Nuclear

Procedure

TITLE
MANAGEMENT OF THE ENVIRONMENTAL MONITORING PROGRAMS

AUTHORIZATION	
SINGLE POINT OF CONTACT:	B. Medeiros Senior Manager, Environment, Health and Safety - Corporate
DOCUMENT OWNER:	John Beauchamp Director, Environment, Health and Safety - Corporate
APPROVAL FOR ISSUE:	Jack Vecchiarelli VP, Nuclear Regulatory Affairs

DOCUMENT RELATIONSHIP	
Applicability:	Environment, Health and Safety
Receives Authority from:	OPG-PROG-0005, Environment, Health and Safety Managed Systems

Document is Related to Pressure Boundary ☐	Document Requires CNSC Notification ☑

PURPOSE

This procedure provides direction and accountabilities for design, implementation, and operation of Environmental Monitoring Programs (EMPs) at Ontario Power Generation (OPG) nuclear facilities. These programs are required to:

1. Assess potential effects on humans and the environment by nuclear substances, hazardous substances, and physical stressors.
2. Demonstrate and confirm that radiation doses to members of the public resulting from the operation of OPG nuclear facilities remain below the annual legal limit specified in the current Radiation Protection Regulations under the Nuclear Safety and Control Act.

Implementation of this procedure will fulfill the operating licensing requirements for OPG Nuclear facilities.

DATES (YYYY-MM-DD)	
PDF Creation Date:	2021-07-30
Compliance Date:	Immediate

EXCEPTIONS

Sampling and analysis for emergency conditions are beyond the scope of the EMPs.

Public dose calculation and Site Specific Survey for the Western Waste Management Facility (WWMF) is integrated into Bruce Power Nuclear Site's Environmental Monitoring Program (EMP). Bruce Power Nuclear Site's EMP is reported and managed by Bruce Power, independent of this procedure.

Management of the groundwater monitoring programs is described in N-PROC-OP-0044, Contaminated Lands and Groundwater Management.

Requirements for monitoring and reporting of fish impingement and entrainment are set out in the Fisheries Act Authorizations issued by Fisheries and Oceans Canada (DFO) for DN (NK38-CORR-07262-0550525) and PN (P-CORR-00539.4-00003).

TABLE OF CONTENTS

Page

1.0 Direction 5
1.1 Criteria for Determining the Need to Establish an EMP 5
1.2 Objectives of an EMP 6
1.3 Design of an EMP 7
1.4 Program Boundaries 7
1.5 Design Basis 8
1.5.1 Environmental Risk Assessment 8
1.5.2 Design in Support of Radiological Dose Calculations 9
1.5.2.1 Provincial Background Data 9
1.5.2.2 Site Specific Survey 9
1.5.2.3 Pathway Analysis 10
1.5.2.4 Identification of Contaminants and Pathways of Importance 11
1.5.3 Supplementary Studies 11
1.6 Program Elements 12
1.6.1 Sample Scheduling 12
1.6.2 Sample Collection and Analysis 13
1.6.3 Sampling Equipment and Infrastructure 13
1.6.3.1 Environmental Media Sampling Equipment 14
1.6.3.2 Environmental Monitoring Stations 14
1.6.3.3 Noble Gas Monitoring Network 14
1.6.3.4 Meteorological Data 15
1.6.4 Performance and Acceptance Criteria 16
1.6.4.1 Performance Indicator Targets 16
1.6.4.2 Unavailability 16
1.6.4.3 Laboratory Analytical Results Unavailability 17
1.6.4.4 Noble Gas Detector Data Unavailability 19
1.6.4.5 Meteorological Data Unavailability 20
1.6.5 Data Interpretation and Dose Calculations 20
1.6.6 Quality Assurance and Quality Control 21
1.6.6.1 General 21
1.6.6.2 Field Verification 21
1.6.6.3 Self Assessments 21
1.6.7 Qualifications and Training 22
1.7 Criteria for Determining the Need to Revise an EMP 22
1.8 Program Design Review and Audit 23
1.8.1 Program Design Review 23
1.8.2 Program Audit 24
1.9 Reporting 24
1.9.1 Annual Environmental Monitoring Program Reporting 24
2.0 ROLES AND ACCOUNTABILITIES 26
2.1 Senior Vice-Presidents, Pickering and Darlington 26
2.2 Vice President, Environment, Health and Safety 26
2.3 Manager, Health Physics Department 27
2.4 Director, Environment, Health and Safety – Nuclear Environment 27

2.5 Senior Managers, Environment, Health and Safety – Environment Support and Health and Safety Field Services- Pickering 27
2.6 Manager, Performance Engineering 28
2.7 Senior Manager, Plant Computers 28
3.0 DEFINITIONS AND ACRONYMS 28
3.1 Definitions 28
3.2 Abbreviations and Acronyms 30
4.0 BASES, RECORDS AND REFERENCES 30
4.1 Bases 30
4.2 Records 31
4.3 References 33
4.3.1 Performance References 33
4.3.2 Developmental References 35
4.4 REVISION SUMMARY 35

Appendix A: Environmental Monitoring Program Documents 38

1.0 Direction

This procedure provides requirements to establish Environmental Monitoring Programs (EMPs) at Ontario Power Generation (OPG) nuclear facilities in accordance with the Canadian Standards Association (CSA) N288.4-10, Environmental Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills (hereafter referred to as CSA N288.4)

The EMPs are also required to comply with any applicable statutes, regulations, licences, or permits that govern the operation of the facility including, but not limited to the following:

(a) Section 3 (h) of Class I Nuclear Facilities Regulation: An application for a Class 1 nuclear facility licence shall contain the proposed environmental monitoring program.

(b) Section 3.5 of REGDOC 3.1.1 Reporting Requirements for Nuclear Power Plants requires an environmental protection report be submitted annually containing the amounts of nuclear and hazardous substances measured in the environment and the annual radiation dose to the representative person in comparison to the regulatory public dose limit.

Additionally, the EMPs rely on the understanding of environmental risk posed by the facility obtained through Environmental Risk Assessments (ERAs) and Derived Release Limits (DRLs).

Associated documents are referenced in Appendix A, Environmental Monitoring Program Documents.

1.1 Criteria for Determining the Need to Establish an EMP

An EMP for monitoring of radioactive and non-radioactive contaminants, physical stressors, or environmental effects within the environment on and surrounding an OPG site **shall** be established if:

(a) A governing statute, regulation, licence, or permit that governs the operation of the nuclear facility, requires it;

(b) The results of an ERA (or equivalent) indicate a likelihood that the concentration of a contaminant or the intensity of a physical stressor could exceed a Benchmark Value (BV);

(c) The effective dose to members of an off-site critical group from all radioactive emissions from the site during normal operations and anticipated transients is estimated to exceed 0.05 mSv per year, considered to be As Low As Reasonably Achievable (ALARA) in accordance with G-129;

(d) The potential effective dose to members of an off-site critical group from all radioactive emissions from the site in the event of an accident is estimated to exceed 1 mSv per year, which is the public dose limit prescribed by Section 1(3) of the Nuclear Safety and Control Act (NSCA) Radiation Protection Regulations;

(e) There are uncertainties in environmental transfer parameters such that emissions from the site could potentially cause doses exceeding the levels in (c) or (d);

(f) The level of risk from a potential spill, or from unmonitored releases, from the facility is unknown or has been determined, by an ERA or another equivalent analysis, to be of concern;

(g) There are other business reasons, i.e., stakeholder concerns, due diligence, etc.

1.2 Objectives of an EMP

If it is determined that an EMP is required, the EMP **shall consider** applicability of the following objectives:

(a) Assess the level of risk on human health and safety, and the potential biological effects in the environment of the contaminants and physical stressors of concern arising from the facility;

(b) Demonstrate compliance with limits on the concentration and/or intensity of contaminants and physical stressors in the environment or their effect on the environment;

(c) To check, independently of effluent monitoring, on the effectiveness of containment and effluent control, and provide public assurance of the effectiveness of containment and effluent control;

(d) Verify the predictions made by the Environmental Risk Assessment (ERA), refine models used in the ERA, or reduce the uncertainty in the predictions made by the ERA.

Some of the objectives listed above might not be applicable to a particular EMP, but the design of the EMP shall consider the applicability of each.

Additional objectives may include:

(e) Providing data required to support operations or to plan for future stages of the facility lifecycle (e.g. decommissioning);

(f) Providing resources and data that can be of value during the response to an accident or upset, and in the recovery from such an event;

(g) Demonstrating due diligence;

(h) Meeting stakeholder commitment.

1.3 Design of an EMP

(a) When it is determined that an EMP is required, the program shall be designed in accordance with the requirements of CSA N288.4.

(b) The EMP shall be developed using a systematic, informed planning process, as described in CSA N288.4, which:

(1) Defines the objectives of the EMP;

(2) Identifies the information required to meet the defined objectives;

(3) Defines the boundaries of the EMP;

(4) Determines how the data collected will be used to achieve the defined objectives;

(5) Specifies performance or acceptance criteria; and

(6) Develops the detailed design of the EMP that will be implemented to obtain the required data.

(c) The applicable objectives of Section 1.2 to each facility shall be defined and documented (refer to Clause 6.2.2.1 of CSA N288.4).

(d) The information required to meet each objective shall be identified and should include one of more of the following:

(1) Measurements of the concentration of contaminants or the intensity of physical stressors in environmental media;

(2) Measurements of an effect on a receptor at the individual, community, or population level; and

(3) Measurements in a reference or background area(s) that is unaffected by contaminants or physical stressors from the facility.

(e) Performance and acceptance criteria shall be specified for the data collected to ensure the data is adequate for its intended purpose (refer to Clause 6.2.2.5 of CSA N288.4).

(f) The detailed design of the EMP shall be developed and documented in accordance with Clause 13 of CSA N288.4.

1.4 Program Boundaries

(a) The EMP program boundaries should be defined by:

(1) Determining and mapping the boundaries of the potentially contaminated and/or impacted areas.

(2) Determining and mapping the habitat, distribution, and habitat-use factors of the biological receptors that could be adversely affected by the contaminants and physical stressors, to the extent possible.

Note: The above information is generally available from the *ERA*.

(b) The spatial boundaries of the EMPs should be dose/exposure based rather than distance based. Potential critical groups with the highest doses in the local population, as well as critical groups with unique exposure pathways, should establish where environmental monitoring is conducted. This ensures that any future impacts from changes in emissions, environmental transfer factors, exposure factors, dosimetry, or changes in the distribution of radionuclides released, will be captured and reviewed.

(c) Where a number of OPG licensed nuclear facilities reside on the same site, only one EMP is required to encompass the entire site.

1.5 Design Basis

(a) The EMPs are designed to satisfy the primary and secondary objectives listed in Section 1.2 above, as per CSA N288.4.

(b) EMPs shall be designed using a systematic, informed planning process as described in CSA N288.4 and the Environmental Monitoring Programs Quality Assurance Manual, N-MAN-03443-10005.

(c) The detailed design of the individual facility EMPs are documented in:

- P-REP-03443-00003, Detailed Design of Environmental Monitoring Program for Pickering Nuclear Generating Station.
- NK38-REP-03443-10002, Detailed Design of Environmental Monitoring Program for Darlington Nuclear Generating Station.
- W-REP-07002-00001, Detailed Design of Environmental Monitoring Program for the OPG WWMF.

1.5.1 Environmental Risk Assessment

(a) Nuclear Environment (NE) should update facility *ERAs* every five years in accordance with CSA N288.6-12, Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills and file in accordance with REGDOC 3.1.1, Reporting Requirements for Nuclear Power Plants.

(b) ERA reviews should identify potential contaminants, physical stressors and receptors of concern. These are used in the design basis for the EMPs.

1.5.2 Design in Support of Radiological Dose Calculations

1.5.2.1 Provincial Background Data

(a) Provincial background data provides background levels of contaminants in the environment, away from the influence of the operation of OPG Nuclear facilities.

(b) Results of radionuclide analyses of provincial background samples should be used to support calculations of radiation doses to the public, and assessment of measurements taken in the vicinity of the nuclear facilities.

(c) Current requirements for provincial background data are documented in NK38-REP-03443-10002.

1.5.2.2 Site Specific Survey

Site specific surveys allow NE to identify the various potential *critical groups* around each nuclear site and are used for development of the EMPs and site DRLs, and for calculating public collective dose. Site specific survey instructions are documented in N-INS-03443-00003, Instruction for Performing a Site Specific Survey for Ontario Power Generation Nuclear Sites.

(a) NE shall conduct a site specific survey for DN and PN and their surrounding environment to gather local characteristics, such as:

- Population distribution.
- Produce distribution.
- Land use patterns by the public around the facility (e.g. farming, industrial areas, well water usage, and recreational usage).
- Dietary patterns (e.g., sources of drinking water, fraction of food intake obtained from local sources).

(b) NE should review the site specific surveys every five years to assess the validity of data and determine if updated surveys are required.

(c) NE should update the site specific surveys when significant changes affecting local characteristics occur, such as land use patterns.

(d) NE should document the results of the updated site specific surveys in individual reports for Pickering and Darlington.

1.5.2.3 Pathway Analysis

Pathway analysis identifies the significance of each environmental transport pathway for the radiological contaminants released by station emissions. Doses shall be calculated by radionuclide and pathway of exposure for each potential *critical group* using the projected facility emissions for the next five years.

Note: Conventional contaminants of concern and relevant pathways shall be identified and assessed through the ERA.

(a) NE should conduct a pathway analysis for PN, DN and WWMF every five years. The results of the most recent pathway analyses are documented in the program design review reports (Section 1.8.1) for each nuclear site:

- P-REP-03443-00004, Pickering Environmental Monitoring Program (EMP) Review.
- NK38-REP-03443-10003, Darlington Environmental Monitoring Program (EMP) Review.
- W-REP-03443-00003, WWMF Environmental Monitoring Program Design Review
- The program design review for the provincial EMP is documented in N-REP-03481.21-10003, Review of the Provincial Radiological Environmental Monitoring Program - 2006.

(b) NE shall work with Bruce Power to ensure that the Bruce Power pathway analyses and site specific surveys have appropriate consideration of the WWMF.

(c) NE should use the following parameters and models, as applicable, when calculating doses for pathway analyses:

- Site *DRL* model, as described in the most recent *DRL* reports;
- Most recent site-specific survey results;
- Station operational changes and projected five year emissions;
- Previous three to five years of meteorological data;
- Central food intake rates as per CSA N288.1-08, Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities, and N-INS-03443-00001, Methodology for Data Analysis and Public Dose Determination for the Environmental Monitoring Program.

1.5.2.4 Identification of Contaminants and Pathways of Importance

(a) Guidelines for determination of significant contaminants and pathways are outlined in Section 7.5 of CSA N288.4 and N-INS-03443-00001.

(b) Pathways, radionuclides, and contaminants of concern identified as significant contributors to receptor exposure shall form the basis of the EMP sampling plan. Guidance for determining which sampling locations should be included in the EMPs is provided in Section 7.6 of CSA N288.4.

1.5.3 Supplementary Studies

Supplementary studies may be conducted to increase knowledge of the behaviour of contaminants and stressors in the environment, or address other specific, well defined objectives.

(a) These studies should become part of the EMP until the objective of the study has been achieved. At that time, the supplementary study should be terminated.

(b) Supplementary studies should be developed using a systematic, informed planning process, as described in CSA N288.4 and N-MAN-03443-10005.

(c) Before a *supplementary study* is started, NE should develop and approve a work plan which includes the following (refer to U.S. EPA QA/G.4 for details):

- Problem statement;
- Objective (questions the study will attempt to resolve and what actions may result);
- Information required to meet the objective(s);
- Study boundaries (when and where data should be collected);
- Decision rules (e.g. benchmark values or dose limits);
- Performance criteria for the data collected (driven by statistical analysis requirements, i.e. sample representativeness);
- Quality assurance and quality control requirements.

(d) Field work and analytical work should be coordinated through the Health Physics Lab (HPL) or external contractors.

(e) Results of supplementary studies shall be documented and retained as records.

1.6 Program Elements

Not all program elements in Section 1.6 of this document are applicable to WWMF. Elements of the program relating to the public dose calculation and site specific surveys for WWMF are covered under Bruce Power Nuclear Site's EMP.

(a) The EMPs involve collection and analysis of various environmental samples. The majority of samples shall be collected to support the routine annual program; however samples may also be collected to support *Supplementary Studies* as required. In addition, routine three to five-year frequency samples shall be collected to provide data for evaluation of assumptions and transport models used in the *ERA*, *DRL,* and/or public dose calculations at PN and DN.

(b) The EMP program elements shall consist of the following:

- Sample scheduling;
- Sample collection and analysis;
- Sampling equipment and infrastructure;
- Performance and acceptance criteria;
- Data interpretation and dose calculation;
- Quality assurance and quality control;
- Qualifications and training.

1.6.1 Sample Scheduling

(a) *Master Schedules* for the PN EMP, DN EMP, and the provincial-background data shall document the following items:

- Sampling frequency;
- Sampling locations;
- Sample media;
- Analyses required.

(b) NE shall perform the following:

(1) Establish Master Schedules at the beginning of each calendar year.

(2) Update the Master Schedules, as required during the year, in accordance with N-INS-03443-00002, Instructions for Environmental Monitoring Program (EMP) Master Schedules.

1.6.2 Sample Collection and Analysis

Samples used for compliance purposes shall be analyzed at certified laboratories or laboratories with documented comprehensive quality assurance (QA) and quality control (QC) programs, in accordance with clause 8.3.2 of CSA N288.4.

(a) The Canadian Association for Laboratory Accreditation (CALA) certified OPG Health Physics Laboratory (HPL), and external contractors, shall perform the sample collection and analysis for the WWMF, PN, DN, and provincial EMPs.

(b) General QA requirements for sample collection and analysis are outlined in N-MAN-03443-10005.

(c) Requirements for sample collection and analyses by HPL, including limits of detection, are specified in N-GUID-03443-10001, Service Level Agreement: Provision of Environmental Sample Collection and Analysis for Environment Monitoring Program. NE shall maintain and update N-GUID-03443-10001.

(d) In accordance with Section 8.3.3 of CSA N288.4, the detection limit of the method used to measure the concentration, intensity, or other appropriate parameter of any contaminant, physical stressor or effect should be less than the benchmark value identified for that contaminant, physical stressor or effect. Where the detection limit is greater than the benchmark value, rationale shall be provided as to why this is acceptable.

(e) NE shall establish scope of work performed by external contractors, including contract deliverables and expectations for sample collection and analytical results.

(f) NE should manage external contracts in accordance with N-INS-00120-10008, Nuclear Contractor Safety Management Process.

1.6.3 Sampling Equipment and Infrastructure

(a) Equipment required for the EMPs may consist of the following:

- Environmental media sampling equipment;
- Environmental monitoring stations in the vicinity of DN and PN;
- Noble gas monitoring network in the vicinity of DN and PN;
- Meteorological towers at DN and PN.

(b) A list of the EMP environmental media sampling equipment and associated inspections/maintenance requirements for DN, PN and provincial EMPs are available in N-MAN-03443-10007, Environmental Monitoring Program Equipment Maintenance Manual.

(c) Maps detailing the locations of sampling equipment are available in the annual EMP reports, which are described in Section 1.9.1 of this document.

1.6.3.1 Environmental Media Sampling Equipment

(a) NE shall be responsible for design and implementation of EMP sampling equipment.

(b) HPL shall operate and maintain sampling equipment and equipment maintenance records in accordance with N-MAN-03443-10007 and approved laboratory procedures.

(c) NE and HPL shall implement equipment improvements and modifications in accordance with the process outlined in N-GUID-03443-10001.

1.6.3.2 Environmental Monitoring Stations

(a) HPL should perform minor maintenance, garden planting, and harvesting in accordance with N-GUID-03443-10001.

(b) NE shall use N-GUID-03443-10003, Design Guidelines for the Ontario Power Generation Environmental Monitoring Stations, as guidance for designing EMP stations.

(c) Repairs and *modifications* to the monitoring stations located outside the station boundary at DN and PN shall be requested by NE and performed by Facilities in accordance with N-GUID-03443-10002, Service Level Agreement: Routine Maintenance of Environmental Monitoring Program Stations.

(d) For repairs and *modifications* to the monitoring stations located inside the station boundary at DN and PN, NE should perform the following:

(1) Request repairs through Call Centre in accordance with BAS-INS-08965.4-00020, Facilities Work Management;

(2) Coordinate modifications through the site Contract Management Office;

(3) Fund modifications (may follow BAS-INS-08965.4-00021, Facilities Commercial Modification Control, as a reference).

(e) NE shall complete an annual assessment of the environmental monitoring stations at DN and PN in order to assess their physical condition.

1.6.3.3 Noble Gas Monitoring Network

(a) OPG owns the noble gas monitoring network and associated data around the PN and DN perimeters.

(b) Health Canada shall operate and maintain the noble gas monitoring network in accordance to manufacturer's specifications, under a Memorandum of Understanding (MOU) between OPG and Health Canada, N-CORR-03443-0919434.

(c) OPG Health Physics Radiation Protection Field Support shall provide field support to Health Canada for preliminary troubleshooting of noble gas monitoring equipment in accordance with N-MAN-03443-10007.

(d) Plant Computers Department shall maintain remote access to the noble gas detectors and provide on-going support to the system.

(e) OPG shall use the noble gas dose data generated by Health Canada for public dose calculations.

(f) Health Canada shall provide monthly noble gas dose data to NE on a quarterly basis, and a minimum of 10 business days prior to publishing on the Health Canada public website.

(g) Upon receipt of the Health Canada noble gas data, the EMP Environmental Advisor or delegate shall:

(1) Review the data provided by Health Canada with previous months and years to identify any large variations and correlations with station emissions and operational data.

(2) Review the events report provided by Health Canada and determine if the source is from OPG.

(3) Contact Health Canada Single Point of Contact (SPOC) if there are any concerns and provide information to disposition any suspect noble gas dose data.

1.6.3.4 Meteorological Data

(a) Data from DN and PN meteorological towers (wind speed, direction and standard deviation of direction) shall be used for radiological dose assessments.

(1) Measurements from the 10 meter towers shall be processed by NE using MetPro software for use with dose modeling software.

(b) Site Performance Engineering shall perform the following:

(1) Apply the Equipment Reliability Program requirements to the meteorological tower system, in accordance with N-PROG-MA-0026, Equipment Reliability, to ensure unavailability limits specified in Section 1.6.4.5 of this document are not exceeded.

(2) Inform NE if any issues are experienced with respect to invalid or inaccurate data, or extended periods of unavailability.

(c) Plant Computer Department shall perform the following:

(1) Download meteorological tower data from each site and archive data in accordance with P-SPEC-66450-00002, Sheet 0005, PI System Computer System Design Description – Appendix D – Meteorological Tower PI Interface.

(2) Inform Site Performance Engineering and NE if communication problems (i.e. issues with modem at the tower, phone line, or other components) or periods of invalid data are experienced.

(3) Provide electronic meteorological data files to NE and Site Performance Engineering at the beginning of each month for the data collected in the previous month.

1.6.4 Performance and Acceptance Criteria

1.6.4.1 Performance Indicator Targets

(a) The performance indicator target for monitoring of radiation in the environment in support of the annual public dose calculation is the annual public dose legal limit of 1000 µSv per year. Annual public radiation dose from the operation of OPG's nuclear facilities is expected to be a small fraction of the annual legal limit.

(b) The performance indicator targets for monitoring of conventional contaminants/hazardous substances in the environment through supplementary studies are the toxicity reference values and benchmark values from the most recent site ERA. These benchmark values represent health risk to humans and ecological species as a result of exposure to a given hazardous substance. The applicable performance indicator target will be substance and supplementary study specific

1.6.4.2 Unavailability

(a) *Unavailability* of data is an indicator used to track the representativeness of EMP data.

(b) *Unavailability* of data is determined as follows:

(1) Unavailability should be assigned when there is absence of monitoring results due to component impairment or failure, missing or compromised samples, laboratory analysis error, invalid data, or maintenance on equipment without backup monitoring.

(2) Limits on unavailability should be more stringent for pathways that have a more significant impact to receptors. Details on this determination are documented in filing memo N-REP-03481-0293229, Criteria for Establishing Unavailability Limits for Radiological Environmental Monitoring Program Data.

(3) Unavailability shall be quoted in terms of percent of unavailable results versus total results that were expected. If an expected result is not available but there is sufficient justification that it should not be counted towards unavailability, the rationale should be documented. For PN and DN, this should be documented in the Master Schedule (e.g. sample location is discontinued part way through the year and a replacement is not required, collected sample is very dry therefore moisture cannot be extracted for Tritium Oxide (HTO) analysis, etc.).

(4) Reasonable effort should be made to minimize unavailability (e.g. use interim monitoring).

(5) Unavailability shall be calculated for the following data:

- Laboratory Analytical Results.
- Noble Gas Detector Data.
- Meteorological Data.

(c) Best judgement should be used to determine whether unavailable results should be estimated either by modeling from emissions and/or using available results in adjacent wind sectors. Estimated results would still count towards *unavailability*.

(d) Further direction on handling data that do not meet the performance and acceptance criteria is provided in N-MAN-03443-10005.

1.6.4.3 Laboratory Analytical Results Unavailability

(a) *Unavailability* limits should be assigned only to the laboratory analytical results that are used in the public dose calculation.

Note: Hazardous substances are usually analyzed as part of *supplementary studies* or ERAs. *Unavailability* limits for these substances should be specified in the study scope and workplan.

(b) *Unavailability* limits for laboratory analytical results for DN and PN and provincial EMPs are indicated in Table 1, Annual Unavailability Limits for Laboratory Analytical Results, and are determined based on the percent contribution to total dose. These limits shall be applied to the PN, DN, and provincial data separately.

(c) Laboratory analytical results for continuous and/or composite samples may be rejected if they are deemed not to be representative of the measurement period. A sample should represent at least 75% of the measurement period to be acceptable.

(1) Active Tritium in Air Sampler monthly continuous samples: Results shall be rejected if there is a power failure or pump failure resulting in sampler operation for less than 75% of the monthly run time. Analytical results for these samples may be reported by the lab but the results are not considered representative of the month.

(2) Water Supply Plant (WSP) weekly/monthly composite samples: 75% of the samples for the composite period (week for HTO, month for gross beta) shall be required for a valid composite result. If less than 75% is available, the composite shall not considered representative of the week/month.

Table 1. Annual Unavailability Limits for Laboratory Analytical Results

Analyses used in Dose Calculation	DN EMP	PN EMP	Provincial EMP[(a)]
HTO in Air	10%	15%	25%
HTO in Drinking Water (WSPs, Wells)	15%	20%	N/A
HTO in Plants	15%	20%	25%
HTO in Milk	20%	15%	25%
HTO in Lake Water	25%	25%	N/A
HTO in Animal Feed	20%	15%	25%
HTO in Fish	25%	25%	N/A
HTO in Poultry	20%	N/A	25%
HTO in Eggs	20%	N/A	25%
C-14 in Milk	15%	15%	25%
C-14 in Plants	20%	25%	25%
C-14 in Air	25%	25%	25%
C-14 in Animal Feed	15%	15%	25%
C-14 in Fish	25%	25%	25%
C-14 in Poultry	15%	N/A	25%
C-14 in Eggs	15%	N/A	25%
Gamma in Fish	10%	10%	25%
Gamma in Beach Sand	25%	15%	25%

(a) Provincial background samples are expected to be low with little variation over the year, therefore the maximum *unavailability* limit of 25% is applied.

1.6.4.4 Noble Gas Detector Data Unavailability

(a) Annual *unavailability* limits for the noble gas detector data should be defined as follows:

- Twenty-five percent (25%) for each detector (sample location).
- Twenty-five percent (25%) for each nuclear site EMP.

(b) If a detector has missing/invalid data in a given month, the noble gas detector software will automatically extrapolate results over the entire month using the available data. If less than 75% of the month's data is available, best judgement should be used to determine whether the result is adequately representative of the month and therefore should be accepted/rejected. Rationale should be documented in the *Master Schedule*.

(c) Health Canada is responsible to ensure that each detector is available for full service 75% of any month and shall assist in determining an appropriate solution to a deficiency when the minimum availability has not been met per N-CORR-03443-0919434, Updated Memorandum of Understanding Between OPG and Health Canada for the Operation and Maintenance of OPGs Noble Gas Network.

1.6.4.5 Meteorological Data Unavailability

(a) Data is invalid when it is outside the range of the instrument accuracy tolerances. Data that is inaccurate (e.g. incorrect direction readings due to poor calibration or equipment failure) is also considered unavailable.

(b) Instrument accuracy tolerances are specified in the Control Maintenance Procedures for Pickering and Darlington, P-AB-CMP-61120.03, Wind Monitor Calibration Check, and NK38-CMP-61100-01, Meteorological Tower R.M. Young Wind Monitor Calibration, respectively.

(c) *Unavailability* shall be assigned based on the following:

- Percentage of data records with invalid/irrational, inaccurate, or missing/stale data. Each data record must have valid wind direction and wind speed data in order to be considered available (i.e. not missing one or both of the parameters).

- Percentage of data that is unavailable from the datalogger. Data that is not transmitted to the Plant Information (PI) database is considered unavailable. Data that is available in PI, but not available at particular work station/computer is still considered available for EMP purposes.

(d) Annual *unavailability* limit for the meteorological data is ten percent (**10%**), based on the Environmental Protection Agency (EPA),Meteorological Monitoring Guidance (EPA-454/R99-005). This limit shall be applied individually to each meteorological tower height at each site (e.g. *unavailability* of PN's 50m met data must be < 10% and PN's 10m met data must also be < 10%).

(e) *Unavailability* should be checked on a quarterly basis to ensure four consecutive quarters, each with less than 10% *unavailability*, are recovered for a one year cycle.

(f) *Where the 10% unavailability limit is exceeded for either the PN or DN 10m* or 50m meteorological tower, data from the other nuclear facility's corresponding meteorological tower may be substituted for air emissions modeling, provided the data is considered valid.

1.6.5 Data Interpretation and Dose Calculations

(a) NE shall review EMP data against the performance and acceptance criteria described in Section 1.6.4 periodically throughout the year. Corrective actions should be taken to mitigate exceeding the unavailability limits.

- N-MAN-03443-10005 provides direction on corrective actions, handling adverse conditions, and handling of data that do not meet the performance and acceptance criteria.

- Data interpretation should be conducted according to N-REP-03443-10012, Environmental Data Interpretation for Darlington Nuclear and Pickering Nuclear Environmental Monitoring Programs, where appropriate.

- Statistical analysis may also be performed in SiteFX software.

(b) EMP Environmental Advisor or delegate shall:

(1) Perform public dose calculations in accordance with N-INS-03443-00001.

(2) Review public dose calculations that are used for annual reporting following the verification requirements outlined in N-MAN-03443-10005.

1.6.6 Quality Assurance and Quality Control

1.6.6.1 General

(a) *QA* and/or QC is necessary to provide confidence in the results of a monitoring program.

(b) HPL shall conduct *QA* and/or QC to monitor, document, and control the quality of the laboratory program on a continual basis in accordance with N-MAN-03416.3-0020, Dosimetry and Radiological Environmental Measurement Services Quality Assurance Manual.

(c) NE shall conduct *QA* and/or QC to monitor, document, *verify,* and control the quality of the EMP elements on a continual basis in accordance with N-MAN-03443-10005.

(d) Program change control process is outlined in N-MAN-03443-10005.

1.6.6.2 Field Verification

NE shall perform a field verification annually on one element of the DN, PN or provincial EMP in accordance with the requirements of N-MAN-03443-10005.

1.6.6.3 Self Assessments

NE and HPL shall perform self assessments annually for program elements in accordance with the requirements of their respective *QA* manuals.

1.6.7 Qualifications and Training

(a) The qualification and training requirements for all technical professionals managing the EMP are specified in N-TQD-419-00001, Nuclear Environment Personnel Training and Qualification Description.

(b) N-TQD-443-00001, Radiation Protection Training and Qualification, outlines the training requirements for laboratory technologists at HPL.

1.7 Criteria for Determining the Need to Revise an EMP

The need for and adequacy of an EMP shall be reviewed following any update or revision of the ERAs or DRLs for the facility.

The design of the EMP shall be revised if the review indicates:

(a) The EMP objectives have not been adequately met;

(b) There is a change in the environmental risks;

(c) There is a change in any requirement to measure the concentration, intensity, or other appropriate characteristic of a contaminant or physical stressor or effects on receptors in the environment.

Where a further review of the environmental risks has demonstrated that a particular contaminant, physical stressor, or effect no longer meets the criteria for inclusion, monitoring of the contaminant, physical stressor, or effect may be removed from the EMP.

Otherwise, the requirement to establish and operate an EMP shall be reviewed:

(a) Prior to applying for a licence to begin a new stage in the lifecycle of the facility; and

(b) Following any change with the potential to substantially alter the predictions of the ERAs or DRLs, which may include changes in:

(1) The design of operation of the facility;

(2) The population or land use in the surrounding community;

(3) The scientific understanding of the interactions of the facility with the environment;

(4) The nature of the surrounding environment;

(5) The statutes, regulations, licences, or permits that govern the operation of the facility; or

(6) The commitments made by the licensee to any regulatory agency or other stakeholder.

1.8 Program Design Review and Audit

Continual assessment is required to confirm successful implementation and effectiveness of EMP operations. This shall be achieved by:

- Program design reviews (Section 1.8.1)
- Program *audits* (Section 1.8.2)

1.8.1 Program Design Review

(a) NE shall conduct program design reviews to ensure the program is meeting design objectives and regulatory requirements. Program design reviews shall be conducted within a reasonable time-span of any of the following circumstances:

- Following any update or revision of the facility pathway analysis based on the most recent DRL model.
- Following any update or revision of the facility *ERAs*.
- Prior to applying for a license to begin a new stage in the lifecycle of the facility.
- Following any change with the potential to substantially alter the predictions of the *ERA* or the implementation of the EMP, which can include a significant change in any of the following:
  - The design or operation of the facility.
  - The population or land use in the surrounding community.
  - The scientific understanding of the interactions of the facility with the environment.
  - The nature of the surrounding environment.
  - The statutes, regulations, licenses, or permits that govern the operation of the facility.
  - The commitments made by the licensee to any regulatory agency or other stakeholder.

(b) Program reviews should assess

(1) Updates to the Site Specific Survey, Pathway Analysis, Identification of Contaminants and Pathways of Importance, and any resulting changes to the EMPs;

(2) ERA findings and Supplementary Studies results and any changes to the EMPs;

(3) Changes to regulations and/or facility operations;

(4) The existing EMPs.

(c) NE shall prepare a report documenting the program design review for each site EMP.

(d) As part of the WWMF EMP program design review, NE should review the Bruce Power Nuclear Site EMP to ensure appropriate incorporation of WWMF.

1.8.2 Program Audit

(a) OPG shall conduct an independent *audit* of the EMPs once every five years to ensure the EMPs are in compliance with procedures.

(b) *Audits* shall be conducted in accordance with N-PROC-RA-0048, Conducting Audits and Performance Assessments.

1.9 Reporting

1.9.1 Annual Environmental Monitoring Program Reporting

(a) EMP reporting for OPG facilities shall be completed in accordance with operating license requirements.

(b) NE shall submit the annual EMP report for PN and DN to the CNSC by May 1st of the year following the reporting period, as required by the operating licenses of the nuclear facilities.

(c) Contents of the annual PN and DN EMP report shall include, as a minimum, the reporting requirements defined in CNSC Regulatory Document 3.1.1, Reporting Requirements for Nuclear Power Plants, listed below:

- A summary of the results of the EMP and an analysis of the significance of the results with respect to the health and safety of persons and the protection of the environment.

- The amount of nuclear substances, in SI units, released to the environment and monitored as part of the effluent monitoring program, presented on an appropriate basis (weekly or monthly), along with a comparison to regulatory release limits.

- The amount of nuclear substances measured in the environment, in SI units, as part of the EMP.

- The calculations of the annual radiation doses to the *critical group(s)* in comparison to the regulatory public dose limit with a description of the environmental pathways associated with the operation of the nuclear power plant, including the dispersion and dosimetric models used.

- The amount of hazardous substances, in SI units, released to the environment and monitored as part of the effluent monitoring program, and measured in the environment as part of the EMP.

- For each parameter reported as part of the effluent or environmental monitoring programs, a description of the characteristics of the monitoring results, including but not limited to the sample frequency, sample type (e.g. grab, composite, continuous), statistical quantity reported (e.g. monthly mean, annual total).

- A description of any significant events, findings or results, in respect to the conduct of the EMP.

- A summary or any proposed changes to the EMP.

- Name and address of the sender of the report (designated representative of the licensee).

- Date report completed.

Note: If annual reports were submitted to other government departments, including hazardous substances, that show the results of the effluent and environmental monitoring programs, sending a copy of the report to the CNSC is acceptable to satisfy the CNSC's requirement for oversight of the EMP.

(d) NE shall submit the annual EMP report for WWMF to the CNSC by August 31st of the year following the reporting period.

(e) Contents of the annual WWMF EMP report shall include, as a minimum, the reporting requirements listed below:

- summary of the results of the EMP and an analysis of the significance of the results with respect to the health and safety of persons and the protection of the environment.

- The amount of nuclear substances, in SI units, released to the environment and monitored as part of the effluent monitoring program, presented on an appropriate basis (weekly or monthly), along with a comparison to regulatory release limits.

- A comparison of Bruce site radiological emissions and WWMF emissions that contribute to the calculated annual public dose as reported in the Bruce Power EMP report.

- For each parameter reported as part of the effluent or environmental monitoring programs, a description of the characteristics of the monitoring results, including but not limited to the sample frequency, sample type (e.g. grab, composite, continuous), statistical quantity reported (e.g. monthly mean, annual total).

- A description of any significant events, findings or results, in respect to the conduct of the EMP.

- A summary or any proposed changes to the EMP.

- Name and address of the sender of the report (designated representative of the licensee).

- Date report completed.

(f) Additional requirements for the content of the annual EMP reports are provided in Section 11.2.2 of CSA N288.4.

(g) While the EMP reports primarily focus on the results of monitoring conducted in support of the annual public dose calculation or supplementary studies, several other OPG monitoring programs, each with separate reporting requirements and schedules, are briefly discussed in the annual report. They include the thermal monitoring program, the impingement and entrainment monitoring program, and the groundwater monitoring program.

(h) NE should post the annual EMP reports for DN, PN and WWMF on the OPG website in accordance with the Ministry of Energy's prescribed reporting dates for the year following the reporting period.

2.0 ROLES AND ACCOUNTABILITIES

2.1 Senior Vice-Presidents, Pickering and Darlington

2.1.1 Ensures EMPs fulfill CNSC license requirements.

2.1.2 Ensures station operations are aligned with EMP objectives set out in Section 1.2.

2.2 Vice President, Environment, Health and Safety

2.2.1 Ensures EMPs are consistent with corporate environmental policy and programs.

2.2.2 Approves the annual EMP report prior to release to external agencies.

2.2.3 Ensures adequate resources are allocated for EMP.

2.3 Manager, Health Physics Department

2.3.1 Fulfills EMP functional role as Program Manager for laboratory support for EMP.

2.3.2 Ensures operation of HPL meets EMP requirements.

2.3.3 Ensures adequate HPL resources are allocated to support EMP laboratory and field requirements.

2.3.4 Ensures *corrective actions* are implemented to address *non-conformance*s.

2.3.5 Ensures laboratory results are approved and released as scheduled.

2.3.6 Ensures all field sampling, equipment maintenance, and analytical procedures are approved.

2.3.7 Ensures laboratory performance reports are approved and quality of laboratory operations is maintained.

2.3.8 Ensures personnel training requirements are met in accordance with N-TQD-443-00001.

2.4 Director, Environment, Health and Safety – Nuclear Environment

2.4.1 Ensures annual EMP report is prepared and reported to regulatory agencies annually in accordance with licensing commitment.

2.4.2 Updates line management regarding site EMP performance and radiological impacts.

2.4.3 Approves EMP reports, design standards, and specifications prior to release to line management.

2.4.4 Ensures EMP meets objectives set out in Section 1.2.

2.4.5 Approves changes to implementation of EMP.

2.4.6 Ensures adequate resources are allocated to EMP as defined in N-MAN-03443-10005.

2.4.7 Ensures personnel training requirements are met in accordance with N-TQD-419-00001.

2.5 Senior Managers, Environment, Health and Safety – Environment Support and Health and Safety Field Services- Pickering

2.5.1 Ensures operation of EMP meets station license requirements.

2.5.2 Provides Environment resources to support EMP operations and requirements.

2.5.3 Ensures assistance is provided in reviewing any anomalous results from station operation perspective.

2.5.4 Ensures annual and quarterly data from station operations is made available.

2.5.5 Reviews annual EMP report.

2.6 Manager, Performance Engineering

Ensures Performance Engineering applies the program requirements, as defined in N-PROG-MA-0026, to the meteorological tower(s) system to maintain EMP data quality and availability requirements.

2.7 Senior Manager, Plant Computers

2.7.1 Ensures meteorological data at PN and DN sites are accessible, routinely downloaded, archived, and transmitted electronically to NE.

2.7.2 Ensures the remote access to the environmental noble gas detectors is maintained and on-going support to the system is provided.

3.0 DEFINITIONS AND ACRONYMS

3.1 Definitions

Audit is a group of systematic and independent activities carried out to confirm that applicable elements of the *quality assurance* program have been established in accordance with the requirements of the program, and these elements are being effectively implemented in accordance with specified requirements.

Critical Group is a fairly homogeneous group of identifiable people whose location, age, habits, and diet cause them to receive dose equivalents higher than the average received by typical people in all other groups in the exposed population.

Corrective Action is a measure taken, and documented, to determine the cause of deficiencies or *non-conformance*s and prevent their recurrence.

Environmental Risk Assessment (ERA) is an evaluation of risks posed by contaminants and physical stressors in the environment associated with a facility including recommendations for risk management. Human receptors are addressed through a human health risk assessment and non-human biota are addressed through an ecological risk assessment. See CSA N288.6-12 for more information.

Derived Release Limit (DRL) is the rate of release of a single radionuclide or radionuclide group which would cause a member of the *critical group* to receive a dose equivalent to the annual public dose limit if the release continued at that rate for a whole year.

Master Schedule is a collection of tables stored in the SiteFX EMP database, which specify the sample frequency, locations, sample availability, sample types, and analysis required for each program site.

Modification is a change to an operating system or item of equipment, including software that requires or results from a change in design requirements. *Modification* also includes activities that result in the incorporation of additional systems or equipment over and above those installed as part of the original design. The use of a different type, size, or grade of material or component may, depending on its role, be classed as *modification* or replacement.

Non-conformance is a deficiency in characteristic, documentation, or procedure, which renders the quality of an item or service unacceptable or indeterminate, or not in accordance with specified requirements, i.e., procedural changes or deviations, operational problems, and unauthorized *modification*s.

Quality Assurance (QA) comprises all planned systematic actions necessary to provide confidence in the results of a monitoring program.

Supplementary Study is a research project to increase knowledge of the behaviour of contaminants and stressors in the environment, or address other specific, well defined objectives. See CSA N288.4 for further description.

Unavailability is the percentage of time environmental parameters are not monitored, missing, or invalid/inaccurate.

Verification is the confirmation that activities, items, processes, or documents conform to specified requirements, via reviews, inspections, tests, or checks.

3.2 Abbreviations and Acronyms

ALARA	As Low As Reasonably Achievable
BV	Benchmark Value
C-14	Carbon-14
CALA	Canadian Association for Laboratory Accreditation
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Nuclear Standards Association
DN	Darlington Nuclear
DRL	Derived Release Limit
EMP	Environmental Monitoring Program
EPA	Environmental Protection Agency
ERA	Environmental Risk Assessment
HPL	Health Physics Laboratory
HTO	Tritium Oxide
MOU	Memorandum of Understanding
NE	Nuclear Environment
NSCA	Nuclear Safety and Control Act
OPG	Ontario Power Generation
PI	Plant Information
PN	Pickering Nuclear
QA	Quality Assurance
QC	Quality Control
WSP	Water Supply Plants
WWMF	Western Waste Management Facility

4.0 BASES, RECORDS AND REFERENCES

4.1 Bases

Nuclear Safety and Control Act

Radiation Protection Regulations

CNSC, Regulatory Document, “Reporting Requirements for Nuclear Power Plants”, REGDOC-3.1.1

CSA N288.1-08, Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities

CSA N288.4-10, Environmental monitoring programs at Class 1 nuclear facilities and uranium mines and mills

CSA N288.6-12, Environmental risk assessments at class I nuclear facilities and uranium mines and mills

EPA Meteorological Monitoring Guidance (EPA-454/R99-005)

4.2 Records

The following records may be generated by use of this document and shall be registered in appropriate document management system in accordance with the following table.

Record Created	Associated Form or Template Number	QA Record? Y/N	Filing Information/Retention (AIMS Type/Sub-Type)
QA Verification Packages	N-FORM-10977 Sheets 001 through 010 Environment Programs Verification	Y	Submitted by NE as part of Verification Package. Indexed in Asset Suite Records Management. Document Number: N-REF-03443- 7 digit document number Records Retention Code: ENV-0003 Retention: Permanent
Analytical Results	N/A	Y	Submitted by HPL as part of data package. Indexed in Asset Suite Records Management. Document Number: N-REP-03443- 7 digit document number Records Retention Code: ENV-0003 Retention: Permanent
Sample Collection Sheets	N/A	Y	Submitted by HPL as part of data package. Indexed in Asset Suite Records Management. Document Number: N-REP-03443- 7 digit document number Records Retention Code: ENV-0003 Retention: Permanent
Reports (e.g. Supplementary Studies, Annual EMP reports, or other program reports)	N-TMP-10010	Y	Submitted by NE. Indexed in Asset Suite Controlled Documents or Records Management. Controlled Document Number: N-REP-03443- 5 digit document number Records Number: N-REP-03443- 7 digit document number Records Retention Code: ENV-0003 Retention: Permanent

Site Specific Survey Reviews	N-TMP-10010	Y	Submitted as individual reports by NE. Indexed in Asset Suite Controlled Documents. Document Numbers: PN: P-REP-03443- 5 digit document number DN: NK38-REP-03443- 5 digit document number Records Retention Code: ENV-0003 Retention: Permanent
Program Design Reviews	N-TMP-10010	Y	Submitted as individual reports by NE. Indexed in Asset Suite Controlled Documents. Document Numbers: PN: P-REP-03443- 5 digit document number DN: NK38-REP-03443- 5 digit document number WWMF: W-REP-03443- 5 digit document number Provincial: N-REP-03443- 5 digit document number Records Retention Code: ENV-0003 Retention: Permanent
Program Manuals	N-TMP-10010	N	Submitted as individual reports by NE. Indexed in Asset Suite Controlled Documents. Document Numbers: PN: P-MAN-03443- 5 digit document number DN: NK38-MAN-03443- 5 digit document number WWMF: W-MAN-03443- 5 digit document number Records Retention Code: ENV-0002 Retention: Life of Facility
Correspondence to the CNSC	N/A	Y	As per N-PROC-RA-0047.
Temporary / Permanent Change Control Form	N-FORM-10389	Y	Submitted by NE. Indexed in Asset Suite Records Management. Document Number: N-REF-03443- 7 digit sequence number Records Retention Code: ENV-0003 Retention: Permanent
Governance Management Records	OPG-FORM-0001	Y	As per OPG-PROC- 0001.
Change Management Plan	OPG-FORM-0260	Y	As per OPG-STD-0140.

4.3 References

4.3.1 Performance References

BAS-INS-08965.4-00020, Facilities Work Management

BAS-INS-08965.4-00021, Facilities Commercial Modification Control

N-CORR-03443-0919434, Updated Memorandum of Understanding Between OPG and Health Canada for the Operation and Maintenance of OPGs Noble Gas Network

N-FORM-10389, Temporary / Permanent Change Record

OPG-FORM-0260, Change Management Form

N-INS-00120-10008, Nuclear Contractor Safety Management Process

N-GUID-03443-10001, Service Level Agreement: Provision of Environmental Sample Collection and Analysis for Environment Monitoring Program

N-GUID-03443-10002, Service Level Agreement: Routine Maintenance of Environmental Monitoring Program Stations

N-GUID-03443-10003, Design Guidelines for Ontario Power Generation EMP Monitoring Stations

N-INS-03443-00001, Methodology for Data Analysis and Public Dose Determination for the Environmental Monitoring Program

N-INS-03443-00003, Instruction for Performing a Site Specific Survey for Ontario Power Generation Nuclear Sites

N-INS-03443-00002, Instructions for Environmental Monitoring Program (EMP) Master Schedules

N-MAN-03416.3-0020, Dosimetry and Radiological Environmental Measurement Services Quality Assurance Manual

N-MAN-03443-10005, Environmental Monitoring Program Quality Assurance Manual

N-MAN-03443-10007, Environmental Monitoring Program Equipment Maintenance Manual

OPG-PROG-0005, Environment, Health & Safety Managed Systems

N-PROG-MA-0026, Equipment Reliability

N-REP-03443-10012, Environmental Data Interpretation for Darlington Nuclear and Pickering Nuclear Environmental Monitoring Programs

N-REP-03481-0293229, Criteria for Establishing Unavailability Limits for Radiological Environmental Monitoring Program Data

N-REP-03481.21-10003, Review of the Provincial Radiological Environmental Monitoring Program – 2006

OPG-STD-0140, Managing Change

N-TQD-443-00001, Radiation Protection Training And Qualification Description

N-TQD-419-00001, Nuclear Environment Personnel Training and Qualification Description

NK38-CMP-61100-01, Meteorological Tower R.M. Young Wind Monitor Calibration

NK38-MAN-03443-10002, Darlington Environmental Monitoring Program

NK38-REP-03443-10002, Detailed Design of Environmental Monitoring Program for Darlington Nuclear Generating Station

NK38-REP-03443-10003, Darlington Environmental Monitoring Program (EMP) Review

OPG-FORM-0001, Governance Management Record

OPG-PROC-0001, Process Administrative Governance Documents

OPG-PROC-0178, Controlled Document Management

OPG-PROC-0179, Nuclear Quality Assurance Records

N-PROC-RA-0048, Conducting Audits and Performance Assessments

P-AB-CMP-61120.03, Wind Monitor Calibration Check

P-MAN-03443-00002, Pickering Environmental Monitoring Program

P-REP-03443-00003, Detailed Design of Environmental Monitoring Program for Pickering Nuclear Generating Station

P-REP-03443-00004, Pickering Environmental Monitoring Program (EMP) Review

P-SPEC-66450-00002 Sht 0005, PI System Computer System Design Description

W-MAN-03443-00001, Western Waste Management Facility Environmental Monitoring

W-REP-03443-00003, WWMF Environmental Monitoring Program Design Review

W-REP-07002-00001, Detailed Design of Environmental Monitoring Program for the OPG WWMF

4.3.2 Developmental References

N-PROC-OP-0044, Contaminated Lands and Groundwater Management

N-REP-01802-0139990, ESD-HPD-95-04 Analytical Limits and Quality Control in Ontario Hydro Nuclear Health Physics Laboratories, J. Richardson, May 1995.

NA44-REP-03482-00001, Derived Release Limits and Environmental Action Levels for Pickering Nuclear Generating Station A

NK30-REP-03482-00001, Derived Release Limits and Environmental Action Levels for Pickering Nuclear Generating Station B

NK38-REP-03443-10001, Site-Specific Survey for the Darlington Nuclear Site

NK38-REP-03443-10004, Review of the Darlington Nuclear Site Specific Survey

NK38-REP-03482-10001, Derived Release Limits and Environmental Action Levels for Darlington Nuclear Generating Station

P-CORR-00531-03773, Pickering NGS Intake and Thermal Fish Mortality: Closure of Action Items 2008-4-13 (RIB #2433), 2008-4-14 (RIB # 2434) and New Action Item 2012-48-3489, e-Doc 3970429, August 13, 2012.

P-CORR-00531-03783, Plans to Mitigate Thermal Effects, Impingement and Entrainment at Pickering NGS, Action Item 2012-48-3489, e-Doc 4017624, September 28, 2012.

P-REP-03443-10001, Site Specific Survey for the Pickering Nuclear Site

P-REP-03443-10003, Review of the Pickering Nuclear Site Specific Survey

4.4 REVISION SUMMARY

This is an **intent** revision.

- Updated names and roles in Authorization section of title page.
- Updated Exceptions to include requirements of the Fisheries Act Authorizations.
- Removed reference to Thermal Plume studies in Exceptions, as this work is complete.
- Added reference to OPG-PROC-0179, Nuclear Quality Assurance Records to performance references (DCR 133041)
- Added reference to OPG-PROC-0178, Controlled Document Management to performance references. (DCR 133045)

- Changed use of the title “EMP Responsible Engineer” to “EMP Environmental Advisor” to align with the EMP QA Manual N-MAN-03443-10005. (DCR 134964)
- Incorporate Department Name Change from Environment Operations Support (EOS) to Nuclear Environment (NE)(DCR 138090)
- Replaced references to N-GUID-00120-10008 with N-INS-00120-10008, Nuclear Contractor Safety Management Process (DCR 138191)
- Replaced references to N-STD-AS-0024 with OPG-STD-0140, Managing Change (DCR 141582)
- Replaced references to N-PROG-OP-0006 – Environmental Management with OPG-PROG-0005, Environment, Health and Safety Managed Systems (DCR 142261)
- Updated title of N-PROC-RA-0048 to Conducting Audits and Performance Assessments (DCR 144414)
- Replaced references to N-TQD-405-00001 with N-TQD-443-00001 (DCR 153046)
- Revised roles and accountabilities to align with September 2020 reorganization (DCR 154899)
- Added WWMF EMP Design Review to Appendix A and to records table.
- Updated references to N-INS-03481-10000 with N-INS-03443-00003, Instruction For Performing A Site Specific Survey For Ontario Power Generation Nuclear Sites.
- Updated references to P-REP-03481-00001 with P-REP-03443-10003, Review of the Pickering Nuclear Site Specific Survey.
- Updated references to NK38- REP-03481-10002 with NK38-REP-03443-10004, Review of the Darlington Nuclear Site Specific Survey.
- Added references to PN, DN and WWMF program manuals in appendix A and records table.
- Expanded requirement for Pathway Analysis to WWMF in section 1.5.2.3.
- Updated section 1.6.3 to clarify which equipment is associated with PN, DN and WWMF EMPs.
- Removed requirement in section 1.6.3.3 for Noble Gas Verification, as this data is obtained from Health Canada. Added MOU document number.
- Removed use of measurements from 50 meter met towers for noble gas verification process in Section 1.6.3.4.
- Edited wording in Section 1.6.4.2 for clarification.

- Section 1.6.4.3 clarified that unavailability limits within Table 1 apply to DN, PN and provincial EMPs only.
- Updated unavailability limits in Table 1 as reported in latest design reviews.
- Removed what is considered invalid data from noble gas data (bullet a) in Section 1.6.4.4, as this step is no longer performed by OPG. Added section on HC's responsibility regarding noble gas sampler availability and referenced associated MOU.
- Added statement that SiteFX may be used for statistical analysis in Section 1.6.4.6.
- Removed instructions on Field Verifications in Section 1.6.6.2 and directed reader to QA manual for detailed instructions.
- Added reporting requirement for WWMF in section 1.9.
- Added EMP Manual to Records Table.
- Updated Appendix A to include EMP manuals, WWMF EMP Design Review and Site Specific Survey Instruction.

-

Appendix A: Environmental Monitoring Program Documents