September 12, 2012

Mr. Albert Sweetnam
Executive Vice President
Deep Geologic Repository Project
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Subject: Information Request Package #5 from the Deep Geologic Repository Joint Review Panel

Dear Mr. Sweetnam,

In the attached document, please find information requests from the Deep Geologic Repository Joint Review Panel (the Panel). The Panel has determined that responses to these information requests are required to ensure that the available information adequately responds to the Environmental Impact Statement Guidelines issued for the project.

The Panel requests that Ontario Power Generation address the information requests and provide the responses to the Panel in a complete and timely manner. To ensure a consistent approach, the responses should follow the Panel's numbering system and framework as set out in the attached document. The evaluation of information received will include, but not be limited to, a determination of compliance with the Environmental Impact Statement Guidelines and applicable legislation, an assessment of the supporting data and analysis submitted, the clarity and completeness of the information and, where applicable, the credibility of the scientific and engineering principles applied.

If you require clarification with regard to these requests, do not hesitate to contact either of the Panel's Co-Managers. The Panel would appreciate receiving confirmation with respect to the anticipated date of your responses as soon as possible.

Yours truly,

<original signed by>

Dr. Stella Swanson
Chair, Joint Review Panel

cc. Dr. James F. Archibald, Joint Review Panel Member
Dr. Gunter Muecke, Joint Review Panel Member
Frank King, Nuclear Waste Management Organization
Allan Webster, Ontario Power Generation

/Attachment

Attachment 1
Deep Geological Repository Project
Joint Review Panel EIS Information Requests
Package 5 – September 12, 2012

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 05-161	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.9, Effects of the Environment on the Project	▪ *Seismic hazard assessment* (DGR-TR-2011-20)	a) Provide the 24+ Plates referred to in the Seismic Hazard Assessment (e.g. section 3.2.1). b) Provide the fractile seismic hazard values plotted on figure 5.1 and later in a table.	The Seismic Hazard Assessment (DGR-TR-2011-20) refers to 24+ Plates (e.g. section 3.2.1), which could not be found in the referenced document or on the enclosed CD. These figures display maps of the seismic source zones used, and are important in assessing the model used to produce the seismic hazard values against which the stability of the DGR is assessed. The fractiles represent the spread of the uncertainty in the seismic hazard values and give context to the reliability of the seismic hazard values.
EIS 05-162	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 12, Accidents, Malfunctions and Malevolent Acts.	▪ Geology *TSD* (NWMO DGR-TR-2011-03) ▪ *Geosynthesis* (NWMO DGR-TR-2011-011) ▪ *Regional Geology - Southern Ontario* (NWMO DGR-TR-2011-015) ▪ *Descriptive geosphere site model* (NWMO	Provide information or strategies that will be adopted to ensure the integrity of the DGR if future generations of hydrocarbon explorers deem that shale gas/shale oil potential of the Collingwood and Blue Mountain formations are economically feasible.	Various technical supporting documents state that there are no commercial flows of hydrocarbon known near the DGR, but also indicate that there are minor oil seeps, oil staining and petroliferous odours which were encountered in the drilling from many horizons in the Sherman Falls, Cobourg, Collingwood and Blue Mountain formations. These indicators suggest some petroleum and some porosity and permeability in the stratigraphic horizons of interest, which may attract exploration interest in future (e.g. the shale oil potential of the Collingwood and Blue Mountain might be attractive). Additionally, only a tiny proportion of the exploration wells drilled in Ontario are located in the regional study area (RSA), yet they have discovered 12 oil and gas pools (which is a successful ratio). The risk of later exploration drilling

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		DGR-TR-2011-024) ▪ *Three dimensional geological framework model* (NWMO DGR-TR-2011-042)		may be low in today's economic climate, but could be much higher in future. No reference to any quantitative assessment of the hydrocarbon potential of the RSA (either referenced from the literature, or conducted by the proponent) as been provided. The risks/uncertainties of future hydrocarbon exploration, and, possible consequent disruptions to the DGR, have not been adequately described in the EIS
EIS 05-163	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.3, Groundwater ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.3, Groundwater ▪ Section 12, Accidents, Malfunctions and Malevolent Acts	▪ Geology *Technical Support Document* (NWMO DGR-TR-2011-03) ▪ *Geosynthesis* (NWMO DGR-TR-2011-011) ▪ *Regional Geology - Southern Ontario* (NWMO DGR-TR-2011-015) ▪ *Descriptive geosphere site model* (NWMO DGR-TR-2011-024) ▪ *Three dimensional geological framework mode*l (NWMO DGR-TR-2011-042)	Provide a discussion of the risks and mitigation measures that are proposed to address the potential migration of contaminated groundwater in the Shadow Lake Formation if it were to move updip toward the crest of the Algonquin Arch toward the shallow groundwater zone.	There is no discussion of the possible presence of permeable sandstone facies in the Shadow Lake Formation, its possible hydrologic continuity with the underlying permeable Cambrian sandstones (as is the case on the south side of the Arch), and the resulting potential migration path of contaminated groundwater updip toward the crest of the Algonquin Arch and toward the shallow groundwater zone.

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EIS 05-164	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.3, Groundwater ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.3, Groundwater ▪ Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *Geology Technical Support Document* ▪ *Geosynthesis* (NWMO DGR-TR-2011-011) ▪ *Regional Geology - Southern Ontario* (NWMO DGR-TR-2011-015) ▪ *Descriptive Geosphere Site Model* (NWMO DGR-TR-2011-024) ▪ *Three Dimensional Geological Framework Model* (NWMO DGR-TR-2011-042) ▪ *Outcrop Fracture Mapping* (NWMO DGR-TR-2011-043)	a) While faults and fractures may currently be sealed with calcite cements, provide information on the strength of these seals and the pressures at which faults and fractures may reactivate or open. To what degree is the proponent confident that the faults and fractures sealed by calcite will remain sealed? b) Provide a discussion of whether the extensive cavern excavation and "unnatural" disturbance required to build the DGR could encounter faults, or even reactivate faults, due to alteration/release of natural pressures. Include a discussion of risks and uncertainties. c) Provide a discussion of the risks and associated uncertainties that would arise if hot fluids were to move through possible deep-rooted faults and fractures that may cut the Ordovician section. Include a description of any mitigation measures that are proposed to ensure the integrity of the DGR. **d)** Quantitatively assess the possibility that unmapped and undrilled near-vertical faults could be present in RSA and in the DGR, including a discussion of the risks of re-activation and a discussion of the mitigation measures proposed.	Faults are known throughout the RSA at the level of the proposed DGR excavation. The pervasive dolomitization of Cambrian and Silurian rocks throughout the RSA implies that Upper Ordovician seal-rock facies have been breached in the past and that hot fluids have moved through parts of the stratigraphic section within the RSA in the past, possibly along as yet unmapped deep-rooted faults and fractures which cut the Ordovician section. The presence of Mississippi Valley-Type deposits on the north side of the Algonquin Arch also implies movement of hot fluids, localized flows of deep fluids, and vertical faults.
EIS 05-165	▪ Section 10.1.1, Geology and Geomorphology	▪ *Preliminary Safety Report:* Section 4.1.2.3, Site-Scale Structural Geology ▪ *Geosynthesis* (NWMO DGR-TR-2011-011) ▪ *Regional Geology -*	a) Provide an explicit rationalization regarding how the seismic features, previously interpreted as faults, could arise from signal processing. In particular, explain the consistent NNW orientation of these features and why their appearance can be correlated between seismic data collection lines. b) Provide the depth range (corrected for inclination) and stratigraphic horizon(s) over which DGR-6 was	2 D seismic surveys of the local study area have revealed five discontinuities that have been interpreted as fault zones (TR-07-15). Four of these show a consistent NNW-trending orientation (PSR Fig. 3-1). One of the interpreted faults falls on the footprint of the proposed repository. Borehole DGR-6 was angled to intercept the most westerly interpreted fault zone, but no fault was detected in the core. Subsequently the seismic features have been explained as artefacts of signal processing (Geosynthesis TD p.93) while two

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		Southern Ontario (NWMO DGR-TR-2011-015)	projected to intercept the seismic discontinuity in its path. c) Explain why the uncertainties about the presence of possible fault structures in the repository footprint and vicinity have not been resolved using 3D seismic survey tech	independent consultants concluded that "These interpreted zones have been correlated between seismic data collection lines, thus improving confidence that they do exist." (TR-07-15, p. 12). In hydrocarbon exploration 3D seismic surveys are commonly employed to overcome the limitations inherent in 2D surveys.
EIS 05-166	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.3, Groundwater ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.3, Groundwater ▪ Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *Geology Technical Support Document* ▪ *Geosynthesis* (NWMO DGR-TR-2011-011) ▪ *Regional Geology - Southern Ontario* (NWMO DGR-TR-2011-015) ▪ *Analogue study of shale cap rock barrier integrity* (NWMO DGR-TR-2011-023) ▪ *Descriptive Geosphere Site Model* (NWMO DGR-TR-2011-024) ▪ *Three Dimensional Geological Framework Model* (NWMO DGR-TR-	a) Describe how the Collingwood Formation impacts the cap-rock seal. b) Describe how the lack of homogeneity of the Ordovician shale units may impact regional seal capability and the risk of possible seal breaching or contamination by migration updip.	The Collingwood Formation is not really a shale unit, but is a fine-grained limestone (73% calcite, 9% dolomite, 7% quartz, 10% clays), as opposed to the 40-49% clays of the Blue Mountain/Georgian Bay/Queenston formations. Therefore it could act more like a brittle, fracturing limestone than a shale seal rock, and should not be discussed as part of the cap-rock seal. All Upper Ordovician shale units include stacked coarsening-upward sequences with beds characterized by more porosity and permeability in the upper parts of these sequences (especially Georgian Bay and Queenston). In other words, these "shale" units are not homogeneous impermeable units, but include other facies which might reduce their "seal" qualities. The Panel questions the validity of characterizing certain rock units as impermeable, thus impacting on the ability of the cap-rock to act as a seal. The risk of contamination resulting from a breach of the described cap-rock seal should be addressed.

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		2011-042) ▪ *Outcrop fracture Mapping* (NWMO DGR-TR-2011-043)		
EIS 05-167	▪ Section 13, Long term Safety of the DGR	▪ *Geosynthesis Report*: Section 2.2.6.4, Regional Faults - Timing ▪ *Outcrop Fracture Mapping,* (NWMO DGR-TR-2011-43) Section 5.1 ▪ *Regional Geology* (DGR-TR-2011-15), Section 3.1.4	Describe the results of the Jack Satterly Geochronology Lab absolute age dating on fracture-filling minerals referenced in OPG's response to the Panel's IR EIS 02-38. When will the work be completed and the results available to the Panel? Provide an evaluation of the fracture orientations in southern Ontario with respect to the modern North American stress field and the potential for much younger fracture dates. Resolve the apparent inconsistency in the fracture formation in the regional study area with respect to regionally proposed stress fields and their timing.	Suggesting that common orientation of fractures implies the same age of formation presupposes that multiple fracture events must occur under different regional stress fields. If the regional stress field that causes fracturing events is the same, then the orientations would be the similar. The fracture orientations in the study area are consistent with those in southern Manitoba carbonates of similar age and are also consistent with fracture orientations in much younger Tertiary rocks in southern Alberta. These fracture systems have been shown to be parallel to the modern regional stress field. The fracture orientations in southern Ontario then are consistent with much younger fracture systems in Alberta that are consistent with the modern North American stress field. The EIA elsewhere recognizes a young age for fractures, DGR-TR-2011-15, Regional Geology, Section. 3.1.4, page 20: "Post-glacial (i.e.,<12,000 years) popup structures in the area are predominantly oriented 118°, and have nucleated on a sub-set of the ESE fracture set. These popups are interpreted to have formed during rapid release of high in situ tectonic stress shortly after the retreat of the Laurentian ice sheet." These conclusions appear to be internally inconsistent, since on page 23 it is stated: "ENE-trending set: may be neotectonic in origin (i.e., formed during the current tectonic stress regime, which is attributed to mid Atlantic Ridge push

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				and has remained approximately constant since the Cretaceous, Mechanism (2i) above)."
EIS 05-168	▪ Section 10, Existing Environment ▪ Section 10.1.4, Terrestrial Environment	▪ *Terrestrial Environment TSD:* Section 5.8, Significant Species(and subsections)	Provide the location of the Snapping Turtle observed during the 2009 turtle basking surveys. Identify potential habitats for this species within the Project Site and the Site Study Area.	Considering the presence on site and the status of this species as Special Concern under the *Species at Risk Act* (SARA), additional information is required in the Species At Risk analysis in order to determine possible effects on Snapping Turtle. In addition to text-based/map information, provide photos of potential habitats for this species within the Project Site and the Site Study Area immediately adjacent to the Project Site, as these are the areas where potential effects are most likely.
EIS 05-169	▪ Section 10, Existing Environment ▪ Section 10.1.4, Terrestrial Environment	▪ *Terrestrial Environment TSD:* Section 5.8, Significant Species(and subsections)	Confirm that the Eastern Hognose Snake was considered in the assessment of Species At Risk.	Historical records indicate that that the Eastern Hognose Snake has been known to occur in this region. Describe any field studies or analysis that were undertaken to determine whether this species is resident in the Site Study Area and Project Study Area.
EIS 05-170	▪ Section 10, Existing Environment ▪ Section 10.1.4, Terrestrial Environment	▪ *Terrestrial Environment TSD:* Section 5.8, Significant Species(and subsections)	Provide additional information about the presence of the Western Chorus Frog. Identify potential habitats for this species within the Project Site and the Site Study Area.	Since Western Chorus Frog has been recorded as actively breeding in the Project area and the status of this species under SARA is Threatened, additional information is required in the Species At Risk analysis in order to determine possible effects on this species. In addition to textbased/ map information, provide photos of potential habitats for this species within the Project Site and the Site Study Area immediately adjacent to the Project Site, as these are the areas where potential effects are most likely.
EIS 05-171	▪ Section 11.2, Mitigation Measures	▪ *EIS:* Section 4.11.3, Decommissioning of Facilities	Provide a conceptual revegetation plan for the waste rock pile.	Information regarding reclamation of the waste rock pile is limited to a proposal to place 15 cm of soil. A conceptual revegetation plan for the waste rock pile is

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				required to complete the assessment of residual environmental effects of the waste rock management area.
EIS 05-172	▪ Section 16, Follow-Up Program	▪ *EIS:* Section 12.2, Initial Scope of the Follow-Up Program	Provide additional, detailed justification of the follow-up monitoring program for the surface water management system (Tables 3a and 3b of TSD) and pages 5-7. The justification is to include: ▪ the rationale for selection of the three sample sites listed in Tables 3a and 3b (stormwater retention pond discharge, perimeter drainage ditch, shaft sump discharge), including an explanation of how these sample sites constitute adequate coverage of the surface water management system; ▪ a detailed explanation for the list of analytes for surface water samples presented in Tables 3a and 3b, including the expected sources of chemicals of potential concern (COPC) during site preparation, construction and operation, and any screening of COPC that may have taken place prior to determination of the list of analytes for monitoring; ▪ the rationale for the absence of any toxicity testing; ▪ the rationale for the frequency of sampling, including why frequency declines so quickly after the initial discharge (daily for the first week, weekly for one month, and then quarterly during construction), as well as why sampling will only occur for one year during operation of the DGR; ▪ an explanation of how the monitoring program has been designed to ensure data quality in support of confident environmental management decisions; e.g. how the number of stations and frequency of	The Follow-up Monitoring TSD contains insufficient detail regarding the monitoring program for the surface water management system. There is no explanation for why the 3 sampling sites listed in Tables 3a and 3b would constitute an adequate coverage of the system, particularly with respect to the potential for effects on adjacent wetland habitats. The list of analytes is not explained, apart from a brief reference to the Golder (2011) leachate testing and characterization study. Since the surface water management system will contain seepage water from the repository, construction process water, and runoff and seepage from waste rock, there is a fairly lengthy list of Chemicals Of Potential Concern (COPC) that goes well beyond the list presented in the TSD. For example, oils and greases, total petroleum hydrocarbons, metals and major ions associated with the mineralogy of the formations encountered during construction of the repository, and explosives residues would all be on an initial list of COPC. It is unclear how such an initial list would have been shortened to the list presented in the TSD. Furthermore, the particular analyte selected requires explanation if there is more than one choice; e.g., the selection of Total Kjeldahl Nitrogen as a measure of nitrate instead of the direct determination of nitrate and nitrite requires justification. Toxicity testing of discharge water (at the last point of control prior to discharge to MacPherson Bay) would account for the combined effects of all COPC and is usually required to demonstrate compliance with the Fisheries Act (Section 33, Discharge of Deleterious Substances). The absence of toxicity tests from the monitoring program is not

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			sampling produces confidence that exceedances will be accurately identified and that trends with time or location will be correctly identified; and ▪ the explicit identification of the performance or acceptance criteria to be applied to surface water quality data.	explained. The frequency of sampling abruptly drops off, apparently due to an assumption that all analytes will be below discharge criteria. This assumption does not consider seasonal variation in water quality; nor does it consider the likelihood of upset conditions during construction of the repository (e.g. sudden inflow of groundwater with highly elevated salinity and/or metals). The link between the design of the monitoring program and the requirements of the environmental management system is not obvious. The level of confidence associated with the frequency and extent of sampling requires explanation. In particular, the explicit identification of the performance or acceptance criteria to be applied to surface water quality data is required. These performance or acceptance criteria describe the data quality objectives that should be achieved in order to minimize the possibility of either making a decision error or failing to keep uncertainty in estimates to within acceptable levels (e.g. specification of the required precision and accuracy of measurements of each COPC and specification of the acceptable probability either a false positive or false negative when testing for exceedances of discharge criteria).
EIS 05-173	▪ Section 16, Follow-up Program	▪ *EIS:* Section 12.2, Initial Scope of the Follow-Up Program	Provide additional, detailed justification of the follow-up monitoring program for the shallow groundwater (Table 3a and pages 8-10). The justification is to include: ▪ a description of the location of the 8 shallow groundwater monitoring wells, including an explanation of how these wells constitute adequate coverage of the potential for impacts on	"The EA follow-up groundwater monitoring will be capable of detecting spatial and temporal changes in groundwater quality within the uppermost aquifer beneath the DGR surface structures."(Follow-Up Monitoring TSD, page 9). This statement requires additional explanation and justification according to the standard approaches used for the identification of Data Quality Objectives. In particular, the explicit identification of the performance or

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			groundwater; ▪ an explanation for the list of analytes for groundwater quality analysis (major ions, general chemistry, pH, temperature, electrical conductivity, trace elements, and petroleum hydrocarbons) including the expected sources of chemicals of potential concern (COPC) that may migrate to shallow groundwater during site preparation, construction and operation, and any screening of COPC that may have taken place prior to determination of the list of analytes for monitoring; ▪ the rationale for the frequency of sampling; ▪ an explanation of how the monitoring program has been designed to ensure data quality in support of confident environmental management decisions; e.g. how the number of wells and the planned frequency of sampling produces confidence that management of any movement of COPC to groundwater is implemented in a timely manner such that exceedances will not occur; and ▪ the explicit identification of the performance ot acceptance criteria to be applied to groundwater data.	acceptance criteria to be applied to groundwater data is required. These performance or acceptance criteria describe the data quality objectives that should be achieved in order to minimize the possibility of either making a decision error or failing to keep uncertainty in estimates to within acceptable levels (e.g. specification of the range of possible true values of the COPC that correspond to baseline and specification of the acceptable probability of Type I and Type II errors when testing for difference from baseline conditions). Particular attention should be given to verifying predicted effects on the adjacent wetlands.
EIS 05-174	▪ Section 11.4.7, Atmosphere ▪ Section 16, Follow-Up Program	▪ *Atmospheric Environment TSD:* Section 13.1, Initial Scope of the Follow-Up Program	Provide the rationale for proposing the air quality monitoring location near the main entrance (which lies between the site where construction activities will occur and the property boundary where air quality predictions have been made).	Monitoring results from the main entrance cannot be compared with the air quality predictions made during the environmental assessment. Therefore, this is not a suitable monitoring location. It is more appropriate to choose a sampling location where maximum ground level concentrations were predicted, or at sensitive receptor locations, so that predictions can be verified.

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EIS 05-175	▪ Section 11.4.7, Atmosphere ▪ Section 16, Follow-Up Program	▪ *Atmospheric Environment TSD:* Section 13.1, Initial Scope of the Follow-Up Program	Provide the rationale for excluding substances such as CO, SO_2, O3, VOCs and PAHs from the air quality monitoring program.	Due to increased construction activities, off-road and on-road sources (which are mainly powered by diesel fuel, and to a lesser extent gasoline) will increase emissions of these substances.
EIS 05-176	▪ Section16, Follow-Up Program	▪ *Atmospheric Environment TSD: Section 13.1,* Initial Scope of the Follow-Up Program	Justify the termination of the Atmospheric Follow-Up Monitoring Program after one year of monitoring. What considerations are being proposed in the re-evaluation of monitoring at the end of each year? What criteria would result in a decision to continue or discontinue monitoring?	Considering the length of the site preparation and construction phase (5-7 years), and that the degree of activity may not be equal in all years, a single year of atmospheric monitoring is likely inadequate to verify predictions.
EIS 05-177	▪ Section 8, Description of the Project ▪ Section 10.1.1, Geology and Geomorphology ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.2, Surface Water ▪ Section 11.4.3, Groundwater	▪ *EIS:* Section 6.2.7.4, Environmental Heads and Hydrologic Conductivity	Are Salina B salt horizons likely to be removed from the subsurface in the regional study area in the future? How would this affect the long-term stability of the DGR?	The Salina Formation shows strong evidence for systematic and local removal of salt. The elevated hydraulic conductivity and low TDS in the Salina B carbonate suggests that under some circumstances (such as partial glacial cover), there has been significant circulation of water. Available regional data (as stated in the Regional Geology Report) are sparse making detailed predictions about the future challenging. Information in OPG reports concern the possible future collapse of upper formations owing to salt dissolution and/or the presence of undetected paleokarsts in the upper Salina formation (including Salina B).
EIS 05-178	▪ Section 10.1.,1 Geology and	▪ *EIS:* Section 6.2 Geology	a) Provide information on the depth to, and nature of, the deepest stratigraphic horizons penetrated by bore holes	Existing oil and gas exploration boreholes may constitute a factor in vertical permeability through barrier horizons.

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	Geomorphology ▪ Section 10.1.2, Surface Water ▪ Section 10.1.3, Groundwater ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.2, Surface Water ▪ Section 11.4.3 Groundwater	▪ Section 7.2, Geology ▪ Section 7.3, Hydrology and Surface Water Quality	with the Regional Study Area, b) What is the decommissioning status of these boreholes? How will the incompleteness or absence of data be addressed? c) What is the potential impact of these bore holes on the long term regional groundwater flow regime in the RSA? How would this impact the post-closure phase of the DGR?	
EIS 05-179	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.7, Climate, Weather Conditions and Air Quality ▪ Section 11.4.9, Effects of the Environment on the Project	▪ *EIS*: Section 7.13, Effects of the Environment on the Project ▪ Section 9, Long-Term Safety of the DGR	What is the likelihood of closure of the upper Great Lakes drainage due to future climatic desiccation? How would closure of the drainage affect the long-term integrity of the DGR?	No context required.
EIS 05-180	▪ Section 10.1.1, Geology and Geomorphology ▪ Section 10.1.2,	▪ *EIS:* Section, 6.2.7.1, Shallow Groundwater System ▪ Section 6.2.7.1,	a) What evidence is there of the potential for preferential flow development from near surface exposures of the primary barrier and host formations in the areas where they approach the ground surface? **b)** What would the impact of preferential flow be on	Formations containing fractures, especially vertically oriented fractures are be prone to preferential flow. Those formations vulnerable to dissolution (e.g., carbonates & evaporites) may develop enhanced permeability when subject to a significant flux of water.

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	Surface Water ▪ Section 10.1.3, Groundwater ▪ Section 11.4.1, Geology and Geomorphology ▪ Section 11.4.2, Surface Water ▪ Section 11.4.3, Groundwater	Shallow Groundwater System ▪ Section 6.2.7.4, Environmental Heads and Hydrologic Conductivity ▪ Section 6.3, Hydrology and Surface Water Quality ▪ Section 7.2, Geology ▪ Section 7.3, Hydrology and Surface Water Quality	hydrogeological simulations which rely on hydrogeologic properties measured from DGR boreholes?	Flow through fractures and fractures enlarged by dissolution increases the effective porosity and permeability with a proportionate enhancement of groundwater velocities.
EIS 05-181	▪ Section 8.6, Abandonment	▪ *EIS Summary:* Project Phases, page 18	a) Provide a conceptual abandonment plan for the DGR. b) What institutional controls are being considered?	The EIS Guidelines state that "an abandonment plan is required to determine the safety of the facility and its potential impact on human health and the environment." According to the EIS Summary, page 40, abandonment begins when decommissioning is complete and includes “institutional controls for a period up to 300 years”.
EIS 05-182	▪ Section 9.1, Spatial Boundaries and Scale	▪ *EIS Summary:* EA Study Areas, page 16-17	Justify the validity of the chosen spatial boundaries within the timescales of the decommissioning and abandonment phases of the DGR Project,	This IR should supplement the response to IR EIS 03-45

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		▪ *EIS Summary:* Project Phases, page 18		
EIS 05-183	▪ Section 9.2, Temporal Boundaries	▪ *EIS Summary:* EA Study Areas, page 16-17 ▪ *EIS Summary:* Project Phases, page 18	What is the basis for the 1 million year temporal boundary in the post-closure assessment?	No context provided
EIS 05-184	▪ Section 10, Existing Environment ▪ Section 11.5.6, Human Health	▪ *EIS Summary:* Potential Effects on the DGR during the Long-term Period; Postclosure Assessment, page 43-46	How have transient populations been identified? How will potential adverse health effects on transient populations be monitored over the very long term?	Section 10 of the EIS Guidelines states: “Information on existing and projected population densities and distributions in the region, including resident populations and transient populations, must be provided by project phase, and for the entire life of the project.”
EIS 05-185	▪ Section 11.4.6, Radiological Conditions	▪ *EIS Summary:* Shallow Groundwater Resources are Isolated, page 31 ▪ *EIS Summary:* Normal Evolution Scenario, page 44-45	Discuss the potential for contamination of potable water sources (surface and ground water). This discussion should include a detailed examination of the likelihood and consequence of migration of radiological and non-radiological constituents of potential concern. The discussion should address short-, medium- and long-term impacts (all phases of the DGR).	There are several potential sources of ground and surface water contamination. For example the Waste Rock Management is a potential source of metals, nutrients and elevated salinity. The surface water management system is a potential source of, nutrients, metals, major ions, suspended solids, hydrocarbons and pathogens. Air emissions are a potential source of hydrocarbons, VOCs, NO_X and particulates with associated metals. Sources of radionuclides would include accidents and malfunctions during handling and transport of the waste on the surface. Sump water would be a source in the event of

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				an accident or malfunction underground. The screening arguments for eliminating any or all of the above constituents of potential concern are not clear, nor convincing,
EIS 05-186	▪ Section 8.1, General Information and Design	▪ *EIS*: Section 8.3.3.1, Fire Protection and Emergency Response	Provide evidence that there will be adequate capacity for and co-ordination of emergency response during all phases of the DGR.	In the EIS, section 8.3.3.1 page 8-24, it is stated that:"Fire protection and emergency response at the Bruce site is served by its own internal Emergency Response Team provided by Bruce Power".
EIS 05-187	▪ Section 10.1.1, Geology and Geomorphology	▪ *EIS:* Section 3.3, Alternates to the Project, page 3-8 ▪ Section 3.3.3, Deep Rock Vaults, pages 3-10 & 3-11	Provide further details concerning the choice of "appropriate rock support" (p. 3-10) and other repository features, such as cross-sectional shape/geometry and room orientation within the geosphere, that will be used to insure the safety of underground repository workers and/or provide structural reinforcement for facility elements	Section 3.3.3 of the EIS states: "The repository consists of individual excavated vaults with concrete floors and appropriate rock support to protect workers." There is no mention in any section of EIS Volume 1 of any planned support measures (types, density of placement, longevity under standard operating conditions, long term durability etc.) designed to provide worker occupational safety or structural competence either in the short (construction and operational periods) or long term (decommissioning, monitoring and further periods) intervals. The stability of the repository also depends upon the rock mass geotechnical characteristics and its geometric configuration (dimensions, shape and orientation).
EIS 05-188	▪ EIS Guidelines Section 11.3 Significance of Adverse Effects	▪ *EIS*: Section 7.3.1.2. Surface Water Quality, page 7-29.	Explain more fully how the phrase "beyond the natural variability of the water body" was defined and used when assessing predicted changes in surface water quality (EIS, page 7-29). a) Provide a definition of, "beyond the natural variability"	"For changes in surface water quality, a measurable change was considered if the change in any water quality parameters is beyond the natural variability of the water body. The range of parameter concentrations for each indicator for water quality is presented in Section 6.3.5" (EIS, page 7-29). In consideration of the above statement, further information

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
			b) Provide the level of confidence that the baseline adequately represents the range of natural variability in all of the water bodies assessed in the EIS.	on natural variability and the adequacy of the baseline data is required. "The EIS must clearly explain the method and definitions used to describe the level of the adverse effect (e.g., low, medium, high) for each of the above categories and how these levels were combined to produce an overall conclusion on the significance of adverse effects for each VEC. This method must be transparent and reproducible." (EIS Guidelines Section 11.3).
EIS 05-189	▪ Section 11.3, Significance of Adverse Effects	▪ *EIS*: Section 7.3.2.2, Identification and Assessment of Environmental Effects (Surface Water Quality), page 7-36	Explain why the expected increase in nitrate concentrations in Stream C was evaluated using Lake Huron concentrations and drinking water quality guidelines. Include a discussion of the uncertainty introduced by comparisons with a highly dissimilar water body. Include an evaluation of the effects of the predicted nitrate concentrations on algal and macrophyte growth in Stream C, including effects on fish habitat.	Evaluation of "likely effects" from increased nitrate concentrations in Stream C would logically be most reliable if compared with baseline concentrations of nitrate in Stream C, not Lake Huron. Nitrate is relevant to aquatic biota, not just with respect to drinking water. Evaluation of "likely effects" must be extended to consideration of the nutrient enrichment produced by nitrates in coldwater streams such as Stream C.
EIS 05-190	▪ Section 11.1, Effects Prediction	▪ *EIS*: Section 7.3.2.2, Identification and Assessment of Environmental Effects (Surface Water Quality), page 7-37 ▪ *Hydrology and Surface Water Quality TSD:* Section 8.3, pages	Provide a clear and complete description of the calculations performed in support of the statement in the EIS that effects on water flow and water quality in the North Railway Ditch and Stream C will "balance each other". Provide a discussion of the uncertainty associated with the calculation.	"A measurable indirect change to water quality as a result of a measurable change in surface water quantity and flow in the North Railway Ditch and Stream C was identified in Section 7.3.1.2. Since runoff to the North Railway Ditch is the primary source of indicators in surface water, a decrease in runoff will reduce both the loading to the North Railway Ditch, and subsequently Steam(sic) C, as well as the water available to dilute the indicator concentrations. These are expected to balance each other. Therefore, no adverse effects on water quality are likely from indirect effects" (EIS, page 7-37).

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		92-99		The calculations in support of the above statement are not presented in either the EIS or the TSD. The calculations and uncertainty associated with the calculations will assist in the evaluation of the defensibility and scientific credibility of the assessment of effects on the water quality of the North Railway Ditch and Stream C.
EIS 05-191	▪ Section 8.2, Site Preparation and Construction	▪ *EIS*: Section 3.4.6, Surface Facility Design, page 3-41	Clarify the timeframe for the "temporary" stockpile locations for overburden, shales and dolostones within the Waste Rock Management Area (WRMA).	Mitigation of any environmental concerns related to these stockpiles will be directly related to the length of time the stockpiles will be in place..
EIS 05-192	▪ Section 8.2, Site Preparation and Construction	▪ *EIS*: Section 4.7.5.3, Waste Rock Management, page 4-51.	Explain how siltation in the drainage ditches around the waste rock pile will be managed.	The silts accumulating in the drainage ditches will be elevated in metals adsorbed from mine water and waste rock drainage water.
EIS 05-193	▪ Section 10.1.5, Aquatic Environment	▪ *EIS:* Section 6.4.6, Wildlife Communities and Species ▪ Section 6.4.6.2, Regional and Local Study Area, page 6-114.	Provide information (including references) to support the statement that Type E botulism mortalities in waterfowl are not influenced by the operations at the Bruce nuclear site.	"Shorebird, loon, cormorant and waterfowl mortalities associated with Type I botulism exposure are attributed to natural occurrence of the toxin, and are not influenced by the operations at the Bruce nuclear site" (EIS, page 6-114). This statement requires support by reference to the published literature and/or relevant, internal studies. Temperature effects associated with cooling water discharge may be a logical linkage to Type I botulism; therefore, screening arguments for the lack of any linkage supported by references would contribute to the understanding of the defensibility of the above-quoted statement in the EIS.
EIS 05-194	▪ Section 7.3, Alternative Means of Carrying out the	▪ *EIS:* Section 4.12 Abandonment and Long-Term Performance Phase,	In regards to the period of institutional controls lasting up to 300 years, provide:	The decommissioning phase is to be followed by institutional controls lasting up to 300 years. The period of time assumed for institutional controls is supported by one reference to the Swedish waste repository (Postclosure

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
	Project	page 4-82. ▪ *Postclosure Safety Assessment:* Section 3.8, Timeframes of Interest, page 24.	a) evidence of the feasibility of such controls. b) An explanation of whether input from government agencies, aboriginal groups, and community stakeholders was used as part of the rationale for the assumed 300-year timeframe for institutional control. c) more detail regarding the basis for this time-frame, including references from the academic literature and other international nuclear waste repositories.	Safety Assessment, page 24). The 300-year timeframe is referred to as "consistent with international practice". It is unclear how consistent with international practice this actually is, given the single reference. Furthermore, discussion of this timeframe would benefit from wider discussion with government agencies, aboriginal groups and community stakeholders, all of which will have experience, policies, and a world-view to contribute to the discussion. Finally, the academic literature should have been consulted for opinions from experts in human societies and systems regarding whether the 300-year time period is defensible and appropriate.
EIS 05-195	▪ Section 2.5 precautionary approach ▪ Section 8.7 Accidents, malfunctions and malevolent acts ▪ Section 12 Accidents, malfunctions and malevolent acts	▪ *EIS:* Section 4.13.3, Malevolent Acts, page 4-88.	Provide a detailed rationale for why threats and theft were not considered in the assessment of potential malevolent acts.	A one-sentence statement in Section 4.13.3 of the EIS (page 4-88) explains that threats and theft were not considered in the assessment of potential malevolent acts. Assuming that at least some threats would have to be taken seriously and acted upon, at the very least, a considerable expenditure of time and resources would be required to address these threats. This would affect the socio-economic assessment of the DGR Project. It is possible to envisage that there might be serious consequences resulting from theft of material for malevolent purposes. More explanation of why these two malevolent acts were not included is required to build confidence in the completeness and defensibility of the assessment.
EIS 05-196	▪ Section 10.1.5, Aquatic Environment	▪ *EIS:* Section 6.5.3.3, Lake Huron and the Embayments, page 6-129	Discuss the habitat of the nearshore areas of MacPherson Bay with respect to the presence and relative abundance of periphyton and phytoplankton. Include citations to relevant research conducted in the Local Study Area.	EIS Section 6.5.3.3 (page 6-129) states "The coarse substrates in the bay limit primary production (growth of aquatic macrophytes) and offers little by way of cover for fish in its clear shallow waters". This statement does not explain the status of other primary producers in MacPherson

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		▪ *Aquatic Environment TSD,* Section 5.3.3. Lake Huron on the Embayments, page 46		Bay, notably attached algae (periphyton) as well as free-floating phytoplankton. The periphyton community may be a key habitat feature regarding provision of feeding opportunities for the observed species of fish in the bay. The algal community may respond to temperature effects from cooling water discharge and/or nutrient effects from stormwater discharge. This response, in turn, may affect the fish community. Acknowledgement of this potential linkage and discussion of the algal community in MacPherson Bay is required to contribute to the understanding of the reliability, defensibility and appropriateness of the assessment.
EIS 05-197	▪ Section 10.1.5, Aquatic Environment	▪ *EIS:*Section 6.5.3.3, Lake Huron and the Embayments, page 6-129 ▪ *Aquatic Environment TSD,* Section 5.3.3. Lake Huron on the Embayments, page 46	Provide a more detailed rationale for the assertion in the EIS that MacPherson Bay is generally an unsuitable habitat which offers limited foraging opportunities and very limited spawning and nursery habitat (EIS page 6-129). Include reference to the habitat map of MacPherson Bay (Aquatic Environment TSD Figure D-1) and overlay the observations of fish from the 2007 sampling program.	EIS Section 6.5.3.3 (page 6-129) states “MacPherson Bay is unsuitable for critical life history functions of many fish species (e.g. spawning/nursery areas for many species including smallmouth bass and pike), and likely offers minimal foraging opportunities for some species and very limited spawning and nursery habitat for a small proportion of the populations of a few coastal species like the invasive round goby and bluntnose minnow”. This statement is not supported by references. It is not supported by any explanation of the terms “likely” or “small proportion”. It appears to be a statement of professional opinion. Three references are cited in support of a list of species observed in the Local Study Area including the discharge channels, and Baie du Doré; these references are dated 1986, 1993 and 1999 and are not cited in support of the above statement. Two references appear in the TSD, dated 1984 and 1986 (TSD, page 46). There are no citations of more recent data, apart from the limited sampling that took place during the 2007 aquatic field program in support of the assessment. Provision of a more detailed rationale for the above statement is required to evaluate the reliability and

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				defensibility of the assessment that is based upon this interpretation of the existing environment.
EIS 05-198	▪ Section 10.1.5 Aquatic Environment	▪ *EIS:* Section 6.5.3.3, Lake Huron and the Embayments, page 6-130 ▪ Section 6.5.3.4, Other Potential Aquatic Habitat, page 6-130. ▪ *Aquatic Environment TSD,* Section 5.1.2. Field Studies, page 36 ▪ Section 5.3.3, Lake Huron on the Embayments, page 46	Provide the rationale for the absence of benthic invertebrates in the data in support of the EIS for the DGR Project.	EIS Section 6.5.3.4 (page 6-130) states "Several studies undertaken since the commissioning of Bruce A have shown that the benthic invertebrate communities in the wave-washed nearshore zone are reduced in both density and diversity of organisms, and that only a few species are able to colonize this hostile habitat [174; 209] The two references cited are from 1984 and 1986. No further studies are cited. No field studies of benthic invertebrates were conducted in support of the DGR Project EIS (Aquatic Environment TSD). Furthermore, no studies of benthic invertebrates (apart from crayfish surveys) were conducted in the Railway Ditches, marsh and swamp within the Project Area and Stream C in support of the DGR Project EIS. Additional rationale for the absence of recent, relevant benthic invertebrate data is required for the evaluation of the reliability and defensibility of the assessment of effects on the benthic invertebrate VEC.
EIS 05-199	Section 8.2, Site Preparation and Construction	*Preliminary Safety Report:* Section 9.3.1: Installation of Construction Services, page 598 and Table 9-1, p. 600	Assess the impacts of additional traffic flow and space needs resulting from individual contractor requirements to supply stand-alone potable water, and washroom and sanitary facilities, at the DGR construction site.	The PSR states on page 598 that, "Contractors will supply their own stand-alone washroom and sanitary facilities." This indicates that no connection for contractor staff facilities with existing Bruce nuclear site sewer lines will occur, requiring that each separate contractor supply separate facilities for each group of workers, and that continuous additional traffic flow for the purpose of supplying potable water and removing waste water for each must also occur. This will lead to potentially higher rates of traffic flow and a requirement for more site storage space in the contractor staging area.

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EIS 05-200	Section 8.2, Site Preparation and Construction	*Preliminary Safety Report:* Section 9.2.3: Site Grading, pages 596-597	Indicate where unsuitable (as re-usable topsoil overburden) soil materials will be stored within the planned DGR Construction Layout (PSR Figure 9-2, p. 597). Provide a description of overburden material that will be generated during preliminary construction activities, indicating what is meant by "unsuitable overburden material". Indicate where and when the overburden material will be used as backfill.	When performing initial construction site clearing it is stated that "Overburden material that would be unsuitable for use in topsoil will be stockpiled and used later for backfilling." No indicated area for "unsuitable" overburden, such as soil, sand or waste rock, is indicated in the DGR Construction Layout plan view (page. 596).
EIS 05-201	Section 8.2, Site Preparation and Construction Section 11.4.7, Atmosphere	*EIS:* Section 4.7.1, Site Preparation, page 4-41 Section 4.7.4.1, Shaft Excavation, page 4-46	Indicate what types of drilling equipment may be required for surface site preparation scenarios (grouting, freezing or both) involving surface construction and early shaft sinking operations that may be needed to control potential groundwater inflows. Describe the potential effects to air quality from the use of such specialized equipment.	A discussion of surface site preparation operations and equipment requirements for them is made in the EIS page 4-41). In this section mention is made that "implementing a ground improvement program (grouting)" may be required in advance of shaft sinking "to control potential groundwater inflows". Though indeterminate at this time, the application of drilling and grouting processes appears to be highly likely under the surface construction and early shaft sinking scenario. Therefore a description and summary of additional equipment typically used for such operations must be included in the equipment inventory that is proposed in EIS Table 4.7.1-1 page. 4-41). In addition to grout sealing as a means of restricting water inflows, other "ground improvement techniques will be employed in advance of sinking activities" (page 4-46) that may include freezing. This ground sealing technique also involves systematic and extensive drilling of the surface rock, yet no mention is made of potential equipment requirements necessary to complete this work.
EIS 05-202	▪ Section 2.2, Public Participation and Aboriginal	▪ *EIS*: Section 2.3.2, Métis Nation of Ontario	Provide a description of how input was obtained from the Métis Nation of Ontario (MNO) and Historic Saugeen Métis Community (HSMC) regarding Valued Ecosystem	Page 2-19 of the EIS states "The MNO expressed an interest in having an opportunity to review and comment on the Valued Ecosystem Components....". It is unclear

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	Engagement ▪ Section 6.1 Aboriginal Peoples	Engagement, page 2-19.	Components to be used in the assessment. If input was obtained, provide the location of the description of input regarding VECs in the EIS, its Appendices, or the Aboriginal Interests TSD.	whether the MNO or the HSMC were given the opportunity and, if so, where the input obtained regarding VECs is documented.
EIS 05-203	▪ Section 2.2, Public Participation and Aboriginal Engagement ▪ Section 2.3, Traditional Knowledge ▪ Section 6.1, Aboriginal Peoples	▪ *EIS:* Section 2.3, Aboriginal Engagement ▪ Section 7.16, Application of Traditional Knowledge in the Assessment	Describe how input from the SON was used to develop the methods for assessment of effects of the project on VECs (including the use of the burial site); in particular, the magnitude and overall significance of any effects as may be interpreted using Traditional Knowledge.	According to Section 2.3 of the EIS Guidelines, traditional knowledge can contribute to project siting and design, identification of issues, the evaluation of potential effects, and their significance, the effectiveness of proposed mitigation, cumulative impacts, and the consideration of follow-up and monitoring programs. Sections 2.3 and 7.16 of the EIS do not present information regarding how Traditional Knowledge obtained through consultation with the SON was incorporated into decisions regarding project siting and design, the evaluation of potential effects, their significance, the effectiveness of proposed mitigation and follow-up and monitoring.
EIS 05-204	▪ Section 2.2, Public Participation and Aboriginal Engagement ▪ Section 2.3, Traditional Knowledge ▪ Section 6.1 Aboriginal Peoples	▪ *EIS*. Section 2.3, Aboriginal Engagement. ▪ Table 2.3.4-1, Aboriginal OPG/NWMO Interactions – Historical Profile, Pages 2-21 to 2-44.	Provide documentation of input received from the MNO and the Historic Saugeen Métis Community (HSMC) in the preparation of the EIS, including the evaluation of potential effects, their significance, and the effectiveness of proposed mitigation and follow-up and monitoring.	It is apparent from Table 2.3.4-1 that the MNO and HSMC were primarily involved after much of the preparation of the EIS was complete. Given the statements quoted above from the EIS Guidelines regarding incorporation of Traditional Knowledge, how was input from the MNO and HSMC considered (if at all) in the EIS.
EIS 05-205	▪ Section 2.2, Public Participation and Aboriginal Engagement,	▪ *EIS:* Section 2.4.1, Briefings with Local Municipalities and Agencies, pages 2-	Clarify whether the DGR Community Consultation Advisory Group has provided input regarding its objectives; i.e. "...discuss emerging issues related to community interests and concerns and to advise on community consultation	The list of Top Ten issues raised in written comments (Table 2.9.3-1) includes "public consultation in the approvals process". Records of discussions by the DGR Community Consultation Advisory Group related to this issue must be

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	▪ Section 6.3, Stakeholders	50, 2-51.	activities during the regulatory approvals process."	provided.
EIS 05-206	▪ Section 2.2, Public Participation and Aboriginal Engagement, ▪ Section 6.3, Stakeholders	▪ *EIS:* Section 2.9.3, Input to the Identification of Issues, pages 2-92, 2-93	Provide a thorough and complete cross-reference between the Top 10 Issues listed in Table 2.9.3-1 and the responses and actions taken by OPG to address these issues in the EIS.	The description of the responses to the Top 10 Issues provided on page 2-93 of the EIS is cursory and incomplete and does not provide cross-references to specific sections in the EIS where the issues were addressed, and how they were addressed.
EIS 05-207	▪ Section 8.7, Malfunctions, Accidents and Malevolent Acts ▪ Section 12, Accidents, Malfunctions and Malevolent Acts	▪ *EIS:* Section 4.8.3.1, End Walls and Room Closure, page 4-62	Clarify the distinctions between end walls for closing repository rooms versus closure walls for sealing the exhaust ventilation drift versus bulkheads for closing off panels.	End walls will be placed on the access drift sides or rooms as each is completed in order to restrict entry by personnel. When groups of rooms are filled, "closure walls (will be) constructed in the access and exhaust ventilation tunnels to fully isolate this group of rooms … (and) In the very unlikely event that explosive gases build up behind the closure walls and an explosion occurs, the air blast from the explosion would be contained by the closure walls." (p. 4-62) The design of these walls has not been well described in terms of (dimensions, concrete thicknesses to be used, keying of walls into the rock pillars, use of contact seal grouting materials (as with shaft concrete bulkheads to be used – all of which provide pressure resistance or bearing capacity in the case of room-generated pressures.
EIS 05-208	▪ Section 10.1 Biophysical Environment ▪ Section 10.1.6, Ambient Radioactivity ▪ Section 11.4.6,	▪ *EIS:* Section 6.6.5.3 Radioactive Particulates, page 6-140 to 6-145 ▪ *Radiation and Radioactivity TSD:* Section 5.5.3, Radioactive	a) Provide information on the distribution of Gross Beta Deposition rates by month in order that the variability with season and month of the year can be understood. In particular, information on gross beta deposition during the growing season for crops and gardens is requested. b) Provide an explanation for why none of the monitoring stations for gross beta deposition are located within	a) The use of annual average gross beta deposition rates (as presented in Table 5.5.3-1 in the TSD, page 65) and in Table 6.6.5-3 of the EIS (page 6-140) does not allow interpretation of seasonal or monthly variability. The ability to evaluate the deposition rates during the growing season is required to increase the appropriateness of the assessment of radiation dose from this source. b) Sampling locations presented on Figures 5.5.3-1 and

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	Radiological Conditions ▪ Section 11.5.6, Human Health	Particulates and Figures 5.5.3-1 and 5.5.3-2 pages 67 and 68	aboriginal lands. .	5.5.3-2 of the TSD do not indicate the presence of any monitoring stations for radioactive particulates within aboriginal lands. Since the VECs include "Members of the public including Aboriginals" (EIS Table 6.6.2-1, page 6-132), and since aboriginal people may have specific exposure scenarios related to demographics, lifestyle and culture, data for their communities is required. Without these data, it is not possible to evaluate the appropriateness of the assessment for members of the general public in terms of whether that assessment encompasses the exposure scenarios specific to aboriginal individuals.
EIS 05-209	▪ Section 10.1, Biophysical Environment ▪ Section 10.1.6, Ambient Radioactivity ▪ Section 11.4.6, Radiological Conditions ▪ Section 11.5.6, Human Health	▪ *EIS:* Section 6.6.5.4, Carbon-14 in Air, page 6-145 ▪ *Radiation and Radioactivity TSD:* Section 5.5.4, Carbon-14 in Air; Table 5.5.4-1 Carbon-14 Activity in Air, page 71.	a) Provide information on the statistical analysis method that compared carbon-14 concentrations in air in the Local study area with provincial background; include information on which metrics were used in the analysis (annual average, monthly averages) and the *p* value of the analysis (if applicable). b) Provide information on the locations of the sampling stations in the Local Study Area as listed in Table 5.5.4-1 of the TSD (page 71).	a) "Some of these values are higher than those reported at provincial background locations, which averaged 245 Bq/kg-C [223], but not by a statistically significant amount" (EIS, page 6-145). This statement requires further elaboration in order that there be increased confidence in the conclusion presented. b) The location of sample sites for carbon-14 is required for evaluation of the extent of coverage within the Local Study Area, including Aboriginal lands.
EIS 05-210	▪ Section 10.1, Biophysical Environment ▪ Section 10.1.6, Ambient Radioactivity	▪ *EIS:* Section 6.6.6.1 Radioactivity in Surface Water, pages 6-148 and 6-147 ▪ *Radiation and Radioactivity TSD:*	a) Provide the distribution of tritium and gross beta in surface water within years and compare the distributions from year-to-year. b) Provide an explanation for why other radionuclides were not measured in the sites used for tritium and gross beta monitoring. Provide any data not reported in the EIS and TSD on other radionuclides at the sites used for tritium	a) Information on the distribution of tritium concentrations and gross beta activity within individual years and among years will provide information useful for evaluation of the appropriateness of the metrics chosen for input to exposure modelling and the level of conservatism in those metrics. b) Cesium-137, cesium-134 and potassium-40 were

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	▪ Section 11.4.6, Radiological Conditions ▪ Section 11.5.6, Human Health	Section 5.6, Radioactivity in Surface Water, pages 73-81	and gross beta monitoring. Include an analysis of the effect of no data on other radionuclides at the tritium and gross beta monitoring sites on uncertainty of the assessment.	measured in Lake Huron and cobalt-60, cesium-134, cesium-137, potassium-40, strontium-90, iodine-129, technetium-99 and chlorine-36 were measured in surface water samples from the railway ditches (TSD, page 81). However, no reported analyses were conducted on samples taken from the sites used for tritium and gross beta monitoring. The lack of data on other radionuclides from the tritium and gross beta sampling sites produces an uneven dataset with higher uncertainty than would have been the case had other radionuclides been analysed on a routine basis from the standard monitoring sites. An explanation for this situation, and an analysis of the effect the lack of data on other radionuclides on uncertainty is required for the evaluation of the reliability, appropriateness and scientific credibility of the assessment.
EIS 05-211	▪ Section 10.1.1, Geology and Geomorphology	▪ *EIS:* Section 6.2.6.3, Natural Resources ▪ *Geosynthesis (NWMO DGR-TR-2011-11):* Section 4.5, Regional-scale Model	Provide information on the size, geometry, and distribution of Silurian pinnacle reefs in the Project, Site and Local Study Areas that may be encountered. Evaluate their possible impact on shaft sinking and their influence on hydraulic properties affecting the shaft seal.	Reef structures in carbonate rocks are common hydrocarbon exploration targets because of their high porosity and permeability. Silurian pinnacle reefs are reported in the Regional Study Area and modelling shows the presence of such structures in the vicinity of the DGR (Geosynthesis TSD Section 5.4.5.1, page 214). Although the lithologies encountered in the four project drill holes appear to indicate an inter-reef environment, questions remain whether small reef structures could remain undetected.
EIS 05-212	▪ Section 8.3, Operation	▪ *EIS:* Section 4.14 Organization and Management, pages 4-88-4-91. ▪ Figure 4.14-1,	Provide a description of how the 11 Managers illustrated in Figure 4.14-1 will communicate to ensure that there is sufficient awareness of issues as they arise, appropriate responses to those issues as per applicable policies and procedures, documentation of those responses, and follow-	Section 8.3 of the EIS Guidelines states “The proponent is also required to provide, or reference, the policies, programs and procedures that would be followed for the operation of the facility in order to provide some assurance that the facility could be operated safely and in accordance with the *Nuclear Safety and Control Act* and its regulations following

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		NWMO's Site Preparation and Construction Phase Organization, page 4-90.	up to ensure the effectiveness of the responses. Provide examples to illustrate the communication system. Include examples from the Health, Safety and Environment Manager's area of responsibility.	construction." The Project Quality Plan is described on page 4-89 of the EIS as a plan that would ensure meeting minimum NWMO requirements, identification of responsibilities for quality assurance and control, specification of auditing and corrective actions and maintenance of a register of quality compliance. However, it is not clear how the lines of communication from the Quality Assurance Manager through to the 10 managers in charge of specific areas will operate. Nor is it clear how the 10 managers will communicate among each other. The risks associated with non-communication among managers can be considerable and require identification and management.
EIS 05-213	▪ Section 8.3, Operation.	▪ *EIS:* Figure 4.14.2-1, Operations Phase Organization	Provide information on where Health, Safety and the Environment (HSE) as well as Communications would fit within the organization chart in Figure 4.14.2-1. Provide information regarding how HSE and Communications would be integrated across the 10 management functions arranged across the bottom of the organization chart.	Operation of the DGR facility in a manner that will "provide some assurance that the facility could be operated safely and in accordance with the *Nuclear Safety and Control Act* and its regulations" must include the explicit inclusion of HSE and Communication functions within the management structure.
EIS 05-214	▪ Section 8.3, Operation.	▪ *EIS:* Section 4.15.2.2. Bruce Nuclear Site Radiological Environmental Monitoring Program, page 4-97. ▪ *DGR EA Follow-up Monitoring Program*	Provide information that describes the data quality objectives for the Radiological Environmental Monitoring Program (REMP) currently in use at the Bruce Nuclear Site. This information must include: ▪ explicit description of the rationale for spatial and temporal boundaries for the REMP program; and ▪ the interface between the REMP program and management decision-making (in the context of the	Operation of the DGR facility in a manner that will "provide some assurance that the facility could be operated safely and in accordance with the *Nuclear Safety and Control Act* and its regulations" would include the explicit identification of data quality objectives for monitoring programs. Therefore, description of the data quality objectives associated with the current REMP program would provide some assurance that there are existing procedures in place to be used for the future monitoring program. This information could then be

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		TSD: Section 1.	Environmental Management System as well as compliance with all regulatory requirements for emissions); and the tolerable decision error incorporated into the sampling design.	used to support and expand upon the information provided in the Follow-Up Monitoring TSD which currently does not provide the explicit data quality objectives information requested.
EIS 05-215	▪ Section 11.4.6, Radiological Conditions	▪ *EIS:* Table 6.6.2-1, VECs Selected for Radiation and Radioactivity, pages 6-132 and 6-133. ▪ *Radiation and Radioactivity TSD:* Section 4.1, Valued Ecosystem Components.	Provide information on the relative sensitivity to radiation of the indicator species listed in Table 6.6.2-1 and discussed in the Radiation and Radioactivity TSD. Provide justification for the use of the indicators, not only with respect to the degree of exposure, but the threshold for effects.	"The VECs were selected to represent different trophic levels, and hence different exposure pathways." (TSD, page 29). There is no mention of relative sensitivity of indicator species within the VEC grouping. The scientific literature contains references to studies that illustrate substantial differences in sensitivity to radiation, even within taxonomic families or genera (e.g. for tree species). Therefore, provision of information on the relative sensitivity of the indicator species used in the assessment is required to evaluate the reliability and appropriateness of the assessment.
EIS 05-216	▪ Section 11.4.6, Radiological Conditions	▪ *EIS:* Section 6.6.10 Radiation Doses to Members of the Public, pages 6-157-6-159. ▪ *Radiation and Radioactivity TSD:* Section 5.10, Radiation Doses to Members of the Public, pages 110-115; ▪ Table 5.10-2, General Characteristics of Potential Critical	Provide a more detailed rationale for the statement on page 110 of the Radiation and Radioactivity TSD that Aboriginal peoples would not be exposed to a higher dose than the critical groups (TSD, Table 5.10-1, page 113). Include a description of the level of confidence in this statement considering the precautionary principle as well as the duty to consult with aboriginal people and the requirement to include traditional knowledge.	Aboriginal peoples are not identified as a specific candidate group in Bruce Power's REMP program. Their locations, traditional activities/lifestyle or traditional dietary habits mean they will not be exposed to a higher dose than those candidate groups identified here. "This is supported by the results of the diet survey of Chippewas of Nawash First Nation (Neyaashiinigmiing, at Cape Croker ON, on Georgian Bay) as discussed in Section 5.7.3". (Radiation and Radioactivity TSD, Footnote 8, page 110). Details related to the diet survey (Bruce Power 2001 – ref # 50, Radiation and Radioactivity TSD, page 194), plus information on the level of confidence that air, surface water, soil, sediment, fish, fruits, vegetable and milk data sufficiently represent conditions on aboriginal lands are required to evaluate the defensibility of the above statement.

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		Groups, page 113		
EIS 05-217	Section 8.1, General Information and Design Description	▪ *Preliminary Safety Report:* Section 9.4.9.1, Conventional Safety ▪ *EIS:* Section 9.4.9, Occupational Safety, page 620 ▪ Section 4.4.3.3, Communications System, page 4-15	Indicate whether the use of closed circuit television monitoring by DGR surface facility operators will be considered as a procedure for monitoring the safety of underground workers and operational conditions of the repository during all phases of underground operations.	In this section of the Safety Report, analysis of conventional safety aspects of all phases of DGR development and operation have been introduced. In a previous section of the report (Ch. 6.2.4.3, Control and Monitoring Systems, p. 301) it was stated that the surface DGR facility has a main control room from which an operator can view the system status of equipment and operations occurring within the surface facilities "through use of closed circuit video monitors." This is also common in many underground mines for monitoring passage and status of backfill transport operations. No inclusion of similar safety monitoring features (closed circuit television, monitored by surface facility operator of critical underground areas such as fuel storage bays and such) has been made of any description of underground operations, at any stage of development or operations. The only communications systems that are described consist primarily of voice communication networks (telephone, analogue phone, radio and business/process control signal generation).
EIS 05-218	▪ Section 10.2.6, Human Health	▪ *Socio-economic Environment TSD:* Appendix C, Section C2, Protocol for Site Neighbour Survey	For the Site Neighbour Survey and the Community Well-Being Survey, provide information on the employment status of respondents or their family members regarding Bruce Power or one of their contractors.	Anyone surveyed about their attitude towards the Bruce nuclear plant and the siting of a new facility (DGR) may be considered biased if they, or someone in their family, is employed at the site. To evaluate this potential source of bias, the Panel requires clarity about the *employment* status of respondents regarding Bruce Power or one of their contractors.
EIS 05-219	▪ Section 10.1.4, Terrestrial Environment	▪ *EIS:* Section 6.2.4, Soil Quality, page 6-13.	Clarify whether the previous Phase I and II site investigations included soil samples from the proposed DGR Project site.	It is not clear from the text on page 6-13 of the EIS whether previous site investigations included soil samples taken from the proposed DGR site. It is also not clear what the

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	▪ Section 11.4.1, Geology and Geomorphology		Clarify how the Phase I and II data were used (if at all) in the assessment of effects of the DGR Project.	relevance of the Phase I and II site investigation findings are to the assessment of the DGR project; i.e. there are not statements regarding whether the data on contaminants found in soil was carried forward into the assessment, and if so, how.
EIS 05-220	▪ Section 10.1.4, Terrestrial Environment	▪ *EIS:* Section 6.2.4, Soil Quality	Provide baseline soil quality data for the areas of the DGR infrastructure and Waste Rock Management Area (WRMA). Since these areas have been previously disturbed by industrial activity, provide the evidence that no soil contamination has occurred.	Soil sampling and analytical data are presented for the footprint of the Bruce Heavy Water Plant and other contaminated areas near or within the Project Area. To evaluate the impacts of disturbance in the areas of the DGR infrastructure and WRMA the Panel requires baseline data on soil quality in these areas.
EIS 05-221	▪ Section 10.2.1, 11.5.1	▪ *EIS:* Section 7.9, Aboriginal Interests ▪ Section 7.9.1.1, Aboriginal Communities	Provide the number and types of employment currently held by Aboriginal peoples at the Bruce Power Plant and the Western Waste Management Facility. What plans are in place to provide opportunity and training for Aboriginal persons during all phases of the DGR project?	The effects assessment of the socio-economic impacts of the project frequently refers to employment opportunities for Aboriginal peoples of the region. This is considered a beneficial impact. Current employment data and plans for training programs are required to judge the possible magnitude of such a benefit.
EIS 05-222	▪ Section 11.4.9, Effects of the Environment on the Project	▪ EIS: Section 8, Malfunctions, Accidents and Malevolent Acts ▪ Table 8.1-1, Summary of the Initiating Events Considered	Explain how severe rainfall and severe wind can be categorized as having a frequency of $< 10^{-2}$ per annum in the Regional Study Area. Provide estimates on the predicted frequency and severity of hurricanes for the project region for the next 50 years in consideration of climate change.	As per section 11.4.9 of the guidelines, the assessment must take into account severe weather conditions that could adversely affect the project. In Table 8.1-1 (EIS, page 8-3) under Initiating Events 'Severe weather conditions' both Severe Wind and Severe Rainfall are considered as 'Unlikely' (annual frequency between 10^{-2} and 10^{-7}). In 1954 Hurricane Hazel struck southern Ontario and the Toronto region experienced winds up to 110 kilometres per hour and 285 millimetres of rain in 48 hours.
EIS 05-223	▪ Section 10.1.7, Climate, Weather	▪ *EIS:* Section 6.7.5, Existing	What are the major sources of acrolein emissions from the Bruce site? What are the predicted incremental, if any,	Predicted air concentrations of target compounds, resulting from existing sources at the Bruce nuclear site do not

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	Conditions and Air Quality,	Environment ▪ Section 6.11.4.1, Air Quality	sources from the DGR project?	exceed hazard quotient (HQ) of 1.0, with the exception of acrolein.
EIS 05-224	▪ Section 5.2, Project Overview and Purpose	▪ *EIS:* Section 1.2.5, Project Cost, page 1-12	Provide additional detail concerning project costs during each temporal phase, and provide the ranges in costs for each phase.	"The construction cost of the DGR is currently estimated to be about $1 billion." This statement does not clarify whether the $1 billion cost is only for the site preparation and construction phase (5-7 years), or for the site preparation and construction phase plus the operations phase (40-45 years), the decommissioning phase (5-6 years) and the abandonment and long-term performance phase (institutional controls for up to 300 years). It is unclear as to what the actual total cost of the Project will be.
EIS 05-225	▪ Section 11.4.8, Noise and Vibration	▪ *EIS:* Section 7.8, Noise and Vibrations. ▪ Section 7.8.3, Significance of Residual Adverse Effects	Clarify the two definitions of low magnitude noise levels adopted in the determination of significance.	In Table 7.8.3-1 low magnitude noise levels are defined as change in L_{eq} >3 and ≤6 dB. In Table 7.8.3-2 a low magnitude noise level is defined as when the value exceeds the baseline values by 5 dB.
EIS 05-226	▪ Section 10.2, Socioeconomic Conditions	▪ *EIS:* Section 6.10.5.5, Community Character	Clarify the degree of visibility of the Bruce site from the nearest highways.	Page 6-237 of the EIS states that: "existing nuclear generating stations are not visible from the nearest highway". On p. 6-254 it is maintained that " County Road 20 leads straight into the Bruce nuclear site from the east and views from this road are greatly influenced by the existing Bruce nuclear site. Intermittent views from Highway 21 are also possible."
EIS 05-227	▪ Section 10.1.2, Surface Water.	▪ *EIS:* Table 6.3.2-1, VECs Selected for Hydrology and	Provide an explanation for the absence of total petroleum hydrocarbons, and oils and greases from the list of	On page 6-13 of the EIS, total petroleum hydrocarbons are identified as one of the chemicals measured in soil in previous Phase I and II site investigations. Therefore, there

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		Surface Water Quality, pages 6-60 and 6-61.	measures for surface water quality in Table 6.3.2-1.	is a possible linkage between soil and surface water quality in the existing environment of the Project and Local Study Areas. Provide the rationale for screening out this linkage.
EIS 05-228	▪ 10.1.2, Surface Water	▪ *EIS:* Section 6.3.5.2, Water Quality in Surface Drainage Features in Site Study Area, page 6-83, Water Temperature	Provide an explanation for why there were no continuous water temperature/dissolved oxygen/conductivity measurements at the deeper sampling stations in the Site Study Area.	"In general, the water temperatures at all the locations correlated reasonably well with the average ambient air temperature." (EIS, page 6-83). Water temperature drives many important indicators of aquatic ecosystem health. It determines the assemblage of aquatic biota, affects toxicity of some chemicals (e.g. ammonia), and fundamentally affects the productivity of the system. Installation of continuous temperature/DO/conductivity monitors is common practice. An explanation for the absence of such measurements in the context of data quality objectives is required to evaluate the defensibility and appropriateness of the assessment.
EIS 05-229	▪ 10.1.1, Geology and Geomorphology	▪ *EIS*: Section 6.2.5, Overburden Geology ▪ Golder Associates Ltd. 2012. *OPG's Deep Geologic Repository for Low & Intermediate Level Waste, Soil Investigation for Proposed Surface Facilities, Kincardine, Ontario*. 1011170042-REP-G2030-0002-00	In view of the sedimentary variability of the uppermost till unit, provide additional data on the hydrogeologic properties of the uppermost till layer under the proposed WRMA, Surface Water Ditches, and Stormwater Management Pond that would justify the absence of liners under these features. The additional data are to be collected from numerous locations that adequately reflect the variability across the entire surface area within the WRMA boundary, as well as the Stormwater Management Pond boundary.	The surficial deposit encountered beneath the topsoil and/or fill is characterized as the Upper Weathered Silt Till Unit and described as consisting mostly of weathered, brown silt till with fractures extending to depths of approximately 3 m. (EIS, Section 6.2.5). In the 2012 Golder report (1011170042-REP-G2030-0002-00) this uppermost unit is variously described as "Sandy Silt to Sand and Silt Till"' "Silty Sand to Sand and Silt to Sand and Gravel", "Clayey Silt to Silty Clay Till". In the new test pits surrounding the WRMA, Stormwater Management Pond, and Surface Water Ditches five attempts were made to measure hydraulic conductivities. Two proved unsuccessful, one is far removed from the proposed facilities. Direct sampling of near-surface sediments in the areas of

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				the WRMA and Stormwater Management Pond need not compromise the integrity of the potential barrier to surface water infiltration.