2024 Results of OPG's Darlington and Pickering Environmental Monitoring Programs

DNHC Meeting

September 26, 2025

Today's Agenda

1. EMP Overview and Key Objectives
2. EMP Sampling Locations
3. 2024 EMP Results Summary
4. 2024 Public Dose Results
5. Other Monitoring Programs
6. Audits and Inspections
7. Looking Ahead

Environmental Monitoring Programs

- OPG maintains Environmental Monitoring Programs (EMPs) in the vicinity of Darlington Nuclear (DN) and Pickering Nuclear (PN) Generating Stations in accordance with operating licence requirements.
- The program scope encompasses protection of both the public and the environment from nuclear substances, hazardous substances, and physical stressors resulting from the operation of DN and PN sites, including the on-site waste management facilities.
- Environmental sampling and analyses for the EMPs support the calculation of annual public dose resulting from operation of OPG nuclear facilities.

EMP Objectives

- Demonstrate, independent of effluent monitoring, the effectiveness of containment and effluent control
- Demonstrate compliance with limits on the concentration/intensity of contaminants/physical stressors in the environment
- Provide data to assess the level of risk on human health and the environment and/or to confirm predictions made by environmental risk assessments

DN Critical Groups and Sampling Locations

PN Critical Groups and Sampling Locations

Radiation dose examples

150 mSv:
Average annual exposure to astronauts working on the International Space Station

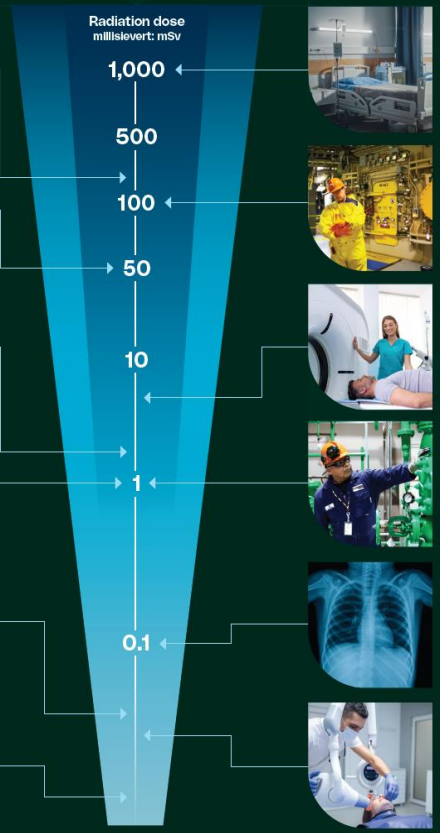
50 mSv:
Annual dose limit for nuclear energy worker

1.8 mSv:
Average annual dose from natural background radiation in Canada

1 mSv:
Annual public dose limit

0.02 mSv:
Typical cross-Canada flight

0.001 mSv:
Typical dose from living one year within a few km of an operating nuclear power plant



1,000 mSv:
Dose that may cause symptoms of radiation sickness

100 mSv:
Five-year dose limit for nuclear energy workers

7 mSv:
Typical chest CT scan

1 mSv:
Typical annual dose received by a worker in a uranium mine or nuclear power plant in Canada

0.1 mSv:
Typical chest x-ray

0.005 mSv:
Dental x-ray

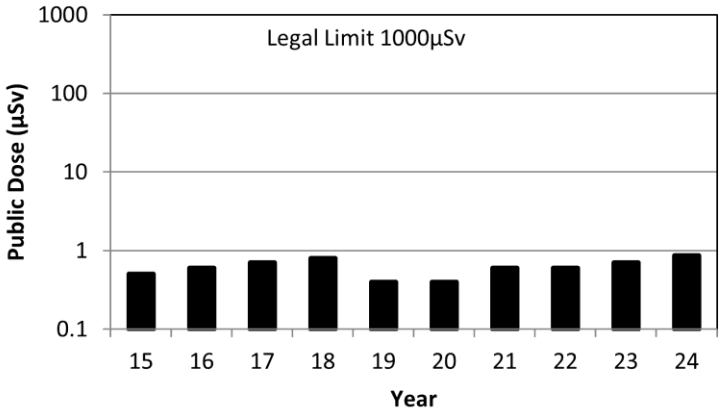
Source: Canadian Nuclear Safety Commission Radiation Dose Examples

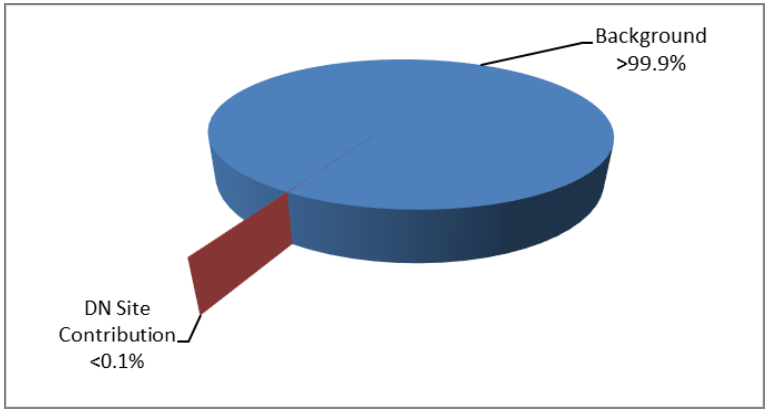
2024 EMP Results Summary

- 874 laboratory analyses performed for the dose calculation (e.g., air, water, fruits, vegetables, animal feed, eggs, poultry, milk, fish, sand).
- Annual public doses resulting from PN and DN operations were 1.4 µSv and 0.85 µSv, respectively.
- Station radiological emissions remained at very small fractions of their regulatory limits.
- Dose calculations and annual report preparation were performed by an independent third party and reviewed and verified by OPG.
- 2024 EMP report was submitted to Canadian Nuclear Safety Commission (CNSC) in April 2025 and is available on www.opg.com, under Regulatory Reporting.

Darlington Station 2024 Public Dose

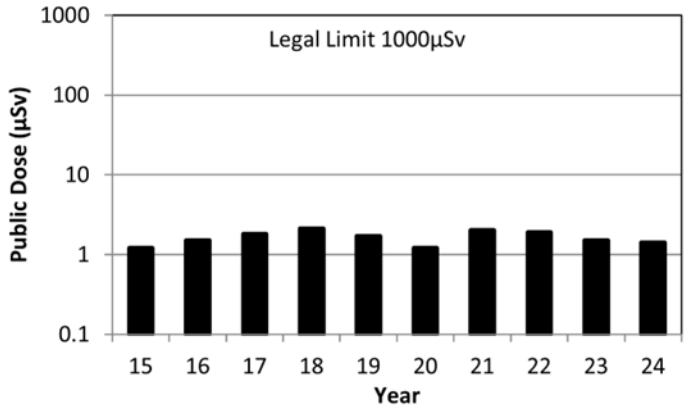
- 2024 public dose was 0.85 µSv, represented by the Farm adult
- Darlington public dose continues to be very low and is consistent with the 2023 dose (0.74 µSv)
- HTO, C-14, and noble gases are the main dose contributors in 2024 (no change from 2023)
- < 0.1% of annual regulatory limit of 1,000 µSv and < 0.1% of annual natural background radiation of 1,400 µSv

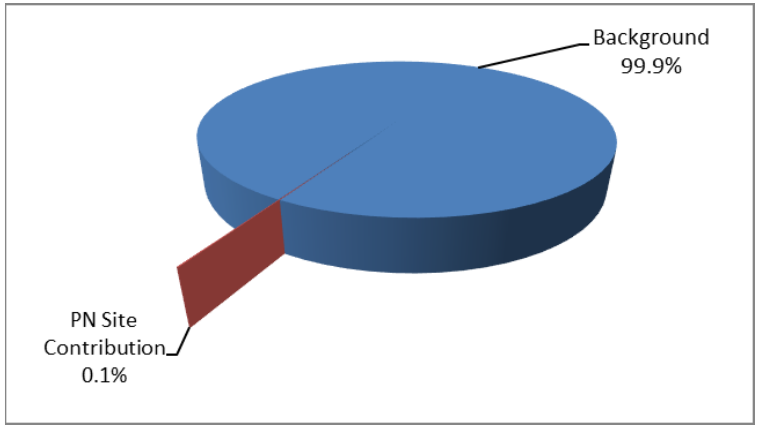




Pickering Station 2024 Public Dose

- 2024 public dose was 1.4 µSv, represented by the Urban Resident adult
- Pickering public dose continues to be very low and is consistent with the 2023 dose (1.5 µSv)
- Noble gases, HTO ,Cs-134 are the main dose contributors in 2024 (HTO and noble gases were the main dose contributors in 2023)
- 0.1% of annual regulatory limit of 1,000 µSv and 0.1% of annual natural background radiation of 1,400 µSv





2024 Results of Radiological Emissions Monitoring

Site Emissions[d]	DN		PN	
	Bq	% DRL	Bq	% DRL
AIR				
Tritium Oxide	2.0E+14	0.51	4.0E+14	0.35
Elemental Tritium [a]	9.1E+13	0.01	NA	NA
Noble Gas [b]	2.9E+13	0.08	9.9E+13	0.32
I-131[c]	1.2E+08	<0.01	9.4E+06	<0.01
Particulate	2.8E+07	<0.01	1.1E+07	<0.01
C-14	1.8E+12	0.23	2.4E+12	0.07
WATER				
Tritium Oxide	2.7E+14	<0.01	3.7E+14	0.05
Gross Beta/Gamma	1.5E+10	0.04	3.4E+11	22.82
C-14	5.3E+08	<0.01	3.5E+09	0.01

NOTES: NA = Not Applicable, Bq = Bequerels

(a) Emissions from Darlington Tritium Removal Facility

(b) Units for noble gas emissions are Bq-MeV

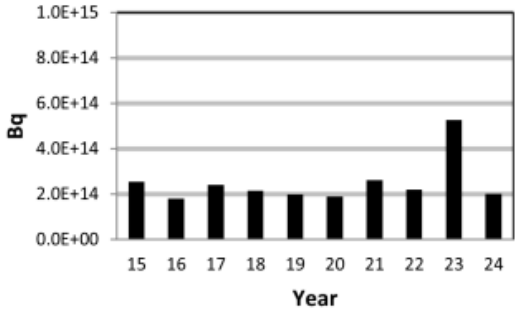
(c) Weekly samples are usually < Method Detection Limit (MDL)

(d) Annual air emissions are the sum of continuous samples analysed weekly.
Note that if interim Noble Gas sampling is in place, samples may not be continuous.
Annual water emissions are the sum of monthly composite samples for C-14, and weekly composite samples for tritium oxide and gross beta/gamma.

(e) As of 2019 PN DRLs and emissions are for PNA and PNB combined rather than separate as in the past.

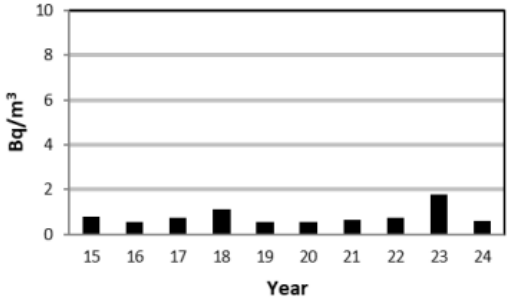
Emissions and EMP Data

DN Tritium Oxide (HTO) to Air Emissions



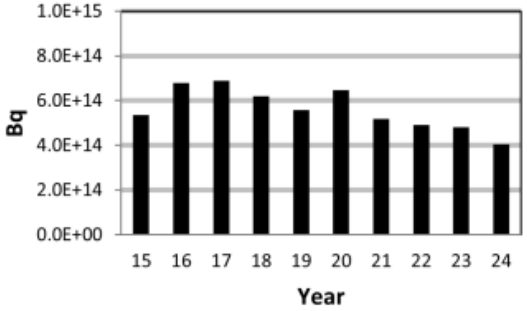
2024 = 2.0 x 10^{14} Bq

DN HTO to Air at Site Boundary



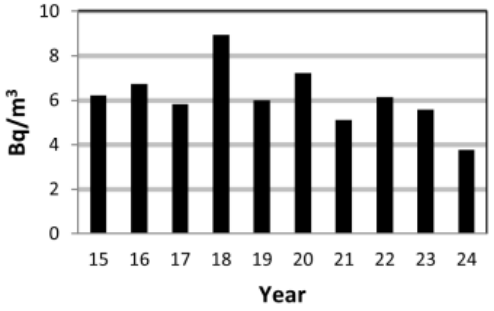
2024 = 0.6 Bq/m^3

PN HTO to Air Emissions



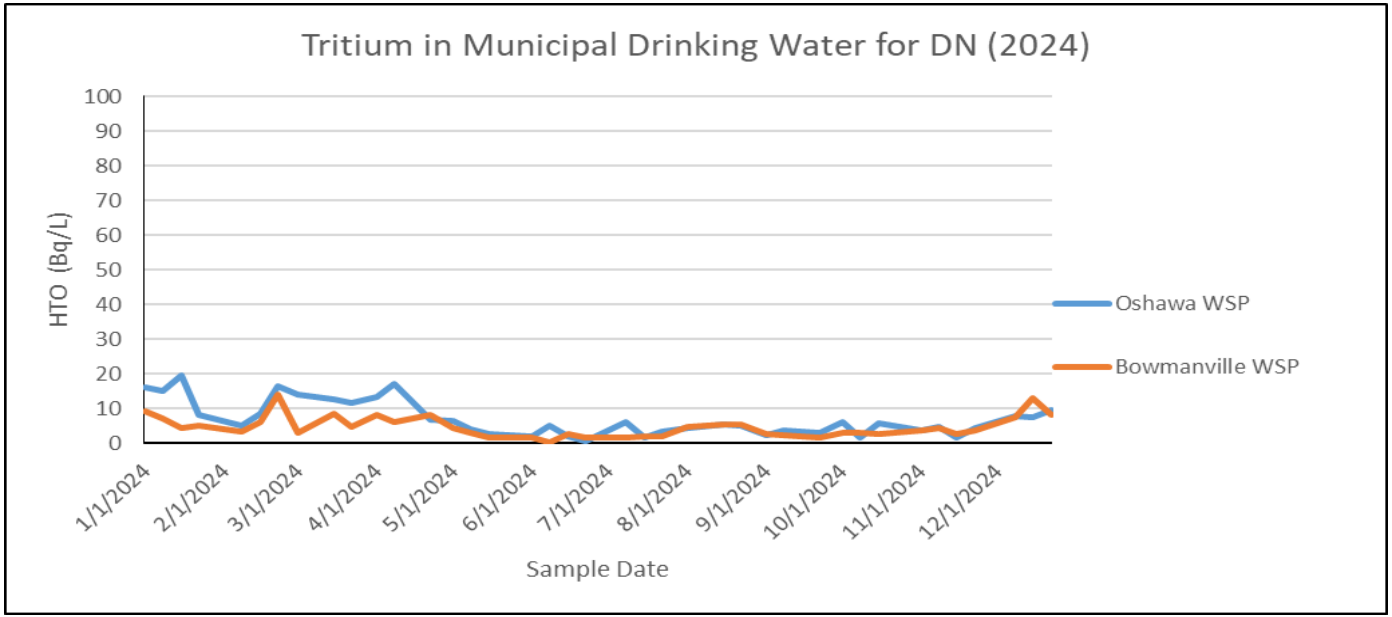
2024 = 4.0 x 10^{14} Bq

PN HTO to Air at Site Boundary



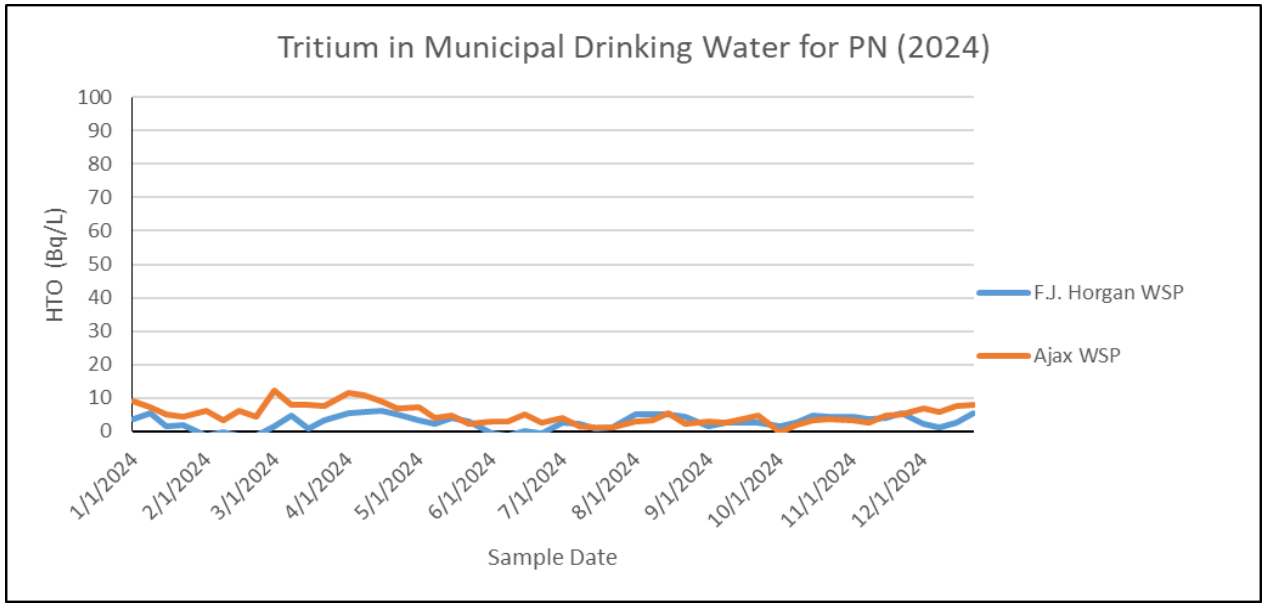
2024 = 4.0 Bq/m^3

Tritium at Water Supply Plants near DN



- Average Tritium Oxide (HTO) Concentrations: Oshawa = 6.7 Bq/L , Bowmanville = 4.4 Bq/L
- Ontario Drinking Water Quality Standard is 7000 Bq/L
- Water Supply Plant annual average concentrations far below OPG's commitment of < 100 Bq/L

Tritium at Water Supply Plants Near PN



- Average Tritium Oxide (HTO) Concentrations: F.J. Horgan = 2.7 Bq/L, Ajax = 5.0 Bq/L
- Ontario Drinking Water Quality Standard is 7000 Bq/L
- Water Supply Plant annual average concentrations far below OPG's commitment of < 100 Bq/L

Results of Non-Radiological Emissions Monitoring

Hazardous Material [a]	DN	PN
	Mg	Mg
AIR		
SO_2 to Air[b][c]	2E-02	3E-02
NO_2 to Air[c]	1.4E+01	1.6E+01
CO_2 to Air[b][c]	2.59E+03	2.95E+03
Ammonia to Air	1.9E+01	6.6E+01
Hydrazine to Air[d]	1.1E-02	5.2E-03
Ozone Depleting Substances (ODS) Releases[e]	9.9E-02	0
WATER		
Ammonia to Water	1.4E+00	6.0E-01
Hydrazine to Water[d]	2.4E-01	2.5E-01

NOTES:

Mg = Megagrams

(a) Hazardous Materials as calculated for NPRI reporting requirements

(b) Reported in OPG Sustainable Development Report as an OPGN aggregate value.

(c) Based on annual fuel consumption.

(d) Based on annual consumption.

(e) Based on estimated quantity when a release occurs.

- 2024 emissions continue to be reported through 2025, therefore the 2024 EMP Report summarized the complete set of emissions for 2023.
- In 2023, there were no Ozone Depleting Substances (ODS) releases in excess of 100kg at DN or PN. Any ODS releases between 10 kg and 100 kg are reported to Environment Canada in semi-annual halocarbon release reports.
- In 2023, there were no regulatory non-compliances associated with sulphur dioxide, nitrogen oxides, carbon dioxide, hydrazine or ammonia emissions.

Other Monitoring Programs

- Supplementary/Other studies (e.g. Darlington New Nuclear Project Environmental Assessment follow up activities)
- Groundwater Monitoring Program
- Pickering Nuclear Impingement Monitoring

Audits & Inspections

EMP

- CNSC Type II compliance inspection (PN EMP and Groundwater Program) - August 19 to September 12, 2024.
    - CNSC staff did not find evidence of unsafe operation that would result in undue risk to the health and safety of persons, or the environment.

- OPG Nuclear Oversight audit - April 15 to May 3, 2024.
    - Results of this audit indicate the managed system controls for the EMPs are generally effective.

Health Physics Lab (HPL)

- The Ministry of the Environment, Conservation and Parks (MECP) inspection - October 2024.
    - There were no non-compliances or findings from this inspection cycle. The Final Inspection Rating was 100%.

- MECP unannounced inspection - June 2024.
    - There were no non-compliant findings during this inspection. The Final Inspection Rating was 100%.

Looking Ahead

- In 2024, no major changes to the routine sampling program were identified.
- No supplementary studies are planned in 2025 as part of the EMP. Darlington New Nuclear Project (DNNP) Environmental Monitoring and Environmental Assessment Follow-up activities will continue in 2025 as project-specific studies which will meet relevant requirements identified under EMP governance.
- The next Environmental Risk Assessment (ERA) updates for DN and PN will be completed in 2026 and 2027, respectively.
- EMP Design Reviews:
    - Information from the latest ERAs.
    - The Harvester is a receptor that has recently been included in the Predictive Environmental Risk Assessment for the Darlington New Nuclear Project and has been included in the Predictive Environmental Risk Assessment for PN Pickering Refurbishment, Decommissioning, and Continued Operations. This receptor will be incorporated into the EMPs during the next design reviews.
    - Information from the site-specific surveys.
- The site-specific surveys, which identify the potential critical groups and their characteristics for DN and PN EMPs, are currently being carried out.

Help OPG enhance its Environmental Monitoring Program (EMP)

OPG's EMP assures the safe operation of its nuclear stations for the public and the environment.

You are invited to take a survey to ensure our EMP reflects the people living and working near Darlington and Pickering Nuclear Generating Stations.

Scan the QR code or visit *survey.opg.com/environment*.

Takes just 10 minutes!

Complete the survey by Oct 20, 2025 for your chance to win* one of six Canadian Tire gift cards ($100 each in value)! **See contest rules for details.*

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