

## **11.0 PROPOSED MITIGATION AND PRELIMINARY PLAN FOR MONITORING AND FOLLOW-UP PROGRAM**

### **11.1 INTRODUCTION**

This chapter provides a summary of the feasible mitigation measures assumed or proposed to reduce or avoid the likely adverse effects of the project. It also provides a plan for, and preliminary scope of, a follow-up and monitoring program for the Project as required by the EA Guidelines. The purpose of the follow-up program is two-fold: to assist in determining if the environmental and cumulative effects of the project are as predicted in the EA Study Report; and to confirm whether the proposed mitigation measures are effective, and thus to determine if new mitigation strategies are required. Since the PNGS B Project is very similar to other recently completed projects within the PN site, many of the mitigation measures have already been shown to be effective, and have been incorporated into the ongoing PN site monitoring programs, the associated operating policies and procedures, and specific construction practices.

New mitigation measures would be justified if the existing PN site procedures and associated mitigation measures were found to be ineffective, or if the actual adverse environmental effects were significantly greater than those predicted in the EA Study Report. Therefore, the follow-up process should be expected to function in part as a component of the ongoing process of continual improvement in environmental performance of the PN site. The design of the Project follow-up program is planned to be staged and structured appropriately for the specific scale of each site activity (Refurbishment Phase and Continued Operation Phase) as they occur over time. The timing, the nature of the studies, and the results will be integrated on an ongoing basis in subsequent stages in the Project.

As the RA for the project, the CNSC has the overall responsibility to ensure that appropriate feasible mitigation measures are implemented and that the follow-up program is designed and carried out. The CNSC licensing and compliance program will be used as the mechanism for ensuring the final design and implementation of the follow-up and monitoring program and reporting of the program results. The program will be based on regulatory principles of compliance, adaptive management, reporting and analysis.

Each of the likely effects of the Project identified in the EA Study Report and associated TSDs was reviewed to determine how the predicted effect could be confirmed. The focus of the review was to identify which VECs, or other components of the environment, might be incorporated into the follow-up and monitoring program. Secondly, each of the feasible mitigation measures was reviewed to determine how its effectiveness could be monitored.

The following sections provide a summary of the proposed mitigation measures, and a plan and preliminary scope for the follow-up and monitoring program.

## **11.2 PROPOSED MITIGATION MEASURES**

Potential adverse environmental effects of the Project would be mitigated in two ways:

- Mitigation measures which are part of the basic project design (“in-design” mitigation measures). These in-design mitigation measures were taken into account at the outset of the EA study and are identified in the various assumptions made in the context of assessing the various project works and activities. These in-design mitigation measures are described in Chapter 2 and summarized briefly in Section 11.2.1.
- Additional feasible mitigation measures identified during the EA study with the goal of reducing or avoiding likely adverse effects of the Project. These additional mitigation measures are identified in Chapter 5 for each environmental component and described briefly in Section 11.2.2.

### **11.2.1 In-Design Mitigation Measures Taken into Account at Outset of the EA Study**

#### ***11.2.1.1 Construction-Related Measures During Refurbishment Phase***

- Prior to commencing site preparation or construction, either OPG or the contractor will be required to prepare an Environmental Management Plan (EMP) consistent with the current OPG operating policies and procedures. Under the EMP, Construction Spill Response, and Erosion and Sediment Control Plans will be developed, and specific monitoring requirements will be identified. OPG will independently monitor aspects of the performance of the contractor where there is a risk to the environment identified by the site preparation or construction activities. Furthermore, OPG has a Spill Management Procedure in place. In the event of a spill, the Emergency Response Team (either OPG’s or the contractor’s, depending on the location of the spill) would be mobilized to contain the spill, stop the source where possible, and direct the subsequent clean-up.
- Cutting of the reactor building concrete for steam generator removal will be done using wet methods and spray drift covers as appropriate to control dust. The slurry will be sampled and tested for radioactivity. Slurry confirmed to be non-radioactive will be processed on site or off site to separate out the bulk of the water. The discharge location of the separated water will depend on its composition, but will not be released directly to the environment. The concrete and dry solids from the cutting slurry will be checked to confirm they are not radioactive, then will be disposed of off site, meeting all regulatory requirements. If they are radioactive, they will be handled as LLW in a similar manner to other LLW.

- OPG will review services buried under the roadway and the expected loading from the crane moving above services. Should potential problems be identified, means of mitigation such as lightening the load (e.g., through removal of crane counterweights) and/or dispersing the weight (e.g. laying steel plating on roadway) would be implemented.
- During construction activities involving site clearing and grading type activities, the contractor will ensure that standard stormwater management measures will be implemented.
- Other standard practices will be implemented for construction activities, including:
  - Practicable means of dust control (e.g., road watering on dry days);
  - Maintenance of construction equipment in good working order with installed noise control devices (e.g., mufflers) and compliance with noise regulations for the operation of construction equipment;
  - In the unlikely event that items of archaeological significance are encountered, immediate stoppage of work in the affected areas and contacting of the appropriate authorities and other stakeholders for assessment.
- Management of road clearing and salting activities in any laydown or parking areas according to ongoing Environmental, Health and Safety practices;
- Implementation of measures, such as good housekeeping and use of drain covers, in areas of potential oil contamination;
- Review and monitoring of ongoing systems and equipment (e.g. standby generators, piping, tanks both above and below ground, etc.) to ensure integrity for the life of the station.

#### ***11.2.1.2 Other Measures During Continued Operation Phase***

- OPG has a Spill Management Procedure in place. In the event of a spill, the Emergency Response Team (either OPG's or the contractor's, depending on the location of the spill) would be mobilized to contain the spill, stop the source where possible, and direct the subsequent clean-up.
- The design of additional waste storage structures at PWF II will be assessed and be integrated with the overall Stormwater Management Plan for the PWF II. The overall stormwater management system will meet appropriate standards and requirements with each PWF expansion.
- Operation and management of the network of existing tritium in groundwater monitoring wells for the PN site will continue through both Project phases.

- OPG will continue to conduct tritium in groundwater sampling, and where necessary revise the sampling program to track the tritium in groundwater. Appropriate corrective actions will be used to reduce, or eliminate, any effects of tritium in groundwater identified at PNGS B.

#### **11.2.1.3      *Radiation Protection During Refurbishment Phase and Continued Operation Phase***

- Doses to the public and workers will be maintained as low as reasonably achievable, social and economic factors taken into consideration (ALARA) based on a detailed ALARA assessment of the facility and activity. This may include a range of measures such as shielding and procedural controls, as well as controlling exposure duration for non-NEWs.
- During the Refurbishment Phase, radioactivity emissions are assumed to be no greater than those during operation of the units.
- During the times when there will be openings in containment (i.e. specially prepared and approved openings in the reactor building dome for steam generator replacement or open airlocks), procedures will be in place to control radioactive releases to the environment. These controls will be determined through an assessment of the work that will be in progress and system/equipment availability (e.g., status of vapour barriers between boiler room and reactor vaults, status of reactor building ventilation and filter systems, status of monitoring systems). The controls will take into account parallel work activities, air flow considerations, radioactivity monitoring, decontamination, and contingency actions should an abnormal event or condition occur.
- The design of the additional storage buildings for refurbishment waste and used fuel at the PWF will provide sufficient shielding in the walls such that gamma radiation levels at the perimeter fence will comply with the regulatory dose limits, and OPG's dose targets for the public and workers at the facility fence and beyond will be met. The exposure duration for non-NEWs is controlled by OPG.
- The design requirement for the radioactive waste transport containers is to have sufficient shielding to provide a dose rate less than the regulatory limit of 100  $\mu\text{Sv/h}$  at one meter from the surface of the container.

#### **11.2.2 Additional Mitigation Measures Identified During the EA Study**

- Protection of breeding birds during vegetation clearing activities will be accomplished in one of three ways:

- Undertake clearing activities to reduce the likelihood of nesting birds between August and March, and optimally after November to reduce re-growth of vegetation. Breeding bird nesting period is approximately from April 1 to July 20.
- Verify that nesting is not taking place in the excavation areas; and
- Avoid nesting areas by establishing and flagging around the nesting area by a qualified biologist.
- Clearing would only be undertaken during the sensitive nesting period following a breeding bird survey of potentially affected habitat and, if appropriate, the implementation of mitigation measures to avoid disturbing nesting birds.
- Prior to commencement of Refurbishment Phase activities, confirm appropriate signage and/or pavement markers around the PN site to ensure safety of, and reduce the potential for, disruption to Waterfont Trail users;
- Review with City of Pickering and Town of Ajax officials that traffic management and parking can safely accommodate the Refurbishment workforce. A Parking Management Plan for temporary parking during the Refurbishment Phase may be developed as a contingency.
- Review and amend all existing agreements between OPG and community service providers as required to address issues arising during the Refurbishment Phase and Continued Operation Phase; and,
- Continuation of the Project-specific Communication Plan during the Refurbishment Phase to ensure communication with residents in the Local Study Area regarding Project-related issues and concerns if they should occur; provision of a telephone number at PNGS B so that local residents can call with any questions, complaints or nuisance-related issues.

### **11.3 PLAN AND PRELIMINARY SCOPE OF FOLLOW-UP AND MONITORING PROGRAM**

#### **11.3.1 Overview of Plan**

The proposed plan for the development of the follow-up and monitoring program consists of the following steps:

- Identification of the general timeframe for the follow-up program;
- Identification of the preliminary scope of follow-up studies related to the general timeframe; and
- Proposal of a process for developing the final scope and timing of the follow-up program (including details such as monitoring parameters, locations and frequencies).

### **11.3.2 General Timeframe for Follow-up and Monitoring Program**

In carrying out the assessment, it was determined by the technical experts responsible for each of the environmental components that there was sufficient information to support the assessment of the likely effects of the project. The extensive baseline information provided in the EA Study Report, reflecting over five years of recent site preparation and construction, associated operations monitoring, and the associated TSDs, as well as historical data and other information collected during more than three decades of operation, is judged to be adequate. Additional information would not substantially alter the findings of the EA study. Accordingly, there is no need for inclusion of substantial pre-construction monitoring in the follow-up and monitoring program. Thus, the focus of the proposed preliminary scope of the program (Section 11.3.3) is primarily, though not exclusively, on activities during and after the Refurbishment Phase. The duration of the different components of the program would be reviewed through the consultative process outlined in Section 11.4.

### **11.3.3 Preliminary Scope of Follow-up and Monitoring Program**

As noted above, the scope of any follow-up and monitoring program is focused on providing information needed to verify the predictions in the EA Study Report and the effectiveness of the identified mitigation measures. Follow-up studies will be focused on specific potential effects and, as much as possible, will be limited to finite periods of time. This would allow results to be evaluated and any appropriate corrective action to be taken in a timely manner.

As stated in Section 1.2.1, the PN and PWF licences are proposed to be amended to incorporate the expansion of the PWF and the life extension of PNGS B into the existing operating licences. Therefore, all of the existing monitoring requirements of the licences would be applied. Table 11.3-1 provides a summary listing of the monitoring requirements relevant to PNGS B Refurbishment that are part of the normal existing monitoring programs for PN and for the PWF I and II as described in Section 2.11. Therefore, these activities will not be unique to the Project.

Table 11.3-2 provides a preliminary listing of the follow-up activities that will be specifically developed for the PNGS B Project. These were identified primarily as part of the mitigation measures in Chapter 5.0. It is anticipated that many of these activities will be incorporated into PN's overall Environmental Management System (EMS). Details of the program will be developed later in consultation with the CNSC and other stakeholders as appropriate (Section 11.4).

**TABLE 11.3-1**  
**NORMAL PN SITE MONITORING PROGRAM RELEVANT TO PNGS B PROJECT**

Environmental Component	Monitoring Location	Description	Duration and Frequency of Monitoring	Relationship to other PN programs	Objective / Status
Radiation and Radioactivity	Site and Local/Regional Study Area	<ul style="list-style-type: none"> <li>On-going monitoring associated with the Radiological Environmental Monitoring Program (REMP).</li> <li>REMP program monitors radioactivity in air, water, gamma, foodstuffs, soil, groundwater, fish, lake water, lake sediment.</li> </ul>	Duration: Life of the Project; Frequency: varies depending on monitoring activity.	<ul style="list-style-type: none"> <li>Part of ongoing monitoring required by PNGS and PWF Licences.</li> </ul>	Confirm low levels of radiation in the natural environment.
Radioactivity in Effluents	Airborne and liquid effluent streams	<ul style="list-style-type: none"> <li>Airborne radionuclides (tritium, particulates, iodine, noble gases, C-14 and).</li> <li>Liquid radionuclides (tritium, C-14, gross alpha, gross beta, gross gamma).</li> </ul>	Duration: Life of the Project Frequency: varies depending on radionuclide.	<ul style="list-style-type: none"> <li>Ongoing station monitoring activities.</li> </ul>	Demonstrate compliance with Derived Release Limits (DRLs) and Environmental Action levels.
Radiation and Radioactivity Radiation Protection	PNGS	<ul style="list-style-type: none"> <li>Exposure control, contamination control and dosimetry including training programs, protection procedures, monitoring and ALARA.</li> </ul>	Duration: Life of the Project. Frequency: Continuous.	<ul style="list-style-type: none"> <li>Ongoing station monitoring activities.</li> </ul>	Ensure the safeguarding of the health and safety of workers, public and the environment from radiological hazards.
Air, Noise – C of A	Site and Local Study Areas	<ul style="list-style-type: none"> <li>PN has a Comprehensive C of A (Air) for discharges to the atmosphere.</li> <li>Monitoring and preparation of report to confirm OPG is within conditions of C of A.</li> <li>No specific monitoring requirements.</li> </ul>	Duration: Life of the Project. Frequency: Annual Report to MOE and reports and revised approvals as needed. Revised periodically with the MOE.	<ul style="list-style-type: none"> <li>Ongoing station activity.</li> </ul>	Confirm compliance with MOE regulations and Certificate of Approval conditions.

**TABLE 11.3-1 (Cont'd)**  
**NORMAL PN SITE MONITORING PROGRAM RELEVANT TO PNGS B PROJECT**

Environmental Component	Monitoring Location	Description	Duration and Frequency of Monitoring	Relationship to other PN programs	Objective / Status
Surface Water – C of A	Site Study Area	<ul style="list-style-type: none"> <li>PN has a Consolidated C of A for Sewage Works for water discharges.</li> <li>Monitoring for oil and grease, TSS, total residual chlorine, ammonia, hydrazine, morpholine, pH, temperature at locations specified in C of A.</li> </ul>	Duration: Life of the Project as required by the MOE. Frequency: as specified in C of A, revised periodically with the MOE.	<ul style="list-style-type: none"> <li>Ongoing station monitoring activities.</li> </ul>	Confirm compliance with MOE regulations and Certificate of Approval conditions.
Surface Water – MISA	Site Study Area – Locations specified by MISA program	<ul style="list-style-type: none"> <li>Monitoring at specific effluent control points specified in MISA regulation for toxicity, pH, TSS, oil and grease, aluminum, iron, zinc, total phosphorous.</li> </ul>	Duration: Life of the Project as required by the MOE. Frequency: Daily / monthly.	<ul style="list-style-type: none"> <li>Ongoing station monitoring activities.</li> </ul>	Confirm compliance with MISA regulation. Quarterly Reports submitted to MOE.
Groundwater monitoring	Site Study Area	<ul style="list-style-type: none"> <li>Ongoing monitoring program for tritium.</li> </ul>	Duration: Completion of tritium in groundwater investigation as specified by the CNSC.	<ul style="list-style-type: none"> <li>Ongoing monitoring activity.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm status of tritium in groundwater at the PN site and verify the effectiveness of any corrective actions.</li> </ul>

**TABLE 11.3-2  
PRELIMINARY ELEMENTS OF FOLLOW-UP AND MONITORING PROGRAM SPECIFIC TO PNGS B PROJECT**

Environmental Component	Monitoring Location	Description	Duration and Frequency of Monitoring	Relationship to other PN programs	Objective / Status
Aquatic Environment	Site Study Area	<ul style="list-style-type: none"> <li>Undertake a fish impingement mortality assessment and entrainment sampling program to evaluate the effect of fish impingement and compare results to baseline study. Sampling program will include the sediment suction screenhouse.</li> </ul>	<ul style="list-style-type: none"> <li>For one year after the restart of all units to correspond to impingement studies conducted as part of the PARTS EA Follow-up Studies.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Environmental Management System.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm low rate of impingement of VEC species.</li> </ul>
		<ul style="list-style-type: none"> <li>Conduct an overview evaluation of technologies for reducing fish impingement / entrainment to determine whether there are economically achievable technologies that warrant further consideration at PNGS B.</li> </ul>	<ul style="list-style-type: none"> <li>During Refurbishment Phase.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Environmental Management System.</li> </ul>	<ul style="list-style-type: none"> <li>Determine applicability of various technologies to reduce impingement losses.</li> </ul>
		<ul style="list-style-type: none"> <li>Undertake a creel census in vicinity of PNGS discharges (e.g. Frenchman's Bay) to confirm use of these habitat areas by VEC fish species, such as Northern pike.</li> </ul>	<ul style="list-style-type: none"> <li>Prior to commencement of Refurbishment Phase during winter and spring.</li> <li>During Refurbishment Phase in winter and spring.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Environmental Management System.</li> </ul>	<ul style="list-style-type: none"> <li>Quantify boat and shore-based angler effort.</li> <li>Confirm conclusions of Foregone Production Report (Golder 2007).</li> <li>Confirm use of these habitat areas by VEC fish species.</li> </ul>
		<ul style="list-style-type: none"> <li>Collect temperature data near the substrate at possible whitefish spawning areas between the PNGS B and Duffins Creek potentially affected by the thermal plume, and at control locations offset several km from the discharge.</li> </ul>	<ul style="list-style-type: none"> <li>Prior to commencement of Refurbishment Phase during the winter season (from November to March).</li> <li>During Refurbishment Phase during the winter season (from November to March).</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Environmental Management System.</li> </ul>	<ul style="list-style-type: none"> <li>Verify MWAT temperatures, particularly with respect to whitefish spawning and/or larval development.</li> <li>Verify expected plume bottom temperatures in vicinity of potential whitefish spawning areas between PNGS B and Duffins Creek.</li> <li>Confirm predictions of "no effect" from thermal discharge on whitefish spawning.</li> </ul>

**TABLE 11.3-2 (Con't)**  
**PRELIMINARY ELEMENTS OF FOLLOW-UP AND MONITORING PROGRAM SPECIFIC TO PNGS B PROJECT**

Environmental Component	Suggested Location for Monitoring	Description	Suggested Duration and Frequency of Monitoring	Relationship to Other PN Programs	Objective / Status
Traffic	Local Study Area	<ul style="list-style-type: none"> <li>Develop a program to assess Level of Service during Refurbishment Phase.</li> <li>Review with City of Pickering and Town of Ajax officials that traffic management and parking can safely accommodate the refurbishment workforce.</li> <li>A Parking Management Plan for temporary parking during the Refurbishment Phase may be developed as a contingency.</li> </ul>	<ul style="list-style-type: none"> <li>Traffic monitoring at appropriate intersections during Refurbishment Phase to verify the conclusions of the traffic assessment.</li> </ul>	<ul style="list-style-type: none"> <li>Continuation of PARTS EA Follow-up Studies.</li> </ul>	<ul style="list-style-type: none"> <li>Verify predicted effects and confirm effectiveness of mitigation.</li> </ul>
Socio-economic Conditions	Local Study Area	<ul style="list-style-type: none"> <li>Public attitude research to provide directly comparable results to the 2006 survey in terms of questions and approach to sampling.</li> </ul>	<p>Update of public attitude research (by telephone survey) at the following intervals:</p> <ol style="list-style-type: none"> <li>one year prior to commencement of Refurbishment Phase activities;</li> <li>during peak year of on-site employment during Refurbishment Phase;</li> <li>within one year of commencement of Continued Operation Phase; and</li> <li>subsequent to any accident or malfunction at the PN site resulting in a significant release of radioactive contaminants into the environment.</li> </ol>	<ul style="list-style-type: none"> <li>Results of public attitude research to be reviewed as part of the PN Public Affairs programs and with the PN Community Advisory Committee.</li> <li>Contingency measures (if required) to be developed as part of the PN Public Affairs programs.</li> </ul>	<ul style="list-style-type: none"> <li>Verify public attitudes throughout the Project.</li> </ul>

**TABLE 11.3-2 (Con't)**  
**PRELIMINARY ELEMENTS OF FOLLOW-UP AND MONITORING PROGRAM SPECIFIC TO PNGS B PROJECT**

Environmental Component	Suggested Location for Monitoring	Description	Suggested Duration and Frequency of Monitoring	Relationship to Other PN Programs	Objective / Status
Socio-economic Conditions	Local Study Area	<ul style="list-style-type: none"> <li>Development of an Impact Management Program in consultation with the City of Pickering, associated with the Sandy Beach Road residents.</li> </ul>	<ul style="list-style-type: none"> <li>Prior to Refurbishment Phase.</li> </ul>		<ul style="list-style-type: none"> <li>Ensure that if any issues or concerns related to the Project arise with respect to traffic disruption, they can be dealt with in a timely manner.</li> </ul>
Public Consultation	Local Study Area	<ul style="list-style-type: none"> <li>Development of a follow-up Communication Plan.</li> </ul>	<ul style="list-style-type: none"> <li>Communication activities are to continue periodically throughout the Refurbishment Phase of the Project.</li> </ul>	<ul style="list-style-type: none"> <li>Integrate with PN Public Affairs Programs.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the public is informed about the progress of the Project.</li> </ul>
Malfunctions and Accidents	Site Study Area	<ul style="list-style-type: none"> <li>Prepare and implement a strategy to reduce the probability of an EPRC5A category event. Strategy will focus on potential physical modifications and may also include reassessment of safety analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Following the start of the Refurbishment Phase.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing PBRA analysis and revisions.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the already low probability of occurrence of an EPRC5A event.</li> </ul>
Climate Change	Site Study Area	<p>Develop an adaptive management strategy to:</p> <ul style="list-style-type: none"> <li>Confirm adequacy of existing monitoring programs for effects on water systems due to algae impingement, zebra mussels, or changes to lake water temperatures.</li> <li>Monitor any redefinition of Regional Storm Event and review adequacy of stormwater management system as appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Develop the strategy during the Refurbishment Phase of the Project.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Environmental Management System.</li> </ul>	<ul style="list-style-type: none"> <li>Periodically review systems to determine whether the effects of a potentially changing climate are affecting the Project.</li> </ul>

#### **11.4 PROCESS FOR DEVELOPING FINAL SCOPE OF FOLLOW-UP AND MONITORING PROGRAM**

It is proposed that the final scope and details of the program be determined through a consultation process, involving the CNSC and other stakeholders, as appropriate. It is envisaged that other stakeholders would include, but not necessarily be limited to:

- Federal Authorities identifying themselves as expert Federal Authorities having an interest in the EA study, including Health Canada, Environment Canada, Department of Fisheries and Oceans and Natural Resources Canada;
- Provincial ministries, including the Ministry of the Environment and Ministry of Natural Resources, and the Toronto Regional Conservation Authority;
- Regional and local municipal governments;
- The Community Advisory Council; and
- Durham Nuclear Health Committee.

The proposed approach for developing the details of the follow-up and monitoring program is as follows:

- Review the preliminary program outlined in Tables 11.3-1 and 11.3-2;
- Determine the scope and timing of each of the identified program elements (including details of the monitoring parameters, locations, frequency, duration);
- Identify how the proposed program elements might be incorporated into or co-ordinated with existing or on-going PN Site monitoring programs (e.g. REMP, EMS, Public Affairs Program);
- Determine the frequency and the method of reporting results to the CNSC, public and other stakeholders;
- Review the details of all proposed program elements with the CNSC and other regulatory agencies, as appropriate;
- Review and discuss the program with the Community Advisory Council and other stakeholders, as appropriate; and,
- Incorporate appropriate elements of the program into the existing or ongoing PN Site and monitoring programs (e.g. REMP, EMS, Public Affairs Program).