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Written Submission from

Ontario Power Generation Inc.

In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement for OPG's Deep Geological Repository (DGR) Project for Low and Intermediate Level Waste

Joint Review Panel

September 16 to October 12, 2013

Mémoire de

Ontario Power Generation Inc.

À l'égard de

Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences environnementales pour l'Installation de stockage de déchets radioactifs à faible et moyenne activité dans des couches géologiques profondes

Commission d'examen conjoint

16 septembre au 12 octobre 2013

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Ontario Power Generation

Public Hearing for Ontario Power Generation's Deep Geologic Repository for Low and Intermediate Level Waste

Scheduled for:
September 16, 2013

Request for a Decision

Regarding:

Environmental Assessment for Ontario Power Generation's Application to Prepare a Site and Construct a Deep Geologic Repository for Low and Intermediate Level Waste

Submitted by:
Ontario Power Generation

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EXECUTIVE SUMMARY

This written submission presents an overview of Ontario Power Generation's (OPG) project for long-term management of its low and intermediate radioactive waste in a Deep Geologic Repository (DGR) to be located at the Bruce nuclear site in the Municipality of Kincardine, Ontario. A summary of OPG's environmental impact statement for the DGR Project is also presented.

Throughout the public comment period, which began on February 3, 2012, and ended on May 24, 2013, OPG provided responses to 575 Information Requests from the Joint Review Panel. OPG also provided submissions in support of its presentations at three Technical Information Sessions. The Information Request responses provided further information and/or clarification of information presented on the characteristics of the waste to be emplaced in the DGR, the assessment of alternatives to the project, the integrity of the cap rock sequence, management of stormwater and waste rock pile runoff, effects on at-risk species, effects on human health, livestock and wildlife particularly from predicted noise emissions, and the effects of climate change and seismicity. This additional information, which is supplemental to OPG's April 14, 2011, submission to the Joint Review Panel, is summarized, as appropriate, in this Panel Member Document.

The supplementary information provided in the Technical Information Sessions and Information Request responses and summarized in this submission, supports OPG's conclusion, as presented in the EIS, that the site preparation and construction, operation, decommissioning and abandonment of the DGR Project are not likely to have any significant adverse effect on the environment.

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1.0 INTRODUCTION

In 2001, the Municipality of Kincardine approached OPG seeking to assess the feasibility of long-term management options for the radioactive Low and Intermediate Level Waste (L&ILW) at the Western Waste Management Facility (WWMF) at the Bruce nuclear site. Kincardine and OPG entered into a Memorandum of Understanding which led to the conduct of the Independent Assessment Study (IAS) of Long-Term Management of options for Low and Intermediate Level Wastes at OPG's Western Waste Management Facility (GOLDER 2004). The IAS concluded that all options considered (enhanced processing and storage, surface concrete vaults and deep rock vaults) could safely manage all of the low level waste and some could also manage portions of the shorter-lived intermediate level waste. Only the deep rock vault could manage the low level waste (LLW) and all of the intermediate level waste (ILW) for the long term.

In 2004 the Municipality of Kincardine passed a resolution asking OPG to pursue the deep rock vault (deep geologic repository) because, in their view, it provided the greatest margin of safety, was consistent with international best practice, provided opportunities for economic benefit to members of the community and provided a permanent solution for all L&ILW. OPG's Board of Directors agreed, in August 2004, to proceed with a Deep Geologic Repository (DGR) recognizing the reasons cited by the Municipality of Kincardine. Subsequently, the Municipality of Kincardine and OPG signed a Hosting Agreement. The Hosting Agreement was conditional on the Municipality of Kincardine demonstrating a clear mandate of community support for the DGR. With 71 per cent of households participating, the results of a poll of all residents in the Municipality of Kincardine showed that 60 percent of respondents were in favour.

After receiving endorsement for the DGR project at the Bruce nuclear site from the Municipality of Kincardine, and following OPG Board approval, OPG submitted to the Canadian Nuclear Safety Commission (CNSC) a letter of intent and a project description for the DGR Project in December 2005.

The CNSC held a scoping hearing in Kincardine in October 2006 to determine the environmental assessment track of the DGR project. This resulted in a recommendation to the federal Minister of the Environment that the project be referred to a federal Environmental Assessment review panel. In June 2007, the Minister of Environment announced that the DGR project had been referred to a public review panel. Environmental Impact Statement (EIS) Guidelines (the Guidelines) (CEAA and CNSC 2009a) and a Joint Review Panel (JRP) Agreement for the DGR (CEAA and CNSC 2009b) Project were subsequently issued in January 2009, after a public review.

OPG completed an environmental assessment (EA) and submitted to the Joint Review Panel, in April 2011, an Environmental Impact Statement (EIS) (OPG 2011a) consistent with the requirements outlined in the Environmental Impact Statement Guidelines (CEAA and CNSC 2009a). The roadmap for the environmental assessment submission is presented in Figure 1. The assessment was completed using best available published information, supplemented by specific field studies to characterize the existing environment conditions. In preparing the EIS, best practice and the preliminary design were used. The EIS identifies potential interactions between the project and the environment and predicts the potential effects of the Project on the environment over the lifetime of the Project. OPG concluded that the Project, including the consideration of malfunctions and accidents and long-term safety, would not have a significant adverse effect on the environment.

Since the submission of the EIS and technical support documents, OPG has been providing responses to information requests from the Joint Review Panel and continuing its

communications and engagement activities. The purpose of this written submission is to provide a concise summary of the results of the EA and to summarize the additional information and clarifications provided through the information requests during the public review period pertinent to OPG's earlier conclusion in the EIS. It is not intended to provide a complete summary of all OPG's submissions in support of the EA.

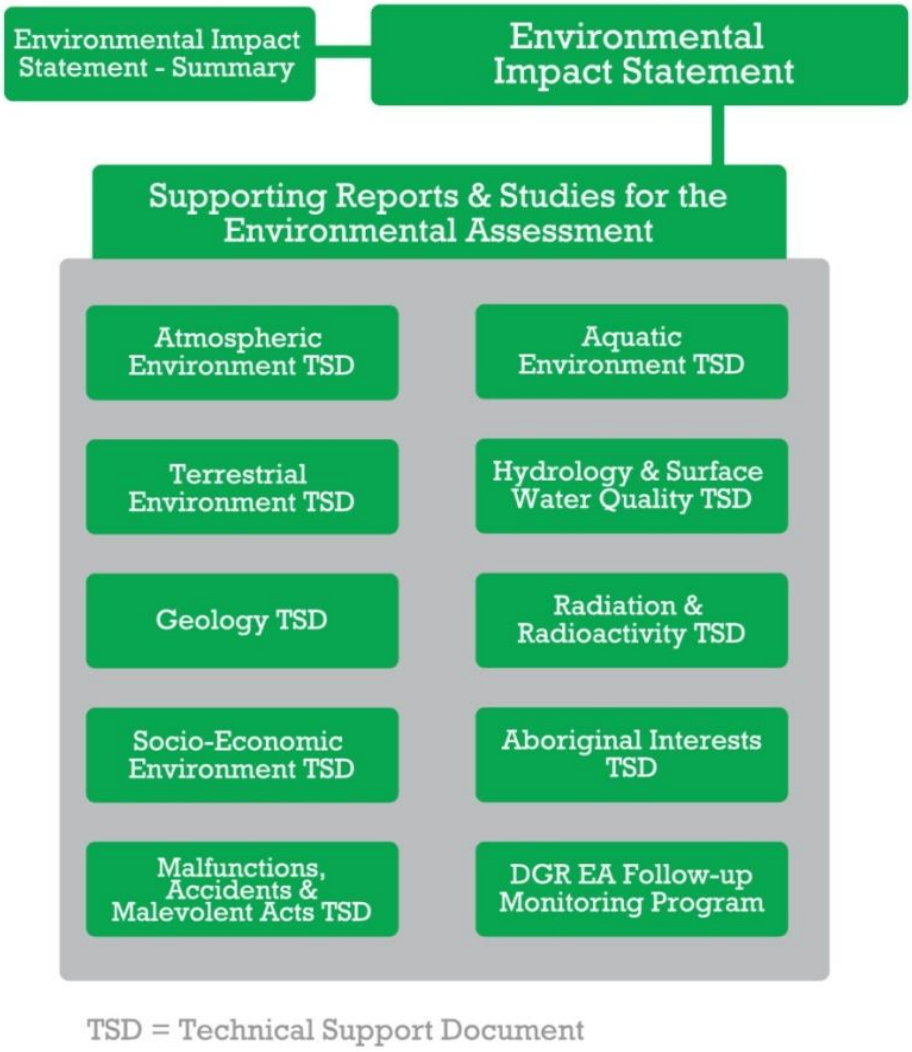

Figure 1: Environmental Assessment Document Roadmap

2.0 PURPOSE AND NEED FOR THE PROJECT

OPG has operated interim L&ILW management facilities at the Bruce nuclear site for over 40 years. The DGR Project, a schematic of which is shown in Figure 2, will provide safe long-

term management of L&ILW from the operation of OPG-owned or operated generating stations up to a volume of approximately 200,000 m^3 (emplaced volume). Most of OPG's existing L&ILW is held in interim storage at the WWMF (91,000 m^3 at end of December 2012).

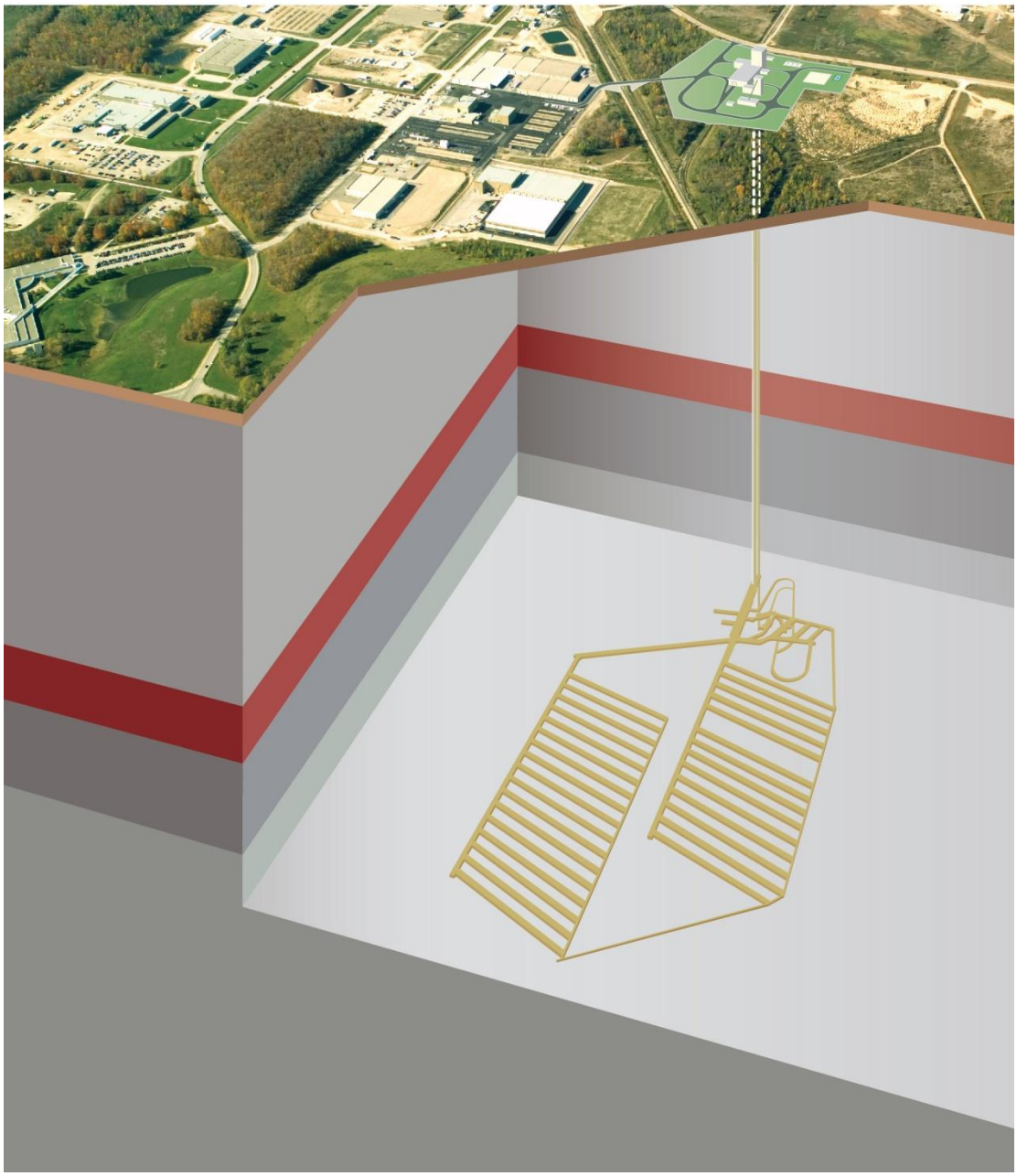

Figure 2: Schematic of the DGR Project at the Bruce Nuclear Site

Since L&ILW contains materials that can remain radioactive for hundreds and thousands of years due the presence of long-lived radionuclides, long-term management of these wastes is needed in a manner that protects humans and the environment. These considerations and

international guidance and practice suggest that deep geologic disposal in a suitable rock formation provides the best solution. The need for the project to be implemented now is due to:

- OPG's desire to provide a long-term solution for the waste generated from the current use of nuclear power and not leave the task and cost for future generations to bear;
- the need to manage both the existing waste inventory and future waste arisings until end of station life; and
- the interest of a municipality in hosting and implementing a long-term management solution.

Waste to be emplaced in the DGR includes, as described in the EIS (Section 4.5) and OPG's response to IR EIS-04-102, waste from OPG-owned or operated new-build reactors. As discussed in the EIS (Section 4.5), the DGR will not accept used nuclear fuel or recognizable fuel fragments. OPG's response to IR EIS-03-51 confirms that the DGR will not accept liquid waste.

Although OPG's DGR Project licensing application does not seek approval to include the volumes of waste that would result from reactor decommissioning, from a planning perspective, the EA considered the potential inclusion of greater volumes of waste in future as part of the cumulative effects assessment. As described in OPG's response to IR EIS-04-102, decommissioning waste could be accommodated in the DGR at some time in the future.

2.1 Description of the Project

The proposed DGR Project will be located on the Bruce nuclear site in the Municipality of Kincardine, in the Province of Ontario. The facility will be located entirely within the boundaries of the OPG-owned and retained lands (i.e. lands not leased to Bruce Power) at the Bruce nuclear site. The DGR will provide safe long-term management of L&ILW. The DGR will consist of above- and below-ground facilities for the receipt of L&ILW, transfer of L&ILW underground, and emplacement of L&ILW in rooms excavated at a nominal depth of 680 m below surface in competent sedimentary rock.

The DGR consists of surface facilities that include the waste package receiving building (to receive waste from the WWMF), amenities and other supporting buildings, headframes, and the waste rock and stormwater management areas. The underground facilities include access tunnels, emplacement rooms and a services area. Two shafts (main shaft and ventilation shaft) provide access to underground facilities.

The DGR is currently assumed to operate for approximately 35 to 40 years, followed by decommissioning over a period of five to six years. The abandonment and long-term performance phase of the DGR Project begins once decommissioning activities are completed. This period is assumed to include institutional controls, with societal memory and surface monitoring, for a period up to 300 years, but the duration would be determined at the time of closure in discussion with the host municipality and regulator.

The waste to be emplaced in the DGR includes approximately 200,000 m^3 of low and intermediate level waste from OPG-owned or -operated nuclear generating stations. As discussed in OPG's responses to IRs EIS-04-102, EIS-08-341 and EIS-08-378, OPG's current application does not include emplacement of decommissioning waste in the DGR Project. OPG's responses to Information Requests (IRs) EIS-04-120 and EIS-04-145 discuss the maximum expansion potential of the DGR that has been assessed, as well as some of the factors that would be involved in constructing such an expansion. In accordance with the Guidelines, the cumulative effect of expanding the DGR to include waste arising from

decommissioning was specifically considered. The cumulative effects assessment concluded that increasing the size of the facility to address 400,000 m^3 of low and intermediate level waste with the same characteristics considered in the EA would not result in a significant adverse environmental effect.

OPG considers waste as LLW if the corresponding waste package has a dose rate of less than 10 mSv/h at 30 cm, and as ILW if the dose rate is greater than or equal to 10 mSv/h at 30 cm, or known to have a significant amount of long-lived radionuclides. There is no upper level dose rate for ILW. The purpose of distinguishing LLW from ILW is to facilitate appropriate waste handling (from a worker dose perspective) and for placing the waste in an appropriate interim storage facility.

As discussed in OPG's response to IR EIS-11-504, OPG's use of the terms low and intermediate level waste is consistent with the CSA Standard (N292.3-08, Management of Low- and Intermediate-Level Waste) (CSA. 2008a) and with the IAEA Safety Glossary (2007):

- Low-level radioactive waste (LLW) contains material with radionuclide content above established clearance levels and exemption quantities, but generally has limited amounts of long-lived activity. LLW requires isolation and containment for periods of up to a few hundred years. LLW does not generally require significant shielding during handling and interim storage.
- Intermediate-level radioactive waste (ILW) typically exhibits levels of penetrating radiation sufficient to require shielding during handling and interim storage. ILW generally requires little or no heat dissipation during its handling, transportation, and long-term management. However, because of its total radioactivity level, ILW might require consideration of the implications of short-term heat generation. Because of its long-lived radionuclides, ILW generally requires a higher level of containment and isolation than can be provided in near-surface repositories.

OPG's response to IR EIS-08-343 presents information indicating that waste containers are designed according to Design Requirements documents and procured under OPG's nuclear procurement procedures, which include requirements for manufacturing, inspection and test plans. This ensures that the products meet OPG's specified Design Requirements and Technical Specifications. In addition, they are procured from vendors on OPG's qualified suppliers list. These vendors undergo periodic quality management audits by OPG to ensure that they are maintaining their Quality Management Systems. As discussed in OPG's responses to IRs EIS-04-122, each package will be visually inspected prior to transfer to the DGR to ensure it meets the DGR waste acceptance criteria.

OPG's response to IR EIS-08-344 describes the handling procedures for moving the wastes from the WWMF to the DGR and emplacing containers in the DGR. Waste package movement at the DGR, through surface handling, shaft handling, underground transfer and placement in emplacement rooms, will be conducted in a physically stable configuration utilizing practices that meet applicable regulations. Packages will be secured for transfer to the DGR to ensure physical stability is maintained during transfer.

2.2 Alternatives

As required by the Guidelines, OPG considered alternative means of meeting the Project needs as well as alternative means of carrying out the project. As discussed in Section 2.1, the DGR Project is the preferred alternative. Alternative means were considered for several different aspects of the Project including for example, siting, DGR access (shaft vs. ramp), and waste

rock management. The evaluation of alternative means of carrying out the project is presented in Section 3.4 of the EIS.

2.2.1 Alternatives to the Project

OPG, in conjunction with the Municipality of Kincardine, assessed the feasibility of three alternatives to the DGR Project, and the status quo (continued operation of the current Western Waste Management Facility). The alternatives, enhanced processing, treatment and long-term storage, covered above-ground concrete vault and deep geologic repository, were assessed in the Independent Assessment Study (IAS) relative to geologic feasibility, technical feasibility, environmental and socio-economic effects and cost. The results of the IAS (GOLDER 2004) showed that all alternatives were feasible and the costs were comparable based on analysis of LLW. Some alternatives were not suitable for managing ILW (i.e. enhanced compaction, treatment and long-term storage) or only some of the ILW (i.e. covered above-ground vault). Following visits to operating L&ILW facilities, the Municipality of Kincardine Council expressed a preference for a DGR as it was consistent with international best practice and provides the greatest margin of safety.

In the response to IR EIS-06-277, OPG explains that the selection of a deep geologic repository for OPG's LLW and ILW would not have changed if ILW had been considered in the engineering feasibility, and safety and licensibility assessments sections of the IAS.

2.2.2 Alternative Means of Carrying Out the Project

Section 3.4 of the EIS and OPG's response to IR EIS-03-49 identify the alternative means and describe the process used for evaluating alternative means of carrying out the Project. In OPG's response to IR EIS-09-407, a detailed explanation of the scoring for each criterion used is presented. Each of the alternative means was evaluated based on consideration of economics, worker health and safety, public health and safety, technical considerations, physical/biophysical environment, socio-economic environment and acceptability/achievability. Each alternative means was ranked for each criterion relative to the others. In most cases, the supporting data and/or information provided in Section 3.4 of the EIS were sufficient to make the ranking of each alternative apparent and transparent. In a few cases, this information was supplemented with professional judgment based on relevant specific expertise. OPG's response to IR EIS-06-278 provides the rationale for the evaluation of alternative means of carrying out the project, in the context of risk avoidance, adaptive management capacity, and preparation for surprise. These concepts were incorporated in the evaluation of the alternative means relative to the criteria listed above. For example, those alternative means that avoid public or worker health and safety risks were considered more favourable. The results of peer reviews were incorporated in the design and contributed to risk avoidance. OPG's response to IR EIS-06-273 confirms that sustainability principles were taken into consideration in the evaluation of alternative means. The primary contribution of the DGR to sustainability is that it manages the L&ILW in this generation instead of leaving it for future generations. On a local scale, the DGR Project contributes to sustainability through avoidance of transport of the waste, reducing the surface footprint for waste management, avoidance of sensitive lands such as the northeast marsh, decreasing contact opportunities for terrestrial and aquatic species, and providing continued employment and revenue opportunities in the Regional Study Area.

As described in OPG's response to IR EIS-02-40, OPG considered alternate sites both on and off the Bruce nuclear site, looking conceptually at the alternative of locating the DGR Project on the Bruce nuclear site versus seeking a greenfield site off the Bruce nuclear site. The assessment of on-site versus off-site locations considered the cost, worker health, public health and safety, technical feasibility, and effects on the environment including social and economic

effects. A site on the Bruce nuclear site is preferred as the host municipality is supportive, the geology is known to be suitable, and environmental effects resulting from transporting the on-site waste are eliminated.

OPG's response to IR EIS-03-50 clarifies that the postclosure safety of the repository does not rely on "institutional control" to ensure safety. However an extended period of such control, including land use control, simple societal memory and surface monitoring, would help minimize the risk of human intrusion into the repository. The duration of this period is not specified, and would be subject to discussion with the host municipality and regulator at the time of closure.

The safety case assumes that inadvertent intrusion would not occur for at least 300 years. The peak dose from early intrusion (to the drill crew or a person living on the repository site) would be about 4 mSv higher than for intrusion at 300 years. However, inadvertent deep drilling into the repository within 100 years of closure is not considered credible - societal memory alone is likely sufficient to ensure this. From 100 to 300 years, the intrusion consequences are essentially as presented in the Preliminary Safety Report (PSR) (OPG 2011b, Section 8.7) at 300 years.

In the responses to IR EIS-03-50 and 51, OPG presents the evaluation of alternative means of managing moist, combustible and gas generating waste, and describes international practices in treating waste. OPG's DGR will accept only solid waste, with low levels of moisture. A portion of the combustible waste received at the WWMF is incinerated and emplaced in the DGR as ash. There are no alternative means that would significantly reduce gas generation in the repository with the given L&ILW inventory. OPG's response to IR EIS-03-50 also presents information on grouting and sealant as an alternative treatment for repository walls, concluding that treatment is not recommended as transport through the host rock is not an important pathway for release of radioactivity to the surface.

OPG's response to IR EIS-09-409 explains that alternative arrangements for the shafts and shaft functions were considered as part of developing the preliminary design and the advantages of using the exhaust ventilation shaft for waste package transfer while leaving all other transfers in the other shaft did not outweigh the disadvantages for reasons of safety and engineering.

The additional information presented in OPG responses to IRs does not change the results of the assessment of alternatives to the DGR or alternative means of carrying out the DGR Project.

3.0 PUBLIC AND STAKEHOLDER ENGAGEMENT

OPG's engagement activities for the DGR Project began in 2002 and have continued through to the present time. Throughout the assessment, OPG provided information and opportunities to provide input on the DGR Project to members of the public and to stakeholder groups, focussing on those in close proximity to the DGR Project site. Information and opportunities to provide comment about the project were provided to all who expressed an interest. Information received from the public and stakeholders throughout the process has been incorporated in the assessment, in particular, with relation to the selection of the DGR as the preferred technology, the valued ecosystem components (VECs), the orientation of the underground layout relative to Lake Huron, and potential effects of the Project on Lake Huron.

OPG's decision to proceed with the regulatory approvals process for the DGR Project was based in part on the results of a community poll conducted by the Municipality of Kincardine. which indicated that 60 percent of respondents supported a long-term L&ILW management

facility, 22 percent did not support, 13 percent were neutral and 5 percent did not know or declined to answer. The poll included responses from 71 percent of households, permanent and seasonal. As discussed in OPG's submission for Technical Information Session #3, while a local vocal minority opposing the DGR Project has emerged during the public comment period, there continues to be support from the majority of members of local community groups, Chamber of Commerce groups, and members of the public with whom OPG has engaged at community events. The Kincardine Council and councils in Saugeen Shores, Brockton, Huron-Kinloss, Aaron-Elderslie, South Bruce and Bruce County Council also continue to support OPG's DGR Project as evidenced by letters of support. OPG travelled to Michigan in 2009 and again in 2011 to engage elected representatives and representatives of non-government organizations on the DGR Project.

In 2009 and 2010, OPG made efforts to advise the executive and staff of the Great Lakes and St. Lawrence Cities Initiative (GLSLCI) that they were willing and available to make presentations and provide information on the DGR Project to the GLSLCI. There was no response to these offers at the time. In 2013, several member mayors and the executive director of GLSLCI visited the DGR site and the WWMF. OPG also presented information on the DGR at the 2013 annual general meeting of the GLSLCI.

Following the EIS submission, OPG continued to provide information about the DGR Project and engage the public and stakeholders, particularly with respect to the regulatory review process to ensure they were aware of the status of the review and the associated participation opportunities. For example, OPG issued two newsletters in 2011, three in 2012, and one in 2013 to-date, to approximately 35,000 residents in the Regional Study Area and on the stakeholder mailing list. Each newsletter provides an update on the regulatory approvals process. The DGR mobile exhibit continued to participate in home shows, local summer markets, and community events to provide an additional opportunity for the public to obtain information and provide input on the Project. OPG also provided tours and briefings to non-government organizations who received Participant Funding and other community groups who expressed an interest, and continued to provide briefings to local stakeholder, service and community groups and municipal government representatives.

OPG is committed to continuing to engage the public and stakeholders in information exchanges about the DGR Project throughout the site preparation and construction, and operations phases. A variety of means will be used to continue to engage the public on a number of topics, including informing the public of significant milestones in the project or significant events associated with the project, and presenting and discussing the results of EA follow-up monitoring. OPG's response to IR EIS-09-458 and Section 2.4 of OPG's submission for Technical Session #3 provide additional information on OPG's going-forward communication plans related to the site preparation and construction and operations phases of the DGR project. OPG plans to continue to use a variety of means to engage and inform the public, stakeholders and members of First Nations and Métis communities, including newsletters, to communicate project activities and progress, mitigation efforts and their effectiveness, and the results of monitoring activities undertaken to confirm predicted effects. OPG will continue to respond directly to questions and requests for information and will offer update briefings to stakeholder and community groups. OPG is committed to ongoing, meaningful engagement and dialogue with Municipal, First Nation and Métis communities regarding the DGR and OPG's nuclear waste management operations. The avenue for these conversations could include community councils, or some other form of mutually agreeable structure.

4.0 FIRST NATIONS ENGAGEMENT

The Saugeen Ojibway Nation consists of the Chippewas of Saugeen First Nation and the Chippewas of Nawash Unceded First Nation whose ancestors have lived in the Great Lake region. OPG recognizes that the DGR Project is proposed in lands that are the traditional territories of the Saugeen Ojibway Nation.

OPG made an initial presentation on the IAS to the Joint Council of the Saugeen Ojibway Nation (SON) in 2003. The purpose of the presentation was to introduce the feasibility study and to initiate further engagement with First Nations. Following the initial presentation, OPG continued to meet with representatives of SON, and entered into a Communications Agreement in 2005, and subsequently signed a Participation Protocol with SON in 2009. The purpose of the Agreement and Protocol was to provide SON with capacity to communicate with community members about the project, conduct studies and peer reviews of project materials and to establish and maintain the SON Environment Office.

Through these meetings with SON, OPG provided information about the DGR Project, sought to obtain input from SON on VECs, traditional knowledge that could be included in the assessment of effects, and information on rights, traditions and practices, and potential effects of the DGR Project on SON rights, traditions and practices.

OPG's response to IR EIS-05-203 provides information on how input from SON was used to develop the methods for assessment of effects, and summarizes questions and recommendations from SON and where they are addressed in the EIS. OPG's response to IR EIS-07-296 describes engagement activities conducted by OPG/NWMO with SON since the EIS was completed in March 2011.

OPG continues to meet with representatives of the SON community and is committed to doing so beyond the EA period prior to, during and after construction. OPG is committed to an ongoing dialogue (and education) on the DGR, nuclear waste management and OPG's other activities in SON territory. OPG also seeks to continue to be informed (and educated) about the SON community, its rights and interests. Engagement could take the form of a community council, community discussions or other forms of interaction as agreed upon by SON and OPG.

In 2011, following award of funding under the Participant Funding Agreement, OPG contacted the United Chiefs and Council of Mnidoo Mnising and the Wikwemikong First Nation, located on Manitoulin Island. OPG presented information and engaged in discussion of the DGR Project with each of these groups in May of 2012. Wikwemikong requested a follow-up meeting which was held in June of 2013. OPG also invited representatives of the United Chiefs and Council of Mnidoo Mnising and Wikwemikong First Nation to tour the WWMF and the DGR site. Neither group had accepted the offer at the time of writing.

5.0 MÉTIS ENGAGEMENT

Métis communities are described as distinct collectives with their own customs, way of life and group identity. From a demographic perspective, Métis people generally do not reside in distinct geographic areas; rather they reside within a local or regional municipality. In the context of the DGR Project, four Métis communities are identified, the closest of which is the self-represented Historic Saugeen Métis, located at Southampton, Ontario and the others being the Great Lakes Métis, Georgian Bay Métis and Moon River Métis, who are represented by the MNO.

In identifying groups and individuals with whom to engage on the DGR project, OPG looked first to those who had participated in environmental assessment processes for other projects at the

Bruce nuclear site. OPG did not find evidence that representatives of the Métis peoples had participated in these projects.

5.1 Historic Saugeen Métis

The Historic Saugeen Métis (HSM) consists of the independent historic Métis who have resided along the Lake Huron proper shoreline from the islands at the tip of the Bruce Peninsula to the Ausable River system (south of Goderich) beginning with the Trader Pierre Piché. The present day HSM community members are descendents of the historic Métis who have lived in, cared for and relied on the shared traditional Saugeen Territory for generations. The major HSM community location is Southampton. The DGR Project is located within the HSM traditional territory.

In 2008, OPG first met with representatives of the HSM Community (then the Saugingue Métis Community) and continued to meet with them up to and following the submission of the EIS in 2011. As discussed in the EIS (Section 2.3.3) a Letter of Agreement was signed by HSM and OPG. The Agreement included provision for funding of HSM to participate in the regulatory approvals phase of the DGR Project. OPG's response to IR EIS-03-47 provides information on the process used to engage HSM in the selection of VECs for the DGR Project. OPG's responses to IRs EIS-05-202 and 204 provide information on OPG's efforts to engage HSM-represented citizens in the Georgian Bay Region and input received from HSM on the VECs. OPG's response to IR EIS-07-296 describes engagement activities conducted by OPG/NWMO with HSM since the EIS was completed in March 2011.

5.2 Métis Nation of Ontario

OPG approached the Grey-Owen Sound Métis (now Great Lakes) community in writing in 2008 seeking to begin engagement on the DGR Project. Later in 2008, OPG met with representatives of the Métis Nation of Ontario (MNO), who represent the Métis communities, to provide a briefing on the project and initiate engagement activities. Following MNO indication of their interest in participating in the regulatory review process, OPG provided tours of the WWMF, provided draft documents for review and comment, and met to discuss the project. Absence of a formal agreement and capacity funding did not prevent engagement. In 2009, the Georgian Bay, Grey-Owen Sound and Moon River Métis Councils signed, with the MNO, a Regional Consultation Protocol for the Georgian Bay Traditional Territory. The Protocol called for establishment of a Consultation Committee, the Georgian Bay Traditional Territory Consultation Committee. It is this committee with which OPG meets to discuss the DGR Project.

As discussed in OPG's response to IR EIS-02-43, in 2011 OPG signed a Participation Agreement with MNO to assist them in accessing capacity to participate in the environmental assessment process for the DGR Project, including engaging the MNO and the three Community Councils (Great Lakes, Georgian Bay and Moon River Métis Councils) in the Georgian Bay harvesting area and completing Traditional Land Use studies. OPG's responses to IRs EIS-05-202 and 204 provide information on OPG's efforts to engage MNO-represented citizens in the Georgian Bay Region and input received from MNO on the VECs. OPG has continued to meet with the Georgian Bay Traditional Territories Consultation Committee and participate in community events to engage members of the Métis community on the DGR Project. In its response to IR EIS-07-296, OPG describes engagement activities with MNO and the three community councils since the EIS was completed in March 2011.

6.0 APPROACH TO THE ASSESSMENT

The approach used in the assessment included a two-step screening, to identify potential interactions and then to identify measurable change, to focus the assessment where effects are likely to occur. Where there was likely to be measurable change, effects on the environment were predicted and assessed as to whether they were adverse. For adverse effects, mitigation was proposed and the likely adverse effect re-evaluated to assess whether any residual adverse effects remained. Residual adverse effects were then assessed to determine whether the effect was significant, taking into consideration the magnitude, geographic extent, duration, frequency, irreversibility and social/ecological context of the effect. OPG's response to IR EIS-03-94 provides information on the approach used in assessing significance of residual adverse effects. The significance of residual adverse effects was completed using a decision tree approach. A decision tree was deemed appropriate for all disciplines for which residual adverse effects were identified. The decision tree was suitable for assessing all of the VECs considered within that discipline. The hierarchy and order in which criteria were presented and decisions made with respect to significance were based upon the professional judgment of the experts conducting the assessment.

OPG's response to IR EIS-03-92 provides information on the confidence in the prediction of the significance of residual adverse effects. In assessing the significance of residual adverse effects, they were considered to have a probability of occurring of 1; that is, it was assumed that the effects would occur. This means the EIS places equal weight and importance in assessing both highly-likely and unlikely effects. This is a conservative approach as it avoids the potential for diluting the assessment of significance if there is a low probability of occurrence.

6.1 The Precautionary Principle

The precautionary principle was used in predicting effects from the DGR Project as discussed in the EIS (Section 1.6.6). Technical Information Session #2 provided additional information on the conservatism and confidence that were associated with the application of numerical modelling completed for the DGR Project.

OPG's response to IR EIS-03-44 explains how the precautionary principle was applied in the development of the effects-level definitions and conservatism incorporated into the levels for defining significance. Interactions between the environment and the project were carried forward for further evaluation if they could not be systematically removed from consideration through the application of rigorous, sound and credible scientific evidence. Conservative estimates were used in assessing the potential effects of the DGR Project on the environment. When assigning effects magnitudes, established criteria were used where they were available and appropriate, with the criterion being assigned high magnitude, and fractions of the criterion being assigned moderate and low magnitude. Criteria were typically developed with a built-in level of conservatism. Meeting or exceeding a criterion does not mean an adverse effect on the environment will result. OPG's response to IR EIS-06-278 provides information on the application of the precautionary principle in the context of risk avoidance as discussed previously in Section 2.2.2 of this submission document.

6.2 Sustainability Considerations

The primary contribution to sustainable development of the DGR Project is that it addresses the management of low and intermediate level waste in this generation rather than delaying it to the future, providing flexibility for future generations. On a local scale, the DGR Project contributes to sustainability through avoidance of transport of the waste, reducing the surface footprint for

waste management, avoidance of sensitive lands such as the northeast marsh, decreasing contact opportunities for terrestrial and aquatic species, and providing continued employment and revenue opportunities in the Regional Study Area. Potential effects of the Project on the capacity of renewable resources are considered in the EIS (Section 11).

Sustainability concepts were also incorporated in the assessment. The EIS used a systematic approach for identifying, predicting and evaluating the potential environmental effects before decisions were made, and identified mitigation for adverse effects. The extent to which biological diversity may be affected by the DGR Project is considered through the assessment of ecological features VECs.

In completing the assessment, where relevant, sustainability has been used to guide how the effects of the project were evaluated. For example, the aquatic environment considered the availability and importance of habitat critical to the sustainability of the VECs when assessing the potential effects of the DGR Project. OPG's response to IR EIS-03-44 describes how sustainability principles were used to develop the criteria for assessing significance. Sustainability was core to the description of effects in the case of the "degree of irreversibility" assessment measure. Only those effects that are readily reversible were given a low rating in significance. Such effects would have no impact beyond the life of the project, and the environment would return to the existing conditions. Effects that were reversible with time were classified as medium, as they may have the potential to affect the environment beyond the life of the project. OPG's response to IR EIS-06-273 explains how sustainability criteria were incorporated in the assessment of alternative means of carrying out the project and the relative contributions of each alternative means to sustainability. Although sustainability concepts were not explicit in the criteria used to evaluate the alternative means, sustainability principles were applied in the evaluation.

6.3 Traditional Knowledge

The EIS incorporated Traditional Knowledge to the extent that it was available. The EIS incorporated Traditional Knowledge obtained through examination of available information pertaining to general ecological, socio-economic and cultural heritage interests for Ojibway and Métis peoples in Ontario. OPG's responses to IRs EIS-07-296 and 297 provide information on efforts to obtain traditional knowledge.

SON, in correspondence to the Joint Review Panel (SON 2013), have indicated they will be providing information to the Panel on the impacts that the DGR Project will have on their rights, interests and way of life.

7.0 EFFECTS OF THE PROJECT AND MITIGATION

The existing (pre-project) environmental conditions are described in Section 6 of the EIS. The methodology used for assessing the effects of the DGR Project on the environment is described in the EIS (Section 7.1). OPG's response to IR EIS-08-322 explains that radiological effects are assessed only in the Radiation and Radioactivity Technical Support Document (TSD) (AMEC NSS 2011b) and not in TSDs for specific components of the environment. OPG's response to IR EIS-03-45 explains the rationale for the Regional Study Area (RSA) selected for the DGR Project. The RSA was selected to be large enough to capture the direct, indirect and cumulative effects of the Project. As necessary, the generic RSA was modified for specific components of the environment.

The assessment encompassed biophysical and social features likely to be affected by the DGR Project and also assessed ecological multi-feature VECs which comprise a number of individual VECs that are part of different environmental components. Detailed assessments of effects of the DGR Project are presented in Technical Support Documents for each component of the Environment and summarized in Section 7 of the EIS. Additional information on the "decision tree" approach (an example of which is shown in Figure 7.7.3-1 of the EIS) used to assess the significance of residual adverse effects is provided in OPG's responses to IRs EIS-03-94 and EIS-06-253. OPG's response to IR EIS-03-92 explains how confidence in the assessment of effects, as well as the determination of the significance of adverse effects, were estimated and justified.

7.1 Geology

As discussed in the EIS (Section 6.2), the repository was purposely positioned at a depth of 680 m within the near-horizontally bedded 840 m thick sedimentary sequence to take best advantage of the natural geologic site conditions to assure the long-term isolation and containment of the low and intermediate level radioactive waste. As described by NWMO (2011a), the DGR is situated in Ordovician (444 - 485 Ma) age sediments associated with an ancient deep seated groundwater system in which mass transport has been determined to be diffusion dominant for geologic time periods. The DGR will be excavated into the clay-rich limestone of the Cobourg Formation at 680 m depth, which is directly overlain by 200 m of Ordovician age shale comprising the Queenston, Georgian Bay and Blue Mountain formations. These rock formations possess very low hydraulic conductivities characteristic of an aquiclude-aquitard groundwater system that are further overlain by approximately 270 m of low hydraulic conductivity Silurian (419 - 444 Ma) age shale, evaporite and carbonates. These bedrock formations 'blanket' the repository within the Cobourg Formation and provide multiple natural barriers that will protect potable groundwater resources and Lake Huron.

Surface facilities, such as the Waste Rock Management Area and stormwater management pond, are underlain by a dense low-permeability glacial till.

The EIS identified no residual adverse effects on the geology VECs in the assessment.

7.1.1 Cap Rock Barrier Integrity

A key element in the DGR concept relates to the long-term barrier integrity of the near-horizontally layered Ordovician age shale cap rocks. The lateral traceability and continuity of the bedrock formations proposed to host and enclose the DGR are described in OPG's responses to IRs EIS-02-37 and EIS-08-314. The occurrence of structural discontinuities within the shale cap rock and the potential for future fracture development influencing DGR performance is discussed in OPG's responses to IRs EIS-02-36, EIS-08-315 and EIS-09-414.

Geomechanical analyses that examined rock mass displacement and potential for fracture development under possible future earthquake and glacial loading scenarios, are described in ITASCA (2011) and OPG's response to IR EIS-08-398. Cap rock barrier integrity as examined over geologic history is described by Engelder (2011) and OPG's response to IR EIS-09-416. OPG's responses to IRs EIS-04-113 and EIS-04-116 describe cap rock integrity as evidenced in site-specific natural analogue studies related to the observation of formation hydraulic underpressures and environmental tracer distributions. As described in OPG's responses to IRs EIS-09-429 and EIS-09-428, the preservation of very low rock mass hydraulic conductivities in the cap rock and underlying Ordovician carbonates is reflected, in part, in substantial evidence of diffusion dominating mass transport in these sediments over geologic time period.

OPG's responses to IRs EIS-01-24 and 24a and EIS-05-162 provide information explaining that the potential for hydrocarbon accumulation within the Ordovician sediments is considered low.

In entirety, the evidence above strongly supports a conclusion that the Ordovician formations proposed to host the DGR are able to provide long-term waste isolation and containment.

7.1.2 Pore Fluid Residence Times

In examining the long-term stability of the hosting bedrock formation one specific line of reasoning has focused on pore fluid residence times. OPG's responses to IRs EIS-09-435 and EIS-09-444, and Clark et al. (2013, in press) provide a further summary of scientific evidence related to pore fluid residence time. This supplementary information supports the case that the pore waters residing in the bedrock formations proposed to host the DGR have chemical signatures consistent with evaporated seawater and environmental tracer distributions indicating residence time beyond 100 Ma.

7.1.3 Repository Geomechanics

Evidence regarding the effectiveness of sealing within the upper 200 m of permeable Devonian and upper Silurian age bedrock formations, necessary for DGR shaft construction, is provided in OPG's responses to IRs EIS-01-01/01a, LPSC-01-31, and LPSC-04-64. DGR seal integrity, as required for the DGR safety case, is described in OPG's responses to IRs EIS-03-63 and EIS-03-64. Additional description of geoscientific verification activities to be undertaken during DGR construction to confirm sub-surface conditions relevant to the design and safe excavation of the repository, as well as the adaptability of the DGR design and layout, are provided in OPG's responses to IRs EIS-07-312 and LPSC-04-65.

OPG's response to IR EIS-03-54, supported by the report, Soil Investigation for Proposed Surface Facilities (GOLDER 2012a), describes the spatial distribution of surficial deposits, water table and hydraulic head distribution, and hydrogeologic properties, within the near-surface directly below the DGR Project Area. The report confirms that the site is underlain by at least 10 m of low-permeability glacial till.

7.1.4 Waste Rock Management Area

An evaluation of the effects of the waste rock management area (WRMA) and the stormwater management pond (SWMP) on the elevation of the groundwater table and local groundwater flow regime was provided in OPG's responses to IRs EIS-03-57 and EIS-03-57a. A Technical Memorandum (Sykes 2012a) describes a case study in which numerical groundwater simulations (MODFLOW) were performed to assess the influence of surface recharge beneath the proposed WRMA and SWMP on the shallow groundwater regime. Results indicate that the operation of the WRMA and SWMP will not materially influence groundwater flow patterns within the underlying shallow groundwater system.

OPG's response to IR EIS-05-185 discusses the potential for contamination of potable water sources (surface and groundwater) from the WRMA and the SWMP. In summary, both the natural physical setting of the surficial sediments and the subsequent WRMA and SWMP modelling assessments demonstrate that these aspects of the Project will be protective of potential potable water supplies.

Options for managing shale excavated during shaft construction, including options for use, are discussed in OPG's response to IR EIS-02-34. The WRMA for the DGR Project, including the area where the excavated shale is to be placed, is underlain by 10 m of dense till. This

undisturbed native dense till beneath the shale will minimize the amount of infiltration from the shale pile to groundwater.

7.1.5 Effects of Dewatering

As described in OPG's response to IR EIS-03-55, the radius of influence was estimated to be tens of metres away from each shaft during excavation of the upper 170 m and will not approach any surface water courses or wetland features. The zone of influence during deeper excavation, and during operation of the shafts, will be much less than the radius described above, because of the lower hydraulic conductivities at depth, and the upper shaft will have been lined.

As stated in the Geology TSD (GOLDER 2011a, Section 5.6.1.1), the direction of shallow groundwater flow beneath the DGR site is to the north and west, away from Stream C. An assessment of the impact of the DGR main and vent shaft construction on the shallow groundwater system beneath the Bruce nuclear site is provided in Sykes (2012b) which was provided as an attachment to OPG's response to IR EIS-01-01. As discussed in OPG's response to IR EIS-01-01, the temporary drawdown created by shaft construction is not expected to influence areal recharge or surface water recharge. Once the hydrostatic shaft liners are installed and sealed, the shafts will be hydraulically isolated and no longer influence the groundwater system. Verification of assessment results will be achieved through proposed routine groundwater and shaft discharge monitoring programs, as discussed in the DGR EA Follow-up Monitoring Program (NWMO 2011b, Section 3).

The shallow groundwater monitoring program in particular, described in the EA Follow-up Monitoring Program (NWMO 2011b, Table 3a), with additional detail provided in OPG's response to IR EIS-05-173, will be capable of identifying any changes to the local water table and shallow hydraulic gradients that may have an impact on base flow and recharge in the site study area. It is by these means that the accuracy of the predictions and effectiveness of the mitigation measures presented in the EIS will be verified.

7.1.6 Historical Contamination

A review of existing information in the EIS concluded that there was no evidence of historical contamination of soil in the DGR Project Area. Clarification of information provided in the EIS to characterize select sites from the Phase I and Phase II Environmental Site Assessments (ESAs) (Hogenbirk 1997 and KINECTRICS 2000) was provided in OPG's response to IR EIS-05-219.

OPG's response to IR EIS-05-220 provides information on baseline soil sampling conducted in 2011 as part of the DGR EA Follow-up Monitoring Program (NWMO 2011b) to further characterize the soil quality at the DGR site. The analytical results of sampling at 28 locations on the site were compared to the Soil Quality Standards provided under O. Reg. 153/04 (MOE 2011), in a non-potable groundwater condition for industrial/commercial/community property uses, for coarse textured soils . The results of the soil sampling program support the findings of the historical ESAs: there is no evidence of historical contamination above Table 3 criteria (MOE 2011) at the DGR project site.

7.1.7 Seismicity

OPG's responses to IRs EIS-03-73, EIS-03-75, EIS-06-259, EIS-06-270, EIS-08-398 and EIS-09-462 provide further discussion on the characterization of seismic hazard, the geomechanical stability of DGR openings, barrier bedrock formations longevity and long-term DGR safety. Evidence indicates that backfilling of DGR shafts will prevent long-term stability or performance concerns. Similarly, assessment of seismic ground shaking strongly indicates that the waste

emplacement rooms are passively safe with all rock damage under long-term loading scenarios being confined within the host rock beneath the Blue Mountain Formation. No seismic loading scenario resulted in displacement or fracture occurring in the Ordovician shale cap rocks overlying the DGR horizon.

7.2 Hydrology and Surface Water Quality

7.2.1 Hydrology

The DGR Project Site drains primarily to the north and west, with a small area in the southeast corner of the site draining to the east as shown in Figure 3 (GOLDER 2011d, Figure 5.4.3-2). As a result of the DGR Project, drainage from the southeast area will be diverted to the surface drainage system and discharged through the stormwater management pond to MacPherson Bay. As indicated in the EIS and illustrated in the enclosure to OPG's response to IR EIS-09-471, the small quantity of surface runoff diverted from the North Railway ditch will not impact Stream C. OPG's response to IR EIS-05-190 explains that the runoff coefficient used in predicting surface runoff will be the same during both the existing and the Project conditions because the land use, topography and soil conditions are not expected to change materially. This clarification provides further confirmation that the volume of drainage diverted as a result of the DGR Project will not result in a significant adverse effect on hydrology.

OPG's responses to IRs EIS-04-130, EIS-07-298 and 301 and EIS-09-471 and 473 provide additional information supporting the EIS conclusion that there is no pathway between the DGR Project and Stream C. OPG's response to IR EIS-09-413 explains the existence of the marshes located near the DGR Project Area. The marshes are the result of precipitation retained in depressions. Neither the northeast marsh nor the southeast (seasonal) wetland has inflows beyond surface runoff from a small area. The DGR Project Area is underlain by dense low permeability glacial till resulting in low potential for infiltration. This glacial till aquitard prevents measurable drainage of water from the wetlands into the sub-surface, and surface water drainage from below the WRMA and the stormwater management pond (SWMP) into the shallow groundwater, as discussed in OPG's responses to IRs EIS-03-56, EIS-03-57, and EIS-07-298. Furthermore, the zone of influence from dewatering during excavation and construction of the shafts will not approach any surface water courses or wetland features as discussed in OPG's responses to IRs EIS-03-55 and EIS-07-298.

OPG's response to IR EIS-05-185 provides information on the potential for contamination of potable water as a result of migration of radiological and non-radiological contaminants from the SWMP or the WRMA through the till. The stormwater management pond will be excavated into the dense till and the till will act as a natural liner. The pond side walls will be lined, as required, to limit lateral seepage into any surrounding permeable overburden that overlies the till.

OPG's response to IR EIS-04-130 provides additional information on the design and operation of the stormwater management system, including flows, design parameters, and rationale for the design storm event. The SWMP will be designed in accordance with MOE guidance (MOE 2003). The use of storm rainfall for Environment Canada's meteorological station at Goderich (located 64 km south of the DGR site) will result in the conservative design of the SWMP as the rainfall depths are 13 to 14% higher at Goderich than at Kincardine. OPG's response to IR EIS-04-101 provides additional information on the quantities of excavation water and sump water pumping. Further assessment of groundwater inflows during construction has been completed incorporating new information collected from recent site investigation programs. The groundwater inflow modeling for fully-lined shafts (GOLDER 2012b) shows a significant reduction in expected groundwater inflows.

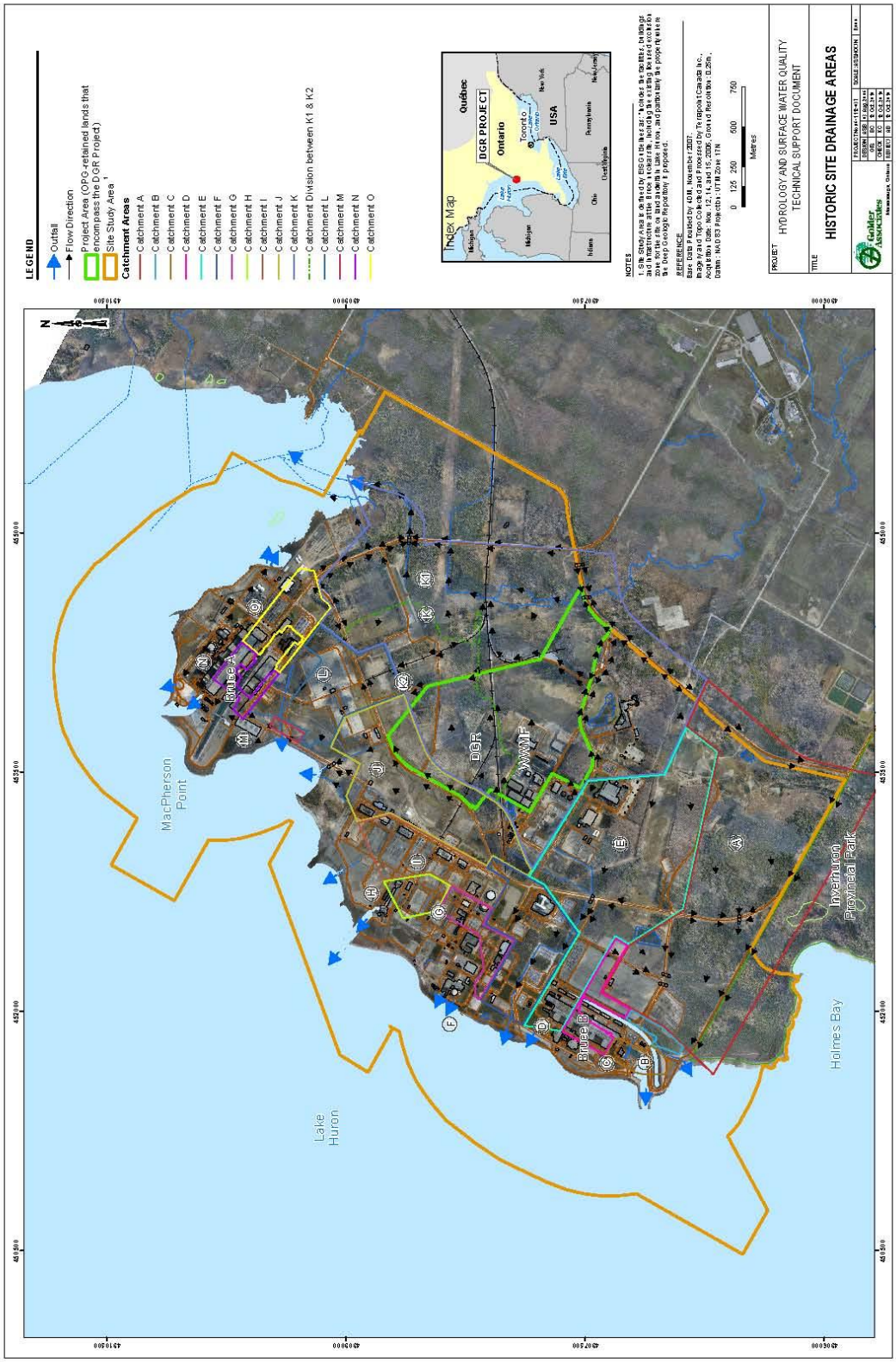

Figure 3: Historic Site Drainage Areas (GOLDER 2011d, Figure 5.4.3-2)

The IR responses provide additional information to support the conclusion of the EIS, that there will be no residual adverse effect on hydrology, including the marshes on the Bruce nuclear site, as a result of the DGR Project.

7.2.2 Surface Water Quality

All water from underground and all surface runoff from the DGR Project site will be managed and discharged through the SWMP to MacPherson Bay in Lake Huron. There will be no surface water discharges to the North or South Railway ditches, to Stream C or to the northeast marsh. The EIS concluded that effluent from the SWMP will have no significant adverse effect on the environment. OPG's response to IR EIS-03-66 explains the rationale for the hydrology and surface water quality field studies conducted for the DGR Project. The objective of the sampling program was to determine whether the surface waters at or near the DGR Project Area have been affected by past activities at the Bruce nuclear site, and to provide more detailed and up-to-date information regarding the existing conditions within the Site Study Area to provide a basis for comparison with historic information and potential effects of the DGR Project. Detailed studies were not completed for surface waters which would not be affected by the DGR Project, such as Stream C and Baie du Doré. Additional surface water sampling was conducted at SW6 (MacPherson Bay) in 2011 and the results were presented in OPG's response to IR EIS-08-387.

Leach-testing was performed to understand the leachate characteristics of the rock and to identify contaminants of potential concern (COPC). Short-term laboratory leach-testing with simulated rainfall was performed on samples of shale, dolostone and limestone. The concentrations of major elements (sulphate, sodium and chloride), selected dissolved metals, and pH in the leachate are reported in GOLDER (2011b Section 4.3, Table 5). The results from this testing were compared to Provincial Water Quality Objectives (PWQOs) to identify potential contaminants of concern. The results of short-term leaching do indicate a potential for some metals (boron, aluminum, thallium, cobalt and vanadium) to leach at concentrations slightly above the PWQOs and two samples had leachate pH greater than the PWQO range. However, given that the results of the geochemical testing (GOLDER 2011b) indicated no potential for acid generation, the overall sulphide content was low, and the leachate concentrations were not significantly above the criteria (Provincial Water Quality Objectives), further testing was not considered warranted. Also, as discussed in OPG's response to IR EIS-04-159, the short-term leach results were used in a conservative way because it was assumed that the concentrations leaching from the waste rock are the same through the life of the project, and do not decrease with time as would be expected.

In-design (source reduction) mitigation measures are available and will be implemented if necessary to reduce contaminant concentrations in the SWMP discharge. Total Dissolved Solids concentrations can be significantly reduced or eliminated by grouting the Salina A1 and Guelph formations. Best management practices in blasting will be employed to reduce nitrogen compound concentrations in the SWMP.

OPG will obtain an Environmental Compliance Approval (ECA) (referred to in the EIS as a Certificate of Approval) from the Ontario Ministry of the Environment for the SWMP. Additional information on the design and operation of the stormwater management system is provided in OPG's response to IR EIS-04-130. Final water quality criteria for the effluent from the SWMP will be developed as part of the Ontario ECA. The limits will be established taking into consideration the PWQOs, the acute toxicity thresholds for sensitive species that are present in the receiving environment, and the existing water quality in the receiving water at MacPherson Bay. The regulatory process will not allow the release of effluent from the SWMP that is acutely toxic to aquatic receptors.

Additional water quality modelling (GOLDER 2012c), completed during the comment period in support of OPG's response to IR EIS-08-399, provides further information to support the conclusion of the EIS (Section 7.3.2.2) that the DGR Project will not have a significant adverse effect on surface water quality. The report predicts the expected contaminant concentrations in the SWMP and demonstrates that mitigation measures are available, should they be necessary, to reduce contaminants in the SWMP discharge to within ECA limits.

Also, as discussed in OPG's response to IR EIS-05-228, the discharge from the SWMP will be at ambient temperature and is not predicted to result in temperature effects to the receiving water.

As discussed in OPG's response to IR EIS-04-160, monitoring in the initialization period, when only a small volume of rock has been brought to surface, will accurately characterize the SWMP discharge quality. If monitoring results indicate that in-design mitigation has not resulted in water quality that meets criteria, treatment options are available. An evaporator, for example, could be used to treat saline groundwater at the bottom of the shafts before it is discharged to the SWMP. Water from the waste rock pile could be routed to a separate pond and treated by aeration to reduce ammonia prior to being routed to the SWMP.

The IR responses provide additional information to support the conclusion of the EIS, that there will be no residual adverse effect on surface water quality, including the quality of Lake Huron, as a result of the DGR Project.

7.3 Terrestrial Environment

The assessment of effects on the terrestrial environment considered both the potential for direct and indirect effects on VECs selected for the DGR Project. The selected VECs included plants, mammals, birds and herpetofauna. As discussed in Section 6.0, all potential interactions between the project were screened to identify potential interaction and then to assess the potential for measurable change to focus the assessment where effects were likely. The direct effects assessed included vegetation removal and effects associated with the construction and operation of the DGR facility. Indirect effects assessed included changes to air quality, surface water quantity and flow, surface water quality, soil quality, groundwater quality and flow, and changes carried through as a result of effects on the aquatic environment VECs.

The only residual adverse effect identified related to the clearing of mixed forests within the Project Area. This effect is associated with the removal of eastern white cedar found within the mixed forest communities. The other plant species VECs will not be measurably affected by the proposed clearing and site preparation activities on the site because they are restricted to areas on the site which are not expected to experience measurable changes as a result of the proposed site preparation and clearing activities. The overall assessment of the significance of the clearing of eastern white cedar in the Project area is that it is not significant. Eastern white cedar is a common species and the effect is reversible with time.

The EIS (Section 3.4.3.2) states that a minimum 30-m setback between the marsh and the SWMP will be maintained. OPG's response to IR EIS-10-491 confirms that the SWMP will be located such that it does not result in a loss of wetland habitat in the northeast marsh. Excavation of the SWMP is not expected to change the water level in the northeast marsh as the low hydraulic conductivity of the glacial till will maintain water levels in the vicinity of the wetland similar to existing conditions.

Information on the condition of wetlands located within 500 m of the Project Area is provided in OPG's response to IR EIS-03-85. The assessment concluded that there would be no adverse effects on the terrestrial environment.

OPG's response to IR EIS-08-353 provides supplementary information on proposed mitigation for plant species. Where possible, opportunities to retain tree cover could be investigated, and where retention is not possible, exclusionary fencing to prevent additional loss during construction surrounding the DGR Project site will be installed. Temporary construction fencing to protect vegetation will help prevent incidental damage. Re-vegetation will be completed for the rock pile as described in OPG's response to IR EIS-05-171 and for the drainage ditches as described in OPG's response to IR EIS-05-192.

7.3.1 At-Risk Species

The list of at-risk species is updated regularly by the Ontario Ministry of Natural Resources (MNR), resulting in changes to designation status since the time of EIS submission in 2011. OPG's response to IR EIS-03-65 explains the approach taken to including listed species as VECs for the Project. OPG's response to EIS-01-15 provides information on species of conservation concern known or having potential to be on the Bruce nuclear site or its vicinity. No species of concern are predicted to be affected by the DGR Project. OPG's response to IR EIS-05-168 provides information on potential habitat for the snapping turtle, and other at-risk reptiles and amphibian species on the DGR Project site. The DGR Project site and Site Study Area immediately adjacent to the DGR Project site provide limited habitat for snapping turtles.

OPG's responses to IRs EIS-05-170 and EIS-10-498 provide additional information on the presence of and habitats for the Western Chorus Frog in the DGR Project and Site Study Areas. A single chorus frog was identified calling on the evening of May 7, 2007 from the marsh habitat and associated forest communities located in the northeastern portion of the Project Area, outside of the DGR Project Site. No adverse effects are expected on the species.

OPG's response to IR EIS-07-305 provides information on the presence of and potential effects of the DGR Project on the Eastern Meadowlark and Canada Warbler. No adverse effects are predicted.

OPG's response to IR EIS-08-370 provides information on the studies that were conducted to determine whether at-risk species were in the study area. Background studies included review of a number of sources, including the Natural Heritage Information Centre, a database which documents and tracks records for rare and uncommon species in the province, including those species regulated under the Endangered Species Act and the Species at Risk Act as well as detailed field data collection.

OPG's response to IR EIS-09-477 provides information on mitigation measures that would be implemented to avoid effects on snapping turtles. The mitigation measures best suited to protect individual snapping turtles include:

- avoidance through timing of activities to allow turtles to move from wintering to spring and summer habitats (when feasible);
- installation and regular monitoring of exclusion fencing to prevent turtles from overwintering in poorly drained areas that will be cleared during the site preparation activities; and
- close consultation with the local MNR to develop mitigation plans, including strategies for relocating species to optimal habitats located within the Site Study Area and Local Study Area.

OPG will consult with the Ministry of Natural Resources Species at Risk Biologist to discuss appropriate mitigation measures. OPG's response to IR EIS-10-490 provides best management

practices for mitigation of potential effects on snakes. Exclusion fencing is the most effective way to keep snakes from entering specific portions of a development site.

Additional information presented in the IR responses does not change the results of the assessment of effects of the DGR Project on the terrestrial environment. The DGR project is not likely to have a significant adverse effect on the terrestrial environment, including species-at-risk.

7.4 Aquatic Environment

The assessment of effects on the aquatic environment considered both the potential for direct and indirect effects on VECs selected for the DGR Project. Aquatic species VECs identified for the DGR were selected to be representative of the aquatic environment likely to be important and susceptible to effects from the DGR Project. The selected VECs included plants, fish and benthic invertebrates. As discussed in Section 6.0, all potential interactions between the project were screened to identify potential interaction and then to assess the potential for measurable change to focus the assessment where effects were likely. The assessment of effects on the aquatic environment considered both the potential for direct and indirect effects on VECs selected for the DGR Project. The direct effects assessed for the aquatic environment included loss of quality and quantity of habitat for species in the South Railway Ditch and loss of habitat for the burrowing crayfish in the Project Area. No indirect effects were predicted to result in measurable change; therefore none warranted further assessment.

The only residual adverse effect identified for the aquatic environment was associated with the loss of habitat for the burrowing crayfish and the VECs in the South Rail Ditch related to the construction of the crossing of the abandoned rail bed and other surface infrastructure. The other VECs will not be measurably affected by the proposed clearing and site preparation activities on the site. There were no residual adverse effects during operations. The overall assessment of the significance of the loss of habitat for the species in the South Railway Ditch and loss of habitat for the burrowing crayfish is that it is not significant because it involves the removal/alternation of only non-critical habitat over a very limited portion of the Project Area (low magnitude). Also, from an ecological and social perspective, burrowing crayfish, benthic invertebrates and the fish and plant species are tolerant of a broad range of environmental conditions and are considered common in Ontario.

OPG's response to IR EIS-05-189 provides an assessment of potential effects of nitrate on the aquatic environment and fish habitat and concludes there would be no adverse effect. The response to IR EIS-08-379 provides information on the whitefish population including the results of 2010 and 2011 EA follow-up monitoring for another project. These results do not change the conclusion of the EIS (Sections 7.5.1.3 and 7.9.1.3), that there will be no effects on the whitefish population as a result of the DGR Project.

OPG's response to IR EIS-07-291 provides detailed information on the fish sampling program conducted. In OPG's responses to IRs EIS-01-14 and 14a, additional quantitative historic data on fish surveys and data on fish habitat are provided for the Site Study Area including the South Railway Ditch, Stream C and MacPherson Bay and Baie du Doré. OPG's responses to IRs EIS-01-15 and 15a confirm that there are no aquatic species considered to be at-risk in the Project Area. Within the Site Study Area, there is potential for habitat for three at-risk species. The DGR Project is not expected to affect these species. Several species which use aquatic habitat are discussed in OPG's response to IR EIS-01-15a. The DGR Project is not expected to affect these species. OPG's response to EIS-05-197 provides additional information explaining why MacPherson Bay has limited potential as fish spawning habitat.

The EIS (Section 7.5.1.1) indicates that the South Railway Ditch is the aquatic habitat nearest where blasting will occur and is located 150 m or more from both the ventilation shaft and the main shaft (main areas of blasting). The predicted maximum ground vibration during shaft sinking is predicted to be 8.4 mm/s. The Department of Fisheries and Oceans (DFO) Guidelines state that no explosive may be used that produces, or is likely to produce, a peak particle velocity greater than 13 mm/s in a spawning bed during egg incubation. No effects from blasting on the nearest aquatic habitat and VEC species are expected.

Information on benthic invertebrates has been provided in OPG's responses to IRs EIS-05-197 and EIS-05-198. The EIS relied on historic benthic invertebrate sampling supported by field work in 2007 and documented in the EIS (Section 6.5.3.3).

Results of historical sediment sample analysis were provided in OPG's response to IRs EIS-03-86, IR EIS-06-238, and EIS-07-295. The response to IR-EIS-07-295 also discusses the reasons for variability in sediment monitoring results. The elevated parameters measured in the Site Study Area are not uncommon to sites with a long history of industrial development. These findings are consistent with those of the 2009 sampling programs completed for and documented in the EIS.

Additional information presented in the IR responses does not change the results of the assessment of effects of the DGR Project on the aquatic environment, that the effects on the aquatic environment are assessed to be not significant.

7.5 Radiological Conditions

The EIS presents the results of the assessment of radiological releases from the DGR Project on humans, including on the public, workers and non-human biota and concludes that the Project will have no residual adverse effects. Bruce Power undertakes a Radiological Environmental Monitoring Program (REMP) that assesses the effect of radioactive releases from all operations at the Bruce nuclear site including those of OPG. The REMP will be continued throughout the site preparation and construction and operations phases of the DGR Project and will include the DGR.

7.5.1 Radionuclide Inventory

The radionuclide inventory of the waste to be emplaced in the DGR is described in EIS Section 4.5.2. OPG's responses to IRs EIS-03-59 and EIS-11-504, and Section 2.1, provide further information on how LLW and ILW are defined. In OPG's response to IR EIS-01-05, additional information on the measurement of radionuclides is provided. OPG's response to IR EIS-06-264 provides additional information on the scaling factor approach for waste stream radionuclide content. OPG's response to IR EIS-08-345 presents additional information on the principal waste categories for each radionuclide. OPG's response to IR EIS-08-384 indicates, for radionuclides that are directly measured, the number of times these nuclides were measured in each waste type, and provides upper confidence limits. OPG's response to IR EIS-01-06 and EIS-01-06a discusses the uncertainty associated with the radionuclide inventory. The response to IR EIS-01-07 illustrates how to verify calculations of the quantity of radionuclides in the waste inventory.

7.5.2 Radiological Environmental Monitoring Program (REMP)

The baseline environmental radiological data are described in the EIS (Section 6.6), and the proposed radiological environmental monitoring is described in the EA Follow-up Monitoring Report (NWMO 2011b, Section 8). OPG's response to IR EIS-09-433 explains why a baseline radiological monitoring program specific to the DGR Project was not undertaken and results

from existing data sources were relied on in the assessment. OPG's responses to IRs EIS-03-78, EIS-03-78a, EIS-03-81, EIS-03-81a, EIS-03-82, EIS-03-82a, EIS-03-83, EIS-03-83a, EIS-03-84, EIS-03-84a, EIS-03-88, EIS-03-88a, EIS-03-08-388, EIS-10-480, EIS-10-481 and EIS-10-482 provide additional information on the REMP, including information on sediment sampling, surface and groundwater sampling, and fish sampling. OPG's response to IR EIS-05-214 describes the data quality objectives for the REMP. OPG's response to IR EIS-05-208 explains why seasonal variation in gross beta deposition is not required. Year-to-year variation in tritium in surface waters is discussed in OPG's response to IR EIS-05-210.

OPG's response to IR EIS-03-78 provides information on why there are no monitoring stations within Aboriginal lands. The Regional Study Area (RSA) for Radiation and Radiological Environment (AMEC NSS 2011b, Section 2.4.2.1) is the generic RSA. It includes the monitoring locations for the annual REMP conducted for the Bruce nuclear site. Doses to members of the public in the vicinity of the Bruce nuclear site are calculated based on the results of the REMP. As shown in the Radiation and Radioactivity TSD (AMEC NSS 2011b, Table 5.10-4) estimated doses are considerably less than 1% of the regulatory limit. Doses to any distinct group such as Aboriginal communities or member of the public would be lower at greater distances from the Bruce nuclear site. Métis community members reside within the larger municipal population and would not be expected to receive a dose higher than members of the public.

OPG's response to IR EIS-06-236 provides further information on the radionuclides measured in the ventilation air, and explains how the gross beta measurement represents a total of all the beta-emitting radionuclides. OPG's response to IR EIS-06-237 explains that alpha-emitting radionuclides are present in the waste at much lower levels than the above radionuclides and hence are not included in monitoring. OPG's response to IR EIS-06-238 discusses the broad categories of radioactivity in the environment, available baseline data for radionuclides in sediments, soils, fish, agricultural plants and milk, and finally provides additional information on how public dose is calculated from environmental radioactivity measurements for these groups of radionuclides.

7.5.3 Dose

During operation of the DGR, the CNSC will regulate radiological doses (effective and equivalent) for Nuclear Energy Workers (NEWs) and members of the public (non-NEWs) through prescribed dose limits. OPG's response to IR EIS-08-351 differentiates between exceedances and target doses for project workers and members of the public. In order to ensure that the regulatory dose limits are not exceeded, OPG has implemented Exposure Control Levels (ECLs) and Administrative Dose Limits (ADLs) for NEWs and members of the public. These are dose levels that, if reached, require additional OPG management follow-up and controls to prevent exceeding CNSC prescribed dose limits. The annual cumulative doses to DGR NEWs at the Bruce nuclear site are expected to remain well below regulatory limits (EIS Section 7.6). OPG's response to IR EIS-01-25 provides information on cumulative effects from past and existing projects and activities, certain and planned projects and activities, and reasonably foreseeable projects and activities, on DGR workers. For NEWs the dose contributions from all past, present and future nuclear projects and operations at the Bruce nuclear site will be included in the occupational dose measurements when those activities occur. Since each NEW's dose is individually monitored and recorded, regardless of where the dose originates, cumulative doses to individual workers are inherently addressed through the dosimetry program, as well as ALARA (As Low As Reasonably Achievable) initiatives. During construction, the largest dose would be to a DGR worker routinely operating close to the WWMF site perimeter, as noted in OPG's response to IR EIS-09-431; workers on the central

part of the DGR site area would receive much lower doses. OPG's response to IR EIS-01-28 presents dose estimates to persons who will be transferring waste from the WWMF to the DGR. OPG's response to IR LPSC-01-07 provides information to demonstrate how the DGR design and operation will comply with equivalent dose limits contained within the Radiation Protection Regulations. OPG's response to IR LPSC-01-40 provides information on the applicability of the WWMF Derived Release Limits (DRLs) to the DGR.

OPG's response to IR EIS-05-216 explains why First Nation and Métis people would not be exposed to a higher dose than the critical groups considered in the assessment and the response to IR EIS-06-234 explains how the critical group dose assessment for members of the public adequately addresses aboriginal communities and seasonal residents. OPG's response to IR EIS-06-243 presents information on the doses to each critical group. OPG's response to IR EIS-06-245 provides the doses to the public calculated using the CSA N288.1-08 pathways model (CSA 2008b). It also presents doses to critical groups using different exposure pathways and identifies the critical group that will receive the highest dose. The results are consistent with those presented in the EIS. OPG's response to IR EIS-05-185 provides further information on likelihood and consequence of migration of radiological and non-radiological constituents of potential concern to groundwater. There are currently no wells on the Bruce nuclear site used for drinking water. Flow within the formations that could potentially supply potable water is from the DGR Project towards Lake Huron. There is no expectation that a potable groundwater supply would be established downgradient of the DGR Project prior to the closure of the Project. All current and potential future potable groundwater supplies are, or will be, upgradient of the DGR Project Area over this period, hence, no potable groundwater sources will be affected. The WRMA and SWMP will be constructed within an area underlain by at least 10 m of hard low permeability glacial till (refer to OPG's response to IR EIS-03-54). The SWMP will be excavated into this thick glacial till unit and the till will serve as a natural liner for the pond. The pond side walls will be lined, as required, to limit lateral seepage into any surrounding permeable overburden that overlies the till. OPG's responses to IRs EIS-07-290 and EIS-10-497 provide information on the tritium concentrations in groundwater monitoring wells at the WWMF. A routine groundwater monitoring program is conducted at the WWMF as a condition of an operating licence issued by the CNSC. The purpose of the monitoring program is to observe and detect changes in groundwater quality that may occur as a result of WWMF operation. The results of the groundwater monitoring program are reported quarterly to the CNSC as a condition of the WWMF operating licence. In certain circumstances sampling is conducted bi-weekly and reported monthly to the CNSC. It should be recognized that all monitoring wells are controlled and inaccessible to the public, and are constructed such that they cannot be used as a source of potable drinking water.

OPG's response to IR EIS-10-483 provides estimates of tritium concentration in the SWMP from all sources, including the DGR and other facilities at the Bruce nuclear site. The estimated peak tritium levels in the SWMP are comparable to peak values observed in the South Railway Ditch (described in OPG's response to IR EIS-03-78) and in the surface drainage from WWMF into the South Railway Ditch (described in OPG's response to IR EIS-07-299), and are well below the Ontario Drinking Water Standard (MOE 2001).

OPG's response to IR EIS-09-406 provides a discussion of the relative contribution of incinerator emissions to the baseline and compares incinerator emissions to the incremental emissions predicted from the DGR. The DGR Project will not result in changes to the operation of the incinerator or the volume characteristics of waste incinerated. WWMF incinerator emissions are a small fraction of the total radionuclide releases from the Bruce nuclear site.

Information on the relative sensitivity of indicator species and the rationale for indicator species used in the assessment is provided in OPG's response to IR EIS-05-215. Identification of the

most radiosensitive species was not considered specifically as a selection criterion; however, selected Estimated No Effect Values (ENEVs) (AMEC NSS 2011b, Table 8.1.1-1) are based on the most radiosensitive species within the considered classes of non-human biota. Thus, the use of thresholds for effects based on the most radiosensitive species ensures that the use of indicators results in a conservative assessment.

OPG's response to Undertaking #1 from Technical Information Session #2 provides information on the effects of remobilization of radionuclides in soil as a result of construction on non-human biota. OPG's response to Undertaking #2 from Technical Information Session #2 provides information on confidence and the level of conservatism regarding the protection of listed species, at an individual level, from radionuclides.

OPG's response to IR EIS-08-313 explains how tritium was included in the postclosure assessment of radiological effects on non-human biota. The maximum incremental calculated tritium concentrations in surface media (well water, irrigated soil, sediment, and surface water) were calculated. They were all found to be negligible due to radioactive decay within the DGR, orders of magnitude below natural background tritium levels. OPG's response to IR EIS-04-105 discusses how radiological hazards from the DGR Project will change over time. At the time of repository closure, the total radioactivity in the DGR wastes is about the same as the total (natural) radioactivity in the rock on the Bruce nuclear site above the repository horizon, and also about the same as the current total radioactivity in Lake Huron. After about 100,000 years, due to radionuclide decay, the remaining radioactivity in the DGR wastes is less than that in the rock directly above the repository footprint.

7.6 Atmospheric Environment

The assessment of the potential effects of the DGR Project on the atmospheric environment considered the direct effects on the air quality and noise VECs. Although there were no plausible indirect effects identified on either air quality or noise, changes in air quality and noise were considered as indirect effects on several other disciplines, e.g., human health, terrestrial environment).

The assessment of effects on air quality used dispersion models to predict increased air emissions at the Bruce nuclear site during the site preparation and construction, operations and decommissioning phases of the project that would affect the off-site concentrations of the indicator compounds. The assessment of direct effects on noise used predictive models to indicate how noise emissions at the DGR Project would affect the combined noise levels (i.e., including both the existing environment and the DGR Project effects) at nearby receptors.

7.6.1 Air Quality

Residual adverse effects on air quality during the site preparation and construction and decommissioning phases were predicted for the nitrogen dioxide (NO_2), carbon monoxide (CO) and particulate (SPM, PM_{10} and $PM_{2.5}$) indicators. The effects for NO_2 and CO during the site preparation and construction and decommissioning phases were of low and medium and were not classified as being significant. The effects for the 24-hour particulate indicators (SPM, PM_{10} and $PM_{2.5}$) during the site preparation and construction and decommissioning phases were predicted to be of a high magnitude, but infrequent (less than 1% of the time). This effect was classified as "may not be significant". Although significant impacts are not expected given the low frequency of occurrence and the conservative nature of the assessment, monitoring was recommended during the site preparation and construction phase to confirm the level of effects and effectiveness of the in-design mitigation measures. During the operations phase, residual adverse effects on air quality were predicted for the nitrogen dioxide (NO_2), carbon monoxide

(CO) and particulate (SPM, PM_{10} and $PM_{2.5}$) indicators; however, the magnitude of effects ranged from low to medium. Therefore, the effects on air quality during the operations phase were determined to be not significant.

Additional discussion regarding the rationale for the selection of indicators, development of model input (including equipment), criteria, and emission factors is provided in OPG's responses to IRs EIS-01-09, EIS-04-138, EIS-04-139, EIS-04-148, EIS-05-201, EIS-05-223, EIS-06-249, EIS-06-252, EIS-08-321, EIS-08-323, EIS-08-324, EIS-08-327, EIS-08-330, and EIS-09-467. The indicators selected are those compounds for which there is a reasonable expectation that measurable amounts will be released by the DGR Project and for which there are applicable ambient air quality criteria. A number of other compounds that are emitted to air in relatively small amounts from the DGR Project were not identified as air quality indicators in the Atmospheric Environment TSD (GOLDER 2011c), but were considered as inputs for the human health assessment (refer to OPG's response to IR-EIS-04-138). The additional information supports the conclusions of the assessment.

Discussion regarding acrolein emissions and the relevant standards are provided in OPG's responses to IRs EIS-01-09 and EIS-05-223, which also explain the rationale for evaluating acrolein emissions in the human health assessment.

A quantitative analysis of the uncertainties associated with the dispersion model used to evaluate changes in air quality is provided in OPG's response to IR EIS-03-90 and in Technical Information Session #2. The development and use of background data in the model used to predict air emissions is explained in OPG's responses to IRs EIS-03-91 and IR EIS-08-325. Additional information regarding meteorological data used in the model is provided in OPG's responses to IRs EIS-01-10, EIS-04-131, EIS-04-133, and EIS-08-326. Confidence in the model used to predict air emissions is presented in OPG's submission to Technical Information Session #2.

OPG's responses to IR EIS-08-321 and IR EIS-08-322 confirm that the DGR project will emit compounds to the air other than those selected as indicator compounds. These emissions are extremely low, and in some cases below the minimum measurement thresholds of monitoring equipment.

The rationale for the derived air emission bounding scenario, outlined in the Atmospheric Environment TSD (GOLDER 2011c), which is used as an input for dispersion modeling, was provided in OPG's response to IR EIS-01-12. The response also provides additional assessment that includes the highest emission estimates per parameter, regardless of the stage (i.e., year of site preparation and construction) and concludes that adjusting the stage of construction by indicator compound would have resulted in minor changes to the resulting predictions but would not have altered the conclusions of the air quality assessment.

As discussed in OPG's response to IR EIS-01-12, no single stage of the site preparation and construction phase had the highest emissions for all of the individual indicator compounds. The scenario used as the bounding case in the EIS was selected so that a common source configuration could be used for all of the indicator compounds modelled. During this stage of construction all activity will be occurring at or near the surface. This stage of construction has the highest particulate emissions and thus would result in the highest particulate concentrations. Therefore, the predictions for particulate that were presented in the EIS are conservative.

During the site preparation and construction phase, residual adverse effects are predicted for the air quality indicators. The approach to assessing residual adverse effects was based on whether there was any increase in concentration over the existing concentration for the indicator in the Local Study Area. During the site preparation and construction phase potential residual

adverse effects were identified for NO_2 (1-hour, 24-hour and annual), CO (1-hour and 8-hour), SPM (24-hour and annual) and 24-hour $PM_{2.5}$ and PM_{10}. In determining significance of residual adverse effects, relevant criteria were used to assign a magnitude for the predicted effects. The benchmarks used for determining adverse effects are more conservative (i.e., lower) than the MOE criteria for all indicator compounds. Use of the 2012 Atmospheric Air Quality Criteria would not have changed the results of the assessment of significance. OPG will obtain an Environmental Compliance Approval, consistent with MOE requirements, for air emissions from the DGR Project.

OPG's responses to IRs EIS-04-134, EIS-04-137, and EIS-08-328 describe additional mitigation that may be implemented in the event that air emissions are routinely approaching limits for air quality parameters. Mitigation for vehicle emissions could include replacing equipment with equipment that meets higher emission standards, for example replacing equipment that meets Tier 2 standards with equipment that meets Tier 3 standards, reducing the operating hours of equipment, increasing air flow underground; and stopping underground work and, once workers have left, stopping ventilation until the source of the problem has been identified and addressed. Mitigation for particulate emissions could include improving road surfaces, increased frequency of watering roads or using dust suppressants, limiting material transfer during high winds.

7.6.2 Noise and Vibration

The DGR Project is located on an industrial site. The EIS predicted the noise at the three receptors, including an adjacent Provincial Park, and assessed the potential effects of noise at those receptors. The noise assessment identified a residual adverse effect at the noise receptor near Baie du Doré during site preparation and construction and decommissioning phases. The effect would be of low magnitude (i.e., perceptible), would occur only 24% of the time, and would occur primarily during night-time hours. Therefore, the overall assessment of the effect is not significant. There were no residual adverse effects on noise predicted during the operations phase. The noise assessment of the DGR Project was completed considering mitigation measures integral to the design. For example, all equipment will be fitted with appropriate silencers and be maintained in good working order.

An analysis of the quantitative uncertainties associated with the CadnaA Noise Model used to evaluate changes in noise levels was provided in OPG's response to IR EIS-03-97 and in Technical Information Session #2. OPG has a high degree of confidence that the assumptions included in the assessment of noise effects would result in a conservative result.

Clarifications regarding the ambient noise monitoring program used to characterize the existing environment, including methodology and equipment, are provided in OPG's responses to IRs EIS-09-449, EIS-09-450 and EIS-09-451. Clarifications regarding the noise model used in the assessment are provided in OPG's responses to IRs EIS-09-452, EIS-09-453, and EIS-10-479.

OPG's response to IR EIS-06-254 provides further justification for the inclusion of "sounds of nature" in the description of the existing environment and confirms that this approach results in a more conservative assessment. OPG's response to IRs EIS-06-255 and EIS-09-432 provide additional rationale on sound level adjustments used to account for impulsive, highly impulsive, high energy impulsive (blasting), tonal and/or quiet rural areas. Additional discussion regarding factors such as frequency changes, variable modulation, and increased impulsiveness was provided in OPG's response to IR EIS-06-256. OPG's response to IR EIS-06-257 provides additional rationale for the assessment of blasting noise (assessed as vibration).

OPG's responses to Undertakings #5 and #6 from Technical Information Session #3 present information on the noise sensitivity of livestock and wildlife. Animals may have a lower sensitivity than humans to the low frequency noises most associated with the types of activities

associated with the DGR Project. The available literature indicates that livestock can readily habituate and adapt to the types of noise that will be generated by the DGR Project. Available literature, and photographic evidence at the Bruce nuclear site, indicates that wildlife can and will readily habituate and adapt to the types of noise that will be generated by the DGR Project.

The EIS (Section 7.8.2.2) and OPG's response to IR EIS-09-454 provide information on additional noise mitigation measures that could be considered if necessary.

The additional information, clarifications, definitions and rationale provided in OPG's IR responses and Technical Information Sessions #2 and #3 further support the results of the noise assessment presented in the EIS and verify the predictions and conclusion of the EIS that the DGR Project is not likely to have a significant adverse effect on the air quality and noise VECs.

7.7 Aboriginal Interests

The assessment of effects of the DGR Project on First Nations and Métis people was based on traditional knowledge and information that was available to OPG through the examination of published information and interests raised in relation to previous studies. As discussed in Sections 4 and 5, OPG met with representatives of First Nation and Métis communities and sought to obtain input on relevant VECs, potential rights and traditions that could be impacted by the project and the potential impacts of the DGR Project on these rights and traditions. OPG also entered into agreements with the First Nations and Métis communities, to assist them in accessing capacity to participate in the regulatory review process for the Project.

The EIS concludes that the DGR Project will not have a significant adverse effect on the Aboriginal Interests VECs. While the DGR Project may diminish the quality or value of ceremonial activities undertaken at the Jiibegmegoong burial site on the Bruce nuclear site, the effect is not likely to be significant because the burial ground is located on an existing industrial site and it is unlikely that the ceremonies would occur coincident with increased dust and noise.

OPG's response to IR EIS-03-47 explains the development of the Valued Ecosystem Components (VECs) used in the assessment of effects on Aboriginal Interests. OPG's response to IR EIS-01-29 confirms that the human health assessment completed as part of the assessment includes potential effects to First Nations and Métis peoples. OPG's response to IR EIS-03-78 explains why there are no radiological environmental sampling locations on Aboriginal lands.

OPG's submission to Technical Information Session #3 provides information on the level of confidence in the effects predicted on Aboriginal Interests. Further information on the potential effects of the DGR Project on First Nations and Métis traditional gathering, fishing and hunting is presented as is information on commercial fishing and land leasing to cottagers by First Nations and Métis peoples. Likely effects on cottagers leasing lands from Aboriginal peoples and the land leasing activities undertaken by Aboriginal peoples would be similar to those considered in the Socio-economic Environment TSD (AECOM 2011a) regarding business activity, tourism, residential property values, community character and use and enjoyment of private property. The DGR Project is expected to have the potential to increase cottage rentals. It is not likely that the project would be visible from the nearest area used for land leasing purposes by Aboriginal peoples.

7.7.1 First Nations

OPG's response to IR EIS-05-203 describes opportunities provided for SON representatives to provide input to the assessment of effects of the DGR Project and indicates where in the EIS information to address their comments and concerns is presented.

OPG's response to IR EIS-02-42 indicates that a draft Jiibegmegoong burial site ceremony and monitoring protocol between the Saugeen Ojibway Nation (SON) and Ontario Hydro/OPG was developed but not formally finalized. The absence of a finalized protocol is not believed to have prevented SON from accessing the burial site at any time. OPG's response to IR EIS-03-46 explains why the traditional Ojibway spiritual worldview that includes the "rock of the earth" as the first order of creation was not included as a VEC. The EIS includes VECs for other components of the environment for the other orders of creation in the traditional Ojibway spiritual worldview – the plant world, the animal world and the human world. The Aquatic, Terrestrial, and Socio-economic Environment TSDs identify VECs which reflect the plant, animal and human world. The assessment also considers the interactions between the VECs and therefore, the relationships between the various "orders of creation". The Aboriginal Interests TSD (AECOM 2011b) acknowledges that the presence of the DGR Project, which directly affects this first order of creation (i.e., the rock of the earth), may have special meaning to some Aboriginal peoples and therefore, may be seen by some Aboriginal people as incompatible with their worldview, affecting how Aboriginal people value the plants and animals that they harvest for traditional purposes. Therefore, the spiritual worldview is considered in terms of effects on the Traditional Use of Land and Resources VEC.

Commercial fishing in the vicinity of the Bruce nuclear site is managed in partnership with the area First Nations. The SON has an interest in the traditional use of land and resources within their territory and emphasized their specific relationship to the fisheries of Lake Huron and Georgian Bay as central to their cultural and economic health. Historically, Lake Whitefish have been one of Lake Huron's most commercially valuable fish and the Chippewas of Nawash Unceded First Nation stated that the fish harvest, particularly whitefish, is the single largest component of the Nawash commercial fishery (Orkin and Edwards 1998). The DGR Project is not anticipated to result in a loss of whitefish habitat.

Evaluation of the aquatic environment showed that there are no potential interactions between business activity and renewable resources within the study area, and no adverse effects are forecast. No changes in fish population are anticipated, nor are any changes in water quality or quantity as a result of the project. Therefore, no effects on commercial fishing are anticipated.

7.7.2 Métis

OPG's response to IR EIS-05-202 describes the opportunities provided for Métis people to provide input to the VEC list.

In correspondence to the JRP (MNO 2013), the MNO requested confirmation that the species of importance listed in their submission are adequately assessed in the EIS and are represented by the ecological VECs chosen. The approach used in the environmental assessment (EA) was to use VECs to focus the assessment. To achieve this focus, the VECs selected in the assessment, specifically aquatic and terrestrial VECs, were chosen because the VEC species:

- is confirmed or potentially present in the study areas;
- has reasonable potential to be affected by the project; and
- provides an indication of how the project affects the environment as a whole.

Therefore, potential effects of the project on VECs determined in the assessment can also be used to describe the potential effects of the project on species that were not selected as VECs, but share physiological, biological or habitat characteristics with the individual VECs evaluated. That is, VECs in the assessment are strategically chosen such that the results of the effects assessment can be extended to individual species not explicitly evaluated. For this reason, the ecological VECs selected for assessing the effects of the DGR Project adequately assess the effects of the project on the species of importance identified by the MNO in the following ways:

- species that were identified as a VEC and assessed in the EIS (e.g., bass, whitefish, deer, wild turkey and cedar);
- species that were not individually identified in the EIS but have similar life history strategies or share habitat preferences with a selected VEC species (e.g., burbot has similar lake habitat preferences for spawning and nursery as lake whitefish, and catfish share the same reproductive behaviour as smallmouth bass); and
- species that were not individually identified in the EIS but use the same habitat as a VEC species (e.g., pickerel and beaver have similar habitat preference as smallmouth bass and muskrat, respectively).

It is noted that some of the MNO-listed species of importance would not be present, and could not be affected by the project (e.g., char, moose and crane are not found in the area of the project). In addition, MNO listed some species of importance that are considered invasive species by the province of Ontario (e.g., carp and dandelion). Finally, some MNO-listed species of importance may be present in the region, but there is little or no potential for them within the Site Study Area and Project Area that will be directly affected by the construction of the DGR (e.g., maple trees [maple syrup/sap], strawberries and beech trees [beech nuts]). MNO also suggested several alternate VECs for the assessment of effects on Aboriginal Interests, including MNO subsistence hunting, MNO subsistence fishing, and MNO subsistence gathering, MNO cultural sites and places. The EIS considered these VECs in the context of Aboriginal rather than specifically MNO Interests. The information provided in MNO's submission to the JRP, regarding species of interest to the Métis, does not change the results of the assessment. There are no tangible reasons for Aboriginal peoples to change their attitudes or behaviours as a result of the DGR Project regarding the fish, wildlife and plants that they harvest for traditional purposes. Therefore, the DGR Project is not likely to the affect aquatic and terrestrial environment; no reduction in the harvesting success of Métis people is anticipated and no adverse effects on MNO subsistence fishing, hunting or gathering VECs are likely.

It is not known with certainty if any cultural sites or places of importance to the MNO are currently located in the immediate vicinity of the Bruce nuclear site. An archaeological assessment completed for the project determined that disturbance to unidentified cultural sites or places is unlikely. Had MNO cultural sites or places been identified in the LSA or RSA at the time the EIS was prepared, the effects on a MNO Cultural Sites and Places VEC are likely to be the same or less than the effects to the existing Aboriginal burial site located within the Bruce nuclear site.

OPG's response to IR EIS-03-69 explains how the receptor locations selected for the socio-economic and human assessments reflect members of Métis community. Métis communities are described as distinct collectives with their own customs, way of life and group identity, and who have interests in the Study Area. Members of the Métis community could be permanent or seasonal residents near the Bruce nuclear site and as such, represented by human receptors AR1 through AR5. OPG's submission to Technical Information Session #3 presents information on potential health effects to members of the Métis community. The Métis community is not resident in one specific location and there is little data available on their traditional

activities/lifestyle or traditional dietary habits. For these reasons, the potential influence of the Project on the health of Métis people is considered in the same context as for other members (i.e., non-Aboriginal) of the public for the purposes of the human health assessment. Therefore, the predicted emissions would be the same for the Métis as for the remainder of the public. Consumption of country foods by the Métis community could be different than the public; however, there are no effects predicted on terrestrial and aquatic VECs that might be harvested or otherwise used by Aboriginal peoples for traditional purposes beyond the Project Area (i.e., no harvesting is allowed within the Bruce nuclear site). Therefore, no effects via consumption of country foods by the Métis community are anticipated.

The additional information presented in the responses to IRs and the Technical Information Session #3 does not change the conclusions of the assessment, that there are no significant adverse effects on the Aboriginal Interests VECs.

7.8 Socio-Economic Environment

The socio-economic environment assessment considered the potential effects of the DGR Project on all components of the socio-economic environment using a community well-being approach. The assessment included a traffic study, visual impact assessment study and economic modelling. The assessment concluded that there will be some temporary loss of enjoyment of use of property by those in proximity to and north of the Bruce nuclear site as a result of changes in noise levels; however, the effects are not significant. The DGR Project will result in added benefits in terms of employment, economic activity and additional municipal revenues in the local and regional study areas.

OPG's responses to IRs EIS-01-31, EIS-03-70, and EIS-03-71 and the material submitted in support of Technical Information Session #3 provide additional information on the public attitude research completed as a part of the socio-economic assessment, including information on the confidence levels of the studies. OPG's response to IR EIS-03-77 provides the rationale for the boundaries used in the Site Neighbour Survey. OPG's response to IR EIS-05-218 provides information on the employment status of participants in the Public Attitude Survey relative to the nuclear industry.

OPG's submission to Technical Information Session #3 provides additional information on the confidence in the model used in predicting economic effects of the DGR Project. As discussed in the Technical Information Session #3 and OPG's response to IR EIS-08-369, the DGR Project construction work force and the operations work force are not of a magnitude such that they could result in boom and bust effects.

Additional information was provided in OPG's responses to IRs EIS-08-331 and 332 to verify that no buildings 40 years or older will be affected by the DGR Project, and there are no effects on natural heritage features.

7.8.1 Economic Modelling

The economic model used in the assessment provides estimates of project effects based on current economic conditions extrapolated forward through population projections. The economic model was constructed and operationalized to produce a "best estimate forecast" of potential project effects on the local economy. Economic forecasts, especially to a long-term end date (i.e. 2062), do not seek precision; rather they look to provide a reasonable projection of direction and scale given a broad spectrum of input data and contextual assumptions.

As discussed in OPG's submission to Technical Information Session #3 (Section 5.3.3), uncertainty in the model is largely a function of the input data and extrapolation of trends. The

multipliers used were the most recent available at the time and reflected conditions in the 2007 economy. The direct labour assumptions and project costs used reflected the best assumptions available on project cost and associated direct labour force complement at the time. The input/output results were allocated to the LSA, RSA and outside study areas based on historic workforce data derived from an employee survey of the WWMF and from estimates of where major project expenditures might be made. The calculation of municipal impacts was formulated around population projections for the LSA and RSA municipalities. The assumptions behind these population assumptions were derived from available municipal documents which, for the most part, gave estimates out to 2031. Beyond 2031, population forecasts were produced by extrapolating compound annual growth rates experienced in the study area municipalities during the period 2006 to 2031, out to 2062.

The local, regional, and provincial economic effects are assessed in Section 7.10 of the EIS. The anticipated beneficial effects as a result of the DGR Project are:

- increased population associated with DGR Project-related employment will occur in all RSA municipalities, with the greatest benefit anticipated in Kincardine;
- increased educational opportunities for local students and others with an interest in nuclear technology;
- the DGR Project will create new direct, indirect and induced employment opportunities;
- a positive effect on business activity is anticipated during all DGR Project phases, which can be enhanced through policies to utilize local business services wherever practical and appropriate;
- the DGR Project may result in increased municipal revenue because of increases in property taxes and other revenues; as well as through one-time and annual payments agreed to in the 2004 Hosting Agreement; and
- the DGR Project will increase the direct, indirect and induced labour income in the LSA and RSA.

The income generated by the DGR Project, through direct, indirect and induced employment will likely generate business activity through household spending. OPG proposes to enhance the potential for beneficial effects on local and regional business activity by sourcing non-salary expenditures for the DGR Project locally wherever practical and in accordance with relevant OPG supply chain policies, procedures and standards for competitive purchasing.

7.8.2 Tourism

OPG's submission to Technical Information Session #3 includes additional information on potential effects of the DGR Project on tourism, including the results of a literature research providing information on effects of other nuclear facilities on tourism. The information indicates that tourism has continued to expand at destinations even after a nuclear facility has been developed.

As discussed in OPG's response to IR EIS-08-368, the DGR Project is not expected to adversely affect the attractiveness of the LSA or RSA to tourists and cottagers for the following reasons:

- no noticeable increases in dust or noise levels at the two provincial parks, downtown Kincardine or Port Elgin are anticipated during the DGR Project phases;
- the DGR Project is not likely to change environmental conditions at the beaches and near shore areas used by tourists and day users;

- increased traffic is not anticipated to be noticeable at the entrance to Inverhuron Provincial Park or on Highway 21, both of which are regularly used by tourists;
- the DGR Project is not expected to substantially change the visual character of the LSA, nor block views of the lake from the provincial parks or the Bruce Power Visitors' Centre;
- based on the results of the Inverhuron and MacGregor Point Provincial Park Survey, the DGR Project is not likely to affect the things or special features that instigate the use and enjoyment of the provincial parks by tourists (i.e., beaches, park amenities and atmosphere, surrounding environment and recreational opportunities); and
- the DGR Project will be visible from Lake Huron, but its above-ground facilities will not be dominant as compared to the existing buildings and structures at the Bruce nuclear site.

Tourist operators may benefit from the DGR Project as workers for the Project may use tourist accommodation in the off-season. The number of DGR workers is not high enough however, to encourage tourist operators to invest in significant improvements in facilities or to contribute to a bust and boom economy.

7.8.3 Stigma and Property Values

OPG's submission to Technical Information Session #3 provides additional information on the sociological aspects of siting a nuclear facility. Literature research was provided on what factors contribute to a positive attitude toward a nuclear facility, what factors can influence change in attitudes toward a nuclear facility, the influence of the media on attitudes and experience on public attitudes from other nuclear facilities.

A community has the potential to develop a stigma in response to certain initiating circumstances. If a stigma develops in a community, this could contribute to the lowering of property values. The DGR Project is not likely to adversely affect those characteristics which could contribute to stigma and no change in community character or stigma is expected.

OPG has safely managed low and intermediate level waste at the WWMF for more than 40 years. The agricultural and tourism industries and residential property values have continued to be strong throughout that time. The DGR is also not expected to result in decreased property values because of changes in dust, noise or local traffic conditions.

Although no contamination due to radiation and/or radioactivity is expected to result from the DGR Project, the 2004 Hosting Agreement for the DGR Project between OPG and the Municipality of Kincardine stipulates a property value protection plan to provide compensation to property owners for economic losses due to the diminution of property values occasioned by contamination resulting from radioactivity at the DGR site or beyond the site's boundaries caused by operation of the DGR.

7.8.4 Cultural and Heritage Resources

A new archaeological assessment (Stages 1 and 2) was conducted in 2013 and submitted to the Ministry of Tourism, Culture and Sport. The Stage 1 and Stage 2 assessment report concludes that the DGR Project Area has been sufficiently assessed and documented through the Stage 1 and Stage 2 archaeological assessments and contains no potential to possess further cultural heritage value or interest. The assessments do not change the results of the assessment documented in the Environmental Impact Statement for OPG's Deep Geologic Repository Project for Low and Intermediate Level Waste.

In the Project Area there are no buildings that are more than 40 years old. In the Site Study Area, the Douglas Point generating station is more than 40 years old. However, as indicated in OPG's response to IR EIS-08-332, there are no buildings or structures on the DGR Project site and no buildings or structures in the Project Area or Site Study Area will be removed or demolished for the Project.

OPG's response to Information Request EIS-08-332 provides information on registered heritage buildings and structures in the Local Study Area. The DGR Project is predicted to have no effects on these heritage buildings and structures. Although there are shipwrecks located in Lake Huron near Kincardine and also in the Regional Study Area (Maritime History of the Great Lakes), there are none in the Site Study Area. The DGR Project is not predicted to have a direct or indirect impact on any marine archeological sites.

7.9 Human Health and Quality of Life

The assessment of effects on human health considers the physical environment determinants (effects of changes in the physical environment), socio-economic determinants, cultural determinants, and emotional determinants. The detailed analysis is presented in Appendix C of the EIS and a summary of the results is presented in Section 7.11. Effects on local residents, permanent and seasonal, workers, members of First Nations and Métis communities are considered in the assessment. The EIS concludes that there are no adverse effects on the overall health of seasonal residents or workers as a result of the DGR Project. Residual adverse effects are predicted on the overall health of local residents and members of First Nations and Métis communities during site preparation and construction and decommissioning as a result of changes to air quality (i.e., acrolein concentrations in air). Residual adverse effects are discussed with reference to overall health, including cultural, socio-economic and emotional health determinants. The residual adverse, the potential exposure to acrolein, was assessed to be not significant. The effect occurs infrequently, only in the Local Study Area, and only during site preparation and construction, and is immediately reversible when exposure ceases. OPG's response to IR EIS-11-506 provides information on how sensitive cohort groups, such as the elderly and those with chronic conditions, are considered in the human health assessment. It also provides information on OPG's plans to provide factual information to avoid potential anxiety about the DGR Project.

The results of Public Attitude Research, conducted in the Local and Regional Study Areas in 2009, indicated that very few residents viewed nuclear waste as a threat to the community, a clear majority of survey participants have confidence in the radioactive waste management techniques used at the WWMF and in the safety of the proposed DGR, and very few residents expect to change their commitment to living in the community or their feelings of personal health and safety. OPG's response to IR EIS-03-70 and OPG's submission to Technical Information Session #3 provided information on the confidence in the results of the Public Attitude Research.

OPG's responses to IRs EIS-03-89 and EIS-08-390 provide additional information and discuss the interpretation and use of local cancer statistics in the assessment. There was no statistically significant difference in overall cancer incidence for the time period of 1986 to 2004 between Grey Bruce and Ontario (Grey Bruce Health Unit 2008).

OPG's response to IR EIS-06-256 indicates that the predicted project noise levels at the noise receptors will be broadband in nature, meaning that no distinguishable character (i.e., tonality) will be present and the noise energy will be distributed. Based on the conservative nature of the assessment and the large separation distances between the DGR Project and noise receptors, it is anticipated that fine details such as frequency changes and variable modulation will not be

noticeable the vast majority of the time, but may be noticeable during the quietest nighttime hours. As outlined in OPG's response to IR EIS-06-254, the noise assessment took the conservative approach of assessing the effects of the DGR Project against the minimum 1-hour L_{eq}. A less than 3 dBA change relative to the minimum 1-hour L_{eq} is not considered to be perceptible to humans. OPG's response to IR EIS-06-256 also clarifies that the noise sources included in the assessment for site preparation and construction, and operations, are not considered to be impulsive. Potential project noise impacts on sleep were discussed relative to the World Health Organization's (WHO) threshold for sleep disturbance in OPG's response to IR EIS-06-258. The ambient noise will be below the thresholds recommended by the WHO to protect against sleep disturbance.

OPG's response to IR EIS-06-255 provides additional clarification on the adjustments that were used in the assessment of noise effects on human health. The response confirms that adjustments taken were appropriate and no other adjustments should have been taken. The calculated change in percent highly annoyed was appropriate. As discussed in OPG's response to IR EIS-11-506, in looking at how noise could affect human health, indicators developed by Health Canada were used. In accordance with Health Canada, the following two measures were included: the percentage of the exposed population that could be "highly annoyed" by increased noise levels by projects (%HA) and the specific impact, or impulse noise, indicator (HCII). Health Canada considers a change in the %HA of 6.5% and an HCII in excess of 75 dBA to have the potential for adverse effects on human health. The health assessment indicated that there were no effects on human health as a result of noise (OPG 2011a, Appendix C, Section C2.3.2).

OPG's response to IR EIS-09-465 provides information concerning the safety hazards associated with operations at the WWMF that may compromise the health and safety of the public, workers and the environment and provides a comparison of the hazards at the WWMF with those of the DGR. Historically, since operation of the WWMF began in 1974, there have been no doses to the public or to workers that exceed regulatory dose levels. Accidents that have occurred at the site are industrial in nature, and include events such as small non-radiological spills, and minor employee injuries. Permanent emplacement of the wastes in a DGR where they are separated from the biosphere by multiple geological barriers is a safer solution over the long term than is the current method of storage at the WWMF.

The DGR Project will create employment opportunities and increased income, which may contribute to better health and well-being. The EIS concludes that no significant adverse effects on human health VECS will result from the DGR Project. The likely adverse effects are not considered to be significant because of the low magnitude and duration of the effect.

7.10 Ecological Features

Ecological feature VECs are identified for the assessment of the combined effects resulting from the DGR Project. These VECs included Lake Huron, Stream C, South Railway Ditch, and wetland within the Project Area. The assessment identified no significant residual adverse effects on any of the ecological feature VECs.

As discussed in Sections 7.1.5 and 7.2.1 and OPG's response to IR EIS-03-55, the zone of influence during dewatering will not approach any surface water courses or wetland features. OPG's response to IR EIS-03-57 along with the technical memorandum (Sykes 2012a) confirms that the WRMA and the SWMP are not expected to materially influence the groundwater table or near surface groundwater flow regime. Consequently, no material changes to base flow to local hydrological features are expected. Since there is also no change expected in the infiltration rate of the soils, there is not expected to be any measurable effect on the water table

or groundwater flow direction due to the presence/operation of the WRMA. Therefore, there is not expected to be any measurable effect on the groundwater regime beneath these two wetlands or to any base flow.

Additional information provided in OPG's response to IR EIS-07-298 supports the conclusions of the assessment that there will be no significant adverse effect on Stream C.

The stormwater management system has been designed to prevent the release of contaminants and deleterious substances to Lake Huron. The SWMP monitoring program has been designed to verify that regulatory requirements are met. Further information on the quality of the SWMP discharge is presented in Section 7.2.2.

As described in OPG's response to IR EIS-09-413, water levels in the northeast wetland (marsh) and southeast wetland (seasonal swamp) in the Project Area are not expected to change as a result of shaft dewatering activities, or the presence of the WRMA or SWMP.

7.11 Effects of the Environment on the Project

The DGR stormwater management system is designed to safely pass a 100-year storm without overtopping of the embankments (OPG 2011b, Section 6.2.4.8). OPG's response to IR EIS-05-221 and EIS-04-143 discuss recent literature on effects of climate change on hurricane and heavy rainfall frequency. More specifically, for the 100-year return period storm, the 3-day accumulated rainfall totals are projected to increase from about 100 mm currently observed to 130-170 mm for the period 2051-2100 (Cheng et al. 2011). As discussed in OPG's response to IR EIS-04-130, if deemed necessary through future analysis of climate change data, the active storage volume in the pond will be increased to accommodate potential impacts of climate change on extreme rainfall intensity over the life of the project. There is sufficient space on the DGR project site for this potential expansion of the SWMP.

Various flooding scenarios were evaluated for the DGR (AMEC NSS 2011c). As noted in the EIS and in OPG's response to IR EIS-06-270, coastal flooding is not credible because the DGR will be about 1 km from the shoreline and several metres above the lake level. Tsunamis are not credible because of the low seismicity of the region and the geography of Lake Huron. Surface flooding due to extreme rainfall is also not credible because the WPRB is placed at a local high point in the site drainage, and specifically designed to be above a very conservative rainfall level. Specifically, the shaft collar height is designed to ensure the repository is not flooded even for a conservative Probable Maximum Precipitation (PMP). The reference PMP was taken from the latest (draft) Ontario Ministry of Natural Resources PMP guidance (OMNR 2006). A review of the literature indicated that there was no substantive basis to change this reference PMP (AMEC NSS 2011c, Section 6.2). The flood analysis assumed a PMP of 380 mm precipitation in one hour. For comparison, the maximum precipitation from Hurricane Hazel was 280 mm in Ontario over 48 hrs (peak rate of 50 mm/hr).

OPG's response to IR EIS-04-143 updates the evaluation of the potential for climate change to affect precipitation, including extreme events, and how this may affect the design of the DGR Project. OPG's response to IR EIS-04-144 provides updated future temperature and precipitation trends.

IR EIS-09-408 requested information on the possibility that flow in the aquifers below 200 m will be influenced by climate change during the repository postclosure period. Postclosure safety analyses examining the influence of transient changes in the groundwater system during glaciation were completed in response to IR EIS-01-17. These analyses (NWMO 2012), submitted as a supplement to the response to IR EIS-01-17, indicated that groundwater flow and gas transport to and from the repository remain low throughout a glacial cycle, and the

repository remained largely unsaturated. Solute transport from the repository was not calculated, but is expected to be small due to the low groundwater and gas transport. The dose impacts are expected to be many orders of magnitude below the dose criterion.

8.0 MALFUNCTIONS, ACCIDENTS AND MALEVOLENT ACTS

The EIS considered malfunctions, accidents and malevolent acts that could occur during the operating phase of the DGR Project as well as the long-term performance phase following closure of the repository. It reports on the behavior of the repository under operational and abnormal events for both conventional and abnormal events for both conventional and nuclear scenarios.

The assessment concluded that the site preparation and construction, operations and decommissioning phase malfunctions and accidents would not exceed relevant criteria for humans or non-human biota. For disruptive scenarios in the long-term performance phase, specifically the human intrusion scenario, the calculated doses could be about 1 mSv for the drill crew and for a future person farming on the site. The calculated dose for the severe shaft seal failure scenario could also be about 1 mSv assuming a family is living directly on top of the shafts. Under more extreme 'what if' intrusion or shaft failure scenarios, the peak dose to persons living on the site could be tens of mSv. Given the low likelihood of these scenarios, and since the peak consequences are local and conservatively modelled, the risk from these scenarios is low.

The radiological consequences of credible malevolent acts are expected to be similar to those of malfunctions and accidents. The potential non-radiological consequences of malevolent acts are also expected to be similar to those of non-radiological malfunctions and accidents, particularly in terms of effects to the public.

Responses to several IRs provided additional discussion of non-credible events. OPG's responses to IRs EIS-01-03 and EIS-08-365 provide additional information on initiating event frequencies. Frequencies for events were estimated based on regional information for meteorology and seismicity, and on operating experience in nuclear waste management facilities, including OPG's, and in the mining industry. The assessment that several extreme events, notably criticality, explosion, tornado, external fire affecting the DGR Project, aircraft crash and meteor impact are not credible at the DGR site is primarily based on the likelihood of events that could lead to radiological releases, and the justification is provided in the PSR (Section 7.5.1) and in OPG's response to IR EIS-01-03.

However, the potential consequences of non-credible accidents are further discussed in OPG's response to IR EIS-06-248 and EIS-06-270, including large explosions, aircraft crashes and one-in-a-million meteor impacts at the surface facility. An aerial assault is considered in OPG's response to IR EIS-08-355. The estimated public consequences for these types of events are around 0.1 mSv, which is less than the accident dose criterion of 1 mSv. A credible aerial impact event cannot cause the release of radioactive materials from wastes stored underground in the DGR. The consequences on the DGR due to postulated accidents with the reactors on the Bruce site are discussed in OPG's response to IR LPSC-01-41.

OPG's response to IR EIS-07-304 confirms that rock fall/rock burst was included as an initiating event. OPG's response to IR EIS-10-485 provides information that addresses worker health and safety related to rock falls/rock burst. The risk of rock burst has been assessed and determined to not be a concern. OPG's responses to IRs EIS-07-304, EIS-08-381, and EIS-10-

485 provide additional information related to protection against falls of rock. To mitigate the risk of major falls of ground, the following major activities have been or will be undertaken:

- geomechanical modeling based on conservative assumptions of rock mass properties;
- testing and monitoring of the rock response both during shaft sinking and lateral development to confirm rock mass behaviour as predicted by modeling;
- adjustment of rock support design based on observation of rock mass behaviour during excavation;
- implementation of a rigorous quality control program during procurement and installation of the rock support system; and
- long-term monitoring of cavern response and periodic testing of the rock support system during DGR operations to ensure safe operating conditions in the underground repository.

OPG's response to IR EIS-09-475 provides a summary of incident reports of container failure or damage at the WWMF, site of origin, and during transfer to the WWMF, involving containers that will be transferred into the DGR. OPG's response to IR LPSC-01-41 explains how events at the Bruce nuclear site could affect the DGR.

Additional information has been provided for specific scenarios in response to the IRs. OPG's response to IR EIS-05-185 discusses the potential impact on potable water supplies due to accidents and malfunctions during handling and transport of the waste on the surface as well as the potential impact of an underground malfunction or accident on sump water.

Additional dose assessments have been provided in response to IRs. OPG's response to IR EIS-06-248 provides dose estimates for each of the Malevolent Acts Scenarios described in Section 6 of the Malfunctions, Accidents and Malevolent Acts TSD (AMEC NSS 2011a).

As stated in OPG's response to IR EIS-09-401, OPG has no record of any threats, theft or other malevolent act with respect to radioactive materials or equipment that could pose a hazard to workers or the public on or in relation to the WWMF located within the Bruce nuclear site. In response to a request for similar information regarding the Bruce site, Bruce Power stated, "A review of incident information for the last ten years at the Bruce Power site, including all facilities, revealed no threats, theft and other malevolent acts with respect to radioactive materials or equipment that could pose a hazard to workers or the public".

The Bruce nuclear site is served by its own internal emergency response team, medical and fire response facilities, in addition to off-site emergency response plans. OPG has provided IR responses addressing the emergency response plans of the DGR, the Bruce nuclear site, and off-site emergency. OPG's response to IR EIS-08-354 provides a brief description of emergency response plans and includes references to other IRs which have provided information on emergency response.

OPG's response to IR EIS-09-460 evaluates additional scenarios during or just after the operating phase and before full closure. Three cases are considered:

- abandonment of the DGR before completely full, but with closure;
- temporary loss of service to the DGR; and
- long-term abandonment of the DGR without closure (e.g. without shaft sealing).

OPG's response to IR EIS-08-385 presents the results of a number of simulations of vertical fault cases which help to understand the sensitivity of the system. New cases that were analyzed include:

- a vertical fault located north of repository;
- no-flow side boundary conditions; and
- a short fault terminating at the Collingwood Formation beneath the Ordovician age shale cap rocks.

The general trends are as follows:

- the effect of a vertical fault on contaminant transport from the repository increases as the fault gets close, with strong enhancement when the fault is within 10 m of the repository;
- a fault on the repository's east side generally leads to higher transport to the shallow groundwater system due to the contaminant plume in the Guelph intersecting the DGR shafts;
- unrealistic no-flow boundary conditions imposed on the confined Guelph aquifer lead to a one or two order-of-magnitude increase in mass transport into the shallow groundwater system; and
- the peak impacts from a shorter fault may be somewhat higher or lower than a fault extending to the Guelph Formation.

The dose impacts for a fault within 10 m of the repository are expected to be similar to or bounded by those for shaft seal failure or human intrusion. Faults beyond about 50 m are expected to have virtually no dose impact.

OPG's response to IR EIS-06-246 provides the estimated doses to the drill crew and to a future person living and farming on the DGR site for the Human Intrusion Scenario, as well as information concerning the mitigation measures required to reduce the probability and/or the consequence of human intrusion. OPG's response to IR EIS-09-461 provides dose rate calculations for human intrusion scenarios commencing at the time of decommissioning.

The additional analyses completed in response to information requests do not change the conclusion of the EIS; that malfunctions and accidents during site preparation and construction, operations and decommissioning are not likely to have an adverse effect on the environment, or human or non-human biota. Disruptive scenarios are of low likelihood and the consequences would be local and are conservatively modelled; any impacts further afield would be much smaller.

9.0 LONG-TERM SAFETY OF THE DGR

The long-term safety of the DGR was assessed for the expected evolution of the DGR system with time and for the potential impacts of low-probability events leading to degradation and loss of containment. The assessment addressed the period following the closing and sealing of the DGR and looked one million years into the future. It considered a range of potential future scenarios from likely to unlikely and assessed the impacts on a family living and farming on the site in the future, as well as the potential impact to people consuming fish from Lake Huron downstream from the site.

In the normal evolution scenario, the conditions in the repository become anaerobic after closure, the gas pressure rises due to corrosion and degradation of the waste packages, and water starts to fill the repository. The repository remains largely gas filled, and may take hundreds of thousands of years or longer to resaturate. Effects of seismic activity and glacial activity were considered.

The assessment calculations for the Normal Evolution Scenario indicate that the DGR system provides effective containment of the emplaced contaminants. Most radionuclides decay within the repository or the deep geosphere. The amount of contaminants reaching the surface is very small, such that the maximum calculated dose rates for the normal evolution scenario are many orders of magnitude below 0.1 percent of the regulatory dose limit. In addition, potential impacts of radionuclides on biota and non-radioactive contaminants on humans and non-human biota are well below the relevant criteria.

Disruptive scenarios consider the potential impacts of low-probability events leading to penetration of barriers and abnormal loss of containment. Four disruptive scenarios were considered in the assessment: human intrusion, severe shaft seal failure, vertical fault and poorly sealed boreholes.

The postclosure safety assessment indicates there will be little to no impact from the DGR in the long term. For disruptive scenarios associated with human intrusion and shaft seal failure there is potential for doses above the dose criterion. The peak impact applies to someone living and farming directly on top of the repository; impacts further afield are much smaller. These scenarios are very unlikely.

OPG's response to IR EIS-06-246 provides information on doses to a drill crew or persons living on the site for the human intrusion scenario and discusses mitigation measures which reduce the probability of intrusion, including:

- placing the DGR at depth of about 680 m, far below the depth of casual construction excavation or easy drilling;
- placing the DGR in a location with low potential for natural resources (minerals, salt, gas); and
- placing the DGR at a depth where there is no potable water (below 170 m from surface).

In addition, following closure of the repository, the specific nature of institutional controls that might be put in place to reduce the likelihood of future inadvertent intrusion would be determined in the future as part of the planning for a site decommissioning licence. Institutional controls refer to land use restrictions that would be put in place by municipal, provincial and/or federal governments and agencies, to minimize the likelihood of intrusion. For example, deep drilling anywhere in Ontario requires permits from the provincial government; the Province could therefore prevent deep drilling at the DGR site. Societal memory and other controls such as fences and markers would ensure that future generations are aware that radioactive waste is stored deep underground at the DGR site.

OPG's response to IR EIS-01-20 and Technical Information Session #2 discuss conservatism in the postclosure safety assessment. OPG's response to IR EIS-04-109 and material presented at Technical Information Session #2 discuss the range of methods that have been used to develop confidence in the postclosure safety assessment models and assure conservatism in the results. OPG's response to IR EIS-01-20 and information provided in Technical Information Session (TIS) #2, discuss the conservatisms considered in the postclosure safety assessment to ensure that the modelling of postclosure assessment scenarios and of radiological effects on non-human biota was conservative.

OPG's response to EIS-05-183 explains the rationale for the selection of the one million year timeframe for the postclosure safety assessment. Canadian regulatory policy requires that "the assessment of future impacts of radioactive waste on the health and safety of persons and the environment encompasses the period of time when the maximum impact is predicted to occur" (CNSC 2004). A time period of 1,000,000 years is selected as a default baseline for the postclosure calculations because it encompasses the period of highest radioactivity (~10,000 years) and the decay of C-14 (~60,000 years), as well as the timeframe in which the residual radioactivity drops below that of the overlying rock at the Bruce nuclear site (100,000 – 1,000,000 years).

OPG's response to IR EIS-01-16 discusses shoreline evolution processes and impacts on the postclosure safety assessment. The receptor model used for assessing impacts is appropriate and sufficiently conservative to account for changes in the lake shoreline relative to the DGR site, including if the shoreline was further away from the DGR site, closer to the DGR site and if the DGR site was covered with water.

Section 7.5.1 discusses the radionuclide inventory and related Information Requests. OPG's response to IR EIS-04-115 explains why C-14 was singled out for modelling. In large part it is because C-14 is one of the more important radionuclides due to its amount in the repository (almost 50% of the inventory in Bq at repository closure, assumed to be 2062), its relatively long half life (5700 years), and its presence in the gas phase in the repository, and therefore warrants more attention.

OPG's response to IR EIS-03-64 provides additional information on the durability of concrete bulkheads (in shaft seals and repository rooms), asphalt seals, and bentonite/sand seals extending into the postclosure phase. The combination of materials used in the shaft seal design provides an immediate short-term low permeability barrier to ensure protection of the freshwater aquifer from deeper saline waters, and a long-term low permeability barrier to contain the radioactivity in the repository. OPG's response to IR EIS-10-492 provides information on the long-term behavior of shaft seal materials through consideration of natural analogs. The analogs described above are neither exactly the same materials nor under the same conditions as in the DGR. However, these analogs provide evidence that key elements of the seal materials have demonstrated durability under some natural settings for timeframes well beyond one million years.

OPG's response to IR EIS-08-335 provides an evaluation of the 'What-if' scenario of basement faulting leading to disruption of the shaft seal(s) and thus providing two pathways to the surface environment. Potential dose consequences of the proposed scenario to someone living on the repository site are in the range of 10 -100 mSv per year.

OPG's response to IR EIS-02-36 provides the rationale for OPG's confidence that there are no vertical faults near to the repository and the basis for the modelled fault locations. OPG's responses IR EIS-02-36 and EIS-02-36a provide analyses of vertical fault scenarios with faults located at distances of 10 m, 50 m and through the repository. The results show worst-case dose consequences to someone living on the repository site in the future in the range of mSv to tens of mSv per year. These very unlikely cases remain within the DGR risk criterion.

OPG's response to IR EIS-04-119 provides additional information to explain the resaturation rates for the repository and evaluates additional saturation scenarios. There is observational evidence from excavations elsewhere in Ontario that the host rock Cobourg Formation is expected to be virtually dry. In particular, the cooling water intakes to the Darlington nuclear station were excavated through the Cobourg Formation where it outcrops in eastern Ontario, and were found to be very dry. While early resaturation of the repository increases the corrosion of the wastes, the release of radionuclides from the wastes and repository via

groundwater, and the calculated maximum dose; the dose remains orders of magnitude below the dose criterion and so the safety of the repository system is not compromised.

OPG's response to IR EIS-04-158 discusses sensitivity of the postclosure safety assessment results to the reported chemical variations among the Cobourg porewater data and concludes that they are not sensitive to precise porewater composition. OPG's response to IR EIS-10-486 provides modelling results for the evolution of the DGR site using the very conservative assumption of 300 m of bedrock removal due to glaciation.

The supplementary information provided in response to IRs does not change the results of the long-term safety assessment, which is that the DGR will safely isolate and contain the low and intermediate level waste for many tens of thousands of years without any significant adverse effects on the environment or human health.

10.0 CUMULATIVE EFFECTS

The EIS assessed the potential effects of the DGR Project in conjunction with existing, planned and reasonably foreseeable projects that could overlap temporally or spatially. A repository for used fuel in the Regional Study Area was not considered to be a reasonably foreseeable project and was not considered in the assessment of cumulative effects because only approved projects must be taken into account; uncertain or hypothetical projects or activities need not be considered. Receptor populations for the cumulative effects assessment are expected to be the same as those for the current projects at the Bruce nuclear site as there are no foreseeable future projects that would substantively change land use in the vicinity of the Bruce nuclear site.

The identification of project effects provided the basis for the assessment of cumulative effects. All non-trivial effects that remained after mitigation (i.e., residual adverse effects) were carried forward and considered in the cumulative effects assessment. Residual adverse effects of the project which were identified included the combined influence of both the direct and indirect (synergistic) effects of the project on the VEC in question. In this way, the EIS addressed interactions among VECs and multiple stressors among VECs. For each of the residual adverse effects, the projects considered in the cumulative effects assessment were examined to determine whether there was potential for cumulative effects with those VECs. In the event that a cumulative effect was identified, both the direct and indirect (synergistic) cumulative effects would have been carried forward. No adverse cumulative effects were identified. The approach to cumulative effects assessment is described in further detail in OPG's responses to IRs EIS-08-358, 359 and 361.

OPG's responses to IRs EIS-04-110 and EIS-08-338 explain that the existing operations at the WWMF, including the incinerator, were included as an "existing project" in the cumulative effects assessment.

OPG's response to IR EIS-06-232 provides a description of all projects identified as having a cumulative effect on the radiation and radioactivity environment in the vicinity of the proposed DGR, including radionuclides released. Although consideration of the cumulative effects on the radiation and radioactivity environment was not required because the assessment in the EIS did not identify any potential residual adverse effects on radiation and radioactivity VECs as a result of the DGR Project, cumulative effects for radiation and radioactivity were assessed in the EIS (Section 10.6.6) in keeping with a precautionary approach because of the potential for additive radiological effects with other projects. OPG's response to IR EIS-06-233 provides cumulative dose estimates for members of the public at the Bruce nuclear site over the life of the DGR Project in conjunction with other projects. OPG's responses to IRs EIS-01-25 and 25a provide

information on the potential cumulative effects of the DGR Project, in conjunction with other existing, planned and reasonably foreseeable projects, on DGR workers. The DGR Project will not contribute to radionuclide dose during the site preparation and construction phase. Each Nuclear Energy Worker's (NEWs) dose is individually monitored and recorded, regardless of where the dose originates, and cumulative doses to individual workers are inherently addressed through the dosimetry program. The annual cumulative doses to DGR NEWs at the Bruce nuclear site are expected to remain well below regulatory limits. These responses support the conclusion of the EIS that no residual adverse cumulative human health effects associated with doses to workers from the DGR Project are considered likely.

OPG's response to IR EIS-04-110 explains that the emplacement of decommissioning waste in the DGR was considered in the assessment of cumulative effects of the DGR Project in response to the requirement of the EIS guidelines. As discussed in Section 2.1 above, OPG's application for licensing for the DGR Project does not include low and intermediate level waste arising from decommissioning.

11.0 FOLLOW-UP MONITORING

OPG submitted its Environmental Assessment Follow-up Monitoring Program (NWMO 2011b) as a separate document supporting the EIS. The purpose of the monitoring is to verify the predicted effects and to assess the effectiveness of mitigation measures. The follow-up monitoring program was presented in several categories of monitoring including:

- baseline monitoring in some areas to better define baseline characteristics and provide more detailed information to support applications for approvals;
- follow-up monitoring to verify the predictions made in the EIS and to assess the effectiveness of mitigation measures;
- Environmental Management Plan monitoring to assess the effectiveness of routine preventive practices to manage environmental aspects;
- regulatory radiological monitoring; and
- conventional regulatory compliance monitoring.

OPG's responses to IRs EIS-06-276 and EIS-09-411 provide further information on how the EA Follow-up program incorporates risk avoidance, adaptive management, and preparation for surprise.

In responses to IRs, OPG committed to additional monitoring to supplement that included in the Follow-up Monitoring Program. In OPG's response to IR EIS-10-493 one sample location was added to the baseline surface water monitoring program (Un-named ditch) for a total of three sample locations (SW6, SW7 and SW8). OPG has also committed to conduct baseline sediment sampling in the 2013 sample season at the baseline surface water sample locations.

Additional details for the follow-up monitoring program activities, including sample locations, sample frequencies, duration and rationale, were provided in responses to IRs, as follows:

- Air Quality (IRs EIS-04-134, EIS-04-137, EIS-05-174, EIS-05-175, EIS-05-176, EIS-06-252, and LPSC-01-24);
- Surface Water (EIS-04-160, EIS-05-172, EIS-08-395);
- Groundwater (EIS-05-173 and EIS-08-383);

- Radiological (EIS-06-236, EIS-06-237 and LPSC-01-23)
- Socio-economic (EIS-08-368); and
- Aquatic Environment (EIS-09-413).

OPG's response to IR EIS-05-172 explains that the follow-up monitoring program does not include toxicity testing because there are no direct discharges to a water body supporting fish habitat.

Discussion on the integration of the waste rock monitoring program with the surface water monitoring program is described in OPG's response to IR EIS-04-160. The detailed waste rock monitoring program is described in OPG's response to IR EIS-08-395.

Groundwater baseline monitoring was initiated as described in OPG's response to IR EIS-08-383. The results were submitted to the JRP in an interim report (GEOFIRMA 2013) on May 14, 2013. The report supports the EIS conclusions that groundwater flow in the shallow bedrock system at the Bruce nuclear site is northwest, towards Lake Huron. The data collected from the WSH-series monitoring wells improves the understanding of background groundwater conditions at the site and future monitoring events will add to the database and will provide data to examine the impact of future DGR activities.

OPG's response to IR EIS-01-33 explains how OPG plans to verify waste inventories during the operational phase. OPG's waste tracking system will continue to track the waste packages emplaced in the DGR and can provide a running inventory of total waste emplaced at any time along with the characteristics of the emplaced waste. During DGR operations, all waste packages sent to the DGR will be checked against the DGR waste acceptance criteria, which will include measuring the waste package dose rate to ensure it is within specified limits.

OPG's response to IR EIS-06-235 indicates that an environmental assessment is expected to be required for the decommissioning phase of the DGR Project and a follow-up monitoring program for that phase will be developed at that time.

OPG's responses to IRs EIS-08-363 and EIS 09-412 explain the rationale for the assumed 300-year timeframe for institutional control. The 300-year timeframe is the period following DGR closure assumed for postclosure safety assessment purposes; it could be longer in practice, since it also includes societal memory. An assumed period of institutional control of 300 years for safety assessment is consistent with international practice. The detailed aspects of institutional control and the period of monitoring following DGR closure will be determined in consultation with the community and regulatory authorities many decades from now.

12.0 CONCLUSIONS

After more than four years of studies, investigations, and analysis of nine components of the environment, the EIS concluded, taking into consideration the proposed in-design and identified mitigation measures, the DGR Project is not likely to result in any significant adverse environmental effects. The additional information provided in response to IRs from the JRP during the public review and comment period and the information presented in three Technical Information Sessions, confirms OPG's conclusion that the DGR Project will not have a significant adverse effect on the environment on the health and safety of workers, the public and non-human biota.

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14.0 GLOSSARY

ADL	Administrative Dose Limit
ALARA	As Low as Reasonably Achievable
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminants of Potential Concern
DGR	Deep Geologic Repository
DRL	Derived Release Limit
EA	Environmental Assessment
ECA	Environmental Compliance Approval
ECL	Exposure Control Limit
EIS	Environmental Impact Statement
ENEV	Estimated No Effect Value
ESA	Environmental Site Assessment
GLSLCI	Great Lakes & St. Lawrence Cities Initiative
HA	Highly Annoyed
HCII	Health Canada Impulse Noise Annoyance Indicator
IAS	Independent Assessment Study
ILW	Intermediate Level Waste
IR	Information Request
JRP	Joint Review Panel
L&ILW	Low and Intermediate Level Waste
LLW	Low Level Waste
LSA	Local Study Area
Ma	Million years
MNO	Métis Nation of Ontario
MOE	Ministry of Environment
NEW	Nuclear Energy Worker
NWMO	Nuclear Waste Management Organization
OMNR	Ontario Ministry of Natural Resources
OPG	Ontario Power Generation
PM	Particulate Matter
PMP	Probable Maximum Precipitation
PSR	Preliminary Safety Report

PWQO	Provincial Water Quality Objectives
REMP	Radiological Environmental Monitoring Program
RSA	Regional Study Area
SON	Saugeen Ojibway Nation
SPM	Suspended Particulate Matter
SWMP	Stormwater Management Pond
TIS	Technical Information Session
VEC	Valued Ecosystem Component
WHO	World Health Organization
WRMA	Waste Rock Management Area
WWMF	Western Waste Management Facility