment of the BWRX-300, there is an opportunity for several aquatic features to remain in place. Treefrog, Polliwog and Dragonfly Ponds will remain and the Darlington Creek tributary D2 will be affected by the multi reactor layout, whereas the EIS assumed the tributary would be affected regardless of the number of reactors. A new access road will not be required to cross Darlington Creek.

5.5.4.3 EIS Section 5.4.3 – Assessment Criteria

Predicted changes in conditions in the Aquatic Environment as a result of the DNNP were evaluated against the following applicable criteria:

- Aquatic habitat quantity (i.e., area) and quality (i.e., function and relative productivity with respect to aquatic community).
- Population conservation (e.g., impingement losses in the context of known or likely population size of VEC Indicator species and comparisons with other facilities on the Great Lakes).

5.5.4.4 EIS Section 5.4.4 – Assessment of Likely Effects on Aquatic Habitat

The EIS states that the likely effects on Aquatic Habitat will be primarily a result of direct losses of habitat. Consequently, the EIS assessed the removal of the on-site ponds as an adverse effect of the DNNP.

The removal of on-site ponds (Treefrog, Dragonfly and Polliwog Ponds) is not required for the BWRX-300 due to the smaller footprint. The EIS notes that these constructed ponds do not contain fish, would not be considered a direct fish habitat, and are not considered likely to fall under the fish habitat protection provisions of the federal *Fisheries Act*. The ponds are inhabited by certain species of amphibians, though none of these species are at risk. Assessment of surface water hydrology for the BWRX-300 deployment has been conducted, with estimated monthly water balances for the ponds and two tributaries [32]. Changes described were relatively minor and, in all cases, resulted in marginally increased flows. In particular, the ponds and associated wetlands and wildlife habitat show relatively small changes in flows and hydroperiods and adverse effects are not anticipated.

The EIS states that Coot's Pond will remain and will not be affected by the DNNP. This is consistent with the BWRX-300 deployment.

Compensation for the loss of ponds will not be required, however, mitigation measures to minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with these retained ponds and Coot's Pond are still required.

The EIS assumed that relocation of Maple Grove Rd. will include a box culvert crossing of Darlington Creek. This was considered a harmful alteration, disruption or destruction of fish habitat (HADD) under the *Fisheries Act*. The BWRX-300 deployment will not require a crossing over Darlington Creek; therefore, this effect will not occur.

The EIS states that DNNP activities will affect portions of two intermittent swales that are upper reaches of tributaries to Darlington Creek. For the BWRX-300 deployment, there will be no effect for the single reactor layout. For the BWRX-300 4-reactor layout, Darlington Creek tributary D2 will be affected in a similar manner due to a soil storage pile.

The EIS states that, although the upper reaches of an intermittent Lake Ontario tributary are not within the proposed footprint for soil placement into the Northwest Landfill Area, it is considered possible that the watercourse may be affected by the soil placement activities. For the BWRX-300 deployment, there is no longer a requirement for soil to be placed at the Northwest Landfill Area.

In contrast to the scenarios assessed in the EIS, no lake infilling is required with the BWRX-300 deployment, therefore, effects on the nearshore of Lake Ontario will not occur from this activity. Nevertheless, the monitoring plan proposed for potential effects on the Aquatic Habitat applies to the shoreline protection activities for the BWRX-300 deployment.

The BWRX-300 deployment uses once-through cooling, which was one of the options assessed in the EIS. The EIS identified the following mitigation measures associated with the intake and discharge structures:

- Development of an appropriate Fish Habitat Compensation Plan by OPG to satisfy the requirements of a federal *Fisheries Act* Section 35(2) authorization; and
- Location of the cooling and/or service water intakes and discharge structures in less sensitive habitats removed from more productive nearshore habitats and spawning areas.

In the *Aquatic Environment Assessment TSD* [31], the thermal effects of the once-through cooling with a discharge temperature of 9°C above ambient was found to have negligible residual thermal effects. The BWRX-300 deployment is designed for a 9ºC temperature rise [9] with a flow rate of less than 68 m^3/s for 4-reactors. Therefore, the BWRX-300 deployment effects are similar to those assessed in the EIS.

5.5.4.5 EIS Section 5.4.5 – Likely Environmental Effects on Aquatic Biota

Effects of Physical Works

There is no lake infilling required with the BWRX-300, deployment, therefore, the effects associated with this activity will not occur.

The EIS considers that the construction of the intake and discharge structures may involve some limited underwater blasting, and as such, will require a Section 32 authorization under the *Fisheries Act* for destruction of fish by means other than fishing. These works are also required for the BWRX-300 deployment. Therefore, the effects from BWRX-300 deployment are similar to those assessed in the EIS.

The EIS identified the following mitigation measure associated with the underwater blasting for the intake and discharge structures:

- Conduct underwater blasting program in compliance with applicable guidance to minimise incidental mortality to satisfy a *Fisheries Act* Section 32 authorization.

The same mitigation measure applies to the BWRX-300 deployment.

Effects of Fish Impingement and Entrainment

The EIS states that the current DNGS design incorporates features to prevent fish impingement and entrainment. For purposes of the EA, the DNNP intake design was assumed to be the same as the existing DNGS intake with proportional increases to consider the higher flow requirement while maintaining the same intake velocity. The BWRX-300 has a lower intake velocity, with a maximum of [redacted] whereas the EIS states a maximum velocity of 0.15 m/s (15 cm/s). Therefore, the effects of BWRX-300 deployment on aquatic biota are consistent with the those assessed in the EIS regarding impingement and entrainment.

The EIS identified the Deepwater Sculpin, Lake Sturgeon, Atlantic Salmon and American Eel as fish species of conservation concern. The EIS determined that the nearshore area does not contain critical habitat for any of these species, (EIS p. 4-45). Although entrainment of some Deepwater Sculpin has recently been identified, significant interactions with the existing DNGS have not been detected in monitoring studies to date. Therefore, there is no further concern for these species. Nevertheless, fish protection measures such as in-design mitigation will be taken if needed at the intake structure, especially for Deepwater Sculpin, so as to ensure no significant environmental effects.

Prior to commencing in-water works, the provincially listed American Eel and Lake Sturgeon would have to be included as part of the permitting process under the *ESA* (S. 17(2)(c) or (d)). Requirement for this permit was identified under D-P-3.7 of the DNNP Commitments Report [1] Overall, the listing of these two fish species do not alter the determinations made with respect to residual adverse effects of the DNNP and do not change the overall determination of the significance of residual adverse effects made in the EIS.

In addition, the EIS identified the following in-design mitigation measures to address effects from fish impingement and entrainment:

- Incorporation of intake and discharge structures for once-through cooling of a design similar to DNGS but sized to the necessary water volumes. The intake structure will be designed to limit the velocity of the water in the vicinity of the intake, minimizing the impingement of fish and effects of local currents;
- Location of the cooling and/or service water intakes and discharge structures in less sensitive habitat removed from more productive nearshore habitats and spawning areas;
- Effects associated with impingement and entrainment will be considered in the Fish Habitat Compensation Plan noted above; and
- Implementation of an Adaptive Management Strategy to address changes to the environment associated with aquatic ecosystems over time.

These mitigation measures will also apply to the BWRX-300 deployment.

Effects of Thermal Discharge

For BWRX-300 deployment, the once-through cooling water discharge is assumed to be similar to that currently in use at DNGS and consistent with the EIS. The EIS states that the potential effects of the thermal discharge on aquatic biota are limited to the immediate area surrounding the diffuser. In the *Aquatic Environment Assessment TSD* [31], the thermal effects of the once-through cooling with a discharge temperature of 9°C above ambient (for 4-reactor BWRX-300 deployment) was found to have negligible residual thermal effects.

5.5.4.6 Summary – EIS Section 5.4 - Aquatic Environment

The area required for BWRX-300 deployment is smaller in size than the area assessed in the EIS and does not require removal of on-site ponds. As a result, there is an opportunity to retain some of the on-site aquatic features that were slated for removal in the EIS. The assessment of hydrology [32], hydrogeology [33], and air quality [11] were completed and it determined there will be negligible effects to the wetlands and ponds. Any disturbance or disruption effects during site preparation and construction can be expected to be better than the outright loss of aquatic habitat features assumed in the EIS.

Regarding the effects to the upper reaches of intermittent tributaries to Darlington Creek, Coot's Pond, upper reaches of an intermittent Lake Ontario tributary, the effects resulting from the construction and presence of the intake and discharge structures, and from thermal discharge, the effects of BWRX-300 deployment are similar to those assessed in the EIS. For example, for the single reactor layout, there would be no impact to the uppermost portions of two intermittent tributaries of Darlington Creek. Darlington Creek Tributary D2 will be impacted for the multi-reactor layout due to a soil storage pile; this is consistent with the EIS.

The BWRX-300 deployment uses once-through cooling which is assessed in the EIS. The following mitigation measures associated with the intake and discharge structures remain applicable to the BWRX-300 deployment.:

- Development of an appropriate Fish Habitat Compensation Plan by OPG to satisfy the requirements of a federal *Fisheries Act* Section 35(2) authorization; and
- Location of the cooling and/or service water intakes and discharge structures in less sensitive habitats removed from more productive nearshore habitats and spawning areas.

No lake infilling is required for the BWRX-300 deployment; and therefore, the effects resulting from this activity will not occur. The effects of the construction of the intake and discharge structure, fish impingement and entrainment, and thermal discharge from BWRX-300 deployment are expected to be similar but less than those assessed in the EIS.

Overall, this EIS Review confirmed that the following two residual adverse effects described in the EIS may remain following the consideration of mitigation and were advanced for consideration of significance:

- Loss of some aquatic biota (i.e., benthic invertebrates, fish) during the construction of the cooling water intake and discharge structures; and
- Impingement and entrainment losses associated with the operation of the once-through lake water cooling system.

5.5.5 EIS Section 5.5 – Terrestrial Environment

A review of the Project-Environment Interactions, likely effects, mitigation measures and the residual effects of the DNNP on the Terrestrial Environment considered six environmental subcomponents. These are:

- Vegetation Communities and Species;
- Insects;
- Bird Communities and Species;
- Amphibians and Reptiles;
- Mammal Communities and Species; and
- Landscape Connectivity.

The assessment focused on physical change to terrestrial conditions (e.g., habitat removal) and its consequence on receptors. Potential effects on non-human biota in the Terrestrial Environment because of exposures to radiological and conventional constituents from DNNP were evaluated in the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD [30] and discussed in Section 5.5.14 of this supporting document.

5.5.5.1 EIS Section 5.5.1 - Potential Project-Environment Interactions

This EIS Section provided an overview of the approach to identifying potential Project-Environment interactions. For the terrestrial environment, each work and activity was considered to determine if there was a plausible mechanism for it to interact with the individual sub-components of the Terrestrial Environment. The works and activities that were considered likely to result in a measurable change were summarized in EIS Table 5.5-1. Where a measurable change was considered likely, the interaction was further evaluated in subsequent sections of the EIS to determine if the change would represent an environmental effect.

This approach to identifying interactions has been applied to the BWRX-300 and is consistent with the EIS. However, some of the works and activities for the BWRX-300 differ from those considered in the EIS and have implications for the DNNP interactions with the Terrestrial Environment. Examples of these differences include reduction in the extent of earthworks and excavations, cooling towers not being included, and limiting shoreline works.

Given the BWRX-300's smaller footprint than the EIS bounding scenario reactors, an opportunity exists to conserve some of the vegetation communities, such as meadow and thicket, and the species and habitat functions associated with them within the DNNP site. Preserving these features represents an effects level that falls below that anticipated by the EIS.

The smaller footprint of the BWRX-300 deployment introduces a potential opportunity to retain Terrestrial Environment features within the DNNP site that were previously expected to be removed in the EIS (i.e., Bank Swallow nesting habitat, wetlands, woodlands, etc.). These Terrestrial Environment features, if they are retained may potentially be subjected to interactions with the BWRX-300 deployment activities.

Table 5-8 presents a comparison of the identified works and activities to the BWRX-300 deployment.

Table 5-8: Comparison of DNNP Works and Activities Likely to Measurably Change the Terrestrial Environment Identified in the EIS to the BWRX-300 Deployment

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Site Preparation and Construction Phase		
Mobilization and Preparatory Works	Will result in removal of vegetation and disruption of wildlife communities (including Bank Swallow burrows). Potential to affect remaining vegetation and wildlife through	Footprint and facility would be smaller. There are opportunities to retain some vegetation communities/habitat due to smaller scale of DNNP. This includes some cultural meadows, thickets, woodlands and wetlands including the three on-site ponds. Additional studies to assess potential effect, if any , on the retained vegetation communities/habitat have been completed. Bank Swallow nesting habitat to remain for one BWRX-300

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
	dust and noise. Disrupt landscape connectivity and traffic likely to cause wildlife road mortality.	reactor deployment. For the 4-reactor scenario the Bank Swallow habitat would be rendered unsuitable due to activities during excavation and grading and/or marine and shoreline works – see below. Disruption to landscape connectivity and potential for wildlife road mortality are still applicable but likely on a smaller scale.
Excavation and Grading	Dust and noise will disrupt habitat. Construction activity may disrupt waterfowl use of inshore lake area. Traffic likely to cause wildlife road mortalities. Construction activities will physically disrupt landscape connectivity. Wetland areas beyond the excavation footprint may be affected by groundwater drawdown.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8. Disruption to landscape connectivity and potential for wildlife road mortality are still applicable but likely on a smaller scale. Bank Swallow nesting habitat to remain for one BWRX-300 reactor deployment. For the 4-reactor scenario the Bank Swallow habitat would be rendered unsuitable due to shoreline protection and/or hydrogeological changes; this is consistent with the effects assessed in the EIS. The impact on groundwater from the BWRX-300 is evaluated in a separate Groundwater Flow Modelling study [33]. The assessment results relative to wetlands is discussed in Section 5.5.5.4.
Marine and Shoreline Works	Will disrupt waterfowl use of area and connectivity, and result in a loss of inshore habitat.	Marine and shoreline works are still expected, but not to the same extent; no lake infilling is required. The associated effects with lake infilling will not occur. Some shoreline development is required including shore protection. Bank Swallow nesting habitat to remain for one BWRX-300 reactor deployment. For the 4-reactor scenario the Bank Swallow habitat would be rendered unsuitable due to shoreline protection and/or hydrogeological changes; this is consistent with the effects assessed in the EIS.
Development of Administration and Physical Support Facilities	Migrant bird strikes on tall structures.	Development of administration and physical support facilities and associated effects are still applicable.
Construction of Power Block	Dust may affect vegetation and dust and noise may disturb wildlife.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8.
Construction of Intake and Discharge	Dust and noise likely to disturb near-shore birds.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8.

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Structures		
Supply of Construction Equipment Material and Operating Plant Components	Dust may affect vegetation and dust and noise may disturb wildlife. Traffic likely to cause wildlife road mortalities and disrupt landscape connectivity.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8. Disruption to landscape connectivity and potential for wildlife road mortality are still applicable but likely on a smaller scale.
Workforce, Payroll and Purchasing	Commuting traffic may affect vegetation and disturb wildlife (as a result of dust and noise) and cause road mortalities.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8. Potential for wildlife road mortality is still applicable but likely on a smaller scale due to reduced volume of workforce vehicles anticipated for the BWRX-300.
Operation and Maintenance Phase		
Operation of Condenser, Condenser Circulating Water, Service Water and Cooling Systems	Waterfowl likely to be attracted to facilities and warmer water. Fogging, icing effects and salt deposition on vegetation communities and species. Migrant bird strikes on tall structures.	Waterfowl still likely to be attracted to facilities and warmer water associated with the condenser cooling system. BWRX-300 to utilize lake water cooling and therefore cooling tower related effects on vegetation communities and migrant bird strikes are no longer applicable.
Operation of Electrical Power Systems	Particulate emissions and noise may affect vegetation and disturb wildlife.	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8.
Operation of Site Services and Utilities	Station lighting likely to increase bird strikes. Security measures may cause wildlife hazards (e.g., razor wire fencing) and disrupt connectivity.	Associated effects from station lighting and security measures related to bird strikes and wildlife hazards are applicable for the BWRX-300.
Physical Presence of the Station	Migrant bird strikes on station building.	Associated effects from the physical presence of the station related to bird strikes are applicable for the BWRX-300.
Administration, Payroll and Purchasing	Commuting traffic may affect vegetation and disturb wildlife (as a result of dust and noise)	Air quality and noise modelling has been completed [11]. The assessment results relative to terrestrial subcomponents are discussed in Sections 5.5.5.4, 5.5.5.6, and 5.5.5.8.

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
	and cause road kills.	Potential for wildlife road mortality is still applicable but likely on a smaller scale due to reduced volume of workforce vehicles anticipated for the BWRX-300.

5.5.5.2 EIS Section 5.5.2 - Effects Assessment Scenario

In the EIS, the assessment of likely effects on the Terrestrial Environment was based on the bounding site development layout which considered the removal of vegetation within the areas of construction. As previously indicated, given the BWRX-300's smaller footprint than the bounding scenario reactors, an opportunity exists to retain some of the vegetation communities, and the species and habitat functions associated with them within the DNNP site.

Overall, the effects are primarily limited to the DNNP site and are not expected to be measurable at the local or regional levels. This applies to the BWRX-300 deployment and is consistent with the EIS.

5.5.5.3 EIS Section 5.5.3 - Assessment Criteria

In the EIS, predicted changes in conditions in the Terrestrial Environment as a result of the DNNP were evaluated against applicable Provincial and Federal criteria that were applied for the evaluation of changes in existing conditions as well as the effects that would result from these changes.

These assessment criteria or parameters remain valid for the BWRX-300 deployment. Notwithstanding the comprehensive nature of the assessment contained in the EIS, additional terrestrial baseline data has been collected through a variety of studies conducted since the EIS. Surveys for species at risk (Eastern Meadowlark, Bobolink, Barn Swallow, Least Bittern, Bank Swallow, and bats), amphibians, reptiles, breeding birds, and pond biodiversity were conducted on the DNNP site, providing updated information on these species. Conservation status of several terrestrial species changed since the EIS, in particular Bank Swallow and several bat species, that had not been identified in the EIS. Each is discussed previously in Section 5.4.5.

5.5.5.4 EIS Section 5.5.4 - Assessment of Likely Effects on Vegetation Communities and Species

The EIS determined that likely effects on Vegetation Communities and Species will be bounded by the direct losses of Vegetation Communities and Species due to works and activities performed during the Site Preparation and Construction phase, in particular Mobilization and Site Preparation which will see extensive clearing and grubbing of the site to facilitate its development, and Excavation and Grading which will generate dust. Dust emissions are also likely to result from some works and activities during the Operation and Maintenance phase with associated effects on vegetation.

In terms of the more valued vegetation elements, the receptors for the Vegetation Communities and Species sub-component are Cultural Meadow and Thicket Ecosystem, Shrub Bluff Ecosystem, Wetland Ecosystem and Woodland Ecosystem.

The EIS states that likely effects on these receptors from the DNNP are:

> *The Project will result in the loss of an estimated 113 ha of Cultural Meadow and Thicket Ecosystem. This is considered an adverse effect of the DNNP and is further considered in terms of mitigation measures and residual effects.*
>
> *The Project will result in the loss of an estimated 17 ha of Wetland and Thicket Ecosystem. An additional 5 ha of Wetland Ecosystem may be converted to upland vegetation (as a result of changes in groundwater flow). This is considered an adverse effect of the DNNP and is further considered in terms of mitigation measures and residual effects.*
>
> *Clearing and grubbing of the site may result in the loss of rare plant species: Shag-bark Hickory, Butternut, Common Water Flax-seed, Cup Plant and Loesel's Twayblade. This is considered an adverse effect of the DNNP and is further considered in terms of mitigation measures and residual effects.*

The EIS identified the following mitigation measures to address the effects on Vegetation Communities and Species:

- Re-planting of approximately 40 to 50 ha of Cultural Meadow and approximately 15 to 20 ha of Cultural Thicket with native shrub plantings, and Woodland dominated by Sugar Maple.
- Creation of new fish-free wetland ponds with riparian plantings.
- Create wetlands on lake filled area.
- Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond.
- Salvage and relocate or re-plant rare plant species in suitable existing or created habitat.
- Include native forb seeds in seed mixture for Cultural Meadow re-planting.

Some of these mitigation measures may not be necessary for the BWRX-300 deployment. The area required for BWRX-300 deployment is smaller in size and deployment may not require removal of on-site ponds. As a result, there is an opportunity to retain some of the on-site features, once slated for removal. This opportunity would be explored further during the finalization of the DNNP plant layout and the construction plan.

There are differences in the layouts as well as works and activities for the BWRX-300 deployment compared to those considered in the EIS. Through the bounding scenario, vegetation removal and/or impacts associated with DNNP works were to occur throughout the east side of the DNNP site, as well as areas west of Holt Road. Works west of Holt Road included the use of the existing northwest landfill as soil storage and an expansion of the existing DNGS switchyard. The BWRX-300 footprint is east of Holt Road and does not include re-opening the northwest landfill or locating the switchyard west of Holt Road. For the land east of Holt Road, the bounding scenario considered in the EIS involved works that would result in the loss of a large proportion of the vegetation communities on the east side of the site, including Cultural Meadow and Thicket Ecosystem, Shrub Bluff Ecosystem, Wetland Ecosystem and Woodland Ecosystem. The BWRX-300 deployment will result in the removal and impacts to vegetation communities east of Holt Road, albeit in smaller proportion than the bounding scenario (Figure 3-4).

Overall, this will likely result in the loss of some areas of vegetation communities, but it is anticipated to be less than predicted in the EIS with the BWRX-300 deployment.

The removal of the Cultural Meadow and Thicket Ecosystem, Shrub Bluff Ecosystem, Wetland Ecosystem, and Woodland Ecosystem Terrestrial Vegetation receptors were addressed in the EIS and associated commitments.

For some sensitive vegetation communities including wetlands and woodlands, there are some locations (i.e., North Woodlands, Treefrog Pond, Polliwog Pond and Dragonfly Pond, South and Southeast Wetlands) that were to be removed for the bounding scenario reactors in the EIS that may be retained for the BWRX-300 reactors. To explore this potential retention, the potential impacts from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed.

Dust

Dust can create effects to vegetation communities and species. During the growing season or year-round for evergreen species, dust can physically coat vegetation limiting photosynthesis and other growth processes. Certain types of dust can also result in concomitant chemical changes or reactions on leaf surfaces. This in turn, can affect associated wildlife communities. These effects are most likely to influence vegetation communities and species, but could, if of a sufficiently high level of effect, cascade into other wildlife sub-components. The EIS considered the potential for adverse effects from dust on vegetation and determined that an adverse effect from dust deposition on vegetation was unlikely.

The potential for dust effects from the BWRX-300 deployment has been considered using the result of suspended particulate matter (SPM) modelling targeted at terrestrial receptor locations [11]. The potential for impairment to vegetation from dust is considered as an indicator for potential cascading effects to other terrestrial sub-components. The daily incremental deposition rates at terrestrial receptors ranged from 0.1 to 0.4 g/m^2/day, which is well below the 14 g/m^2/day threshold for vegetation loss described in the literature [34]. The maximum predicted 24-hour SPM concentrations were predicted to be the highest at receptors associated with the three ponds in the northeast with values ranging from 524.3 to 803.7 μg/m^3, during the period when then spoils piles are being operated for the multi-unit BWRX-300 activities. The maximum 30 day predicted incremental deposition rates for these receptors during the same period range from 7.5 to 12.8 g/m^2/30days. These values are the only receptor exceedances over the 7.0 g/m^2/30days soiling criteria. The scenario when these exceedances are to occur is temporary as it considers a period with heavy truck traffic travelling to the spoil piles, which was conservatively considered in the model to be 360 trips per day. During the other model scenarios when traffic to the spoils pile is predicted to be less frequent, exceedances are not predicted. Additionally, the model for all scenarios conservatively assumed that all activities/equipment would be operating concurrently throughout the entire workday. Mitigation will be employed through the Site Preparation and Construction phase which includes a suite of standard mitigative options to limit dust to reduce or eliminate effects to ensure that residual effects are not significant.

Hydrogeology (Groundwater)

The hydrogeology report [33] notes that groundwater may contribute to the presence of the constructed ponds and to wetlands in the southern and eastern parts of the site. For a single reactor BWRX-300 deployment and during construction, the modelled changes are either minor in nature (i.e., less than 10%), or in the case of the ponds increase the groundwater supply by 20%. Therefore, no measurable adverse effects are anticipated, even assuming that groundwater is an important hydrological component of these features. Groundwater is not affected post-construction [33].

For the 4-reactor scenario, the ponds and the eastern wetland and tributary to Darlington Creek and associated wetland are anticipated to be retained. Modelled groundwater changes are in the order of an 80% decline to the tributary wetlands and 30% to the ponds indicating there could be a shift in vegetation community from wetland towards upland. For the ponds the modelled groundwater change is -30%, which, while not minor, is mitigated by the fact that these features fill-up with surface water and then overflow. Regardless of the relative percentage of surface water versus groundwater that maintains these features, the maintenance of the outflow structures to the ponds is likely to have a far greater impact on water levels and community response.

The southern wetlands associated with the tributary to Darlington Creek may see an 80% decline in groundwater inputs [33], but this effect is temporary. However, this wetland and tributary will see a major increase in surface water inputs (see following sub-Section - Hydrology). Given that the wetland community is dominated by robust marsh species that are adapted to water level fluctuations, and not species typically associated with steady groundwater discharge, it is unlikely that adverse effects on wetland plant community and species would be expected to occur. The EIS bounding scenario assumed that these communities and species would be removed entirely, therefore the retention of some of these wetlands with BWRX-300 deployment is a lesser effect than was considered in the EIS.

Hydrology

Regarding surface water inputs, monthly water balances for the ponds and two tributaries have been estimated [32]. Changes resulting from the deployment of four BWRX-300 units were relatively minor and resulted in marginally increased flows. In particular, the ponds and associated wetlands and wildlife habitat show relatively small changes in flows and hydroperiods and adverse effects are not anticipated.

The exception is the southeast wetland and associated tributary (south of the railway right of way) that flows eastwards into the adjacent property and ultimately Darlington Creek. The hydrology report [32] anticipates "*major increases in monthly flows during summer*". The EIS bounding scenario assumed that these features on site would be removed. For the BWRX-300 deployment they will remain but could be subject to effects related to the altered hydrology.

This tributary system is well-vegetated with a marsh community that is adapted to fluctuating water levels, this contrasts with treed swamp systems and fens or bogs that are very sensitive to water level changes especially during summer. Furthermore, the additional summer water will flow through this system as the hydraulics are not constrained (i.e., it is a flow-through system). Accordingly, the additional water will not result in an adverse environmental effect to vegetation communities or species.

The EIS bounding scenario did not consider the retention of these features on site, therefore the BWRX-300 deployment will have a lower level of effect on these communities and species. The Project-Environment interactions for hydrological effect have been considered and adverse effects are not anticipated.

5.5.5.5 EIS Section 5.5.5 - Assessment of Likely Effects on Insects

The EIS determined that the likely effects on Insects will be bounded by the direct loss of habitat due to various works and activities performed during the Site Preparation and Construction phase. Excavation and Grading would also generate dust and noise.

The receptors for the Insect sub-component were identified as dragonflies and damselflies and butterfly stopover areas. Likely effects on these receptors from the DNNP were described in the EIS as follows:

> *A rare species of dragonfly, Amber-winged Spreadwing, whose only known occurrence on the site is at Treefrog Pond will be lost to the DN site. This is considered an adverse effect of the DNNP and is further considered in terms of mitigation measures and residual effects.*
>
> *Clearing of the DN site will result in the loss of an estimated 74 ha of Monarch (and other) butterfly habitat. This is considered an adverse effect of the DNNP and is further considered in terms of mitigation measures and residual effects.*

It was assumed in the EIS that all Monarch habitat within the DNNP site would be removed. The BWRX-300 deployment area of Monarch habitat loss may be less than described in the EIS as the BWRX-300 footprint is smaller.

The removal of the ponds associated with the Odonate receptors was addressed in the EIS and the associated commitments. However, the three on-site ponds (Treefrog Pond, Polliwog Pond and Dragonfly Pond) that are the only habitats for the insect receptor (the Amber-winged Spreadwing) on the site may be retained. The potential effects from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and are discussed in Section 5.5.5.4.

5.5.5.6 EIS Section 5.5.6 - Assessment of Likely Effects on Bird Communities and Species

Breeding Birds

The EIS determined that site clearing will reduce the habitat, and consequently, the breeding population of the two indicator species of this receptor (i.e., Yellow Warbler and Red-eyed Vireo). They currently occupy primarily cultural communities and are expected to persist at the DN site. The loss of breeding bird habitat on the DN site is considered further as an effect of the Project in the EIS. Likely effects on the breeding bird sub-component because of the Project were described in the EIS as follows:

> *"As a consequence of the removal of existing breeding bird habitat within the DN site, the Project will result in a decrease in the population of breeding birds on the site. This is considered an adverse effect of the Project and is further evaluated in terms of mitigation measures and residual effects* [3]."

The EIS determined that the decrease in populations of breeding birds on the DNNP site may remain despite the implementation of mitigation.

The BWRX-300 deployment would result in some breeding bird habitat being retained that was previously considered to be removed in the EIS. The potential impacts from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and are discussed in Section 5.5.5.4. The potential for noise impact on bird communities and species from the BWRX-300 deployment is discussed below.

Noise

The potential for Noise generated from the BWRX-300 deployment to affect the breeding birds associated with the retained habitat has been considered. The following provides an overview of the noise modelling for the BWRX-300 deployment [11] in the context of potential for interaction with bird communities and species (e.g., breeding birds, waterfowl, migrant songbirds, winter raptors) within retained habitats.

Environment and Climate Change Canada (ECCC) provides guidance that loud noise emissions, "…*especially when exceeding 10 dB above ambient in natural areas or greater than about 50 dB have a higher risk of disturbing nesting birds*." At the DN site, there are several sources of constant and intermittent noise. These include DNGS, the mainline CN railway, St. Marys Cement and Highway 401. The background L90 24-hr sound level is 54.2 dBA [11]. Most of the receptors for the retained bird habitats show increases of less than 10 dB above background levels with the exception of one location (T2022_A) [11]. This receptor is in an area of deciduous swamp directly east of the excavation footprint for the one-unit BWRX-300 deployment. The modelling indicated that there will be an incremental increase of 13.3 dB above background. Given the existing relative high levels of noise, it is likely that the bird communities are already adjusted to the high levels of noise and it is predicted that this increase will not result in a measurable adverse effect. During the modelled scenario for the multi-unit BWRX-300 deployment, the habitat for receptor T2022_A was assumed to be removed in the four-unit BWRX-300 scenario and therefore was not considered in the model. At all other receptors predicted noise levels were within 10 dB of background. The additional noise modeling for the BWRX-300 deployment demonstrates that the bird communities are subject to elevated noise levels during background conditions and there will be relatively minor increases during the deployment of the BWRX-300 which likely will not result in a measurable effect to birds communities and species.

Waterfowl Staging Area

The EIS determined that the area of shoreline near the DNNP site supports larger than typical numbers of waterfowl in part because of the staging and loafing opportunities offered by the DNGS structures and St. Marys Cement wharf. DNNP-related activities in the lake itself may disrupt these birds since they use this area throughout the year. The EIS determined that more waterfowl will likely be attracted to the area after the disruptions have subsided, but an effect may occur while the disruptions are in progress.

The EIS identifies that the design of the condenser cooling water discharge diffusers is such that it will reduce the extent of warm water plumes, but still increase existing areas of warm water along the shoreline. This effect is largely a positive one as migrant, summering and winter waterfowl will have additional habitat opportunities created by these effects. Coot's Pond is unlikely to be directly affected by the DNNP and waterfowl use and staging are anticipated to continue there. This information is consistent with the BWRX-300 deployment information.

The effects of BWRX-300 deployment are similar to those assessed in the EIS since there is no change anticipated to the use of the site by staging waterfowl at Coot's Pond, as it will not be affected. Areas of warm water may still increase along the shoreline of Lake Ontario, and it is unlikely there would be a decrease in waterfowl staging. The additional noise modeling for the BWRX-300 deployment demonstrates that the bird communities are subject to elevated noise levels during background conditions and there will be relatively minor increases during the deployment of the BWRX-300 which likely will not result in a measurable effect.

Migrant Songbirds and their Habitat

The EIS states that the DNNP will result in the loss of an estimated 74 ha of vegetation suitable for migrant songbirds.

The BWRX-300's smaller footprint than the bounding scenario reactors provides an opportunity to retain some of the woody vegetation and habitat for migrant songbird communities within the DNNP site. The additional noise modeling for the BWRX-300 deployment demonstrates that the bird communities are subject to elevated noise levels during background conditions and there will be relatively minor increases during the deployment of the BWRX-300 which likely will not result in a measurable effect to birds communities and species.

Bird Strikes

The EIS states that the killing or injury of birds may occur because of bird strikes on cooling towers, other structures and buildings, and their possible entanglement in security fencing.

As the BWRX-300 does not include the construction of cooling towers, the major cause of bird strikes has been eliminated. Bird strikes remain as an effect of the DNNP given that large/high structures and buildings will be constructed. The BWRX-300 deployment is therefore likely to have similar or lesser effects than those associated with the cooling tower option assessed in the EIS.

The EIS also identified the following in-design mitigation measures related to injuries to birds:

- Implementation of Good Industry Management Practice in the design and development of lighting systems and structures, including strategies to reduce the incidence of bird strikes to the extent practicable while considering the needs of navigation safety and site security; and
- Implementation of Good Industry Management Practice in the initial design of security fencing systems to reduce the incidence of bird entanglement and entrapment to the extent practicable.

These mitigation measures remain applicable to the BWRX-300 deployment.

Winter Raptor Feeding and Roosting Areas

The EIS stated that two primary winter raptor feeding and roosting areas are related to historical owl roosts used for winter foraging habitat for raptors, which is primarily Cultural Meadow.

The EIS identified that there is at least one primary owl roost located on the DNNP site near where the site preparation and construction will occur. The other will remain alongside the

Waterfront Trail east of the Northwest Landfill Area. The loss of the one primary owl roost, and approximately 50% of the suitable winter raptor foraging habitat, is considered further as an effect of the DNNP. The BWRX-300 deployment would result in the opportunity to retain vegetation which would have been removed for the bounding scenario reactors described in the EIS. The additional noise modeling for the BWRX-300 deployment demonstrates that the bird communities are subject to elevated noise levels during background conditions and there will be relatively minor increases during the deployment of the BWRX-300 which likely will not result in a measurable effect to birds communities and species.

Bank Swallow

The EIS states that because of the removal of the shoreline bluffs in the development area of the DNNP site, the DNNP will result in a decrease in Bank Swallow nesting habitat that supports approximately 1,300 active burrows (based on 2007 data) and a reduction in overall colony size. This was considered in the EIS as an adverse effect of the DNNP and was further evaluated in terms of mitigation measures and residual effects.

The mitigation measures identified in the EIS to address the decrease in Bank Swallow nesting habitat and colony size included:

- Acquisition of lands that contain existing large Bank Swallow colonies for study and protection;
- Development of artificial Bank Swallow habitat in potentially suitable locations on the DN site and the monitoring of existing colonies;
- Development of artificial habitat for aerial forage species (e.g., Chimney Swift and Purple Martin) in potentially suitable locations on the DNNP site;
- Development of partnerships to undertake research into the general decline of aerial foragers in Ontario; and
- Integrate interpretive opportunities related to the effects of the DNNP on shoreline bluff habitat and Bank Swallows such as erecting interpretative signage and constructing observation decks.

Following the application of mitigation, the EIS determined that the residual effect of the DNNP on Bank Swallows would be the loss of nesting habitat for up to 1,000 active Bank Swallow burrows and acknowledged that some mitigation not directly comparable to the effects will result in advances for the species elsewhere.

Since the completion of the EIS in 2009, the Bank Swallow has been listed as a "threatened" species both provincially and federally and the species and its habitat are regulated under the provincial *Endangered Species Act* and the federal *Species at Risk Act*. Adverse effects of the DNNP will be subject to permitting/approval requirements under the relevant legislation. This approach to regulatory requirements has been adopted within this EIS review and therefore, requirements specific to complying with and obtaining approvals under the *Endangered Species Act* and/or *Species at Risk Act* are not incorporated into the review.

The small footprint for the first BWRX-300 reactor provides an opportunity to preserve the Bank Swallow nesting habitat along the Lake Ontario shoreline in the short term. However, the footprint for four BWRX-300 reactors would require some shoreline protection measures which will likely cause the bank to become unsuitable for Bank Swallows to inhabit.

The Bank Swallow colonies as a receptor for interaction with the DNNP were not assessed in the EIS as the habitat was to be entirely removed during site preparation. The potential for disturbances or impacts from Project-Environment interactions related to dust, noise, hydrogeology, vibrations from blasting, and/or shoreline protection on the Bank Swallows and their habitat were assessed using the recent modeling results indicated that the adverse effects on Bank Swallows following the implementation of mitigation are anticipated to be minor.

- Vibration

  A potential effect to Bank Swallows related to ground vibration from BWRX-300 blasting activities required quantitative assessment as this potential effect was not addressed in the EIS. Activities that generate ground vibration during the active nesting period may have the potential to disrupt Bank Swallows or cause the nesting burrows to collapse.

  A quantitative vibration assessment of the potential for disruptive ground vibrations from blasting was completed [35]. The assessment used a modelling approach using blasting velocity magnitudes generated by St. Marys Cement as a threshold to compare the modelled anticipated ground vibrations that could be expected to be generated by blasting for the BWRX-300 deployment. The study determined that the maximum velocity magnitude anticipated to be generated by the BWRX-300 at the burrows closest to the blasting location are less than those experienced at the burrows closest to the St Marys Cement blasting activities (0.6 mm/s and 0.7 mm/s). Velocity magnitudes ranging from 0.6 mm/s to 0.37 mm/s over the bluff height are anticipated from the BWRX-300, which are similar to ground vibrations generated by St. Marys Cement. Follow-up monitoring of the Bank Swallows and habitat may be necessary to confirm the assumptions utilized in the quantitative assessment.

- Shoreline Protection

  Shoreline protection based on the 1-reactor BWRX-300 layout does not represent a potential effect as the protection does not coincide with where the Bank Swallow colonies occur, and it is assumed that all works necessary for this activity can avoid the habitat.

  For the 4-reactor BWRX-300 layout, it is assumed that shoreline protection will interact with the portion of the bluff where the colonies occur, and therefore represents a Project-Environment interaction. This potential for effect can be qualitatively assessed using the assumption that shoreline protection will result in the cessation of shoreline erosion. Stopping shoreline erosion will ultimately render the habitat unsuitable for Bank

Swallow as the species requires erosion of the bluff face for newly exposed nesting substrate to establish colonies. The overall adverse effect to Bank Swallow nesting habitat remains consistent with the EIS.

- Hydrogeology

  Potential for effects from changes in groundwater contributions to the bluff is a Project-Environment interaction that was not assessed in the EIS and requires consideration for the BWRX-300 layout. The nesting substrates on the bluff require groundwater contribution to maintain suitability for Bank Swallows. Bank Swallows excavate burrows, which average approximately 0.7 m, into substrates on the bluff. This requires that the moisture of the substrates to be such that the birds can dig into the material as well as that the burrow maintains its structure without collapsing for the duration of the nesting period. An increase or decrease in the groundwater contributions to the bluff could compromise the cohesion of the substrates.

  A quantitative hydrogeology assessment of the potential for changes in groundwater contributions to the bluff was completed [33]. For the first BWRX-300 reactor, there are no expected impacts to the bluff from the temporary changes in groundwater contribution, however, for the 4-reactor BWRX-300 the hydrogeological assessment indicates that there will be a measurable decrease (i.e., up to -21%) in groundwater contribution to the bluff during the construction phase. The groundwater drawdown in the bluff will render the Bank Swallow habitat unsuitable, which is the scenario assessed in the EIS.

  Although the effect to Bank Swallow was different in the EIS (i.e., to be realized by removal of the bluff), the effects of the shoreline protection or hydrogeological changes for the 4-reactor BWRX-300 deployment are consistent with those assessed in the EIS as the habitat function is assumed to be lost.

- Noise

  Noise modelling has been undertaken to evaluate the effects of the BWRX-300 deployment on Bank Swallows [11]. For the 4-reactor BWRX-300 footprint, potential effects are limited to the period prior to the installation of shoreline protection or activities that will result in a change to groundwater contribution to the bluff, as the Bank Swallow habitat is assumed to be eliminated by these works. These effects were not considered in the EIS, because this area of the bluffs was to be removed for the construction of the bounding scenario reactors. Potential for adverse effects from noise on Bank Swallow during construction has been considered and the predicted noise levels have been modelled for a receptor location that corresponds with a colony located within the lakeshore bluff. At this location the noise levels are predicted to reach 54.3 dB(A), which is an increase of only 0.1 dB(A) above background [11]. Therefore, an adverse effect to Bank Swallow from noise is not anticipated.

A summary of the potential effects to Bank Swallows for the BWRX-300 deployment are provided in Table 5-9.

Table 5-9: Summary of the Potential Effects to Bank Swallows

Potential Effects	Qualitative Assessment with BWRX 300
Shoreline Protection	• No potential Project-Environment interaction from shoreline protection in a 1-reactor BWRX-300 layout. • Effects to Bank Swallow from shoreline protection during the construction phase for a 4-reactor BWRX-300 deployment is consistent with the EIS based on the assumption that shoreline protection will extend to the eastern property boundary of the DN site.
Noise Disturbance to Bank Swallow	• Potential for noise disturbance to Bank Swallows during the site preparation, construction and/or operation phases of BWRX-300 was not assessed by the EIS. • Assessment of noise effects on Bank Swallow habitat has been completed and indicated that there are no adverse effects predicted.
Dust Disturbance to Habitat	• Potential for dust disturbance to Bank Swallows during the site preparation, construction and operation phases of a 1-reactor or 4-reactor BWRX-300 deployment is not assessed by the EIS because this area of the bluffs was to be removed for the construction of the bounding scenario reactors. A review of dust effects on Bank Swallow habitat has been completed and indicated that there are no adverse effects predicted.
Changes in groundwater flows to the bluff habitat	• Potential for changes in groundwater interaction with the Bank Swallow colonies and bluff during the site preparation, construction and/or operations phase of a 1-reactor or 4-reactor BWRX-300 deployment was not assessed by the EIS. • A hydrogeology assessment has since been completed [33] and concludes that for the first BWRX-300 reactor, there are no expected impacts to the bluff from the temporary changes in groundwater contribution, however, there may be appreciable temporary changes to groundwater contribution to the bluff for 4 BWRX-300 reactors. However, the impacts to the Bank swallow habitat from changes in groundwater may not be realized depending on the timing of the installation of the shoreline protection works.
Vibration effects to the Bank Swallow burrows and bluff habitat from blasting	• Potential for disturbance to Bank Swallow or their habitat from vibration during the construction phase of 4-reactor BWRX-300 deployment was not assessed by the EIS. • An assessment of the planned blasting activities for the BWRX-300 has since been completed and concluded that the Bank Swallows and nesting habitat are anticipated to be subject to blasting velocity magnitudes that are similar to those generated by blasting from the St Marys operation [35].

5.5.5.7 EIS Section 5.5.7 – Assessment of Likely Effects on Amphibians and Reptiles

The EIS determined that the likely effects on amphibians and reptiles will be bounded by the direct loss of habitat due to DNNP works and activities.

Overall, it was determined that the DNNP will result in the removal of three amphibian breeding areas (Treefrog Pond, Polliwog Pond and Dragonfly Pond). These ponds were not assessed in the EIS as a receptor for interaction with the DNNP as the habitat was to be entirely removed during site preparation for the bounding scenario reactors.

The EIS determined that mitigation measures associated with the effects on Vegetation Communities were also beneficial for the Amphibians and Reptiles. No other mitigation measures were identified in the EIS.

The BWRX-300 deployment will not result in the removal of the three amphibian breeding areas as shown in Table 5-10. For the bounding scenario reactors, three amphibian breeding areas were removed and any potential for disturbance or impacts to these ponds was not addressed by the EIS.

Table 5-10: Summary of the Potential Effects to Amphibians and Reptiles

Potential Effects Pathway	Qualitative Assessment
The physical retention of the three created ponds (Polliwog, Treefrog and Dragonfly ponds), creates a new pathway for an effect.	The surface water catchment for these wetlands likely includes the footprint of the BWRX-300 deployment and therefore the designed delivery of water to these features may be required to avoid an adverse effect (i.e., the physical drying out of these breeding ponds). Hydrology and hydrogeology investigations determined that with the proper delivery of water to the ponds no appreciable effect is anticipated. Effects to the vegetation (wetland) is addressed in Section 5.5.5.4.

Hydrology [32] and hydrogeology [33] investigations determined that no appreciable effect to surface water and groundwater flow to these ponds is anticipated. Therefore, an opportunity exists to retain these features and functions that were considered to be removed in the EIS.

5.5.5.8 EIS Section 5.5.8 Assessment of Likely Effects on Mammal Communities and Species

Breeding Mammals

The EIS determined that the likely effects on Mammal Communities and Species will largely result from the direct loss of habitat and construction-related disruption associated with works and activities performed during the Site Preparation and Construction phase. For example, clearing of the DNNP site will result in the loss of an estimated 113 ha of Cultural Meadow and Thicket Ecosystem. This is considered a potential adverse effect of the DNNP and is further evaluated in terms of mitigation measures and residual effects.

A range of common mammal species occur at the DN site. Although some mammal species are sensitive to noise, those at the DN site are already exposed to elevated noise levels and have become habituated to these conditions.

The EIS determined that effects may also occur in the form of mammal collisions with DNNP-related traffic. However, the mammals present at the DN site are unlikely to be affected by road mortality at a measurable level.

The EIS identified that mitigation measures associated with the effects on Vegetation Communities were also beneficial for the Breeding Mammals. Consequently, no other additional mitigation measures were identified in the EIS for Breeding Mammals.

With the BWRX-300 deployment, there is an opportunity to retain habitat that was assessed as being removed in the EIS. Because it was anticipated that all habitat within the construction areas would be removed, the potential for disturbance or effects to these mammals and their habitats from dust and noise during the site preparation, construction and/or operation phases of the BWRX-300 deployment was not addressed by the EIS.

The BWRX-300 deployment would result in some breeding mammal habitat being retained that was previously considered to be removed in the EIS. The potential impacts from dust to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and are discussed in Section 5.5.5.4. The potential for noise impact from the BWRX-300 deployment on breeding mammals with a specific focus on bats as a sensitive receptor is discussed below.

Bats

Bats or bat habitat were not considered as a receptor or indicator species in the EIS. Since the completion of the EIS, OPG has carried out extensive bat monitoring at the DNNP site [36], [37], [38], [39]. These surveys have documented eight species of bats on the DNNP site. These are: Big Brown Bat, Silver-haired Bat, Hoary Bat, Eastern Red Bat, Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis and Tri-colored Bat [37], [39], [36]. Of these eight species, three are listed as endangered both provincially through the *Endangered Species Act* and federally, on Schedule 1 of the *Species at Risk Act*. These are: Little Brown Myotis, Northern Myotis and Tri-coloured Bat. Eastern Small-footed Myotis is listed as endangered provincially but not federally. A variety of habitat functions for bats, including endangered bats, occur on the DNNP site associated with woodland and treed swamp vegetation communities including roosting, foraging and flyover habitat [36].

Habitat for endangered species of bats is regulated under the provincial *Endangered Species Act* and/or the federal *Species at Risk Act* and any adverse effects of the DNNP will be subject to permitting/approval requirements under the relevant legislation. The assumption related to OPG's regulatory obligations, as specified in the EIS and described previously in Section 5.5.5.6 of this document, is also applicable for endangered bats.

Findings from the bat surveys conducted after the EIS were identified as a change in baseline conditions during the DNNP Site Preparation Licence Renewal process and mitigation/commitments were evaluated to determine if additional mitigation or commitments would be warranted to address this change in baseline conditions [40], [12].

The DNNP Site Preparation Licence Renewal process concluded, with regards to bats:

> *"no further mitigation is required to address change in baseline conditions. Mitigation and commitments documented in Darlington New Nuclear Project Commitments Report, including for ESA/SARA permitting, are sufficient to address potential for change to the effects of the Project. Therefore, the original conclusions regarding residual adverse effects of the Project remain valid and no further actions are necessary"* [13].

As the extent of woodland removal, which also function as bat habitat, considered in the bounding site development scenario may not be realized with the BWRX-300 layout there are potential Project-Environment interaction during the site preparation, construction, and operations phases of the DNNP that may be different from the EIS. The potential for disturbances or impacts from pathways related to noise, dust, changes in hydrogeology/ hydrology, and/or light have undergone further assessment and the effects were found to be minor.

- Lighting

  The effects from lighting on terrestrial fauna were considered in the EIS in the context of the potential for migrant bird strikes; however, the potential for lighting effects of the DNNP on bats were not addressed in the EIS or the DNNP Site Preparation Licence Renewal process. This potential Project-Environment interaction occurs in the BWRX-300 layout as habitats for bats that were to be removed through the bounding site development scenario may remain as there is an opportunity to retain these features with the BWRX-300 layout.

  Lighting for the DNNP is to be installed and operational during the site preparation and construction phases, as well as throughout the operations phase. Lighting has been identified in the Project Description as being a component of other auxiliary systems; however, the current layout for the BWRX-300 deployment does not specify where lighting systems are to be installed. Therefore, it was assumed that the extent of lighting or level of lighting across the DNNP site would be the same as that assumed in the EIS.

  For the BWRX-300 deployment, roosting habitat for Little Brown Myotis (an endangered species of bat) is associated with the woodland in the northeast portion of the DN site as well as the treed foraging habitats for multiple species of bats that occur throughout the eastern portion of the site [36].

  Disturbance to bats from lighting results in a range of adverse effects such as abandoning roosting areas, changing nightly emergence timing which in turn alters foraging opportunities, increasing risk of predation, severing key flight paths between critical habitat features, and changing distribution of flying insects through attraction to lit areas [41]. The effects of artificial illumination are thought to be more pronounced on slower-flying species, such as Myotis species, as these species have an aversion to lit areas [42]. Although the potential for effects from lighting on bats cannot be eliminated from anthropogenic influenced landscapes, there are best management guidelines that can be adopted into DNNP lighting design [43]. These include elements such as:

- Avoiding lighting on key habitat and features;
- Implementing dark buffer zones, illuminance limits and zonation around key habitat and features;
- Incorporating lighting source specifications that are less impactful to bats. Examples include:
  - no ultra-violet or florescent sources;
  - reduced blue light components;
  - peak wavelengths higher than 550nm;
  - low-level downward directional lighting;
  - Consideration for mounting height and horizontal orientation;
  - Use of baffles, hood or louvres to reduce light spill;
- Use of landscape screening; and
- Strategic dimming and part-night lighting.

The EIS identified the need for in-design mitigation related to lighting design; however, this was targeted to reduce migrant bird strikes. The potential effect of lighting on bats which has been identified for the BWRX-300 was not assessed in the EIS. Mitigation/commitments related to bats were provided in the DNNP Site Preparation Licence Renewal process and additional in-design mitigation and measures will be developed to reduce or eliminate residual adverse effects. The following mitigation is recommended:

- Implementation of Good Industry Management Practice in the design and development of lighting systems and structures, including strategies to reduce the impact of lighting on bat species to the extent practicable while considering the needs of navigation safety and site security.

- Hydrology/Hydrogeology

  The potential for disturbances or effects from pathways related to hydrology or hydrogeology has been quantitively reviewed and adverse effects are not anticipated (see discussion in Section 5.5.5.4).

- Dust

The potential for disturbances or effects from pathways related to dust has been quantitively reviewed and adverse effects are not anticipated (see discussion in Section 5.5.5.4).

- Noise

It is anticipated that the greatest likelihood for an effect on bats from noise could be realized in treed habitats that function as roosting habitat. Adverse effects to foraging or flyover function is not anticipated. This is due to the timing of the site preparation and construction activities, which is expected to occur during daylight hours when bats are not active. As no noise generating activities will occur during the active bat period, i.e., throughout the evening and overnight period, potential for adverse effects is avoided.

Activities associated with the on-land earthmoving and grading such as operation of the spoil haul route and operation of the spoil pile are anticipated to generate elevated levels of noise during the daytime hours during the active bat roosting season. These activities are to occur in close proximity to the deciduous forest in the northern portion of the DNNP lands which has been documented to support likely roosting by endangered Little Brown Myotis. Reductions in occurrence of bat activity has been documented in areas that are subjected to elevated levels of anthropogenic noises, including roads [44] [45] [46] [47]. However, many of these studies have focused on noise effects during nighttime and effects to foraging and established thresholds for daytime noise levels that can trigger an effect to bat roosting function is lacking.

Studies have assessed the behavioural response of bats while roosting when subjected to anthropogenic noises [48] [49]. Both studies found that elevated anthropogenic noises stin the immediate vicinity of roost sites did elicit behavioural responses by roosting bats. Noise that causes bats to emerge from the roost site during the daytime would likely lead to mortality from exposure, predation, and lack of available food [48]. A negative outcome for bats that emerge at dusk but fail to return at dawn is less likely as these individuals may select alternate roost sites and return to the original roost once the noise disturbance ceases [48]. This study did not document behavioural responses with predicted detrimental outcomes for roosting bats when heavy equipment was operated, or drilling was undertaken as close as 45 m from roosting bats.

At the DN site, there are several sources of constant and intermittent noise. These include DNGS, the mainline CN railway, St. Marys Cement and Highway 401. The existing background noise level are 54.2 dB(A) [11]. Within the potential Little Brown Myotis roost the noise levels are predicted to reach a maximum of 62.4 dB(A), which is an incremental increase of 8.2 dB(A) (15%) over background [11]. These results were modelled using several conservative assumptions including continuous operation during the daytime and therefore represent a maximum noise level scenario, Another factor to consider is that given the existing relative high levels of noise, it seems possible that the Little Brown Myotis that utilize the woodland for potential roosting are already adjusted to the levels of noise on the site and the limited increase in noise levels may not cause behavioural responses that would be detrimental to the species.

A summary of the potential for effects not assessed in the EIS is provided in Table 5-11.

Table 5-11: Summary of the Potential Effects to Breeding Mammals (Indicator: Bat Species)

Potential Effects Pathway	Qualitative Assessment
Increased lighting	Potential for effects related to lighting impacts on bats during site preparation, construction and/or operation phases of the BWRX-300 was not assessed in the EIS. Qualitative assessment for the BWRX-300 indicates that additional mitigation related to lighting design and deployment should be included in the project.
Noise Disturbance to Bats	Potential for noise disturbance to bats during the site preparation, construction and/or operation phases of the BWRX-300 was not assessed in the EIS. The recent noise studies [11] indicate that the effects are anticipated to be minor.
Dust Disturbance to Woodlands and Treed Swamp Habitats	Potential for dust disturbance to bat habitat during the site preparation, construction and operation phases of the BWRX-300 was not assessed in the EIS. The recent dust studies [11] indicate that the effects are anticipated to be minor.
Changes in groundwater and/or surface water inputs to treed wetlands	Potential for changes in groundwater and/or surface water interaction with treed wetlands during the site preparation, construction and/or operations phase of the BWRX-300 was not assessed in the EIS. Hydrology investigation [32] shows that no appreciable effect on surface water or groundwater is anticipated.

5.5.5.9 EIS Section 5.5.9 - Assessment of Likely Effects on Landscape Connectivity

The EIS determined that likely effects on Landscape Connectivity will be a result of physical disruption (e.g., physical presence, noise, temporary barriers) associated with various works and activities performed during the Site Preparation and Construction phase. There are no regional connectivity pathways associated with the DN site and the local linkage shoreline corridor is not continuous due to the presence of the St. Marys Cement property wharf complex and the existing DNGS. However, a terrestrial corridor does extend east-west through the DN site with a local linkage from the on-site ponds to the Raby Head Marsh wetland on the St. Marys Cement property. Some disruption of the east to west corridor can be expected during the Site Preparation and Construction phase. During this period movement of wildlife along this route will be minimal.

The likely effects to Landscape Connectivity were related to the interruption of wildlife travel along the wildlife corridor extending east-west across the DN site This is considered an adverse effect of the DNNP and is further evaluated in terms of mitigation measures and residual effects.

The EIS identified the following mitigation measure to reduce or eliminate the effects on Wildlife Corridors:

- Incorporate to the extent practicable in the DNNP design, measures to maintain access for wildlife travel on the east-west wildlife corridor during construction activities; and to enhance the corridor function for the long-term.

Regarding the disruption of landscape connectivity affecting wildlife travelling along the east-west corridor, the DN site annual biodiversity monitoring since 1997 has led to the observation that wildlife is present, despite the roads and other disturbances on site. The mitigation measures and commitments associated with the bounding site development layout adequately address landscape connectivity and the effects of the BWRX-300 deployment.

5.5.5.10 Summary – EIS Section 5.5 - Terrestrial Environment

The works and activities provided in Section 3.2 are similar to the EIS project works and activities, therefore, the Project-Environment interactions considered for this review were the same as those considered in the EIS Table 5.5.-1. The assessment scenario for the BWRX-300 deployment provides an opportunity to retain some of the vegetation communities, and the species and habitat functions associated with them within the DNNP site.

The assessment criteria used in the EIS remain valid for the BWRX-300 deployment. Terrestrial baseline data has been updated since the EIS. Surveys for species at risk, amphibians, breeding birds, and vegetation communities have been carried out on the DNNP site, providing updated information on these species, particularly Bank Swallow and several bat species, that had not been identified in the EIS. Table 5-12 summarizes the review of the potential effects of the DNNP on the Terrestrial Environment.

Table 5-12: Summary of DNNP Likely Effects on Terrestrial Environment

EIS Section	Receptors	EIS Description	Application to BWRX 300 deployment
EIS Section 5.5.4 - Vegetation Communities and Species		The EIS determined that likely effects on Vegetation Communities and Species will be bounded by the direct losses of Vegetation Communities and Species due to works and activities performed during the Site Preparation and Construction phase, in particular Mobilization and Site Preparation which will see extensive clearing and grubbing of the site to facilitate its development, and Excavation and Grading which will generate dust. Dust emissions are also likely to result from some works and activities during the Operation and Maintenance phase with associated effects on vegetation. In terms of the more valued vegetation elements, the receptors for the Vegetation Communities and Species sub-component are Cultural Meadow and Thicket Ecosystem, Shrub Bluff Ecosystem, Wetland Ecosystem and Woodland Ecosystem.	The BWRX-300 deployment will result in the removal and impacts to vegetation communities east of Holt Road, albeit in smaller proportion than for the bounding scenario reactors in the EIS. For some sensitive vegetation communities including wetlands and woodlands, there is the opportunity that some locations (i.e., North Woodlands, Treefrog Pond, Polliwog Pond and Dragonfly Pond, South and Southeast Wetlands) that were to be removed for the bounding scenario reactors in the EIS may be retained due to the smaller footprint of the BWRX-300 reactors. To explore this opportunity, the potential impacts from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and identified that the effects are anticipated to be minor.
EIS Section 5.5.5 - Insects		The EIS determined that the likely effects on Insects will be bounded by the direct loss of habitat due to various works and activities performed during the Site Preparation and Construction phase. The receptors for the Insect sub-component were identified as dragonflies and damselflies and butterfly stopover areas. A rare species of dragonfly and an estimated 74 ha of Monarch butterfly habitat will be lost. This was further considered in terms of mitigation measures and residual effects.	The BWRX-300 deployment area of Monarch habitat loss may be less than described in the EIS as the BWRX-300 footprint is smaller. The three on-site ponds (Treefrog Pond, Polliwog Pond and Dragonfly Pond) that are the only habitats for the insect receptor (the Amber-winged Spreadwing) on the site may be retained. To explore this opportunity, the potential impacts from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and identified that the effects are anticipated to be minor.
EIS Section 5.5.6 - Bird Communities and Species	Breeding Birds	The EIS determined that site clearing can be expected to reduce the habitat, and consequently, the breeding population of the two indicator species of this VEC (i.e., Yellow Warbler and Red-eyed	The effects to breeding bird habitats and populations from the BWRX-300 deployment layout needed to be reviewed to comprehensively compare the BWRX-300 deployment to the EIS.

EIS Section	Receptors	EIS Description	Application to BWRX 300 deployment
		Vireo). They currently occupy primarily cultural communities and are expected to persist at the DN site. As such, the EIS concluded that the decrease in populations of breeding birds on the DNNP site is a residual adverse effect that may remain despite mitigation.	Air quality and noise modelling has been completed [11]. The potential effects from dust and noise disturbance on breeding birds are anticipated to be minor [11].
	Waterfowl Staging Area	The EIS determined that the area of shoreline near the DNNP site supports larger than typical numbers of waterfowl in part because of the staging and loafing opportunities offered by the DNGS structures and St. Marys Cement wharf. DNNP-related activities in the lake itself may disrupt these birds since they use this area throughout the year. The EIS determined that more waterfowl will likely be attracted to the area after the disruptions have subsided, but an effect may occur while the disruptions are in progress. Greater use of the waterfront by waterfowl is largely a positive effect as migrant, summering and winter waterfowl will have additional habitat opportunities created by these effects. Coot's Pond is unlikely to be directly affected by the DNNP and waterfowl use and staging are anticipated to continue there.	The effects of BWRX-300 deployment are similar to those assessed in the EIS since there is no change anticipated to the use of the site by staging waterfowl at Coot's Pond, as it will not be affected. Areas of warm water may increase along the shoreline of Lake Ontario, and it is unlikely there would be a decrease in waterfowl staging.
	Migrant Songbirds and their Habitat	The EIS determined that the DNNP will result in the loss of an estimated 74 ha of woody vegetation that are attractive to migrant songbirds, and this is considered further as an effect on migrant songbirds.	The smaller footprint of the BWRX-300 deployment results in less habitat loss for migrant songbirds than what was assessed in the EIS. Air quality and noise modelling has been completed [11]. The potential effects from dust and noise disturbance on migrant songbirds are anticipated to be minor.
	Bird Strikes	The EIS determined that the killing or injury of birds may occur because of bird strikes on cooling towers, other structures and buildings, and their possible entanglement in security fencing.	As the BWRX-300 does not include the construction of cooling towers the major cause of bird strikes has been eliminated. Bird strikes remain as an effect of the DNNP given that some large (i.e., high) structures and buildings will be constructed. The BWRX-300 deployment is therefore likely to have lesser effects than those associated to the cooling tower option assessed in the EIS.

EIS Section	Receptors	EIS Description	Application to BWRX 300 deployment
	Winter Raptor Feeding and Roosting Areas	The EIS determined that the winter raptor feeding and roosting areas are related to historical owl roosts and to winter foraging habitat for raptors, which is primarily Cultural Meadow. The EIS identified the loss of the one primary owl roost, and approximately 50% of the suitable winter raptor foraging habitat.	The BWRX-300 deployment would result in the opportunity to retain vegetation which would have been removed for the bounding scenario reactors described in the EIS. Air quality and noise modelling has been completed [11]. The potential effects from dust and noise disturbance on winter raptor feeding and roosting areas are anticipated to be minor.
	Bank Swallow	The EIS determined that because of the removal of the shoreline bluffs in the DNNP development area, a decrease in Bank Swallow nesting habitat will result. This was considered in the EIS as an adverse effect of the DNNP and was further evaluated in terms of mitigation measures and residual effects. The mitigation measures were identified in the EIS to address the decrease in Bank Swallow nesting habitat and colony size. Following the application of mitigation, the EIS determined that the residual adverse effect of the DNNP on Bank Swallows would be the loss of nesting habitat for up to 1,000 active Bank Swallow burrows and acknowledged that some mitigation not directly comparable to the effects will result in advances for the species elsewhere. The Bank Swallow colonies as a receptor for interaction with the DNNP were not assessed in the EIS as the habitat was to be entirely removed during site preparation for the bounding scenario.	Since the completion of the EIS in 2009, the Bank Swallow has been listed as a "threatened" species both provincially and federally and the species and its habitat are regulated under the provincial *Endangered Species Act* and the federal *Species at Risk Act*. Adverse effects of the DNNP will be subject to permitting/approval requirements under the relevant legislation. The footprint for the first BWRX-300 reactor provides an opportunity to preserve the Bank Swallow nesting habitat along the Lake Ontario shoreline in the short term. However, the footprint for four BWRX-300 reactors would likely require some shoreline protection measures which will cause the bank to become unsuitable for Bank Swallows to inhabit. The recent dust and noise [11], hydrogeology [33], and vibration modelling [35] found that the potential effects on Bank Swallows from these pathways are anticipated to be minor.

EIS Section	Receptors	EIS Description	Application to BWRX 300 deployment
EIS Section 5.5.7 - Amphibians and Reptiles		The EIS determined that the DNNP will result in the removal of three amphibian breeding areas (Treefrog Pond, Polliwog Pond and Dragonfly Pond). These ponds were not assessed in the EIS as a receptor for interaction with the DNNP as the habitat was to be entirely removed during site preparation for the bounding scenario reactors. The EIS determined that mitigation measures associated with the effects on Vegetation Communities were also beneficial for the Amphibians and Reptiles.	The smaller footprint of the BWRX-300 deployment results in less amphibian breeding areas than what was assessed in the EIS. The potential impacts from dust or changes in hydrology/ hydrogeology to these areas during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and identified that the effects are anticipated to be minor.
EIS Section 5.5.8 - Mammal Communities and Species	Breeding Mammals	The EIS determined that the likely effects on Mammal Communities and Species will largely result from the direct loss of habitat and construction-related disruption associated with works and activities performed during the Site Preparation and Construction phase. Although some mammal species are sensitive to noise, those at the DNNP site are already exposed to elevated noise levels and have become habituated to these conditions. Nevertheless, the EIS does not consider the potential adverse effect caused by atmospheric deposition of dust on vegetation that is habitat for mammals. The EIS determined that effects may also occur in the form of mammal collisions with DNNP-related traffic. However, the mammals present at the DNNP site are unlikely to be affected by road mortality at a measurable level. The EIS identified that mitigation measures associated with the effects on Vegetation Communities were also beneficial for the breeding mammals.	With the BWRX-300 deployment, there is an opportunity to retain habitat that was assessed as being removed in the EIS.
	Bats	Bats were not considered a receptor or indicator species in the EIS since their presence was only detected on the DNNP site in 2012.	Four species of bats that occur at the DNNP site are listed as a "threatened" species provincially and three of those are also listed as "threatened" federally and the species and its habitat are regulated under the provincial Endangered Species Act and the federal Species at Risk Act. Adverse effects of the DNNP will be subject to permitting/approval requirements under the relevant legislation. The qualitative assessment related to the potential for effects to bats from lighting has concluded that there is a

EIS Section	Receptors	EIS Description	Application to BWRX 300 deployment
			potential for effect that is not considered by the EIS or DNNP Site Preparation Licence Renewal process and warrants the adoption of in-design mitigation. The potential impacts from dust, noise [11] or changes in hydrology/ hydrogeology [33] to bat habitat during the site preparation, construction and/or operation phases of the BWRX-300 deployment have been completed and identified that the effects are anticipated to be minor.
EIS Section 5.5.9 - Landscape Connectivity		Regarding the disruption of landscape connectivity affecting wildlife travelling along the east-west corridor, the DN site annual biodiversity monitoring since 1997 has led to the observation that wildlife is present, despite the roads and other disturbances on site. The effects of the BWRX-300 deployment are expected to be similar to those assessed in the EIS.	The mitigation measures and commitments associated with the bounding site footprint adequately address landscape connectivity and the effects of the BWRX-300 deployment.

5.5.6 EIS Section 5.6 – Geological and Hydrogeological Environment

A review of the Project-Environment Interactions, likely effects, mitigation measures and the residual effects of the DNNP on the Geological and Hydrogeological Environment considered three sub-components: Soil Quality, Groundwater Quality and Groundwater Flow.

5.5.6.1 EIS Section 5.6.1 - Potential Project-Environment Interactions

Table 5-13 compares the works and activities likely to measurably change the geological and hydrogeological environment identified in the EIS to the BWRX-300 deployment.

Table 5-13: Comparison of DNNP Works and Activities Likely to Measurably Change the Geological and Hydrogeological Environment Identified in the EIS to the BWRX 300 Deployment

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
Site Preparation and Construction Phase		
Mobilization and Preparatory Work	Preparatory works will remove vegetation and loosen surface soils thereby increasing infiltration and the creation of roads and other hard surfaces will reduce infiltration. As a result, groundwater flow will change.	Removal of vegetation, loosening of surface soils and creation of roads and the associated effects are still applicable. Therefore, the BWRX-300 deployment information is consistent with the DNNP information in this EIS section.
Excavation and Grading	Excavation and grading activities (regardless of the surface compression or compaction associated with them) will change the recharge characteristics of the site and therefore will change the groundwater flow. Placement of fill materials will alter infiltration and recharge conditions and flow conditions (e.g., gradients). Excavation and associated dewatering will change groundwater flow.	Excavation and associated dewatering and the associated effects are still applicable. Deployment is expected to generate far less excavated material (3.3 Mm^3) than the bounding case assessed in the EIS of 12.4 Mm^3. The excavation depth required for the BWRX-300 reactor shaft will be deeper than assessed in the EIS. The impact on groundwater from the difference in depth is evaluated in a separate Groundwater Flow Modelling study [33]. The assessment results are discussed below this Table.
Marine and Shoreline Works	Extension of the shoreline into the lake will increase groundwater travel times to the lake thereby changing groundwater flow and groundwater discharge to the lake. Lake infill within the coffer dam will change infiltration	Lake infilling is not required and the associated effects are not applicable.

Project Works and Activities	EIS Rationale	BWRX 300 Deployment
	rates at the shoreline.	
Management of Stormwater	Stormwater runoff from parking areas, laydown areas and roadways discharging into ditches, swales, retention ponds, etc. can affect groundwater flow and recharge and when containing road salts, oils and greases, metals, nutrients, pesticides and petroleum hydrocarbons, can affect soil and groundwater quality.	Stormwater runoff and the associated effects are similar to those assessed in the EIS.
Operation and Maintenance Phase		
Operation of Active Drainage and Active Ventilation Systems	Releases of contaminants in the ventilation system and subsequent washout from precipitation have the potential to interact with the hydrogeology environment. Washout and infiltration of precipitation will affect groundwater quality.	Releases of contaminants in the ventilation system are similar to those assessed in the EIS. Therefore, the BWRX-300 deployment information is consistent with the DNNP information in this EIS section.
Operation of Condenser, Condenser Circulating Water, Service Water and Cooling Systems	Condenser Circulating Water System (for once through cooling water) will intercept groundwater (i.e., in the Forebay Channel) thereby affecting groundwater flow.	Uses once-through cooling and the system and associated effects are still applicable. Therefore, the BWRX-300 deployment information is consistent with the DNNP information in this EIS section.
Operation of Site Services and Utilities	Stormwater management systems (e.g., ditches, trenches) intercepts precipitation and changes groundwater infiltration and groundwater flow.	Comparable stormwater management systems and the associated effects are still applicable. Therefore, the BWRX-300 deployment information is consistent with the DNNP information in this EIS section.
Physical Presence of the Station	Deep foundations, utility trenches, hard surfaces, stormwater management facilities and other features will affect and potentially change groundwater flow. The Forebay Channel will change the shoreline thereby altering groundwater discharge locations.	The BWRX-300 foundation embedment is deeper than the bounding scenario reactors in the EIS. The effects associated with the deeper foundation are assessed in a separate Groundwater Flow Modelling study [33]. The assessment results are discussed below this table. The Forebay Channel and the associated effects are still applicable.

The effects associated with the deeper foundation are assessed in a separate Groundwater Flow Modelling study [33]. This study confirmed that the dewatering operations during construction would affect the groundwater flow, which normally flows towards Lake Ontario, but this effect would be temporary. After the construction period, and thereafter during the operation phase, the dewatering operations would cease and the effect of the deeper embedment on groundwater flow would be negligible. In contrast, the EIS considered permanent dewatering resulting in permanent changes to groundwater flow conditions. These changes were not considered to represent an adverse effect in the Geological and Hydrogeological Environment. Given that the BWRX-300 deployment will involve dewatering only during construction, and changes following construction are negligible, the deployment of four BWRX-300 reactors can be expected to have less anticipated effect on the hydrogeological environment than what was assessed in the EIS.

5.5.6.2 EIS Section 5.6.2 - Assessment Scenarios

The DNNP will alter groundwater flow on the site due to dewatering during construction, and alterations to the existing topography and recharge/discharge conditions. The 4 BWRX-300 reactors and, where necessary, 1 reactor are assessed in the groundwater flow study [33].

5.5.6.3 EIS Section 5.6.3 - Assessment Methods

Changes in groundwater flow on the DNNP site due to dewatering during construction were evaluated through a computer-based, three-dimensional groundwater flow model to determine the nature and extent of the changes. To compare the BWRX-300 deployment against the EIS, groundwater flow modelling was completed to assess the effects of the deeper BWRX-300 foundation on groundwater flow [33].

5.5.6.4 EIS Section 5.6.4 - Assessment Criteria

Predicted changes in conditions in the Geological and Hydrogeological Environment as a result of the DNNP were evaluated against applicable criteria listed below.

- Soil Quality - Ontario Environmental Protection Act, Part XV.1, Table 3
- Comparisons to background soil and groundwater quality concentrations
- Groundwater Quality - Ontario Environmental Protection Act, Part XV.1, Table 3
- Ontario Drinking Water Standards
- Groundwater Flow - Past studies
- Professional judgement

5.5.6.5 EIS Section 5.6.5 - Assessment of Likely Effects on Soil Quality

The EIS states that the likely effects on soil quality will largely be due to changes associated with the management of stormwater. This is generic information and is applicable to any reactor technology, including the BWRX-300. The EIS identifies the following mitigation measures to address the potential adverse effects associated with runoff:

- *Good Industry Management Practices during all phases of the DNNP will be routinely implemented for stormwater management. Good practice typically includes, among other actions: sediment control practices, stormwater conveyance systems and conventional stormwater treatment methods such as stormwater management ponds and oil-grit separators (EIS pg. 5-84* [3]*).*

The mitigation measures noted above are expected to reduce the adverse environmental effects and no residual effects were identified for soil quality. These mitigation measures are applicable to the BWRX-300 deployment and therefore no residual adverse effect on soil quality remains valid for the BWRX-300 deployment.

5.5.6.6 EIS Section 5.6.6 - Assessment of Likely Effects on Groundwater Quality

The EIS states that the likely effects on groundwater quality will largely be as a result of the management of stormwater. However, groundwater will flow to and discharge into the lake and the groundwater on the site is not used for drinking purposes (nor is groundwater on the DN site considered to represent a potable groundwater source). There are no Provincial Water Quality Objectives for chloride and sodium (derived from road salt) and therefore there will be no adverse impacts on surface water quality resulting from stormwater-impacted groundwater discharging into surface water. This is generic information applicable to any reactor technology, including the BWRX-300.

The EIS analyzes the effect of atmospheric emissions from the DNNP increasing the concentration of tritium in groundwater. Only tritium is considered as it is the dominant radionuclide affecting groundwater at the DNNP site, with other radionuclides having a negligible transfer to groundwater. The EIS uses the existing conditions associated with DNGS as representative of the potential effects of the DNNP, which have resulted in tritium concentrations of less than 10% of the Ontario Drinking Water Standard (ODWS). The gaseous radioactive emissions during normal operation are described in *Table 5.7-3 - Radionuclide release to air* of the EIS [3]. These correspond to the total emissions for a single reactor, using the bounding activity for each radionuclide. The tritium emissions are summarized in Table 5-14; the prorated values have been calculated based on the maximum number of reactors assessed for each design. The EIS determined that tritium in groundwater as a result of the DNNP is not considered to represent an adverse effect in the Geological and Hydrogeological Environment.

As seen in Table 5-14, the BWRX-300 tritium emissions are far less than the emissions of the bounding scenario reactors assessed in the EIS, for both the single reactor and prorated scenarios [50].

Table 5-14: Summary of Tritium Airborne Emissions (Bq/y) During Normal Operation – Single Reactor and Values Prorated for the Number of Reactors

Radionuclide	ACR 1000	EPR[a]	AP1000	EC6	BWRX 300
Single reactor values	1.20E+14	6.67E+12	1.30E+13	2.45E+14	9.70E+11
Prorated values	4.80E+14[b]	2.00E+13	5.20E+13	9.80E+14	3.88E+12

a. The prorated value for EPR corresponds to 3 reactors, while the rest correspond to 4 reactors.
b. This value is from Table 4.1-1 in the *Scope of Project for EA Purposes TSD* [51], which was the value used in the EIS, instead of the value of 2.00E+14 Bq [9].

A separate study [50] was conducted to assess the deposition of tritium onto soil and groundwater as a result of the operation phase of the DNNP. The baseline tritium activity was assessed for the operation of DNGS. The increased activity in air concentration, soil porewater, and groundwater for on-site locations was less than [redacted] for the operation of four BWRX-300 reactors. For off-site locations, the increase in activity is less than [redacted] for the operation of four BWRX-300 reactors.

The EIS identified the following mitigation measure when evaluating the effects of the DNNP on Groundwater Quality:

- *Good Industry Management Practices during all phases of the NND Project will be routinely implemented for stormwater management.*

The EIS determined that no residual adverse effects on groundwater quality are predicted in the Geological and Hydrogeological Environment as a result of the DNNP. Similarly, the BWRX-300 deployment will adopt the mitigation measures identified for the management of stormwater and its emissions of tritium to the atmosphere are lower than those assessed in the EIS.

5.5.6.7 EIS Section 5.6.7 - Assessment of Likely Effects on Groundwater Flow

<u>*Excavation and Grading (Dewatering)*</u>

The EIS describes permanent changes to the groundwater flow on the DN Site during the construction phase and the operational phase, since sump pumps would maintain a lower water table. The foundation for the BWRX-300 shaft will extend deeper into bedrock (38 m) than what was assessed in the EIS (13.5 m). The deeper foundation embedment depth for BWRX-300 deployment could also result in changes to the groundwater flow.

However, the BWRX-300 will use traditional vertical shaft construction methods using conventional construction equipment to excavate an oversized shaft full depth. The bedrock portion of the shaft will be excavated using pavement breakers, drilling, and blasting. De-watering systems will be employed during shaft excavation. During operation, groundwater surrounding the reactor building will be allowed to recharge to its pre-construction levels.

The *Geological and Hydrogeological Environment Assessment of Environmental Effects Technical Support Document*, *Volume 2* [52] summarizes the anticipated effects of the dewatering during construction and operation:

- Dewatering would lower the water table by approximately 14 m to an elevation of approximately 76 masl. Dewatering will result in drawdown of the water table and the Interglacial Deposits in the overburden. Because dewatering will be maintained by toe drains at the base of the excavated slopes throughout the operation of the facility, groundwater flow on the DN Site will be permanently changed.

- The effect of dewatering will reduce baseflow in Darlington Creek, eliminate the tributary through the DNNP area and extend off site into the St. Marys property. However, the effect on Darlington Creek is mitigated by increased recharge resulting from stormwater management and additional recharge in the area of the proposed Northeast Landfill. As a result, the effect on Darlington Creek, as determined by the groundwater flow model, is less than 2 to 5 percent of baseflow and will not be measurable. The effects on the Geological and Hydrogeological Environment are not considered to be meaningful.

Furthermore, as described in the *Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document, Volume 1* [53], the relatively higher K values for the hydro stratigraphic units will ensure that the lake water will not recharge to the reactor building excavations.

For the BWRX-300 reactors, there will be no permanent impact to the groundwater flow during the operational phase as the groundwater will be allowed to recharge to natural levels after excavation and construction. The ultimate flow direction and discharge point will remain Lake Ontario [33].

Excavation and Grading; Marine and Shoreline Works

The EIS discusses changes to groundwater flow from the construction of the Northeast Landfill Area, lake infilling at the Lake Ontario shoreline and the placement of additional soil in the Northwest Landfill Area. The placement of additional soil in the Northwest Landfill Area is not required for the BWRX-300 deployment. Lake infilling is not required for the BWRX-300 deployment and the associated effects are not applicable. Construction of the Northeast Landfill Area and placement of soil there, and the associated effects, is still applicable to the BWRX-300. Therefore, the BWRX-300 is consistent with the DNNP information in this EIS section.

Management of Stormwater

The EIS identified that stormwater management has the potential to alter groundwater flow conditions and recharge characteristics. There is generic information in this EIS section that applies to any reactor technology including the BWRX-300.

The EIS describes the following specific "in-design" mitigation measures that were considered in evaluating likely environmental effects:

- Stormwater management features incorporated into the Northeast Landfill Area will be designed and implemented with objectives of contributing additional baseflow into Darlington Creek and reducing the extent of the groundwater drawdown area north of the DN site; and
- All stormwater management features such as swales, ditches, and retention ponds will be designed and implemented to optimize opportunities to recharge the groundwater flow regime with surface water runoff.

The BWRX-300 will apply the same stormwater management measures.

Operation of Condenser and Condenser Circulating Water, Service Water and Cooling System

The operation of the Condenser and Condenser Circulating Water, Service Water and Cooling System (for the once-through lake water cooling system) will alter groundwater flow in that area of the site since the Forebay Channel required for such a system will collect groundwater that, under existing conditions, would discharge directly to Lake Ontario. The BWRX-300 deployment will require the same structures.

Physical Presence of the Station

The groundwater flow modelling has been analyzed in a separate Groundwater Flow Study [33] to evaluate the physical presence of the station during operation. Both the single reactor and 4-reactor scenario were assessed and confirmed that the presence of the BWRX-300 has negligible impact on groundwater flow.

5.5.6.8 Summary – EIS Section 5.6 - Geological and Hydrogeological Environment

The EIS states that the likely effects on soil quality will largely be due to changes associated with the management of stormwater. The EIS identifies the following mitigation measures to address the adverse environmental effects associated with runoff:

- *Good Industry Management Practices during all phases of the NND Project will be routinely implemented for stormwater management. Good practice typically includes, among other actions: sediment control practices, stormwater conveyance systems and conventional stormwater treatment methods such as stormwater management ponds and oil-grit separators.*

The mitigation measures noted above are expected to improve the adverse environmental effects and no residual effects have been identified for soil quality. The BWRX-300 deployment will align with these requirements to mitigate any effects on soil quality.

The EIS states that the likely effects on groundwater quality will also be largely the result of the management of stormwater and the effect of atmospheric emissions from the DNNP increasing the concentration of tritium in groundwater. Only tritium is considered as it is the dominant radionuclide affecting groundwater, with other radionuclides having a negligible transfer to groundwater. The EIS determined that tritium in groundwater as a result of the DNNP is not considered to represent an adverse effect in the Geological and Hydrogeological Environment.

The BWRX-300 tritium emissions are far less than the emissions of the bounding scenario reactors assessed in the EIS. In a separate study [50] the baseline tritium activity was assessed for the operation of DNGS. The increased tritium activity in air concentration, soil porewater, and groundwater for on-site locations was less than [redacted] for the operation of four BWRX-300 reactors. For off-site locations, the increase in activity is less than [redacted] for the operation of four BWRX-300 reactors.

The EIS determined that no residual adverse effects on groundwater quality are predicted in the Geological and Hydrogeological Environment as a result of the DNNP. Similarly, the BWRX-300 deployment will adopt the mitigation measures identified for the management of stormwater and the emissions of tritium to the atmosphere are lower than those assessed in the EIS.

The excavation depth required for the BWRX-300 reactors will be deeper than defined in the EIS. An assessment of the effects on groundwater flow and quality associated with the deeper foundation has been completed in a separate Groundwater Flow Modelling study [33]. This study confirmed that the dewatering operations during construction would affect the groundwater flow, which normally flows towards Lake Ontario, but this effect would be temporary. After the construction period, and thereafter during the operation phase, the dewatering operations would cease and the effect of the deeper embedment on groundwater flow would be negligible. In contrast, the EIS considered permanent dewatering resulting in permanent changes to groundwater flow conditions. These changes were not considered to represent an adverse effect in the Geological and Hydrogeological Environment. Given that the BWRX-300 deployment will involve dewatering only during construction, and changes following construction are negligible, the deployment of four BWRX-300 reactors can be expected to have less anticipated effect on the hydrogeological environment than what was assessed in the EIS.

5.5.7 EIS Section 5.7 – Radiation and Radioactivity Environment

This section of the EIS provides an evaluation of effects of the DNNP on the Radiation and Radioactivity Environment, giving consideration to five environmental subcomponents: Radioactivity in the Atmospheric Environment, in the Surface Water and Aquatic Environments, in the Terrestrial Environment, in the Geological and Hydrogeological Environments, and in Humans.

5.5.7.1 EIS Section 5.7.1 – Potential Project-Environment Interactions

The EIS presents potential interactions between the DNNP and the radiation and radioactivity sub-components in Table 5.7-1. The interactions identified in the EIS are entirely consistent with the BWRX-300 deployment with consideration that the BWRX-300 deployment is designed to be a zero radioactive liquid effluent release facility. There are no additional project activities that would have likely measurable changes that warrant further assessment.

5.5.7.2 EIS Section 5.7.2 – Assessment Criteria

Predicted changes in conditions in the Radiation and Radioactivity Environment as a result of the DNNP were evaluated against applicable criteria as described in Table 5-15. These criteria were used in the EIS and are applicable to BWRX-300 deployment.

Table 5-15: Evaluation Criteria for the Radiation and Radioactivity Environment

Radiation and Radioactivity Sub Component	Evaluation Criteria
Atmospheric Environment	• Radiation doses to humans must be below regulatory limits [54][1]
Hydrology, Surface Water and Aquatic Environment	• Drinking Water Standard [55] • OPG's commitment to maintain annual average tritium levels at all nearby WSPs below 100 Bq/L [56] • Radiation doses to humans must be below regulatory limits [54][1]
Terrestrial Environment	• Radiation doses to humans must be below regulatory limits [54][1]
Hydrogeology Environment	• Radiation doses to humans must be below regulatory limits [54][1]
Members of the Public	• Radiation Protection Regulations [54] • Natural background radiation dose in Canada[2]
Workers	• Radiation Protection Regulations [54]

[1] The levels of radiation and radioactivity in this environmental sub-component are not directly limited by regulation but are indirectly limited by this requirement.

[2] Used for comparison and perspective, but they are not regulatory criteria.

5.5.7.3 EIS Section 5.7.3 – Assessment Methods

The EIS assessed impacts from the Radiation and Radioactivity Environment to human health and to non-human biota. The discussion of environmental effects is framed in terms of doses to humans. It is noted that effects to non-human biota are addressed in EIS Section 5.14. These assessment methods used in the EIS are applicable to BWRX-300 deployment.

5.5.7.4 EIS Section 5.7.4 – Assessment Scenarios

The assessment scenario used in the EIS to assess the effects on the Radiation and Radioactivity Environment included:

- The maximum annual releases of the radionuclides to air and water from any of the reactor technologies, thus forming the bounding release scenario for assessment purposes.

The atmospheric release scenario corresponds to the total emissions for a single reactor, using the bounding activity for each radionuclide. Although the mix of radionuclides is different between the EIS and the BWRX-300, it is possible to compare the emissions by grouping the radionuclides. This is routinely done when calculating the annual dose to members of the public for the Environmental Monitoring Program (EMP) report [20]. Table 5-16 shows the summary of the estimated airborne emissions during normal operation for each reactor assessed in the EIS as well as the BWRX-300 [9].

Table 5-16: Summary of bounding airborne emissions (Bq/y) during normal operation (single reactor values)

Radionuclide	ACR 1000	EPR	AP1000	EC6	Bounding Value (BV)	BWRX 300	Ratio BWRX/BV
Carbon-14	2.76E+11	2.70E+11	2.70E+11	3.20E+11	3.20E+11	4.00E+11	1.25
Noble Gases	5.90E+13	1.78E+15	4.09E+14	2.45E+14	1.78E+15	2.30E+13	0.01
Iodines	1.60E+07	1.51E+09	1.92E+10	1.60E+07	1.92E+10	1.93E+10	1.01
Particulates (beta-gamma)	4.74E+07	4.67E+07	1.75E+09	4.75E+07	1.75E+09	1.17E+08	0.07
Tritium	1.20E+14	6.67E+12	1.30E+13	2.45E+14	2.45E+14	9.70E+11	0.00

Table 5-17 shows the summary of the estimated airborne emissions during normal operation for the prorated number of reactors.

Table 5-17: Summary of bounding airborne emissions (Bq/y) during normal operation (values prorated for the number of reactors)

Radionuclide	ACR 1000 (4 Reactors)	EPR (3 Reactors)	AP1000 (4 Reactors)	EC6 (4 Reactors)	Bounding Value (BV)	BWRX 300 (4 Reactors)	Ratio BWRX/BV
Carbon-14	1.10E+12	8.10E+11	1.08E+12	1.28E+12	1.28E+12	1.60E+12	1.25
Noble Gases	2.36E+14	5.34E+15	1.64E+15	9.80E+14	5.34E+15	9.22E+13	0.02
Iodines	6.40E+07	4.53E+09	7.68E+10	6.40E+07	7.68E+10	7.73E+10	1.01
Particulates (beta-gamma)	1.90E+08	1.40E+08	7.00E+09	1.90E+08	7.00E+09	4.69E+08	0.07
Tritium	4.80E+14 [a]	2.00E+13	5.20E+13	9.80E+14	9.80E+14	3.88E+12	0.00

a. This value is per Table 4.1-1 in [51], which took priority over the value of 2.00E+14 [9].

As shown in Table 5-16 and Table 5-17, the BWRX-300 atmospheric emissions (i.e., tritium, particulates, and noble gases) are lower than the emissions for the bounding single reactor and 4-reactor scenarios in the EIS. The BWRX-300 atmospheric emissions of iodine and carbon-14 are slightly higher than emissions in the EIS. The BWRX-300 reactor emits negligible tritium activity compared to the bounding scenario reactors because it does not use heavy water. The activation of the light water primary coolant in the BWRX-300 is expected to generate very little tritium compared to the CANDU reactors.

The BWRX-300 is designed to be a zero radioactive liquid effluent release facility and thus will not release radioactive liquid effluents during normal operations.

5.5.7.5 EIS Section 5.7.5 – Likely Effects of Radioactivity on Humans

Doses to the General Public

The key inputs to the dose to public calculation are receptors, exposure pathways and radiological contaminants. The calculated estimated annual dose is then compared against the regulatory limit to ensure compliance.

The following content was identified as contributing information to the dose to public, requiring review and verification:

- Human receptors for the calculation of the dose to the public
- Exposure pathways for humans
- Specific design features with an impact to effluents, such as different cooling options
- The resulting annual doses to receptors from bounding releases for prorated number of reactors during normal operation, so that the airborne releases for the ACR-1000 and AP1000 correspond to 4-reactors, while the airborne releases for the EPR corresponds to 3-reactors.
- The regulatory limit as benchmark dose for significance of effect

All these factors contribute to and culminate in the total public dose estimates from normal operation. In the EIS, the maximum calculated dose is to the resident at the dairy farm and is approximately 4 μSv/y for the prorated scenario (four ACR-1000 reactors, three EPR reactors, four AP1000 reactors).

Since the completion of the EIS in 2009, there have been changes to the human receptors, exposure pathways for humans, and to design features that impact effluents, such as the zero radioactive liquid effluent design of the BWRX-300 deployment.

The impact of the change in emissions for the BWRX-300 deployment has been assessed by calculating the dose to human receptors located around the DNNP site during normal operation. This has been completed in a separate assessment [50]. The results from this assessment estimate that the dose to a receptor is approximately 1.2 μSv/year for four BWRX-300 reactors. This dose is well within the 1000 μSv/year regulatory limit, as well as the dose of 4 μSv/year calculated in the EIS. Therefore, the anticipated dose to the public is less than that assessed in the EIS.

Doses to Workers

The estimated annual collective dose for the EIS bounding scenario reactors is approximately 0.67 Person-Sv per reactor or 2.68 Person-Sv in total, considering the maximum number of reactors for each reactor type. This includes both normal operations and routine outage maintenance activities.

In the EIS, the dose to workers was assessed to have a measurable change on the radiation and radioactivity environment but was not considered to have an adverse impact from the DNNP. In the EIS, the predicted radiation doses are well below the regulatory limit for workers (100 mSv per 5 years with a maximum of 50 mSv in any one year). Accordingly, radiation doses to workers are not considered to represent an adverse effect of the DNNP in the Radiation and Radioactivity Environment and no further evaluation is warranted.

According to the EIS, improved equipment reliability performance standards will contribute to shorter and more efficient outage execution requiring plant workers to spend less time in radiological hazard locations, hence receiving less radiation dose. Thus, it is expected that the actual dose for the three reactor designs (AP1000, EPR and ACR-1000) will be lower than existing reactors of predecessor designs. This is expected to be the case with the BWRX-300 deployment.

During the Operation and Maintenance, and Decommissioning phases, the access and movement of non-Nuclear Energy Workers (non-NEWs) involved on DNNP will be controlled by OPG. Radiation doses to these non-NEWs as a result of licensed activities on site will also be controlled by OPG, thus ensuring that they do not exceed 1 mSv/y, the regulatory limit for individuals who are not NEWs.

Overall, the dose to NEWs and non-NEWs will be kept below their respective regulatory limits. The EIS bounds the deployment of BWRX-300 reactors.

5.5.7.6 Summary – EIS Section 5.7 - Radiation and Radioactivity Environment

Overall, the Radiation and Radioactivity Environment is considered a Project-Environment interaction in other environmental components such as Aquatic, Terrestrial, Non-Human Biota Health and Human Health. The EIS determined that there are no significant adverse residual effects on these environmental components.

A comparison of emissions from the BWRX-300 reactors and the bounding scenario reactors found that airborne tritium, carbon-14, particulates, and noble gases emissions from the BWRX-300 are less than the emissions from the same parameters for the bounding scenario reactors. In contrast, the emissions of iodines are slightly higher for the BWRX-300 than for the bounding scenario reactors in the EIS. The BWRX-300 is a zero radioactive liquid effluent plant by design, with zero radioactive liquid releases anticipated during normal operation.

The EIS assumed a high rate of emission of tritium, which resulted in elevated tritium concentrations in soil, surface water, groundwater, and vegetation. The overall emissions of tritium from the BWRX-300 are negligible in comparison, with zero discharge to surface water. Since the overall emissions of the BWRX-300 are lower than what was assessed in the EIS, the effects on the Terrestrial and Aquatic Environment are consistent with the EIS.

Calculations of the estimated dose to the public during normal operation confirm that the design and release characteristics of the BWRX-300 result in doses that are a small fraction of the dose limit for the public. This analysis is documented in a separate assessment [50] where the dose to members of the public for the deployment of four BWRX-300 reactors was found to be less than that assessed for the bounding scenario reactors in the EIS.

5.5.8 EIS Section 5.8 – Land Use

The EIS provides an assessment of effects of the DNNP on the Land Use environmental component and considers two sub-components: Land Use and Visual Setting.

5.5.8.1 EIS Section 5.8.1 - Potential Project-Environment Interactions

The Project-environment interactions identified in EIS for the different land use sub-components remain largely consistent with the BWRX-300 deployment except for the effects associated with lake infilling and cooling towers, as these are not utilized for the BWRX-300 deployment. As such, the following effects identified in EIS will not occur for the BWRX-300:

- Marine and Shoreline Works: Lake infilling will result in a measurable change to the visual setting from Lake Ontario vantage points.
- Construction of Ancillary Facilities: Construction of cooling towers will result in a measurable change on the visual setting.
- Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems: Vapour plumes from mechanical draft cooling towers; and the physical presence of the natural draft cooling towers and associated vapour plumes will result in a measurable change to land use and visual setting.
- Physical Presence of the Station (specifically referring to the cooling towers): The increased intensity of on-site activities; and the apparent visual presence of dominant features (e.g., cooling towers) are likely to contribute to the evolution of employment uses in proximity to the DNNP site.

5.5.8.2 EIS Section 5.8.2 – Assessment Scenarios

For land use, four time-based scenarios were adopted as milestone points at which DNNP-related effects would be evaluated: existing land use scenario (2006 baseline), growth scenario (2006-2031), growth scenario (2032-2056) and long-term growth scenario (beyond 2056).

For visual setting, the scenarios chosen for visual analysis included plant layouts with cooling towers as these are the most visually dominant plant features. Cooling towers are not applicable to the BWRX-300 deployment as once-through cooling is to be used. Therefore, the visual-related effects of the BWRX-300 are considered to be an improvement over that assessed in the EIS.

5.5.8.3 EIS Section 5.8.3 - Assessment Methods

To consider potential effects of the DNNP on Land Use, the forecast future uses of lands in relevant assessment zones were evaluated, the applicable land use designations and policy regime for the existing (i.e., 2006 baseline) condition. The DN site already existed as an operating licensed nuclear site and the planning and design of the site was based on the expectation that it would be expanded to add reactors in the future. The forecast uses were based on the growth scenarios noted above. Two land use assessment zones were adopted for the Land Use EA studies:

- An Exclusion Zone: A specific exclusion zone has not been established for the bounding scenario reactors in the EIS. For EA purposes, it is assumed that the site's exclusion zone will not extend beyond the DN site boundary.
- 10-km Land Use Assessment Zone: This zone includes the major urban areas and residential communities in proximity to the DN site and is appropriate for evaluation of atmospheric emissions, traffic impacts and the interface between land uses and visual interactions.

The Visual Setting was assessed primarily considering the likely effects associated with cooling towers since, if they are selected as the means for condenser cooling, they will be the most visually dominant features on the DN site. The visual effect of towers considers both their physical presence and the vapour plumes released from them. Views and vistas under baseline conditions were compared to the future views and vistas as developed through computer simulations.

5.5.8.4 EIS Section 5.8.4 - Assessment Criteria

Predicted changes in parameters relevant to conditions in the Land Use environmental sub- components were evaluated against applicable criteria described below:

- Regular disturbance/nuisances to off-site residences, businesses and institutions which may change the manner in which land is used (i.e., increased noise, dust, or traffic).
- Compliance with legislation, regulations, policy and good planning practice.
- Existing and future use and development of land (impact on present and planned land use).
- Impact on views and vistas (based on sensitivity of vantage point; extent of obstruction, distance from DNNP site and duration of view).
- Likelihood of change brought about on existing and future uses of land as a result of the visual feature.

- Professional judgement

5.5.8.5 EIS Section 5.8.5 - Assessment of Likely Effects on Land Use

Existing land uses in proximity to the DNNP site include a range of residential, employment and commercial and related uses. This is still applicable to the site today. Since the completion of the EIS in 2009, the area surrounding the DNNP site has developed, and areas designated for development have been updated.

The EIS identified several developments in the vicinity of the DNNP site, including residential development, employment development, proposed developments including sensitive land uses and Future Living and Employment Areas. A review of current development plans and proposals for the Municipality of Clarington [57] [58] confirm that the surrounding region continues to grow in terms of population and economy.

The two likely effects on Land Use VECs presented in the EIS are:

1. The visual analysis established that cooling towers associated with DNNP will be a visually dominant feature in the landscape. Cooling towers are not used for the BWRX-300 deployment as the BWRX-300 reactor uses once-through cooling.
2. As DNNP is developed and operated, the increased intensity of activities on the DNNP site is likely to result in changes to the land use and development patterns that would not emerge otherwise. As the intensity of use increases on the DNNP site, some of the existing, as well as currently proposed sensitive land uses (school, hospitals, and residences for vulnerable clienteles) surrounding the site will likely transition to employment and industrial uses. For emergency planning purposes, it can be expected that new sensitive land uses will be directed away from the DNNP site, which will result in a change to the land use and development patterns from those that would otherwise exist. This environmental effect is applicable to the BWRX-300 deployment as DNNP will still be developed and operated.

The EIS identifies the following mitigation measures to address environmental effect #2 (above):

- OPG to continue to monitor land use activity in proximity to the DNNP site and consult with the Municipality of Clarington and the Region of Durham on proposed land use changes and effects on implementation of emergency plans; and
- OPG to continue to engage the Region of Durham with respect to the Regional Official Plan Amendment application to implement the Growing Durham Study, Preferred Growth Scenario and Policy Directions and proposed Future Land Uses in the Primary and Contiguous Zones.

The mitigation measures noted above are expected to ameliorate adverse environmental effects on the land use planning regime in the local area around the DNNP site. No residual effects have been identified for Land Use. It is expected that the BWRX-300 deployment will implement these measures to mitigate any effects on Land Use.

5.5.8.6 EIS Section 5.8.6 - Assessment of Likely Effects on Visual Setting

Cooling towers are not used for the BWRX-300 deployment since the BWRX-300 reactor uses once-through cooling and cooling towers will not be constructed. Therefore, the visual-related effects of the BWRX-300 deployment are less prevalent than those assessed in the EIS.
The recommended mitigation measures are not applicable as once through cooling is the selected cooling option.

5.5.8.7 Summary – EIS Section 5.8 - Land Use

The BWRX-300 deployment information is consistent with the DNNP information in the EIS, except for the effects associated with lake infilling and cooling towers, which are not being used. BWRX-300 deployment does not require lake infilling. The visual effect of cooling towers is not applicable for the BWRX-300 reactor since no cooling towers are required.

The EIS identifies mitigation measures to address the applicable effects on land use such that no residual effects are likely. The BWRX-300 deployment will implement these measures to mitigate any effects on Land Use.

5.5.9 EIS Section 5.9 – Traffic and Transportation

This section of the EIS presents an evaluation of effects of the DNNP on the Traffic and Transportation environmental component, giving consideration to two sub-components: Transportation System Operations (road, rail, marine) and Transportation System Safety (road, rail, marine).

5.5.9.1 EIS Section 5.9.1 – Potential Project-Environment Interactions

The Project-Environment interactions identified in Table 5.9-1 in the EIS for the different traffic and transportation sub-components and are all still applicable with the BWRX-300 deployment, except for:

- Off-site transportation of excavated material. The BWRX-300 deployment is expected to produce far lower volumes of excavated soil and rock than assessed in the EIS; The bounding value for excavated soil and rock in the EIS is 12.4 Mm^3, which is the earthmoving value for 4 reactors. The BWRX-300 has an estimated excavation requirement of approximately 3.3 Mm^3 for 4-reactors [10] which is much lower than the earthmoving estimations in the EIS and also lower than the area available in the Northeast Landfill Area of 4.5 Mm^3. This means that soil may not need to be transported to off-site disposal. Nonetheless, this option was still assessed in the EIS, if it is required.

EIS Assessment Scenarios

To evaluate the likely effects on traffic and transportation, the DNNP was considered at specific points in time throughout its evolution. Four time-horizons were developed. Road traffic modelling results are also presented in this EIS section. Road traffic conditions for each time horizon of the DNNP were evaluated.

For the EIS assessment, changes in traffic and transportation conditions on the road network were predicted based on traffic modelling to establish the Level of Service (LOS) at key intersections in the road network.

Updated dates and associated project activities and information were aligned with the current schedule for the BWRX-300 deployment.

5.5.9.2 EIS Section 5.9.2 - Assessment of Likely Effects on Transportation System Operations

Transportation System - Road

Traffic volumes generated by the DNNP is highly dependent on staffing levels. The BWRX-300 is expected to have less workers present at each stage of the DNNP's lifecycle. The EIS assumed a peak construction workforce of approximately 4,200 people. In the later years of the site preparation and construction phase, the construction complement may range from 1,750 to 3,500 workers depending on how many reactors are constructed. If two additional reactors are constructed, the project related workforce would be approximately 5,200, which includes approximately 1,400 workers involved in reactor operation.

The BWRX-300 deployment expects approximately 2,100 workers to be on-site during peak construction. The BWRX-300 deployment estimates only 150 people will be required for each reactors' operation. This value combined with the maximum plant construction workforce for BWRX-300 reactors of ~2,100 people would mean a maximum workforce of 2,250 during the construction of the of the other three reactors. Once the four reactors are in operation, the workforce on site is expected to be around 600 people.

Along with a smaller workforce needed for all phases of the BWRX-300 deployment, the removal of soil and rock will be less than assessed in the EIS, resulting in fewer trucks and less construction related traffic.

Transportation System - Rail

The EIS assumes the CN Rail corridor will remain in service for all phases and that operation of the rail service is not expected to be affected by the DNNP. It is assumed this will be applicable for the BWRX-300 deployment and consistent with the effects outlined in the EIS.

Transportation System - Marine

The EIS states that it is possible that some oversize operating components will be shipped to the DNNP site by marine transport and that the shipments will be limited in number. The same assumption is valid for the BWRX-300 deployment, as it is possible that the turbine-generator might be shipped by barge, if necessary. Therefore, BWRX-300 deployment information is consistent with the DNNP information assessed in this EIS section.

The EIS identified the following mitigation measures associated with Transportation System Operations:

- *A Traffic Management Plan will be implemented with the objective of reducing disruption and maintaining safe traffic conditions during the Site Preparation and Construction phase;*
- *As part of the Traffic Management Plan, collaborate with the responsible agencies to ensure that the DNNP-related traffic is fully considered in the design and implementation of off-site road improvements; and*
- *As part of the Traffic Management Plan, collaborate within a framework of specific undertakings between the appropriate parties to identify transportation system deficiencies and facilitate improvements with respect to traffic safety and roadway degradation related to the DNNP*.
- Traffic Management Plan will ameliorate the disruption to normal school bus operation.

No other transportation mitigation measures were identified in the EIS. After considering implementation of these mitigation measures, the EIS determined that no residual adverse effects on Transportation System Operations (road, rail, marine) are predicted. Given the reduced workforce, reduced traffic volumes and no expected change to either marine or rail transport conditions, no residual adverse effects on transportation system operations as a result of the BWRX-3000 deployment are anticipated following the implementation of mitigation measures identified in the EIS.

5.5.9.3 EIS Section 5.9.3 - Assessment of Likely Effects on Transportation System Safety

The EIS determined that, after consideration of the mitigation measures, no residual adverse effects on Transportation System Safety (road, rail, marine) are predicted. The BWRX-300 deployment information is not expected to change conditions in terms of either marine or rail transport to the extent that transportation system safety would be affected.

At the time of the EIS a Traffic Management Plan was proposed to be developed in consultation with Municipality of Clarington, Region of Durham, and Ministry of Transportation Ontario (MTO). This plan would include the objective of "*reducing disruption and maintaining safe traffic conditions during the Site Preparation and Construction phases*". Therefore, any change in transportation system safety is expected to be captured and mitigated within this plan. This Traffic Management Plan has now been completed.

5.5.9.4 *Summary – EIS Section 5.9 - Traffic and Transportation*

The BWRX-300 deployment would generate less traffic than what was assumed in the EIS as it requires a smaller workforce throughout the phases of the DNNP and requires fewer trucks and vehicles to remove the reduced volume of soil and rock. Effects to traffic and transportation system operations and safety both on and off the DNNP site are anticipated to be less than that assessed in the EIS.

5.5.10 EIS Section 5.10 – Physical and Cultural Heritage Resources

This section of the EIS presents an evaluation of effects of the DNNP on the Physical and Cultural Heritage Resources environmental component, giving consideration to two sub-components: Archaeology and Built Heritage, and Cultural Landscapes.

5.5.10.1 *EIS Section 5.10.1 - Potential Project-Environment Interactions*

The EIS determined that the only project works or activities that might interact with this environmental component are those associated with physical disturbance to the site that take place during the Site Preparation and Construction phase of the DNNP. No interactions will occur during the Operation and Maintenance phase. Interactions are identified for mobilization and preparatory works, excavation and grading and management of stormwater.

All of these works and activities are still required for the BWRX-300 deployment. Therefore, the Project-Environment interactions identified are still valid.

This EIS section also describes the methods and assessment criteria used to evaluate the potential effects of the DNNP on the physical and cultural heritage resources component. This is generic information that applies to any reactor technology, including the BWRX-300. There is no changes to the effects outlined in the EIS.

EIS Review of Assessment Scenarios

To consider the likely effects associated with the DNNP, the locations of identified Physical and Cultural Heritage Resources were overlain on the bounding site development layout as this represented the aggregated worst-case physical disturbance and the extent of the loss or disturbance to these resources.

EIS Assessment Criteria

Predicted changes in conditions relating to Physical and Cultural Heritage Resources as a result of the DNNP were evaluated against the following criteria:

- Archaeology Loss or displacement of archaeological sites determined to have heritage value or interest.

- Loss, displacement or disruption of built heritage features (BHF) or cultural landscape units (CLU) determined to have heritage value or interest.

5.5.10.2 EIS Section 5.10.2 - Assessment of Likely Effects on Archaeology

The EIS states that two resources will experience total displacement due to Site Preparation and Construction works and activities:

> *As a result of physical disturbance of the site during the Site Preparation and Construction Phases, two Euro-Canadian archaeological resources, identified as Site H1 (Brady, AlGq-83) and Site H7 (Crumb, AlGq-86), will experience total displacement* (EIS pg. 5-129) [3].

The locations of these resources are identified on EIS Figure 4.10-1 and are shown in Figure 5-4.

Figure 5-4: Locations of Archaeological Resources on the DN Site

The 4-reactor layout is shown in Figure 5-5. The construction of 4 BWRX-300 reactors will require the use of the Northeast Landfill, where Site H7 is located. In addition, it will require some development along the shoreline where Site H1 was located. For the 4-reactor layout, both sites will be disturbed. The other three sites are not anticipated to be affected by BWRX-300 deployment. Since the EIS assumed that both sites will be disturbed, the effects of BWRX-300 deployment are consistent with those assessed in the EIS.

Figure 5-5: BWRX-300 4-Reactor Layout - Construction

The EIS identifies the following mitigation measures to ameliorate the likely effects on archeology:

- Excavation of the two affected archaeological sites consistent with procedures identified in the revised draft Standards and Guidelines for Consultant Archaeologists (MCL 2009: Section 4).

The EIS determined that the implementation of this mitigation measure will result in no residual adverse effects on the Indigenous and Euro-Canadian archaeological resources.

OPG has already implemented these mitigation measures. Both Site H1 (Brady) and H7 (Crumb) have been excavated and artifacts recovered. OPG has also taken measures to engage archeological specialists to provide orientation training to trades staff and perform field monitoring during site preparation activities, in consultation with First Nations representatives.

The BWRX-300 will comply with any additional mitigation measures identified in the EIS to address the effects on archaeology.

5.5.10.3 EIS Section 5.10.3 - Assessment of Likely Effects on Built Heritage and Cultural Landscapes

The EIS describes the likely effects on built heritage and cultural landscapes, as well as the planned mitigation measures and residual effects. The EIS states that soil placement may encroach onto these sites:

> *The Project may include the placement of surplus excavated soil at the existing Northwest Landfill Area. Should this occur and should the soil placement encroach into the area thought to be occupied by the Burk Cemetery, and Burk Pioneer Cemetery Monument and Plaque (BHF-1) (see Figure 4.10-2) the cemetery, and the monument and plaque will be deemed to be totally Displaced* (EIS pg. 5-130).

Figure 5-5 shows the layout of the construction area needed for the 4 reactors and use of the Northwest Landfill Area is not required for the BWRX-300 deployment.

The EIS identifies the following mitigation measures to avoid or minimize the likely effects on the built heritage and cultural landscapes:

- Avoidance and/or protection of built heritage resources.
- If DNNP impacts are unavoidable, then documentation and re-location measures will be implemented.
- If necessary, and in advance of construction-related activities in the area, the Burk Cemetery will be closed in accordance with the Cemeteries Act (Revised 1992) and all burial remains re-interred in a local cemetery. The Burk Pioneer Cemetery Monument and Plaque will be relocated to a suitable off-site location.

The BWRX-300 will comply with these mitigation measures to address the effects on the Euro-Canadian built heritage resources and Euro-Canadian cultural landscape resources.

5.5.10.4 Summary – EIS Section 5.10 - Physical and Cultural Heritage Resources

The survey conducted during the EIS indicated that the only affected heritage resources sites at the DNNP site or along the access road were the Brady (H1) and Crumb (H7) sites. Both were later recovered in 2012/2013. However, should previously undocumented archaeological resources be discovered during the BWRX-300 deployment, procedures that comply with the *Ontario Heritage Act* would be followed and OPG would inform and consult with Indigenous Nations and communities. Any identified heritage resource sites will be protected and monitored during project activities.

5.5.11 EIS Section 5.11 – Socio-economic Environment

The EIS presents an evaluation of effects of the DNNP on the Socio-economic Environment, considering five sub-components: Human Assets, Financial Assets, Physical Assets, Social Assets and Natural Assets.

To support the submission to the CNSC for licence renewal, OPG completed a review of the socio-economic assessment originally completed in 2009 [59] in the *Darlington New Nuclear Project Site Preparation Licence Renewal – Socio-Economic Effects Review* (2019) [60].

5.5.11.1 EIS Section 5.11.1 – The DN Site and its Socio-economic Context

The EIS describes the historical context of the DNNP Site and the OPG, and the Clarington DNNP Host Municipality Agreement. These details have changed since the completion of the EIS in 2009 and are not specific to any reactor technology including BWRX-300.

5.5.11.2 EIS Section 5.11.2 - Potential Project-Environment Interactions

The EIS identifies a broad range of Project-Environment interactions with the Socio-economic Environment for each phase of the DNNP. All the works and activities identified are still required for the BWRX-300 and all identified Project-Environment interactions are applicable to the BWRX-300 deployment.

Assessment Methods

The EIS describes the assessment methods used in the socio-economic assessment. These included:

- Field Reconnaissance Visits
- Statistics Canada and Secondary Source Data Collection
- DN Site and DNNP Socio-economic Characterization
- Public Attitude Research
- Local and Regional Stakeholder Interviews
- Economic Modelling
- Natural and Physical Assets Analysis

5.5.11.3 EIS Section 5.11.3 - Evaluation Indicators, Parameters and Criteria

The appropriate receptors and indicators for evaluating conditions in the Socio-economic Environment were developed with an overall Community Well-Being Framework used as the framework for the socio-economic assessment. A detailed set of evaluation indicators are provided in the EIS and in the *Socio-Economic Effects Review* [60] for the following environmental sub-compartments:

- Human Assets
- Financial Assets
- Physical Assets

- Social Assets
- Natural Assets

5.5.11.4 EIS Section 5.11.4 - Assessment of Likely Effects on Human Assets

This EIS section and its sub-sections discuss the effects assessment results for several human assets: population and demographics, skills and labour supply, education, fire, police and emergency service and health care, social services as well as economic development services.

Population and Demographics

The EIS determined that DNNP will result in population growth:

> *Overall, the NND Project will result in an increase in the population associated with, or directly dependent on Project-related employment. The Project will be a positive contributor to the anticipated growth in population across the study areas; with Durham Region in the RSA[4] and the Municipality of Clarington in the LSA experiencing the most Project-related growth* (EIS pg. 5-140).

The *Socio-Economic Effects Review* [60] concluded that there were no changes to the residual socio-economic effects to populations and demographics since 2009.

Due to a smaller number of workers for all phases of the DNNP, the site-related population increase will not be as much as assessed in the EIS. However, the BWRX-300 will still contribute to population growth of the area through DNNP-related employment.

Skills and Labour Supply

The DNNP's effects on the skills and labour supply in the area are summarized below. The DNNP will:

- Draw on Ontario's trades labour force, which are expected to be sufficient to supply peak labour demands of the DNNP.
- Place a sustained demand on the regional and provincial construction labour force. However, measurable adverse effects on the labour force are not considered likely due to recent initiatives to sustain the construction labour workforce. However, the BWRX-300 is expected to have fewer workers present at each stage of the site's lifecycle. Since the BWRX-300 will require less personnel, it can be qualitatively concluded that the demand for skilled labour will be less than previously anticipated for DNNP.
- Create new apprenticeship opportunities that will positively contribute to the ongoing initiatives of government, labour groups and others involved in the construction industry [3]. The BWRX-300 is expected to have fewer workers and apprenticeship opportunities

[4] Regional Study Area

will be lower than anticipated in the EIS. A beneficial effect of the BWRX-300 deployment remains.

- Likely place an increased and sustained demand on provincial electricity sector labour force and increase competition for skilled electricity sector workers. On its own, the BWRX-300 deployment is not expected to increase competition for skilled electricity sector workers.
- Help maintain existing jobs at the DNNP site during the Operation and Maintenance phase and serve to maintain the skilled employment base of the Regional Study Area (RSA)'s and LSA's energy sector in the short term and contribute to the expansion of the skills base over the long term [3].

The *Socio-Economic Effects Review* [60] concluded there was no change since 2009 regarding the residual effects of the DNNP on the maintenance of the skilled employment base.

In summary, the effects of BWRX-300 deployment are similar to those assessed in the EIS, albeit smaller in magnitude. It is expected that the same demands and workforce availability will be experienced for the BWRX-300 and that the DNNP will contribute to economic growth and post-pandemic recovery of Ontario's workforce.

Education

The EIS states that increased school enrolment will occur across the RSA because of DNNP, with the greatest increase during the Operation and Maintenance phase. The EIS states that DNNP will increase school enrollment, but that it will not disrupt the education system.

The BWRX-300 deployment is expected to have fewer workers present at each stage of the site's lifecycle. As the BWRX-300 will require less personnel, it can be concluded that the proportional increase in school enrollment will be less than assessed in the EIS.

The only adverse effect noted is the disruption to normal school bus operation. The implementation of a Traffic Management Plan will ameliorate this adverse effect, after which, no residual effects are likely. This mitigation measure also applies to the BWRX-300 deployment. As such, it can be concluded that no residual effects would remain as well.

Health and Safety Services

The EIS describes that during the DNNP Site Preparation and Construction phase, the entity retained by OPG to implement the site preparation and construction activities will be required to develop a health and safety plan that will include provisions, among others, for fire and emergency protection, that is acceptable to OPG and applicable regulatory agencies. This requirement would still be applicable for the BWRX-300 deployment.

The EIS states that DNNP will increase demand on fire and police services but that projected staffing levels is considered sufficient to meet the indirect DNNP related demands. There have been changes since 2009 by OPG to its on-site fire protection services, as OPG has transitioned to an in-house nuclear response force [60]. This would increase OPG's capability to respond to emergencies and would decrease any draw on off-site resources.

Regarding emergency preparedness, the EIS states that it is likely that existing nuclear emergency plans may need to be reviewed and updated to reflect the presence of additional reactors and the increased number of construction workers on the DNNP site. Emergency preparedness will be addressed through the completion of Emergency Management and Fire Protection Plans. OPG's updated Emergency Management Plan for the DNNP has already been developed.

The *Socio-Economic Effects Review* [60] stated that there are updates to the Provincial Nuclear Emergency Response Plan and municipal plans; the Implementing Plan for the DNGS and OPG's Consolidated Nuclear Emergency Plan may contribute to the overall confidence in OPG's operations at the DNNP site and overall feelings of satisfaction and safety living in the nearby municipalities. Given its smaller power level than DNGS, the BWRX-300 is anticipated to have a smaller Emergency Planning Zone (EPZ) than the current emergency plans for DNGS.

The EIS states that DNNP will directly increase the demand for emergency medical services and an indirect demand for hospital beds, but noticeable effects are not anticipated. This information would not change with the selection of technology.

Social Services

The *Socio-Economic Effects Review* [60] confirmed that the effects from Social Services from the EIS remain valid, so that no residual effects are expected, and that:

> *The increased demand on the already strained child care system in 2009 is now considered very marginal in 2019 given the substantial reforms and system expansions undertaken since 2009. Increased indirect demand on services intended for the aged remain unchanged and is expected to be met with further expansions of the public and private systems over time.*

This is not expected to change with the BWRX-300 deployment.

Economic Development Services

The EIS states that the DNNP will contribute to increased local and regional economic development throughout all its phases. The *Socio-Economic Effects Review* [60] concluded that there continues to be no residual effects and that:

> *The DNNP will likely stimulate local and regional economic development during each phase of the Project as well as be a driver for the further development of the energy*

industry through the establishment of new business operations in the RSA that are involved in the nuclear service industry.

This conclusion is not expected to change with the BWRX-300 deployment.

The EIS identified the following mitigation measures associated with likely effects on Human Assets:

- *OPG and the Municipality of Clarington entered into a Host Municipality Agreement, dated August 31, 2009. The Agreement provides compensation to the Municipality to mitigate effects resulting from the NND Project, as identified in the EIS;*
- *OPG will share information with local and regional land use planners, economic development staff, and social service providers with respect to the timing and magnitude of its on-site labour force during the Site Preparation and Construction phase;*
- *OPG will work with government, other electricity sector employers, labour groups and educational institutions through existing liaison mechanisms and programs during the Site Preparation and Construction and Operation and Maintenance phases; and*
- *A Traffic Management Plan will be implemented with the objective of reducing disruption and maintaining safe traffic conditions during the Site Preparation and Construction phase.*

The BWRX-300 will implement these mitigation measures to address the effects on Human Assets and overall community well-being.

The EIS determined that no residual adverse effects are likely on Human Assets. This is not changed by the selection of technology, which was done in deliberate recognition of the value to the local community of supply chain localization in the Province and Region.

5.5.11.5 EIS Section 5.11.5 - Assessment of Likely Effects on Financial Assets

Employment

The EIS determined that the DNNP will result in the creation of new direct, indirect, and induced employment opportunities for existing and potential in-movers. It will positively influence employment growth in local and regional area municipalities. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in the creation of new direct, indirect and induced employment opportunities.

These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

Business Activity

The EIS determined that the DNNP will result in the creation of new business activity and opportunities due to increased spending associated with households, directly or indirectly associated with employment from DNNP, and increased DNNP expenditures of goods and services during the Site Preparation and Construction phase and the Operation and Maintenance phase. The *Socio-Economic Effects Review* [60] confirmed that DNNP will result in the creation of new business opportunities. These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

DNNP will require the removal of the 46.3-ha plot of Class 1 agricultural land currently farmed on the DNNP site and the termination of the lease or licensing arrangement of one farm operator with OPG. This land is on the eastern portion of the DNNP site and will still require development for the BWRX-300. The farmer who owns the land indicated that all revenues are important to his operation, but this loss of revenue would not likely affect the overall viability of the overall farm operation. Therefore, no adverse effects are anticipated.

The EIS indicates that traffic related to DNNP can be expected to affect the movement of slow-moving farm vehicles such as tractors and combines. Lower traffic volumes for BWRX-300 deployment will reduce this effect.

Tourism

The EIS determined that DNNP will result in improved economic viability and increased investment in tourist accommodation businesses (i.e., hotels and motels) resulting in improved stock of tourist accommodations in the nearby area during the DNNP Site Preparation and Construction phase. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in improved economic viability and increased investment in tourist accommodation businesses resulting in improved stock of tourist accommodations. These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

Income

The EIS determined that the DNNP is anticipated to have a beneficial effect on this component and total household income is expected to increase. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in increased total household income.

These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

Residential Property Values

The EIS states that increased demand for residential properties will likely occur due to population growth, which will be a beneficial effect. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in increased rate of growth in property values and increased sales. It is also noted that the continued growth in property values that may be sustained by DNNP can be both a positive and negative effect depending on the social entity affected. The smaller workforce will result in a reduced demand for residential housing. These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

Cooling towers were characterized in the EIS as being a potentially major contributor to downward pressures on property value due to changes in community character and impact. The BWRX-300 deployment uses once-through cooling and adverse effects on residential property values from the presence and operation of cooling towers will not occur.

Municipal Finance

The EIS determined that DNNP is expected to have a beneficial effect on municipal finance and will increase municipal tax and other revenues. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in increased municipal tax and other revenues. These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

The following mitigation measure related to the effects on Financial Assets was identified in the EIS:

- *A Nuisance Effects Management Plan (e.g., to address dust and noise concerns) will be implemented for residential properties along transportation routes affected by the NND Project as identified in the Traffic Management Plan during the Site Preparation and Construction phase. The Plan will include a process for receiving, resolving and following-up on complaints and issues raised by the public.*

The BWRX-300 will implement these mitigation measures to address the effects on Financial Assets and overall community well-being.

5.5.11.6 EIS Section 5.11.6 - Assessment of Likely Effects on Physical Assets

Housing

The EIS determined that the DNNP is expected to have a beneficial effect on housing growth and diversification of housing stock in the surrounding areas. These beneficial effects are applicable to the BWRX-300 deployment, albeit at a reduced magnitude. These beneficial effects are not considered further in terms of mitigation measures and residual effects.

Municipal Infrastructure and Services

The DNNP's effects on the municipal infrastructure and services in the area are anticipated to be similar to those assessed in the EIS, albeit at a reduced magnitude.

Community Character

The EIS mentions that the presence of cooling towers may be detrimental to community character, and it was identified as an adverse effect of the DNNP. The *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from 2009 and that DNNP will result in changes in public attitudes or behaviours with the construction of additional nuclear reactors on the site. The BWRX-300 uses once-through cooling this adverse effect on community character and image will not occur.

5.5.11.7 EIS Section 5.11.7 - Assessment of Likely Effects on Social Assets

Community and Recreational Facilities and Programs

The EIS determined that there is likely to be some reduced use and enjoyment of the community and recreational features on the DNNP site during the Site Preparation and Construction phase. The EIS considered this an adverse effect of the project. The BWRX-300 deployment is expected to result in similar effects, albeit at a reduced magnitude.

Use and Enjoyment of Private Property

The EIS determined that some residents living along truck haul routes may experience disruption to their use and enjoyment of their property due to dust, noise, traffic during the Site Preparation and Construction phase. The assessment of the effects on Enjoyment of Private Property in EIS applies to any reactor technology, including the BWRX-300. There is the potential for excavated materials to be managed on-site and that fewer trucks would be required to travel along a haul road off-site. In such a case, reduced effects can be expected.

The presence and operation of cooling towers would result in reduced enjoyment of private property locally. The BWRX-300 uses once-through cooling and this effect is not applicable.

Community Cohesion

The EIS mentions that the DNNP might have an adverse or beneficial effect on community cohesion and depending on the social groups involved. Public attitude research reported in the *Socio-Economic Effects Review* [60] confirmed that there is no change to this information from

2009 and that DNNP will result in changes in public attitudes or behaviours with the construction of additional nuclear reactors on the site.

In addition to the mitigation measures already identified, the following mitigation measures related to the effects on Social Assets were identified in the EIS:

- *OPG will continue to work with various stakeholders to deliver its community, recreational, educational and biodiversity initiatives;*
- *OPG will continue to keep its neighbours and the broader public informed concerning activities at the DN site as appropriate to each phase of the DNNP;*
- *OPG will re-establish full access to and use of the Waterfront Trail in stages once safe access can be provided; and*
- *OPG will seek to establish a resolution with recreational users of the DNNP Site should there be any effects.*

The BWRX-300 will implement these mitigation measures to address the effects on Financial Assets and overall community well-being. Nevertheless, residual adverse effects of the DNNP on Social Assets may remain after mitigation and are advanced for consideration of significance:

- *Reduced use and enjoyment of community and recreational features on the DNNP site (e.g., Waterfront Trail, soccer fields) during the Site Preparation and Construction phase;*
- *Disruption to use and enjoyment of property because of nuisance-related effects (e.g., dust, noise, traffic) during the Site Preparation and Construction phase for some residents living along the truck haul routes; and*
- *Reduced enjoyment of private property in the local and regional areas as a result of the visual dominance of the natural draft cooling tower structures and the associated vapour plumes released from either the natural draft or mechanical draft cooling towers (if the NND Project were to be implemented with cooling towers).*

Due to the smaller scale of the BWRX-300 on the DNNP site, the first two residual adverse effects are likely to be less than those considered in the EIS. Since DNNP will not use cooling towers, the remaining adverse effect is not applicable to the BWRX-300 deployment.

5.5.11.8 EIS Section 5.11.8 – Assessment of Likely Effects on Natural Assets

The EIS discusses the results of the effects assessment for natural assets that might influence socio-economic conditions. The BWRX-300 deployment information is consistent with this.

5.5.11.9 Summary - EIS Section 5.11 - Socio-economic Environment

The BWRX-300 deployment information is consistent with the DNNP information in the EIS used for the evaluation of effects of the DNNP on the Socio-economic Environment. The DNNP’s employment and payroll spending will generate beneficial economic effects, but less than anticipated in the EIS. Residual adverse effects associated with population growth, housing, infrastructure, and service demands will also be less than anticipated in the EIS.

5.5.12 EIS Section 5.13 – Health – Human

This section of the EIS provided an evaluation of effects of the DNNP on Human Health considering two sub-components: Health and Well-being of the General Public, and Health and Safety of Workers. The assessment of effects on Human Health was undertaken in the context of physical, mental and social well-being. The EIS described how the existing factors that influence Human Health may be changed because of the DNNP and the consequences of any such changes on the receptors selected to represent Human Health.

5.5.12.1 EIS Section 5.13.1 – Physical Well-Being

The EIS describes the effects of the DNNP on physical well-being. Physical well-being is influenced by radiation and radioactivity, occupational worker health and safety, the atmospheric environment, surface water and ground water quality and socio-economic conditions.

Radiation and Radioactivity

The assessment of radiation doses to humans associated with the DNNP was derived from forecasts of future conditions in the Radiation and Radioactivity Environment for workers and the general public. The maximum annual individual nuclear energy worker (NEW) doses for normal operation, routine maintenance activities and refurbishment were expected to be well below the regulatory limit. The calculated dose from DNNP to the most exposed critical group was approximately 4 μSv/y (0.004 mSv/y), well below (0.4%) the regulatory limit for members of the public.

An assessment of radiation doses to humans during normal operation of the BWRX-300 was completed as part of a separate assessment [50] using a methodology consistent with the most recent DN Site Environmental Risk Assessment [22]. It determined that the dose to members of the public will be lower than the dose assessed in the EIS. The dose to workers for the BWRX-300 deployment will also meet the current regulatory limits. As a result, the effect of radiation and radioactivity from the BWRX-300 deployment on physical well-being is within the bounds of the EIS.

Occupational Worker Health and Safety

OPG's current Occupational Health and Safety Management System is designed to ensure employees work safely in a healthy and injury-free workplace. The BWRX-300 would be subject to the same programs, practices, and procedures to protect workers from hazards. Therefore, the effect on occupational worker health and safety from the BWRX-300 deployment is consistent with the EIS.

Atmospheric Environment

The assessment criteria for air quality including dust and noise that were used in the EIS have evolved since 2009. There may be a requirement to enhance the specific measures to control air releases and noise during the site preparation and construction phase to meet the current air quality and noise criteria.

Overall, for the BWRX-300 the extracted soil volume and associated material handling requirements (i.e., construction equipment usage, truck hauling, etc.) and overall workforce will be reduced. There will be no steam generator/secondary heat transport system employed. Therefore, effects on the environment from steam generator chemicals such as hydrazine and acetic acid are no longer applicable. These are expected to lead to a reduction of the effects on the atmospheric environment from BWRX-300 deployment compared to those developed in the EIS for the bounding scenario reactors.

Surface Water Quality

The DNNP's effects on surface water quality were reviewed of the EIS. The BWRX-300 deployment was found to be consistent with the information in EIS. Therefore, the information on effects on physical well-being assessed in the EIS applies to the BWRX-300 deployment.

Groundwater Quality

The DNNP's effects on groundwater quality were assessed in the review of EIS. The BWRX-300 deployment was found to be consistent with the information in EIS Section 5.6.6. Therefore, the information on the effects on physical well-being as they relate to groundwater quality applies to the BWRX-300 deployment.

Socio-Economic Conditions

The DNNP's effects on the socio-economic environment were assessed in the review of EIS. The BWRX-300 deployment information is consistent with the effects on physical well-being as they related to Physical and Social Assets in particular.

5.5.12.2 EIS Section 5.13.2 - Mental Well-Being

The EIS describes the effects of the DNNP on mental well-being. Mental well-being relates to people's attitudes and behaviours from a complex network that can affect the mental health of individuals and the well-being of communities. For the purposes of this assessment, indicators of mental well-being were people's feelings of personal health and safety, satisfaction with community, and effects of traffic. These are factors that are not necessarily dependent on the selection of the technology but are evaluated against the presence of DNNP altogether.

Feelings of Personal Health and Safety

Public attitude research undertaken for the EIS indicated that community interaction appears to have a strong influence on people's feelings of personal health, whether it is opportunities for physical activity (recreation), the people in the community, or access to services that safeguard, promote and protect their physical health. Also, the quality of policing and the level of crime are the dominant influence on people's sense of safety.

Public attitude research that was undertaken in 2008, 2010 and most recently in 2019 in support of the EIS and the *Socio-Economic Effects Review* [60] indicate that residents have expressed higher ratings of the feelings of personal health, sense of safety and higher levels of confidence in ongoing operations at the DN site in 2019 than in 2009. There is no indication that these attitudes might adversely change due to the BWRX-300 deployment at the DNNP site.

Satisfaction with Community

Public attitude research undertaking in 2009 indicated that almost all respondents are either "very" or "somewhat satisfied" with living in their community. Indeed, 63% of the LSA respondents are "very satisfied". Public attitude research also indicates that a large majority of residents did not anticipate a change in their satisfaction with community as a result of the DNNP. The research undertaken for the EIS cautioned people's satisfaction with community would decrease as a result of the DNNP, linking this change in attitude to the potential for cooling towers on the DN site. The BWRX-300 deployment will not require the construction or operation of cooling towers. As such, it can be expected that the high levels of satisfaction with community will continue.

Public attitude research that was undertaken in 2008, 2010 and most recently in 2019 indicate that residents continue to express higher ratings of their satisfaction with community and higher levels of confidence in ongoing operations at the DN site in 2019 than in 2009. In 2019, none (0%) of the survey respondents mentioned the DN site or nuclear power generation as an important issue facing the community. In 2008 and 2010, approximately 2% mention these as important issues. There is no indication that these attitudes might adversely change due to the BWRX-300 deployment at the DNNP site.

Traffic

Traffic volumes in the vicinity of the DN site will increase in the future both as a result of the DNNP and of unrelated population growth and development in the community and the Greater Toronto Area overall. Because of the added traffic, and in the absence of system improvements, elements of the system infrastructure are predicted to operate at unsatisfactory levels of service (e.g., some intersections in the local area around the site). However, consistent with standard transportation engineering practice, it is reasonable to expect that the authorities having jurisdiction over the system (i.e., Ontario Ministry of Transportation, Region of Durham and Municipality of Clarington) will progressively address operational deficiencies as they arise.

Accordingly, it is expected that there will be no residual adverse effects on transportation system operations or safety because of the DNNP. The effects of BWRX-300 deployment on off-site traffic are anticipated to be lower than assessed in the EIS. It is reasonable to expect that future conditions with respect to traffic will not negatively affect the mental well-being of members of the public.

Mental Well-Being of Workers

OPG has extensive health and safety programs, policies and procedures in place at their nuclear facilities and these, or similar, are expected to be applied at the DNNP and for BWRX-300 deployment. These programs will help to ensure workers' sense of well-being and security. These may include programs encouraging healthy living (such as information for employees working shifts that may involve rotating night and day work), access to onsite health and safety representatives, and ergonomics assessment.

5.5.12.3 EIS Section 5.13.3 – Social Well-being

The EIS describes the effects of the DNNP on social well-being. Social well-being is influenced by employment, income, community recreational facilities and programs, and community cohesion.

Employment

The EIS determined that the DNNP will result in the creation of new direct, indirect, and induced employment opportunities for existing residents and potential in-movers. It will positively influence employment growth in local and regional area municipalities. These beneficial effects on the social well-being of any community are applicable to the BWRX-300 deployment, albeit at a reduced magnitude.

Income

The EIS determined that the DNNP is anticipated to have a beneficial effect on this component and total household income is expected to increase. These beneficial effects on the social well-being of any community are applicable to the BWRX-300 deployment, albeit at a reduced magnitude

Community and Recreational Facilities and Programs

The EIS indicated that the DNNP may require the displacement of the soccer fields and the fitness loop (part of the Waterfront Trail) currently located on the DN site. The lands on which these facilities are located may be required for DNNP purposes, and thus will be a direct loss to those who use these facilities. However, the results of the DN Recreational Use Survey indicated that, except for the soccer fields, there are many other recreational options available within the community. There is potential for OPG to plan the BWRX-300 deployment to avoid some of these potential effects.

Community Cohesion

Research conducted for the EIS indicated that local residents feel a strong sense of belonging in their communities regardless of their distance from the DN site. Results of public attitude research indicate that the vast majority of local area residents (81%) do not anticipate any change to the cohesiveness of their community as a result of the DNNP. Given the beneficial effects of the BWRX-300 deployment and the few residual adverse effects on socio-economic VECs, there are no indications that BWRX-300 deployment will change people's overall feelings of cohesiveness. With the continuation and expansion of corporate community programs and partnerships as a result of the BWRX-300 deployment, OPG will continue to foster socially meaningful interactions within the community, and thus strengthen its positive influence on community cohesion.

Social Well-being of Workers

OPG and the DN site in particular, contribute to overall community and social well-being. It is anticipated that many of the BWRX-300 workforce, particularly those associated with the Operation and Maintenance Phase, would reside in local communities near the DN site. It is likely that these BWRX-300 workers would experience the same sense of social well-being and satisfaction with their communities as those workers and other residents currently living in these communities.

5.5.12.4 EIS Section 5.13.4 - Assessment of Likely Effects on VECs

The assessment of radiation doses to humans was addressed in a separate study [50]. Using a methodology consistent with the most recent DN Site Environmental Risk Assessment, it determined that the dose to members of the public will be lower than the dose assessed in the EIS. The dose to workers for the BWRX-300 deployment will also meet the current regulatory limits. Residual effects identified in the EIS that are applicable to the BWRX-300 are reduced enjoyment of some residents living along truck haul routes due to nuisance-related effects (e.g., dust, noise, traffic) as well as reduced use and enjoyment of the community and recreational features on the DNNP site during the DNNP Site Preparation and Construction phase. For the BWRX-300 deployment, there will be substantially less hauling of soil offsite, if any, resulting in less residual effects for the BWRX-300 deployment.

5.5.12.5 Summary – EIS Section 5.13 - Human Health

The EIS determined that no residual adverse effects on the health and well-being of the public or workers at the DN site are likely from DNNP. Beneficial effects from employment opportunities and increased household incomes from the BWRX-300 deployment will be less than assessed in the EIS.

Calculations of the estimated dose to the public during normal operation of four BWRX-300 reactors confirm that its design and release characteristics do not present an adverse effect on human health. This analysis is documented in a separate assessment [50] where the dose to the public from deployment of the BWRX-300 reactors was found to be less than the dose calculated for the bounding scenario reactors.

In the EIS, radiation doses were predicted to be well below the regulatory limit for workers. The overall regulatory compliance will be the same for the BWRX-300 deployment.

5.5.13 EIS Section 5.12 – Indigenous Rights and Interests

This section of the EIS deals with Indigenous rights and interests. The lands and waters on which the DNNP is situated are the traditional and treaty territory of the Williams Treaties First Nations, which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation. It is also the traditional territory of other indigenous peoples.

The EIS for DNNP was completed in 2009 to assess the environmental impacts of the DNNP. OPG recognizes that the EIS, while accurate in its assessment of environmental impacts, may not fully address the impact of the DNN on Indigenous inherent and treaty rights as they are understood today. This is particularly true in light of the Williams Treaties First Nations (WTFN) 2018 settlement agreement with the Governments of Canada and Ontario. While OPG is not privy to the contents of the settlement agreement, OPG recognizes the importance of furthering its knowledge and understanding, in ongoing meaningful engagement with the WTFN.

OPG will continue to work with Indigenous Nations and communities to appropriately identify the rights impacted by the DNNP, and to work toward mitigation measures and/or accommodation. These commitments are reinforced by OPG's dedication to reconciliation and to renewing its relationships with Indigenous peoples.

Through discussions with Indigenous Nations and communities on DNNP to date, interventions made by the Indigenous Nations and communities at the PRSL Renewal public hearing in 2021, and WTFN input on the EIS Review report, OPG understands that key interests include:

- Meaningful engagement and relationship building.
- Identification of impact to Indigenous Rights.
- Environmental impacts, including: the effect on aquatic and terrestrial species, with specific interest in biocultural species; air and water emissions, including thermal emissions; overall effect on the water; and respectful use of the land.
- Radioactive waste streams and management.
- Incorporation of Indigenous Knowledge and Ceremony.

- Community and environmental safety.
- Climate change mitigation.
- Opportunities for Indigenous communities and Indigenous people, including: training and employment; community benefits; Indigenous business opportunities; investment opportunities.

OPG remains committed to protecting the environment and meeting commitments made throughout the EA process. As OPG develops DNNP plans and designs further, OPG wishes to engage further on the specific items listed above, and any other matters of interest that may be identified. OPG will seek to create opportunities for additional dialogue on potential impacts to Indigenous rights and interests, Indigenous Knowledge, and to identify mitigation measures with input from Indigenous Nations and communities.

5.5.14 EIS Section 5.14 – Health - Non-Human Biota

This section of the EIS provides an evaluation of effects of the DNNP on the health of Non-Human Biota based on a synthesis of the assessments of effects on other receptors. There is generic information in the EIS that applies to any reactor technology, including the BWRX-300.

5.5.14.1 EIS Section 5.14.1 - Evaluation for Likely Measurable Changes to the Environment

The EIS describes the potential effects on non-human biota. Likely measurable effects are identified for several works and activities in the site preparation and construction phase as well as the operation and maintenance phase. The works and activities identified are still required for the BWRX-300 deployment. Therefore, the Project-Environment interactions identified are still valid and the BWRX-300 deployment information consistent with the information in the EIS.

5.5.14.2 EIS Section 5.14.2 - Assessment Methods

The EIS describes the method used to evaluate the potential effects of the DNNP on non-human biota. There is generic information in this section that applies to any reactor technology, including the BWRX-300.

5.5.14.3 EIS Section 5.14.3 - Assessment Criteria

The EIS describes the criteria applied to evaluate the changes in conditions due to the DNNP as well as the effects that would result from the changes. There is generic information in this Section that applies to any reactor technology, including the BWRX-300.

5.5.14.4 EIS Section 5.14.4 - Assessment of Likely Effects on Non-Human Biota – Non-Radiological

The EIS describes the likely non-radiological effects on aquatic and terrestrial (i.e., non-human) biota resulting from non-radiological releases from the DNNP.

Management of Stormwater

The EIS determined that the relocation of soil within the DNNP site will not alter the surface water or ground water chemistry such that stormwater quality would be measurably affected. As the BWRX-300 deployment will excavate soil and create stockpiles within the DNNP site, the effects are considered similar, if not reduced, from those assessed in the EIS.

The EIS notes that Good Industry Management Practices will be applied throughout all DNNP phases with respect to stormwater management, with a focus on maintaining appropriate quality standards for discharge of surface water to the environment. These mitigation measures would be applied to the BWRX-300 deployment as well.

Chemical Releases to Air and Water

The EIS describes the chemical releases to the environment that may result from the operation of active ventilation and radioactive liquid waste management system, operation of the secondary heat transport system and turbine generators, operation of CCW, service water and cooling systems as well as operation of electrical power systems. For the BWRX-300 deployment:

- cooling towers will not be used and therefore, any chemical releases from cooling tower operations are not applicable.
- steam generators will not be used for the BWRX-300, so any chemical releases due to steam generator chemicals are also not applicable.
- releases of non-radioactive effluent to surface water are consistent with those assessed in the EIS.

Therefore, the BWRX-300 deployment information is either consistent or has less effect than that assessed in the EIS for chemical releases to air and water.

Releases to Atmosphere

The releases to the atmosphere from BWRX-300 deployment are considered to be less than those assessed in the EIS because of the smaller scale of the DNNP and the smaller workforce.

The review also identified that terrestrial environment habitats that were considered to be removed in the EIS may be retained on the site during the BWRX-300 deployment. Air quality and noise studies have been undertaken to evaluate effects on these terrestrial habitats and found that the effects are anticipated to be minor [11].

Releases to Surface Water

The releases to surface water from the BWRX-300 deployment are consistent with those assessed in the EIS.

5.5.14.5 EIS Section 5.14.5 - Assessment of Likely Effects on Non-Human Biota – Radiological

The EIS examined the likely radiological effects on aquatic and terrestrial (i.e., non-human) biota resulting from radiological releases from the DNNP.

Using the predicted emissions of DNNP, exposure to non-human biota was calculated in the EIS resulting in "*the potential effects to populations of non-human biota arising from NND are considered to be unlikely and of no consequence*" [3]. A comparison of the dose to non-human biota from radiological emissions in the EIS and for the BWRX-300 deployment has been made to provide an assessment of expected impacts to non-human biota.

Doses to non-human biota for the normal operation of one and four BWRX-300 reactors were calculated in the dose calculation report [50] using a methodology consistent with the most recent DN Site Environmental Risk Assessment. For 1 reactor of the BWRX-300, the highest doses to terrestrial and aquatic receptors were 7.11E-05 mGy/day and 2.96E-06 mGy/day, respectively. The receptor receiving these doses was Song Sparrow at location F (ecological receptor close to the BWRX-300) for terrestrial receptors, and frogs in Dragonfly Pond, Polliwog Pond and Treefrog Pond benthic invertebrates in Lake Ontario for aquatic receptors.

For 4 reactors of the BWRX-300, the highest doses to terrestrial and aquatic receptors were 2.84E-04 mGy/day and 1.18E-05 mGy/day, respectively. The receptors receiving these doses were the same as those for 1 reactor of the BWRX-300. These doses are less than the doses to non-human biota evaluated in the EIS, of 4.7E-03 mGy/d for terrestrial biota and 3.0E-04 mGy/d for aquatic biota in Lake Ontario, and are far below the current radiological benchmarks of 2.4 mGy/d and 9.6 mGy/d for terrestrial and aquatic biota specified in CSA N288.6 [61].

Calculation of the dose to non-human biota during normal operation confirm that the design and release characteristics have no adverse impact on non-human biota health.

5.5.14.6 Summary - EIS Section 5.14 - Health – Non-Human Biota

The EIS determined that the DNNP is not expected to result in changes in the non-radiological and radiological environment that would represent an adverse effect on the ecological receptors identified for the non-human biota component of the environment. Estimated doses to non-human biota as a result of expected radiological atmospheric and aquatic emissions from four BWRX-300 reactors have been calculated [50] and are confirmed to be less than those calculated for the bounding scenario reactors.

5.5.15 EIS Section 5.15 – Summary of Likely Adverse Effects, Mitigation Measures and Residual Effects

The results of the review of effects on receptors are summarized in Table 5-18. For clarity the following color coding is used for this table:

- Blue: No Residual Adverse Effects are anticipated on the receptor from the BWRX-300 deployment, as determined in the EIS.
- Green: BWRX-300 deployment is likely to result in "less effect" on a VEC than assessed in the EIS.
- Pink: These are opportunity areas that were not considered in the EIS but could now be available due to the smaller footprint for the BWRX-300 deployment. These represent potential adverse effects not considered in the EIS.
- Yellow: The Residual Adverse Effect assessed in the EIS is no longer expected as it is related to a proposed DNNP feature that is not applicable to BWRX-300 deployment at the DNNP site.
- Grey: Indicate a baseline condition not previously considered.
- White: Residual adverse effects assessment is and will continue to be ongoing.

Table 5-18: Summary of Residual Adverse Effects and Relevant VECs

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
Atmospheric Environment	No residual adverse effect. Mitigation measures reduced potential adverse effect from dust and noise.	Air quality (dust) and noise are pathways to VECs in other environmental components	No residual adverse effect in the Atmospheric Environment. Residual effects in other environmental components potentially resulting from dust and noise as a pathway are described in the appropriate sections of this table.
Surface Water Environment	No residual adverse effect. Effects of modification of surface water environment on other VECs is assessed in Aquatic Environment.	Lake Circulation, Lake Water Temperature, Site Drainage and Water Quality, and Shoreline Processes are pathways to VECs in other environmental components	No residual adverse effect in the Surface Water Environment. Residual effects in other environmental components potentially resulting from lake circulation, lake water temperature and quality, shoreline processes, as a pathway are described in the appropriate sections of this table. The completed additional analysis on the surface water hydrology confirmed that the BWRX-300 deployment will have no residual adverse effects to on-site wetlands.
Aquatic Environment	Loss of approximately 40 ha of Lake Ontario nearshore aquatic habitat as a result of lake infilling and construction of cooling water intake and discharge structures.	Aquatic habitat	Less effect anticipated. No lake infilling. Footprint of in-water structures would be smaller.
	Loss of some aquatic biota (i.e., benthic invertebrates, fish) during the construction of the lake infill and the cooling water intake and discharge structures.	Benthic invertebrates and VEC fish species	Less effect anticipated. No lake infilling. Footprint of in-water structures would be smaller.
	Impingement and entrainment losses		Less effect anticipated.

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
	associated with the operation of the once-through lake water cooling option and, to a far lesser degree, the cooling tower option.		The location and design of the intake will include screening and reduced intake (approach) velocities to mitigate fish impingement and entrainment. Furthermore, the operation of the condenser circulating water and service water requires a smaller flow rate than the description in the EIS.
	No residual adverse effect. Mitigation measures reduced the effect of the removal and/or alteration of on-site ponds, a portion of two intermittent tributaries to Darlington Creek and intermittent portions of a tributary to Lake Ontario; road crossing of Darlington Creek and other physical works in proximity to the creek.	On-site Aquatic Habitat	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Potential preservation of on-site ponds and other wetlands due to smaller scale of the Project. Hydrological assessment determined there will be minimal hydrological change to on-site ponds or tributaries. Effects from dust, hydrology/hydrogeology were evaluated and are anticipated to be minor [11] [32] [33], Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
Terrestrial Environment	Loss within the DN Site of approximately 40 to 50 ha of mostly Cultural Meadow Ecosystem.	Cultural Meadow and Thicket Ecosystem	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of some meadow and thicket due to smaller scale of the Project. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
			residual adverse effects to a non-significant level.
	No residual adverse effect.	Wetland Ecosystem	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of some wetlands, including ponds due to smaller scale of the Project. Hydrogeological/Hydrological assessment determined there will be minimal surface water or groundwater change to wetlands. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	No residual adverse effect.	Woodland Ecosystems	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of some woodlands due to smaller scale of the Project. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	No residual adverse effect.	Rare Plant Species	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS.

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
			Footprint and facility would be smaller, potential preservation of some habitat where these species may occur due to smaller scale of the Project. Hydrogeological/Hydrological assessment determined there will be minimal surface water or groundwater change to wetlands. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	No residual adverse effect.	Amphibians and Reptiles	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of some habitat where these species may occur, such as the ponds, due to smaller scale of the Project. Hydrogeological/Hydrological assessment determined there will be minimal surface water or groundwater change to wetlands. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	The net loss of approximately 24 to 34 ha of	Insects - Migrant	Opportunity area not considered in the EIS – Potential

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
	on-site habitat currently used as butterfly stopover area migration.	butterfly stopover areas	adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of meadow habitat where these species may occur, due to smaller scale of the Project. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual effects to a non-significant level.
	No residual adverse effect.	Insects – Dragonflies and Damselflies	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of some habitat where these species occur - the ponds - due to smaller scale of the Project. Hydrological assessment determined there will be minimal hydrological change to on-site ponds. Hydrogeological/Hydrological assessment determined there will be minimal surface water or groundwater change to wetlands. Effects on the retained habitat from dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	Decrease in populations of breeding birds on the DN Site.	Migrant songbirds and their habitat,	Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS.

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
		winter raptor feeding and roosting	Footprint and facility would be smaller, potential preservation of some wetlands, woodlands, and meadow, due to smaller scale of the Project. Effects on the retained habitat from noise and dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	Loss of nesting habitat for up to 1,000 Bank Swallow burrows; however, some mitigation not directly comparable to effect, will result in advances for the species elsewhere.	Breeding birds	Similar effect anticipated. For the four-reactor scenario the habitat would likely be rendered unsuitable due to shoreline protection and/or hydrogeological changes; this is consistent with the effects assessed in the EIS.
			Opportunity area not considered in the EIS – Potential adverse effect not considered in the EIS For the one-reactor scenario, effects on the retained Bank Swallow habitat from hydrogeology, vibration, noise and dust were evaluated and are anticipated to be minor [33], [35] [11]. Mitigative measures are available to eliminate or reduce residual effects to a non-significant level.
	Bird strike mortalities associated with natural draft cooling towers (estimated at <110 in the spring and <300 in the fall, assuming four natural draft cooling towers).	Breeding birds Migrant songbirds and their habitat	Not applicable No cooling towers will be used.
	No residual adverse effect.	Mammal communities	Opportunity area not considered in the EIS – Potential

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
		and species	adverse effect not considered in the EIS. Footprint and facility would be smaller, potential preservation of habitat for mammals (wetlands, woodlands, and meadow), due to smaller scale of the Project. Effects on mammal communities and their habitat from noise and dust were evaluated and are anticipated to be minor [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
	Loss of habitat for mammals (new)	Bats (new baseline condition)	Potential adverse effect not considered in the EIS. Not considered a VEC or indicator species in the EIS, represents a baseline condition not previously considered. Footprint and facility would be smaller, potential preservation of habitat for bats woodlands and foraging areas, due to smaller scale of the Project. Habitat loss (woodland) was considered in the EIS. Potentially less woodland habitat will now be removed. Effects on bat habitat from hydrology/hydrogeology, light, noise and dust were evaluated and are anticipated to be minor [32] [33], [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level and

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
			consistent with other regulatory requirements.
	Periodic and short-term disruption to wildlife travel along the east-west wildlife corridor during the Site Preparation and Construction phase of the Project.	Landscape connectivity	Less effect anticipated. Footprint and facility would be smaller, potentially increasing the preservation of connecting habitat, due to smaller scale of Project.
Geological & Hydrogeological Environment	No residual adverse effect	Soil quality, groundwater quality, and groundwater flow are pathways to VECs in other environmental components	No residual adverse effects
Radiation & Radioactivity Environment	No residual adverse effect	Radioactivity in the Atmospheric, Surface Water, and the Hydrogeological Environments are pathways to VECs in other environmental components	No residual adverse effects
Land Use	Changes in the quality of existing views of the DN Site throughout the operating life of the Project from viewing locations in the Local Study Area (LSA) and Regional Study Area (RSA) as a result of the presence of natural draft cooling tower structures and the associated plumes released from either natural draft or mechanical draft cooling towers.	Visual aesthetics	Not applicable No cooling towers will be used.

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
Traffic & Transportation	No residual adverse effect	N/A	No residual adverse effects
Physical & Cultural Heritage Resources	No residual adverse effect	N/A	No residual adverse effects
Socio-Economic Environment	Change in the character of communities in the RSA and LSA as a result of the presence of the natural draft cooling tower structures, and the associated plumes released from either natural draft or mechanical draft cooling towers (if the NND Project were to be implemented with cooling towers).	Community character	Not applicable No cooling towers will be used.
	Reduced use and enjoyment of the recreational features on the DN Site during the Site Preparation and Construction phase.	Community and recreational facilities (also applies to Health-Human VEC – members of the public)	Less effect anticipated. Nuisance effects at recreational features on-site are reduced.
	Disruption to use and enjoyment of property because of nuisance-related effects (e.g., dust, noise, traffic) during the Site Preparation and Construction phase for some residents living along the truck haul routes.	Use and enjoyment of property (also applies to Health-Human VEC – members of the public)	Less effect anticipated. Nuisance effects are reduced.
	Reduced enjoyment of private property in the RSA and LSA as a result of the visual dominance of the natural draft cooling tower structures and the associated vapour plumes released from either the natural draft or mechanical draft cooling towers (if the NND Project were to be implemented with cooling towers).	Use and enjoyment of property (also applies to Health-Human VEC – members of the public)	Not applicable No cooling towers will be used.
Indigenous Rights	Refer to Section 5.5.12	N/A	Refer to Section 5.5.12

Environment Component	EIS		BWRX 300
	Likely Residual Adverse Effects	Relevant VECs	
and Interests			
Health – Human	No residual adverse effects except for those noted above under Socio-Economic Environment.	Health and Well-being of the General Public and Health and Safety of Workers.	No residual adverse effects (except for those noted above under Socio-Economic Environment)
Health – Non-Human Biota	No residual adverse effects	Aquatic and terrestrial non-human biota.	No residual adverse effects

Note: N/A = Not Applicable

5.6 EIS Chapter 6 – Assessments of Other Likely Effects

The EIS assessed how the environment could adversely affect the DNNP for a range of environmental conditions such as flooding, severe weather, biophysical effects, seismicity, and climate change. The following sections summarize this assessment for the BWRX-300 deployment and compares these results with those predicted in the EIS.

5.6.1 EIS Section 6.1 – Sustainability

General information about the sustainability and its inclusion in the EA process was provided in this EIS section. This information is not specific to BWRX-300 deployment.

5.6.1.1 EIS Section 6.1.1 – Scope of the Sustainability Assessment

This EIS section describes the scope of the sustainability assessment, considering the effects of the DNNP during its Site Preparation and Construction phase (2010-2025) and its Operation and Maintenance Phase (2016-2100). The description of the DNNP is at a high level: the development of up to four nuclear reactors supplying up to 4,800 MWe of electrical capacity. The BWRX-300 deployment information is consistent with this description.

The lifecycle of the BWRX-300 deployment for the first reactor is anticipated to cover the following timeline: Site Preparation and Construction phase (2022-2028), Operation and Maintenance Phase (2029-2089), Decommissioning (2089-2119) (Section 5.2.4.3). For the 4-reactor option, Site Preparation and Construction phase (2022-2035), Operation and Maintenance Phase (2029-2095), Decommissioning (2089-2125).

Beyond the change in the dates of the DNNP, the BWRX-300 deployment information is consistent with the information provided in this EIS section. This EIS section addresses the construction of up to four reactors. The deployment of four BWRX-300 reactors on the DNNP site is consistent with this description.

5.6.1.2 EIS Section 6.1.2 – Approach to the Sustainability Assessment

Review of the Approach Taken to the Sustainability Assessment

At the time the EIS was written, the concept of sustainability had already become generally accepted as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*.

In its 2007 Sustainable Development Report [62], OPG defines sustainable development as *"embracing business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting and enhancing the human and natural resources that will be* *needed in the future."* In the report, its sustainability commitments are represented within three areas: i) environmental performance; ii) social performance; and iii) economic contribution.

At that time, there was little guidance on how best to conduct a sustainability assessment in a project-level EA such as for the DNNP. For example, the EIS Guidelines for the EIS required that the proponent consider sustainability of the DNNP in terms of the extent to which biological diversity may be affected by the DNNP; and the capacity of renewable resources that are likely to be significantly affected by it.

Therefore, the purpose of the sustainability assessment included in the EIS was to consider, in an integrated manner, the net ecological, economic and social benefits to society and the overall extent to which the DNNP is supportive of sustainable development. Specifically, as required by the Guidelines, the assessment was to consider:

- The extent to which biological diversity may be affected by the DNNP; and
- The capacity of renewable resources that are likely to be significantly affected by the DNNP.

In considering sustainability, each of the above-noted evaluation pillars (ecological, economic, social) was correlated to a set of sustainable development considerations (or visions) synthesized from the stated objectives of the Region of Durham, the Municipality of Clarington and the City of Oshawa. Goals and objectives were defined and a sustainability scorecard completed to evaluate actions or progress towards sustainability that considered the likely interactions between the sustainability visions and the DNNP. These interactions were measured within three levels; diminish, maintain and enhance allowing a collective judgement of sustainability.

This approach, while innovative and novel for the time, would not necessarily meet current expectations of federal regulators nor would the approach taken at the time satisfy current guidance from the Impact Assessment Agency and its "Framework: Implementation of the Sustainability Guidance". The approach taken addresses the four basic principles of a sustainability assessment as set out in the IAAC guidance document, namely:

- **Principle 1:** Considers the interconnectedness and interdependence of human-ecological systems.
- **Principle 2:** Considers the well-being of present and future generations.
- **Principle 3:** Considers positive effects and reduce adverse effects of the designated project.
- **Principle 4:** Applies the precautionary principle and considers uncertainty and risk of irreversible harm.

Review of the Findings of the Sustainability Assessment

The sustainability assessment concluded that the DNNP can enhance regional progress towards sustainability largely through economic and social means, while not diminishing overall progress from an ecological perspective. Nevertheless, the DNNP is likely to have a greater adverse effect on progress towards sustainability if implemented with natural draft cooling towers as this may adversely affect the perceived character of the neighbourhoods in the vicinity of the DN site where the towers would be dominant features on the landscape. It was also to be recognized, however, that this adverse effect would be expected to diminish over time as the presence of cooling towers and associated vapour plumes became familiar features and OPG as continued to maintain or improve its positive environmental and safety record. Table 5-19 provides the overall balanced scorecard presented in the EIS and provides commentary regarding how BWRX-300 deployment might affect the conclusions of the sustainability assessment.

Table 5-19: Comparison of Balanced Scorecard Findings with BWRX-300 Deployment Findings

Sustainability Criteria from EIS	Key Findings Regarding Sustainability from EIS	BWRX 300 Deployment
Regional Ecology	The DNNP as a whole is not likely to affect progress towards ecological sustainability across the RSA. A large area of the DN site is likely to be ***maintained*** as a green urban area within the Municipality of Clarington.	**Contribution to Sustainability is enhanced over that assessed in the EIS.** Smaller Project Footprint There are opportunities to retain natural habitat previously assumed to be lost.
Green Space in Urban Areas	Should natural draft cooling towers be required, there is a greater potential that the DNNP might serve to ***diminish*** the beautification objectives for urban areas	**Contribution to Sustainability is maintained in comparison to that assessed in the EIS.** Cooling towers are not required.
Biodiversity and Ecosystem Integrity	On balance and over the long term, the Project as a whole is not likely to affect progress towards sustainability across the RSA. It is expected that the DN site's role in protecting biodiversity and ecosystem integrity can be ***maintained***.	**Consistent** There are opportunities to retain natural habitat previously assumed to be lost. Lake filling is not required.
Environmental Stewardship	Through example, commitment and communication, OPG and the DNNP as a whole can be positive contributors to **enhanced** environmental stewardship across the regional study area.	**Consistent** OPG remains committed to sustainability and reports annually on their progress towards sustainability and is committed to having an active and visible role in the community and community environmental stewardship.
Energy Conservation	The DNNP is about energy generation and does not directly affect progress by the Province, municipalities and others aimed at energy	**Consistent** BWRX-300 deployment is about energy

Sustainability Criteria from EIS	Key Findings Regarding Sustainability from EIS	BWRX 300 Deployment
	conservation. As such, the project as a whole may ***maintain*** efforts towards sustainability through energy conservation.	generation and does not directly affect progress by the Province, municipalities and others aimed at energy conservation.
Capacity of Renewable Resources (Surface Water)	No Project-related activities are expected to affect the sustainability of surface water as a renewable resource and therefore this aspect of the Project is expected to ***maintain*** progress towards sustainability.	**Consistent** BWRX-300 deployment will result in similar effects to surface water as assessed in the EIS.
Capacity of Renewable Resources (Aquatic Biota)	Overall, it is unlikely that there will be any adverse effect on the sustainability of fish populations and diversity as a result of the Project. Therefore, this aspect of the Project is expected to ***maintain*** progress towards sustainability.	**Consistent** BWRX-300 deployment will result in similar effects to aquatic biota as assessed in the EIS.
Capacity of Renewable Resources (Terrestrial Biota)	In the context of the amount of natural habitat available across the RSA, the long-term sustainability of vegetation communities and species may not be affected but this loss may somewhat ***diminish*** progress towards sustainability.	**Consistent** BWRX-300 deployment will result in similar or reduced effects to terrestrial biota as assessed in the EIS.
Capacity of Renewable Resources (Groundwater)	It is unlikely that there will be any effect on the sustainability of groundwater as a result of the Project and therefore this aspect of the Project is expected to ***maintain*** progress towards sustainability.	**Consistent** BWRX-300 deployment will result in similar or reduced effects to groundwater as assessed in the EIS.
Balanced Development	The Project as a whole is not likely to affect progress towards sustainability across the RSA and is likely to ***enhance*** balanced development within the Municipality of Clarington.	**Consistent** A smaller workforce for BWRX-300 deployment will make it easier for the Municipality of Clarington to maintain balanced development.
Efficient Use of Infrastructure and Access to Services	The DNNP's large construction and operations workforce on the DN site and increased Project-related population present an opportunity for the expansion or extension of transit in the RSA. On balance, the Project as a whole is likely to ***enhance*** progress towards sustainability.	**Consistent** BWRX-300 deployment is expected to make smaller positive contribution to sustainability regarding efficient use of infrastructure and access to services
Live, Work and Play Communities	The Project may increase the number of persons residing within the Municipality of Clarington that will work at the DN site or gain indirect employment, thereby promoting live, work and play communities. The Project may also generate additional property tax and other revenues from new residents and OPG that may serve as the means for sustaining and investing in the recreational and other assets of communities, particularly within the Municipality of Clarington. The Project as a whole is not likely to affect progress	**Consistent** BWRX-300 deployment is expected to make smaller positive contribution to sustainability regarding live, work and play communities.

Sustainability Criteria from EIS	Key Findings Regarding Sustainability from EIS	BWRX 300 Deployment
	towards sustainability across the regional study area, but is likely to ***enhance*** the potential for live, work and play communities within the Municipality of Clarington.	
Community Pride and Identity	The Project will likely be a catalyst for increased local and regional economic development and the further development of the Durham Energy Industry Cluster. The Project may promote the image of Durham Region, the Municipality of Clarington and the City of Oshawa as an economic engine for growth in the province and the country. On balance, the DNNP as a whole is not likely to affect progress towards sustainability across the RSA but is likely to ***enhance*** community pride and identity of Durham Region, the Municipality of Clarington and the City of Oshawa. Should natural draft cooling towers be required, there is a greater potential that community pride and identity might ***diminish***.	**Consistent** BWRX-300 deployment as one of the first SMR projects in North America can be expected to make a positive contribution to community pride and identity. BWRX-300 is also expected to make smaller positive contribution to sustainability regarding local and regional economic development. **Contribution to Sustainability is maintained in comparison to that assessed in the EIS.** Cooling towers are not required.
Personal Well-being	The Project may serve to promote the personal well-being of residents across the RSA through increased employment and business opportunities and higher levels of household income. Increased opportunities for the investment of additional tax and other revenues in community assets that contribute to human health and quality of life may also serve to improve personal well-being. To this end, the Project may result in opportunities for more people and communities to share project benefits. On balance, the Project as a whole is likely to ***enhance*** the personal well-being of residents	**Consistent** BWRX-300 deployment is expected to make a positive contribution to personal well-being BWRX-300 is also expected to make a smaller positive contribution to sustainability regarding local and regional economic development than assessed in the EIS.
Employment Opportunities	The duration of the Project itself indicates that the project has the potential to generate a substantial number of new certified tradespeople that would be available for the Project itself and/or Ontario's construction labour market subsequently. The Project may enhance progress towards achieving Clarington's desired population to employment ratio. On balance, Project as a whole is likely to ***enhance*** the economic development objective through the creation of new job opportunities.	**Consistent** BWRX-300 is also expected to make a smaller positive contribution to employment, generating certified tradespeople and local and regional economic development than assessed in the EIS.
Business	Project as a whole is likely to ***enhance*** the economic	**Consistent**

Sustainability Criteria from EIS	Key Findings Regarding Sustainability from EIS	BWRX 300 Deployment
Retention, Expansion and Creation	development objective through business retention, expansion and creation in the RSA.	BWRX-300 deployment as one of the first SMR projects in North America can be expected to generate new types of opportunities for businesses in the RSA. BWRX-300 is expected to make a smaller contribution to economic development in the RSA than assessed in the EIS.
Durham as an Energy Hub	Project may contribute to and ***enhance*** Durham's stature as an energy hub. It may further the Region's goal to implement energy-related projects and provide opportunities for the development of affiliated businesses and training opportunities.	**Consistent** BWRX-300 deployment as one of the first SMR projects in North America can be expected to generate new types of opportunities for energy businesses in the RSA and further enhance Durham Region as a leader in energy development in Canada and internationally.
Diversification of the Skills Base	The Project is expected to be a catalyst for increased enrolment in specialized post-secondary educational programs across Ontario and the RSA in particular On balance, the Project as a whole is likely to ***enhance*** the economic development objective through the diversification of the skills base in the RSA.	**Consistent** BWRX-300 deployment is expected to make a smaller contribution to the diversification of the skills base in the RSA than assessed in the EIS.
Healthy Municipal Finance	New revenues generated by the Project may provide RSA municipalities with new opportunities to make investments that support their sustainable development initiatives and/or relieve current debt burdens to allow future generations to make their desired investments in a more certain fiscal context. As such, the Project is likely to *enhance* the economic development objective by contributing to the financial health of RSA municipalities	**Consistent** BWRX-300 deployment will be a new source of revenue to the Municipality of Clarington and Durham Region.

Summary – Review of Sustainability Assessment.

A review of the key findings of the sustainability assessment indicates that the overall contribution of BWRX-300 deployment to sustainability is consistent with that assessed in the EIS, albeit smaller in scale with respect to economic and social benefits. A smaller ecological footprint associated with BWRX-300 deployment is an overall improvement over that assessed in the EIS.

5.6.2 EIS Section 6.2 – Likely Effects of the Environment on the Project

This EIS section provides information that describes how the environment could adversely affect DNNP, for environmental conditions such as flooding, severe weather, and biological environment. The BWRX-300 deployment is consistent with the assessment of the risk of flooding, severe weather, or biophysical effects conducted in the EIS, since these are site-specific hazards independent of the DNNP and reactor technology selected. Design requirements and mitigation measures related to flooding, severe weather, and biophysical effects are noted in the OPG Commitments Report [1].

The local and regional seismic hazards and how they could affect the BWRX-300 deployment were assessed. It is 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 noted in the OPG Commitments Report [1].

The effects of climate change on the BWRX-300 deployment, and effects of the DNNP on climate change, were assessed. The EIS determined that there are no medium or high-risk interactions between the climate change parameters and the DNNP due to the mitigations incorporated in the DNNP design, such as enhanced ability to deal with extreme weather events. BWRX-300 deployment does not change this determination. Prior to construction, OPG will prepare a contingency plan for the construction, operation, and decommissioning phases, to account for uncertainties associated with flooding and other extreme weather hazards. As part of this work, OPG will conduct localized climate change modelling or utilize published studies to evaluate the effect of climate change on the DNNP area (OPG commitment D-C-7.1 [1]).

As discussed previously, the scale of site preparation and construction activities is smaller than what was assessed in EIS, therefore it is expected that the GHG emissions from the deployment of the BWRX-300 reactors will be less than those assessed in the EIS.

Since 2009, there has been a sustained effort to ensure that projects help reduce emissions of GHG. SMRs are non-emitting sources of reliable energy that have the potential to replace fossil fueled electricity, such as coal-fired power, for provincial energy grids and diesel power in remote locations. They also reduce the need for natural gas generation as a transition fuel to decarbonization. SMRs can complement intermittent renewable energy sources in the on-grid context, as well as produce high-quality steam and reduce emissions from industrial processes.

In Ontario, over 90 per cent of the electricity consumed is supplied from clean and non-emitting sources, with nuclear representing about 60 per cent. Nuclear energy played a key role in Ontario’s ability to phase out coal-fired generation by 2014, which was the single largest greenhouse gas emissions reduction on the continent. SMRs are a potential source of baseload energy to meet future electricity demand and reduce reliance on natural gas-fired generation.

5.6.3 EIS Section 6.5 – Summary of Likely Effects of the Environment on the Project

The EIS determined that no significant effects of the environment on DNNP are anticipated once design and contingency features are considered.

The summary of the analysis of the residual adverse effects of the environment on the DNNP, as presented in the EIS and assessed for the BWRX-300, are shown in Table 5-20.

Table 5-20: Summary of Effect of the Environment on the DNNP

Environment Effect	EIS	BWRX 300
Flooding	Adverse effects on the DNNP are not anticipated	Consistent
Severe Weather	Adverse effects on the DNNP are not anticipated	Consistent
Biophysical Effects	Adverse effects on the DNNP are not anticipated	Consistent
Seismicity	Adverse effects on the DNNP are not anticipated	Consistent
Climate Change	Adverse effects on the DNNP are not anticipated	Consistent

The *DNNP – Site Preparation Licence Renewal Activity Report – Environment* presented to the CNSC in 2020 [13, p. 012] has updated the information on the effects of the environment on DNNP. This report concluded that the conclusions drawn from the original site evaluation, based on RD-346, remain valid as the intent of REGDOC 1.1.1 has been satisfied. Seven updated environmental standards were identified from review of REGDOC 1.1.1. Application of these updated standards to baseline data does not alter the conclusions in the EIS nor the site evaluation.

Overall, The BWRX-300 deployment information is consistent with this section of the EIS. In the EIS, no significant residual adverse effects of the environment on the DNNP were anticipated following the consideration of in-design and mitigation features. The determinations made in the EIS apply to the BWRX-300 deployment. The design requirements identified in the EIS are applicable to the BWRX-300 reactor. Further details on the ability of the BWRX-300 to satisfy these design requirements will be contained in the future safety analysis report for the BWRX-300 deployment.

5.7 EIS Chapter 7 – Malfunctions, Accidents and Malevolent Acts

The safety of the BWRX-300 reactor and the effects of malfunctions and accidents were reviewed and compared to the assessment included in the EIS.

5.7.1 EIS Section 7.1 – Objective and Approach

This section of the EIS is an introduction to Chapter 7 and describes its purpose regarding the environmental effects of malfunctions, accidents, and malevolent acts in connection with the

DNNP. The information in this EIS section is applicable to any reactor technology including BWRX-300.

5.7.2 EIS Section 7.2 – Conventional Malfunctions and Accidents

The review of the list of conventional malfunction and accident scenarios showed that most are also applicable to the BWRX-300 deployment, except for the *Leak or release of chemicals from the blowdown ponds for cooling towers*, since the BWRX-300 deployment will not include cooling towers nor blowdown ponds. Table 5-21 identifies the relevance of conventional malfunction and accident scenarios to the BWRX-300 reactors. No additional conventional malfunctions and accidents were identified for the BWRX-300 deployment.

Table 5-21: Potential Conventional Malfunction and Accident Scenarios Screened in EIS

Potential Malfunction or Accident Scenario	EIS Screening Decision	Relevance to BWRX 300
Boat or barge accident resulting in release of oil or fuel into the lake	Due to the quantity of fuel that could be spilled in this scenario, a boating accident is carried forward for consideration of bounding scenarios.	Yes
Transportation or vehicle accident resulting in a spill of fuel, oil, transmission fluid, hydraulic fluid, coolant or lubricant to land	Vehicle accidents have in the past been one of the largest contributors to spills at OPG facilities. Therefore, a spill of fluid to land is carried forward for consideration of bounding scenarios.	Yes
Fire event at transformer with associated release of oil due to operation of deluge system	Due to prior operating experience with this spill scenario and the magnitude of the resultant spill, a release of oil is carried forward for consideration of bounding scenarios.	Yes
Fuel spill from standby power generator fuel storage tank.	Likely effect would be minor or negligible after the clean-up. However, a spill may still have a measurable environmental effect. Therefore, this scenario is carried forward for consideration of bounding scenarios.	Yes
Spill of oil or lubricant from fuelling equipment	Likely effect would be minor or negligible after the clean-up. The volume of spill is not expected to result in a measurable environmental effect. No further assessment required.	Yes
Leak or release of chemicals from blowdown ponds for cooling towers	No further assessment required.	No The BWRX-300 deployment will not use cooling towers.
Spill of hazardous waste during handling, processing, or transport	No further assessment required.	Yes
Spill of sewage during tie-in to site services and utilities	No further assessment required.	Yes
Spill of chemicals used for construction such as cement, paints, solvents or sealants	No further assessment required.	Yes

Potential Malfunction or Accident Scenario	EIS Screening Decision	Relevance to BWRX 300
Spill of process chemicals or fluids, lubricants or oils during maintenance and operation activities, or during transport of chemicals for addition to process systems	Spills of process fluids may be attributed to equipment failure or procedural issues. Due to the variety of chemicals used at nuclear power plants, and the volumes of chemicals that could potentially spill to land or water, a spill of process chemicals is carried forward for consideration of bounding scenarios.	Yes Spill of hydrazine is not applicable since BWRX-300 will not use this chemical, but other process chemicals with less toxicity will be used.
Crane failure resulting in damage to existing structures and facilities	No further assessment required.	Yes
Accident involving moving heavy equipment from barge or rail	No further assessment required.	Yes
Fire involving hazardous waste packaging or shipment	No further assessment required.	Yes
Blasting accidents resulting in chemical release, personnel injury, or damage to existing structures and processes	No further assessment required.	Yes
Release of hydrogen resulting in fire or explosion	Due to the worker safety risk associated with a hydrogen fire, this scenario is carried forward for consideration of bounding scenarios.	Yes Although the generator of the BWRX-300 turbine is air-cooled instead of hydrogen-cooled, the BWRX-300 uses hydrogen injection in the reactor cooling system to control corrosion.
Fire or explosion of transformer	Due to the potential environmental effects from a transformer fire, this scenario is carried forward for consideration of bounding scenarios.	Yes
Fire from fuel or oil	Due to the potential environmental effect of a fire during the operation and Maintenance phase, this scenario is carried forward for consideration of bounding scenarios.	Yes
Accidents involving compressed gas cylinders	No further assessment required.	Yes
Dry storage container (DSC) accident resulting in non radiological consequence and personnel injuries (Note: Potential radiological consequences are addressed in EIS Section 7.3.1)	No further assessment required.	Yes

Potential Malfunction or Accident Scenario	EIS Screening Decision	Relevance to BWRX 300
Personnel injury during the performance of maintenance or operation activities	Despite adherence to strict policies and procedures to minimize the potential for personnel injury during operation and maintenance activities, this event is still considered credible and is carried forward for consideration of bounding scenarios.	Yes
Water-related accident resulting in personnel injuries and drowning	No further assessment required.	Yes
Potential personnel injury due to construction activities.	Despite adherence to strict policies and procedures to minimize the potential for personnel injury or fatality during construction activities, this event is still considered credible and is carried forward for consideration of bounding scenarios.	Yes
Sediment release during water related activities (i.e., dredging, building cofferdam).	No further assessment required.	Yes The BWRX-300 deployment will involve construction activities in the lake for the water intake and outlet diffuser.

With one exception, the conventional accident scenarios and their assessment presented in the EIS are applicable to the BWRX-300 deployment and led to the same determinations relative to the absence of significant residual adverse effects. For the BWRX-300, accidents related to the operation of cooling towers are not applicable. No other accident scenarios specific to the BWRX-300 deployment have been identified.

Following the screening of the conventional malfunction and accidents, the following bounding scenarios were selected for the further assessment:

- Spill of Oil to Land During Transformer Fire
- Spill of Fuel to Lake Ontario during nearshore construction activities on the water
- Spill of Hydrazine During Operation
- Fire in Fuel Storage Tank During Operation and Maintenance
- Personnel Injury During Construction Activities

As mentioned before, hydrazine spill is not relevant to the BWRX-300 deployment as it is not used in its operation. The other bounding scenarios are equally applicable to the BWRX-300 deployment.

The information provided in the EIS regarding the mental and social health effects that could result from a conventional malfunction or accident is generic in nature and applies to the BWRX-300 deployment. The EIS also describes the specific OPG procedures that govern communications with the public regarding on-site accidents and malfunctions. These procedures are applicable to any reactor technology, including the BWRX-300. The EIS determined that no residual human health effects were determined to result from credible conventional malfunction and accident scenarios associated with DNNP.

5.7.2.1 EIS Section 7.2.6 – Summary of Residual Effects

The residual adverse effects of bounding conventional malfunctions and accidents identified in the EIS and their relevance to BWRX-300 are described in Table 5-22.

Table 5-22: Bounding Scenarios and Residual Effects for Conventional Accidents

Bounding Scenarios	Residual Effects (EIS)	Relevance to BWRX 300
Release of 200,000 L of transformer oil to finished or gravel ground surface along with deluge water following a transformer fire	Limited local effects to surface water, terrestrial, and hydrogeological environment are anticipated from this scenario; however, no long term or residual effects are expected.	This scenario is still relevant to the BWRX-300 deployment. This is a bounding scenario for the BWRX-300 deployment and the EIS mitigation measures are applicable to BWRX-300 deployment.
Spill of Fuel to Lake Ontario during nearshore construction activities on the water	Local changes in water quality are expected immediately following the accident, but it is anticipated that mitigation measures will contain potential effects to within a limited area. This accident is expected to occur in an area where extensive construction activities are occurring and any aquatic habitat or species would already be disturbed. No residual effects are expected from this scenario.	This scenario is still relevant to the BWRX-300 deployment. This is a bounding scenario for the BWRX-300 deployment and the EIS mitigation measures are applicable to BWRX-300 deployment.
Spill of Hydrazine During Operation	The potential effects of this scenario were considered by comparison to the assessments completed for a similar spill for the Pickering B EA and PARTS EA and it was determined that no residual effects are anticipated as a result of this accident scenario.	Hydrazine is a toxic chemical used to control corrosion in the secondary circuit (steam generators and turbine). This scenario is not relevant to the BWRX-300 deployment, which doesn't have steam generators and doesn't use hydrazine to control corrosion. The BWRX-300 uses hydrogen and noble metals to control corrosion. These chemicals have low toxicity. Although the BWRX-300 does not use hydrazine, its spill still represents a bounding case for all chemicals used in the BWRX-300.

Bounding Scenarios	Residual Effects (EIS)	Relevance to BWRX 300
Fire in Fuel Storage Tank During Operation and Maintenance	A fire involving a fuel storage tank is expected to be rapidly extinguished and therefore atmospheric effects are expected to be short term and local in scope. Workers in the vicinity of the fire will be required to leave the area immediately, and those remaining will wear appropriate personal protective equipment. Limited local effects are anticipated from this scenario; however, no long term or residual effects are expected.	This scenario is still relevant to the BWRX-300 deployment. This is a bounding scenario for the BWRX-300 deployment and the EIS mitigation measures are applicable to BWRX-300 deployment.
Personnel Injury During Construction Activities	The effects of this scenario are not expected to be distinguishable from the effects of working on any other construction project. Therefore, no residual effects are anticipated for this accident scenario.	This scenario is still relevant to the BWRX-300 deployment. This is a bounding scenario for the BWRX-300 deployment and the EIS mitigation measures are applicable to BWRX-300 deployment.

Overall, the malfunctions and accidents, their assessments, and their residual effects discussed in the EIS apply to the BWRX-300 deployment and no further assessment is required.

5.7.3 EIS Section 7.3 – Nuclear Malfunctions and Accidents

This EIS section describes the scope of the assessment for malfunctions and accidents that have radiological consequences. Four types of accidents are considered:

- Radiological Malfunctions and Accidents
- Transportation Accidents
- Nuclear Accidents
- Out of Core Criticality

The generic description of credible nuclear malfunctions and accidents presented in the EIS also applies to the BWRX-300 deployment.

5.7.3.1 EIS Section 7.3.1 – Radiological and Transportation Malfunctions and Accidents

This EIS section and sub-sections describe the type of radiological malfunctions and accidents that are assessed, such as on-site events that involve radioactive substances and components within nuclear power plant facilities, other than those directly associated with the reactor and its auxiliaries (e.g., radioactive waste and used fuel storage facilities). The nuclear waste and used fuel transportation, processing and storage accidents are addressed in the *Nuclear Waste Management TSD* [63]. This would cover accident scenarios for the following waste types:

- Low and Intermediate Level Waste (L&ILW);

- Refurbishment Waste; and
- Used Fuel Processing and Storage.

Accident involving Low Level Waste

The EIS's average LLW activity per m^3 is given in Table 3.1-1 of the *Nuclear Waste Management TSD* [63]. The volumetric activity used for the LLW accident scenario [64] and the LLSB volume inventory (Box Compacted Waste = 7800 m^3) + (LL Resin = 200 m^3) [64] have been used to calculate the average activity per unit volume summarized in Table 5-23 below. These values were applicable for the types of reactors considered in the EIS, namely PWR and CANDU reactors. The calculation in the EIS uses average values instead of bounding values because the accident involves a large volume of waste that accumulated over several years.

The radionuclides that contributed the most to the dose in the EIS (H-3, C-14, alpha emitters) were included in the calculation of the dose from the BWRX-300 [65]. In addition, radionuclides that are the most significant for a BWR [65] were added to the list. The activity of the retained radionuclides was then normalized to the total average activity in LLW to account for other radionuclides that contribute negligibly to the total activity. The use of the average activity in LLW is consistent with the assumptions made in the EIS calculation. The activity per unit volume of the radionuclides for the BWRX-300 is shown in Table 5-233.

Table 5-23: Solid LLW Radioactive Waste Activity (Bq/m^3) [65]

Radionuclide	EIS Average LLW (Bq/m^3)	BWRX 300 Average LLW (Bq/m^3)
Ag-108m	3.89E+03	[redacted]
Ag-110m	2.88E+06	[redacted]
Am-241	9.93E+05	[redacted]
Am-243	1.24E+03	[redacted]
C-14	3.05E+08	[redacted]
C-14-p	7.63E+07	[redacted]
Ce-141	3.29E+08	[redacted]
Ce-144	1.86E+07	[redacted]
Cl-36	7.56E+02	[redacted]
Cm-242	1.17E+05	[redacted]
Cm-244	2.46E+05	[redacted]
Co-58	2.06E+06	[redacted]
Co-60	7.56E+08	[redacted]
Cr-51	6.78E+07	[redacted]
Cs-134	1.07E+08	[redacted]
Cs-135	3.88E+02	[redacted]
Cs-137	3.63E+08	[redacted]
Eu-152	2.50E+04	[redacted]
Eu-154	2.26E+06	[redacted]

Radionuclide	EIS Average LLW (Bq/m^3)	BWRX 300 Average LLW (Bq/m^3)
Eu-155	7.53E+05	[redacted]
Fe-55	8.50E+08	[redacted]
Fe-59	6.83E+06	[redacted]
Gd-153	1.45E+07	[redacted]
H-3	2.83E+11	[redacted]
I-129	1.30E+02	[redacted]
La-140	1.95E+08	[redacted]
Mn-54	3.39E+06	[redacted]
Nb-94	9.79E+05	[redacted]
Nb-95	7.04E+08	[redacted]
Ni-59	4.06E+05	[redacted]
Ni-63	6.34E+07	[redacted]
Np-237	5.85E+01	[redacted]
Pu-238	2.33E+05	[redacted]
Pu-239	5.01E+05	[redacted]
Pu-240	7.25E+05	[redacted]
Pu-241	9.98E+07	[redacted]
Pu-242	5.75E+02	[redacted]
Ru-103	7.03E+06	[redacted]
Ru-106	5.95E+07	[redacted]
Sb-124	1.48E+08	[redacted]
Sb-125	6.11E+07	[redacted]
Sc-46	6.06E+06	[redacted]
Se-79	1.36E+01	[redacted]
Sm-151	1.30E+03	[redacted]
Sn-113	7.50E+07	[redacted]
Sn-126	2.03E+03	[redacted]
Sr-90	2.93E+07	[redacted]
Tc-99	1.51E+02	[redacted]
U-234	6.20E+02	[redacted]
U-235	1.05E+01	[redacted]
U-236	1.17E+02	[redacted]
U-238	7.94E+02	[redacted]
Zn-65	4.16E+06	[redacted]
Zr-93	5.78E+00	[redacted]
Zr-95	2.04E+07	[redacted]
Sum	**4.08E+09**	[redacted]

Since OPG is currently planning to manage the LLW at an OPG licensed facility, the hazards are the same for the BWRX-300. Consequently, the BWRX-300 bounding malfunction or accident scenario for LLW remains a pool fire (spill of gasoline or diesel fuel from a material handling vehicle that catches fire) beside a stack of waste containers. For storage of low-level waste, a pool fire could involve up to [redacted] of waste.

The EIS (page 7-36 [3]) shows that the hypothetical radiation dose to a member of the public from this fire is 14 µSv which is less than 2% of the regulatory limit for a member of the public. The hypothetical radiation dose to the NEW in this fire scenario is 14.2 mSv which is about 28% of the regulatory maximum annual dose to a worker. Most of the dose in the EIS is due to the release of H-3.

Using the LLW activity for the BWRX-300, the dose to a member of the public would be 4.0E-02 µSv, which is less than the regulatory limit for a member of the public. The dose to the NEW would be 40 µSv [65], which is less than the maximum annual dose to a worker. The doses for the BWRX-300 are therefore less than those calculated in the EIS, mainly because the H-3 activity in the waste is negligible compared to the values in the EIS.

Accident involving Intermediate Level Waste

The bounding malfunction or accident scenario for ILW is a pool fire (spill of gasoline or diesel fuel from a material handling vehicle that impacts on the waste) involving transfer of an intermediate level waste form, such as a [redacted] spent ion-exchange resin liner. In the EIS, the activity in the resin liner represents a conservative (maximum) value of three resin types. For the BWRX-300, the maximum package activity for the spent resin of the Condensate Filters and Demineralizers system (CFD) was used, supplemented with the maximum activity of long-lived radionuclides from the UK Advanced BWR (UKABWR) Clean Up Water ion exchange resin. The activity in this waste package is the maximum and is not representative of the average activity in ILW waste packages. It is therefore not consistent with the total waste activity per year.

The values used for the ILW accident scenario in the EIS and for the BWRX-300 [65] have been summarized in Table 5-24 below.

Table 5-24: Solid ILW radioactive waste activity (Bq/m^3) [65]

Radionuclide	EIS Maximum ILW (Bq/m^3)	BWRX 300 Maxiumum ILW (Bq/m^3)
Ag-108m	5.60E+05	
Ag-110m	1.80E+08	
Am-241	2.80E+07	1.01E+08
Am-243	3.40E+04	6.63E+06
Ba-140		1.03E+07
C-14	2.70E+12	1.28E+12
Ce-141	5.30E+10	1.44E+11
Ce-144	5.40E+09	1.60E+11
Cl-36	3.40E+05	1.28E+11

Radionuclide	EIS Maximum ILW (Bq/m^3)	BWRX 300 Maxiumum ILW (Bq/m^3)
Cm-242	2.30E+06	6.99E+07
Cm-244	4.80E+06	3.54E+09
Co-58	4.50E+08	1.14E+07
Co-60	5.10E+10	2.19E+09
Cr-51	2.60E+10	2.64E+05
Cs-134	2.70E+10	8.13E+04
Cs-135	5.50E+04	
Cs-136		3.80E+10
Cs-137	5.30E+10	1.43E+12
Cu-64		1.28E+09
Eu-152	4.90E+09	
Eu-154	6.40E+08	
Eu-155	4.80E+07	
Fe-55	3.40E+10	2.30E+11
Fe-59	9.10E+08	1.17E+10
Gd-153	5.80E+11	
H-3	1.20E+12	6.42E+10
I-129	6.50E+04	1.28E+04
I-131		4.93E+11
I-132		3.32E+08
I-133		2.56E+11
I-134		6.70E+03
I-135		5.00E+10
La-140	7.40E+09	1.21E+12
Mn-54	1.90E+10	8.63E+10
Mn-56		2.08E+06
Mo-99		2.33E+11
Na-24		3.40E+08
Nb-94	1.10E+07	
Nb-95	2.70E+10	1.97E+12
Ni-59	1.60E+07	
Ni-63	2.50E+09	2.60E+08
Np-237	1.60E+03	1.51E+05
Np-239		1.62E+11
P-32		5.57E+08
Pu-238	6.90E+06	1.74E+09
Pu-239	1.50E+07	9.43E+07
Pu-240	2.20E+07	1.71E+08
Pu-241	3.80E+09	3.37E+10
Pu-242	1.60E+04	6.63E+05

Radionuclide	EIS Maximum ILW (Bq/m^3)	BWRX 300 Maxiumum ILW (Bq/m^3)
Rh-103m		1.74E+09
Ru-103	8.00E+09	1.83E+11
Ru-106	1.30E+10	1.94E+11
Sb-124	5.80E+09	
Sb-125	1.90E+09	
Sc-46	1.70E+09	
Se-79	1.90E+03	
Sm-151	1.90E+05	
Sn-113	3.00E+09	
Sn-126	2.90E+05	
Sr-89		4.07E+10
Sr-90	1.10E+09	9.13E+09
Sr-91		6.93E+10
Sr-92		1.27E+09
Tc-99	2.10E+05	
Tc-99m		5.37E+10
Te-129m		3.32E+11
Te-131m		1.21E+10
Te-132		6.87E+09
U-234	1.70E+04	
U-235	2.90E+02	
U-236	3.20E+03	
U-238	2.20E+04	
W-187		1.59E+08
Y-90		8.00E+09
Y-91		7.57E+11
Y-92		6.67E+09
Y-93		5.53E+09
Zn-65	2.60E+09	3.40E+10
Zr-93	1.90E+03	
Zr-95	6.60E+09	1.29E+12
Sum	**4.84E+12**	**1.21E+13**

The EIS (page 7-37 [3]) shows that the hypothetical radiation dose to a member of the public was calculated to be 83 μSv which is about 8% of the regulatory limit to a member of the public. The hypothetical dose to a NEW is 1.43 mSv which is about 3% of the regulatory maximum annual dose to a worker.

Using the ILW activity for the BWRX-300, the dose to a member of the public would be 801 µSv, which is 80% of the regulatory limit for a member of the public. The dose to the NEW would be 13.8 mSv, which is 28% of the maximum annual dose to a worker [65].

The malfunction and accident scenarios for refurbishment waste are not relevant to the BWRX-300 deployment since they involve a retube container from the refurbishment of a CANDU reactor and the drop of a steam generator. There is no retubing operation for BWRX-300, and there is no steam generator in a BWR. There is no mid-life refurbishment for the BWRX-300. The reactor life is 60 years, in contrast to the CANDU reactor assessed in the EIS.

Accident involving used fuel

The bounding malfunction and accident scenario for used fuel processing and dry storage involves a fuel dry storage canister loaded with 40 assemblies which is dropped, causing damage to 30% of the fuel assemblies. The values used for the used fuel accident scenario in the EIS have been summarized in Table 5-25 below. The activity per fuel assembly for the BWRX-300 is from reference [65].

Table 5-25: Release Parameters for Used Fuel Accident [65]

Key Parameter	EIS	BWRX 300
Kr-85 per assembly (Bq)	1.55E+14	[redacted]
Kr-85 gap fraction	0.1	0.1
H-3 per assembly (Bq)	1.39E+13	[redacted]
H-3 gap fraction	0.05	0.05
Bundles or assemblies per container	40	89
Fraction of assemblies in container that fail during accident	30%	30%
Kr-85 activity released during accident (Bq)	1.86E+14	[redacted]
H-3 activity released during accident (Bq)	8.34E+12	[redacted]
Dose adult at site boundary (µSv)	237	331
Dose infant at site boundary (µSv)	240	371
Dose worker in vicinity (mSv)	33.9	45.1

The EIS (page 7-38 [3]) shows that for this scenario, the hypothetical maximum radiation dose is 240 µSv for a member of the public. The dose estimate is about 24% percent of the regulatory dose limit for members of the public. The estimated hypothetical maximum radiation dose to a worker in the vicinity is 33.9 mSv. This is approximately 68% of the maximum radiation dose limit for a NEW (50 mSv per year).

The same scenario has been updated with parameters specific to the BWRX-300 reactor, as shown in Table 5-25 [65]. For the BWRX-300, the dose to a member of the public is 371 µSv (37% of the regulatory dose limit) and the dose to the worker is 45 mSv (90% of the dose limit). Since the BWRX-300 Kr-85 activity released during the accident is slightly higher than what was assessed in the EIS (Table 5-25), the doses to member of the public and to workers are also slightly higher than the doses in the EIS, although they remain below the applicable dose limits. As a result, the conclusions of the EIS remain valid.

The EIS (page 7-38 [3]) assessed that no residual human health effects are expected from radiological malfunctions and accidents as a result of DNNP. In addition, no potentially significant effects to populations of non-human biota would be expected. The same conclusions apply for the BWRX-300 deployment.

In the EIS, all accidents involving damage to used fuel were classified as radiological accidents. For the BWRX-300, the drop of a heavy load over the core or in the fuel pool is included in the nuclear accident analysis for the BWRX-300 and is reflected in the core damage frequency and the large release frequency analyzed for nuclear accidents (Section 5.7.3.2). Consequently, the drop of a heavy load over the core is not included in the radiological accidents (this Section), and no other radiological or transportation accident specific to the BWRX-300 has been identified.

Transportation accidents are defined as those malfunctions and accidents related to the off-site transportation of low and intermediate-level radioactive wastes. These accidents are addressed in the *Nuclear Waste Management TSD* [63] and the *Malfunctions, Accidents and Malevolent Acts TSD* [66].

The EIS determined that an off-site transport accident is not likely to result in an effect on the environment or on human health due to the comprehensive control and mitigation measures that are in place to prevent a release of radioactivity. The same conclusions apply for the BWRX-300 deployment.

<u>Summary of the review of the Radiological and Transportation malfunctions and Accidents</u>

For the BWRX-300, the radiological waste contains different proportions of radionuclides than the waste that was assessed in EIS. In addition, the mass of fuel placed in the used fuel transfer cask is different than what had been assessed in the EIS. As a result, the assessment of radiological malfunctions and accidents involving radioactive waste and used nuclear fuel was reanalyzed for the BWRX-300 in Section 5.7.3.1, using the same scenario as was examined in the EIS. Since the dose to members of the public and to the workers met the same criteria as the accidents analyzed in the EIS (i.e., regulatory dose limits of 1 mSv for members of the public or 50 mSv for worker dose resulting from the accident), the reassessment led to the same determination relative to the absence of significant residual adverse effects.

A re-evaluation of nuclear material transportation accidents presented in the EIS for the BWRX-300 deployment led to the same determinations.

In the EIS, accidents involving damage to used fuel were classified as radiological accidents. For the BWRX-300, the drop of a heavy load over the core or in the used fuel pool is included in the nuclear accident analysis for the BWRX-300 and is reflected in the core damage frequency and the large release frequency analyzed for nuclear accidents (Section 5.7.3.2). Consequently, the drop of a heavy load over the core is not included in the radiological accidents, and no other radiological or transportation accident specific to the BWRX-300 has been identified.

Overall, the assessment of the radiological and transportation malfunctions and accidents for radioactive waste and used fuel specific to the BWRX-300 deployment remains below the applicable dose limits.

5.7.3.2 EIS Section 7.3.2 – Nuclear Accidents

Nuclear accidents are assumed to involve the operation of the reactor and associated systems and may involve damage to the nuclear fuel or the reactor core and which could result in a release of radioactivity to the environment.

The EIS determined that the reactors under consideration in the EIS were able to meet the safety goals that were part of the CNSC licensing requirements for new reactors that existed at the time (Regulatory Document RD-337 [67]). This document has been superseded by REGDOC-2.5.2 [68], however, the safety goals have remained the same, as shown in Table 5-26.

The results to date for the PSA indicate that the design, as it has progressed to date, are below the stated safety goals [69].

Table 5-26: Comparison of PSA Results with REGDOC 2.5.2 Limits [69]

Safety Goal	Limit (events/reactor year)	All Hazard Estimate (events/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

The BWRX-300 will be designed to also meet these safety goals, as will be demonstrated during the licensing process with the CNSC. The BWRX-300 is an enhancement of BWR designs currently operating and implements passive safety features. As shown in Table 5-26, the design, as it has progressed to date, exceeds the stated safety goals.

This section of the EIS also includes a description of the emergency response arrangements in the Province of Ontario. These arrangements have been superseded in the latest *Ontario Provincial Nuclear Emergency Response Plan (PNERP) Master Plan 2017* [70]. The old triggers for protective actions (Protective Action Levels) were replaced by Generic Criteria that have different values. With the new Emergency Response Generic Criteria, the projected evacuation area remains within a few km of the release point. Therefore, the same conclusions remain valid for the BWRX-300 deployment.

The events selected for assessment in the EIS had an accident frequency greater than 1E-06 per year to be considered credible for EA purposes. For the EIS, stylized radioactive release accident scenarios were created, using actual reactor design information. It should be noted that the analyzed releases did not correspond to any of the proposed reactor technologies. The activity released in the analyzed scenarios were adjusted by two scaling factors to create two release scenarios for use in the EIS, with the I-131 and Cs-137 activities released aligned to the RD-337 small release and large release Safety Goal threshold values, respectively. The radioactive releases that are associated with the small release are 10^{15} Bq of I-131 and for the large release, 10^{14} Bq of Cs-137.

The EIS then assessed the impact of these stylized accidents on the human health and non-human biota. It also calculated the collective dose to members of the public and assigned a risk of fatality of 5E-05 per person-mSv.

The EIS determined that a small statistical increment in cancer risk (0.01%) caused by the postulated accident would not be measurable in the overall population due to natural variation in cancer deaths on an annual basis. The EIS determined that no potentially significant effects to populations of non-human biota would be expected. These conclusions also apply to the BWRX-300, which is subject to the same safety goals.

Summary of the review of the Nuclear Accidents

The EIS described the CNSC licensing requirements for new reactors that existed at the time (Regulatory Document RD-337 [67]). This document has been superseded by REGDOC-2.5.2 [68], however, the safety goals and limits have remained the same. The evaluation of BWRX-300 PSA indicates that the design, as it has progressed to date, meets the stated safety goals, with calculated results in nuclear accident frequencies much below the relevant limits.

The nuclear accidents assessed in the EIS were based on the safety goals and limits from RD-337. These safety goals put a limit on the likelihood that the reactor core can be damaged, or that a small or large release of radioactivity can occur. The radioactive releases that are associated with the small release are 10^{15} Bq of I-131 and for the large release, 10^{14} Bq of Cs-137.

These releases and their consequences on the human health and the environment were assessed in the EIS. Since the EIS found that no residual adverse effects are expected from nuclear accidents on humans or non-human biota, and the BWRX-300 deployment meets the same safety goals and the same accident scenarios apply, the same EIS conclusion applies to the BWRX-300 deployment.

5.7.3.3 EIS Section 7.3.3 – Out of Core Criticality

Out of core criticality accidents applies to both new fuel and used fuel. The EIS examined the consequences of a criticality accident that generates 5E+18 fissions, which is considered a bounding scenario. The EIS determined that no evacuation of members of the public would be required for this accident. This is based on the assessment results that the dose drops below

20 mSv at 300 m from the criticality accident location. For the BWRX-300 deployment, the criticality accident location is at least 300 m from the exclusion boundary. The EIS also determined that an out of core criticality event would represent a significant potential risk to any workers within the vicinity of the event. A criticality safety program implemented by OPG and compliant with REGDOC-2.4.3 would ensure that this event has an extremely low probability.

The criticality safety assessment presented in the EIS is based on uranium fuel that will be enriched to between 1% and 5% (by mass) of U-235. The fuel of the BWRX-300 reactor will have a maximum enrichment of 5% [9]. Therefore, the enrichment of the BWRX-300 fuel is within the range assessed in the EIS.

Summary of the review of the Out of Core Criticality

Out of core criticality was assessed in the EIS for uranium fuel that is enriched to between 1% and 5% (by mass) of U-235. The fuel of the BWRX-300 reactor will have a maximum enrichment of less than 5%, therefore the BWRX-300 fuel is within the range assessed in the EIS. Since the risk of criticality accident is highly dependent on the enrichment of the fuel, the accident described in the EIS is applicable to the BWRX-300 deployment.

5.7.4 EIS Section 7.4 – Malevolent Acts

Although malevolent acts are not accidents, the physical consequences of a malevolent act are likely to be bounded by the consequences of an accident. The details of security measures around nuclear installations are prescribed information and cannot be disclosed in a public forum as this could compromise the security of the facility. Specific security provisions, including a consideration of design basis threats, will be addressed in separate submissions to the CNSC as part of the licensing process.

Malevolent acts were assessed in the EIS which determined that the physical consequences of a malevolent act are likely to be bounded by the consequences of a nuclear accident discussed in Section 5.7.3.2 above. This determination also applies to the BWRX-300 deployment.

5.7.4.1 EIS Section 7.4.1 – Human Health Effects Related to Malevolent Acts

The EIS determined that the social, mental, and economic effects that could arise from a malevolent act would not be specific to DNNP and are common to malevolent acts taking place at any location, such as public buildings. Federal, provincial, and corporate programs that are in place at other OPG facilities will be adopted at DNNP to support emergency planning. The EIS determined that if the appropriate mitigation measures are put in place, it is not expected that a malevolent act would result in physical human health effects. Measures to reduce feelings of anxiety or stress among the affected population such as talk therapy and frequent communication with the community may be employed to reduce negative effects on human mental health as a result of a malevolent act. This information is applicable to any reactor design, including the BWRX-300.

5.7.5 Summary of EIS Chapter 7 – Malfunctions, Accidents and Malevolent Acts

A summary of residual adverse effects for malfunctions, accidents, and malevolent acts is presented in Table 5-27. No residual adverse effects are anticipated from any malfunctions and accidents related to BWRX-300 deployment. Except where otherwise noted, these scenarios and the conclusions regarding residual effects are still relevant to the BWRX-300 deployment.

Table 5-27: Summary of Residual Adverse Effects of Malfunctions, Accidents, and Malevolent Acts

Scenario	EIS		BWRX 300
	Potential Environmental Effects	Residual effects	
Spill of transformer oil to soil, along with deluge water following a transformer fire	Surface water effects due to oil draining into catch basins or stormwater management system.	No long term or residual adverse effects	No residual adverse effects
	Terrestrial and hydrogeological effects due to spill on land.		
Boating accident during marine activities that could result in a release of fuel to Lake Ontario.	Surface water and aquatic effects due to spill of fuel directly to water.	No residual adverse effects	No residual adverse effects
Spill of hydrazine solution during transport	Air quality effect from evaporation of hydrazine spill.	No residual adverse effects	No residual adverse effects In the EIS, the spill of hydrazine is a bounding scenario for the spill of chemicals, oils, or fuel. The BWRX-300 will not use hydrazine but will use oils and fuel.
Fire in a fuel storage tank	Air quality effect from smoke plume resulting from the fire.	No long term or residual adverse	No residual adverse effects

Scenario	EIS		BWRX 300
	Potential Environmental Effects	Residual effects	
	Human health effect to workers from exposure to smoke and heat from the fire and to members of the public through atmospheric effects.	effects	
Lost time accident to, or fatality of, personnel during Site Preparation and Construction Phase	Human health effect to the health and safety of workers.	No residual adverse effects	No residual adverse effects
Radiological Malfunctions and Accidents	Dose to members of the public and dose to workers.	No residual adverse human health effects	No residual adverse effects
	Dose to non-human biota.	No significant residual adverse effects to populations of non-human biota	
Transportation Accidents	Dose to members of the public and dose to workers. Dose to non-human biota.	Not likely to result in an effect on the environment or on human health.	No residual adverse effects
Nuclear Accidents	Dose to members of the public.	No residual adverse effects	No residual adverse effects The accident scenarios are the same as those assessed in the EIS.
	Dose to non-human biota.	No residual adverse effects	
	Social, mental, and economic health effects of sheltering and evacuation following a nuclear accident.	No long-lasting residual adverse effects	
Out of Core Criticality	Dose to members of the public.	No residual adverse effects	No residual adverse effects
	Dose to workers.	No residual adverse effects	
Malevolent acts	The consequences of malevolent acts are encompassed by the assessment of nuclear accidents.	No residual adverse effects	No residual adverse effects

5.8 EIS Chapter 8 – Assessment of Cumulative Environmental Effects

This section of the EIS identified past, present, and future projects that have the potential to act cumulatively (i.e., coincide or overlap) with the effects predicted for DNNP. These other projects were identified for the surrounding regional area and had a reasonable degree of certainty to proceed at the time the EIS was written. Since the timeline of the BWRX-300 deployment starts in 2022 instead of 2010 as indicated in the EIS, the status of the projects identified in the EIS Table 8.2-1 was updated and is shown in Table 5-28

The larger off-site construction projects that were expected to occur at the same time as the construction of the original DNNP have either already been completed (e.g., Highways 407, 412, and Highway 401 improvements) or have yet to commence (e.g., GO Transit expansion). The expansion of St. Marys Cement, adjacent to the DNNP site, has been cancelled.

Table 5-28: Updated Status for Projects Identified in Table 8.2-1 of the EIS.

Project	Status
Highway 401/Holt Road Interchange Improvements	• Completed in 2016 and in service.
GO Transit Rail Extension – Oshawa to Bowmanville	• Environmental Assessment approved. In February 2020, Metrolinx's Board approved the Preliminary Design Business Case. Province announced Project funding. Procurement process for constructor started in 2022.
Durham York Energy from Waste Facility	• Project completed and in service.
Clarington Energy Business Park development	• East Penn Battery facility – completed in 2021. • Darlington Energy Complex – completed in 2014. • Other existing land uses (CoPart Auto Salvage, Crago Farm) remain. • OPGs Clarington Corporate Campus currently being planned for construction during DNNP (scheduled for completion in 2024) • Anaerobic digestion facility in Clarington Energy Park is currently being planned for implementation during DNNP.
Expansion of Courtice Water Pollution Control Plant	• Not yet started.
Expansion of Other Municipal Water Treatment and Pollution Control Plants	• Environmental Assessment to expand the Newcastle WPCP initiated in January 2022. Expansion will overlap with DNNP. The expansion of Municipal Pollution Control Plants was included in the EIS.
Port Darlington Area Enhancements	• Port Darlington WPCP completed in 2017 which increased daily wastewater capacity from 13.6 million litres per day to 27.3 million litres per day.

Project	Status
Pickering Airport	• Not yet started. Lands remain in ownership of federal government.
Oshawa Ethanol Plant	• Project cancelled in 2016.
DNGS Refurbishment	• The refurbishment of DNGS is currently under way since 2022 and its completion is expected in 2026 [71]. Since DNGS is being refurbished, the earliest shutdown date for a unit will not take place until approximately 2050.
Pickering U05-08 refurbishment and continued operation	• Pickering U05-08 is currently approved to continue operation until the end of 2024, however OPG has recently announced a plan to seek approval to operate until Sept 2026 and plans to reassess the feasibility of refurbishing Pickering U05-08. The Pickering U05-08 refurbishment and continued operation was considered in the EIS.
Growth and Development in Regional Communities	• Ongoing growth and development as planned in urban communities including Courtice, Bowmanville, Newcastle and Oshawa. • In 2020, Toyota's Eastern Canada Parts Distribution Centre opened its 300,000 ft^2 facility in east Bowmanville.

In the EIS, residual adverse effects of the proposed DNNP were identified in the following environmental components:

- Aquatic,
- Terrestrial,
- Visual landscape, and
- Socio-economic.

Therefore, the assessment of cumulative effects in the EIS focused on relevant receptors (VECs) within these four areas of the environment. In addition, although no residual adverse radiological health effects were found to be likely, the effects of radiation and radioactivity on human health were considered in the EIS cumulative effects assessment because of concerns generally expressed by some members of the public that their health, safety and well-being may be affected by radiation and radioactivity from any nuclear project or operation. Similarly, although no residual Project traffic or air quality effects were found to be likely, related community concerns were considered in the EIS cumulative effects assessment.

There are 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. The beneficial effects identified in the EIS remain applicable to the BWRX-300 deployment. The following provides a summary of the cumulative effects of BWRX-300 deployment in comparison with those assessed in the EIS.

5.8.1 Aquatic Environment

The EIS considered the cumulative effect of the DNNP and other projects that would coincide with DNNP and could affect the same aquatic environment. The predominant relevant effect of the DNNP would be impingement losses of fish from the once-through cooling system. The EIS determined that no measurable cumulative effect is likely to occur. The BWRX-300 will require a smaller flow rate of cooling water (less than 68 m^3/s) for four reactors than what has been assessed in the EIS (228 m^3/s) for four bounding scenario reactors. The assessment of cumulative effects on the aquatic environment is consistent with the effects in the EIS and should result in smaller or equal cumulative effects with other surrounding projects.

5.8.2 Terrestrial Environment

The cumulative effects analysis in the EIS involved looking at on-site and off-site projects. Since very few on-site projects were identified no cumulative adverse residual effects on vegetation and wildlife habitat were determined in the EIS. Since the BWRX-300 reactor has a smaller footprint than what has been assessed in the EIS, less habitat will be lost as result of the BWRX-300 deployment. As such cumulative effects on the terrestrial environment should be the same or less as the bounding scenario reactors assess in the EIS since the potential for cumulative effects with other on-site and off-site projects and activities is limited.

5.8.3 Land Use and Visual Setting

The BWRX-300 has a smaller footprint (19 ha for 1-unit) and will require less landfill (soil and rock removal can be estimated at approximately 3.3 Mm^3 for four reactors [10]) for the excess soil from its deployment. It will also require less material (40,000 m^3 of concrete for the plant facilities including the reactor, turbine, and fuel buildings) for construction of plant facilities than what was assessed in the EIS (400,000 m^3 of concrete for the EPR). As such, the residual cumulative effects on land use are considered less than those assessed in the EIS.

Since the BWRX-300 deployment does not include cooling towers, the visual effect and potential cumulative effects on land use and visual setting of the cooling towers is no longer applicable.

5.8.4 Socio-Economic Conditions

The smaller footprint of the BWRX-300 deployment means less disruption in terms of nuisance effects such as dust, noise, and traffic, to recreational facilities located near the DN Site.

The EIS determined that the other projects that would coincide with DNNP are not likely to contribute measurably to cumulative concerns about truck traffic along excess soil haul routes through residential areas or related property value effects. As mentioned, most large projects in the Durham Region have been completed and with the smaller quantity of soil, rock, and materials to be transported, and the smaller DNNP construction workforce, means less traffic associated with the DNNP. As such, the residual cumulative effects on the socio-economic environment are considered less than those assessed in the EIS.

5.8.5 Effect of Radiation and Radioactivity on Human Health

The dose to the most exposed members of the public from the BWRX-300 deployment was calculated in the Dose Estimation Report [50] and was found to be approximately 0.3 μSv/year for a single reactor, or 1.2 uSv/year for four reactors. These calculated doses are less than the prorated value 4.4 μSv/year for up to four reactors in the EIS.

5.8.6 Community Concerns Regarding Concentration of Projects and Activities

The larger construction projects that were expected to occur at the same time as the construction of the original timeline for DNNP have either already been completed (e.g., Highways 407, 412, and Highway 401 improvements) or have yet to commence (e.g., GO Transit expansion). Since the EIS assumed that these projects would occur at the same time as the construction of the BWRX-300, their impact had already been assessed as minor residual cumulative effects in the EIS.

Regarding the cumulative socio-economic effects on local labour supply, community services and infrastructure, the EIS concluded that the DNNP is not likely to result in residual adverse effects. Given the completion of large projects over the past decade, the short overlap period of the Darlington Refurbishment and the DNNP construction, and a smaller scale of the BWRX-300 deployment, this determination remains valid.

The effect on the community character was mostly due to the presence of the cooling towers, which are not part of the BWRX-300 deployment.

5.8.7 Summary of EIS Chapter 8 – Summary of Assessment of Cumulative Environmental Effects

The EIS determined that only one residual cumulative adverse effect was identified and carried forward to Chapter 9 for determination of Significance:

- Combined visual and related community effects (concerns about a negative change in community character and reduced enjoyment of private property) resulting from the possible DNNP cooling towers and other tall structures existing and foreseeable in the vicinity of the DN site.

Since the BWRX-300 deployment does not include cooling towers, this effect is not relevant. In the remaining aquatic, terrestrial, visual landscape and socio-economic components of the environment, the cumulative effects were found to be such that no additional mitigation measures were necessary.

5.9 EIS Chapter 9 – Significance of Residual Adverse Effects

In the EIS, 24 likely residual adverse effects were identified. In accordance with the requirement of the *CEAA*, these effects were assessed for their significance. The assessment of the significance of residual adverse effects for the bounding scenario reactors and for the BWRX-300 deployment is summarized below in Table 5-29.

For clarity, the following color coding is used for this table:

- Blue: No residual adverse effects are anticipated on the receptor from BWRX-300 deployment, the same as was determined in the EIS.
- Green: “minor” and “not significant” residual adverse effects from BWRX-300 deployment because they are likely to have less effect on the receptors (characterized as a VEC) than assessed in the EIS.
- Pink: Opportunity areas that were not considered in the EIS but could now be available due to the smaller footprint for the BWRX-300 deployment.
- Yellow: The residual adverse effect assessed in the EIS is no longer expected as it is related to a DNNP feature assessed in the EIS that is not applicable to BWRX-300 deployment at the DNNP site.
- Grey: Indicate a baseline condition not previously considered.
- White: Residual adverse effects assessment is and will continue to be ongoing.

Table 5-29: Determination of Significance of Residual Adverse Effects

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
ATMOSPHERIC ENVIRONMENT			
No residual adverse effects	Air quality (dust) and noise are pathways to VECs in other environmental components		No residual adverse effect in the Atmospheric Environment Residual effects in other environmental components potentially resulting from dust and noise as a pathway are described in the appropriate sections of this table.
SURFACE WATER ENVIRONMENT			
No residual adverse effects	Lake Circulation, Lake Water Temperature, Site Drainage and Water Quality, and Shoreline Processes are pathways to VECs in other environmental components		No residual adverse effects in the Surface Water Environment. Residual effects in other environmental components potentially resulting from lake circulation, lake water temperature and quality, shoreline processes, as a pathway are described in the appropriate sections of this table.
AQUATIC ENVIRONMENT			
Loss of approximately 40 ha of Lake Ontario	Aquatic Habitat	**Minor Residual Adverse Effect (Not significant)** There is nothing distinctive about the DN Site	Minor Residual Adverse Effect

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
nearshore aquatic habitat as a result of lake infilling and construction of cooling water intake and discharge structures.		nearshore habitat as a spawning or feeding area that is not shared by adjacent areas for many kilometers east and west of the site, influenced to a limited extent by the seasonal presence of warmwater fish from nearby tributaries, bays, and coastal marshes. The nearshore in this area is a high energy environment. Its ecology is heavily skewed toward the seasonal and intermittent presence of migratory Lake Ontario fish species. Preliminary results of the Habitat Alteration Assessment Tool (HAAT) model also suggested the low productivity of the proposed lake infill area, and areas affected by the construction of the cooling water intake and discharge structures. The Project will not result in a residual adverse effect on Aquatic Habitat because of the mitigation measures that will be implemented (notably, the Fish Habitat Compensation Plan).	Effect on Lake Ontario nearshore aquatic habitat is less than that described in the EIS. (Not significant)
Loss of some aquatic biota (i.e., benthic invertebrates, fish) during the construction of the lake infill and the intake and discharge structures.	Benthic Invertebrates, VEC Fish Species	**Minor Residual Adverse Effect (Not significant)** Near shore environment of proposed infill is a high energy zone (typically shallow; influenced by waves, storm events), with few documented invertebrate species. Round gobies are an invasive species. Footprint of cooling/service intake and discharge	Minor Residual Adverse Effect Effect is less than that described in the EIS. (Not significant)

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
		structures is small, and habitat loss is not significant relative to entire area.	
Impingement and entrainment losses associated with operation of the once-through lake water cooling option, and to a lesser degree, with the cooling tower option.	Benthic Invertebrates, VEC Fish Species	**Minor Residual Adverse Effect (Not significant)** Once-through-cooling porous veneer intake has been designed specifically for reducing entrainment and impingement of fish. The intake incorporates design features based on fish behavioural principles and is also located offshore at depths which are less productive than inshore locations. The expected losses will be low relative to Lake Ontario populations.	Minor Residual Adverse Effect Effect is less than that described in the EIS. (Not significant)
No residual adverse effect.	On-site Aquatic Habitat (ponds, intermittent tributaries to Darlington Creek and to Lake Ontario, Darlington Creek)	No residual adverse effect	Opportunity area not considered in the EIS – Residual Adverse Effects anticipated to be minor. More of the habitat may remain. Effect from habitat removal may be less than that described in the EIS. Hydrological assessment determined there will be minimal change to on-site ponds or tributaries. Effects from dust, hydrology/hydrogeology were evaluated and are anticipated to be

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
			minor [32] [33] [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
TERRESTRIAL ENVIRONMENT			
Loss within the DN Site of approximately 40 to 50 ha of mostly Cultural Meadow Ecosystem.	Cultural Meadow and Thicket Ecosystem, including Breeding Mammals Migrant Butterfly Stopover Area Breeding Birds, including Winter Raptor Feeding and Roosting Area, and Migrant Songbirds and their Habitat	**Minor Residual Adverse Effect (Not significant)** Cultural meadows and other terrestrial habitat of the types found at DN Site are widespread in the environment in southern Ontario, and in the RSA and LSA. Many of those at the DN Site are hydroseed mixture or otherwise of low ecological function. The effect is also confined to the DN Site. The VECs will persist at the DN Site as some habitat will remain where raptors can feed or roost. Breeding birds occupy almost all habitats, constructed and natural. None of the breeding bird habitats being reduced due to effects of the Project are unique to the DN Site and they occur commonly in the RSA and LSA, VECs will persist at the DN Site as will most of the suite of breeding birds known to occur.	Opportunity area not considered in the EIS – Residual Adverse Effects anticipated to be minor. More of the habitat may remain. Effect from habitat removal may be less than that described in the EIS. Effects from dust, noise, hydrology/hydrogeology on terrestrial habitats potentially remaining were evaluated and are anticipated to be minor [32] [33] [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
			level.
No residual adverse effect	Wetland and Woodland Ecosystems, Rare Plant Species, Amphibians and Reptiles, Insects – Dragonflies and Damselflies, Mammal communities and species	No residual adverse effect	Opportunity area not considered in the EIS – Residual adverse effects anticipated to be minor. More of the habitat may remain. Effect from habitat removal may be less than that described in the EIS. Effects from noise, dust and hydrology/hydrogeology were evaluated and are anticipated to be minor [32] [33] [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level.
Loss of nesting habitat for up to 1,000 active Bank Swallows	Breeding Birds (Bank Swallows)	**Minor Residual Adverse Effect (Not significant)** The mitigative options being advanced for consideration are innovative including the long-term protection of important nesting areas, design and construction of artificial Bank Swallow colonies, and research into declines in aerial foraging birds.	Minor Residual Adverse Effect Anticipated (for four reactor deployment). Residual adverse effect anticipated to be not significant.. For the four-reactor scenario, the habitat would likely be rendered

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
		These actions are expected to bring long-term tangible benefits to the species and perhaps others. The portions of the colony being removed are confined to the Site Study Area (SSA) and a larger portion of the associated colony will remain viable.	unsuitable due to shoreline protection and/or hydrogeological changes; this is consistent with the effects assessed in the EIS.
			Opportunity area not considered in the EIS (for one reactor deployment) – Residual Adverse Effects anticipated to be minor. For the one reactor deployment, footprint and facility would be smaller, which will allow the Bank Swallow habitat to remain. Effects on Bank Swallows from hydrogeology, vibration, noise and dust were evaluated and are anticipated to be minor. Mitigative measures are available to eliminate or reduce residual effects to a non-significant level.
Loss of habitat for mammals (new)	Bats (new baseline condition)	Impacts to bats were not considered in the EIS as this is a new condition.	Residual Adverse Effects anticipated to be minor.

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
			New baseline condition. Effects on bat habitat from hydrology/hydrogeology, light, noise and dust were evaluated and are anticipated to be minor [32] [33], [11]. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level and consistent with other regulatory requirements.
Bird strike mortalities associated only with natural draft cooling tower structures. (Estimated at <110 in the spring and <300 in the fall assuming natural draft cooling towers).	Migrant Songbirds and their Habitat	**Minor Residual Adverse Effect (Not significant)** Compared to the large numbers of migrant birds passing over the DN Site in spring and fall, or to the known level of mortalities at lit buildings in Toronto or due to other anthropogenic sources (e.g., residential windows, pet cats) these anticipated strike numbers are low. In addition, the effect will occur in a relatively small area associated with the tower structures in the SSA only. The	Not applicable

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
		effects are unlikely to result in measurable change to bird populations	
Disruption to wildlife travel along the east-west wildlife corridor during Site Preparation and Construction phase.	Landscape connectivity	**Minor Residual Adverse Effect (Not significant)** Although there is no major wildlife corridor on site, a corridor does exist. Wildlife using the east-west corridor through the DN Site are already adapted to the road network and high levels of human disturbance that characterize both the LSA and SSA. The DN Site remains permeable for many of these species and the period of disturbance will be relatively limited.	Minor Residual Adverse Effect Effect is less than that described in the EIS. (Not significant)
GEOLOGICAL AND HYDROGEOLOGICAL ENVIRONMENT			
No residual adverse effects advanced for significance assessment.	Soil quality, groundwater quality, and groundwater flow are pathways to VECs in other environmental components		No residual adverse effects.
RADIATION AND RADIOACTIVITY ENVIRONMENT			
No residual adverse effects advanced for significance assessment.	Radioactivity in the Atmospheric, Surface Water, and		No residual adverse effects.

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
	the Hydrogeological Environments are pathways to VECs in other environmental components		
LAND USE			
Changes in the quality of existing views of the DN Site throughout the operating life of the Project from viewing locations in the RSA and LSA as a result of the presence of the natural draft cooling tower structures and the associated plumes released from either natural draft or mechanical draft cooling towers. (Residual Project effect considered in	Visual Aesthetics	**Minor Residual Adverse Effect (Not Significant)** The combined residual adverse effect and likely cumulative effect will not likely preclude the use and enjoyment of private property in LSA communities. Although the conditions creating the effect will not be reversible, the magnitude of the effect is likely to further diminish over time as the structures become a familiar feature of the landscape.	Not applicable

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	**BWRX 300**
combination with the effects of other tall structures existing and foreseeable in the DN Site vicinity.)			
TRAFFIC AND TRANSPORTATION			
No residual adverse effects			No residual adverse effects
PHYSICAL AND CULTURAL HERITAGE			
No residual adverse effects			No residual adverse effects
SOCIO-ECONOMIC ENVIRONMENT			
Change in the character of communities in the RSA and LSA because of the presence of the natural draft cooling tower structures and the associated plumes released from either natural draft or mechanical draft cooling towers.	Community Character	**Minor Residual Adverse Effect (Not significant)** Although there is likely to be a cumulative visual effect, the NND Project (in combination with other tall structures existing and foreseeable in the DN Site vicinity) will not likely change the unique and distinctive qualities of LSA communities. The area in the immediate vicinity of the DN Site is a mix of industrial, commercial, and residential land uses. The presence of industrial and commercial land uses is increasing.	Not applicable
Reduced use and enjoyment of community	Community and Recreational	**Minor Residual Adverse Effect (Not significant)**	Minor Residual Adverse Effect

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	**BWRX 300**
and recreational features on the DN Site during the Site Preparation and Construction phase	Facilities and Services (also applies to Health-Human VEC – members of the public)	The Project does not preclude the use of the DN Site for recreational purposes. The reduced use and enjoyment of the DN Site for recreational purposes will likely be experienced by a small number of users for a few years prior to its restoration.	Effect is less than that described in the EIS. (Not significant)
Disruption to use and enjoyment of property because of nuisance-related effects (e.g., dust, noise, traffic), during the Site Preparation and Construction phase for some residents living along the truck haul routes.	Use and Enjoyment of Private Property (also applies to Health-Human VEC – members of the public)	**Minor Residual Adverse Effect (Not significant)** Although those affected will likely notice increased traffic, noise and dust, these effects are not anticipated to be of sufficient magnitude to preclude continued use of private property. Effects will also be limited to a few properties along the haul route within the LSA during the Site Preparation and Construction phase.	Minor Residual Adverse Effect Effect is less than that described in the EIS. (Not significant)
Reduced enjoyment of private property in the RSA and LSA because of the visual dominance of the natural draft cooling tower structures and the associated vapour plumes released from either the natural draft or	Use and Enjoyment of Property (also applies to Health-Human VEC – members of the public)	**Minor Residual Adverse Effect (Not significant)** Although there is likely to be a cumulative visual effect, the NND Project (in combination with other tall structures existing and foreseeable in the DN Site vicinity) will not likely preclude the use and enjoyment of private property in LSA communities. Although the conditions creating the effect will not be reversible, the magnitude of the effect is likely	Not applicable

Likely Residual Adverse Effect (After Mitigation) from the Bounding Scenario Reactors	Valued Ecosystem Component Affected	Significance of Residual Adverse Effects (After Mitigation)	
		From the EIS	BWRX 300
mechanical draft cooling towers		to further diminish over time as the structures become a familiar feature of the landscape and the Project establishes a positive track record.	
INDIGENOUS RIGHTS AND INTERESTS			
Refer to Section 5.5.12			Refer to Section 5.5.12
HEALTH HUMAN			
No residual adverse effects (except for those noted above under Socio-Economic Environment)			No residual adverse effects (except for those noted above under Socio-Economic Environment)
HEALTH NON-HUMAN BIOTA			
No residual adverse effects			No residual adverse effects

Note: the assessment of the effects of malfunctions, accidents, malevolent acts and their significance is assessed in Section 5.7. The determination of significance for cumulative effects can be found in section 5.8.

As shown in the table above, the EIS significance analysis had assessed all the residual adverse effects to be "Not Significant". Of the likely residual adverse effects that were forwarded for assessment of significance in the EIS:

- seven (7) were also determined to result in minor residual adverse effects from the BWRX-300 but less than that described in the EIS
- four (4) were not applicable to the BWRX-300 reactor largely due to a change in design (e.g., no cooling towers); and
- a review of potential adverse effects was undertaken for terrestrial receptors in habitats that may be retained. Mitigative measures are available to eliminate or reduce residual adverse effects to a non-significant level and consistent with other regulatory requirements.

OPG will continue to work with Indigenous Nations and communities to appropriately identify rights impacted by the DNNP, and to work toward mitigation measures and/or accommodation. These commitments are reinforced by OPG's dedication to reconciliation and to renewing its relationships with Indigenous peoples.

In the EIS, no residual adverse effect was anticipated for seven (7) environmental components. This remains unchanged for the deployment of BWRX-300 reactors.

5.10 EIS Chapter 10 – Communications and Consultation Program

The EIS provides an overview of the communications and consultation program developed for DNNP. The program was based on industry best practices and available guidance materials at that time. In normal practice, the CNSC Guidelines issued to OPG for the EIS required notification of, and consultation with, the potentially affected public and other stakeholders. These Guidelines also required that the EIS summarize the public and stakeholder comments received and indicate how any related issues are considered in the completion of the EA studies, or how they may be addressed at any subsequent stage in the regulatory process.

A wide range of regulatory, Indigenous community, stakeholder groups and the general public were identified and engaged through a wide variety of means, including active methods such as: regular meetings with existing and new stakeholder committees; periodic briefing sessions and workshops with key stakeholders; five rounds of community information sessions; OPG participation at community events; and a special program for engaging Indigenous Nations and communities.

Since 2009, OPG has continued to communicate with regulators, Indigenous Nations and Communities, stakeholders, and the public about the status of DNNP.

OPG posts updated information about DNNP and related licensing activities both online and at their existing facilities. They also operate a toll-free information line and maintain a fully staffed public information centre where the public can go to ask questions. OPG is active on all popular social media applications and shares information through these channels, as well as using their public website as a means of interaction with stakeholders and members of the public.

OPG has also committed to ensuring transparency through different community outreach activities. This includes presentations and bus tours of the Darlington Nuclear site and DNNP lands, a Quarterly Neighbours Newsletter for the Darlington Nuclear station that is distributed to all residents and businesses within ten kilometers, and OPG's annual public open house in which the nearby community is encouraged to come and ask questions. Community groups are also encouraged to use the meeting room and event space at the Information Centre for events unrelated to the industry. Welcome letters from the Darlington Nuclear Site Vice President were distributed to all new members of the community via the community programs.

OPG meets with local community committees, such as the Darlington Community Advisory Council, to provide update on OPG nuclear operations, current and future nuclear projects. OPG also receives advice on issues of environmental, economic, and public concern regarding nuclear projects and operations at this forum. OPG staff also make regular presentations at the Durham Nuclear Health Committee on different environmental, community outreach, and operational issues.

Overall, OPG's communication and consultation activities since 2009 have met their commitments to the CNSC and others and can be expected to continue and meet or exceed industry best practices, regulatory requirements and the expectations of Indigenous Nations, stakeholder groups and the general public.

5.11 EIS Chapter 11 – Preliminary Plan for EA Follow-up Program

This chapter of the EIS describes the preliminary plan and scope of the follow-up and monitoring program to verify the accuracy of the EA and determine the effectiveness of measures taken to mitigate any adverse environmental effects of DNNP. The preliminary scope of the follow-up program addresses the Site Preparation and Construction, and Operation and Maintenance phases of DNNP.

As part of the EIS, OPG made Commitment D-P-12.1 [1] to have an environmental monitoring and EA follow-up monitoring program in place as well as the methodologies to implement this program. The purpose of the EA follow-up monitoring program is to:

1. Verify predictions of environmental effects identified in the environmental assessment.
2. Determine the effectiveness of mitigation measures in order to modify or implement new measures where required.

OPG has designed an EA follow-up monitoring program for the DNNP life cycle and developed methodology reports for certain VECs to support the DNNP site preparation activities. As concluded from this supporting document, the EA follow up monitoring program remains suitable for the deployment of BWRX-300. Should unanticipated adverse environmental effects emerge, they will be addressed through adaptive management measures.

Table 5-30 provides descriptions of the preliminary EA follow-up program elements listed in Table 11.6-2 of the EIS [3] as well as the recommended refinements to the program to address the findings and explore opportunities identified in this supporting document. Refinements to the EA follow-up program may be further updated, if the opportunity to retain some terrestrial habitats is realized.

Where the impact of the BWRX-300 deployment is qualitatively determined to be similar to or less than those in the EIS, associated EA follow-up monitoring program elements still apply.

Table 5-30: EA Follow-Up Program Recommended Refinements

Environmental Sub Components	EIS Preliminary Follow Up Program Descriptions	Recommended Program Refinements
Atmospheric Environment		
Air Quality	Measure Total Suspended Particulate (TSP), PM_{10} and $PM_{2.5}$, NO_2, SO_2, VOC, PAH (BaP) during Site Preparation and Construction activities to periodically confirm the effectiveness of the Dust Management Plan and verify EIS predictions.	The follow-up monitoring of this element is applicable to the BWRX-300 deployment. The BWRX-300 deployment is expected to result in a lesser impact to the atmospheric environment than the reactors previously assessed in the EIS (see Section 5.5.2).
Noise	Measure noise levels during Site Preparation and Construction activities to periodically confirm the effectiveness of the Noise Management Plan and verify EIS predictions.	Health Canada suggests that when a project undertaking causes a change in percent highly noise-annoyed of +6.5%, a significant noise impact is expected, hence evaluation of noise control would be required. Consideration of noise control is also required when the Ldn exceeds 75 dBA. This guideline was not in force at the time of the EIS but would now be applicable to BWRX-300.
Surface Water Environment		
Lake Circulation and Shoreline Processes	For the once through cooling option, monitor performance of new intake (e.g., velocities and associated effects on substrates, current deflection) and new discharge diffuser (discharge velocities and associated effects on substrates and current deflection; thermal plumes) during commissioning.	The follow-up programs apply to the BWRX-300 deployment. The BWRX-300 deployment results in a lesser impact to the surface water environment than the reactors previously assessed in the EIS (see Section 5.5.3). Once-through cooling will be used.
Lake Water Temperature	For the once through cooling option, periodically monitor lake water temperatures near the surface and at the bottom to verify the performance of the intake and diffuser.	
Site Drainage and Water Quality	Undertake post-construction water quality sampling in Lake Ontario focused on verifying the effects of the Project as predicted in the EIS.	
	To verify the effects of the EIS, sample stormwater discharges from the DNNP following a plan (with	

Environmental Sub Components	EIS Preliminary Follow Up Program Descriptions	Recommended Program Refinements
	regard for parameters and frequency) appropriate for the facility.	
Aquatic Environment		
Aquatic Habitat	Consistent with the Authorization for Works or Undertakings Affecting Fish Habitat conditions, monitor postconstruction conditions to confirm success of habitat restoration and compensation plans.	The follow-up programs apply to the BWRX-300 deployment. The BWRX-300 deployment results in a lesser impact to the aquatic environment than the reactors previously assessed in the EIS and the residual effects identified remain valid (see Section 5.5.4).
Aquatic Habitat and Aquatic Biota	For the once-through lakewater cooling option, periodically monitor data on cooling water discharge temperature and plume characteristics interpreted in relation to fish habitat and susceptibility of VEC species, to verify EIS predictions.	
Terrestrial Environment		
Vegetation Communities and Species, Breeding Birds, Insects, Amphibians and Reptiles, Landscape Connectivity	Monitor conditions to confirm the EIS predictions of habitat restoration post-construction.	The follow-up program applies to the BWRX-300 deployment.
Bird Communities and Species	Develop, prior to site preparation activities, a Bank Swallow mitigation plan for implementation during Site Preparation and Construction phase and verify the implementation of the plan. Verify the results predicted in the EIS during initial operation of the DNNP.	For the one reactor BWRX-300 deployment, the Bank Swallow habitat will remain on the DNNP site. Site preparation activities are not expected to affect Banks Swallows nor their habitat. For site preparation and construction phase, the vibration study has demonstrated that it is unlikely that vibrations from blasting, boring, and other construction activities would be greater than those generated currently by St Marys Cement.

Environmental Sub Components	EIS Preliminary Follow Up Program Descriptions	Recommended Program Refinements
		For the 4-reactor layout, the Bank Swallow nesting habitat function may be lost through shoreline protection and/or changes in hydrogeology, which is consistent with the EIS. The follow-up program applies to the BWRX-300 deployment, with the refinement that the Bank Swallow mitigation plan should be developed for implementation prior to the execution of activities impacting the species or their habitat.
Mammal Communities and Species, Bird Strikes	Periodically conduct wildlife mortality surveys during Site Preparation and Construction.	The follow-up program partially applies to the BWRX-300 deployment. The follow-up program will periodically conduct wildlife mortality surveys and verify the results predicted by the EIS throughout all phases of the BWRX-300 deployment. Additional follow-up monitoring will be conducted as required by the provincial regulator through ESA approvals. Bird strike monitoring was incorporated in the EIS specifically related to cooling towers. As the BWRX-300 will not use cooling towers this monitoring is not required.
	Not identified in the EIS.	Bats are identified as a receptor which was not considered at the time of EIS completion (see Section 5.5.5). Follow-up monitoring will be completed based on the conditions of the ESA permit.
Geological and Hydrogeological Environment		
Ground Water Flow and Quality	Monitor groundwater flow to confirm EIS predictions.	The follow-up programs apply to the BWRX-300 deployment. The BWRX-300 deployment results in a lesser impact to the geological and hydrogeological environment than the reactors previously assessed in the EIS (see Section 5.5.6). The follow-up programs will monitor groundwater flow and confirm EIS predictions of the post-construction on-site flow regime and confirm baseflow estimates in Darlington Creek at the beginning of the
	Confirm EIS predictions post-construction of on-site groundwater flow regime.	
	Confirm baseflow estimates in Darlington Creek at the beginning of the Operation and Maintenance phase.	

Environmental Sub Components	EIS Preliminary Follow Up Program Descriptions	Recommended Program Refinements
		Operation and Maintenance phase.
Land Use		
Land Use	Monitoring Regional Policy (e.g., Growing Durham Study; DROP Amendment process). Monitor additional relevant policy. Monitor committee and Council minutes and the Study approval process. Confirm projected population, at the end of the Site Preparation and Construction activities, to ensure that emergency response plan is consistent with the projections.	The follow-up programs apply to the BWRX-300 deployment. The BWRX-300 deployment results in a lesser impact to land use than the reactors previously assessed in the EIS (see Section 5.5.8). The follow-up programs will monitor Regional Policy, committee and council minutes, and the Study approval process as well as confirm the projected population at the end of preparation and construction phases.
Traffic and Transportation		
Transportation System Safety (Road)	As part of the Traffic Management Plan, undertake pre-Project road condition assessment as a baseline for considering incremental Project-related degradation. Follow with periodic inspections of road conditions to document changes relative to baseline during construction. As part of the Traffic Management Plan, at the beginning of the Operation and Maintenance phase, verify road safety as predicted in the EIS.	The follow-up program applies to the BWRX-300 deployment. The BWRX-300 deployment information is consistent with the EIS (see Section 5.5.9). The follow-up program, as part of the Traffic Management Plan, will verify EIS road safety predictions at the beginning of the Operations and Maintenance phase and will periodically monitor and document changes in road conditions.
Socio-Economic Environment		
Physical Assets (Community Character and Image)	Undertake Public Attitude Research (PAR) at the end of each phase of the Project.	The EIS identified negative change in character of communities due to presence of cooling towers as a residual (not significant) adverse effect of DNNP. The BWRX-300 deployment will not use cooling towers and changes in the character of communities in the RSA and LSA due to the presence of cooling structures is not applicable (see Section 5.5.10). OPG should still consider Public Attitude Research to verify the continuing absence of significant residual adverse effects.

<table>
<tr><th>Environmental Sub Components</th><th>EIS Preliminary Follow Up Program Descriptions</th><th>Recommended Program Refinements</th></tr>
<tr><td>Social Assets (Community and Recreational Facilities and Services)</td><td>Undertake a recreational user survey of the DN site recreational facilities at the start of the Construction phase and the Operation and Maintenance phase.</td><td rowspan="2">The follow-up programs apply to the BWRX-300 deployment. The BWRX-300 deployment information is consistent with the EIS findings that there is likely to be some reduced use and enjoyment of the community and recreational features on the DN site during the Site Preparation and Construction phase (see Section 5.5.11).

The follow-up programs will conduct door to door and user surveys for DN site neighbours and recreational facility users at the start of the Construction phase and the Operation and Maintenance phase.</td></tr>
<tr><td>Social Assets (Ability to use and enjoy property)</td><td>Undertake a door-to-door survey of DN site neighbours at the start of the Construction phase and the Operation and Maintenance phase.</td></tr>
<tr><td colspan="3">Non-Human Biota</td></tr>
<tr><td>Non-Human Biota</td><td>No residual adverse effects on non-human biota are predicted. However, if follow-up and monitoring programs conducted for other environmental components suggest changes or conditions that may lead to effects on non-human biota, the Ecological Risk Assessment will be updated, including the identification of mitigation measures or other actions that may be appropriate to address such effects.</td><td>The follow-up program applies to the BWRX-300 deployment. The BWRX-300 deployment information is consistent with the EIS (see Section 5.5.14).</td></tr>
<tr><td colspan="3">Public Consultation</td></tr>
<tr><td>Public Consultation</td><td>Develop a follow-up Communication Plan.</td><td>The follow-up program applies to the BWRX-300 deployment. The BWRX-300 deployment information is consistent with the EIS.</td></tr>
</table>

5.12 EIS Chapter 12 – Preliminary Decommissioning Plan

The EIS guidelines require a Preliminary Decommissioning Plan for the DNNP site at the pre-implementation phase. Due to the preliminary nature of the decommissioning plan, the level of information available to assess the environmental effects of decommissioning is less detailed than it would be at implementation phases of the Project. Hence the assessment of potential environmental effects of the DNNP decommissioning are at a conceptual level.

Much of the information in the EIS related to the decommissioning is generic information and applies to any reactor technology, including the BWRX-300 deployment. Table 5-31 provides the results of the review of EIS sections related to the EIS preliminary decommissioning plan.

Table 5-31: Comparison of Preliminary Decommissioning Plan

EIS Section	EIS Description	Application to BWRX 300 deployment
Section 12.1 - Regulatory Requirements for Decommissioning and Forecast of Decommissioning Dates	CNSC's regulatory guidelines for preparing a Preliminary Decommissioning Plan (PDP) during the multi-stage licensing process in accordance with the CNSC's Regulatory Guide G-219 *Decommissioning Planning for Licensed Activities.* The EIS assumes that for EA planning purposes, decommissioning will begin in 2100.	The information provided in the EIS is applicable to any technology including the BWRS-300 deployment. Further OPG will ensure that all requirements contained within the new regulatory document REGDOC-2.11.2 "Decommissioning" (replacing CNSC's Regulatory Guide G-219) and the CSA N294:19 will be met by the PDP for the BWRX-300 deployment. According to the project timeline provided in Section 3.3 of this report, the decommissioning of the first and fourth reactors will begin in 2089 and 2095, respectively.
Section 12.2 - Decommissioning Strategy – Reactors, Nuclear Waste Management Facilities, Abandonment	The preferred decommissioning strategy for DNNP was deferred dismantling to minimize the occupational radiation dose and the potential exposure of the public and the environment. The nuclear waste management facilities would be dismantled after stored nuclear waste has been safely removed.	As the decommissioning strategy for the BWRX-300 has not been established, the strategy used in the EIS is applied to the decommissioning of the BWRX-300 reactors. Therefore, their effects are anticipated to be similar as considered in the EIS. If the decommissioning strategy differs from this assumption, after submission of the PDP, OPG will review the assessment of the effects as part of its licensing commitments.
Section 12.3 - Preparing for Decommissioning	The steps taken prior to initiating decommissioning of DNNP. This will include completing all necessary regulatory activities to comply with requirements from the current NSCA and regulations of the CNSC, the CEAA and	The information in this EIS section is generic and applicable to any reactor technology including the BWRX-300 deployment

EIS Section	EIS Description	Application to BWRX 300 deployment
	Regulations and other Federal and Provincial statutes and regulations.	
Section 12.4 - Steps in Decommissioning a Station - Phase I – Preparation for Safe Storage, Phase II – Safe Storage and Monitoring, Phase III – Dismantling, Disposal, and Site Restoration	The first stage of decommissioning defined in the EIS. During this phase reactors are defueled, and dewatered, and most external non-fixed surface contamination will be removed. The second stage involves the safe storage and monitoring, where time allows for the decay of short-lived fission and activation products remaining in plant components. The final stage of decommissioning defined in the EIS which will typically extend over 10 years. Different surveys will be conducted for radioactive and other hazardous materials to ensure they have all been removed before demolition of buildings and structures.	The information in this EIS section is generic and applicable to any reactor technology including the BWRX-300 deployment.
Section 12.5 – Steps in Decommissioning a Waste Management Facility	The decommissioning plan is logically divided into three decommissioning planning envelopes: Processing Buildings, Storage Buildings, and Outdoor Surfaces.	The BWRX-300 licence to construct does not include the waste management facilities, since radioactive waste from the BWRX-300 deployment will be sent to licensed facilities, which will be decommissioned separately. The generic information related to the used fuel dry storage facility is applicable to the BWRX-300 deployment.
12.6.1.1 – Waste Management During Decommissioning - Used Nuclear Waste	Section 12.6.1.1 of the EIS assumed that a long-term fuel management is a responsibility of Nuclear Waste Management Organization (NWMO) and a long-term used fuel management facility will be in-service by 2035.	NWMO has updated the operational start date of the long-term fuel management facility in 2040 to 2045 [72]. Apart from this change, the information in this EIS section applies to the BWRX-300 deployment, which will ensure long-term management of the BWRX-300 used fuel.
12.6.1.2 – Waste Management During Decommissioning – Low-and Intermediate-Level Waste	The projected quantity of L&ILW that will be produced during the decommissioning of the waste management facilities were based on those estimated for current waste management facilities at Darlington Nuclear generating Station (DNGS) and Darlington Waste Management Facility	The waste generated by the Operation and Maintenance, and the Decommissioning of the BWRX-300 will be managed at licensed facilities. The mass of all forms of radioactive material produced by the BWRX-300 deployment will be much less than those generated from the reactors considered in the EIS.

EIS Section	EIS Description	Application to BWRX 300 deployment
	(DWMF). The projected waste volumes are provided in the EIS Table 12.6-1.	Based on the surface area of the BWRX-300 facilities and the mass of the waste produced during operations and from the decommissioning process, the BWRX-300 deployment will produce less waste than what was assessed for the bounding scenario reactors.
12.6.2 – Waste Management During Decommissioning - Hazardous Waste Management	The hazardous wastes will be transported and disposed of in accordance with all federal and provincial regulations. It is also noted that an assessment of the designated substances used at DNNP will be completed as required, with the three most likely to be found at the time of shutdown being mercury, lead, and asbestos.	The BWRX-300 may not have the same three designated substances listed in the EIS. OPG will seek to minimize the use of designated substances in the deployment of the BWRX-300 and will ensure that such substances are disposed in accordance with the applicable regulations.
12.6.3 – Waste Management During Decommissioning - Other Wastes	Section 12.6.3 of the EIS covers the production of non-hazardous waste produced during the decommissioning phase and how this waste will be dealt with. The volume or mass of non-hazardous waste is not discussed in this section of the EIS.	Due to its size, footprint, and size of its buildings, it is expected that there will be less equipment and material that needs to be removed during the decommissioning process of the BWRX-300 than for the bounding scenario reactors.
12.7 – Potential Hazards and Protection Strategies - Hazards	The potential hazards that might be encountered during decommissioning are a combination of those encountered during a routine outage (temporary shutdown for maintenance) of an operating station and which may arise during dismantling or demolition work, with a unique radiological hazard that must also be considered. The hazards discussed included: • Radiological Hazards handling used fuel and tritiated heavy water, performing decontamination work, and the decay of tritium and cobalt-60 during safe storage. • Non-Radioactive Hazards • Chemical Hazards • Industrial and Construction Hazards • Biological Hazards • Transportation Hazards • Other Potential Hazards	This EIS section contains generic information that applies to any reactor technology including the BWRX-300 deployment, with the exception that the BWRX-300 generates very little tritium and does not use heavy water, hence the handling of tritiated heavy water is not applicable to the BWRX-300 deployment. The remaining contaminants are applicable to the BWRX-300, in different proportions.

EIS Section	EIS Description	Application to BWRX 300 deployment
Section 12.7.2 – Protection Strategies	This EIS section states that a Detailed Decommissioning Plan (DDP) will be prepared to support the application for a Decommissioning Licence, which will identify all decommissioning activities and associated protection strategies. All decommissioning activities will be carried out in accordance with: • The decommissioning licence Radiation Protection Program • The applicable Occupational Health and Safety regulations • The Nuclear Safety Regulations and Standards • An agreement between the Government of Canada and International Atomic Energy Agency (IAEA).	The information in this EIS section is generic and applicable to any reactor technology including the BWRX-300 deployment
Section 12.8 – Quality Assurance Program	The quality management programs will be in place to ensure all activities during the decommissioning phase will comply with all appropriate requirements, including those of occupational, public, and environmental protection.	The information in this EIS section is generic and applicable to any reactor technology including the BWRX-300 deployment.
Section 12.9 – Decommissioning Experience	The completion of decommissioning of different reactors across the United States and Europe and their sites released for other uses offer considerable experience to ensure the feasibility of OPG's end state objective with DNNP.	The EIS indicates that existing decommissioning practices are expected to be applicable to modular designs and features that aim to simplify the construction and eventual decommissioning process. These decommissioning practices are applicable to the BWRX-300 facilities. The BWRX-300 design is simpler than nuclear power reactors that have undergone the decommissioning process successfully. The BWRX-300 reactor has a 90% volume reduction in plant layout, which results in 50% less concrete per MW of energy produced [73], hence lower quantity of material and concrete to be removed during the decommissioning. Additionally, the BWRX-300 does not require steam generators like the reactors considered in the EIS, hence less equipment that needs to be removed.

5.12.1 Section 12.10 – Potential Environmental Effects of Eventual NND Decommissioning

Section 12.10 of the EIS states that preliminary stage of the decommissioning plan only allows for a conceptual assessment of environmental effects. However, the assessment is still supported by experience and studies from decommissioning projects elsewhere.

Table 5-32 provides the results of the review of EIS sections related to the preliminary decommissioning plan.

Table 5-32: Comparison of Potential Environmental Effects of Eventual Decommissioning

EIS Section	EIS Description	Application to BWRX 300 deployment
Section 12.10.1 – Study Area and Timeframe for Conceptual Assessment	The assumed time frames for each phase of decommissioning and the guidelines as to when decommissioning will begin. The EIS previously assumed that decommissioning would begin in 2100.	As shown in Table 3.1, Proposed Project Timeline, the planned DNNP operation start date is now 2029 instead of 2016 as originally planned, hence, the production of used fuel has been delayed by several years and the operational start date for the long-term used fuel disposal facility is expected around 2040-2045 [72]. Therefore, the delay in production of used fuel by BWRX-300 deployment will result in being closer to availability of the long-term used fuel disposal facility.
Section 12.10.2 – Interactions Between Decommissioning and the Environment	The hazards and instances where the potential release of radioactivity into the environment during decommissioning are described in a generic fashion.	This generic description applies to the BWRX-300 deployment.
Section 12.10.3 – Assessment of Environmental Effects of Future Decommissioning	• The assessment of environmental effects from the decommissioning process was very preliminary in nature and was based on OPG's nuclear decommissioning plans at the time, nuclear EA experience and professional judgement. It included the consideration of the effects of normal and abnormal decommissioning activities and effects of the environment on decommissioning. Radiological effects, and potential effects on the atmospheric environment, surface water environment, aquatic environment, terrestrial environment, geological	The information in this EIS section is generic and is applicable to the BWRX-300 deployment. As the smaller footprint of the BWRX-300 may provide an opportunity to retain some terrestrial habitats on the DNNP site.

EIS Section	EIS Description	Application to BWRX 300 deployment
	environment, socio-economic environment, and land use were considered. • The malfunctions and accidents during decommissioning of a nuclear station is the radiological hazard. With the deferred dismantling strategy, the radiological hazard would be greatly reduced after 30 years or more of Safe Storage. The demolition of buildings and structures will likely present the greatest risk of accidents. However, the risk and mitigation strategies for demolition are well known. • The potential effects of natural events during decommissioning are expected to be bounded by those during operation. • With respect to cumulative effects, apart from the overlap between the early stages of decommissioning of one or more of reactors and the latter stages of operation of the remaining reactors, efforts to predict other on-site or off-site projects and activities that may coincide with the DNNP decommissioning would be difficult and subject to great uncertainty at this time. The EIS argues that the doses from combined operation of the DNNP reactors are very low. Doses from operating reactors and those undergoing decommissioning should be lower since radioactive decay will reduce the activity released from reactors being decommissioned.	
Section 12.10.4 – Availability of Effective and Practical Mitigation Measures	The EIS stated that it is reasonable to assume the availability of technology and mitigations options to effectively complete decommissioning without significant adverse effects due to the number of successful decommissioning Projects that have already been completed.	This generic description applies to the BWRX-300 deployment.
Section 12.10.5 – Significance of Residual Adverse Decommissioning Effects	The properly planned decommissioning likely only results in minor adverse environmental effects. Specific adverse events and their significance will be determined based on environmental, social, and economic conditions closer to the time of decommissioning.	For the BWRX-300 deployment, a similar approach will be used. Specific effects which may eventually be caused by the BWRX-300 decommissioning activities will be assessed more fully in the future, based on the conditions which prevail at that time.

5.13 EIS Chapter 13 – Conclusions of the EIS

This EIS Chapter provides conclusions regarding the likely environmental effects of DNNP and its significance. The EIS determined that:

- Residual adverse effects (i.e., after mitigation) were in the Aquatic and Terrestrial Environments, in Land Use, and in the Socio-Economic Environment. All residual adverse effects and one cumulative effect were evaluated for significance, and the EIS determined that the DNNP will not result in any significant adverse environmental effects on the environment.

- No significant residual adverse effects on the health and safety of workers and on the general well-being of the public are anticipated as a result of the DNNP. Radiation doses from the DNNP are expected to be well below the regulatory limits for human exposure. These doses are not expected to result in health effects on the public or on workers, or to result in adverse effects in non-human biota.

- No significant effects on the DNNP were anticipated as a result of conditions in the environment. Notable among the findings was the determination that no seismic-related issues were identified that would make the DN site unsuitable for construction of new nuclear facilities.

- The bounding scenario was determined to not result in residual adverse environmental effects of significance, therefore, all considered alternative means of implementing the DNNP are deemed acceptable for the DNNP.

As demonstrated in the above subsections of Section 5, the chapter-by-chapter review confirmed that the conclusions of the EIS are consistent and remain valid for the deployment of BWRX-300. The conclusions of the EIS review for the BWRX-300 deployment are further detailed in Section 6.

6. CONCLUSION OF THIS SUPPORTING DOCUMENT

In December 2021, OPG selected a SMR, the BWRX-300, for deployment at the DNNP site which represents another step in the development of the DNNP. In preparation for the LTC for DNNP, OPG needs to fulfil the obligations of DNNP Commitment D-P-12.1(a) - Comprehensive Environmental Impact Statement Review which stated that *"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."* [1]

OPG has been working with the vendor, GE Hitachi Nuclear Energy (GEH), to progress the design of the BWRX-300 and develop sufficient information to conduct this EIS review and to ensure that results of the EIS remain valid for the deployment of the BWRX-300. The results of the comprehensive chapter-by-chapter review of the EIS for the BWRX-300 are summarized below.

1. Many chapters of the EIS are not affected by the choice of reactor technology, including the BWRX-300. The following chapters apply equally to the deployment of the BWRX-300:

    - *EIS Chapter 1 – Introduction*
    - *EIS Chapter 3 – Methodologies Used in the EIS*
    - *EIS Chapter 10 – Communications and Consultation Program*

2. The review of EIS *Chapter 2 - The Project for EA Purposes* shows that the BWRX-300 reactor technology is essentially the same as the reactors assessed in the EIS. The main refinement is that the primary and secondary heat transport systems are combined, but otherwise, the BWRX-300 is similar to the PWR technology that was assessed in the EIS. The timeline of the project is similar, although it will start later than projected in the initial plan. The project works and activities are the same as those evaluated in the EIS with the exception of some key refinements:

    - cooling towers will not be used for the BWRX-300 for neither normal operation nor for the ultimate plant heat sink,
    - lake infilling is not required, and
    - the BWRX-300 reactors are smaller in physical size and electrical power production.

3. The review of the following EIS Chapters includes updated information to reflect changes in the baseline conditions in LSA and RSA and changes in the EA Follow-up Program as a result of the selection of the BWRX-300.

    - *EIS Chapter 4 – Description of the Existing Environment*

- *EIS Chapter 11 – Preliminary Plan for EA Follow-up Program*

This EIS Review concluded that the EA follow-up and monitoring programs remain suitable for BWRX-300 deployment.

4. For the review of the following EIS Chapters, the BWRX-300 deployment information was found to be consistent with the information presented in the EIS. For these chapters, the conclusions of the EIS remain valid for the deployment of four BWRX-300 reactors.

    - *EIS Chapter 6 - Assessment of Other Likely Effects*
    - *EIS Chapter 7 - Malfunctions, Accidents and Malevolent Acts*

5. For the review of the EIS *Chapter 5 - Assessment and Mitigation of Likely Environmental Effects,* the BWRX-300 deployment was found to be consistent with the information presented in the EIS. For the Terrestrial Environment, positive outcomes or opportunities with the BWRX-300 deployment may be realized through conservation of some habitats that were expected to be removed in the EIS due to the larger footprint of the original reactors. Air quality, noise, vibration, hydrology, and hydrogeology modelling has been completed and found that the potential effects are anticipated to be minor.

6. Although the BWRX-300 will include a few tall buildings, it doesn't include cooling towers which were the focus of the community concerns. In addition, the BWRX-300 tall structures do not exceed the height of the cooling towers in the EIS. As a result, the residual cumulative adverse effect related to combined visual and related community effects due to cooling towers identified in the EIS no longer exist.

7. For the review of this EIS Chapter 9 – Significance of Residual Adverse Effects, the BWRX-300 deployment was found to be consistent with the information presented in the EIS, except where noted for the Terrestrial environment, where habitats may now be retained and studies undertaken to assess effects to biota that were assumed to be removed in the EIS. The additional studies undertaken have indicated that there are appropriate mitigation measures available such that no significant residual adverse effects will occur.

8. For the review of the EIS Chapter 12 – Preliminary Decommissioning Plan, the BWRX-300 deployment was found to be consistent with the DNNP information presented in the EIS, apart from EIS Section 12.10.3. The EIS Section 12.10.3 involved discussion on the Assessment of Environmental Effects from Future Decommissioning. Due to the reduced scale of the BWRX-300 deployment, parts of the terrestrial habitat that were previously expected to be removed may have the opportunity to be retained for the BWRX-300 deployment.

Overall, the comprehensive chapter-by-chapter review has shown that since the BWRX-300 is smaller in size and requires less footprint, the effects on the environment would be less than those assessed in the EIS. Therefore, the determinations regarding the significance of residual adverse effects made in the EIS remain valid. The DNNP, considering the mitigation measures identified, will not result in significant adverse environmental effects, including effects from accidents, malfunctions and malevolent acts, effects of the environment on the DNNP, and cumulative effects.

OPG recognizes that while the assessment of environmental effects from DNNP has been satisfied from the Western perspective, it may not fully address the impact of the DNNP on Indigenous inherent and treaty rights as they are understood today. OPG endeavors to continue to work with Indigenous Nations and communities to appropriately identify the rights impacted by the DNNP and to achieve feasible mitigation measures and/or accommodation.

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