OPG's DEEP GEOLOGIC

REPOSITORY

FOR LOW & INTERMEDIATE LEVEL WASTE

Terrestrial Environment Technical Support Document

March 2011

Prepared by: Golder Associates Ltd.

NWMO DGR-TR-2011-05

Golder Associates

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

Ontario Power Generation (OPG) is undergoing a multi-year planning and regulatory approvals process for a deep geologic repository (DGR) for the long-term management of low and intermediate level waste (L&ILW). Currently, the L&ILW produced as a result of the operation of OPG's nuclear reactors is stored centrally at OPG's Western Waste Management Facility (WWMF) located at the Bruce nuclear site. Although current storage practices are safe and could be continued safely for many decades, OPG's long-term plan is to manage these wastes in a long-term management facility. Throughout this report, OPG's proposal is referred to as the "DGR Project".

The DGR Project includes the site preparation and construction, operations, decommissioning, and abandonment and long-term performance of the DGR. The DGR will be constructed in competent sedimentary bedrock beneath the Bruce nuclear site near the existing WWMF. The underground facilities will include access-ways (shafts and tunnels), emplacement rooms and various underground service areas and installations. The surface facilities include the underground access and ventilation buildings, Waste Package Receipt Building (WPRB) and related infrastructure.

An environmental assessment (EA) of the proposed DGR Project is required under the provisions of the *Canadian Environmental Assessment Act* (CEAA) because the proponent (OPG) will be required to obtain a licence from the Canadian Nuclear Safety Commission (CNSC) to allow the project to proceed. The findings of the EA are presented in the Environmental Impact Statement (EIS) and Technical Support Documents (TSDs).

ES.2 APPROACH

The approach used for assessing effects of the DGR Project supports the philosophy of EA as a planning tool and decision-making process. The assessment characterizes and assesses the effects of the DGR Project in a thorough, traceable, step-wise manner. The approach used in the assessment includes the following steps:

- describe the project;
- describe the existing environment;
- screen potential project-environment interactions to focus the assessment;
- predict and assess effects, apply mitigation measures to reduce or eliminate the effects and identify residual adverse effects;
- determine significance of residual adverse effects; and
- propose a follow-up program to confirm mitigation measures are effective and the DGR Project effects are as predicted.

The assessment of effects considers direct and indirect effects of the DGR Project, effects of the environment on the project, climate change considerations, and effects of the project on renewable and non-renewable resources. Effects of radiation and radioactivity on the terrestrial environment are addressed in the Radiation and Radioactivity TSD. An assessment of the cumulative effects associated with the DGR Project in association with exsting and planned

projects is addressed in Section 10 of the EIS. Effects are predicted in the context of temporal and spatial boundaries.

The temporal boundaries for the EIS establish the timeframes for which the effects are assessed. Four temporal phases were identified for the DGR Project:

- site preparation and construction phase;
- operations phase;
- decommissioning phase; and
- abandonment and long-term performance phase.

The abandonment and long-term performance phase is discussed in Section 9 of the EIS. Spatial boundaries define the geographical extents within which environmental effects are considered. As such, these boundaries become the study areas adopted for the EA. Four study areas were selected for the assessment of the terrestrial environment: the Regional Study Area, Local Study Area, Site Study Area and Project Area. The Project Area, although not specified in the guidelines, was defined to help describe the potential site-specific effects of the DGR Project. Each study area includes the smaller study areas (i.e., they are not geographically separate).

ES.3 VALUED ECOSYSTEM COMPONENTS

While all components of the environment are important, it is neither practicable nor necessary to assess every potential effect of a project on every component. The EA focuses on the components that have the greatest relevance in terms of value and sensitivity, and which are likely to be affected by the project. To achieve this focus, specific Valued Ecosystem Components (VECs) are identified. A VEC is considered to be the 'receptor' for both project-specific effects and cumulative effects. A VEC can be represented by a number of 'indicators', which are features of the VEC that may be affected by the DGR Project (e.g., habitat use). Each indicator requires specific 'measures' that can be quantified and assessed (e.g., changes in habitat availability and suitability). In essence, the nature and magnitude of the effects of the DGR Project on these VECs has been studied and their significance determined.

Selection of the terrestrial VECs considered the following:

- presence and abundance in the study areas;
- ecological importance – position in the food web, relative contribution to productivity;
- baseline data availability – sufficient information to allow a reasonable evaluation of effects;
- whether it is a species native to the area;
- the degree of exposure to the "stressors" produced by the DGR Project physical works or activities;
- sensitivity to the "stressors" produced by the DGR Project physical works or activities;
- socio-economic importance – i.e., value as commercial, recreational or subsistence fishery;
- inherent aesthetic value;
- historical Aboriginal importance; and

- conservation status – specifically protected by law; designated as rare, threatened, or endangered.

The following VECs are used in assessing the effects of the DGR Project on the terrestrial environment:

- eastern white cedar;
- heal-all;
- common cattail;
- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- red-eyed vireo;
- wild turkey;
- yellow warbler;
- mallard;
- bald eagle;
- Midland painted turtle; and
- northern leopard frog.

ES.4 RESULTS

Project-environment interactions are identified and assessed for potential measurable changes. Measurable changes to both wildlife species (e.g., disruption from changes in noise levels) and plant species (e.g., clearing during site preparation) are identified. The identified measurable changes are assessed to determine whether they were adverse. The following residual adverse effect is identified after taking mitigation measures into consideration for the terrestrial environment:

- The loss of eastern white cedar resulting from clearing of mixed forests within the Project Area. This effect was assessed to be not significant.

In addition, the following other conclusions are made regarding the terrestrial environment:

- all other plant species VECs will not be adversely affected by the proposed clearing and site preparation activities on the site;
- biodiversity within any of the study areas is not expected to be affected as the result of the construction, operation or decommissioning of the DGR Project;
- as the mixed forest is not being managed as a renewable source of lumber, the clearing of the land nor any other activity involved with the DGR Project are not expected to affect any other renewable and non-renewable resources considered in this TSD.
- no residual adverse effects were identified for wildlife species VECs as the result of the site preparation and construction, operation or decommissioning of the DGR Project; and
- climate change is not expected to alter the conclusions reached regarding the effects of the DGR Project on plant or wildlife species VECs, or the environment on the DGR Project.

ES.5 PRELIMINARY FOLLOW-UP PROGRAM

Follow-up monitoring programs are required to:

- verify the key predictions of the EA studies; or

- confirm the effectiveness of mitigation measures, and in so doing, determine if alternate mitigation strategies are required.

The proposed follow-up program for the terrestrial environment includes monitoring of plant species, communities, and wildlife habitat use adjacent to the areas that have been cleared. Monitoring is to be completed once, following the site preparation and construction phase of the DGR Project.

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1. INTRODUCTION

Ontario Power Generation (OPG) is undergoing a multi-year planning and regulatory approvals process for a deep geologic repository (DGR) for the long-term management of low and intermediate level waste (L&ILW). Currently, the L&ILW produced as a result of the operation of OPG-owned nuclear reactors is stored centrally at OPG's Western Waste Management Facility (WWMF) located at the Bruce nuclear site. Although current storage practices are safe and could be continued safely for many decades, OPG's long-term plan is to manage these wastes in a long-term management facility.

A key element of the regulatory approvals process is an environmental assessment (EA), the findings of which are presented in an Environmental Impact Statement (EIS). The EA considers the long-term management of L&ILW currently in interim storage at the WWMF, as well as that produced by OPG-owned or operated nuclear generating stations, in a DGR at the Bruce nuclear site in the Municipality of Kincardine, Ontario. The project location is shown on Figure 1-1. Throughout this report, OPG's proposal is referred to as the "DGR Project". The DGR Project includes site preparation and construction, operations, decommissioning, and abandonment and long-term performance of the proposed DGR.

The DGR Project will be constructed in competent sedimentary bedrock beneath the Bruce nuclear site near the existing WWMF. The underground facilities will include access-ways (shafts and tunnels), emplacement rooms and various underground service areas and installations. The surface facilities include the underground access and ventilation buildings, Waste Package Receiving Building (WPRB) and related infrastructure. All surface and underground facilities will be located within the boundaries of the OPG-retained lands near the WWMF at the Bruce nuclear site.

OPG is the proponent for the DGR Project. OPG will own, operate, and be the licensee for the DGR Project. The regulatory approvals phase of the DGR Project, including the EA process and the site preparation and construction licensing, has been contracted to the Nuclear Waste Management Organization (NWMO). The NWMO is responsible, with support from OPG, for completing the EA, preparing the EIS and obtaining the site preparation and construction licences.

1.1 EA PROCESS AND REGULATORY CONTEXT

The EA process was initiated by the submission of a Project Description for the DGR Project by OPG to the Canadian Nuclear Safety Commission (CNSC) on December 2, 2005. The site preparation and construction licence application for the DGR was submitted by OPG to the CNSC on August 13, 2007. An EA of the proposed DGR Project is required under the provisions of the *Canadian Environmental Assessment Act* (CEAA) because the proponent (OPG) will require a licence from the CNSC to allow the DGR Project to proceed. Under the CEAA, the CNSC is identified as the Responsible Authority (RA); however, the Canadian Environmental Assessment Agency also has statutory responsibilities.

Under the CEAA, this type of project is identified in the Comprehensive Study List Regulations. The CNSC issued draft guidelines for a comprehensive study EA of the DGR Project, which were the subject of a public hearing held in Kincardine on October 23, 2006. Following the hearing, CNSC Commission members recommended to the Minister of the Environment that the

DGR Project be referred to a review panel given the public concerns, possibility of adverse environmental effects, the first-of-a-kind nature of the project and concerns regarding the comprehensive study's ability to address all the questions raised [1].

The Minister of the Environment referred the EA of the DGR Project to a joint review panel on June 29, 2007. Draft guidelines for the preparation of the EIS were issued by the Canadian Environmental Assessment Agency and the CNSC for public review on April 4, 2008. The guidelines, a copy of which is included in EIS as Appendix A, were finalized on January 29, 2009. The scope of the EA for the DGR Project includes the site preparation, construction, operations and decommissioning of the above- and below-ground facilities for the long-term management of L&ILW. The EA also addresses the abandonment and long-term performance of the DGR Project.

An EA is a tool to provide an effective means of integrating environmental factors into the planning and decision-making processes in a manner that promotes sustainable development and minimizes the overall effect of a project. The methods used in the EA and presented in the EIS are consistent with the final guidelines, and are based on systematic and detailed consideration of the systems, works, activities and events comprising the DGR Project.

1.2 EA REPORTING STRUCTURE

The EA for the DGR Project is documented in an EIS, which is based on the final DGR Project EIS Guidelines and the work detailed in a series of technical support documents (TSDs). In addition, there are parallel technical studies, information from which is also used in preparing the EIS and TSDs. Finally, the findings are summarized in the EIS Summary. Figure 1.2-1 illustrates the relationships between the EIS and summary report, its supporting documents, and the independent technical studies for the DGR Project.

The EIS comprises the following volumes:

- **Volume 1** consolidates and summarizes all aspects of the EIS studies. It includes a description of the EA methods, a description of the DGR Project, a description of the existing environment, an assessment of likely environmental effects, including cumulative effects, a discussion of the proposed follow-up program, and a discussion of the communication and consultation program.
- **Volume 2** contains a series of appendices that support the material in Volume 1, including a copy of the guidelines and human health assessment. It also contains a summary of the community engagement and consultation program along with copies of supporting materials.

The TSDs present information on the existing environment and discuss the process used to assess the direct and indirect effects of the DGR Project on the environment. The TSDs, on which the EIS is based, are as follows:

- Atmospheric Environment;
- Hydrology and Surface Water Quality;
- Geology;
- Aquatic Environment;

- Terrestrial Environment;
- Socio-economic Environment;
- Aboriginal Interests;
- Radiation and Radioactivity; and
- Malfunctions, Accidents and Malevolent Acts.

These TSDs are also interconnected with one another. Each respective report focuses on the effects of the DGR Project on that particular aspect of the environment, be it through a direct interaction with the DGR Project or through a change identified in another TSD (i.e., an indirect interaction). Cross-references are provided throughout the TSD where it relies on information predicted in another report.

The TSDs assess the direct and indirect effects of the DGR Project as a result of normal conditions, with the exception of the Malfunctions, Accidents and Malevolent Acts TSD. The EIS guidelines require an identification of credible malfunctions and accidents, and an evaluation of the effects of the DGR Project in the event that these accidents or malfunctions occur. All of these effects are discussed and assessed in the Malfunctions, Accidents and Malevolent Acts TSD regardless of the element of the environment that is affected. The reasoning for this is that a single accident is likely to affect multiple elements of the environment.

It is important to note that the assessment of potential radiation and radioactivity effects of the DGR Project are documented in the Radiation and Radioactivity TSD, regardless of the physical media through which they are transported (e.g., air or water). This was done because of the special importance placed on radiation and radioactivity, and the combined effects to the receiving environment regardless of the path of exposure.

The independent parallel technical study reports used in preparing the EIS include the following:

- Postclosure Safety Assessment [2];
- Geosynthesis [3]; and
- Preliminary Safety Report [4].

This Terrestrial Environment TSD evaluates the non-radiological effects of site preparation and construction, operations, and decommissioning of the DGR Project on vegetation (terrestrial and riparian) and wildlife (including mammals, birds and herpetofauna). The abandonment and long-term performance phase is considered in Section 9 of the EIS. To facilitate this assessment, a description of the existing environmental features is also included.

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LEGEND

- City
- Highway
- Provincial Highway
- Secondary Highway

0 5 10 20 30 40 50

Kilometres

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2005
Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

LOCATION OF THE DGR PROJECT

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	14 Apr. 2010		
CHECK	BC	14 Apr. 2010		
REVIEW	MAR	14 Apr. 2010		

FIGURE 1-1

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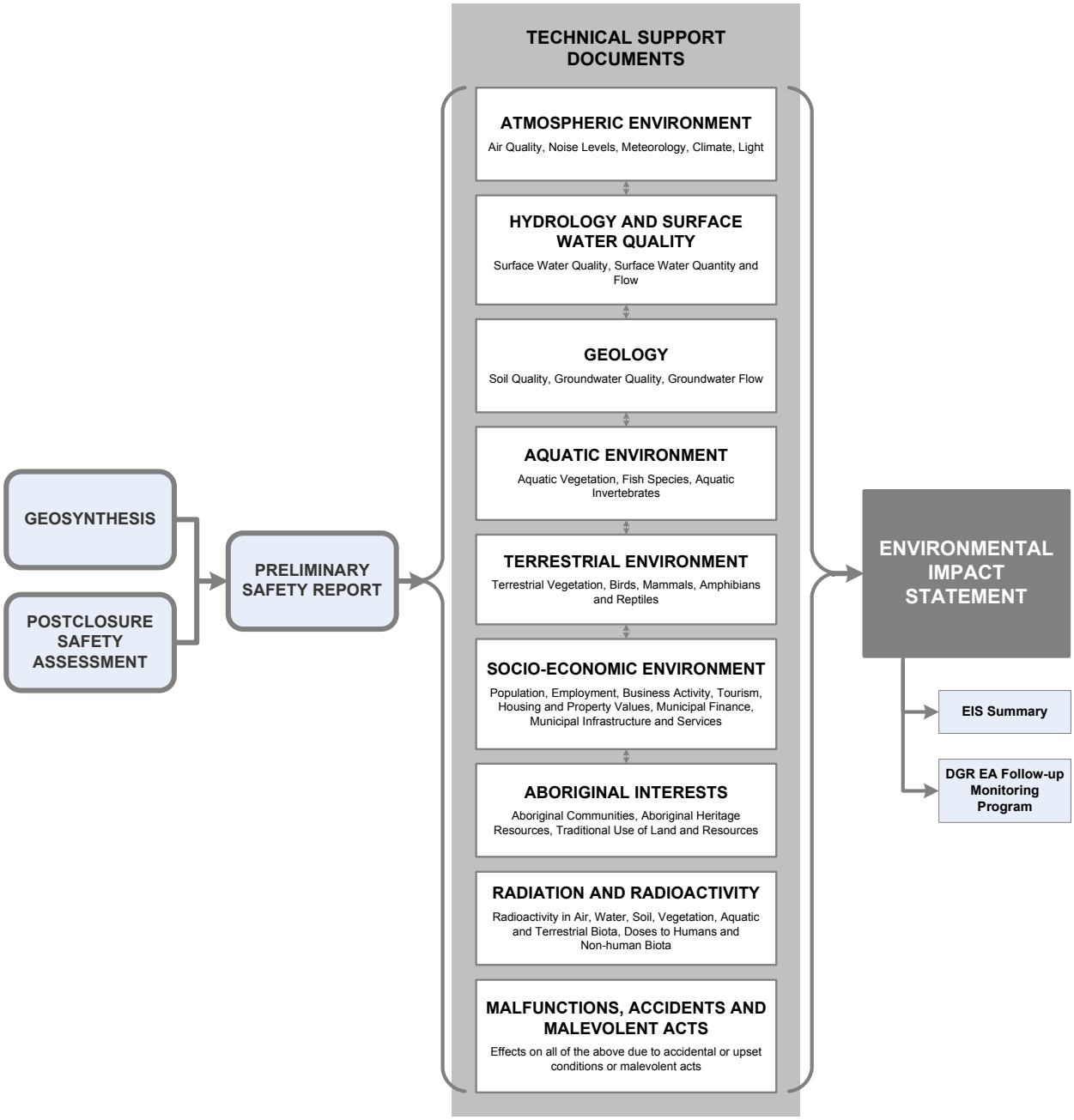

Figure 1.2-1: EIS Reporting Structure

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2. APPROACH

2.1 GENERAL SUMMARY OF EA APPROACH

The approach used for assessing the DGR Project, and documented in this TSD, supports the philosophy of EA as a planning and decision-making process. The assessment characterizes and assesses the effects of the DGR Project in a thorough, traceable, step-wise manner. The approach used in the assessment is illustrated on Figure 2.1-1, and includes the following steps:

- **Describe the Project.** As summarized in Section 3, the project is described as a number of works and activities that could affect the surrounding environment.
- **Describe the Existing Environment.** The existing environment is characterized using available information and field studies, as described in Section 5. The description of the existing environment reflects the cumulative effects of past and existing projects on the environment.
- **Screen to Focus the Assessment.** Two screening steps, first for potential interactions and secondly for measurable change, allow the assessment to focus on where effects are likely to occur. These steps are completed using professional judgement; if there is uncertainty, the interaction is advanced for assessment. The screening steps are completed in Sections 6 and 7.
- **Assess Effects.** Where there is likely to be a measurable change, the effects on the environment are predicted and assessed as to whether or not they are adverse, as described in Section 8. If adverse effects are predicted, mitigation measures to reduce or eliminate the effect are proposed, and residual adverse effects, if any, are identified. Any residual adverse effects are then assessed in Section 10 of the EIS to determine whether they are likely to combine with the effects of other past, present or reasonably foreseeable future projects and activities in the surrounding region to produce cumulative effects.
- **Determine Significance.** All residual adverse effects are then assessed in Section 11 to determine whether the effect is significant, or not, taking into account the magnitude, extent, duration, frequency and irreversibility of the effect.
- **Propose Follow-up Programs.** Finally, follow-up monitoring is proposed to confirm that mitigation measures are effective and the effects are as predicted. Monitoring activities are described in Section 13.

The assessment of effects of the DGR Project focuses on Valued Ecosystem Components (VECs), which are elements of the environment considered to be important for cultural or scientific reasons. Terrestrial environment VECs are defined and described in detail in Section 4. Criteria for determining measurable changes and adverse effects are defined for each individual VEC. The detailed methods for each of these steps, including how they are applied to this particular TSD, are described at the beginning of each of the respective sections.

The screening and assessment steps described above follow a source-pathway-receptor approach. The DGR Project works and activities represent the source of a change, a measurable change to the environment represents a pathway and the VEC represents the receptor. In some cases, VECs may act as both pathways and receptors.

Effects from the DGR Project may occur either directly or indirectly. A direct interaction occurs when the VEC is affected by a project work and activity (e.g., collisions with worker vehicles may affect individual white-tailed deer). An indirect interaction occurs when the VEC is affected by a change in another VEC (e.g., changes in air quality [a VEC in the Atmospheric Environment TSD] could affect the eastern white cedar).

There are many linkages and connections between aspects of the physical, biophysical and socio-economic environments in an integrated EA. The linkages to this TSD are illustrated using an information flow diagram. Figure 2.1-2 presents the flow of information related to the terrestrial environment VECs and where the indirect effects are evaluated. Multi-feature VECs are evaluated in Section 7 of the EIS (e.g., human health). An assessment of the cumulative effects associated with the DGR Project is addressed in Section 10 of the EIS.

The assessment is completed within the framework of defined temporal and spatial boundaries, and takes into account a precautionary approach and Aboriginal traditional knowledge, where available. These are described in further detail in the following sections.

2.2 PRECAUTIONARY APPROACH

The EA, as a forward-looking planning tool used in the early stages of project development, is based on a precautionary approach. This approach is guided by judgement, based on values and intended to address uncertainties in the assessment. This approach is consistent with Principle 15[1] of the 1992 Rio Declaration on Environment and Development and the Canadian government's framework for applying precaution in decision-making processes [5].

Throughout the EA, the DGR Project has been conservatively considered in a thorough and traceable manner. For example, at each of the screening stages, potential project-related effects are advanced if they cannot be systematically removed from consideration through application of rigorous, sound and credible scientific evidence. In addition, with the exception of malfunctions, accidents and malevolent acts, all identified residual adverse effects are assumed to occur (i.e., probability of occurrence is assumed to be 1.0), and are assessed for significance.

A further precautionary feature incorporated into the assessment method is that the evaluation of potential effects is based on changes to the existing environment and not solely on regulatory compliance. This captures and assesses changes to the existing environment that may fall outside or below applicable regulatory frameworks.

The precautionary approach adopted for the EA of the DGR Project is described further in Section 1 of the EIS, and a summary of how precaution has been taken into account in the assessment of the terrestrial environment is provided at the end of the assessment section (Section 8).

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[1] Principle 15 of the 1992 Rio Declaration on Environment and Development states that "Where there are threats of serious or irreversible damage, lack of full scientific certainty must not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

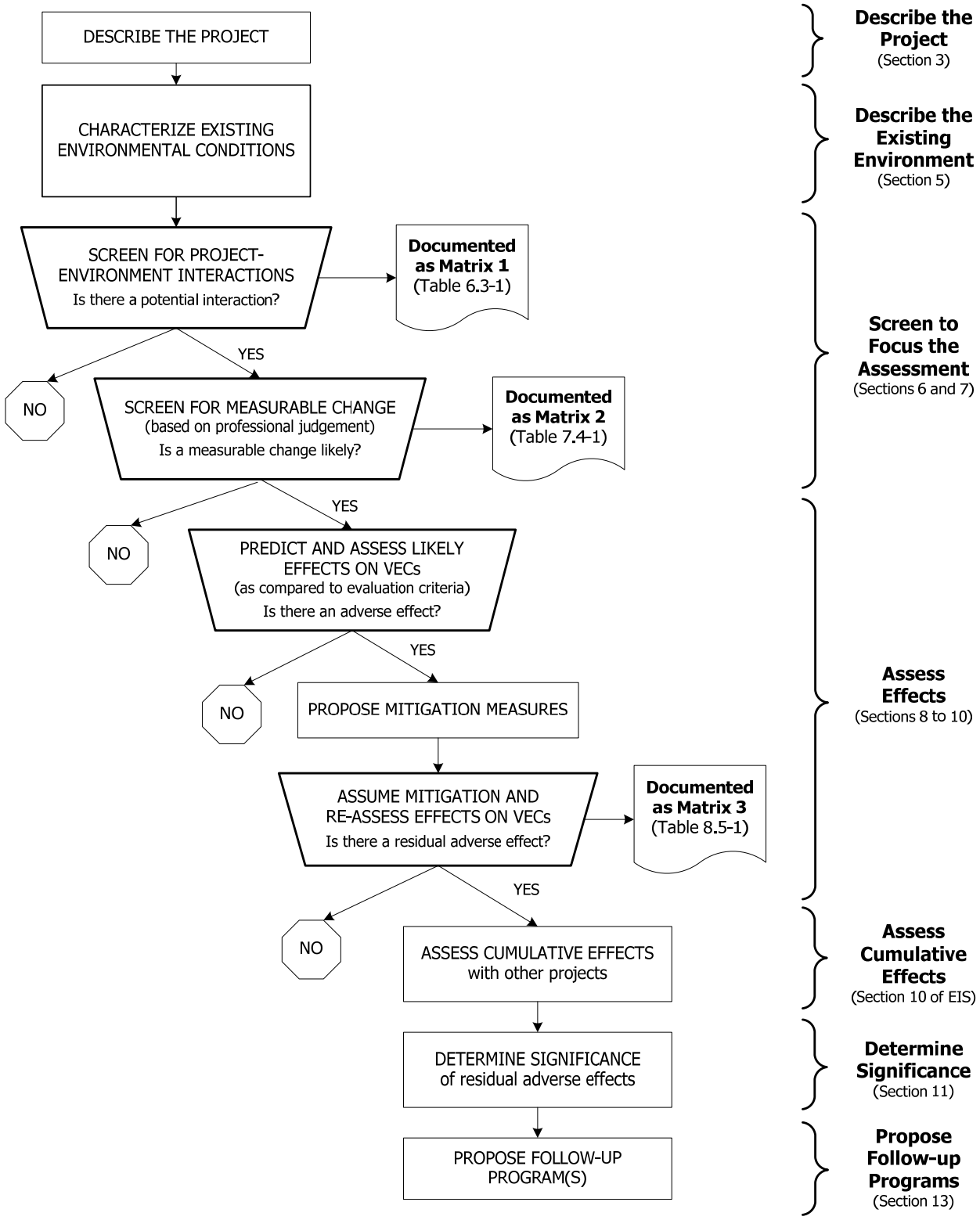

Figure 2.1-1: Methodology for Assessment of Effects

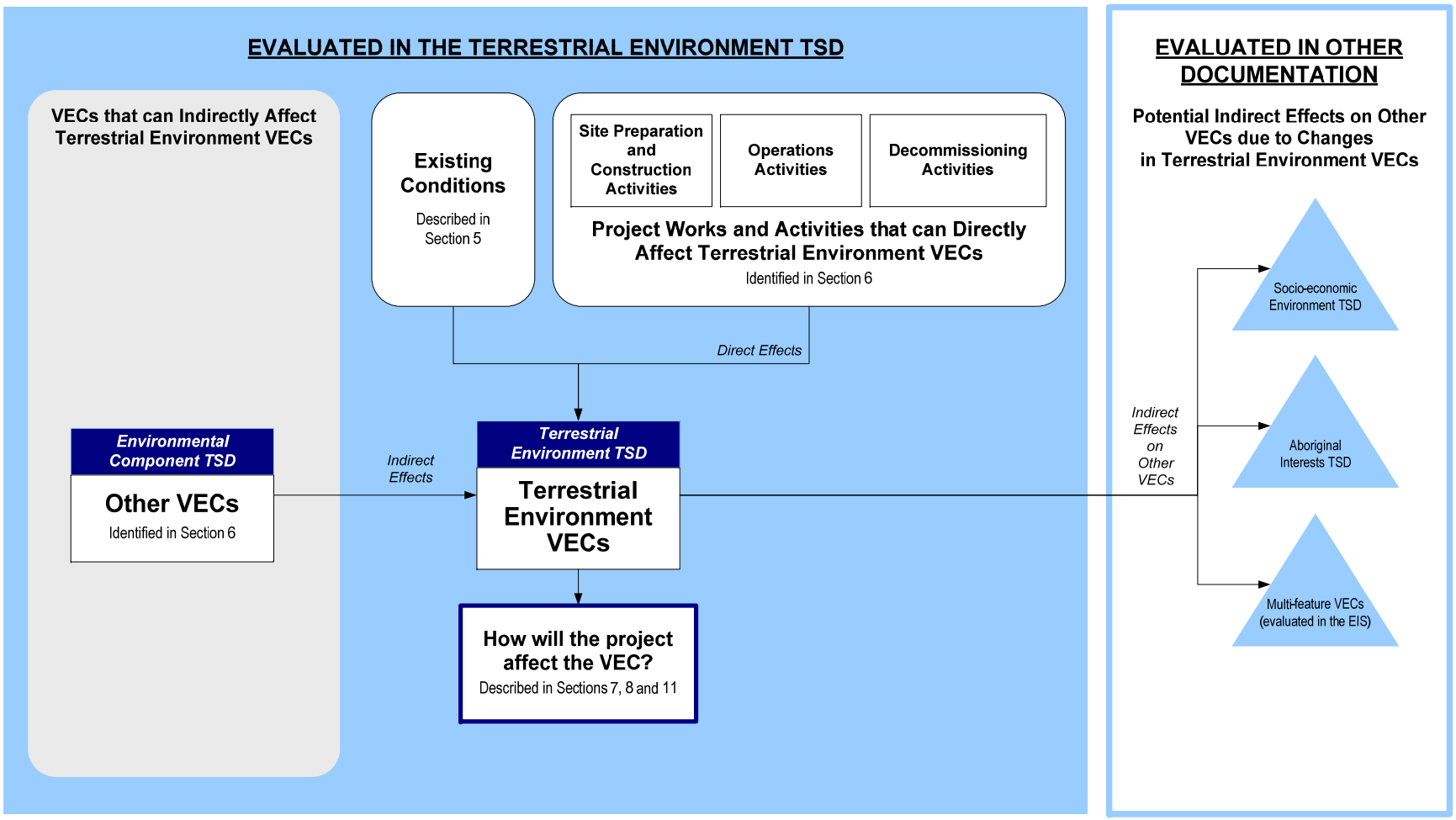

Figure 2.1-2: Information Flow Diagram for the Terrestrial Environment VECs

2.3 ABORIGINAL TRADITIONAL KNOWLEDGE

This EA considers both western science and traditional and local knowledge, where that information is available. Guidance provided by the Canadian Environmental Assessment Agency describes Aboriginal traditional knowledge as knowledge that is held by and unique to, Aboriginal peoples [6]. Aboriginal traditional knowledge is a body of knowledge built up by a group of people through generations of living in close contact with nature. It is cumulative and dynamic and builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change.

Traditional ecological knowledge is a subset of Aboriginal traditional knowledge. Traditional ecological knowledge "refers specifically to all types of knowledge about the environment derived from the experience and traditions of a particular group of people" [7]. There are four traditional ecological knowledge categories:

- knowledge about the environment;
- knowledge about the use of the environment;
- values about the environment; and
- the foundation of the knowledge system.

In this EA, specific traditional knowledge where available, is incorporated through the characterization of the existing environment and assessment of effects. Issues of importance to Aboriginal communities were identified as part of the Aboriginal Interests TSD through examination of available information pertaining to general ecological, socio-economic and cultural heritage interests for Ojibway and Métis peoples in Ontario. This examination identified a range of interests raised by Aboriginal communities that can be used to focus this EA relative to potential effects on residents of the Aboriginal communities in the study areas. This examination included the following:

- interests raised by Aboriginal communities as presented in previous studies;
- interests raised by Aboriginal communities in the context of dialogue for the DGR Project; and
- insight into traditional knowledge, and interests of general importance to Ojibway and Métis peoples.

The analysis undertaken and conclusions reached regarding adverse and beneficial effects are applicable to both Aboriginal and non-Aboriginal communities.

2.4 TEMPORAL AND SPATIAL BOUNDARIES

The assessment of the DGR Project works and activities on the environment is conducted within the framework of temporal and spatial boundaries that are common to all of the environmental components (with some modifications). The particular temporal and spatial boundaries used in the assessment of the terrestrial environment are described in the following sections.

2.4.1 Temporal Boundaries

The temporal boundaries for the EA establish the timeframes for which the direct, indirect and cumulative effects are assessed. Four temporal phases were identified for the DGR Project:

- **Site Preparation and Construction Phase**, which includes site preparation and all activities associated with the construction of the DGR Project, up until operations commence with the placement of waste. All of the construction activities at the DGR Project will occur during this phase. The site preparation and construction phase is expected to last approximately five to seven years.
- **Operations Phase**, which covers the period during which waste is emplaced in the DGR Project, as well as a period of monitoring prior to the start of decommissioning. Activities include receipt and on-site handling of waste packages, transfer underground and emplacement of L&ILW in rooms in the DGR Project, and activities necessary to support and monitor operations. The operations phase is expected to last approximately 40 to 45 years with waste being emplaced for the first 35 to 40 years. The length of the monitoring period would be decided at some future time in consultation with the regulator.
- **Decommissioning Phase**, which begins immediately after the operations phase for the DGR Project. Activities include preparation for decommissioning, decommissioning and may include monitoring following decommissioning. The decommissioning activities, including dismantling surface facilities and sealing the shaft, are expected to take five to six years.
- **Abandonment and Long-term Performance Phase**, which begins once decommissioning activities are completed. This period will include institutional controls for a period up to three hundred years.

These timeframes are intended to be sufficiently flexible to capture the effects of the DGR Project. The assessment of the terrestrial environment focuses on the first three phases as there are no activities during the abandonment and long-term performance phase that could interact with terrestrial environment VECs. The effects of the DGR Project during the abandonment and long-term performance phase are discussed in Section 9 of the EIS.

2.4.2 Spatial Boundaries

Spatial boundaries define the geographical extents within which environmental effects are considered. Therefore, these boundaries become the study areas adopted for the EA.

The DGR Project EIS Guidelines require that the study areas encompass the environment that can reasonably be expected to be affected by the DGR Project, or which may be relevant to the assessment of cumulative effects. Specific study areas are defined by boundaries to encompass all relevant components of the environment including the people, land, water, air and other aspects of the natural environment.

Four study areas were selected for the assessment of the terrestrial environment effects of the DGR Project: the Regional Study Area, Local Study Area, Site Study Area and Project Area. The Project Area, although not specified in the EIS Guidelines, was defined to help describe the potential site-specific effects of the DGR Project. Each study area includes the smaller study

areas (i.e., they are not geographically separate). These areas are described in the following sections.

2.4.2.1 Regional Study Area

The Regional Study Area (Figure 2.4.2-1) corresponds to Bruce County boundaries excluding the peninsula communities of the Town of South Bruce Peninsula and the Township of Northern Bruce Peninsula. The discussion of the terrestrial environment at this spatial scale encompasses larger-scale biological resources and systems within Bruce County potentially affected by the DGR Project because of their interconnections. Examples of such features include the habitat provided by the Niagara Escarpment or areas of importance in the migration of birds through the Regional Study Area, such as Cabot Head and Chantry Island. The Regional Study Area highlights a systems approach to ecology, where large landscape scale habitat features and functions are the focus. The discussion of Regional Study Area considers its associations with biological resources and systems in the Site and Local Study Areas that have been adopted for the terrestrial environment (described in the following sections).

2.4.2.2 Local Study Area

The Local Study Area (Figure 2.4.2-2) corresponds to the 10 km emergency planning zone (centered at the Bruce nuclear site), as identified by Emergency Measures Ontario, and extends northward to include the MacGregor Point Provincial Park Life Science Area of Natural and Scientific Interest (ANSI). The Local Study Area was determined based on the direct and indirect interconnections of habitats from the Regional to Site Study Areas scales, and the linkages that species and communities may utilize for movement through these habitats.

2.4.2.3 Site Study Area

The Site Study Area (Figure 2.4.2-3) corresponds to the property boundary of the Bruce nuclear site, including exclusion zones, within which the DGR Project is located. The terrestrial environment study focussed on characterizing the conditions within this area, expanded by 100 m in all directions. This 100 m buffer has been incorporated into the Site Study Area for the terrestrial environment to provide conservatism in the assessment since it captures sensitive species that may reside in, or utilize habitat units adjacent to or connected with habitat units within the boundaries of the generic Site Study Area. This expansion is consistent with recommendations made by the Ontario Ministry of Natural Resources (OMNR) for habitat area of endangered or threatened species that should be addressed in the assessment of a proposed development [8].

2.4.2.4 Project Area

The Project Area (see Figure 2.4.2-3) corresponds to the boundary of the OPG-retained lands at the centre of the Bruce nuclear site where the DGR Project is being proposed. The Project Area encompasses 95 ha. The effects assessment carried out for the terrestrial environment focused on the Project Area, as this is the scale at which DGR Project is located. The terrestrial environment component focussed on an area generally corresponding to 100 m in all directions beyond the Project Area. This area is consistent with recommendations made by the Ontario Ministry of Natural Resources (OMNR) for the extent of the habitat area of endangered or threatened species that should be addressed in the assessment of a proposed development [8].

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LEGEND

- Site Study Area [1]
- Local Study Area
- Regional Study Area
- County Boundary
- Niagara Escarpment
- First Nations' Lands

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 5 10 20 30 40 50
Kilometres

PROJECT
TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE
REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT No. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	20 Apr. 2010		
CHECK	AB	20 Apr. 2010		
REVIEW	MAR	20 Apr. 2010		

FIGURE 2.4.2-1

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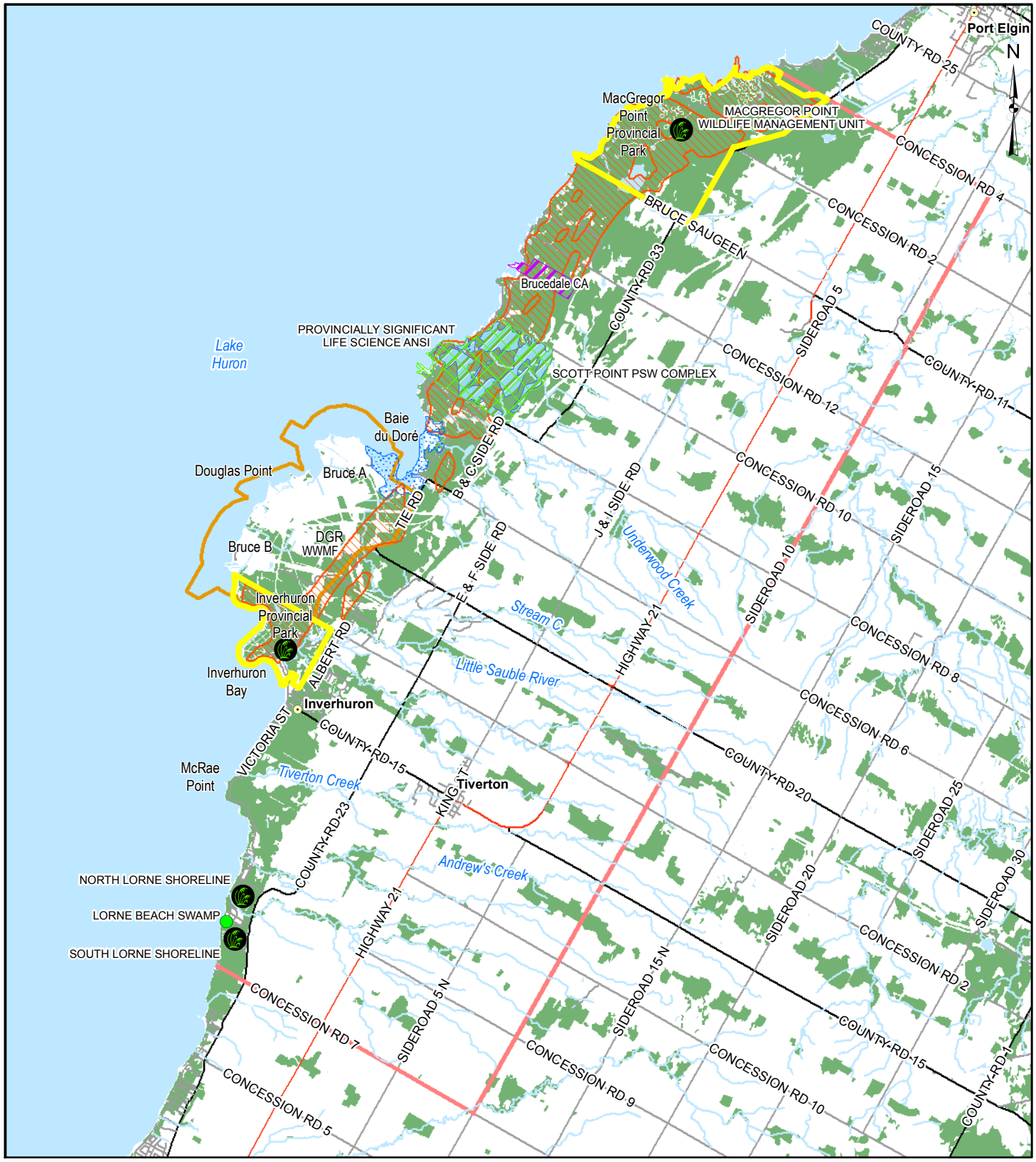

LEGEND

- Regionally Significant Wetland
- International Biological Program Site
- Site Study Area [1]
- Local Study Area
- Baie du Doré Provincally Significant Wetland
- Scott Point Provincially Significant Wetland
- Provincially Significant Life Science ANSI
- Provincial Park
- Huron Fringe Deeryard
- Brucedale CA

0 0.5 1 2 3 4 5
Kilometres

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

LOCAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT No. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct 2007		
GIS	BC	20 Apr. 2010		
CHECK	AB	20 Apr. 2010		
REVIEW	MAR	20 Apr. 2010		

FIGURE 2.4.2-2

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LEGEND

- Project Area (OPG-retained lands that encompass the DGR Project)
- Site Study Area [1]

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 0.5 1 2
Kilometres

PROJECT
TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE
SITE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT No. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	20 Apr. 2010		
CHECK	AB	20 Apr. 2010		
REVIEW	MAR	20 Apr. 2010		

FIGURE 2.4.2-3

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3. PROJECT DESCRIPTION

The assessment of effects requires a detailed description of the DGR Project. The individual works and activities are the physical structures, buildings, systems, components, activities and events comprising the DGR Project. These are collectively referred to as the DGR Project works and activities. This section provides an overview of the DGR Project. The specific works and activities required for the DGR Project are summarized in the Basis for EA in Appendix B. Further details on the DGR Project design can be found in Section 4 of the EIS and in Chapter 6 of the Preliminary Safety Report [4].

3.1 OVERVIEW

The DGR Project will receive L&ILW currently stored in interim facilities at the WWMF, as well as that produced from OPG-owned or operated generating stations. Low level waste consists of industrial items and materials such as clothing, tools, equipment, and occasional large objects such as heat exchangers, which have become contaminated with low levels of radioactivity. Intermediate level waste consists primarily of used reactor components and resins used to clean the reactor water circuits. The capacity of the DGR Project is a nominal 200,000 m³ of "as-disposed" waste.

The DGR Project comprises two shafts, a number of emplacement rooms, and support facilities for the long-term management of L&ILW (Figure 3.1-1). The DGR Project will be constructed over a period of 5 to 7 years. The DGR Project design is the result of a thorough comparison and evaluation of different alternative methods of implementing the DGR Project. This includes considerations such as the layout of the DGR Project and construction methods. The evaluation compared each of the alternative means using technical, safety, environmental and economic factors to identify the preferred alternative. This evaluation is presented in Section 3 of the EIS. This TSD assesses the effects of the preferred alternative means (i.e., the DGR Project) on the terrestrial environment.

3.2 SITE DESCRIPTION AND PROJECT LAYOUT

3.2.1 Surface Facilities

The surface DGR Project facilities will be located on vacant OPG-retained land to the north of the existing WWMF. A new crossing will be constructed over the abandoned rail bed to provide access to the proposed DGR Project site from the WWMF (Figure 3.2.1-1). The surface structures will be grouped in relatively close proximity to facilitate operations and maintenance activities, and provide a compact footprint.

The Waste Package Receiving Building (WPRB) will receive all radioactive waste packages and transfer them to the main shaft cage for transfer underground. A maintenance workshop and stores for essential shaft-related spares and materials will be attached to the WPRB. An office, main control room and amenities building will also form part of the main shaft complex for administrative purposes, control and monitoring of the DGR Project, and receiving visitors to the DGR Project. An electrical sub-station will provide power to the entire facility, both surface and underground, and an emergency power supply system will maintain critical equipment in the event of an outage.

Waste rock piles for the complete excavated volume of rock will be accommodated to the north-east of the two shafts. A stormwater management system of ditches and a pond will be provided to control the outflow of surface runoff and sump discharge water from the site before release into an existing network of ditches at the Bruce nuclear site, and ultimately Lake Huron (Figure 3.2.1-1). The discharge will also be monitored to confirm it meets certificate of approval water quality requirements.

3.2.2 Underground Facilities

The underground DGR Project facilities will be constructed in limestone bedrock (Cobourg Formation) at a nominal depth of 680 m beneath the OPG-retained lands in the centre of Bruce nuclear site (Figure 3.1-1). The overall underground arrangement enables infrastructure to be kept in close proximity to the main shaft, while keeping the L&ILW emplacement areas away from normally occupied and high use areas.

The DGR Project will have two vertical shafts (main and ventilation shafts) in an island arrangement with a services area in which offices, a workshop, wash bay, refuge stations, lunch room and geotechnical laboratory will be provided. From this centralized area, the two panels of emplacement rooms are connected via access tunnels. A main access tunnel will be driven from the main shaft station to the east, passing the ventilation shaft and then proceeding towards the emplacement room panels. The main access tunnel will continue straight into the Panel 1 access tunnel, while a branch tunnel to the south will lead to the Panel 2 access tunnel. The length of the rooms is nominally 250 m. End walls may be erected once the rooms are filled.

The emplacement rooms will all be aligned with the assumed east-north-east direction of the major principal horizontal stresses of the rock mass to minimize the risks of any rock fall in the emplacement rooms.

A ventilation supply system will supply air at a controlled range of temperatures to ensure that freezing does not occur in the main shaft and the atmosphere is kept in a reasonably steady and dry state, which is suitable for workers and limits corrosion of structures and waste packages.

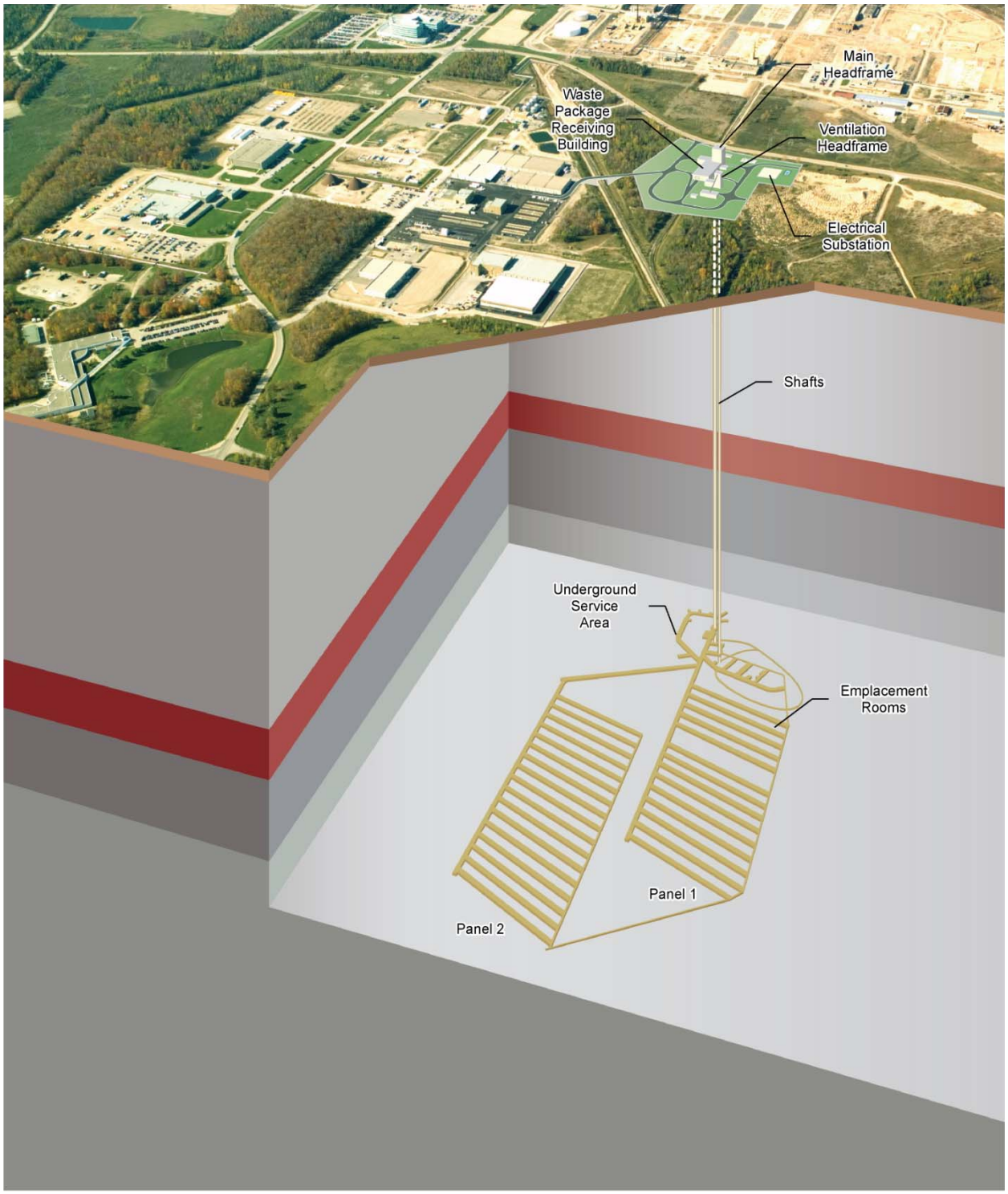

Figure 3.1-1: Schematic of the DGR Project

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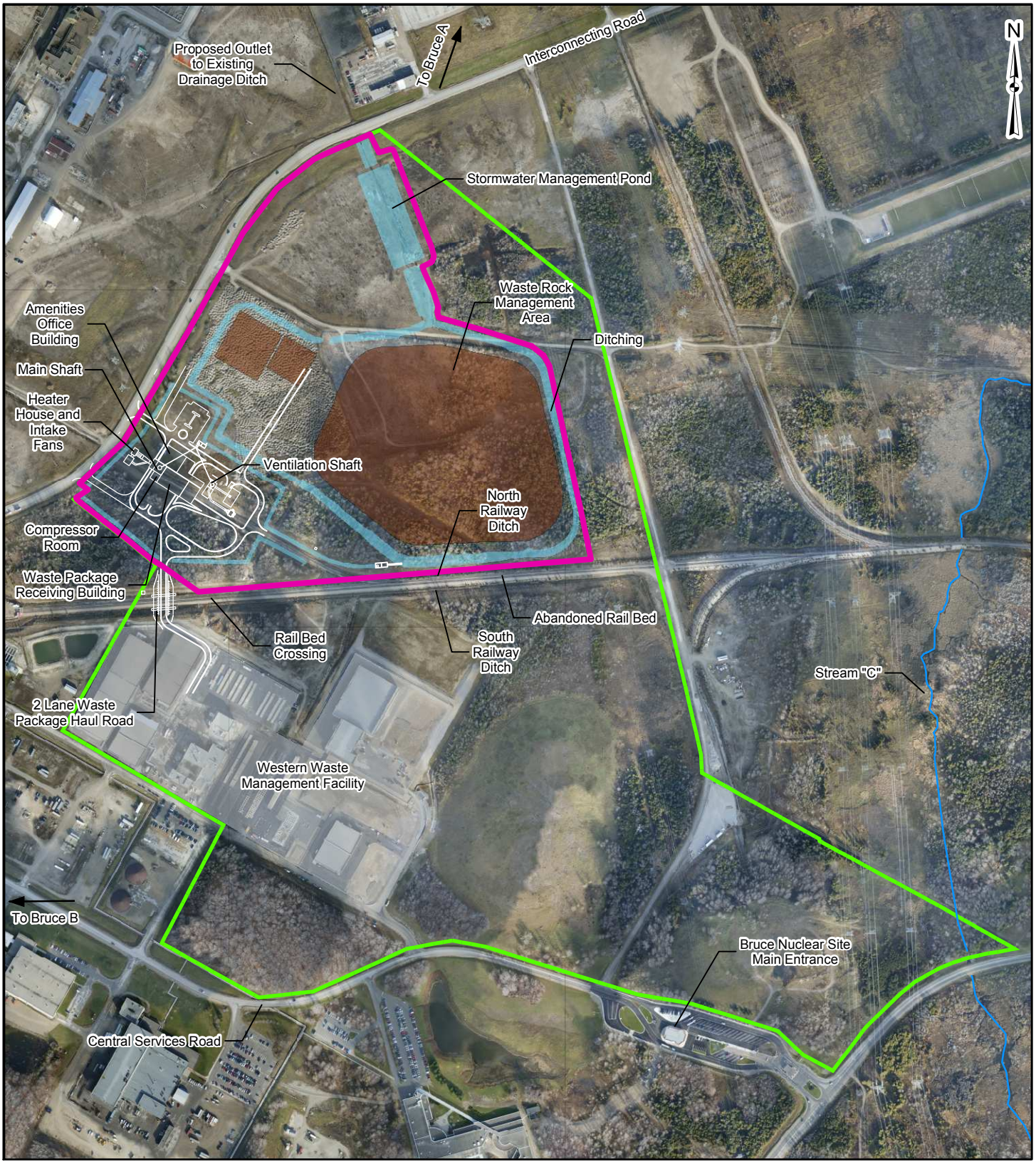

LEGEND

- DGR Project Site
- Project Area (OPG-retained lands that encompass the DGR Project)
- Soils and Rock Stockpile
- Stormwater Management System

0 125 250 500

Metres

REFERENCE

Base Data Provided by 4DM, Nov 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

LAYOUT OF DGR SURFACE INFRASTRUCTURE

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	AB	16 Mar. 2010		
GIS	BC	25 Nov. 2010		
CHECK	KC	25 Nov. 2010		
REVIEW	AB	25 Nov. 2010		

FIGURE 3.2.1-1

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4. SELECTION OF VECS

While all components of the environment are important, it is neither practicable nor necessary to assess every potential effect of a project on every component of the environment. An EA focuses on the components that have the greatest relevance in terms of value and sensitivity, and which are likely to be affected by the project. To achieve this focus, specific Valued Ecosystem Components (VECs) are identified. The Canadian Environmental Assessment Agency states that VECs are *"Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process"* [9]. Importance may be determined on the basis of cultural values or scientific concerns. VECs can be an individually valued component of the environment or a collection of components that represent one aspect of the environment (e.g., species or 'guilds').

From an ecological perspective, VECs can represent features or elements of the natural environment (e.g., a local wetland or stream) considered to be culturally or scientifically important. Such features may be complex, comprising several ecological aspects, and affected by a range of pathways (i.e., routes of exposure or effect). In essence, these ecological feature VECs would encompass a number of individual VECs such as:

- an aspect of the physical environment (e.g., water quality);
- an individual species (e.g., mallard duck or northern short-tailed shrew); or
- a range of species that serve as a surrogate for species that interact similarly with the environment (e.g., benthic invertebrates).

A VEC is considered to be the receptor for both project-specific effects and cumulative effects. A VEC can be represented by a number of indicators. Indicators are features of the VEC that may be affected by the DGR Project (e.g., distribution and abundance). Each indicator requires specific 'measures' that can be quantified and assessed (e.g., changes in distribution).

The VECs are identified using the expertise (including professional judgement, knowledge of previous studies, and knowledge of key species and ecosystem structure in the area) of the technical specialists with input from regulators and members of the public. The VECs for the DGR Project were available for discussion and comment at the open houses held in October 2007, November 2008, November 2009 and summer/fall 2010. At the November 2008 open house, the public was encouraged to add VECs to the list and to identify the VECs that were most important to them. The public also had the opportunity to provide input on the list of VECs during the public review of the draft guidelines.

Thirteen VECs are used in assessing the effects of the DGR Project on the terrestrial environment. These VECs were selected to be representative of the terrestrial environment likely to be important and susceptible to effects within the spatial context of the DGR Project. The rationale for selection of the VECs and the indicators used in the assessment are described in the following sections and summarized in Table 4-1.

The following sections identify and justify the selection of VECs for assessing the effects of the DGR Project on the terrestrial environment.

4.1 VALUED ECOSYSTEM COMPONENTS

A list of individual wildlife and plant species has been identified as biological VECs that are used in the assessment (Table 4-1). These VECs may be important in themselves, they may be a useful indicator of an exposure pathway for the physical environment, or they may be used to evaluate the effects of the DGR Project on important ecological features or functions. The list of biological species selected as VECs is sufficiently broad and representative to allow the effects of the DGR Project to be assessed to an appropriate level of detail.

Selection of terrestrial environment VECs considered the following:

- presence and abundance in the Site and Local Study Areas;
- ecological importance – position in the food web, relative contribution to productivity;
- baseline data availability – sufficient information to allow a reasonable evaluation of effects;
- origin of the species (i.e., whether it is a species native to the area);
- degree of exposure – the VEC must have a significant degree of exposure to the "stressors" produced by the DGR Project physical works or activities;
- sensitivity – the VEC must be sensitive to the "stressors" produced by the DGR Project physical works or activities;
- socio-economic importance – i.e., value as commercial, recreational or subsistence fishery;
- Aboriginal importance;
- inherent aesthetic value; and
- conservation status – specifically protected by law; designated as rare, threatened, or endangered.

Based on the above factors, and the rationale included in Table 4-1, individual species were selected as terrestrial environment VECs for the DGR Project.

The preliminary VECs proposed in the EIS Guidelines included the meadow vole (*Microtus pennsylvanicus*) as a representative small mammal VEC for the DGR Project. This species lives in a variety of habitats such as meadows, marshes, swamps, open areas and forests, and is an important food source for birds of prey and carnivorous mammals. However, small mammal trapping surveys conducted in 2009 failed to confirm that meadow voles are actively utilizing the natural and anthropogenic habitat units within the Project Area. The field program did, however, result in the capture of numerous northern short-tailed shrews (*Blarina brevicauda*). Due to similarities between these two species in terms of niche occupation and role in the foodweb, the northern short-tailed shrew has been identified as a VEC, and is advanced through the assessment.

Table 4-1: VECs Selected for the Terrestrial Environment

VEC	Rationale for Selection	Indicators	Measures
Plants			
Eastern white cedar (*Thuja occidentalis*)	• An abundant tree species in the Local Study Area. • The eastern white cedar is slow-growing, and plays an important role in providing conditions that support wildlife habitat and presence of plant species. • The eastern white cedar is preferred by white-tailed deer for both shelter and as an important food source in the winter, and is also used by such animals as snowshoe hare, porcupine and red squirrel. • As a coniferous plant, the eastern white cedar may be more susceptible to foliar damage from changes in air quality.	• Presence • Distribution • Abundance in plant species communities	• Changes in area of vegetation communities
Heal-all (*Prunella vulgaris*)	• Abundant native flowering perennial plant (forb) in the Site Study Area. • Heal-all grows quickly in a variety of habitats, and is typically found in meadows, grasslands, open woodlands and along roadsides. • Heal-all has long been used as a folk medicine, is used in eastern traditional medicine, and on-going scientific research suggests a variety of extracts may have pharmaceutical value. • As a fast-growing, herbaceous species, heal-all is susceptible to abrupt changes in soil characteristics.	• Presence • Distribution • Abundance in plant species communities	• Changes in area of vegetation communities

Table 4-1: VECs Selected for the Terrestrial Environment (continued)

VEC	Rationale for Selection	Indicators	Measures
Plants (continued)			
Common cattail *(Typha latifolia)*	• Common cattail is a native emergent wetland species. • This species grows intermittently in drainage ditches within the Site Study Area. • Cattail is known for its ability to filter wastewater, which may lead to pollutant (including heavy metals) accumulation in the plant tissues. • It is used by red-winged blackbird for nesting and by muskrat as a primary food source and as a shelter material. • It can be used to assess the effects of non-radiological emissions, in particular those to the surface water environment, on vegetation.	• Presence • Distribution • Abundance in plant species communities	• Changes in area of vegetation communities
Mammals			
Northern short-tailed shrew [a] (*Blarina brevicauda*)	• This species lives in meadows, grasslands, open areas and forests. • They are rarely found in dry habitats. • Burrows in loose soils. • This species was caught in small mammal traps in the Project Area. • They are omnivorous and eat almost their own weight daily. Their diet includes ground-dwelling species (e.g., earthworms) and plant matter. • They are an important food source for birds of prey, foxes and coyotes. • This species can be used to assess the effects of non-radiological emissions (airborne and waterborne) that may, in turn, influence forage opportunities.	• Presence • Distribution • Abundance	• Changes in habitat availability and suitability • Effects on individuals

Table 4-1: VECs Selected for the Terrestrial Environment (continued)

VEC	Rationale for Selection	Indicators	Measures
Mammals (continued)			
Muskrat (*Ondatra zibethicus*)	• Muskrats are found locally in ditches in the Site Study Area. • This is a small mammal species with limited home range that can occur in high densities in areas with appropriate food and shelter (i.e., cattail marsh). • Muskrats can be used to assess the effects of non-radiological emissions on local vegetation and surface water resources by assessing whether the ability of muskrats to continue to use their habitat is affected.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Behavioral effects on individuals
White-tailed deer (*Odocoileus virginianus*)	• Sustainable population of white-tailed deer at the Bruce nuclear site that overwinters in the coniferous forest cover and grazes in the fields and woodlands from spring to fall. • Evidence that the on-site deer population has influenced the development of forested communities within the Site Study Area through selective browsing. • The white-tailed deer can be used to assess the effects of non-radiological emissions that may, in turn, influence forage opportunities, the potential effects of road-related wildlife mortality within the Bruce nuclear site and noise disturbance associated with traffic, construction equipment, and increased human activity.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals

Table 4-1: VECs Selected for the Terrestrial Environment (continued)

VEC	Rationale for Selection	Indicators	Measures
Birds			
Red-eyed vireo (*Vireo olivaceus*)	• Red-eyed vireos have been observed in forest units within the Site Study Area. • Are a sensitive species. • A forest-dwelling nearctic-neotropical migrant songbird that breeds within deciduous and mixed forests within the Site Study Area. • During the breeding season, red-eyed vireo is primarily insectivorous while a mixed diet of fruit and insects is important for fat deposition during migration. • Red-eyed vireo is sensitive to edge disturbance and forest fragmentation; therefore, the species can be used to assess the effects of the loss of upland forested habitat and effects of non-radiological emissions that may, in turn, influence forage and nesting opportunities.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals
Wild turkey (*Meleagris gallopavo*)	• Wild turkey is a territorial ground dwelling bird using deciduous forest habitat near open communities. • Wild turkey is an important subsistence, cultural and recreational feature of the study areas that was nearly extirpated from Canada because of unrestrained hunting and habitat loss, but has been successfully re-established in southern Ontario through MNR reintroduction and conservation efforts. • This species over-winters within appropriate habitat at the Bruce nuclear site (deciduous forest and coniferous swamp). • This species can be used to assess the effects of habitat loss on ground-dwelling game birds with larger territorial areas as well as noise disturbance associated with traffic, construction equipment, and increased human activity.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals

Table 4-1: VECs Selected for the Terrestrial Environment (continued)

VEC	Rationale for Selection	Indicators	Measures
Birds (continued)			
Yellow warbler (*Dendroica petechia)*	• The yellow warbler occurs commonly in the Site Study Area. • This species is likely a regular breeder in the Local Study Area. • It breeds most commonly in wet, deciduous thickets, especially those dominated by willows, and in disturbed and early successional habitats. • The yellow warbler can be used to assess the effects of non-radioactive emissions that may, in turn, affect its ability to continue to use its habitat.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals
Mallard (*Anas platyrhynchos*)	• The mallard is a waterfowl species that is common in the Local Study Area, utilizing stable shallow areas for foraging and nesting. • This omnivorous species primarily feeds on aquatic vegetation, seeds, acorns and grains, and occasionally on fish and other aquatic organisms. • The mallard can be used to assess the effects of non-radioactive emissions (airborne and waterborne) that may, in turn, influence forage opportunities as well as noise disturbance associated with traffic, construction equipment, and increased human activity.	• Distribution • Relative abundance	• Changes in habitat availability and suitability • Effects on individuals
Bald eagle (*Haliaeetus leucocephalus*)	• Bald eagle utilizes shoreline found in the Site Study Area and has an established winter population in the Local Study Area. • It is regulated under Ontario's *Endangered Species Act* and is considered a species of Special Concern in southern Ontario. • It is an apex predator and is a socially important species that represents a healthy environment.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals

Table 4-1: VECs Selected for the Terrestrial Environment (continued)

VEC	Rationale for Selection	Indicators	Measures
Herpetofauna			
Midland painted turtle (*Chrysemys picta marginata*)	• Midland painted turtle can be found in the shallow water and shallow marsh habitats of the Baie du Doré wetland and appropriate habitats throughout the Local Study Area. • The Midland painted turtle has been selected because it is sensitive to non-radiological emissions, in particular water discharges, and road-related mortality is an important consideration for sustainability for Ontario turtle populations.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals
Northern leopard frog (*Rana pipiens*)	• Northern leopard frog is common in the Site Study Area where it can be found in shallow water, wetland and open field areas. • This species has been recorded calling within the Site Study Area. • It uses both aquatic (drainage ditches and wetland areas) and terrestrial environments (cultural and meadow communities) for various life stages. • As an amphibian, it is more vulnerable than birds and mammals to direct contact with non-radioactive airborne emissions, water discharges and changes in soil quality. • Since this species spends the majority of its adult life stage in terrestrial environments, it is susceptible to road-related mortality.	• Presence • Distribution • Relative abundance • Habitat use	• Changes in habitat availability and suitability • Effects on individuals

Notes:
This TSD considers only potential direct effects of the DGR Project on the terrestrial environment, as well as the indirect effects associated with conventional (i.e., non-radiological) parameters. The potential effects of radioactivity on the terrestrial environment are considered in the Radiation and Radioactivity TSD.
a The meadow vole was identified as a VEC in the EIS Guidelines. However, small mammal trapping surveys conducted in 2009 did not confirm the presence of meadow voles in the Project Area. Therefore, northern short-tailed shrew has been adopted as a small mammal VEC for this assessment.

4.2 INDICATORS

For plant species VECs, three indicators were used to evaluate the effects of the DGR Project:

- species presence/absence and relative abundance;
- species distribution; and
- extent of plant communities, including changes to community distribution and extent.

For wildlife species VECs, the following indicators were used to evaluate the effects of the DGR Project:

- species presence/absence;
- species distribution;
- relative abundance; and
- habitat use.

These indicators were chosen as attributes of the VEC species that could be documented as part of the baseline studies and which could be affected by the DGR Project. Baseline data collection was scoped to determine which species of plants and wildlife were present within the Project Area and Site Study Area, and the relative abundance of these species within different plant communities and habitats. Species were documented throughout the site to determine distribution and habitat preference. This documentation allowed for suites of species to be assigned to different habitats. Whereas abundance and distribution vary seasonally with natural changes in environmental conditions such as light, temperature and rainfall, as well as local population dynamics, presence/absence is related to physical habitat features such as vegetation community structure.

4.3 MEASURES

For plant species VECs, the measure that was used to determine the potential for effects was the change in the area of vegetation communities. For wildlife species VECs, the two measures selected to determine effects included changes in habitat availability and suitability, and effects to individuals within the population. Effects to individuals relates to specific interactions with project related activities that result in a change in the individuals health or behaviour (e.g., road mortality).

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5. DESCRIPTION OF THE EXISTING ENVIRONMENT

This section provides a description of the existing environmental conditions in the study areas for the terrestrial environment component of the EA. The existing terrestrial environment within the Regional, Local, Site Study and Project Areas is described in terms of the following components:

- **vegetation communities and species**, which includes plant species and communities and records of significant species;
- **wildlife habitat**, including the biota and abiotic components of wildlife habitat, which are linked with plant communities;
- **natural heritage system**, including brief descriptions of significant or designated areas such as provincial parks and significant wetlands;
- **wildlife communities and species**, comprising bird, mammal, and herpetofaunal species and records of significant populations; and
- **significant species**, including plants and wildlife.

Consistent with EA practices, the effects on terrestrial VECs will be primarily limited to the Project Area defined for this environmental component, with some consideration of the role on-site species play in the context of site, local and regional populations and communities. This focus will be augmented with information on the Regional, Local and Site Study Area spatial scales presented to provide additional context for the effects assessment (Section 8). Field studies completed as part of the baseline characterization for the DGR Project EA are described first to provide context.

While biodiversity has not been selected as a VEC for the terrestrial environment, effects to individual VEC species and populations of VECs has the potential to affect the biodiversity within the Project Area, Site, Local and Regional Study Areas. As the defined study area increases in size and scale from the Project Area to the Regional Study Area, the biodiversity also increases. The Project Area has a restricted natural heritage system, with limited potential for vegetation communities and species, wildlife habitat, communities and species. The Site Study Area includes a more diverse suite of natural habitats, including forested areas, wetlands and the Lake Huron shoreline. Biodiversity in this study area is much higher than in the Project Area because of the diversity of habitats and the increased potential for species to use these habitats. The Local Study Area includes a number of provincially significant natural heritage features, including wetlands, conservation areas and provincial parks and large tracts of wildlife habitat, and a correlated increase in biodiversity to that found in the Site Study Area and the Project Area. The Regional Study Area covers Bruce County, which includes the Lake Huron shoreline, large tracts of forest, significant wetlands, beaches and dunes, several watersheds and areas considered to be notable wildlife habitat. Therefore, biodiversity would be considered to be the highest within the Regional Study Area.

5.1 EXISTING ENVIRONMENT METHODS

The description of the existing environment focuses on VECs identified in Section 4. Information is presented for the study areas with emphasis placed on the aerial extents most likely to be affected by the DGR Project. The description of the existing environment for the terrestrial environment presents:

- a compilation and review of existing information; and
- details and results of the field programs undertaken to update existing information and fill data gaps.

The effects assessment (Section 8) evaluates the potential effects of the DGR Project on the existing environment. The methods used to gather information on which to base the description of terrestrial environment are explained in the following sections.

Within the Project Area and to a limited degree within the Site Study Area, the information obtained from these existing sources is supplemented with data collected during field studies (see Section 5.1.2) to update older studies (e.g., more than five years) and to fill data gaps identified during literature review (Section 5.1.1).

5.1.1 Sources of Existing Data

A large amount of information used in describing the existing terrestrial environment comes from existing studies, including information from the following sources:

- Bruce New Nuclear Power Plant Project Environmental Assessment Terrestrial Environment Technical Support Document [10];
- Terrestrial Environment Technical Support Document for the Bruce A Refurbishment for Life Extension and Continued Operations Project [11];
- Terrestrial Environment Technical Support Document for the Bruce A Units 3&4 Restart Environmental Assessment [12];
- Terrestrial Environment Technical Support Document for the Western Waste Management Facility Refurbishment Waste Storage Project Environmental Assessment [13];
- Bruce Used Fuel Dry Storage Facility Environmental Assessment [14];
- Bruce Heavy Water Plant Decommissioning Environmental Assessment Study Report [15];
- Bruce Nuclear Site Ecological Effects Review [16];
- Bruce Nuclear Site Bioinventory Study [17]; and
- follow-up studies for these EAs, where applicable.

5.1.2 Field Studies

The field studies, study methods and results of the field studies are described in Section 5.3.

5.2 TRADITIONAL KNOWLEDGE

As described in the Aboriginal Interests TSD, concerns with regards to the terrestrial environment historically raised by local Aboriginal communities include:

- concerns regarding treaty rights, traditional land use and harvesting activities, and way of life;
- concerns about increased pressures on traditional heritage sites in Municipality of Kincardine and Ontario Parks adjacent to the Bruce nuclear site;

- the long-term use of lands and waters, including use of traditional territory for hunting, gathering and fishing, and claims and settlements; and
- maintaining their culture, including traditional hunting, traditional gathering, traditional fishing, and claims of rights to access lands and interests in areas of traditional settlements.

The description of the existing terrestrial environment includes a characterization of species previously identified to be of cultural importance and a description of the adjacent parks. This information is used in the Aboriginal Interests TSD to assess effects on traditional use of lands and resources. In addition, First Nations observers were present during a number of field survey events, as described in Section 5.3.

5.3 FIELD PROGRAMS

Supplemental surveys for wildlife species were completed during the 2007 and 2009 field data collection seasons to both supplement and update existing data records for the Project Area and Site Study Areas, and to meet the requirements of the EIS Guidelines. Studies were scoped to address VEC species (i.e., muskrat, white-tailed deer and wild turkey) and/or to update data for seasonal wildlife habitat (i.e., breeding birds, breeding amphibians, turtle basking), as appropriate.

5.3.1 Plant Community Mapping and Vascular Plant Inventories

Previous historical inventories of vascular plants have been compiled for the Site Study Area [17], which have been utilized as part of the baseline characterization process of the site. To better identify the particular plants and plant communities that might be affected by the DGR Project, field work was conducted to refine the existing mapping of plant communities and to compile community-specific inventories of the vascular plants. Particular attention was given to locating any floral Species At Risk (SAR) or species of conservation concern on the site. Specimens of plants difficult to identify in the field were collected for closer scrutiny in the herbarium or submission to specialists. The mapping was carried out for the entire Site Study Area following the botanical field study, and plant communities were classified using the Ecological Land Classification (ELC) System for southern Ontario [18].

Additional field data collection was completed to update and ground truth the existing ELC mapping for the site on August 11 and 12, 2009. Wetland delineation and assessment, and a botanical inventory of the Project Area were also completed during the 2009 site visit by a botanist (accompanied by representatives of the Saugeen Ojibway Nation [SON] and Saar Environmental Ltd. representatives).

5.3.2 Breeding Birds

Two breeding bird surveys were conducted, the first from May 23 to 25 and the second from June 19 to 21, 2007. Two additional breeding bird surveys were completed, one from May 29 to 31 and the second from July 2 to 4, 2009. Each survey was conducted over three consecutive days when conditions for such work were deemed optimal (i.e., clear skies, no precipitation and little or no wind [19]). Stationary point count stations were visited at selected locations within the Site Study Area. Stations were placed to ensure that all locally-occurring habitat-types were sampled, particularly those that were naturally-occurring plant communities

(Figure 5.3.2-1). At each point count station, a five-minute inventory of birds calling or birds observed was made. The call and/or activity of individual birds were noted to assess the likelihood that those birds might be breeding locally, using methods developed by Bird Studies Canada [20]. This field work was conducted from a half hour before sunrise and until approximately 10:00 as recorded by the Breeding Bird Survey [21]. Incidental sightings and records of bird species documented outside of the official 5 minute listening period were also maintained as part of the surveys.

The surveys completed in 2007 included one biologist, and the surveys completed in 2009 included one biologist (during the early season survey), and one biologist accompanied by representatives from SON and Saar Environmental Ltd. (during the second 2009 survey).

One marsh monitoring survey was conducted focusing on king rail (*Rallus elegans,* listed as Endangered both nationally and provincially). The survey was conducted for 10 minutes in total (including a 5 minute call playback and 5 minute listening period) and was conducted between 18:00 and sunset, following the Marsh Monitoring Program protocol [20]. For all surveys, each bird was identified by species, the number of individuals, sex, age, distance from the observer, direction (if flying), and notable behaviour (i.e., foraging, carrying nest material). Habitat associations were also documented in the field notes. Any individuals seen or heard prior to the survey start as well as after the five minute survey, were recorded as incidental observations.

5.3.3 Herpetofauna

5.3.3.1 Breeding Amphibians

Two sets of amphibian call counts were completed for the site, one in 2007 and one in 2009. The 2007 surveys were completed on April 25 and May 7 and in 2009 the surveys were completed on May 7, June 3 and June 16. The surveys were completed by one to two biologists (accompanied by SON and Saar Environmental Ltd. representatives during the June 2009 surveys).

On April 25 and May 7, 2007, at approximately one to two hours after sundown, stationary survey sites within the Local and Site Study Areas were established to conduct breeding anuran call counts. Sample locations were identified by UTM coordinates using a field GPS unit (Figure 5.3.2-1). At each survey site, a period of 20 minutes was spent listening for and identifying frogs by their calls, noting both species and the apparent intensity of each species activity, following protocols developed by Environment Canada and Bird Studies Canada [20]. To minimize the effects of weather and temperature and to ensure that the calling of all anuran species resident in the Site Study Area were sampled, two sampling nights at least 10 days apart were scheduled for the breeding amphibian survey.

The additional surveys completed in 2009 followed the same protocol, as referenced above, and were conducted at the same locations. An additional survey day was required as temperature and weather conditions did not meet the guidelines during the June 3, 2009 survey.

5.3.3.2 Basking Turtles

Basking turtle surveys were completed as part of the 2009 field data collection season to determine the potential habitat found within the Site Study Area. Site reconnaissance was

completed on June 3, 2009 to determine the potential for basking turtles to use habitat found within the Site Study Area lands and to determine locations where the basking surveys would occur. Seventeen basking survey stations were selected and mapped (Figure 5.3.2-1), which were used on the two subsequent surveys (June 16, 2009 and August 12, 2009). Surveys were conducted under favourable weather conditions (sunny and dry). Any evidence of turtle use was recorded, with the most common being direct species observations.

5.3.4 Muskrat Habitat

Muskrat (*Ondatra zibethicus*) surveys were conducted on May 7 and 8, 2007. Three survey sites within the Site Study Area and two reference sites in MacGregor Point Provincial Park were surveyed (Figure 5.3.4-1). All habitat types present in the designated sites were surveyed, though emphasis was put on areas of preferred muskrat habitat (i.e., cattail-abundant wetland areas). All muskrat activity including feed piles, pushups (winter feeding shelters), houses, burrow and tracks were documented and given exact locations with a GPS unit.

5.3.5 Wild Turkey Habitat

A wild turkey (*Meleagris gallopavo*) habitat use and suitability survey was conducted between February 19 and 27, 2007. Transects were spaced at 100 m intervals and covered the Site Study Area. All observed turkey tracks, feeding scrapes and roosting activity were mapped using a GPS unit (Figure 5.3.5-1). Potential roosting habitat was identified by the availability of suitable roosting trees. No additional surveys targeting wild turkey were completed as part of the 2009 field data collection program; however, incidental sightings were documented during the Aerial Wildlife Survey (see Section 5.3.8).

5.3.6 Migratory Waterfowl Survey

During the autumn migration period, waterfowl frequently use large water bodies as staging areas where they congregate before flying south in large flocks. The waterfowl utilization of shoreline and near shore areas in the vicinity of the proposed DGR Project at the Lake Huron shore was assessed during site visits on September 4 and 5, 2007, and on October 1 and 2, 2007. Twenty-four sites were surveyed during each of the two survey visits, including shoreline areas of Inverhuron Provincial Park (one site), Bruce B (five sites), MacPherson Bay (eight sites), Baie du Doré (six sites) and the Brucedale Conservation Area (four sites) (Figure 5.3.6-1). While this work focused on the specific shoreline section that could be most affected by the proposed DGR Project (e.g., MacPherson Bay) because of proximity, activity in Baie du Doré and adjacent areas was also investigated to establish a context for any potential displacement of staging waterfowl.

5.3.7 Small Mammal Survey

Small mammal surveys were completed in the Project Area on September 2 and 3, 2009, as well as between October 2 and 7, 2009. The methodology used to complete the survey was modified after the first survey to increase the potential for rodent capture.

All open areas of the site were surveyed for signs of rodent use and for suitable habitat characteristics. Reconnaissance was focussed in areas where longer grasses with more dense cover existed. During the field reconnaissance, no preferred habitat for small mammals was

documented in the Project Area. Because of the lack of primary habitat, all potentially suitable grassland habitats, with greater than 60% groundcover were surveyed. Trap locations were situated at a minimum of 25 m apart, in the best cover and food source areas documented in the Project Area.

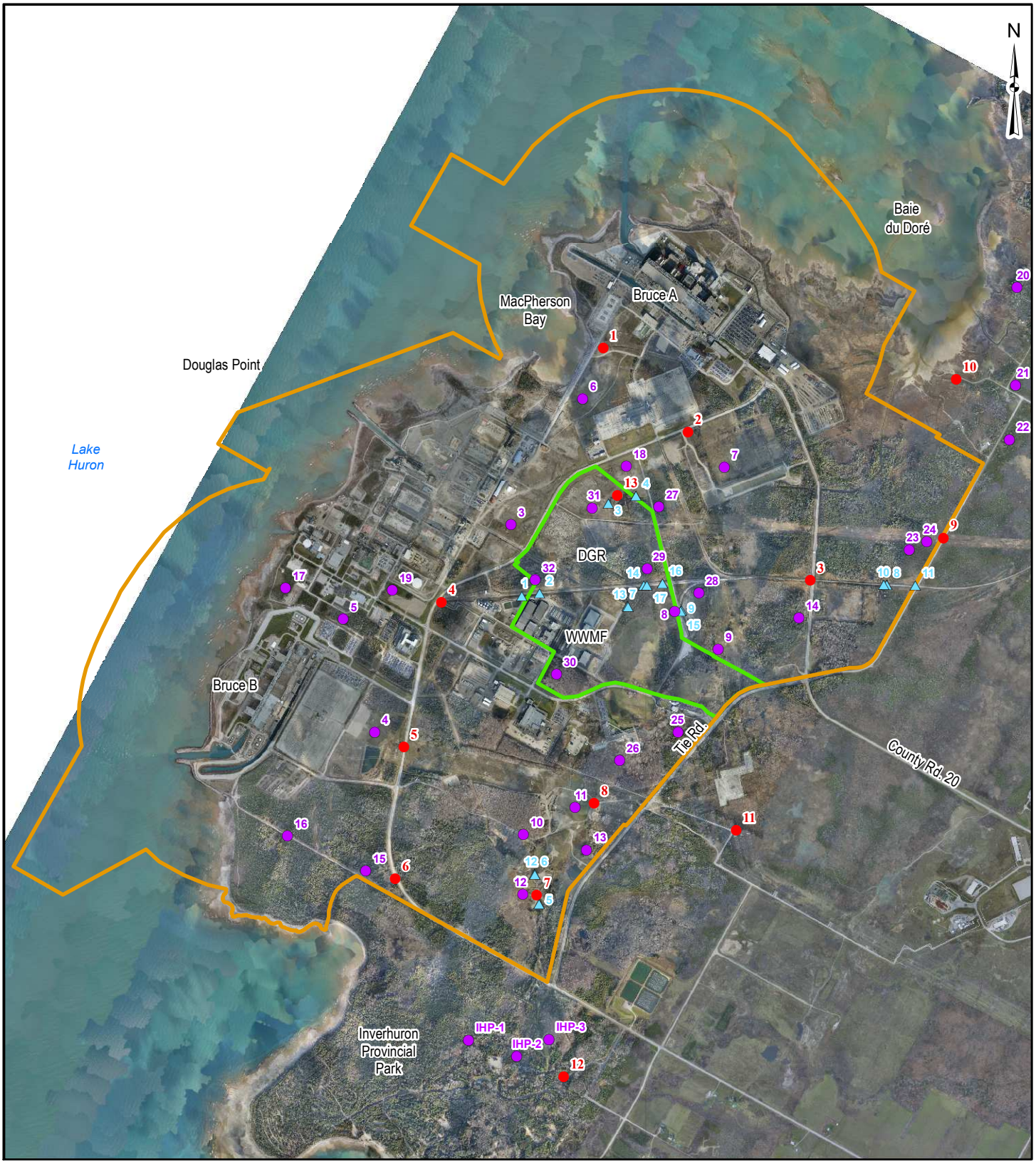
Equipment used for the survey included Victor© Tin Cat live traps, designed to hold up to 30 individual rodents. Live traps were used to minimize the potential impacts to captured species. Captured specimens were measured and weighed, then classified by age category (juvenile, sub-adult and adult) prior to marking and release. The traps were baited with a mixture of peanut butter mixed with rolled oats and chopped walnuts, chopped apple and wet catfood. Bedding material (cotton batting) was also added to the traps for insulation and comfort. The traps were set within 1.5 hours of sunset on September 2, 2009. Trap placement was recorded through the use of a hand held GPS device, to allow for efficient trap checking and retrieval and for the location to be mapped and replicated during the second survey. A total of 15 traps were set in three different habitat type locations within the Project Area (Figure 5.3.4-1). The traps were left overnight and checked within 2.5 hours of sunrise the following day.

Trapping methodology was modified for the second survey event to increase potential for rodent capture. The traps were placed, unset, in the same locations as the first survey, without bait or bedding material, for three consecutive nights. The purpose for this modification was to allow rodents to explore the traps and become desensitized to their presence. The traps were then baited following the same protocol as the first survey event and closed or set. The traps were then covered with vegetation for camouflage and protection from the elements. The traps were left for two consecutive nights following the set.

Staff conducting the survey were accompanied by representatives from SON and Saar Environmental Ltd. during some of the trap setting and retrieval activities associated with the small mammal surveys.

5.3.8 Aerial Wildlife Survey

The Site Study Area was surveyed for the presence of white-tailed deer (and other incidental wildlife) on November 22, 2009. The site survey was completed by flying a grid pattern of north-south and east-west transects over the Site and Local Study Areas. The surveys were conducted in a Schweizer 300C three seater helicopter operated by Bruce Peninsula Helicopters. The site was surveyed between 10:10 and 12:30 and again between 13:00 and 14:00. The site was traversed in a 100 by 100 m grid pattern, observed from a helicopter travelling at an altitude of 500 m. GPS waypoints were documented for each species observed and mapped, including white-tailed deer and wild turkey (Figure 5.3.8-1). Concentrated efforts were focussed in areas providing natural habitat, and included the area where species may exit/enter the site and the associated wildlife movement corridor offsite. This feature is connected to agricultural lands in the area, which provide an excellent food source for terrestrial wildlife species, especially white-tailed deer and wild turkey.



LEGEND

- Breeding Amphibian Survey Sites (April 25 and May 7, 2007; June 16 and May 7, 2009)
- Turtle Basking Survey Locations (June 3,16 and Aug. 12, 2009)
- Breeding Bird Survey Locations (May 23 - 25 and June 19-21, 2007; May 29 - 31 and July 2 - 4, 2009)
- Project Area (OPG- retained lands that encompass the DGR Project)
- Site Study Area [1]

0 0.5 1 2

Kilometres

NOTE

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.
Breeding Bird wetland survey was completed at Station 12 (Breeding Birds)

REFERENCE

Base Data Provided by 4DM, November 2007. Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

BREEDING BIRD AND HERPETOFAUNAL SURVEY LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	20 Apr. 2010		
CHECK	KC	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

FIGURE 5.3.2-1

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LEGEND

- Muskrat Burrow
- Location of Muskrat Lodge
- Meadow Vole (Sept 2-3 and Oct. 2-7, 2009)
- Muskrat Habitat Survey Sites (May 7-8, 2007)
- Project Area (OPG- retained lands that encompass the DGR Project)
- Site Study Area [1]

0 125 250 500

Metres

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.
Breeding Bird wetland survey was completed at Station 12 (Breeding Birds)

REFERENCE

Base Data Provided by 4DM, November 2007. Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

SMALL MAMMAL SURVEY LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	20 Apr. 2010		
CHECK	NS	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

FIGURE 5.3.4-1

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LEGEND

- Eastern Wild Turkey
- Roosting Tree
- Project Area (OPG- retained lands that encompass the DGR Project)
- Site Study Area [1]
- Significant Turkey Habitat

0 250 500 1,000

Metres

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.
Wild turkey survey conducted February 19 and 27, 2007

REFERENCE

Base Data Provided by 4DM, November 2007. Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

WILD TURKEY HABITAT IN THE SITE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007	FIGURE 5.3.5-1	
GIS	BC	20 Apr. 2010		
CHECK	NS	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

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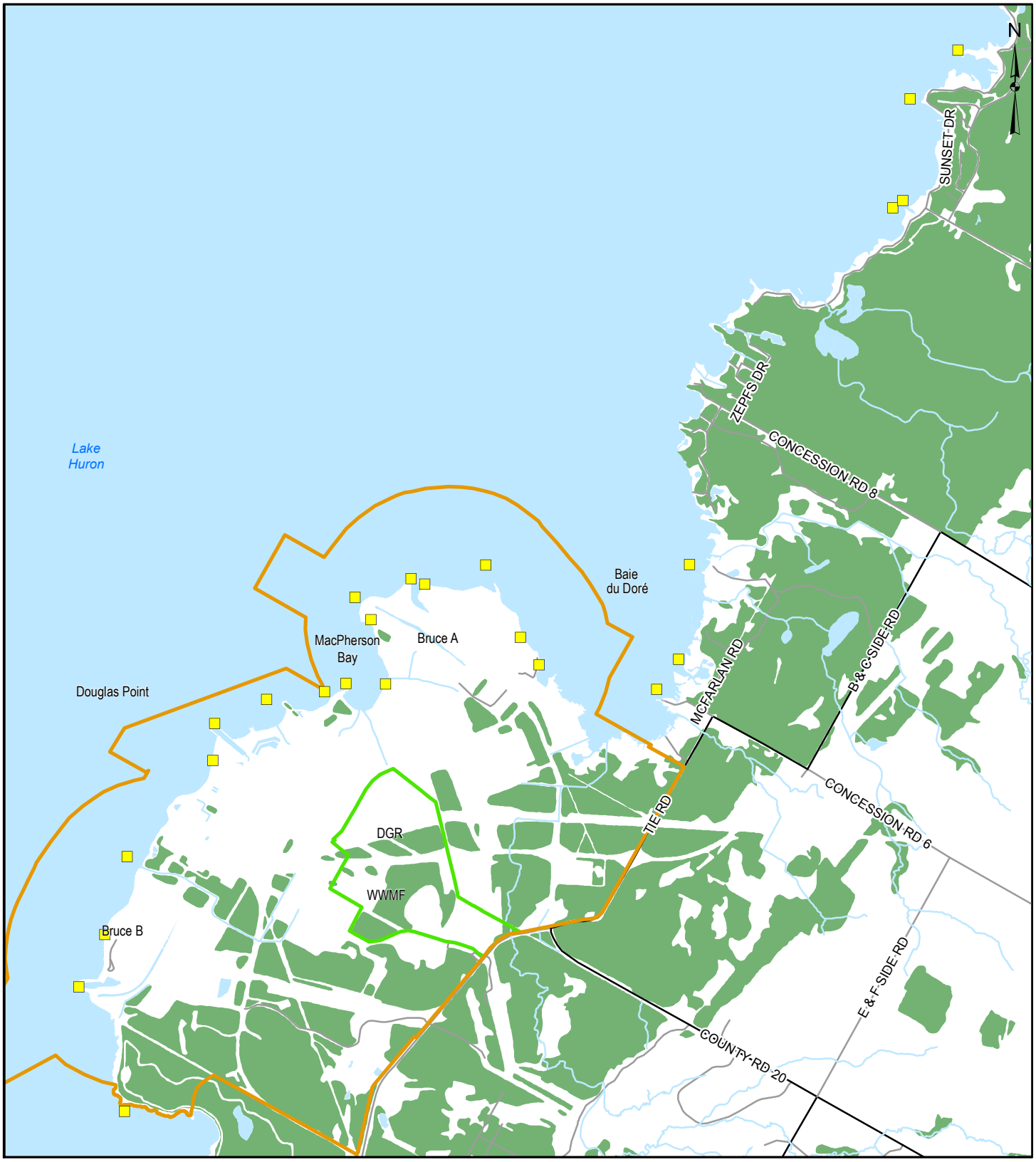

LEGEND

- Waterfowl Survey
- Project Area (OPG-retained lands that encompass the DGR Project)
- Site Study Area [1]

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed. Survey conducted Sept. 4-5 and Oct. 1-2, 2007

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 0.5 1 2
Kilometres

PROJECT
TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE
WATERFOWL SURVEY LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct 2007		
GIS	BC	20 Apr. 2010		
CHECK	AB	20 Apr. 2010		
REVIEW	MAR	20 Apr. 2010		

FIGURE 5.3.6-1

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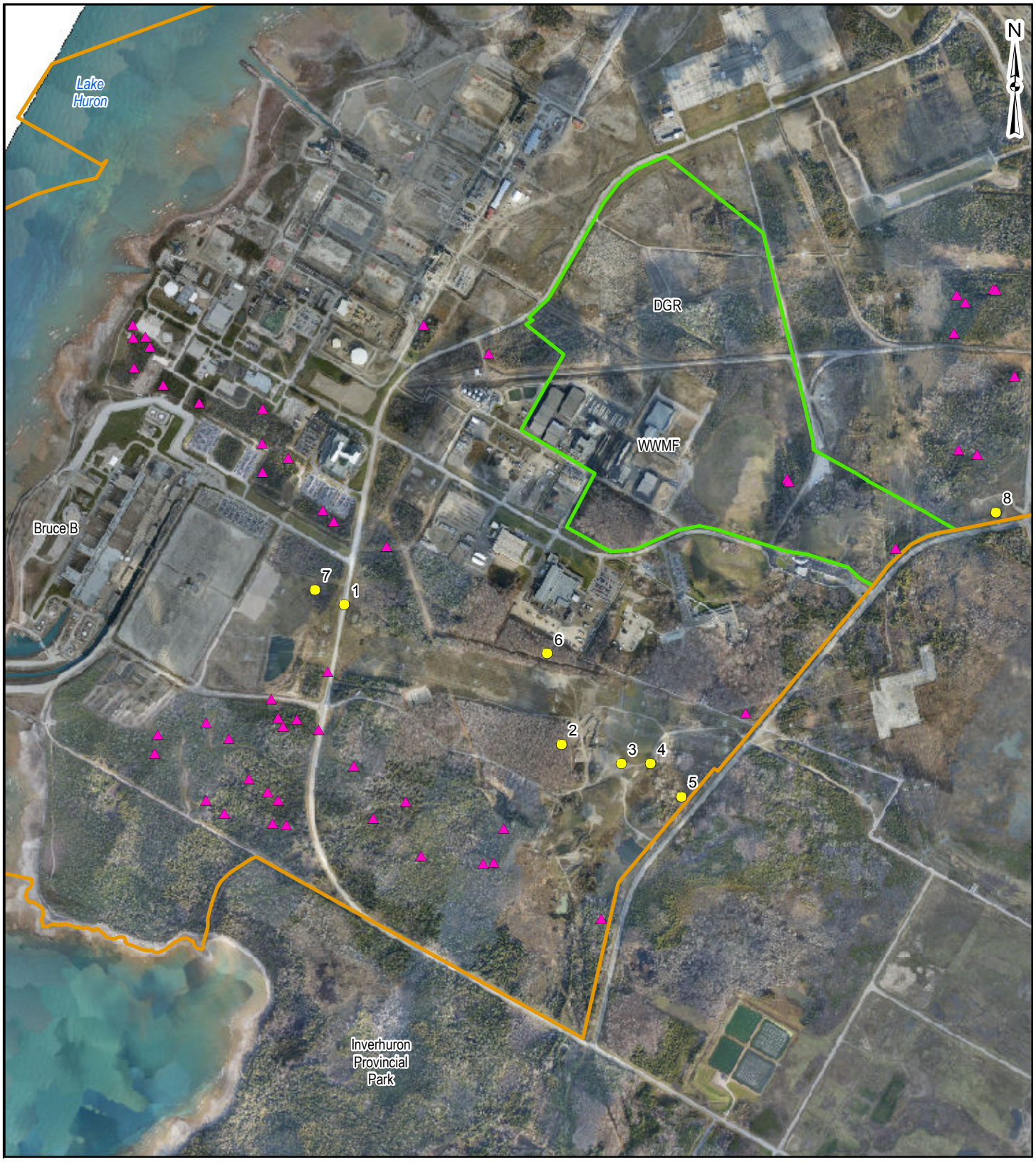

LEGEND

- Aerial Wildlife Survey - Nov. 22, 2009
- Whitetail Deer - Incidental observations during Feb. 19-27, 2007 Wild Turkey Surveys
- Project Area (OPG- retained lands that encompass the DGR Project)
- Site Study Area [1]

0 250 500 1,000

Metres

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.
Breeding Bird wetland survey was completed at Station 12 (Breeding Birds)

REFERENCE

Base Data Provided by 4DM, November 2007. Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

AERIAL WILDLIFE SURVEY

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037		SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007	
GIS	BC	20 Apr. 2010	
CHECK	NS	20 Apr. 2010	
REVIEW	AB	20 Apr. 2010	

FIGURE 5.3.8-1

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5.4 VEGETATION COMMUNITIES AND SPECIES

5.4.1 Site Study Area and Project Area

An ecological land classification (ELC) for the Bruce nuclear site was conducted in 2007 using the ELC system for southern Ontario [18] to identify and characterize the plant communities on the Site Study Area (see Section 5.3.1). In 2009, this was refined focussing on the ELC in the Project Area. The vegetation community data was collected to examine the condition and qualities of the wetlands on and within 100 m of the Project Area and inventory the vascular plants in those features, to identify and locate any culturally significant vegetation or species of vascular plants, and to identify and locate any plants that may have particular significance to local residents, including Aboriginal residents of Bruce County.

A total of 195 plant community polygons were identified within the Site Study Area, representing 12 broad categories and 30 specific community-types (Figure 5.4.1-1). The broad categories of vegetation types found within the Site Study Area include alvar (AL), beach (BB), cultural barren (CB), cultural grassland (CUG), cultural meadow (CUM), cultural thicket (CUT), forest (FO), industrial barren (IB), industrial lands (IND), marsh (MA), open water (OA) and swamp (SW).

Forest-type polygons occur most frequently in the larger Site Study Area, including 30 conifer forest polygons, 13 hardwood forest polygons and 30 mixed woods forest (a mix of hardwoods and conifers) polygons. In both the conifer and mixed woods forest communities, eastern white cedar is a principal or co-dominant species, as it is for most of the Regional and Local Study Areas (Sections 5.4.3 and 5.4.2, respectively). In the deciduous forest communities, sugar maple is dominant in the majority of community-types, but a trembling aspen (*Populus tremuloides*) dominated community is present on some of the moister sites and a number of sub-dominant species, including beech (*Fagus grandifolia*), ironwood (*Ostrya virginiana*) and trembling aspen, are present in the different communities (Figure 5.4.1-1). The second most abundant community-type is the 57 cultural communities, some of which are old field communities of agricultural grasses, colonizing herbs and sapling trees and shrubs. The minor vegetation community units identified in the Site Study Area include 11 beach communities, nine swamp communities, six marsh communities, five open water units and one alvar community.

Previously disturbed (culturally affected) lands predominate the Project Area lands with just under 63% of the area in active industrial use or in barrens that have been created by past clearing and/or grading and filling. The extent of anthropogenic activities is considerable and even the naturally-occurring vegetation has, in some areas, been greatly affected by past human activity. Fill has been placed in some areas and mounded in others. For example, the old-field type meadow (cultural meadow or CUM1-1 of the southern Ontario ELC) just east of the WWMF has been established on a closed landfill site and the plant community represents a combination of post-closure seeding with a cover-crop mix of agricultural species and invasion of the area by colonizing species suited to the local soil, moisture and climatic conditions. The small marsh on the north side of the site appears to be established in ditches that may have had some past drainage function but are presently isolated by fill surrounding the trenches and adjacent low-lying lands. Here, no after-use seeding of herbaceous vegetation species has occurred and the plant community has developed from the propagules of locally available species that are able to tolerate the extended and seasonal flooding that occurs in this low area.

The soils across much of the area are shallow and drainage is bedrock-controlled. Drainage is further affected by the numerous raised roads and rail beds that cross the area, creating several small basins that are seasonally flooded or wet until drained by gravity or dried out by evapotranspiration. With the exception of the woodland located between the WWMF and the Central Maintenance and Laundry Facility (Breeding Bird Survey location 30, Figure 5.3.2-1), all of the woodland units are in shallow basins, surrounded by anthropogenic features such as roadways. This anthropogenic boundary has the effect of making the moisture regime of these woodlands somewhat wetter than they may have been historically. A breakdown of the areas occupied by each vegetation type is provided in Table 5.4.1-1.

Table 5.4.1-1: Plant Communities Identified in the Project Area in 2009

Community Type	Area (ha)	Percentage
Industrial lands	17.2	18.0
Barrens	42.8	44.7
Cultural meadow	8.1	8.5
Woodland	23.7	24.7
Marsh	0.9	0.9
Swamp	3.1	3.2
Total	**95.8**	**100.0**

The two wetland features that occur in the Project Area are, in part, defined by fill placement. The wetland located in the northeast corner of the Project Area (Figure 5.4.1-1) is a shallow marsh dominated by the aquatic mermaidweed (*Proserpinaca palustris*) and the emergent reed canary grass (*Phalaris arundinacea*). The mermaidweed occupies the central portions of the two flooded ditches whereas the reed canary grass dominates the sides of the ditch and low, flat areas at the north end of the feature. A diversity of other narrow-leaved emergents is present in the wetland, including various species of *Carex* (mainly *C. pseudocyperus* and *C. flava*), spikerush (*Eleocharis* spp.), rush (*Juncus* spp.) and bulrushes (*Schoenoplectus* spp. and *Scirpus* spp.).

The seasonal swamp located in the southeast portion of the Project Area (Figure 5.4.1-1) is dominated by a mix of trembling aspen (*Populus tremuloides*) and eastern white cedar (*Thuja occidentalis*) with a scattering of balsam fir (*Abies balsamea*). The canopy is patchy and channels filled with reed canary grass and fowl manna grass (*Glyceria striata*) are common throughout the area. In contrast to the marsh community, diversity in the swamp is relatively low with only some scattered patches of sensitive fern (*Onoclea sensibilis*) and marsh fern (*Thelypteris palustris*) present along with the grasses. This community is also somewhat fragmented by fingers of fill that extend into the area.

LEGEND

- Site Study Area [1]
- Project Area (OPG-retained lands that encompass the DGR Project)
- DGR Site

ELC Group

- Alvar
- Beach
- Cultural Barren
- Cultural Grassland
- Cultural Meadow
- Cultural Thicket
- Forest
- Industrial Barren
- Industrial land in active use
- Open Water
- Marsh
- Swamp

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

The ELC data within the Site Study Area was collected during 2007. The ELC data within Project Area was updated during 2009 survey.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m,
Datum: NAD 83 Projection: UTM Zone 17N

0 125 250 500 750 1,000
Metres

PROJECT
TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE
ELC MAPPING IN THE SITE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT No. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	03 Aug. 2006		
GIS	BC	20 Apr. 2010		
CHECK	KC	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

FIGURE 5.4.1-1

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The woodlands appear relatively young and no stems above 30 cm diameter at breast height were observed. Though fragmented into 12 separate units, woodlands represent a total of nearly 25% of the Project Area. Most of the woodlands on the site are dominated by white cedar. Minor components are balsam fir and white birch (*Betula papyrifera*). Trembling aspen and red maple (*Acer rubrum*) occur as scattered trees or small patches at the woodland edges. The understory is relatively sparse and patchy. Poison-ivy (*Rhus radicans*) and dwarf raspberry (*Rubus pubescens*) are two of the more frequent species. Others, such as red-osier dogwood (*Cornus stolonifera*), choke cherry (*Prunus virginiana*) and red raspberry (*Rubus idaeus*) occur as scattered stems, often at the edges of the stands. Ground cover is sparse and varies greatly from stand to stand. Few plants are present where the cedar canopy is dense. Under hardwoods and in glades, species such as wild columbine (*Aquilegia canadensis*), sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*) and large-leaved aster (*Symphyiotrichum macrophyllum*) occur as scattered stems or small patches.

The various barrens that occupy most of the Project Area appear to be areas in which some historical grading and movement of fill has occurred. Substrates are shallow and most have a high gravel content. Bare ground is prevalent and plants occur as sparse scattered individuals or as small clusters of both single species and multiple species. Scattered tree stems include white birch, white spruce (*Picea glauca*), white pine (*Pinus strobes*), balsam poplar (*Populus balsamifera*) and white cedar. Most of the white spruce and white pine appear to have been planted. The other species have colonized the areas from the adjacent woodland patches. The great majority of shrubs and herbaceous plants that are present are colonizing species but because the drainage is bedrock-controlled, these areas also mimic shoreline habitats and a variety of shoreline colonizing species are also present, including shrubby St. John's-wort (*Hypericum kalmianum*), shrubby cinquefoil (*Potentilla fruticosa*), Baltic rush (*Juncus balticus*) and silverweed (*Potentilla anserina*). The non-native colonizing species include the knapweeds (*Centaurea jacea* and *C. maculosa*), wild carrot (*Daucus carota*), viper's bugloss (*Echium vulgare*), narrow-leaved plantain (*Plantago lanceolata*), and common mullein (*Verbascum thapsus*).

Generally, the vegetation communities found in the Site Study Area are not outstanding examples of their type in this part of southern Ontario. Both woodlands and wetlands are relatively young, and there are no particularly significant elements associated with them. A comparison of the 2001, 2007 and 2009 ELC mapping shows that there is an increasing fragmentation of woodlands through the construction of roadways and right-of-ways, and erosion at the edges of woodlands attributed to the constant expansion of roadways and the construction of new pipelines and other infrastructure.

Important vegetation-types found in the Site Study Area include alvar (AL) and beach (BB). The alvar community noted in the Site Study Area is categorized as ALS 1-2, which constitutes a dwarf shrub alvar dominated by creeping juniper (*Juniperus horizontalis*), with scattered shrubby St. John's-wort, and shrubby cinquefoil (*Potentilla fruticosa*). Alvar communities of this type can be found occasionally in the Local Study Area, and are ranked as 'very rare' (S2) in Ontario by the Natural Heritage Information Centre (NHIC), with usually between five to 20 occurrences in the province. Additionally, the NHIC ranks this type of vegetation community as 'imperilled

globally' (G2?[2]) because of extreme rarity or because of some factor(s) making it very vulnerable to extinction throughout its range.

Beach communities in the Site Study Area were classified as BBO 1, BBO 2, BBS 2 and BBT 2. BBO 1 is considered open beach of unconsolidated sand, shingle and cobbles with scattered patches of herbaceous plants, including some widely scattered shrub species such as the red osier dogwood (*Cornus stolonifera*). BBO 2 is open beach of carbonate bedrock shelves with very little vegetation. BBS 2 is an open beach of carbonate bedrock with shingle and cobbles, with scattered patches of willow thicket. BBT 2 is open beach of carbonate bedrock with shingle and cobbles with groves and coalescing patches of trees. The eastern white cedar is the most common species, with balsam poplar and trembling aspen scattered around the edges of patches.

5.4.1.1 Vascular Plants in the Site Study Area and Project Area

The flora of the Site Study Area is typical of the Huron-Ontario Section of the Great Lakes-St. Lawrence Forest Region as delineated by Rowe [22]. Characteristic species include such trees as sugar maple, red maple (*Acer rubrum*), beech, white and black ash (*Fraxinus americana* and *F. nigra*), red oak (*Quercus rubra*) and white elm (*Ulmus americana*). Characteristic shrubs are the swamp fly-honeysuckle (*Lonicera oblongifolia*), choke cherry (*Prunus virginiana*) and meadowsweet (*Spiraea alba*). Typical herbaceous plants include jack-in-the-pulpit (*Arisaema triphyllum*), yellow trout-lily (*Erythronium americanum*), false Solomon's-seal (*Maianthemum racemosum*), hairy Solomon's-seal (*Polygonatum pubescens*), white trillium (*Trillium grandiflorum*) and barren strawberry (*Waldsteinia fragarioides*). The boreal floristic element [23] is represented by species such as balsam fir (*Abies balsamea*), white birch (*Betula papyrifera*), tamarack (*Larix laricina*), white spruce (*Picea glauca*) and eastern white cedar, as well as the shrubs dwarf birch (*Betula pumila*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*) and bristly black currant (*Ribes lacustre*) and such herbaceous plants as red baneberry (*Actaea rubra*), goldthread (*Coptis trifolia*) and rattlesnake plantain (*Goodyera tesselata*). Two species characteristic of the Great Lakes floristic element [23] are the marram grass (*Ammophila breviligulata*) and shrubby St. John's-wort, both of which are shoreline species of restricted distribution in the Site Study Area.

Although more than 500 species of vascular plants occur in the vicinity of the Bruce nuclear site, only a modest subset of that number occurs in the Project Area (Appendix D). As discussed above, the lands within the Project Area have been affected by anthropogenic factors and as a result, the diversity of vegetative species is lower than in the Site Study Area. These habitats are also smaller in size (area) than the habitats that have been documented within the larger Bruce nuclear site. For the Project Area, a total of 181 taxa of vascular plants have been identified, including 16 species of trees, 19 species of shrubs and woody vines, five species of ferns and fern allies, 50 graminoids (plants with grass-like leaves) and 91 forbs (all herbaceous flowering plants, excluding graminoids). The appended tabulation (Appendix D) also indicates the origin of each species as native or introduced, any special conservation status designation that may have been applied to the species by federal or provincial agencies, the size of the 'global' population (G Rank), the size to the provincial population (S Rank), and community occurrence data will be added to the rightmost column.

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[2] A question mark (?) is assigned to global ranks when there is insufficient information available from which to properly determine rank.

The non-native component of the local flora is just over 34%, a value that is slightly above the provincial average of 28.3%, reflecting, in part, the anthropogenic disturbance that has occurred on the site. As well as having a relatively large component of non-native species, the local flora does not have any species with a special conservation status designation. As the data on population abundance ('G Rank' and 'S Rank') indicates, all of the native vascular plants on the site have relatively large and secure populations (i.e., S Ranks of '4' or '5').

Cattail samples were collected from the Project Area (from within the North and South Railway Ditches located adjacent to the northern boundary of the WWMF) in June 2004, and analyzed for metal concentrations. The results indicated that several metal concentrations were elevated in the tissues of the vegetation from the Project Area compared with the concentrations found in cattails sampled from an area located in Milton, Ontario used as background condition [24]. The elevated metals included arsenic, cadmium, cobalt, copper, lead and zinc; however, no guidelines are available to evaluate the importance of existing levels in the vegetation. Follow-up studies undertaken in support of environmental assessments completed for previous projects within the Project Area indicate that the source of the elevated metals in the North and South Railway Ditches vegetation is likely historic, and not attributable to recent undertakings in the vicinity of the WWMF [24].

5.4.1.2 Culturally Significant Plant Species and Communities

No plant community previously considered of special significance to Aboriginal peoples has been identified in the Project Area, and no vascular plant species with special significance have been identified. Eastern white cedar is a species with a multitude of uses in crafts, but it is widely abundant on the site, in the broader study areas and across Bruce County. As the most abundant tree species across Bruce County, it is too common to map on an individual basis. Additionally, wild strawberry, raspberry species and common heal-all have been documented during field data collection. These species are also common and abundant in Bruce County and provincially. No species with a limited or restricted distribution on the site has previously been identified as of special significance for Aboriginal peoples. Further consideration of Aboriginal interests is found in the Aboriginal Interests TSD.

5.4.2 Local Study Area

The Local Study Area is located within the Alleghanian or Transition Life Zone, which corresponds to the northern fringe of the deciduous forest zone. This zone supports fauna and flora from both northern and southern affinities, and may represent unique groupings of species [11]. The Local Study Area also includes the Huron Fringe woodland, which is a narrow stretch of woodland along the shore of Lake Huron comprising terraces created by glacial Lake Algonquin. This area stretches south from Tobermory to Sarnia and contains wetland, sand dune, and ridge areas. Vegetation in the Huron Fringe ranges from alvar, bog, swamp, fen, and marsh species to dune grasses [25]. Much of the natural forest cover within the Local Study Area, similar to that within the Regional Study Area (Section 5.4.3), has been historically cleared for agriculture. Remnant forested areas in the Local Study Area are primarily associated with the Lake Huron shoreline, valleys and areas with steep topography, and poorly drained sites [26].

Many studies of vegetation have been conducted on and near the Bruce nuclear site in support of EAs and other projects conducted on-site (e.g., [17 ; [15]). These studies, ranging from the

mid-1980s to the mid-1990s, have inventoried vegetation communities and species based on the Ecological Land Classification for Southern Ontario [18]. The Local Study Area includes representative ecosystem components discussed in relation to the Regional Study Area. While it is acknowledged that this data may not be representative of the exact community mosaic present in the Local Study Area under current conditions, it provides a sound basis for understanding the vegetation communities that are potentially interconnected to those present in the Site Study Area and Project Area. Potential effects of the DGR Project are expected to be greatest at the Project Area spatial scale. Field work to record the existing vegetation communities and species at that scale is reported in Section 5.4.1. The broad vegetation community categories found throughout the Local Study Area are described in the following sections.

5.4.2.1 Shallow Water

Numerous rivers and wetlands occur throughout the Local Study Area landscape. Watercourses within the Local Study Area include Tiverton Creek, Little Sauble River, Stream C, Underwood Creek and Mill Creek.

Areas of shallow open water, which occur along the lakeshore and as inland ponds less than 2 m deep, support some emergent aquatic communities where light penetration is sufficient. The open-water (i.e., non-vegetated) portion of these communities is predominant. The margins of the aquatic habitat support some patches dominated by cattails (*Typha* sp.), American bulrush (*Scirpus pungens*) and spike-rushes (*Eleocharis* sp.).

5.4.2.2 Wetlands

Several extensive and significant wetland habitats exist within the Local Study Area, including the MacGregor Point Provincially Significant Wetland (PSW) Complex and the Baie du Doré PSW. Seventy-one component wetlands consisting primarily of swamp habitat, with some fen and marsh have been identified within the MacGregor Point PSW Complex. More than 650 vascular plant species have been found within the wetlands, which represents approximately two-thirds of known vascular plants in southern Bruce County [27]. The Local Study Area also includes many smaller marsh, swamp and fen ecosystems, some of which occur within the perimeter of the Bruce nuclear site and within Inverhuron Provincial Park.

Marsh

Shallow marsh vegetation communities are present in the Baie du Doré wetland, accounting for a large area of this PSW. These communities are located adjacent to the shallow water habitat associated with Lake Huron and are primarily cattail organic shallow marshes. This emergent marsh community is dominated by cattails (*Typha angustifolia; T. latifolia*) and narrow-leaved emergent cover of reed canary grass (*Phalaris arundinacea*) with interspersions of sedges (e.g., *Carex lasiocarpa*), softstem bulrush (*Scirpus validus*), common reed (*Phragmites australis*), wool-grass (*Scirpus cyperinus*) and wild blue-flag (*Iris versicolor*). Standing water pockets are usually present, as well as wet meadow pockets, underlain by primarily saturated or moist organic soils. Eastern white cedar and white birch (*Betula papyrifera*) are some of the tree species that occur most commonly in these areas. Typical shrubs include shrubby cinquefoil (*Potentilla fruticosa*), Kalm St. John's-wort (*Hypericum kalmianum*), red-osier dogwood (*Cornus sericea*) and smooth wild rose (*Rosa blanda*).

Swamp

White cedar swamp is found in the Local Study Area, including the southeast corner of the Bruce nuclear site. Tree cover is dominated by eastern white cedar, tamarack, white birch, black ash (*Fraxinus nigra*), trembling aspen, balsam fir, large-toothed aspen and red maple. Shrub cover is low and is dominated by red-osier dogwood, young eastern white cedar and balsam fir. There are some depressional areas with wetter soils and some standing water; species within these areas include narrow-leaved cattail, wire sedge and rush species (*Scirpus* spp.). Groundcover in drier areas includes heath aster, silverweed (*Potentilla anserina*), bracken fern, watercress (*Nasturtium officionale)*, wintergreen, colt's foot (*Tussilago farfara*), wild strawberry (*Fragaria virginianum)*, enchanter's nightshade (*Circaea lutetiana*), spotted joe-pye weed, scouring rush and running club moss (*Lycopodium clavatum*).

White Cedar – Hardwood Mixed Swamp is scattered throughout the Local Study Area. Tree cover is dominated by eastern white cedar, white birch, black ash, trembling aspen and balsam poplar. Shrub and regeneration layers are limited in these swamps and are dominated by red-osier dogwood and young eastern white cedar. Groundcover species recorded within this community include bunchberry (*Cornus canadensis*), water plantain (*Alisma plantago-aquatica),* bulbiferous water hemlock (*Cicuta bulbifera*), twinflower *(Linnaea borealis*), rice cutgrass (*Leersia oryzoides*), purple-stemmed aster, flat-top white aster (*Doellingeria umbellata*), white turtlehead (*Chelone glabra*), spotted joe-pye weed, boneset, climbing nightshade (*Solanum dulcamara)*, reed canary grass, colt's foot, marsh fern (*Thelypteris palustris*), royal fern (*Osmuda regalis*), purple loosestrife (*Lythrum salicaria*), grass-leaved goldenrod and common cattail.

There are organic thicket swamps located within the Local Study Area. Examples of these communities are located on the southern edge of the Baie du Doré PSW. Shrubby vegetation is dominated by speckled alder (*Alnus incana* ssp*. rugosa*), pussy willow (*Salix discolor*), red-osier dogwood, shrubby St. John's-wort (*Hypericum prolificum*), which is a rare species in Ontario[3] [27], and shrubby cinquefoil. Ground cover species include Ohio goldenrod (*Solidago ohioensis*), heath aster, sedges (*Carex* spp.), rushes (*Juncus* spp.) and fringed gentian.

Fen

The plant species found in this wetland community are dominated by shrubby cinquefoil, as well as rush and sedge species depending on the type of fen. Fen communities are scattered throughout the Local Study Area and are located within the Baie du Doré PSW. The Saugeen Valley Conservation Authority (SVCA), with assistance from Bruce Power and local public schools, has been conducting a control program for the invasive purple loosestrife that occurs in these communities.

5.4.2.3 Forest

Several hardwood and coniferous forests with varying moisture regimes occur within the Local Study Area. These communities are distributed throughout the Local Study Area, including

[3] Shrubby St. John's wort is listed as an imperilled (S2) species by NHIC.

within the perimeter of the Bruce nuclear site. The main communities documented throughout the Local Study Area are briefly summarized below.

White cedar coniferous forests consist mainly of mature to semi-mature eastern white cedar in pure stand, or in association with balsam fir (*Abies balsamea*). Common species that are frequently found in association with larger white cedar stands include tamarack (*Larix laricina*), white birch (*Betula papyrifera)*, trembling aspen (*Populus tremuloides)*, white ash (*Fraxinus americana*), large tooth aspen (*Populus grandidentata*), balsam poplar (*Populus balsamifera*), and occasional black cherry (*Prunus serotina*) and yellow birch (*Betula allegheniensis*). In regenerating areas, the white cedar forest often forms dense thickets in association with balsam fir and white birch. Depending on the canopy closure, typical groundcover species recorded in these forests include sensitive fern (*Onoclea sensibilis*), gay-wings (*Polygala paucifolia*), grasses (*Danthonia spicata, Oryzopsis asperifolia, Schizachne purpurascens*), sedges (*Carex eburnea, C. pedunculata*), wintergreen (*Gaultheria procumbens*), common raspberry (*Rubus idaeus* ssp. *melanolasius*), calico aster (*Symphyotrichum lateriflorum*), common speedwell (*Veronica officinalis*), Canada mayflower (*Maianthemum canadense*), poison ivy (*Toxicodendron rydbergii* ssp. *rydbergii*) and helleborine (*Epipactis helleborine*). The fresh-moist stands occur on less well-drained soils, with isolated wetland pockets in depressed areas. Groundcover species found in these more moist communities include sensitive fern, snowberry (*Gaultheria hispidula*), field horsetail (*Equisetum arvense*) and mosses.

Mixed forest communities are also present in the Local Study Area. The overstorey of these communities consists of variable mixtures of mature to semi-mature eastern white cedar and/or balsam fir, with deciduous trees such as trembling aspen, sugar maple (*Acer saccharum)*, white ash and white birch. Other tree species occurring in these units include red maple (*Acer rubrum*), black cherry, American beech (*Fagus grandifolia)*, large-toothed aspen and white elm (*Ulmus americana)*. Tamarack is also found in lowland areas within this type of forest.

These mixed forest communities are typically underlain by well-drained to imperfectly-drained silt loam soils with abundant boulders. Typical groundcover species found in these communities include sedges (*Carex eburnea, C. pedunculata*), grasses (*Glyceria striata, Poa alsodes, Schizachne purpurascens*), white snakeroot (*Eupatorium rugosum)*, marginal wood fern (*Dryopteris marginalis*), woodland strawberry (*Frageria vesca*), heal-all (*Prunella vulgaris*), asters (*Symphyotrichum cordifolium, S. lateriflorum*), poison ivy and bracken fern (*Pteridium aquilinum*). Regeneration within mixed forests is mainly limited to balsam fir, eastern white cedar and occasional sugar maple.

5.4.2.4 Cultural Lands

The plant species that dominate cultural lands such as old field communities vary based on disturbance history, exposure and soil characteristics. Old fields persist in many areas of former agricultural use or other disturbance (e.g., previous construction-related activities). These patches are at various stages of succession, depending on the extent and duration of past disturbance. In addition to old fields, some lands within the Local Study Area are actively maintained as intensive agricultural and manicured areas (e.g., parks and residential properties).

The moist old field habitats are dominated by reed canary grass in combination with pioneering goldenrods (*Solidago altissima, S. canadensis*), spotted joe-pye weed, boneset and asters

(*Symphyotrichum ericoides, S. novae-angliae, S. puniceum*). Wetter pockets support blue-eyed grass (*Sisyrinchium montanum, s. mucronatum*), variegated scouring-rush (*Equisetum variegatum*) and a variety of sedges (e.g., *Carex buxbaumii, C. flava, C. granularis, C. hystericina, C. lanuginosa, C. vulpinoidea*) and rushes (*Juncus articulatus, J. balticus, J. dudleyi, J. nodosus, J. torreyi*).

5.4.2.5 Beach/Bar and Sand Dunes

Evidence of the remnant shoreline of glacial Lake Nippissing is present in the low bluff and sand dunes along the shore of Lake Huron at the MacGregor Point Provincial Park, between Scott Point and Port Elgin. Representing forested and shoreline ecosystems within its boundaries, the Inverhuron Provincial Park, which is located to the southwest of the Site Study Area, contains early successional and second growth vegetation communities and shoreline sand dunes. Dominant sand dune vegetation includes balsam poplar, juniper and clumps of white cedar and balsam fir. Other beach environments exist along the shoreline of the Inverhuron Provincial Park dominated by eastern ninebark (*Physocarpus opulifolius)* and balsam poplar [27].

5.4.3 Regional Study Area

The description of the natural environment features in the Regional Study Area is used primarily to identify and assess the potential cumulative effects of the DGR Project and to identify, at the landscape scale, linkages and corridors that are partially composed of or have the potential to interact with natural features in the Site and Local Study Areas.

The Regional Study Area (Figure 2.4.2-1) for the terrestrial ecological environment corresponds to Bruce County boundaries excluding the peninsula communities of the Town of South Bruce Peninsula and the Township of Northern Bruce Peninsula. The westerly limit follows the shore of Lake Huron from Southampton in the north to Highway 86 south of Municipality of Kincardine in the south. Bruce County is located within the Manitoulin-Lake Simcoe Ecoregion, which is characterized by fertile soils and a climate with warm summers and mild winters. The landscape is predominantly level or gently rolling plains, disrupted by large physical features such as the Niagara Escarpment, which runs from Niagara Falls to the northern end of the Bruce Peninsula and Manitoulin Island. This divide in terrain type has resulted in land use in southern Bruce County being primarily agricultural, while natural systems in northern Bruce County are less disrupted by anthropogenic influences.

The landscape of Bruce County has been influenced by glaciations, resulting in cliffs, dunes, talus slopes, karst[4] environments and wetlands. The Niagara Escarpment runs along the east side of the Bruce Peninsula, which forms the north portion of Bruce County. The escarpment is recognized as a World Biosphere Reserve because of the significance of its natural and physical environment features (further described in Section 5.5.3). Natural areas present along

[4] Karst refers to a type of topography that is formed in limestone, gypsum or other rocks, primarily by dissolution, and that is characterized by sinkholes, caves and underground drainage. The most common type of karst is associated with the dissolution of limestone by meteoric waters when the carbonate rocks are exposed to the atmosphere at the Earth's surface, forming an unconfined aquifer. This most commonly occurs when shallow-marine limestones have become exposed due to a fall in sea-level. Karst can also be formed in coastal settings where fresh and marine waters mix, or as a result of limestone dissolution by sulphuric acid during deep burial of sediments.

the escarpment form a regional corridor supporting a variety of unique natural communities, including cliffs, alvars, wetlands, and prairie. Approximately 25% of Bruce County is forested, with much of the north portion of the County, the Bruce Peninsula, under forest cover [28]. The Bruce Peninsula acts as a transition zone between southern deciduous and northern boreal forests. As a result, representative species of a variety of natural areas are present in this area, often at the extreme limits of their range [29]. These forested areas include both lowland and upland deciduous, mixed, and coniferous forests. Bruce County is within the Huron-Ontario section of the Great Lakes-St. Lawrence Region. This physiographic region is generally characterized by sugar maple (*Acer saccharum*) and beech (*Fagus grandifolia*) climax forests, often in association with green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), wild black cherry (*Prunus serotina*), American basswood (*Tilia americana*), northern red oak (*Quercus rubra*), white oak (*Quercus alba*) and Bur (mossy-cup) oaks (*Quercus macrocarpa*) [22]. Eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and balsam fir (*Abies balsamea*) are frequently located in drier or upland areas. Eastern white cedar (*Thuja occidentalis*) is frequently recorded along swampy depressions. Upland coniferous forests in this area often support provincially significant plant species [30].

The Bruce Peninsula and Bruce County in general are home to a broad diversity of ferns (e.g., northern holly-fern, *Polystichum lonchitis*[5]), orchids (e.g., fairy slipper, *Calypso bulbosa*) and insect-eating plants (e.g., northern pitcher-plant, *Sarracenia purpurea*), as well as ancient forests of eastern white cedar located on the Niagara Escarpment [31]. Many plants on the Niagara Escarpment are commonly collected for use in medicines [32]. Remnant shorelines from glacial lakes including Nippissing are evident in the sand dune communities found along the shore of Lake Huron. These dunes represent habitat for grass species such as the provincially rare Great Lakes wheatgrass (*Elymus lanceolatus ssp. psammophilus*), sand reed grass (*Calamovilfa longifolia var. magna*), or the nationally endangered Pitcher's thistle (*Cirsium pitcheri*) [33].

A variety of plant species communities with conservation status are found in Bruce County based on information provided in the NHIC database. These communities are distributed throughout Bruce County and may be found within the Regional Study Area. Table C-1 in Appendix C provides a summary of these communities.

5.5 WILDLIFE HABITAT

5.5.1 Site Study Area and Project Area

The wildlife habitat functions of the remnant woodland habitat units within the Site Study Area are limited by their small size, high degree of fragmentation, and disturbed nature. These areas are capable of supporting wildlife species which are not dependent on forest interior; however, they may be part of habitat areas used by wildlife with larger territorial ranges (e.g., wild turkey and white-tailed deer). The Site Study and Project Areas have been extensively modified through the placement of fill, limiting the availability of topsoil. The site does not provide good habitat for burrowing species of mammals, and the stony nature of the soils limits the growth of herbaceous groundcover in some of the more open habitats.

[5] All nomenclature in this TSD is consistent with that used by the Natural Heritage Information Centre (NHIC).

Networks of small naturalized ditches that are intermittently wet provide corridors for wildlife movement between the Project Area and the Site, Local and Regional Study Areas. The North and South Railway Ditches, which traverse the Project Area adjacent to the north side of the WWMF, are the largest of these naturalized corridors. Although riparian vegetation is limited along the length of the railway ditches, it is populated by a variety of typical emergent and submergent vegetation, dominated by cattails. A variety of herptiles (e.g., green frog and northern watersnake) and small mammals (e.g., muskrat) are regularly recorded using these areas [13;24].

A wild turkey habitat use and suitability survey conducted in February 2007 revealed that at least two distinct flocks of 20 to 30 birds occur at the Bruce nuclear site. Turkey roosting on the site is habitat-specific, with a preference for a combination of open field areas edged by a mix of larger deciduous and coniferous tree stands (Figure 5.3.5-1). No roosts were identified within the Project Area. Disturbed areas within the Site Study Area create suitable feeding/breeding ground for wild turkeys, as manicured grasses, snow clearing, hydro corridors and landfills provide vegetation necessary for winter survival and spring breeding. Additionally, the proximity of travel corridors linking Inverhuron Provincial Park and surrounding farm fields and woodlots provide substantial diversity and range of habitats for wild turkeys within the Site Study Area.

Field observations in 2004 indicated that forest communities within the Project Area have been strongly influenced by deer browse that restricts understorey development [13]. When this occurs, there is reduced likelihood of habitat use by ground or low nesting birds that would otherwise be expected within this habitat. The absence of a developed understorey may also be affecting some small mammal species since there is little protective cover and reduced foraging opportunities. Over time, the large number of deer present throughout the Site Study Area may affect the development of the existing woodlands leading to single-aged stands, with reduced seedbanks and increased occurrences of invasive species.

In a muskrat habitat suitability and usage survey conducted in May 2007, active muskrat houses were observed at one of two study sites within the Project Area where cattails were available (Figure 5.3.4-1). At a reference site in MacGregor Point Provincial Park three active muskrat houses were observed.

Vernal ponds within the Site Study Area provide a number of habitats that are utilized by amphibians during various life stages. In the Project Area, northern leopard frog egg masses have been recorded [24], and a variety of species including northern spring peeper, green frog, gray treefrog, wood frog and yellow-spotted salamander (*Ambystoma maculatum*) have been historically recorded [13]. In a survey of the Project Area completed during April and May 2007, a total of four actively breeding species of frogs including northern spring peeper, northern leopard frog, chorus frog (*Pseudacris maculata*) and gray treefrog were identified (Figure 5.3.2-1). Breeding activity was most intense within wetland communities with the greatest amount of surface water.

As part of the breeding bird survey conducted in the Site Study Area in 2007, five locations were surveyed within the Project Area (see Figure 5.3.2-1). Plots represented cultural meadow, deciduous forest, mixed hardwood forest and mixed swamp. A total of 37 individual birds of 21 species were observed showing breeding behaviour over the three-day periods in May and June with a total of 19 individuals of 16 species in May and 11 individuals of 11 species in June 2007. All of the species observed are common to Ontario. The highest number of species was observed in deciduous forest habitat with a total of eight species. Six species were

identified in both cultural meadow and mixed hardwood habitats. American redstart, blue-headed vireo, common yellowthroat and red-eyed vireo were each identified in two of the four habitat types observed in the Project Area. All other species were observed in one habitat type only.

5.5.2 Local Study Area

Wildlife habitat in the Local Study Area is generally associated with vegetation communities such as forests, meadow and other cultural lands, wetlands and the Lake Huron shoreline. Some important habitat areas found in the Local Study Area are found in MacGregor Point Provincial Park, Inverhuron Provincial Park, and within the Bruce nuclear site; however, larger areas of natural habitat within the perimeter fence of the Bruce nuclear site show more evidence of human disturbance than similar habitat areas outside the limits of the Bruce nuclear site [17]. As discussed in Section 5.5.3 relating to wildlife habitat in the Regional Study Area, the range of wildlife habitat and lack of barriers to wildlife movement suggest that wildlife groups and species likely utilize the habitat in the Local Study Area connected with habitats in the Regional and Site Study Areas.

Second-growth upland coniferous and mixed forest communities in the Local Study Area including much of the Bruce nuclear site are dominated by eastern white cedar (Section 5.4.2). The extensive coniferous content of the forest cover provides important overwintering and feeding sites for white-tailed deer. The deer populations within the Local Study Area as well as the Bruce nuclear site make use of the large Huron Fringe Deeryard that extends from Inverhuron Provincial Park in the south to MacGregor Point Provincial Park in the north. The upland coniferous forest habitat also supports a number of bird species, including species common to woodland edge habitats and wild turkey, which use the coniferous forests for winter cover.

Short to medium height cover of field grasses and herbs characterize the cultural meadow/old field habitat found in the Local Study Area, which also includes some limited shrub and tree cover. These areas support several ground nesting bird species as well as other species that forage on the ground. These habitats also attract raptors that hunt over the open field. Wild turkey habitat also exists within the Local Study Area including within the perimeter fence of the Bruce nuclear site because of the varied habitat including open meadow, cleared hydro corridor and forests. High numbers of wild turkeys have been observed within the Bruce nuclear site and are partially attributed to the lack of large predators that are excluded from the site by the perimeter fence, which was previously thought to be a barrier to wildlife movement offsite. However, wild turkey and white-tailed deer have been documented moving offsite to the east. Additional discussion on the availability of wild turkey habitat within the Site Study Area and Project Area is presented in Section 5.5.1. Mixed forests, open meadow, wetlands and cultural thickets in the Local Study Area provide habitat suitable for a variety of breeding birds. The dense cover provided by cultural thickets supports a combination of open land bird species and those requiring woody structures for nesting as well as small mammals requiring shelter and foraging sites [12].

The high water table and hummocky terrain with the surrounding forested and cultural habitat units create localized ponding. Ponding within these habitats can be used by adult amphibians throughout summer and fall periods and provides local amphibian breeding habitat. The abundance of woody debris, tree cavities, boulders and vernal pools in the swamp and marsh habitats increases the suitability for wildlife habitat use in these communities. Seepage areas

have been documented in this community, which are an important feature for wild turkeys. The swamp and marsh habitats, however, are quite small compared with the surrounding forested areas and cultural vegetation communities. Because of this, these communities likely do not provide specialized habitat that is sufficient to support a different wildlife community than is present in the surrounding mixed forest and meadows, with the exception of potential amphibian breeding habitat.

Open-water habitat throughout the Local Study Area, particularly associated with the Lake Huron shoreline supports waterfowl and herpetofaunal breeding. Ponds within the Local Study Area vary from constructed to natural with steep to gentle sloping sides and shoreline vegetation ranging from dune grasses to forest edge. These open waterbodies vary in depth and can contain emergent vegetation in the form of sedges or reeds. Species observed in ponded habitats in the Local Study Area include birds such as blue-winged teal, bufflehead, Canada goose, mallard, wood duck, common snipe; herptiles such as northern leopard and green frogs, painted turtle, spotted turtle, salamander species; and mammals such as muskrat and beaver. Other aquatic environments, such as ditches, ephemeral ponds, and streams represent habitat for fish, herpetofauna, and some birds and mammals [17]. Examples of this habitat type include many of the ponds and streams at the Bruce nuclear site and in the Baie du Doré. Aquatic habitat for fish, aquatic invertebrates, and submergent vegetation are discussed in further detail in the Aquatic Environment TSD.

The waterfowl field program is described in Section 5.3.6. The most common waterfowl species observed within 150 m of the shoreline were mallard, common merganser and double-crested cormorant. Large numbers of Canada goose, ring-billed gull and herring gull were also seen. The numbers of mallards, mergansers and double-crested cormorants peaked in September and dropped off considerably in October, suggesting that their movement south occurred early in the autumn migration period. In contrast, Canada goose and ring-billed gull numbers showed the opposite trend, with more individuals observed in October than in September, suggesting a later migration period.

A number of bird species of concern have been observed in the Local Study Areas, including a winter-resident population of bald eagles (*Haliaeetus leucocephalus*) that appears to feed on fish in the discharge channel of the Bruce A and Bruce B stations and roost along the shore of Lake Huron, particularly within portions of the Baie du Doré wetland [34]. During the shoreline surveys in 2007, three bald eagles were observed either flying over or perched on shoreline boulders in the Baie du Doré area. The bald eagle is presently designated as special concern and is a VEC for this assessment. The shoreline surveys also identified two black-crowned night-herons (*Nycteris nyctericorus*), two Caspian terns and a single golden eagle in the Local Study Area during the September survey. One tern was observed in Baie du Doré, the other in MacPherson Bay. Caspian tern is considered provincially rare [35] but has no special conservation status. The golden eagle was observed on shoreline boulders in the Baie du Doré. Golden eagle is listed as endangered under the *Endangered Species Act* (Ontario 2007).

Other species with special conservation status that have been identified in the Local Study Area are the endangered Acadian flycatcher (*Empidonax virescens*) and the following species of special concern: short-eared owl (*Asio flammeus*), red-headed woodpecker (*Melanerpes erythrocephalus*) and yellow-breasted chat (*Icteria virens*). None of these birds are reported to nest in the Site or Local Study Areas, though they may be local foragers [17]. With the exception of the black-crowned night-heron, which is believed to nest in the vicinity of the mouth

of the Saugeen River, all of the other provincially rare birds are migrants that have their breeding ranges in northern Ontario [36].

The Baie du Doré wetland provides diverse habitat including shallow open-water ecosystems and shallow shoals to shrub fen communities. The wetland is a shallow, flat shoreline area within an embayment that provides a sheltered environment from Lake Huron with partial wind protection toward the back of the embayment [12]. The Baie du Doré wetland provides habitat for a number of species at risk, and includes an overwintering population of bald eagle, which is listed as a species of Special Concern in the *Endangered Species Act* (Ontario 2007) [35].

Shoreline landforms within the Local Study Area include cobble and sand shorelines, shoreline meadow marshes and fens forming complex vegetation ecosystems that are influenced by the water levels of Lake Huron. These landforms, as well as forest communities, occur within Inverhuron Provincial Park. The shoreline area of the park, like most of the Bruce Peninsula, is used by a variety of migratory shorebirds, waterfowl and gulls, as well as an overwintering population of bald eagle.

The varied habitats at MacGregor Point Provincial Park make it a notable area of wildlife habitat that supports a relatively high diversity of species, including forests, ponds, wetlands and shoreline, resulting in a wide variety of habitat types. Over two-thirds of all bird species found in Grey and Bruce Counties make use of habitat within the park, including the provincially rare black-crowned night-heron [25]. Moist forest and fen-pond complex communities at MacGregor Point are also habitat for amphibian and reptile populations. A constructed pond at the park is a very important area within the Local Study Area for both migrating and breeding bird species [25].

The Lake Huron shoreline is used mostly by gulls, waterfowl and cormorants, which use the large rocks at the water's edge for resting. Occasionally the habitat is used by foraging shorebirds. The habitat along the shoreline is quite exposed with a cobble surface that generally lacks vegetation. During winter, warm water discharged from the cooling water systems at the two existing Bruce Power generating stations may prevent the lake from freezing near the point of the discharges [37]. As a result, fish and waterbirds are found near the discharges in higher densities than the surrounding area. Waterfowl species that have historically been recorded using this created habitat include herring gull, bufflehead, common merganser, common goldeneye (*Bucephala clangula*), ring-billed gull, great black-backed gull and bald eagle, as well as a rare sighting of a harlequin duck (*Histrionicus histrionicus*), which are uncommon vagrants in Ontario [17]. The shoreline provides a corridor for movement of wildlife along the cobble substrate within the Local Study Area, but this movement is limited, particularly for mammals, by the presence of the perimeter fence and features such as the discharge channels at the Bruce nuclear site.

5.5.3 Regional Study Area

Wildlife habitat in the Regional Study Area is generally associated with the Lake Huron shoreline, the Saugeen River riparian corridor and associated wetland complexes, and the Niagara Escarpment and naturally vegetated areas including: upland forest, cultural meadow, marsh and swamp communities. The built environment structures and surfaces also provide habitat for some species of birds and mammals that are habituated to anthropogenic land use and human disturbance.

Within the Bruce Peninsula, large stands of contiguous upland coniferous and mixed forest provide habitat for many species of wildlife. Mammal species commonly seen throughout the Bruce Peninsula include white-tailed deer (*Odocoileus virginianus*), snowshoe hare (*Lepus americanus*), raccoon (*Procyon lotor*), eastern chipmunk (*Tamias striatus*), eastern grey squirrel (*Sciurus carolinensis*) and porcupine (*Erethizon dorsatum*) [38]. This forest habitat includes areas with dense canopy cover used by deer in winter months attributed to the reduced snow accumulation [39]. This habitat is also suitable for more rarely seen species such as black bear (*Ursus americanus*), red fox (*Vulpes vulpes*), fisher (*Martes pennanti*), martin (*Progne subis*) and eastern massassauga rattlesnake (*Sistrurus catenatus catenatus*) [38]. The transitional nature of the region is apparent as breeding habitat exists for boreal avifauna such as olive-sided flycatcher (*Contopus cooperi*) and ruby-crowned kinglet (*Regulus calendula*), and for southern avifauna like common moorhen (*Gallinula chloropus*) and red-headed woodpecker (*Melanerpes erythrocephalus*) [29].

Features of the Niagara Escarpment, including cliffs, alvars, talus slopes, wetlands and prairies provide a vast diversity of wildlife habitat within a small geographic range, and are associated with the Regional Study Area attributed to the interconnected nature of terrestrial systems. The cliffs of the Niagara Escarpment provide habitat for a large variety of bird species, including species of special concern like black tern (*Chlidonias niger*) and red-shouldered hawk (*Buteo lineatus*) [40;27]. Rock cliffs in the area near the shoreline also present potential habitat for turkey vulture summer roosting areas [39]. Broken rock piles at the base of cliffs and karst features along the escarpment provide potential habitat for snakes and turtles to overwinter in concentrations referred to as hibernacula [39]. Bat hibernacula for five out of the eight species of bats found in Ontario are found in humid caverns and crevices that occur on the Bruce Peninsula as karst features [29;30]. The varied wetland communities found throughout the Regional Study Area range from shallow marshes to bog environments, which support diverse wildlife including breeding reptiles and amphibians like massassauga rattlesnake and the nationally endangered spotted turtle (*Clemmys guttata*), and migrating birds including hawks and owls. These wetland areas include potential habitat for bullfrogs (*Rana catesbeiana*) [39]. Ridge-top forest areas provide habitat for rare Ontario species including massassauga rattlesnake and southern flying squirrel (*Glaucomys volans*) [29]. Open lands including meadow and grassland communities are also used by the massassauga rattlesnake and species of raptors such as short-eared owl (*Asio flammeus*) for winter feeding and roosting, as they support large communities of small mammals [39].

Major river systems within the Regional Study Area include the Saugeen and Sauble. These rivers are associated with a number of smaller streams, the valley systems of which contribute to the network of habitat corridors and riparian habitat throughout Bruce County. As well, there are a number of inland lakes and natural ponds which represent habitat for a variety of plant species [29]. Fen and marsh wetland areas are common with fewer bog areas within Bruce County. The Greenock Swamp, located in the southeastern portion of the Regional Study Area, is one of Ontario's largest remaining wetlands, approaching 8,000 ha in size (further described in Appendix C). The Lake Huron shoreline, which runs along the west edge of the County, provides a natural habitat corridor that extends north along the Bruce Peninsula. Lake Huron influences shoreline terrestrial habitats in the Regional Study Area. Several unique habitats, including open shore environments, moist grassy meadows near the shore, and open sand dunes occur along the shore.

The Ontario Provincial Policy Statement considers colonial bird nesting sites to represent significant wildlife habitat [41]. Chantry Island and the Bruce Peninsula are recognized as

providing significant wildlife habitat for breeding and migrating birds. Chantry Island, located one kilometre to the west of the Lake Huron shoreline at Southampton, is recognized in Canada as a national migratory bird sanctuary and internationally as an Important Bird Area (IBA) by Bird Life International [42;43]. Nationally significant numbers of colonial wading birds including great egret (*Casmerodius albus*) and black-crowned night-heron (*Nycticorax nycticorax*) are found in this deciduous forest habitat [42]. Great blue heron (*Ardea herodias*) are also found here, but in less significant numbers. The island is predominantly treed, but also provides beach habitats on the south and east sides. Cabot Head on the northeast side of the Bruce Peninsula is also recognized as an IBA site for migratory land birds (e.g., broad-winged hawks – *Buteo platypterus*, blue jays-*Cyanocitta cristata*, American robins – *Turdus migratorius*) and waterbirds (e.g., red-necked grebes – *Podiceps grisegena*). Terrestrial habitat diversity is relatively high in this area with forests, grasslands, alvar, fen, marsh, cliffs, inlets and urban parks [42].

Open water, shallow marsh, fen and bog environments create habitat for a range of species, within the large continuous wetland and aquatic areas found in the southern half of Bruce County (including the Regional Study Area). The northern leopard frog (*Rana pipiens*) relies on marsh environments for breeding and larval life stages. This species overwinters in the mud of lake bottoms. During the adult life phase, northern leopard frogs may use the surrounding upland forest areas as habitat, but prefers open grasslands as summer foraging habitat. Muskrats (*Ondatra zibethicus*) feed on submergent marsh vegetation and use emergent vegetation for construction of lodges.

Wildlife habitat in the Regional Study Area is an extension of that found in the Local Study Area. Potential effects of the DGR Project on wildlife habitat are likely to be greater within the Local Study Area; therefore, habitat provided by the Lake Huron shoreline, upland coniferous forests, organic marsh and deciduous swamps are described in greater detail in Section 5.5.2 for the Local Study Area. Some wildlife guilds and species are expected to move between habitats within the Regional, Local and possibly Site Study Areas because of extensive forest cover mixed with more open transitional areas as well as the lack of physical barriers to wildlife movement.

5.6 NATURAL HERITAGE SYSTEM

5.6.1 Site Study Area and Project Area

A review of the NHIC database indicates that no designated or significant natural areas occur within the boundaries of the Project Area, but Inverhuron Provincial Park and Baie du Doré PSW occur partially within the boundaries of the Site Study Area [27]. As noted in Section 5.5.1, above, the woodland units in the Site Study Area are highly fragmented and have been subjected to considerable disturbance, including heavy deer browse [13].

5.6.2 Local Study Area

Features associated with the Lake Huron shoreline dominate the Natural Heritage System in the Local Study Area. A network of small rivers and streams extends inland from Lake Huron providing habitat corridors that link features along the shoreline with areas of habitat further inland. As previously noted, watercourses within the Local Study Area include Tiverton Creek, Little Sauble River, Stream C, Underwood Creek and Mill Creek. A number of Natural Heritage

System components in the Local Study Area are intrinsically part of the Regional Study Area or have ecological functions that are important at both the local and regional scales. The following core natural areas are present within the Local Study Area, and mapped on Figure 2.4.2-2, and are briefly noted in the summary of the Natural Heritage System presented for the Regional Study Area (Appendix C, Table C-2):

- Inverhuron Provincial Park, which is an International Biological Program (IBP) Site and Provincial Park (Historical);
- Baie du Doré PSW;
- Scott Point PSW Complex and Provincially Significant Life Science ANSI;
- MacGregor Point Provincial Park which is a PSW Complex, a Regionally Significant Life Science ANSI and a Provincial Park (Natural Environment);
- MacGregor Point Wildlife Management Unit, which is an IBP Site;
- Lorne Beach Swamp, which is a Regionally Significant Wetland;
- South Lorne Shoreline IBP Site;
- North Lorne Shoreline IBP Site; and
- Huron Fringe Deeryard.

Inverhuron Provincial Park (~288 ha in size) is a park located immediately south of the Bruce nuclear site. The park contains primarily early successional and second growth vegetation communities resulting from past disturbances, which include logging, clearing, farming, and fire. The largest area of forest cover in the park is a second growth coniferous forest (134 ha in size). A sand dune system is present immediately inland from the existing beach on the Lake Huron shore and supports a number of rare plant species including nationally endangered Pitcher's thistle [27;44]. An overwintering population of bald eagles, which are listed as Special Concern by the OMNR [27], has been observed in Inverhuron Provincial Park [27;44].

The Baie du Doré PSW is located immediately north of the Bruce nuclear site although a small portion of the wetland lies within the boundaries of the Bruce nuclear site. The wetland consists of shrub and open fen, shallow marsh, and swamp habitats. Underwood Creek drains into Lake Huron through the northern portion of the wetland. As noted in the previous sections, the Baie du Doré wetland provides habitat for a number of rare species.

The Scott Point Provincially Significant Life Science ANSI is located within the wooded Huron Fringe Deeryard. This site consists of sand and boulder beach, raised storm beaches, and a Lake Nippissing terrace. The Scott Point Complex is a complex of small coastal wetlands consisting of swamp, marsh and fen. Located on former Lakes Algonquin and Nippissing, the wetland includes shoreline bluffs and beach ridges.

MacGregor Point Provincial Park is designated as a Regionally Significant Life Science ANSI. The park is located along approximately eight kilometres of Lake Huron shoreline in the area between Scott Point and Port Elgin. The park contains a relatively high diversity of habitats supporting a number of provincially rare species as well as numerous breeding migratory birds. The former shoreline of Lake Nippissing is evident as a low bluff that runs the length of the park, while sand dunes run along the Lake Huron shore. A number of other geological features representative of the Huron Fringe Deeryard are also present within the park. In addition, the park contains the MacGregor Point PSW Complex. This coastal wetland complex comprises 71 component wetlands consisting primarily of swamp habitat, with some fen and marsh [27].

MacGregor Point Wildlife Management Unit, an International Biological Program (IBP) Site, comprises five kilometres of Lake Huron shoreline, including sand beaches and dunes, rock beaches, and beach cliff. Poorly drained depressions and shingle beaches support extensive deciduous and mixed lowland forest, deciduous upland forest, shoreline grove thicket, and meadows. A pond with marl substrates supports an aquatic community.

Lorne Beach Swamp is a Regionally Significant Wetland covering approximately 28 ha, composed of three individual wetland communities. The vegetation communities within the Lorne Beach Swamp include coniferous swamp, mixed swamp, thicket swamp and treed fen.

South Lorne Shoreline IBP Site has good representation of lake shore vegetation and covers approximately 38 ha. Relatively undisturbed upland and mixed lowland deciduous forests cover approximately 85% of the undulating backshore plain of the glacial Lake Nippissing foreshore on the Lake Huron shore. Vegetation communities include upland and lowland mixed forest, pastures, and early successional communities. Old beach cliffs and wave-cut terraces follow the lake shoreline and are intersected by a watercourse.

North Lorne Shoreline IBP Site covers approximately 42 ha and consists of relatively undisturbed upland and lowland deciduous, mixed and coniferous forests. Approximately 25% of the site supports early successional vegetation communities. Beach cliffs support homogeneous cedar forest, with the rest of the site showing a mosaic of upland and wetland features, including wetland ponds and streams.

The Huron Fringe Deeryard is another important natural feature within the Local Study Area. This deer yard runs along the Lake Huron shoreline from Inverhuron Provincial Park to MacGregor Point Provincial Park and provides important winter habitat for white-tailed deer and a number of other wildlife species.

5.6.3 Regional Study Area

The diverse habitat features and unique landscape that exists in the Regional Study Area include a number of noteworthy landscape-scale features, based on a review of the NHIC database. As introduced in previous sections, landscape-scale features in the Regional Study Area include the Niagara Escarpment, the Lake Huron shoreline, the headwaters of the Saugeen River, and the shoreline of the historic glacial Lake Nippissing. A large number of other natural heritage features have been evaluated and designated as significant by the Ontario Ministry of Natural Resources (OMNR), including:

- Provincially Significant Wetland (PSW);
- Regionally Significant Wetland[6];
- Life Science Area of Natural or Scientific Interest (ANSI);
- Earth Science ANSI;
- Provincial Parks and Conservation Areas;
- International Biological Program sites (IBP); and
- Life Science Site, Natural Area of Regional Significance (NARS).

[6] Regionally Significant Wetlands are referred to on the NHIC website as “Non-provincially Significant Wetlands” [27].

The natural heritage features in the Regional Study Area may act as important links and corridors of the various types of wildlife habitat described in Section 5.6.2. Table C-2 in Appendix C provides a summary of the Natural Heritage Systems designated features in the Regional Study Area based on a review of the NHIC database. A number of the sites are also located within the Local Study Area, and are described in detail in Section 5.6.2.

5.7 WILDLIFE COMMUNITIES AND SPECIES

5.7.1 Site Study Area and Project Area

The following sections generally describe wildlife communities and species in the Site Study Area and Project Area based on existing literature and DGR Project specific field studies. The wildlife communities and species in the Project Area tend to be subcomponents (e.g., metapopulations) of populations and communities of species at the Regional, Local and/or Site Study Areas scales since habitats are linked. Accordingly, this discussion focuses on the species most likely to use the habitats identified within the Project Area.

5.7.1.1 Birds

The bioinventory study of the Site Study Area completed in 2001 [17] included an assessment of breeding birds at 12 locations on-site. Based on this assessment, approximately 83 species of birds were identified as having potential for breeding within the Site Study Area. Up to approximately 40 species were identified as having breeding potential within the Project Area, including one confirmed breeder [17]. It was postulated in this report that noise and disturbance from construction activities at the WWMF adjacent to some of the survey locations may have resulted in a decreased number and diversity of species recorded than would normally make use of habitat in that area [17]. The list of species recorded includes mainly forest species such as great crested flycatcher, red-eyed vireo, blue jay, black-capped chickadee and black-and-white warbler.

Twenty-five bird species were identified in a field study within the immediate area of the WWMF carried out in 2004 as part of the WWMF Refurbishment Waste Storage Project terrestrial environment study [13]. Four species were confirmed breeders in the area: northern flicker, chipping sparrow, American robin and black-capped chickadee. Noise and disturbance from use of heavy equipment at the WWMF adjacent to the survey location near the north storage area is mentioned as a potential influence on the number and diversity of species recorded [13].

A breeding bird survey of 27 monitoring locations in the Site Study Area and six locations outside of this area in Inverhuron Provincial Park and Baie du Doré was conducted over six days in May and June, 2007 (see Figure 5.3.2-1), as described in Section 5.3.2. Five of the monitoring locations fall within the Project Area. The findings of this survey are discussed below in relation to the habitat types monitored. As part of this study, four species (blackburnian warbler [*Dendroica fusca*], blue-winged warbler [*Vermivora pinus*], gray jay [*Perisoreus canadensis*] and marsh wren [*Cistothorus palustris*]) were observed in the Site Study Area for the first time in 2007, and ten species (American woodcock [*Scolopax minor*], brown creeper [*Certhia americana*], blue-headed vireo [*Vireo solitarius*], chestnut-sided warbler [*Dendroica pensylvanica*], downy woodpecker [*Picoides pubescens*], marsh wren, Philadelphia vireo [*Vireo philadelphicus*], Tennessee warbler [*Vermivora peregrine*], vesper sparrow [*Pooecetes*

gramineus] and Virginia rail [*Rallus limicola*]) were classified as being 'possible' breeders in the Site Study Area for the first time.

From the breeding bird survey conducted in 2007, five plots were surveyed in the Project Area (Figure 5.3.2-1). The most common vegetation type surveyed was deciduous forest, which was found in two plots. Cultural meadow, mixed hardwood forest and mixed swamp were each found in one plot. A total of 19 individual birds showing breeding behaviour accounting for 16 species were observed over the three-day period in May. For the survey carried out in June, a total of 11 individuals representing 11 species were recorded showing breeding behaviour. In total, there were 37 birds observed exhibiting breeding behaviour within the Project Area representing 21 different species in the 2007 field study. American redstart (*Setophaga ruticilla)* was the most commonly observed species overall (three in May, two in June), followed by eastern wood-pewee (two in both May and June) and red-eyed vireo (two in both May and June).

A number of species were observed only once. Of the species seen, only the black-and-white warbler was considered a 'probable' breeder. There were no 'confirmed' breeders observed during the survey. Incidental observations of birds in the Site Study Area during field studies carried out in 2007 include downy woodpecker, eastern wild turkey, pileated woodpecker, ruffed grouse and waterfowl species. Pileated woodpecker was observed only in the wooded areas within the Site Study Area, but the other species identified occurred across both wooded and developed areas (see Figure 5.3.2-1).

Breeding bird surveys were updated as part of the 2009 field data collection season. No additional sites were surveyed as part of this update; however, a more detailed survey for potential wetland bird species was completed at one location to determine the potential for king rail (*Rallus elegans*), a provincially endangered species potentially breeding in this location. Two breeding bird surveys were conducted over two three day periods in May and July 2009. Surveys were conducted when weather conditions (i.e., precipitation and wind) were within the parameters required by monitoring programs such as the Breeding Bird Survey [21] or the Marsh Monitoring Program [20], whenever possible[7]. Surveys were conducted at the same breeding bird plots that were established in 2007 (see Figure 5.3.2-1) using the same methodology. One additional survey focusing on king rail was conducted at location 12 (Figure 5.3.2-1) to investigate the species presence in the marsh. No evidence of king rail was documented during this survey. Table 5.7.1-1 lists all of the species that were recorded during breeding bird surveys within the Project Area and surrounding areas. An "x" in this table indicates a confirmed species within the five minute point count time allotment, and an "I" indicates an observation either prior to or after this window. A total of 83 species were identified during these surveys.

Species at Risk (SAR) documented during these surveys were limited to two incidental sightings. Two black-crowned night herons (*Nycticorax nycticorax*) were observed flying over the site on July 2, 2009. The black-crowned night heron is not listed federally or provincially in Ontario, although it is ranked as a vulnerable species in the province of Ontario by the NHIC [45]. Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities; however, these ranks are not considered legal designations. Additionally,

[7] Wind velocities in this area often exceed 25 km/h because of the proximity to Lake Huron, and some surveys were conducted in slightly higher than suggested wind conditions.

one common nighthawk was documented as an incidental sighting in Inverhuron Provincial Park during the July 2009 surveys. This species is considered to be threatened in Canada by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Special Concern in Ontario by COSSARO.

Table 5.7.1-1: Species Recorded During the 2009 Breeding Bird Survey

Species Common Name	Species Scientific Name	Site Study Area	Project Area	Baie du Doré	Inverhuron
American bittern	*Botaurus lentiginosus*	—	I	—	—
American crow	*Corvus brachyrhynchos*	x	x	x	x
American goldfinch	*Carduelis tristis*	x	x	x	x
American kestrel	*Falco sparverius*	x	—	—	—
American redstart	*Setophaga ruticilla*	x	x	x	x
American robin	*Turdus migratorius*	x	x	x	x
Black-and-white warbler	*Mniotilta varia*	x	x	x	x
Black-capped chickadee	*Poecile atricapilla*	x	x	x	x
Belted kingfisher	*Ceryle alcyon*	—	—	x	—
Brown creeper	*Certhia americana*	x	—	x	—
Brown-headed cowbird	*Molothrus ater*	x	x	—	I
Brown thrasher	*Toxostoma rufum*	I	x	—	—
Blue-headed vireo	*Vireo solitarius*	x	—	x	—
Blue jay	*Cyanocitta cristata*	x	x	—	x
Black-crowned night heron	*Nycticorax nycticorax*	I	—	—	—
Black-throated green warbler	*Dendroica virens*	x	x	x	x
Canada Goose	*Branta Canadensis*	x	x	I	x
Canada warbler	*Wilsonia canadensis*	x	—	x	—
Cedar waxwing	*Bombycilla cedrorum*	x	x	x	x

Table 5.7.1-1: Species Recorded During the 2009 Breeding Bird Survey (continued)

Species Common Name	Species Scientific Name	Site Study Area	Project Area	Baie du Doré	Inverhuron
Chipping sparrow	*Spizella passerina*	x	x	—	I
Common grackle	*Quiscalus quiscula*	x	—	x	—
Common loon	*Gavia immer*	I	I	—	—
Common nighthawk	*Chordeiles minor*	—	—	—	I
Common raven	*Corvus corax*	I	—	—	—
Common yellowthroat	*Geothlypis trichas*	x	x	x	x
Chestnut-sided warbler	*Dendroica pensylvanica*	x	—	—	x
Double-crested cormorant	*Phalacrocorax auritus*	x	—	—	—
Downy woodpecker	*Picoides pubescens*	x	—	—	—
Eastern kingbird	*Tyrannus tyrannus*	x	—	—	—
Eastern meadowlark	*Sturnella magna*	x	x	—	—
Eastern phoebe	*Sayornis phoebe*	—	—	—	—
Eastern towhee	*Pipilo erythrophthalmus*	x	—	—	—
Eastern wood-pewee	*Contopus virens*	x	x	—	x
European starling	*Sturnus vulgaris*	x	x	—	—
Field sparrow	*Spizella pusilla*	x	—	—	—
Grasshopper sparrow	*Ammodramus savannarum*	I	—	—	—
Great blue heron	*Ardea herodias*	—	—	—	x
Great crested flycatcher	*Myiarchus crinitus*	x	x	x	x
Grey catbird	*Dumetella carolinensis*	x	—	—	—
Green heron	*Butorides virescens*	—	x	—	—
Gull species	*Laridae sp.*	x	x	x	—

Table 5.7.1-1: Species Recorded During the 2009 Breeding Bird Survey (continued)

Species Common Name	Species Scientific Name	Site Study Area	Project Area	Baie du Doré	Inverhuron
Hairy woodpecker	*Picoides villosus*	—	x	—	x
Hermit thrush	*Catharus guttatus*	—	—	x	
Herring gull	*Larus argentatus*	x	x	x	x
House finch	*Carpodacus mexicanus*	—	—	—	—
House wren	*Troglodytes aedon*	x	x	x	x
Indigo bunting	*Passerina cyanea*	—	x	x	I
Killdeer	*Charadrius vociferus*	x	—	—	—
Least flycatcher	*Empidonax minimus*	—	I	—	—
Magnolia warbler	*Dendroica magnolia*	I	—	x	I
Mourning dove	*Zenaida macroura*	x	x	—	x
Mourning warbler	*Oporornis philadelphia*	x	I	—	x
Nashville warbler	*Vermivora ruficapilla*	x	—	x	x
Northern cardinal	*Cardinalis cardinalis*	x	—	—	x
Northern flicker	*Colaptes auratus*	x	x	—	
Northern waterthrush	*Seiurus noveboracensis*	x	—	x	x
Ovenbird	*Seiurus aurocapilla*	x	I	x	x
Philadelphia vireo	*Vireo philadelphicus*	x	—	x	x
Pileated woodpecker	*Dryocopus pileatus*	x	—	—	—
Purple finch	*Carpodacus purpureus*	I	—	—	—
Red-breasted nuthatch	*Sitta canadensis*	—	—	—	x
Red-eyed vireo	*Vireo olivaceus*	x	x	x	—

Table 5.7.1-1: Species Recorded During the 2009 Breeding Bird Survey (continued)

Species Common Name	Species Scientific Name	Site Study Area	Project Area	Baie du Doré	Inverhuron
Red-winged blackbird	*Agelaius phoeniceus*	x	x	x	—
Rock pigeon	*Columba livia*	—	I	—	—
Savannah sparrow	*Passerculus sandwichensis*	x	—	—	—
Scarlet tanager	*Piranga olivacea*	—	—	—	x
Sedge wren	*Cistothorus platensis*	—	x	—	—
Song sparrow	*Melospiza melodia*	x	x	x	x
Sharp-shinned hawk	*Accipiter striatus*	I	—	—	—
Swainson's thrush	*Catharus ustulatus*	x	x	I	I
Swamp sparrow	*Melospiza georgiana*	x	x	x	—
Tree swallow	*Tachycineta bicolor*	x	x	x	—
Turkey vulture	*Cathartes aura*	x	—	—	I
Veery	*Catharus fuscescens*	—	—	—	x
Virginia rail	*Rallus limicola*	x	—	—	—
Wild turkey	*Meleagris gallopava*	x	—	—	—
Wilson's warbler	*Wilsonia pusilla*	—	x	—	—
Winter wren	*Troglodytes troglodytes*	x	—	—	—
Wood duck	*Aix sponsa*	—	—	—	x
Wood thrush	*Hylocichla mustelina*	I	—	—	x
White-throated sparrow	*Zonotrichia albicollis*	—	—	I	—
Yellow warbler	*Dendroica petechia*	x	—	I	—

Notes:
— No observation
x Confirmed species within the 5 minute point count time allotment
I Incidental observations prior to and after the 5 minute point count survey

Forested Habitat

Seventeen of the 33 locations in the spring 2007 and 2009 breeding bird surveys (see Figure 5.3.2-1) carried out in the Site Study Area were located in forest habitats including coniferous, deciduous and mixed woods forest. Approximately 31 bird species within these forest habitats showed potential breeding, with two species, American redstart (*Setophaga ruticilla*) and black-and-white warbler found to be probable breeders in 2007 and two in 2009, including American redstart and black-throated green warbler (*Dendroica virens)*. The most commonly observed species with evidence of breeding were American redstart, black-throated green warbler and red-eyed vireo.

Openland Habitat

The spring 2007 and 2009 breeding bird survey in the Site Study Area included areas of cultural meadows (approximately eight of the 33 sites) and cultural woodlands (three of the 33 sites) with 23 potential breeding bird species identified. Of these 23 species, killdeer and red-winged blackbird were also found to be possible breeders in 2007 and song sparrow and eastern kingbird in 2009. Wild turkey was also identified as a possible breeder during both the 2007 and 2009 surveys. The most commonly observed species included chipping sparrow (*Spizella passerina*), common yellowthroat (*Geothlypis trichas*), eastern meadowlark (*Sturnella magna*) and red-winged blackbird.

Wetland Habitat

Mixed swamp, coniferous swamps and a wetland area were represented by four of the monitoring locations included in the spring 2007 and 2009 breeding birds survey at the Bruce nuclear site. Fourteen species of birds showed potential for breeding during this survey with one (wild turkey) showing possible breeding potential during the 2007 season and three (common yellowthroat, red-winged blackbird and wood duck [*Aix sponsa*]) in 2009. The most commonly observed species included common yellowthroat, northern waterthrush (*Seiurus noveboracensis*) and red-winged blackbird.

5.7.1.2 Mammals

Evidence of star-nosed mole, groundhog, eastern chipmunk, racoon and white-tailed deer were recorded as part of historic environment studies [13;17] within the Project Area. Historical evidence of beaver activity was noted in the north storage area. White-tailed deer, muskrat and water shrew were also observed as part of this study.

Incidental observations of mammals within the Site Study Area as part of field studies undertaken in 2007 included beaver, cottontail rabbit, coyote, grey squirrel, snowshoe hare, striped skunk, weasel and white-tailed deer. Most mammals were observed in the wooded area at the southwest corner of the Site Study Area, adjoining Inverhuron Provincial Park, including four snowshoe hares, two coyotes and several white-tailed deer (see Appendix E). Beaver were identified only at the north and south ends of the Site Study Area. Two observations of cottontail rabbit were made in the wooded area to the northwest of the Site Study Area with a single observation of a grey squirrel in the wooded area south of the Bruce Power training building. Two striped skunks were observed south of the WWMF within the Project Area, and a single weasel observation was made in the developed area near the former Bruce Heavy Water

Plant. Incidental observations within the Project Area included several occurrences of white tailed deer in the wooded areas north of the railway ditches and southwest of the WWMF toward Tie Road.

Several site specific surveys were completed within the Site Study Area to further supplement the existing information. These studies are described in more detail below.

Small Mammal – Rodent Surveys

Small mammal surveys were added to the 2009 field data collection season, which were designed to determine habitat use and distribution of meadow voles (*Microtus pennsylvanicus*) (initially selected as a small mammal VEC) within the Project Area, with incidental records of other rodent species, as described in Section 5.3.7. However, as will be discussed with the results, despite considerable effort, meadow voles were not captured during this program and the small mammal VEC was changed to northern short-tailed shrew, as discussed in Section 4.1.

Live traps were used to minimize the potential impacts to captured species. Captured specimens were measured, and weighed and classified by age category (juvenile, sub-adult and adult) prior to marking and release. These small mammals prefer open grassland areas with good herbaceous species cover, which is not abundant on the site. Traps were placed in areas determined to have potential habitat, including thick grass cover.

During the first survey, none of the traps contained any rodent species, and only one trap (Trap #8) showed evidence of any rodent activity (droppings on lid of trap). Therefore, the survey methodology was modified to provide increased opportunities to capture rodents over a longer survey duration as part of the second survey. Although the initial assessment of the site indicated poor habitat potential for small mammal use of the Project Area, the potential for avoidance of the traps was recognized as they had only been set over one night.

The traps were checked and removed in the morning of October 7, 2009. This survey did result in the capture of rodents; however, no meadow voles were captured. Table 5.7.1-2 summarizes the species and locations of rodents trapped. All species captured were estimated to be adults.

Table 5.7.1-2: Small Mammal – Rodent Survey Results

Location [b]	Species	Number and Measurements	Health
Trap #1	Northern short-tailed shrew	76 mm body length (88 mm with tail) 15 g	Poor/deceased
Trap #2	Northern short-tailed shrew	83 mm body length (101 mm with tail) 20 g	Poor/deceased
Trap #2	Northern short-tailed shrew	93 mm body length (111 mm with tail) 30 g	Poor/deceased

Table 5.7.1-2: Small Mammal – Rodent Survey Results (continued)

Location [b]	Species	Number and Measurements	Health
Trap #3	None	n/a	n/a
Trap #4	None	n/a	n/a
Trap #5	None	n/a	n/a
Trap #6	None	n/a	n/a
Trap #7	Northern short-tailed shrew	75 mm body length (96 mm with tail) 20 g	Poor/deceased
Trap #8	None	n/a	n/a
Trap #9	Deer mouse	90 mm body length (130 mm with tail) 15-20 g	Excellent
Trap #10	Northern short-tailed shrew Northern short-tailed shrew	76mm body length (100 mm with tail) __ [a] 76 mm body length (97 mm with tail) 12.5 g	Poor/deceased Poor/deceased
Trap #11	Deer mouse	100 mm body length (170 mm with tail) 21 g	Excellent
Trap #12	Northern short-tailed shrew Northern short-tailed shrew	87 mm body length (105 mm with tail) __ [a] 76 mm body length (90 mm with tail) 15 g	Poor/deceased Poor/deceased
Trap #13	None	n/a	n/a
Trap #14	None	n/a	n/a
Trap #15	Northern short-tailed shrew Northern short-tailed shrew	78 mm body length (88 mm with tail) __ [a] 78 mm body length (96 mm with tail) 15 g	Poor/deceased Poor/deceased

Notes:
All of the shrews captured were found dead in the traps. In instances where two shrews were captured, one of the shrews had killed and disemboweled/eaten the other shrew prior to becoming stuck in the trap door, which is designed strictly as an entrance. No weights were documented for specimens that had been partially consumed.
a Indicates species that were not weighed as they had been partially consumed.
b Trap locations shown on Figure 5.3.4-1.
n/a Not applicable.

A number of non-target species of rodents were captured during the second survey event, including both deer mouse and northern short-tailed shrew. Deer mouse specimens were healthy and vigorous at the time of release. Northern short-tailed shrew did not survive the trapping conditions and killed other individuals contained within the same traps. No deer mice were captured in the same locations as shrews. All captured specimens were determined to be adults.

As numerous northern short-tailed shrews were captured during the small mammal surveys and meadow vole was not captured, the small mammal VEC has been changed from the meadow vole to the northern short-tailed shrew. These two small mammal species occupy similar niches; small burrowing mammals closely associated with soils. They also represent the same role in the food chain, as they are both prey for raptors and predatory mammals. Thus, this change to northern short-tail shrew was a logical opportunity to relate the VEC species to the specific wildlife species present in the Site Study Area, and more specifically to those present in the Project Area.

Trapping methodology did not provide optimal conditions for these species, as traps were not set in areas defined as primary habitat for these individuals (primary habitat was not identified in the Project Area). The most appropriate habitat units for small mammals were included as survey locations for trap placement.

White-tailed Deer – Wildlife Aerial Survey

A late fall wildlife aerial survey was completed within the Site Study Area on November 22, 2009, as described in Section 5.3.8. The survey was designed to document white-tailed deer habitat use within the site to determine where concentration areas and movement corridors exist.

The results of the survey are shown on Figure 5.3.8-1 and in Table 5.7.1-3. Only one white-tailed deer (male) was documented in the Site Study Area, at Location 4 (Table 5.7.1-3). An additional survey of the land immediately surrounding the Site Study Area, within the Local Study Area, was completed to determine if deer were using and movement corridor offsite to access agricultural fields for feeding. A total of eight deer were documented in a recently harvested corn field located 0.75 to 1.0 km east of the Site Study Area. No wild turkey or white-tailed deer were documented within the Project Area during this study.

Table 5.7.1-3: Aerial Wildlife Survey Results

Location	Species Observed
1	8 wild turkey
2	2 wild turkey
3	6 wild turkey
4	1 white-tailed deer (buck)
5	6 wild turkey
6	4 wild turkey
7	2 wild turkey

Table 5.7.1-3: Aerial Wildlife Survey Results (continued)

Location	Species Observed
8	4 wild turkey

5.7.1.3 Herpetofauna

Breeding Anurans (Frogs and Toads)

Spring peeper and American toad are the most commonly recorded amphibian species found on the Site Study Area [13]. In the study sites established in suitable ephemeral habitats during the 2000 to 2001 Bioinventory Study [12], the most widely distributed amphibian species were northern leopard frog, green frog, grey treefrog, American toad, northern spring peeper and wood frog, in order of frequency [17]. As part of the WWMF Refurbishment Waste Storage Project terrestrial environment study carried out in 2004 within the Project Area, northern leopard frog and green frog were observed [13]. In the North and South Railway Ditches, two northern watersnakes and several eastern gartersnakes were observed.

Field studies undertaken at 13 locations (see Figure 5.3.2-1) at the Bruce nuclear site in spring 2007 reinforced the historical findings as spring peeper, northern leopard frog, chorus frog and gray treefrog were identified as actively breeding within the Site Study Area (in order of dominance). Breeding activity was found to be most common in wetland areas within the Site Study Area with the greatest amount of surface water. Spring peeper and chorus frog were identified as actively breeding within the Project Area.

Field studies were updated as part of the 2009 field data collection season, as described in Section 5.3.3. A number of species were documented during the field surveys, including spring peeper, grey treefrog, American toad, northern leopard frog and green frog, which were all recorded during the 2007 field data collection season. A new species for the site, western chorus frog was added to the species list in 2009. The species found in the greatest numbers included spring peeper, green frog, American toad and grey treefrog. Breeding activity was found to be most common in wetland areas within the Site Study Area with the greatest amount of surface water.

While anuran breeding activity takes place predominantly in the wetlands within the Project Area, herpetofauna will use other habitats for breeding and feeding which include seasonally or periodically inundated features such as ditches. During a field visit in 2010 frogs (species unidentified) were observed in the abandoned rail spur ditch.

Basking Turtle Surveys

Basking turtle surveys were completed in 2009, as described in Section 5.3.3. Turtles require open bodies of water with sufficient water depth and floating logs/debris for basking. Dense shoreline and shallow water growth of emergent wetland species of plants is not included in the preferred habitat types for basking turtles. A total of 30 individual turtles were recorded during the basking turtle survey, 20 during the June surveys and 10 during the August survey. Of the

30 individuals documented, 29 were Midland painted turtles, a VEC species for the DGR Project and one was a common snapping turtle, a provincial species of Special Concern.

Surveys completed indicate that the preferred turtle basking habitat found within the Site Study Area is located in the pond on the landfill site (location 5 on Figure 5.3.2-1). This water body includes both open water habitat and basking structures, including logs, woody materials and debris. A total of 13 turtles have been documented here, two on June 16, 2009 and eleven on August 12, 2009.

5.7.2 Local Study Area

From the 1970s to 1990s most of the wildlife studies in the Local Study Area occurred at the Bruce nuclear site and focused on particular species or limited geographic areas within the perimeter fence. These included studies of deer populations, gull colony nests, bird abundance and herpetofaunal studies. Data for a more comprehensive biodiversity study were gathered for the site from 2000 to 2001 [17], including studies of mammals outside of the perimeter fence. Additional species-specific monitoring has been conducted at the Bruce nuclear site and on control sites within the Local Study Area in support of EAs undertaken in the area. The following sections generally describe wildlife communities and species in the Local Study Area based on existing literature and data sources.

5.7.2.1 Birds

Data collected, maintained, and distributed by the Breeding Bird Atlas was used to determine the avian species within the Local Study Area. The Local Study Area is a subset of the Regional Study Area, but contains many of the same communities, and thus many similar species of birds [19]. One hundred and thirty-four species have been historically recorded in the various habitats found in the Local Study Area. Included on this list are bald eagle, a national species of conservation concern, red-headed woodpecker (*Melanerpes erythrocephalus*), which is classified as special concern by COSEWIC and the OMNR, great egret, a provincially imperilled species, black-crowned night-heron, caspian tern and dunlin which are all considered sensitive in Ontario.

Forested Habitat

These types of vegetation communities support a number of species including turkey vulture (*Cathartes aura*), blue jay (*Cyanocitta cristata*), eastern wood pewee (*Contopus virens*), great-crested flycatcher (*Myiarchus crinitus*), black-capped chickadee (*Poecile atricapillus*), brown creeper, veery (*Catharus fescescens*), red-eyed vireo (*Vireo oliveaceus*) and Nashville warbler (*Vermivora ruficapilla*).

The blocks of forest habitat found within the Local Study Area, particularly those which are contiguous with larger scale forested lands at the landscape scale may also support bird species that are identified as forest interior or area-sensitive species. These include black-and-white warbler (*Mniotilta varia*), pileated woodpecker (*Dryocopus pileatus*) and winter wren (*Troglodytes troglodytes*).

Openland Habitat

Some species characteristic of old fields and other open community habitats include area sensitive field species such as bobolink (*Dolichonyx oryzivorus*), and species that may use several types of habitat such as brown thrasher (*Toxostoma rufum*), indigo bunting (*Passerina cyanea*), savannah sparrow (*Passerculus sandwichensis*) and red-winged blackbird (*Agelaius phoeniceus*).

Some of the bird species found within the Local Study Area use the cultural meadow for foraging purposes. For example, wild turkeys (*Melegris galloparo*) require large blocks of deciduous forest habitat adjacent to open field communities and red-tailed hawk (*Buteo jamaicensis*) forage in the fields for small rodents.

Wetland Habitat

These vegetation communities are large enough to provide habitat for area sensitive bird species including black-and-white warbler, Cooper's hawk (*Accipiter cooperii*), pileated woodpecker and winter wren. Other species commonly recorded within those habitat types include wild turkey, red-headed woodpecker (*Melanerpes erythrocephalus*), American redstart and cedar waxwing (*Bombycilla cedrorum*).

Species recorded in Baie du Doré PSW are very similar in habitat preference to the heron, gull, and waterfowl species that use the rest of the Lake Huron shoreline associated with the Local Study Area [17]. Some areas of the wetland provide habitat (e.g., shallow embayments and larger ponded areas) and shelter for species of dabbling ducks that are not usually found in larger open bodies of water and larger ponded areas within the wetland, including blue-winged teal (*Anas discors*). Some fish species found in the ponded areas provide food for terns, bald eagle, and heron species, which also forage for amphibians, crustaceans and molluscs. Shorebird species use the mudflats associated with the Baie du Doré PSW including common snipe (*Gallinago gallinago*), greater yellowlegs (*Tringa melanoleuca*), spotted sandpiper, least sandpiper (*Calidris minutilla*), semipalmated sandpiper (*Chandrius semipalmatus*) and black-bellied plover (*Pluvialis squatarola*). Virginia rail has been recorded using the shallow marsh habitat found in this PSW. The shrub fen habitat found in this wetland supports woodland edge species including yellow warbler (*Dendroica petechia*).

Lake Huron Shoreline

As noted in Section 5.5.2, the exposed environment of the Lake Huron shoreline within the Local Study Area supports loafing habitat for waterfowl and gulls. Species observed in the area offshore of the Bruce nuclear site include double-crested cormorant, red-breasted and common mergansers (*Mergus serrator* and *M. merganser*), mallard (*Anas platyrhynchos*), American black duck (*Anas rubripes*), Canada goose (*Branta canadensis*), herring gulls (*Larus argentatus*), ring-billed gulls (*L. delawarensis*) and greater black-backed gulls (*L. marinus*) [11]. As previously mentioned, bald eagles make use of the shoreline area of Lake Huron associated with the Local Study Area for overwintering and feeding. Monitoring undertaken in 2004 recorded a total of 44 species of avian fauna using the shoreline habitat within the Local Study Area [46].

Some shorebird species that have been noted along the exposed shoreline include spotted sandpiper, great blue heron and black-crowned night-heron. Black-crowned night-heron is considered to be a sensitive species in Ontario that is tracked by the NHIC.

Botulism-related Waterbird Mortality

Mortality of various waterbirds has been reported along the shoreline in the Local Study Area and documented occurrences in other areas of Lake Huron in recent years [47]. Waterbirds usually reported in these die-offs include gulls, common loons (*Gavia immer)*, and double-crested cormorants. The main cause of these die-offs is typically Type E botulism [47]. Botulism is a paralytic condition brought on by the consumption of a naturally occurring toxin produced by the bacterium *Clostridium botulinum*. The botulism poison works its way up the food chain as the bacterium *C. botulinum* Type E found in bottom mud, aquatic invertebrates, and fish. The bacterium is picked up by feeding invertebrates and then bioaccumulated up the food chain as fish ingest the bacterium from the bottom mud, or from eating invertebrates. After the fish die, their carcasses provide a medium for the growth of the bacterium that produces the toxin. Birds then become poisoned by feeding on fish containing the toxin.

Die-offs often occur during the fall when the lake waters begin to cool, characterized by the sinking and mixing of cooler, dense water from the surface, displacing warmer and lighter water below. This overturn causes bottom dwelling invertebrates to move up into the water column where they can be ingested, introducing a high potential for the botulism bacterium to enter the food chain if it has been picked up by the invertebrates [48]. While these outbreaks can kill a significant number of piscivorous birds locally, they typically do not impact waterbird species on a population or community level. Shorebird, loon, cormorant, and waterfowl mortalities associated with Type E botulism exposure are attributed to natural occurrence of the toxin, and are not influenced by the operations at the Bruce nuclear site.

5.7.2.2 Mammals

Mammal records for the Local Study Area are based on evidence of presence (e.g., tracks, scat) or actual sightings as indicated in the background literature.

A number of species that are found in the Local Study Area have adapted to living in close proximity to human development. These species include raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*) and eastern grey squirrel (*Sciuris carolinesis*). Both muskrat (*Ondatra zibethicus*) and beaver (*Castor canadensis*) inhabit the marsh communities, and muskrat are regularly observed utilizing ditches and wetland features at the Bruce nuclear site that support dense stands of cattail species. Snowshoe hare and European hare (*Lepus americanus* and *L. europaeus*) have been found in the built up areas of the Bruce nuclear site but prefer the habitat provided by coniferous swamps and cultural meadows and thickets throughout the Local Study Area. Other species observed within the Local Study Area with less specific habitat requirements include Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), northern short-tailed shrew (*Microtus pennsylvanicus*), woodland jumping mouse (*Napaeozapus insignis*), mink (*Mustela vison*), star-nosed mole (*Condylura cristata*), little brown bat (*Myotis lucifugus*), coyote (*Canis latrans*) and red fox (*Vulpes vulpes*) [17;13]. These species have been observed in both MacGregor and Inverhuron Provincial Parks as well as at the Bruce

nuclear site and throughout the Local Study Area. On occasion, black bears may wander into the forest along the shoreline of the Local Study Area from the Regional Study Area.

Based on the most recent (2000-2001) Bioinventory Study of species at the Bruce nuclear site, white-tailed deer was found to be the most common species occurring in every naturally vegetated habitat and within the built environments [17]. White-tailed deer are known to overwinter in the coniferous forest of the Huron Fringe Deeryard [11], and are commonly found in the Local Study Areas outside of the perimeter fence [17]. Studies carried out on the deer population of the Bruce nuclear site provide a range of yearly estimates from a low of 55 animals in 1987 to a high of 144 animals in 1989 [49]. Most recently, the Site Study Area population was estimated at 121 animals [50]. Aerial surveys to determine white-tailed deer population size and habitat use were completed on November 22, 2009 using a transect method to accurately determine the number of individuals present within the Site Study and Project Areas during the survey. This survey only resulted in one adult male specimen being documented on the site during the survey.

As noted in Section 5.3.4, a muskrat habitat usage survey was conducted in May 2007 at three sites within the Site Study Area (see Figure 5.3.4-1). Monitoring was also carried out at two reference sites at MacGregor Point Provincial Park. Two active muskrat houses were observed approximately 3 m apart at one location within the Muskrat Survey Site #3, and were constructed from cattails. A muskrat burrow was observed at another location within Muskrat Survey Site #1, although there were no new signs of tunnelling or fresh tracks around the burrow. By comparison, in MacGregor Point Provincial Park, one of the survey sites had three active muskrat houses, constructed from muck and dogwood (attributed to limited cattails in the area) and three muskrat burrows with fresh signs of muskrat activity.

5.7.2.3 Herpetofauna

Green frog (*Rana clamitans*) and American bullfrog (*Rana catesbieana*) require permanent bodies of water year-round, while other frogs and toads only require water during the breeding season. Vernal pools in mixed forest and ditches provide habitat for northern leopard, green and Midland chorus frogs, which are species that have been historically recorded at the Bruce nuclear site [24]. These species also use deciduous and mixed swamps, and cultural thickets for foraging [24]. Green frogs have been observed overwintering in streams and ponds at the Bruce nuclear site [12]. Northern leopard frog utilizes the cultural meadow communities located within the Local Study Area for summer habitat, while wood frog (*Rana sylvatica)*, grey treefrog and spring peeper spend the summer in forested areas. Wood and green frogs may also use coniferous swamp edges for breeding and grey treefrogs have been observed in cultural thicket habitat in addition to forest habitat units [12]. American toad is an opportunistic species that uses a wide variety of habitats.

Four species of newt and salamander have been recorded within the Site Study Area, including mudpuppy[8] (*Necturus maculosus*), eastern newt (*Notophthalmus viridescens*), spotted salamander (*Ambystoma maculatum*) and northern red-backed salamander (*Plethodon cinereus*). Four-toed salamander has been recorded in woodlands in MacGregor Point Provincial Park. Eastern newt is an opportunistic species that requires aquatic habitat in the larval stages of its life. As a juvenile, it transforms to the red eft stage that is completely

[8] As the mudpuppy is exclusively an aquatic species, it will not be discussed further in this TSD.

terrestrial, and as a breeding adult it again becomes totally aquatic. Both the red-backed and spotted salamanders spend most of their life cycles in deciduous forests. Spotted salamander breeds in vernal pools, whereas redback salamander breeds terrestrially [11].

The most commonly recorded species of reptile within the Local Study Area has historically been eastern gartersnake (*Thamnophis sirtalis sirtalis*). Northern redbelly snake, smooth green snake and eastern milksnake have been occasionally documented throughout the Local Study Area [17]. Eastern foxsnake, a nationally threatened species, has been recorded in MacGregor Point Provincial Park. Northern ribbonsnake has been observed in mixed swamp environments at the Bruce nuclear site [12] and watersnake has been recorded using the ditches within the Bruce nuclear site. It is likely that this species, which is commonly associated with wetlands, forages in adjacent terrestrial habitats. Brown snake (*Storeria dekayi*) is most commonly found in forested or edge habitats within the Local Study Area. Midland painted turtle (*Chrysemys picta marginata*), snapping turtle (*Chelydra serpentine*) and northern watersnake (*Nerodia sipedon sipedon*) use shallow marshes, mixed swamp, ponded areas and the Lake Huron Shoreline [11;24].

5.7.3 Regional Study Area

The description of the wildlife communities and species at the Regional Study Area level is used primarily to identify and assess the potential cumulative effects of the DGR Project. Wildlife communities and species found in the Regional Study Area may also represent species or communities which make use of the Local and Site Study Areas since habitats are linked. Additionally, some areas within the Regional Study Area provide unique habitat for significant wildlife that could potentially be affected by the DGR Project. Accordingly, these species are briefly discussed in the following sections, and are described in greater detail in Section 5.8.3.

5.7.3.1 Birds

The Ontario Breeding Bird Atlas maintains records of bird observations throughout Ontario. A search of data compiled by the Ontario Breeding Bird Atlas [19] between 2000 and 2005 in the Regional Study Area revealed 199 bird species observations. Of these observations, 134 were confirmed to be breeding, 27 species identified as probably breeding and 11 species were possibly breeding. The remaining 29 species were observed in the Regional Study Area during the breeding season. These birds inhabit a broad spectrum of habitats throughout the Regional Study Area including terrestrial, wetland and aquatic communities. This region is also a commonly utilized corridor for bird migration in both spring and fall, and some birds either occasionally or regularly overwinter in the area.

Sixteen bird Species at Risk have been recorded in the Regional Study Area based on review of the Breeding Bird Atlas and other publications, as indicated. Species at Risk are designated by both the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as well as OMNR. Significant species are discussed in more detail in Section 5.8.3.

Additionally, a cooperative project between OMNR, Bird Studies Canada and Environment Canada identified conservation priorities for birds in southern Ontario on a county basis. The conservation priorities list for Bruce County is divided between forest, marsh and open country habitats, and includes species with conservation priorities of Level 1 (highest) through Level 4.

Appendix C (Table C-5) provides a summary of the species recorded in the Regional Study Area that are included in the conservation priority list for Bruce County [51].

5.7.3.2 Mammals

Since wildlife habitat found within the Regional Study Area is an extension of that found in the Local Study Area, much of the wildlife found within the Local Study Area will also be found within the Regional Study Area. Potential effects of the DGR Project on wildlife are likely to be greater at the Local Study Area spatial scale. Accordingly, mammals found within habitats created by the Lake Huron shoreline, upland coniferous forests, organic marsh and deciduous swamp are described in relation to the Local Study Area (Section 5.7.2.2). As discussed in Section 5.5.3, wildlife habitat in the Regional Study Area does include some prominent landscape features, including the Niagara Escarpment and large continuous wetland areas like Greenock Swamp. These habitat types do not extend into the Local Study Area determined for the terrestrial environment; therefore, some mammals found in the Regional Study Area are not common inhabitants of the Local Study Area.

A population of black bears (*Ursus americanus*) exists in the forests of the Bruce Peninsula and represents the only viable population remaining in southwestern Ontario [52]. Eight species of bats are known to occur in Ontario and all of these species have been identified within the habitat area of the Niagara Escarpment [30]. Rare mammal species found in the Niagara Escarpment World Biosphere Reserve include the small-footed bat (*Myotis leibii*)[9] and the grey fox (*Urocyon cinereoargenteus*)[10] [53].

5.7.3.3 Herpetofauna

As with mammals, herpetofauna common to both the Regional and Local Study Areas are discussed in relation to the Local Study Area (Section 5.7.2.3) as any identified effects of the DGR Project on wildlife are likely to be greater at the Local Study Area spatial scale.

At the regional scale, the Niagara Escarpment in the Bruce Peninsula provides habitat for a wide range of amphibian and reptile species at various life stages. Significant species are discussed in Section 5.8.3. These species are considered vulnerable, threatened, or of special concern by COSEWIC and OMNR. These species are noted in the following sections, so that potential effects of the DGR Project on significant species may be considered.

5.8 SIGNIFICANT SPECIES

In Ontario, two different legislations apply to species at risk. On June 30, 2007 the *Endangered Species Act* (2007) came into effect in the province of Ontario. Provincially-listed endangered species consist of those species protected in regulation under this act. The Committee on the Status of Species at Risk in Ontario (COSSARO) is an independent committee of scientific experts that determines how imperilled a species is and then assigns it to one of the following categories:

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[9] Small-footed bat is ranked as S2S3 (imperiled/vulnerable) by NHIC and may be at risk.

[10] Grey fox is ranked as SZB?, indicating that migrants or vagrants of these species may be breeding in the province. There is very little evidence this species breeds on a regular basis in the province. Both COSEWIC and the MNR have designated grey fox as threatened.

- **Extirpated:** No longer existing in the wild in Ontario, but still exists elsewhere (e.g., greater-prairie chicken);
- **Endangered:** Facing extinction or extirpation (e.g., American badger);
- **Threatened:** At risk of becoming endangered (e.g., eastern hog-nosed snake); and
- **Special Concern:** Sensitive to human activities or natural events which may cause it to become endangered or threatened (e.g., monarch butterfly).

The Canadian *Species At Risk Act* (2002, c.29) provides for the legal protection of wildlife species and the conservation of their biological diversity. Species rarity ranks are determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The term "species at risk" would include the categories of extirpated, endangered or threatened species or a species of special concern at the national level. Each of these terms are defined by the following categories.

- "**Extirpated species**" are those that no longer exist in the wild in Canada, but exist elsewhere in the wild.
- "**Endangered species**" would mean a wildlife species facing imminent extirpation or extinction.
- A "**threatened species**" is one that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
- "**Species of special concern**" (referred to as "vulnerable species" under Bill C-65 and until the year 2000 by COSEWIC) are wildlife species that may become threatened or endangered because of biological characteristics or identified threats. This proposed wording was changed in Bill C-5 to reflect the current COSEWIC definition.

The Natural heritage Information Centre (NHIC) compiles, maintains and distributes information on natural species, plant communities and spaces of special conservation concern in Ontario. This information is stored in a spatial database used for tracking this information. It is maintained by the OMNR. The NHIC database includes the COSEWIC status and the OMNR status, as well as the OMNR provincial ranking (S-RANK) and the global ranking (G-RANK) [45].

Global ranks are assigned by consensus of the network of CDCs, scientific experts and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies or variety [45].

Provincial ranks (S-RANK) are used by the NHIC to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario. By comparing the global and provincial ranks, the status, rarity and the urgency of conservation needs can be ascertained. The NHIC database evaluates provincial ranks on a continual basis and produces updated lists at least annually [45].

5.8.1 Site Study Area and Project Area

5.8.1.1 Flora

Neither historical studies nor current database searches identified habitat use by species listed under Schedule 1 of the *Species At Risk Act* or threatened or endangered species as identified by the province under the *Endangered Species Act* in the Project Area.

5.8.1.2 Fauna

Neither historical studies nor current database searches identified habitat use by species listed under Schedule 1 of the *Species At Risk Act* or threatened or endangered species as identified by the province under the *Endangered Species Act* in the Project Area. Culturally, Commercially or Recreationally Significant Species

Some wildlife species that occur within the Site Study Area and Project Area are valued for cultural or recreational reasons. Most notably, distinct flocks of wild turkey, a popular game bird, utilize the Site Study Area year-round. Further discussion on Aboriginal interests can be found in the Aboriginal Interests TSD.

5.8.2 Local Study Area

As briefly described in Section 5.8 above, vulnerable, threatened and endangered species are identified by the OMNR using procedures established by the COSSARO. Species significance presented in Tables 5.8.2-1 and 5.8.2-2 is based on lists compiled by the NHIC. Federal species at risk are regulated under the *Species at Risk Act* and their rarity rankings are designated by COSEWIC.

The species listed in the following tables are those species of wildlife (fauna) and flora considered to be vulnerable, imperilled or critically imperilled in the Local Study Area based on a review of their provincial ranking as listed in the NHIC database, or have been assigned conservation status by COSEWIC [27]. Fish species and aquatic plants (submergent and floating) are discussed as part of the Aquatic Environment TSD.

5.8.2.1 Flora

Table 5.8.2-1 presents the 19 plants that are vulnerable (S3), imperilled (S2) or critically imperilled (S1) in the Local Study Area, based on a review of the NHIC database and other relevant background literature sources.

Table 5.8.2-1: Provincially Significant Plants in the Local Study Area Based on a Review of the NHIC Database

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Tree						
Juglans cinerea	Butternut	Forest and forest edge	END	END	S3?	G3G4
Shrub, small tree and woody vine						
Salix myricoides var. myricoides	Blue-leaf Willow	Sand Dunes	—	—	S2S3	G4T4
Forb						
Arnoglossum plantagineum	Tuberous Indian-plantain	Riparian, shoreline, and wetland	SC	SC	S3	G4G5
Astragalus neglectus	Cooper's Milkvetch	Alvar, riparian area, forest, and forest edge	—	—	S3	G4
Cirsium pitcheri	Pitcher's Thistle	Sand dune and shoreline	END	END	S2	G3
Cypripedium arietinum	Ram's-head Lady's-slipper	Alvar, wetland, forest and forest edge	—	—	S3	G3
Cypripedium candidum	Small White Lady's-slipper	Open grassland and wetland	END	END-R	S1	G4
Drosera linearis	Slenderleaf Sundew	Wetland	—	—	S3	G4
Iris lacustris	Dwarf Lake Iris	Alvar, sand dunes, shoreline, wetland, and forest	THR	THR	S3	G3

Table 5.8.2-1: Provincially Significant Plants in the Local Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Liatris cylindracea	Slender Blazing-star	Alvar, open grassland, and forest	—	—	S3	G5
Linum medium var. medium	Stiff Yellow Flax	Shoreline and wetland	—	—	S3	G5T?
Lithospermum caroliniense	Plains Puccoon	Sand dunes and open grassland*	—	—	S3	G4G5
Panax quinquefolius[c]	American Ginseng	Forest	END	END[d]	S3[d]	Not available
Graminoid						
Ammophila breviligulata	American Beachgrass	Sand dune and shoreline	—	—	S3	G5
Calamovilfa longifolia var. magna	Sand Reed Grass	Sand dune	—	—	S3	G5T3T5
Eleocharis rostellata	Beaked Spike-rush	Shoreline and wetland	—	—	S3	G5
Elymus lanceolatus ssp. psammophilus	Great Lakes Wheatgrass	Sand dune and shoreline	—	—	S3	G5T3
Scleria verticillata	Low Nutrush	Shoreline	—	—	S3	G5
Moss						
Pseudocalliergon turgescens	Moss sp.	All habitats where moisture regime permits growth*	—	—	S2	G3G5

Notes:
— Not Applicable
a Based on records in the NHIC database, unless otherwise noted [27].
b Habitat designations are based on those provided in *Significant Wildlife Habitat Technical Guide* [39], except where noted with *.

Table 5.8.2-1: Provincially Significant Plants in the Local Study Area Based on a Review of the NHIC Database (continued)

c This record is from the MacGregor Point Provincial Park where the species is considered to have been extirpated since 1997 [25].
d This ranking is based on a review of the *Significant Wildlife Habitat Technical Guide* [39]; NHIC does not provide ranking information for American ginseng on its searchable database.

Global Ranks:
G1 Extremely rare
G2 Very rare
G3 Rare to Uncommon
G4 Common
G5 Very Common
G#G# A numeric range rank (e.g., G2G3) is used to indicate any range of uncertainty about the status of the species or community
T Denotes that the rank applies to a subspecies or variety
G? Unranked, or, if following a ranking, rank tentatively assigned (e.g., G3?)

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:
END Endangered
THR Threatened
SC Special Concern

Provincial Ranks and OMNR Status:
S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
S#S# Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4, where SU is currently unrankable because of the lack of information or because of substantially conflicting information about status or trends).
S? Not Ranked Yet; or if following a ranking, Rank Uncertain (e.g., S3?). S? species have not had a rank assigned.
THR Threatened
SC Special Concern
END-R Endangered (Regulated under the Ontario *Endangered Species Act*)
END Endangered (not regulated)

Source: [27;25;39]

Varying levels of information are available for rare species of flora and fauna that have been recorded in the significant natural heritage features found within the Local Study Area (Section 5.6.2). Species data are summarized, below, for the locations where comprehensive data are available. Some of the species described are not considered significant at the national or provincial level, and are therefore not included in Table 5.8.2-1. However, they are considered significant in Bruce County and are therefore noted in the following summary along with those species that are nationally or provincially significant.

Inverhuron Provincial Park

Pitcher's thistle, a nationally and provincially endangered plant species is associated with the sand dune communities found in Inverhuron Provincial Park. This species is endemic to the shoreline sand dunes of Lakes Michigan, Huron and Superior. It has been extirpated from several locations along Lake Huron.

MacGregor Point Provincial Park

MacGregor Point Provincial Park has been mapped and evaluated into six different vegetation types. Each of these vegetation types contains a number of rare and uncommon species both provincially and in Bruce County. The vegetation communities and associated rare species records include the following [27;25]:

- **Woodland Complex** (excluding upland deciduous forest) contains six provincially rare plants and 19 species[11] that are considered to be rare in southern Bruce County. The six provincially rare plants are: sand reed grass, beaked spike-rush, dwarf lake iris, ram's head lady's slipper, Cooper's milk vetch, and plains puccoon. The species considered to be rare in southern Bruce County include: common reed, American mannagrass (*Glyceria grandis)*, fresh water cordgrass (*Spartina pectinata)*, big bluestem (*Spartina pectinata*), dioecious sedge (*Carex sterilis*), elk sedge (*Carex garberi*), sheathed sedge (*Carex vaginata*), drooping sedge (*Carex prasina*), pale sedge (*Carex pallescens*), tufted leafless-bulrush (*Trichophorum caespitosum*), bristly crowfoot (*Ranunculus pensylvanicus*), late lowbush blueberry (*Vaccinium angustifolium*), trailing arbutus (*Epigaea repens*), northern wild comfrey (*Cynoglossum boreale*), American speedwell (*Veronica americana*) and early goldenrod (*Solidago juncea*).
- **Upland Deciduous Forest** contains one provincially rare species, American ginseng, which has historically been found in the MacGregor Point Provincial Park, but is considered to be extirpated from the area since 1997 [25]. Drooping sedge has also been recorded in this zone; this species is considered to be rare in Bruce County.
- **Fen-Pond Complex** contains four provincially rare species and nine species that are considered to be rare in southern Bruce County. Provincially rare species recorded in this community are: low nut rush, beaked spike-rush, tuberous Indian-plantain, and a moss species. Species considered to be rare in Bruce County that have been recorded in this community include: low spike-moss (*Selaginella selaginoides*), eel-grass (*Vallisneria americana*), common reed, dioecious sedge, tufted leafless-bulrush, slenderleaf sundew (*Drosera linearis*), English sundew (*Drosera anglica*), common butterwort (*Pinguicula vulgaris*) and purple bladderwort (*Utricularia purpurea).*
- **Open Shoreline Complex** contains at least six species (including two coniferous trees) that are locally very uncommon, 10 provincially rare plants and 11 additional species that are considered to be rare in southern Bruce County. Provincially rare plants include: sand reed grass, American beach grass, great lake wheat grass, low nut rush, beaked spike-rush, dwarf lake iris, blue-leaved willow, stiff yellow flax, plains puccoon and a moss species. Regionally significant species found within this habitat type are: common reed, wiry witch grass (*Panicum flexible*), dioecious sedge, elk sedge, slender flatsedge (*Cyperus bipartitus*), sand dune willow (*Salix cordata)*, Drummond rockcress (*Arabis drummondii*), Saskatoon service-berry (*Amelanchier alnifolia*), beach pea (*Lathyrus japonicus*), rough cockle-bur (*Xanthium strumarium*) and common sneezeweed (*Helenium autumnale*) [25].

[11] The MacGregor Point Visitors Centre Preliminary Environmental Study Report [25] indicates that 19 regionally significant species occur within this vegetation community; however, the document identifies only 16 species by name.

- **Man-made Clearing Community** includes two species that are considered to be rare in southern Bruce County; Drummond rockcress and fragrant cudweed (*Gnaphalium obtusifolium*).
- **Open Artificial Flood or Pond Community** includes one species that is considered to be rare in southern Bruce County, namely ditch-stonecrop (*Penthorum sedoides*).

Baie du Doré Provincially Significant Wetland (PSW)

A number of rare species have been recorded within the Baie du Doré PSW as part of the wetland evaluation process completed under the Wetland Evaluation Manual for Southern Ontario [11;34]. Provincially significant plant species recorded in the wetland include beaked spike-rush and stiff yellow flax. Regionally significant species recorded in the wetland include a species of sedge.

Scott Point Area of Natural and Scientific Interest (ANSI)

Several provincially significant species of plants have been recorded in this ANSI [54], namely sand reed grass, beaked spike-rush, low nut rush, dwarf lake iris, sweet-cicely (*Osmorhiza berterii*), Cooper's milkvetch and slender blazing-star (*Liatris cylindracea*). One significant species of aquatic flora has been recorded in the ANSI, discussed as part of the Aquatic Environment TSD. A number of rare species in Bruce County were also recorded within the ANSI including: bristly crowfoot, marsh-speedwell (*Veronica scutellata*), Hooker's orchid (*Platanthera hookeri*), low calamint (*Calamintha arkansana*) and large cranberry (*Vaccinium macrocarpon*).

5.8.2.2 Fauna

Table 5.8.2-2 presents the 23 wildlife species that are considered either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable (S3), imperilled (S2) or critically imperilled (S1) in the Local Study Area, based on a review of the NHIC database and other relevant background literature sources.

Table 5.8.2-2: Provincially Significant Wildlife Species in the Local Study Area Based on a Review of the NHIC Database

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Birds					
Ardea alba[d]	Great Egret	—	—	S2, SZN	G5
Aythya Americana[d]	Redhead	—	—	S2, SZN	G5
Aytha valisineria	Canvasback	—	—	S1B,S2N	G5
Bucephala albeola[e]	Bufflehead	—	—	S3B, SZN	G5
Calidris alpine[d]	Dunlin	—	—	S3B, SZN	G5

Table 5.8.2-2: Provincially Significant Wildlife Species in the Local Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Calidris melanotos[d]	Pectoral Sandpiper	—	—	SHB, SZN	G5
Haliaeetus leucocephalus[d]	Bald Eagle	NAR	SC	S4, SZN	G4
Lanius ludovicianus	Loggerhead Shrike	END	END-R	S2B,SZN	G4
Larus marinus	Great Black-backed Gull	—	—	S2B,SZN	G5
Melanerpes erythrocephalus[d]	Red-headed Woodpecker	SC	SC	S3, SZN	—
Nycticorax nycticorax	Black-crowned Night-heron	—	—	S3B,SZN	G5
Podiceps auritus[f]	Horned Grebe	—	SC	S1B, SZN	
Sterna caspia	Caspian Tern	NAR	NAR	S3B,SZN	G5
Chordeiles minor	Common nighthawk	THR	SC	S4B	G5
Contopus cooperi	Olive-sided flycatcher	THR	SC	S4B	G4
Caprimulgus vociferus	Whip-poor-will	—	SC	S4B	G5
Chaetura pelagica	Chimney swift	THR	SC	S4B, S4N	G5
Herpetofauna					
Clemmys guttata	Spotted Turtle	END	END	S3[c]	G5
Elaphe gloydi	Eastern Foxsnake	THR	THR (Georgian Bay population)	S3	G3
Chelydra serpentina	Snapping turtle	SC	SC	S3	G5
Lampropeltis triangulum	Eastern Milksnake	SC	SC	S3	G5
Thamnophis sauritus	Eastern Ribbonsnake	SC	SC	S3	G5

Table 5.8.2-2: Provincially Significant Wildlife Species in the Local Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Regina septemvittata	Queen Snake	THR	THR	S2	G5

Notes:
— Not Applicable
a Based on records in the NHIC database, unless otherwise noted [27].
b Based on records in the COSEWIC database.
c This ranking is based on a review of the *Significant Wildlife Habitat Technical Guide* [39]; NHIC does not provide ranking information for spotted turtle on its searchable database.
d Based on records in the Ontario Breeding Bird Atlas [19].
e Presence based on field study conducted for *Bruce A Units 3&4 Restart Environmental Assessment Study Report* [55].
f Presence based on field study conducted for *2004 Annual Monitoring Report Environmental Assessment Bruce A Units 3 & 4 Restart Follow-up Program* [46].

Global Ranks:
G3 Rare to Uncommon
G4 Common
G5 Very Common

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:
END Endangered
THR Threatened
SC Special Concern
NAR Not at Risk
N/A Not Available

Provincial Ranks and OMNR Status:
S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
S4 Apparently Secure
SH Possibly Extirpated (Historical)
S#B Indicates breeding and rank
SZN Non-breeding migrants/vagrants.
END-R Endangered (Regulated under the Ontario *Endangered Species Act*)
END Endangered (not regulated)

Source: [27;39;19;55;46]

Similar to significant plant species described in the preceding section, varying levels of information are available for rare species of fauna that have been recorded in the significant natural heritage features found within the Local Study Area. Species data are summarized, below, for the locations where comprehensive data are available. Some of the species described are not considered significant at the national or provincial level, and are therefore not included in Table 5.8.2-2. However, they are considered significant in Bruce County and are therefore noted in the following summary.

MacGregor Point Provincial Park

Both four-toed salamander, which is rare in Bruce County, and spotted turtle, which is nationally endangered, have been recorded in the woodland complex habitat and the fen-pond habitat at

MacGregor Provincial Park. Eastern foxsnake, provincially significant and rare in southern Bruce County, has also been found in woodland habitat. The provincially rare black-crowned night-heron has been recorded nesting in woodland habitat [25].

Baie du Doré Provincially Significant Wetland (PSW)

A number of rare species have been recorded within the Baie du Doré PSW as part of the wetland evaluation process completed under the Wetland Evaluation Manual for Southern Ontario [11;34]. Provincially significant faunal species recorded in the wetland include great egret, canvasback (*Aythya valisineria*), horned grebe, redhead, caspian tern, black-crowned night-heron, bufflehead, bald eagle, pectoral sandpiper (*Calidris melanotos*), dunlin, great black-backed gull and red-headed woodpecker.

Scott Point Area of Natural and Scientific Interest (ANSI)

Blue-gray gnatcatcher *(Polioptila caerulea*), a rare bird species in Bruce County, has been recorded nesting in the Scott Point ANSI [54].

5.8.2.3 Culturally, Commercially or Recreationally Significant Species

Many species of vegetation (e.g., maple trees) found within the Local Study Area are valued for their cultural, commercial, or recreational attributes. Some wildlife species (e.g., white-tailed deer) are also valued for cultural or recreational reasons. These species may be considered significant by members of the public and Aboriginal peoples who use them. Culturally, commercially or recreationally significant terrestrial species were identified through documented industries (e.g., maple industry), activities (e.g., festivals) and literature review (e.g., traditional uses for plant materials) and are presented at the Regional Study Area scale as discussed in Section 5.8.3.3. Aboriginal interests are considered further in the Aboriginal Interests TSD.

5.8.3 Regional Study Area

The determination of conservation status for a species can vary based on the geographic location. To assess the conservation status of species for the Regional Study Area, status levels were obtained from OMNR through the NHIC and through a review of the COSEWIC website.

In addition to individual species, a number of vegetation communities, wildlife habitats, and natural heritage features also possess conservation status that must be considered when assessing the potential effects of the DGR Project on the terrestrial environment. These have been discussed in the preceding sections, as applicable.

5.8.3.1 Flora

Table C-3 (Appendix C) presents the 56 flora species that are considered either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable (S3), imperilled (S2) or critically imperilled (S1) in Bruce County, based on a review of the NHIC database and other relevant background literature sources. Of the 56 secies, one is

a tree species, one is a shrub species, five are ferns and fern allies, 30 are forbs, 14 are graminoids and five are mosses.

As discussed in Section 5.4.3, many of the species listed in Table C-3 (Appendix C) are found in one of three main types of ecosystems in Bruce County, namely the Niagara Escarpment, sand dune environment or wetland areas.

The species presented in Table 5.8.3-1 are those species of flora considered to be either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable, imperilled or critically imperilled in the Regional Study Area by NHIC.

Table 5.8.3-1: Provincially Significant Flora Species in Regional Study Area Based on a Review of the NHIC Database

Scientific Name	Common Name	COSEWIC Status [b]	COSSARO Status [a]	OMNR Provincial Ranking	Global Ranking
Arnoglossum plantagineum	Tuberous Indian-plantain	SC	SC	S3	G4G5
Asplenium scolopendrium var. americanum	Hart's-tongue Fern	SC	SC	S3	G4T3
Astragalus neglectus	Cooper's Milk-vetch	—	—	S3	G4
Calamovilfa longifolia var. magna	Great Lakes Sand Reed	—	—	S3	G5T3T5
Carex tetanica	Rigid Sedge	—	—	S3	G4G5
Cirsium pitcheri	Pitcher's Thistle	END	END	S2	G3
Cypripedium arietinum	Ram's-head Lady's-slipper	—	—	S3	G3
Eleocharis rostellata	Beaked Spike-rush	—	—	S3	G5
Elymus lanceolatus ssp. psammophilus	Great Lakes Wild Rye	—	—	S3	G5T3
Gentianella quinquefolia	Stiff Gentian	—	—	S2	G5
Hybanthus concolor	Eastern Green-violet	—	—	S2	G5
Iris lacustris	Dwarf Lake Iris	THR	THR	S3	G3
Juglans cinerea	Butternut	END	END	S3?	G4
Juncus greenei	Greene's Rush	—	—	S3	G5

Table 5.8.3-1: Provincially Significant Flora Species in Regional Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	COSEWIC Status [b]	COSSARO Status [a]	OMNR Provincial Ranking	Global Ranking
Linum medium var. medium	Stiff Yellow Flax	—	—	S3?	G5T3T4
Monarda didyma	Scarlet Beebalm	—	—	S3	G5
Platanthera macrophylla	Large Round-leaved Orchid	—	—	S2	G4
Potamogeton hillii	Hill's Pondweed	SC	SC	S2	G3
Salix myricoides	Blue-leaved Willow	—	—	S3	G4
Scleria verticillata	Low Nutrush	—	—	S3	G5
Sporobolus heterolepis	Prairie Dropseed	—	—	S3	G5

Notes:
— No designation
a Based on records in the NHIC database unless otherwise noted [27].
b Based on records in the COSEWIC database.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:
NAR Not at Risk
THR Threatened
END Endangered
SC Special Concern

Provincial Ranks and OMNR Status:
S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
S4 Apparently Secure

There are 21 flora species that are considered either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable (S3), imperilled (S2) or critically imperilled (S1) in the RSA, based on a review of the NHIC database and other relevant background literature sources. Of the 21 species, one is a tree species (butternut), one is a shrub species (blue-leaved willow), one is a fern and fern ally (Hart's tongue fern), 30 are forbs, 14 are graminoids, and five are mosses.

5.8.3.2 Fauna

A review of the NHIC revealed 41 bird, four mammal, 10 herpetofauna and 12 insect species considered to be either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable (S3), imperilled (S2) or critically imperilled (S1) in Bruce County (Table C-4, Appendix C). The species presented in Table 5.8.3-2 are those species of wildlife considered to be either endangered, threatened or of special concern by COSEWIC and/or COSSARO, and/or provincially ranked as vulnerable, imperilled or critically imperilled in the Regional Study Area by NHIC. Fish species are discussed as part of the Aquatic Environment TSD prepared in support of the DGR Project.

Table 5.8.3-2: Provincially Significant Wildlife Species in Regional Study Area Based on a Review of the NHIC Database

Scientific Name	Common Name	COSEWIC Status [b]	COSSARO Status [a]	OMNR Provincial Ranking [a]	Global Ranking
Bird					
Aquila chrysaetos	Golden Eagle	NAR	END-R	S1, SZN	G5
Asio flammeus	Short-eared Owl	SC	SC	S3S4B,SZN	G5
Aythya americana[c]	Redhead	—	—	S2, SZN	G5
Aytha valisineria	Canvasback	—	—	S1B,S2N	G5
Bucephala albeola[d]	Bufflehead	—	—	S3B, SZN	G5
Buteo lagopus	Rough-legged Hawk	NAR	NAR	S1, SZN	G5
Buteo lineatus	Red-shouldered Hawk	NAR	SC	S4B,SZN	G5
Calidris alpina[c]	Dunlin	—	—	S3B, SZN	G5
Calidris melanotos[c]	Pectoral Sandpiper	—	—	SHB, SZN	G5
Casmerodius albus	Great Egret	—	—	S2B,SZN	G5
Chlidonias niger	Black Tern	NAR	SC	S3, SZN	G4
Wilsonia canadensis	Canada Warbler	THR	SC	S4B	G5
Dendroica cerulea	Cerulean Warbler	SC	SC	S3B,SZN	G4
Falco peregrinus	Peregrine Falcon	THR	END	S2S3, SZN	G4
Haliaeetus leucocephalus[c]	Bald Eagle	NAR	SC	S4, SZN	G5
Icteria virens	Yellow-breasted Chat	SC	SC	S2S3, SZN	G5
Ixobrychus exilis	Least Bittern	THR	THR	S3B,SZN	G5
Lanius ludovicianus	Loggerhead Shrike	END	END-R	S2B,SZN	G4
Larus marinus	Great Black-backed Gull	—	—	S2B,SZN	G5
Melanerpes erythrocephalus[c]	Red-headed Woodpecker	SC	SC	S3, SZN	G5
Nycticorax nycticorax	Black-crowned Night-heron	—	—	S3B,SZN	G5
Podiceps auritus[e]	Horned Grebe	—	SC	S1B, SZN	G5

Table 5.8.3-2: Provincially Significant Wildlife Species in Regional Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	COSEWIC Status [b]	COSSARO Status [a]	OMNR Provincial Ranking [a]	Global Ranking
Sterna caspia	Caspian Tern	NAR	NAR	S3B,SZN	G5
Chordeiles minor	Common nighthawk	THR	SC	S4B	G5
Contopus borealis	Olive-sided flycatcher	—	SC	S5, SZN	G4
Contopus cooperi	Olive-sided flycatcher	THR	SC	S4B	G4
Caprimulgus vociferus	Whip-poor-will	—	SC	S4B	G5
Chaetura pelagica	Chimney swift	THR	SC	S4B, S4N	G5
Mammal					
Taxidea taxus	American Badger	END	END	S2	G5
Herpetofauna					
Ambystoma hybrid population [f] *(jeffersonianum genome dominates)*	Jefferson X Blue-spotted Salamander, Jefferson genome dominates	See note below[f]	See note belowf	S2	G4
Clemmys guttata	Spotted Turtle	END	END	S3[g]	G5
Elaphe gloydi	Eastern Foxsnake	THR	THR (Georgian Bay)	S3	GNR
Emydoidea blandingii	Blanding's Turtle	THR	THR	S3	G4
Graptemys geographica	Northern Map Turtle	SC	SC	S3	G5
Lampropeltis triangulum	Eastern Milksnake	SC	SC	S3	G5
Thamnophis sauritus	Eastern Ribbonsnake	SC	SC	S3	G5
Regina septemvittata	Queen Snake	THR	THR	S2	G5
Sistrurus catenatus	Eastern Massassauga Rattlesnake	THR	THR	S3	G3G4
Chelydra serpentina	Snapping turtle	SC	SC	S3	G5

Table 5.8.3-2: Provincially Significant Wildlife Species in Regional Study Area Based on a Review of the NHIC Database (continued)

Scientific Name	Common Name	COSEWIC Status [b]	COSSARO Status [a]	OMNR Provincial Ranking [a]	Global Ranking
Insect					
Aeshna verticalis	Green-striped Darner	—	—	S2	G5
Amphiagrion saucium	Eastern Red Damsel	—	—	S3	G5
Boyeria grafiana	Ocellated Darner	—	—	S3	G5
Brychius hungerfordi	Hungerford's Crawling Water Beetle	—	—	S1	G1
Cicindela hirticollis	Beach-dune Tiger Beetle	—	—	S2?	G5
Somatochlora tenebrosa	Clamp-tipped Emerald	—	—	S2	G5
Somatochlora walshii	Brush-tipped Emerald	—	—	S3	G5
Somatochlora williamsoni	Williamson's Emerald	—	—	S3	G5

Notes:
— No designation
a Based on records in the NHIC database unless otherwise noted [27].
b Based on records in the COSEWIC database.
c Based on records in the Ontario Breeding Bird Atlas [19].
d Presence based on field study conducted for Bruce A Units 3&4 Restart EA Study Report [55].
e Presence based on field study conducted for 2004 Annual Monitoring Report EA Bruce A Units 3 & 4 Restart Follow-up Program [46].
f When jeffersonianum dominated hybrids are present, this indicates that pure *A. jeffersonianum* is almost certainly present also. Jefferson salamander (*A. jeffersonianum*) is designated as THR by COSEWIC and the OMNR.
g This ranking is based on a review of the *Significant Wildlife Habitat Technical Guide* [39]; NHIC does not provide ranking information for spotted turtle on its searchable database.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:
NAR Not at Risk
THR Threatened
END Endangered
SC Special Concern

Provincial Ranks and OMNR Status:
S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
S4 Apparently Secure
SH Possibly Extirpated (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from

Table 5.8.3-2: Provincially Significant Wildlife Species in Regional Study Area Based on a Review of the NHIC Database (continued)

	verified extant occurrences. NHIC states that the reason for change from S2B to SHb was that there are fewer breeding records than realized originally (C. Jones 2000)
S?	Not Ranked Yet; or if following a ranking, Rank Uncertain (e.g. S3?). S? species have not had a rank assigned
S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4, where SU is currently unrankable because of the lack of information or because of substantially conflicting information about status or trends).
S#B	Indicates breeding and rank
SZB	Breeding migrants/vagrants
SZN	Non-breeding migrants/vagrants
NAR	Not at Risk
THR	Threatened
SC	Special Concern
END-R	Endangered (Regulated under the Ontario *Endangered Species Act*)
END	Endangered (not regulated)

Source: [27;19;55;46;17]

5.8.3.3 Culturally, Commercially or Recreationally Significant Species

Many species of vegetation found within the Regional Study Area are valued for their cultural, commercial or recreational attributes. Some wildlife species are also valued for cultural or recreational reasons. These species may be considered significant by members of the public and Aboriginal peoples who use them. Culturally, commercially or recreationally significant species were identified through documented industries (e.g., maple industry), activities (e.g., festivals) and literature review (e.g., traditional uses for plant materials). Further discussion of Aboriginal interests can be found in the Aboriginal Interests TSD.

Flora

Examples of plants in Bruce County, including in the Regional Study Area, considered significant for cultural, commercial and/or recreational reasons include the following:

- Sugar maple: the prevalence of sugar maple forest in Bruce County led to the development of a strong commercial industry in harvesting sugar maple sap to produce maple syrup and other maple goods.
- Medicinal plants: upland forest and wetland habitats throughout the Regional Study Area, and in particular along the Niagara Escarpment, produce a variety of plants used for traditional and herbal medicine. Guided walks along the County's extensive trail system provide residents and tourists with the opportunity to learn about these plants. Aboriginal peoples have historically used a variety of plants for medicines. These include the use of many species of plants as medical treatments for a variety of ailments, such as white pine for tuberculosis, leatherleaf (*Chamaedaphne calyculata*) for fever or inflammation, or Labrador tea (*Ledum groenlandicum*) for ulcers, burns, or fevers. Many species of plants serve multiple uses, for example tamarack has historically been used for everything from rope, caulking for canoes, beer and a medical treatment for scurvy, bronchitis, and infection [56].

- Edible plants: similar to medicinal plants, upland forest and wetland habitats throughout the Regional Study Area produce a variety of edible plants, including berries. Mushrooms[12] may also be gathered for consumption. Guided walks along the County's extensive trail system provide residents and tourists with the opportunity to learn about these plants. Aboriginal peoples have historically used a variety of plants for food. These include the use of cotton grasses, blueberry, and cranberry as food sources [56].
- Materials plants: Aboriginal peoples and settlers have historically used a variety of plants for producing goods and improving daily life. These include the use of sphagnum mosses as stuffing for pillows and bedding, willow and reeds for baskets, and trees for constructing large structures (e.g., homes) and methods of transportation (e.g., canoes) [56].
- Orchids: Forty-four species of wild orchids, including several rare species, are found in Bruce County [57]. This diversity attracts visitors to the area during their spring bloom. An annual orchid festival is based out of Tobermory, which is located at the north end of the Bruce Peninsula.
- Eastern white cedar: Cliffs along the Niagara Escarpment support some of the oldest and least disturbed forests in Canada, which are an important part of Canada's natural heritage [26]. The Niagara Escarpment Ancient Trees Atlas Project (1998-2001) recorded 29 eastern white cedars over 500 years in age and 11 eastern white cedars over 700 years in age at three principal study sites in Bruce County [58]. The Atlas identified one of the oldest living trees in Canada east of British Columbia, which occurs in Bruce County (germinated in 952 A.D.)[13]. Additionally, cedar boughs are harvested and sold during the winter holiday season and for craft purposes, providing a source of income for local residents.

Fauna

Species within the Regional Study Area identified as culturally or recreationally significant include:

- Big game: Black bear and white-tailed deer are the two species that draw hunters to the Regional Study Area. In addition to being an important game species, black bear has historically been an important animal in many First Nations cultures.
- Upland game birds: Eastern wild turkey, the largest of Ontario's upland game birds, is a non-migratory species that has been successfully reintroduced into Ontario through OMNR initiatives. This is a popular game species that draws hunters. Additionally, the feathers from this species are used for ceremonial adornment by First Nations groups.
- Furbearers: many furbearing mammal species are potentially hunted and trapped in the Regional Study Area, including muskrat, beaver and coyote.
- Migratory birds: the late spring migration through the Regional Study Area, and Bruce County as a whole, provides a mix of northern and southern species as well as resident birds. The Huron Fringe Birding Festival is an annual 10-day event that provides an excellent opportunity for members of the public to participate in hikes, presentations, and workshops that highlight the spring migration [59]. In addition to recreational bird

[12] It is recognized that mushrooms are not plants, but rather members of the Kingdom Fungi. They have, however, been mentioned under the heading of edible plants for ease of discussion.
[13] This individual was alive at the time of sampling (2000), and may no longer be living.

watching, the fall migration attracts hunters for the abundant waterfowl moving through the Regional Study Area.

- Breeding birds: many species at the extreme limit of their range, such as red-headed woodpecker, breed within the Regional Study Area. As noted above, members of the public actively participate in recreational bird watching. Additionally, popular game birds such as native wild turkey (as discussed above) and ruffed grouse (*Bonasa umbellus*) as well as introduced ring-necked pheasant (*Phasianus colchicus*) occur year-round throughout the various habitats in the Regional Study Area.

5.9 SUMMARY OF EXISTING ENVIRONMENT

Table 5.9-1 provides a summary of the existing terrestrial environment by VEC.

Table 5.9-1: Summary of the Existing Terrestrial Environment

VEC	Existing Environment
Eastern White Cedar	• The eastern white cedar is the most common species in conifer communities in the Site Study Area and Project Area. This species provides winter cover habitat for both white-tailed deer and wild turkey in the Site Study Area and Project Area. • Second-growth upland coniferous and mixed forest communities in the Local Study Area, including much of the Bruce nuclear site, are dominated by eastern white cedar. • This is a common and abundant species within the Regional Study Area, being the most widely distributed coniferous tree species in this area.
Heal-all	• Heal-all is a typical groundcover species found in the mixed forest and open habitat communities within the Project, Site, Local and Regional Study Areas. • This species has historically been harvested for its medicinal properties by both Aboriginal and early settlers groups within all of the study areas.
Common Cattail	• Cattail samples were collected within the North and South Railway Ditches in the Project Area in June 2004 and analyzed for metals. Elevated metal results are likely historic and not attributed to recent undertakings in vicinity of the WWMF. • Found throughout Site Study and Project Area in wetland communities and along wetted ditches. • Cattail is an important food source and homebuilding material for muskrat within the Site and Local Study Areas • Common wetland plant located in shallow marsh communities throughout the Regional Study Area.

Table 5.9-1: Summary of the Existing Terrestrial Environment (continued)

VEC	Existing Environment
Northern Short-tailed Shrew [a]	• Northern short-tailed shrew is a common and abundant species within the Site Study Area, found in grassland communities and forests. This species provides an important food source for species of raptors and small to medium sized carnivores. • This burrowing species feeds mainly on insects and snails.
Muskrat	• In May 2007, active muskrat houses were observed at one of two study plots within the Project Area. • Muskrats inhibit marsh communities, and are observed utilizing ditches and wetland features in the Project and Site Study Areas that support dense stands of cattail species. • One of many furbearing mammal species potentially hunted and trapped in the Regional Study Area.
White-tailed Deer	• White-tailed deer are known to overwinter in the coniferous forest of the Huron Fringe Deeryard, and are commonly found in the Local Study Area, as well as throughout the Site Study Area. • Site Study Area population is estimated at greater than 100 animals. • White-tailed deer is a common species throughout the Bruce Peninsula, and draw hunters to the Regional Study Area.
Red-eyed Vireo	• Red-eyed vireo was identified in two of the four habitat types observed in the Project Area. • It is one of the commonly observed species with evidence of breeding in the Site Study Area. • Red-eyed vireo is found in the forested habitat in the Local and Regional Study Areas.
Wild Turkey	• Wild turkey has been observed in the Project Area; however, no roosts were identified within the Project Area. • At least two distinct flocks of 20 to 30 birds occur at the Bruce nuclear site. Disturbed areas within the Site Study Area create suitable feeding/breeding ground for wild turkeys. • Wild turkeys are popular game birds and occur year-round throughout the various habitats in the Regional, Local and Site Study Areas.
Yellow Warbler	• Yellow warbler habitat is found within the Project and Site Study Areas, and this species has been documented during site specific studies in both of these areas. • Yellow warbler is found within shrub fen, thicket swamp and wetland edge habitat in the Local Study Area. • Yellow warbler has been documented in the Atlas of the Breeding Birds of Ontario in all but one of the atlas squares.

Table 5.9-1: Summary of the Existing Terrestrial Environment (continued)

VEC	Existing Environment
Mallard	• Potential habitat for this species exists in the Project and Site Study Areas in wetland communities with open water habitat. • One of the species observed in ponded habitats in the Local Study Area, and offshore of the Bruce nuclear site. • Common and abundant species found in all of the land based Atlas of the Breeding Birds of Ontario atlas squares within the Regional Study Area.
Bald Eagle	• This species has not been documented within the Project Area. • Bald eagle has been recorded to use habitats near discharges from the Bruce Power generating stations in the Site Study Area. • Bald eagle is identified as a species at risk that is resident in the Regional and Local Study Areas. It is listed as Special Concern by the OMNR, and has been observed in Baie du Doré.
Midland Painted Turtle	• A basking turtle survey completed in 2009 indicated that approximately 30 individual turtles use the Project and Site Study Areas as habitat. • Midland painted turtle uses shallow marshes, mixed swamp, ponded areas, and the Lake Huron shoreline in the Local Study Area. • This species is common and abundant in the Regional Study Area in suitable habitat, as described above.
Northern Leopard Frog	• Northern leopard frog breeding adults and egg masses have been recorded in the Project Area. • Northern leopard frog is a common and abundant species which utilize the cultural meadow communities located within the Site Study Area, and is widely distributed in the Local Study Area. • Northern leopard frog is common and abundant within the Regional Study Area in shallow marshes, open water and meadow/grassland communities.

Note:

a The meadow vole was identified as a VEC in the EIS Guidelines. However, small mammal trapping surveys conducted in 2009 did not reveal the presence of meadow voles in the Project Area. Therefore, northern short-tailed shrew was substituted as a small mammal VEC.

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6. INITIAL SCREENING OF PROJECT-ENVIRONMENT INTERACTIONS

The first screening considers whether there is a potential for the DGR Project to interact with the terrestrial environment VECs.

6.1 INITIAL SCREENING METHODS

Following the description of the DGR Project, identification of VECs, and description of the existing environment, the DGR Project works and activities are screened to determine those with the potential to interact with the terrestrial environment VECs. The screening was conducted based on the general description of the existing environmental conditions. This allowed the EA to focus on issues of key importance where potential interactions between the DGR Project and terrestrial environment effects are likely. The analyses are based on the experience of the technical specialists supported by information collected from field studies and information from earlier EAs carried out for projects at the Bruce nuclear site. This screening is conducted by VEC for site preparation and construction, operations and decommissioning phases of the DGR Project.

The VECs selected for the terrestrial environment may interact with the DGR Project works and activities directly (e.g., removal of habitat or vehicle strikes) or indirectly (e.g., effects on plants attributed to changes in air quality [a VEC in Atmospheric Environment TSD]).

Both direct and indirect interactions are carried forward through this assessment. Where a mechanism for interaction is identified, the individual project work or activity is advanced for further consideration of measurable changes. Where no potential interaction is identified, no further screening or assessment is conducted. The analyses at this stage are based on qualitative data, as well as the professional judgement and experience of the EA team with regard to the physical and operational features of the DGR Project and their potential interactions with the environment.

The results of the screening are documented in an interaction matrix. A potential DGR Project-VEC interaction was marked with a '•' on Matrix 1 (Section 6.3). If, following the evaluation of DGR Project-environment interactions, there are no potential interactions between a VEC and a DGR Project work and activity or other VEC, the VEC may not be considered further.

6.2 IDENTIFICATION OF DGR PROJECT-ENVIRONMENT INTERACTIONS

In the initial screening, all works and activities associated with the DGR Project are identified and analyzed for possible interactions with the terrestrial environment VECs. As shown in the Basis for the EA (Appendix B), the DGR Project includes the following project works and activities:

- site preparation;
- construction of surface facilities;
- excavation and construction of underground facilities;
- above-ground transfer of waste;
- underground transfer of waste;
- decommissioning of the DGR Project;

- abandonment of the DGR facility;
- presence of the DGR Project;
- waste management;
- support and monitoring of DGR life cycle; and
- workers, payroll and purchasing.

The identification of potential direct effects of the DGR Project works and activities is presented in Section 6.2.1, and potential indirect effects are identified in Section 6.2.2.

The abandonment of the DGR facility work and activity is considered in this TSD as being at the end of the decommissioining phase. The abandonment and long-term performance phase is not considered in the assessment as no activities are expected to occur during this phase. It is considered in Section 9 of the EIS. This TSD considers normal operations and non-radiological effects only. Abnormal conditions are considered in the Malfunctions, Accidents and Malevolent Acts TSD. Radiological effects are considered in the Radiation and Radioactivity TSD. Indirect effects caused by changes to the terrestrial environment VECs on other VECs are evaluated in the relevant TSDs, in this case Aboriginal Interests and Socio-economic Environment TSDs.

6.2.1 Direct Interactions

6.2.1.1 Site Preparation

Site preparation involves land clearance and preparation of construction laydown areas. The removal of brush and trees and transfer by truck to on-site storage potentially interacts with all of the VECs for the terrestrial environment by physically removing them, in the case of plant species, or by limiting habitat utilization opportunities (i.e., foraging, reproducing, sheltering), in the case of wildlife species. The excavation, transfer and stockpiling of topsoil has the potential to interact with burrowing species of mammals and herpetofauna. Grading of sites, including roads, construction laydown areas, stormwater management areas and ditches also have the potential to alter surface water availability to plant and wildlife species. Therefore, these project-environment interactions are advanced to Section 7 for further consideration.

6.2.1.2 Construction of Surface Facilities

Construction of surface facilities will include the construction of the rail bed crossing, shaft headframes and all other temporary and permanent surface facilities at the site. It will also include construction waste transfer and material handling (i.e., sanitary waste, trees and brush, diesel fuel, lubricants and used explosives). All of the surface structures for the DGR Project will be constructed during the initial site preparation and construction phase. Although this work and activity does not involve any additional removal or alteration of habitat and its associated plant and wildlife species beyond that completed in the site preparation phase, there is the potential for bird collisions with buildings (e.g., red-eyed vireo, yellow warbler). Therefore, the construction of surface facilities is advanced to Section 7 for further consideration.

6.2.1.3 Excavation and Construction of Underground Facilities

Excavation and construction of underground facilities will include excavation of the access to the repository (i.e., the shafts), installation of the shaft and underground infrastructure (e.g.,

ventilation system) and the underground excavation of the emplacement and ancillary rooms and the access tunnels. This work and activity would not directly interact with the terrestrial environment VECs as it does not involve removal or alteration of habitat and its associated plant and wildlife species because the activities occur underground. Therefore, no further consideration is warranted

Blasting of the rock during the excavation has the potential to affect ground-dwelling wildlife through vibration and is considered as an indirect interaction in Section 6.2.2.2.

6.2.1.4 Above-ground Transfer of Waste

Above-ground transfer of waste will occur during the operations phase of the DGR Project and will include receipt of L&ILW from WWMF at the DGR Project Waste Package Receiving Building and on-site transfer to the shaft. The movement of wastes on-site by truck and forklift has the potential to directly interact with the ground-dwelling terrestrial environment VECs through the increased potential for vehicular strikes of wildlife species including wild turkey, mallard, mammals and herpetofauna. However, it is very unlikely that agile flyers like the yellow warbler, bald eagle and red-eyed vireo would be susceptible to the vehicles moving waste within this short distance. These project-environment interactions are advanced to Section 7 for further consideration.

6.2.1.5 Underground Transfer of Waste

Underground transfer of waste will take place during the operations phase of the DGR Project and will include receipt from the shaft, transfer from the shaft to an underground waste transport vehicle and placement into the final emplacement rooms. This work and activity would not directly interact with the terrestrial environment VECs as it occurs entirely underground. Therefore, underground transfer of waste is not considered further.

6.2.1.6 Decommissioning of the DGR Project

Decommissioning of the DGR Project involves demolition of the surface facilities associated with the operations phase of the DGR Project. Throughout the operations phase of the DGR Project, northern short-tailed shrew may utilize the built environment habitat provided by the surface facilities for marginal shelter and forage opportunities. The demolition of these facilities would remove the possibility for such habitat utilization by northern short-tailed shrew. Therefore, these project-environment interactions are advanced to Section 7 for further consideration.

6.2.1.7 Abandonment of DGR Facility

The abandonment activities may include removal of access controls. These activities are likely to be minor in nature and are not expected to interact with the terrestrial environment VECs. Therefore, abandonment activities do not warrant further consideration in this TSD.

6.2.1.8 Presence of the DGR Project

Presence of the DGR Project represents the meaning people may attach to the existence of the DGR Project in their community and the influence its operations may have on their sense of health, safety and personal security. The potential interactions that result from the presence of the DGR Project have been addressed in the Socio-economic Environment TSD. Therefore, the presence of the DGR Project does not warrant further consideration in this TSD.

6.2.1.9 Waste Management

Waste management includes all activities required to manage waste during all three phases of the DGR Project. During site preparation and construction, waste management will include managing the waste rock along with conventional waste management. During operations, waste management would include management of conventional and radiological wastes from the underground and above-ground operations. Decommissioning waste management may include management of conventional and construction wastes and small quantities of radiological waste.

This work and activity would not directly interact with the terrestrial environment VECs as it does not involve any additional removal or alteration of habitat and its associated plant and wildlife species. Therefore, waste management is not considered further in this TSD.

6.2.1.10 Support and Monitoring of DGR Life Cycle

The support and monitoring of DGR life cycle work and activity includes activities to support the safe construction, operation and decommissioning of the DGR Project. These systems have the potential to interact with terrestrial environment VECs indirectly (e.g., changes in surface water quality, changes in light levels), which are considered in Section 6.2.2. There are no potential direct interactions with terrestrial environment VECs. Therefore, support and monitoring is not considered further in this TSD.

6.2.1.11 Workers, Payroll and Purchasing

Workers, payroll and purchasing encompasses all workers required during each phase of the DGR Project, including use of vehicles to access the Bruce nuclear site and delivery vehicles entering and leaving the site. An incremental increase in the number of workers travelling to and from the site, and the transport of purchased materials to the site potentially interacts with all of the wildlife species VECs through vehicle strikes injuring or killing individual animals. Therefore, the project-environment interactions with wildlife species VECs are advanced for further assessment in Section 7.

6.2.2 Indirect Interactions

6.2.2.1 Changes in Air Quality

Changes in air quality could potentially interact with all of the plant and wildlife species VECs. Therefore, the potential indirect interaction between changes in air quality and these VECs is advanced to Section 7 for further consideration during all phases of the DGR Project.

6.2.2.2 Changes in Noise and Vibration Levels

Changes in noise, and vibration (from blasting), could potentially interact with those wildlife species VECs that reside in or near the site. This includes the following VECs:

- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- northern leopard frog;
- Midland painted turtle;
- mallard;
- red-eyed vireo;
- wild turkey;
- yellow warbler; and
- bald eagle.

Therefore, the potential indirect interaction between wildlife VECs and changes in noise and vibration levels is advanced to Section 7 for further consideration. Plants are not affected by noise or vibration levels. Therefore, no further consideration of the indirect interactions with plant species is warranted.

6.2.2.3 Changes in Light Levels

Changes in light levels could potentially interact with those wildlife species VECs that reside in or near the site, especially those using habitat located in close proximity to DGR Project components that will be artificially lit, including buildings and parking areas. This includes the following VECs:

- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- northern leopard frog;
- Midland painted turtle;
- mallard;
- red-eyed vireo;
- wild turkey;
- yellow warbler; and
- bald eagle.

Therefore, the potential indirect interaction between wildlife VECs and changes in light levels is advanced to Section 7 for further consideration. Plants are not expected to be affected by changes to light levels as the proposed lighting does not provide the broad spectrum (colour) of light that would simulate longer periods of daylight. Therefore, no further consideration of the indirect interactions with plant species is warranted.

6.2.2.4 Changes in Surface Water Quantity and Flow

Changes in surface water quantity and flow could potentially interact with those plant and wildlife species VECs that reside in or use the waterbodies on-site. The potential change may also affect plant and wildlife species using wetland features as habitat. This includes the following VECs:

- common cattail
- eastern white cedar;
- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- northern leopard frog;
- Midland painted turtle;
- mallard;
- wild turkey; and
- yellow warbler.

Therefore, the potential indirect interaction between these VECs and surface water quantity and flow are advanced to Section 7 for further consideration. Surface water changes are not likely to interact with upland species of plants and wildlife.

6.2.2.5 Changes in Surface Water Quality

Changes in surface water quality could potentially interact with those plant and wildlife species VECs that reside in, use or likely consume water from the waterbodies on-site. This includes the following VECs:

- common cattail;
- eastern white cedar;
- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- northern leopard frog;
- Midland painted turtle;
- mallard;
- red-eyed vireo;
- wild turkey;
- yellow warbler; and
- bald eagle.

Therefore, the potential indirect interactions between these VECs and surface water quality are advanced to Section 7 for further consideration.

6.2.2.6 Changes in Soil Quality

Plant species VECs could be indirectly affected by changes in soil quality caused by the uptake of contaminants in the soil. This includes the following VECs:

- eastern white cedar;
- heal-all; and
- common cattail.

Wildlife species VECs could also be indirectly affected by changes in soil quality if they are burrowing animals, largely ground-dwelling animals or consume species that come into direct contact with soil (e.g., earthworms). This includes the following VECs:

- northern short-tailed shrew;
- muskrat;
- white-tailed deer;
- northern leopard frog;
- Midland painted turtle;
- mallard;
- red-eyed vireo;
- wild turkey;
- yellow warbler; and
- bald eagle.

Therefore, the potential indirect interaction between these VECs and changes in soil quality is advanced to Section 7 for further consideration.

6.2.2.7 Changes in Groundwater Quality

Potential for the terrestrial environment VECs to indirectly interact with DGR Project-related changes in groundwater quality are captured in Section 6.2.2.6 (Changes in Soil Quality). Potential changes in groundwater conditions are also linked to potential effects on terrestrial environment VECs through the groundwater/surface water interface, and will be reflected in the assessment carried out for potential indirect changes associated with surface water resources (Sections 6.2.2.4 and 6.2.2.5). Accordingly, no further consideration of indirect interaction between groundwater quality and the terrestrial environment VECs is warranted.

6.2.2.8 Changes in Groundwater Flow

There is a potential for the terrestrial environment VECs to indirectly interact with DGR Project-related changes in groundwater flow. The forested swamp communities within the Project Area which are dominated by eastern white cedar may rely on groundwater levels to survive. Additionally, wild turkey use springs/seeps in the winter as feeding areas. Therefore, this potential interaction is carried forward to the second screening.

Any additional potential interactions between groundwater flow and terrestrial environment VECs would be through the groundwater/surface water interface, and will be reflected in the

assessment carried out for potential indirect changes associated with surface water resources (Sections 6.2.2.4 and 6.2.2.5).

6.2.2.9 Changes in Aquatic VECs

There is the potential for an adverse effect on an aquatic species VEC to indirectly interact with the VECs in the terrestrial environment. An example of this is a change to the fish species affecting a terrestrial VEC that eats fish (i.e., Midland painted turtle, bald eagle) or benthic invertebrates and aquatic plants (i.e., mallard). Therefore, this potential interaction is carried forward to the next screening.

6.3 SUMMARY OF FIRST SCREENING

Table 6.3-1 provides a summary of the initial screening for the DGR Project. Small dots (•) on this matrix represent potential DGR Project-environment interactions involving VECs. These interactions are advanced to Section 7 for a second screening to determine those interactions that may result in a measurable change to the terrestrial environment.

Table 6.3-1: Matrix 1 – Summary of the First Screening for Potential Interactions with VECs

Project Work and Activity	Eastern White Cedar			Heal-all			Common Cattail		
	C	O	D	C	O	D	C	O	D
Direct Interactions									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing									
Indirect Interactions									
Changes in Air Quality	•	•	•	•	•	•	•	•	•
Changes in Noise and Vibration Levels									
Changes to Light Levels									
Changes in Surface Water Quantity and Flow	•	•	•				•	•	•
Changes in Surface Water Quality	•	•	•				•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow	•	•	•						
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.
The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. Abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.
• Potential project-environment interaction
— Not Applicable
Blank No potential interaction

Table 6.3-1: Matrix 1 – Summary of the First Screening for Potential Interactions with VECs (continued)

Project Work and Activity	Northern Short-tailed Shrew			Muskrat			White-tailed Deer		
	C	O	D	C	O	D	C	O	D
Direct Interactions									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—	•	—	—	•	—	—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—	•	—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Interactions									
Changes in Air Quality	•	•	•	•	•	•	•	•	•
Changes in Noise and Vibration Levels	•	•	•	•	•	•	•	•	•
Changes to Light Levels	•	•	•	•	•	•	•	•	•
Changes in Surface Water Quantity and Flow	•	•	•	•	•	•	•	•	•
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.
The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. Abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.
• Potential project-environment interaction
— Not Applicable
Blank No potential interaction

Table 6.3-1: Matrix 1 – Summary of the First Screening for Potential Interactions with VECs (continued)

Project Work and Activity	Midland Painted Turtle			Northern Leopard Frog			Mallard		
	C	O	D	C	O	D	C	O	D
Direct Interactions									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—	•	—	—	•	—	—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Interactions									
Changes in Air Quality	•	•	•	•	•	•	•	•	•
Changes in Noise and Vibration Levels	•	•	•	•	•	•	•	•	•
Changes to Light Levels	•	•	•	•	•	•	•	•	•
Changes in Surface Water Quantity and Flow	•	•	•	•	•	•	•	•	•
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes in Aquatic Environment VECs	•	•	•				•	•	•

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.
The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. Abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.
• Potential project-environment interaction
— Not Applicable
Blank No potential interaction

Table 6.3-1: Matrix 1 – Summary of the First Screening for Potential Interactions with VECs (continued)

Project Work and Activity	Red-eyed Vireo			Wild Turkey			Yellow Warbler			Bald Eagle		
	C	O	D	C	O	D	C	O	D	C	O	D
Direct Interactions												
Site Preparation	•	—	—	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities	•	—	—	•	—	—	•	—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—	•	—	—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—		—	—	
Presence of the DGR Project												
Waste Management												
Support and Monitoring of DGR Life Cycle												
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•	•	•	•
Indirect Interactions												
Changes in Air Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Noise and Vibration Levels	•	•	•	•	•	•	•	•	•	•	•	•
Changes to Light Levels	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Surface Water Quantity and Flow				•	•	•	•	•	•			
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality												
Changes in Groundwater Flow				•	•	•						
Changes in Aquatic Environment VECs										•	•	•

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. Abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

• Potential project-environment interaction
— Not Applicable
Blank No potential interaction

Following the screening of potential DGR Project-environment interactions, all VECs identified had a potential interaction with the DGR Project. Therefore, as summarized in Table 6.3-2, all of the VECs proposed in Table 4-1 will be carried forward for further assessment.

Table 6.3-2: Advancement of Terrestrial Environment VECs

VEC	Retained?	Rationale
Eastern white cedar	Yes	• Potentially interact with site clearing activities • Indirectly interact with changes in the physical environment
Heal-all	Yes	
Common cattail	Yes	
Northern short-tailed shrew [a]	Yes	• Site clearing activities could lead to reduced habitat availability or suitability • Wildlife are susceptible to direct injury or mortality because of project-related vehicle strikes • Indirectly interact with changes in the physical environment
Muskrat	Yes	
White-tailed deer	Yes	
Midland painted turtle	Yes	
Northern leopard frog	Yes	
Mallard	Yes	
Red-eyed vireo	Yes	
Wild turkey	Yes	
Yellow warbler	Yes	
Bald eagle	Yes	

Note:

a The meadow vole was identified as a VEC in the EIS Guidelines. However, small mammal trapping surveys conducted in 2009 did not reveal the presence of meadow voles in the Project Area. Therefore, northern short-tailed shrew was substituted as a small mammal VEC.

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7. SECOND SCREENING FOR MEASURABLE CHANGES

The second screening considers the DGR Project works and activities advanced from Section 6 to determine if the identified interactions are likely to cause a measurable change to the terrestrial environment VECs.

7.1 SECOND SCREENING METHODS

For the purposes of the assessment, a measurable change in the environment is defined as a change that is real, observable or detectable compared with existing conditions. To determine likely direct measurable changes, a judgement is made using qualitative and quantitative information, as available. For the purposes of the terrestrial environment, the thresholds provided in Table 7.1-1 provide the criteria for a measurable change on VECs.

Table 7.1-1: Terrestrial Environment Criteria for Measurable Change

VEC	Criteria for Measurable Change
Eastern white cedar	Loss of some trees at a few locations; Reduction in conifer forest type by >5% or mixed woods forest type by >10% in the Project Area compared with baseline
Heal-all	Loss of >50% of the plants in the Project Area
Common cattail	Loss of >50% of the plants in the Project Area
Northern short-tailed shrew	Relocation or loss of a few animals (>25)
Muskrat	Mortality increase of several individuals (>3 per year) resulting in a noticeable change in the local population, relocation or avoidance of suitable habitat by individuals in the local population
White-tailed deer	Mortality increase of several individuals (>3 per year) resulting in a noticeable change in the local population, relocation or avoidance of suitable habitat by individuals in the local population
Red-eyed vireo	Avoidance/relocation or mortality of a number of individuals resulting in a noticeable change in the local population
Wild turkey	Mortality increase of a several individuals (>5 per year) resulting in a noticeable change in the local population, relocation or avoidance of suitable habitat by several individuals in the local population
Yellow warbler	Avoidance/relocation or mortality of a number of individuals resulting in a noticeable change in the local population
Mallard	Loss of foraging habitat (>5%) associated with wetland edges or open water
Bald eagle	Loss of nesting habitat or winter foraging opportunities
Midland painted turtle	Mortality increase of a few individuals (>2 per year), relocation or avoidance of suitable habitat by individuals in the local population
Northern leopard frog	Mortality increase of several individuals (>5 per year) resulting in a noticeable change in the local population, relocation or avoidance of suitable habitat by several individuals in the local population

For potential indirect changes, a measurable change is considered possible if there is a likely measurable change identified on the other VEC in question (e.g., there could be a measurable change on eastern white cedar if there is a likely change in air quality). Where a physical change has a potential interaction that could cause an indirect effect, the change is predicted in the respective TSD. These changes are presented here for evaluation. If a measurable change in the physical environment is identified, then the indirect effects are advanced to Section 8 for assessment on the terrestrial environment VECs.

A measurable change on a VEC is marked with a '■' on Matrix 2 (Section 7.4).

7.2 PLANT SPECIES

7.2.1 Direct Changes

The site preparation work and activity will physically remove vegetation from areas within the Project Area. As described in Section 5.4.1, the vegetation within the Project Area is varied and includes cultural communities, conifer, mixed woods and deciduous forest, swamp and marsh; however, these natural vegetation communities are not outstanding examples of their type and there are no significant elements associated with them. Both cultural and forest communities are equally represented, with the wetland communities contributing a small portion of the natural vegetation present within the Project Area.

As shown on Figure 5.4.1-1, the land to be cleared for the DGR Project (i.e., DGR Project site), including construction laydown areas, is approximately 30 ha, all of which is located exclusively in the Project Area. The amount of vegetation to be removed during site preparation and the percentage of ELC communities within the Project Area that would be lost as a result of that clearing are summarized in Table 7.2.1-1.

Table 7.2.1-1: Areas of Vegetation Removal and Percentage Change in ELC Communities in the Project Area and Site Study Area

ELC Community	Baseline Extent in Project Area (ha) (2009)	Baseline Extent in Site Study Area (ha) (2009)	Vegetation Removal Area (ha)	% Change in Project Area	% Change in Site Study Area
Cultural Barren	12.7	73.9	0	None	None
Cultural Grasslands	0	25.1	0	None	None
Cultural Meadow	8.1	45.4	0	None	None
Cultural Thicket	0	4.7	0	None	None
Industrial Barren	30.1	187.0	21.7	-72	-12
Industrial Land	17.2	280.7	0	None	None
Total Cultural	**68.1**	**616.8**	**21.7**	**-32**	**-4**
Alvar, Shrub	0	0.6	0	None	None

Table 7.2.1-1: Areas of Vegetation Removal and Percentage Change in ELC Communities in the Project Area (continued)

ELC Community	Baseline Extent in Project Area (ha) (2009)	Baseline Extent in Site Study Area (ha) (2009)	Vegetation Removal Area (ha)	% Change in Project Area	% Change in Site Study Area
Beach/Bar, Open	0	72.7	0	None	None
Beach/Bar, Shrub	0	0.7	0	None	None
Beach/Bar, Treed	0	6.8	0	None	None
Forest, Conifer	5.5	174.6	0	None	None
Forest, Mixed woods	11.5	78.5	8.9	-77	-11
Forest, Deciduous	6.7	43.7	0	None	None
Aquatic, Open	0	2.5	0	None	None
Swamp, Deciduous	0	4.9	0	None	None
Swamp, Mixed woods	3.1	15.3	0	None	None
Swamp, Thicket	0	3.2	0	None	None
Marsh, Meadow	0.9	3.4	0	None	None
Marsh, Shallow	0	11.0	0	None	None
Total Natural	**27.7**	**417.9**	**8.9**	**-32**	**-2**

Considering the location of the land clearing activities, the following plant species VECs may be affected: eastern white cedar and heal-all. The above table shows that the majority of the vegetation to be removed (21.7 ha) occurs in the industrial barren category (i.e., lands already cleared and altered by past anthropogenic activities). A small area (8.9 ha) of naturally-occurring mixed woods forest will also be removed as part of the proposed site preparation activities. This mixed woods forest removal represents a loss of 77% of the area covered by this plant community within the Project Area. The proportional loss is smaller (11%) when the Site Study Area is considered since much larger areas of mixed woods, and all forest types, are present outside the boundary of the Project Area. For the Site Study Area, the proportional loss is 11% of the mixed woods forest. The removal of 77% of the mixed woods forest within the Project Area will result in a measurable change to the plant species and communities and the potential wildlife habitat in this portion of the Site Study Area.

While all of the plant species and communities that are proposed to be removed as part of the site preparation activities are common and abundant within the Site Study Area, the clearing will result in a displacement of the wildlife species currently using this area as habitat. Under existing conditions, the wildlife species and communities documented in this area currently move between habitat units located within the Site Study Area. However, a 77% loss of a single vegetation type community within the Project Area would be considered to be a measurable change to eastern white cedar, and land clearing as part of the site preparation activities has been forwarded for assessment.

Common cattail is present in almost all of the locations within the Site Study Area and Project Area where there is standing water for at least a portion of the year. Common cattail is a hardy species which may be temporarily affected by construction activities, which could result in direct removal of specimens. However, construction activities within the North and South Railway Ditches are limited to installation of a crossing, which will only disturb 20 m of the approximately 1,250 m length of the ditches. Therefore, only the existing plants species and communities found in this 20 m length will be removed. After completion of construction activities, naturalization of this feature to current baseline conditions will occur. Accordingly, no measurable change to common cattail is identified and no further consideration is warranted.

Heal-all is found in open woodland, meadows, pastures, waste areas, roadsides, lawns, and around buildings. Due to its ability to grow in many different habitats, including previously disturbed areas, it is expected that heal-all will regrow in the Project Area after the disturbance and there will not be a measurable change to this VEC. Therefore, no further consideration is warranted.

7.2.2 Indirect Changes

7.2.2.1 Changes in Air Quality

As described in Section 6.2.2.1, changes in air quality have the potential to affect plant and wildlife species VECs. Changes in air quality at receptors of ecological relevance (see Figure 7.2.2-1) have been predicted in the Atmospheric Environment TSD (Appendix J). Ecological receptors were chosen based on proximity to the DGR Project site and locations that provide habitat for species VECs as discussed in Table 7.2.2-1.

LEGEND

- Ecological Receptor
- Project Area (OPG-retained lands that encompass the DGR Project)
- Site Study Area [1]

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007.
Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

0 250 500 1,000
Metres

PROJECT
TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE
LOCATION OF ECOLOGICAL RECEPTORS

Golder Associates
Mississauga, Ontario

PROJECT No. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007		
GIS	BC	20 Apr. 2010		
CHECK	KC	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

FIGURE 7.2.2-1

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Table 7.2.2-1: Location and Description of Ecological Receptors for Air Quality

Location ID	Location	Description of Receptor
ER1	Baie du Doré Provincially Significant Wetland	Marsh habitat for VEC species including common cattail, muskrat, yellow warbler, mallard, Midland painted turtle, and northern leopard frog.
ER2	Beach	Specialized habitat, potential habitat for VEC species including: mallard, Midland painted turtle and bald eagle.
ER3	Forest/adjacent to swamp	Habitat for VEC species, including: eastern white cedar, white-tailed deer, red-eyed vireo, wild turkey and yellow warbler (edge).
ER4	Forest	Habitat for VEC species including: eastern white cedar, white-tailed deer, red-eyed vireo, wild turkey and yellow warbler (edge).
ER5	Industrial barren/ adjacent to forest	Currently marginal habitat for VEC species including: white-tailed deer, red-eyed vireo, wild turkey and northern short-tailed shrew. However, this receptor will no longer remain once the site preparation and construction starts as the waste rock management area will be located here. VECs currently using this receptor location will likely relocate to adjacent areas (e.g., ER4, ER6, or ER7).
ER6	Forest	Habitat for VEC species including: eastern white cedar, white-tailed deer, red-eyed vireo, wild turkey and yellow warbler (edge).
ER7	Mixed habitat – forest/ cultural meadow/ cultural barren	Habitat for VEC species including: eastern white cedar, white-tailed deer, red-eyed vireo, wild turkey, meadow vole, northern leopard frog, heal-all, and yellow warbler (edge).

As shown in Table 7.2.2-2, changes in air quality at the ecological receptor locations may occur from an increase in nitrogen dioxide (NO_2) and suspended particulate matter (SPM) emissions, as well as marginal increases in SO_2, during the site preparation and construction phase of the DGR Project. As described in Appendix J of the Atmsopheric Environment TSD, airborne deposition of nitrates are not likely to be measurable (<2 grams per year per square metre).

Table 7.2.2-2: Likely Measurable Changes in Air Quality at Ecological Receptors During the Site Preparation and Construction Phase

Indicator	Maximum Existing Concentrations ($\mu g/m^3$)	Maximum Predicted Site Preparation and Construction Phase Concentrations ($\mu g/m^3$)	Measurable Change?
1-hour NO_2	81.6	499.5	**Yes**
24-hour NO_2	22.9	154.1	**Yes**

Table 7.2.2-2: Likely Measurable Changes in Air Quality at Ecological Receptors during the Site Preparation and Construction Phase (continued)

Indicator	Maximum Existing Concentrations (µg/m³)	Maximum Predicted Site Preparation and Construction Phase Concentrations (µg/m³)	Measurable Change?
Annual NO_2	7.1	32.6	**Yes**
1-hour SO_2	133.9	133.9	No
24-hour SO_2	40.5	40.6	**Yes**
Annual SO_2	5.7	5.8	**Yes**
24-hour SPM	63.3	182.5	**Yes**
Annual SPM	25.0	46.5	**Yes**

Note: The above numbers do not include predications at ER5 (currently industrial barren) where the waste rock management area is to be located.
Source: Appendix J, Table J1.1.1-1 of the Atmospheric Environment TSD.

Since these measurable changes in air quality may have measurable effects on biological VECs, they are advanced to Section 8 to determine whether they will result in an adverse effect on species VECs.

As shown in Table 7.2.2-3, changes in air quality at the ecological receptor locations may occur from increases in nitrogen dioxide (NO_2) and suspended particular matter (SPM) emissions during the operations phase of the DGR Project.

Table 7.2.2-3: Likely Measurable Changes in Air Quality at Ecological Receptors during the Operations Phase

Indicator	Maximum Existing Concentrations (µg/m³)	Maximum Predicted Operations Phase Concentrations (µg/m³)	Measurable Change?
1-hour NO_2	81.6	184.0	**Yes**
24-hour NO_2	22.9	96.8	**Yes**
Annual NO_2	7.1	11.1	**Yes**
1-hour SO_2	133.9	133.9	No
24-hour SO_2	40.5	40.5	No
Annual SO_2	5.7	5.8	**Yes**
24-hour SPM	63.3	63.5	**Yes**
Annual SPM	25.0	25.1	**Yes**

Note: The above numbers do not include predications at ER5 (currently industrial barren) where the waste rock management area is to be located.
Source: Appendix J, Table J1.1.1-1 of the Appendices to Atmospheric Environment TSD.

Since these measurable changes in air quality may have measurable effects on biota, they are advanced to Section 8 to determine whether they will result in an adverse effect on plant species VECs.

The emissions during decommissioning phase are expected to be similar to, or less than the emissions during the site preparation and construction phase. Therefore, the potential measurable changes would be bounded by those for the site preparation and construction phase presented in Table 7.2.2-2.

7.2.2.2 Changes in Surface Water Quantity and Flow

As described in Section 6.2.2.4, changes in surface water quantity and flow could potentially affect the common cattail and eastern white cedar. Changes in surface water quantity and flow were predicted in the Hydrology and Surface Water Quality TSD. Section 8 of the Hydrology and Surface Water Quality TSD identifies an adverse effect to surface water quantity and flow in the North Railway Ditch, upstream of the confluence with Stream C, associated with the redirection of drainage to MacPherson Bay. These changes may affect common cattail, but would not affect eastern white cedar as they are remotely located from the affected features.

Accordingly, this measurable change in surface water quantity and flow on common cattail is advanced for assessment in Section 8.

7.2.2.3 Changes in Surface Water Quality

As discussed in Section 6.2.2.5, changes in surface water quality could indirectly interact with the common cattail. The assessment on surface water quality was completed in the Hydrology and Surface Water Quality TSD. It was concluded in that TSD that taking stormwater management into account, no adverse effects on water quality are expected as a result of the DGR Project. Treated stormwater discharge will be conveyed to MacPherson Bay through the existing ditch crossing Interconnecting Road. Common cattail is present in sections of the drainage ditch and will persist. No stormwater discharge runoff will be directed to the North Railway Ditch or Stream C. Therefore, there will be no measurable change to the common cattail via the surface water quality pathway and no further consideration is warranted.

The increase in hardened surfaces associates with parking areas and potential new access roads will require an increase in the amount of road safety salt applied during winter months, which has the potential to be transferred to the terrestrial environment though surface water flow. This increase is not expected to have a measurable effect on plant species or communities, because of the resilience of species encountered in surrounding features (and specifically cattail), and has therefore not been advanced for further consideration. Additionally, any salt compounds found within the waste rock excavated from the site and stored in stockpiles are expected to very gradually enter the natural environment through natural hydraulic processes and the stormwater management system. No measurable change to plant species or communities is expected to occur as a result of this DGR Project activity, therefore, stockpiling of waste rock and any surface water quality changes associated with this DGR Project component has not been advanced for further consideration.

7.2.2.4 Changes in Soil Quality

As discussed in Section 6.2.2.6, changes in soil quality could indirectly interact with plant species VECs. The assessment on soil quality was completed in the Geology TSD. It was concluded in that TSD that no adverse effects on soil quality are expected as a result of the DGR Project outside of the Waste Rock Management Area footprint. Accordingly, there is no potential for measurable indirect changes on the terrestrial environment VECs through this pathway, and no further consideration is warranted.

7.2.2.5 Changes in Groundwater Flow

Eastern white cedar is common in the forested swamp communities within the Project Area. It was identified that a potential pathway of effect may exist between groundwater flow and eastern white cedar if the water level in the swamp community was dependent on groundwater levels. However, the wetland communities within the Project Area appear to be maintained by seasonal and surface water flow. Therefore, this interaction is not considered further.

7.3 WILDLIFE SPECIES

7.3.1 Direct Changes

7.3.1.1 Northern Short-tailed Shrew

Northern short-tailed shrew inhabits both disturbed and undisturbed habitats such as green fields, marshes, swamps, deciduous and coniferous woodlands, and backyard gardens. This species consumes up to three times its weight in food each day. While mainly carnivorous, eating invertebrates and small mammals, it also feeds on subterranean fungi and seeds. Northern short-tailed shrews have high evaporative water losses and must have access to a water source or adequate water intake through food.

Reproduction of northern short-tailed shrews involves two to four litters each year. The nests are usually built in tunnels/burrows or under fallen logs.

The following works and activities were identified in the initial screening as potentially directly interacting with northern short-tailed shrew because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from vehicle strikes:

- site preparation;
- above-ground transfer of waste;
- decommissioning of the DGR Project; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

The removal of vegetation communities supporting northern short-tailed shrew sheltering, foraging, or nesting activities during site preparation is not expected to cause a measurable change (will be less than 25 individuals). These activities are not expected to cause a change in the local population as this species has a high reproduction rate. It is also unlikely that

individual animals may be lost when surface structures are removed since the built environment provides only very marginal sheltering habitat for this species, which would continue to rely on primarily cultural vegetation communities to support itself. Accordingly, no measurable changes to habitat utilization opportunities, and in turn, northern short-tailed shrew populations are anticipated to occur as a result of site preparation and decommissioning. No further consideration is warranted.

Vehicle Strikes

The DGR Project workforce is expected to be largest during the site preparation and construction phase. Up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. In the context of ongoing operation at the Bruce nuclear site, these peak workforce requirements contribute very little to the overall Bruce nuclear site traffic. The above ground transfer of waste by truck also presents a risk of vehicle strike although much less than the cars and small trucks at higher speeds of employee traffic.

Species respond to the hazard of traffic in different ways depending on their road and traffic avoidance behaviours, and the road size and traffic volumes [61]. For example, populations that compensate for increasing mortality by increasing their reproductive rates are unlikely to be affected by increased traffic rates. As discussed above, northern short-tailed shrew populations have adapted to relatively high natural mortality rates associated with predation, through specific reproductive strategies (winter and summer cycles with a large number of offspring) to sustain their populations.

The increase in project-related vehicle strikes may result in a small increase (less than 25 individuals) in northern short-tailed shrew mortality; however, this increase is considered to be negligible since the loss of a few individuals will not affect the local populations. Indeed, it is not likely that the northern short-tailed shrew mortality rate on roadways would be measurable in comparison with the high natural mortality rate of this species. The vehicle mortality rate would be expected to be even smaller during the operations phase as there are fewer workers. Accordingly, no measurable change to northern short-tailed shrew populations is predicted and no further consideration is warranted.

7.3.1.2 Muskrat

Muskrat occupy lakes, ponds, marshes, and streams that have cattails, rushes and open water. They are resident within the wetted ditches in the Project Area, and throughout the Site Study Area. Their summer diet includes a variety of emergent herbaceous vegetation with cattails, rushes, sedges, irises, water lilies and pondweeds forming the main staples. Occasionally, frogs, turtles, clams, snails, crayfish and small fish may also be eaten. In winter, muskrat feed on submerged vegetation. Muskrat also rely on herbaceous vegetation, particularly cattails and rushes, to construct their houses (known as “push-ups”). They may also dig bank burrows that have submerged entrances.

Muskrat become sexually mature the spring following their birth. Breeding takes place between March and September, when each female produces two or sometimes three litters a year.

Typically, litters consist of six to seven young that become independent within one month of their birth.

The following works and activities were identified in the initial screening as potentially directly interacting with muskrat because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from vehicle strikes:

- site preparation;
- above-ground transfer of waste; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Table 7.2.1-1 shows that no vegetation communities (i.e., swamp and marsh) key to supporting muskrat sheltering, foraging, or breeding activities will be removed during site preparation. The North and South Railway Ditches will be altered as part of the site preparation activities. Alterations will be limited to the installation of a crossing; however, no recent evidence of muskrat activity was documented in this feature during field data collection completed as part of the DGR Project (see Figure 5.3.4-1). Accordingly, no measurable changes to habitat utilization opportunities, and in turn, muskrat populations are anticipated to occur as a result of the DGR Project. No further consideration is warranted.

Vehicle Strikes

As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. Muskrat exhibit early onset of sexual maturity, and have a high reproductive rate with several breeding cycles each spring and summer. In early spring many first year animals leave their birth locations to establish their own territories, and may travel overland to do so. During this spring dispersal, the animals are most vulnerable to vehicle strikes; however, this species tends to have a small home range, and can occur in high densities in areas with appropriate food and shelter suggesting that long-distance overland trips are not generally required. Additionally, many of the preferred muskrat habitat areas within the Project Area are linked via wetted ditches and culverts to Site Study Area habitats and beyond such that animals could disperse through waterways without traversing roadways.

Therefore, there is a slight chance that muskrat vehicle strikes will increase with the increase in traffic on site; however, this increase is considered to be negligible since the loss will not be enough to affect the local populations. Accordingly, no further consideration is warranted.

7.3.1.3 White-tailed Deer

The optimum habitat for white-tailed deer is a mixture of open areas and young forest with suitable cover, which is well-represented in the Site Study Area. Areas cleared for roads and parking lots, and managed immature forests such as those on-site support much of the vegetation on which this species thrives. The growth of the white-tailed population at the Bruce nuclear site is typical of the current status of this species throughout southern Ontario.

Historically, this species was uncommon in Ontario, but with the spread of agriculture and forest fragmentation that occurred with the arrival of European settlers, white-tailed deer has become common and widespread.

The following works and activities were identified in the initial screening as potentially directly interacting with white-tailed deer because of either: (i) limiting habitat utilization opportunities, or (ii) injury/mortality from vehicle strikes:

- site preparation;
- above ground transfer of waste; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

As discussed in Section 5.7.1.2, white-tailed deer are the most frequently recorded mammal at the Bruce nuclear site. This species has the greatest potential to be affected by forest habitat removal since it moves through the Site Study Area using the forest as cover in which to shelter from would-be predators. This species also uses conifer forest as winter refuge by taking advantage of the protection of the permanent canopy during periods of heavy snowfall. The evidence of heavy deer browse, particularly in conifer and mixed woods forests, is prevalent throughout both the Project and Site Study Areas as this species uses eastern white cedar as an emergency browse.

While 8.9 ha of mixed woods forest will be removed during site preparation (Table 7.2.1-1), a small area which represents only 11.4% of this type of habitat available for sheltering and foraging within the Site Study Area. Accordingly, no measurable changes to habitat utilization opportunities are likely, and in turn, white-tailed deer are not likely to relocate. No further consideration is warranted.

Vehicle Strikes

As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in a peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. Table 7.3.1-1 shows the number of white-tailed deer collisions with vehicles recorded at the Bruce nuclear site for the years 2002 through 2006.

Table 7.3.1-1: Number and Average White-tailed Deer – Vehicle Collisions on Roadways Within the Bruce Nuclear Site (Site Study Area)

White-tailed Deer – Vehicle Collisions	Number of Collisions with White-tailed Deer						Average Annual Collision Rate[a]
	2002	2003	2004	2005	2006	Average	
Total	8	7	7	5	9	7.2	3.3
Injury	3	3	7	3	7	4.6	2.1
Fatality	5	4	0	2	2	2.6	1.2

Note:

a The collision rate is defined as the number of collisions occurring per million vehicles entering the Bruce nuclear site. Since detailed records of the exact location of each strike are not kept, a conservative estimate of collision rates was determined by dividing the average number of collisions within the Bruce nuclear site (2002-2006) by the number of vehicles entering the Main Gate intersection (2.2 million entering Tie Road at Main Gate). The majority of traffic that enters the Bruce nuclear site does so through the Main Gate.

Source: [10]

Based on the above data, the annual average collision rate between white-tailed deer and on-site vehicles is calculated to be 3.3 per million vehicles. The associated animal fatality rate is approximately one third of the total collision rate. Since the DGR Project will contribute only a small number of additional vehicles travelling to and from the Bruce nuclear site (~215,000 trips per year), when discussed with regards to collisions rates per million vehicles, the potential increase of white-tailed deer-vehicle collisions is expected to have a negligible effect on the local population.

Potential vehicle strikes associated with the above-ground transfer of waste is expected to be minimal as this activity involves the movement of vehicles over a distance of 200 to 250 m within the DGR Project site at low speeds. For this reason, the above-ground transfer of wastes has not been forwarded for further consideration.

In summary, vehicle collisions are expected to affect individual animals, but will have a negligible affect upon the local population of white-tailed deer. Accordingly, no further assessment is warranted.

7.3.1.4 Herpetofauna

Midland painted turtle is the most common and most frequently observed turtle species in Ontario. It ranges throughout southern and central Ontario, although Bruce County is not located within its “core” habitat [62]. This turtle utilizes habitat found in slow moving rivers, ponds and marshes with soft substrates and partially submerged logs and rocks that provide basking opportunities.

Northern leopard frog relies on much of the same habitat as Midland painted turtle, provided that emergent vegetation and grasses are present. In summer, however, this common and widespread frog species moves to moist grassy fields to forage. Like Midland painted turtle, northern leopard frog ranges throughout southern Ontario, although Bruce County is not located within its “core” habitat [62].

Since the distribution and habitat requirements of the two species are so similar, they will be considered collectively in the screening below.

The following works and activities were identified in the initial screening as potentially directly interacting with herpetofauna VECs (i.e., Midland painted turtle and northern leopard frog) because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from vehicle strikes:

- site preparation;
- above ground transfer of waste; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Table 7.2.1-1 shows that no vegetation communities (i.e., marsh, open water and grassy fields) key to supporting herpetofauna sheltering, foraging or breeding activities will be removed during site preparation.

Northern leopard frog egg masses have been historically recorded in the Project Area [24]. In 2007, this species was recorded as actively breeding within the Project Area. Not surprisingly, this activity was most intense within wetland communities with the greatest amount of water (see Section 5.5.1). As shown on Figure 5.4.1-1, the DGR Project site is not located adjacent to the majority of wetland (marsh, swamp, open water) communities within the Site Study Area where breeding is expected to be most intense. While site preparation activities will include filling in existing ditches such as the abandoned railway spur ditch, these habitat provide secondary habitat for herpetofauna as they are seasonally or periodically wet and herpetofauna would utilize them only opportunistically. Therefore, the site preparation activities will avoid the key habitats for herpetofauna and are not expected to produce a measurable change to the habitat utilization opportunities, and in turn, herpetofauna individuals are not anticipated to relocate as a result of site preparation. No further consideration is warranted.

Vehicle Strikes

Road-related mortality is an important consideration for both Midland painted turtle and northern leopard frog largely because of their movements overland between one body of water and another. Potential vehicle strikes associated with the above ground transfer of wastes is expected to be minimal as this activity involves the movement of vehicles over a distance of 200 to 250 m within the DGR Project site at low speeds. For this reason, the above ground transfer of wastes has not been forwarded for further consideration.

As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. The workers access route to the DGR Project site during construction as well as during operations is assumed to be through the main entrance travelling straight to Interconnecting Road to the DGR access road at the WWMF.

Although herpetofauna travel through terrestrial areas, this migration is performed to get from one wetland area to another. Large wetland areas exist east of the DGR Project Area and the assumed access route does not bisect the two wetland areas that they could be travelling between. Therefore, painted turtles and northern leopard frogs are not likely to cross this access route with any frequency. Hence vehicle strikes by workers coming to the DGR Project Area through the assumed access route are not expected to cause mortality at a rate that would produce a measurable change to either species of herpetofauna. This interaction has not been forwarded for further consideration.

7.3.1.5 Mallard

Mallard is the most widespread and abundant duck species in North America. It can be found in all wetland habitats, and uses a variety of foraging strategies including dabbling, filter-feeding at the water's surface, tipping-up in shallow areas, and making occasional deeper dives. Breeding occurs in the spring, and a clutch of one to 13 eggs is produced. Chicks are independent at 50 to 72 days following hatching, but are able to leave the nest within 13 to 16 hours of hatching [63]. Within the Bruce nuclear site, storm water ponds provide suitable habitat for feeding and nesting akin to urban park ponds, where mallard are often found.

The following works and activities were identified in the initial screening as potentially directly interacting with mallard because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from vehicle and/or building strikes:

- site preparation;
- construction of surface facilities;
- above ground transfer of waste; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Table 7.2.1-1 shows that no wetland communities or open water will be removed during site preparation. Accordingly, no measurable changes to habitat utilization opportunities, and in turn mallard populations, are anticipated to occur as a result of the DGR Project. No further consideration is warranted.

Collisions with Buildings and Vehicle Strikes

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on site are shaft headframes, exhaust fans, intake fans and heaters. These structures are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the DGR Project site is not expected to cause a measurable change to the local population and is not considered further.

Road-related mortality is not a particularly important consideration for mallard since they are quite large[14], and therefore, easier for motorists to see, and they can easily avoid on-coming traffic through flight. While a few ducks could be unable to avoid a collision in the event they

[14] Height: 50-65 cm; Wingspan: 82-95 cm [63].

choose to cross the road on the ground, it will have a negligible effect upon the local population. Potential vehicle strikes associated with the above ground transfer of waste is expected to be minimal as this activity involves the movement of vehicles over a distance of 200 to 250 m within the DGR Project site at very low speeds. Accordingly, no further consideration is warranted.

7.3.1.6 Red-eyed Vireo

This widespread species is one of the most common birds of eastern North American forests. Red-eyed vireo exhibit diurnal behaviour, and breed in deciduous and mixed woods communities. They tend to be more abundant in forest interior habitats, although they may be found in urban parks that support large trees. Foraging involves searching for prey (insects, especially caterpillars) while moving through branches. As discussed in Section 5.7.1.1, four red-eyed vireos were identified as "possible" breeders in deciduous forest communities within the Project Area.

The following works and activities were identified in the initial screening as potentially directly interacting with red-eyed vireo because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from collisions with buildings and vehicle strikes:

- site preparation;
- construction of surface facilities; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Red-eyed vireo will use deciduous and mixed forest habitats for breeding and foraging. Table 7.2.1-1 shows that no deciduous forest communities will be removed during site preparation. However, 8.9 ha of mixed forest is scheduled to be removed as part of the site preparation activities, which accounts for a removal of 77% of the mixed forest in the Project Area. This activity has, therefore been advanced to Section 8.3 for assessment.

Collisions with Buildings and Vehicle Strikes

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on site are shaft headframes, exhaust fans, intake fans and heaters. These structures are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the DGR Project site is not expected to cause a measurable change to the local population and is not considered further.

Red-eyed vireo may be susceptible to vehicle strikes when moving from one forest block to another for foraging activities. As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in a peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. While a few birds may be struck by DGR Project workers' vehicles, the loss of these individuals is not expected to affect the overall population of red-eyed vireo in the Site Study Area and beyond. Accordingly, no further consideration is warranted.

7.3.1.7 Wild Turkey

Wild turkey is a large-ground dwelling bird that breeds in woodlands. Based on data collected in 2007, turkey roosting at the Bruce nuclear site is habitat-specific with a preference for a combination of open field areas edged by a mix of the larger stands of deciduous and coniferous trees. No roosting sites were identified within the Project Area (Figure 5.3.5-1). Disturbed areas within the Bruce nuclear site provide suitable feeding/breeding ground, while the network of cleared roadways provides year-round travel corridors for these birds, which prefer walking to flying.

The following works and activities were identified in the initial screening as potentially directly interacting with wild turkey because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from collisions with buildings and vehicle strikes:

- site preparation;
- construction of surface facilities;
- above ground transfer of waste; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Table 7.2.1-1 shows that 8.9 ha of mixed woods vegetation will be removed during site preparation. Wild turkey have very large home ranges and can easily travel several kilometres in one day between nighttime roosts. No roosts were identified within the Project Area nor were wild turkey identified during 2007 field surveys as breeding within the Project Area. However, as the removal accounts for 77% of the mixed forest in the Project Area, this activity has, therefore been advanced to Section 8.3 for assessment.

Collision with Buildings and Vehicle Strikes

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on site are shaft headframes, exhaust fans, intake fans and heaters. These structures are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the DGR Project site is not expected to cause a measurable change to the local population and is not considered further.

Vehicle collisions with wild turkeys could occur from worker vehicles and from the above ground transfer of wastes. While wild turkeys are very large[15] and diurnal, and therefore, easy for motorists to see, they frequently travel along roads making them susceptible to vehicle strikes. As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in a peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. As described in Section 7.3.1.5, while a few turkeys could be unable to avoid a collision through taking flight, it will have a negligible effect upon the local population.

[15] Height: 110 - 115 cm; Wingspan: 125 - 144 cm [63].

Potential vehicle strikes associated with the above ground transfer of waste is expected to be minimal as this activity involves the movement of vehicles over a distance of 200 to 250 m within the DGR Project site at very low speeds. Accordingly, no further consideration is warranted.

7.3.1.8 Yellow Warbler

Yellow warbler is a migratory species with a summer (breeding) range from northern Alaska and Canada southward to the mid-U.S. This species winters in Mexico, and Central and South America. Yellow warbler breeds in wet, deciduous thickets and sometimes in shrubby areas and old fields. It forages on insects by gleaning, fly-catching and hovering, and will occasionally consume fruit.

The following works and activities were identified in the initial screening as potentially directly interacting with yellow warbler because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from collisions with buildings and vehicle strikes:

- site preparation;
- construction with surface facilities; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Table 7.2.1-1 shows that 8.9 ha of mixed woods vegetation will be removed during site preparation. Since this is not preferred habitat for yellow warbler, it is unlikely that it would have any affect on this species. Furthermore, as discussed in Section 5.7.1.1, no yellow warblers were identified as confirmed breeders in the Project Area. Accordingly, no measurable changes to habitat utilization opportunities, and in turn, yellow warbler populations are anticipated to occur as a result of the DGR Project. No further consideration is warranted.

Collisions with Buildings and Vehicle Strikes

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on site are shaft headframes, exhaust fans, intake fans and heaters. These structures are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the DGR Project site is not expected to cause a measurable change to the local population and is not considered further.

Similar to red-eyed vireo (Section 7.3.1.6), yellow warbler may be susceptible to vehicle strikes when moving from one vegetation polygon to another for foraging activities. As described in Section 7.3.1.1, up to 313 staff will be required for completion of the site preparation and construction phase works and activities, which will result in peak hour volume of 218 car trips per peak hour associated with workers travelling to and from the site [60]. While a few birds may be struck by DGR Project workers' vehicles, the loss of these individuals is not expected to affect the overall population of yellow warbler in the Site Study Area and beyond. Accordingly, no further consideration is warranted.

7.3.1.9 Bald Eagle

The bald eagle is a well-known bird of prey with a distinctive white head, neck and tail, and a brown body. Young birds are mostly brown with a variable amount of white. It takes four years for the young to attain adult plumage. Bald eagle feed mainly on fish, but they also catch birds and small mammals, scavenge for carrion, and steal food from other birds such as osprey. Their nests are very large stick platforms, usually placed high in a tree, near water.

Bald eagle is protected under the *Fish and Wildlife Conservation Act*, and is listed under Ontario's *Endangered Species Act* in southern Ontario, which protects regulated species and their habitats. The Natural Heritage component of the Provincial Policy Statement under Ontario's *Planning Act* provides for the protection of significant portions of the habitat of species listed under the *Endangered Species Act*. Bruce County has a growing bald eagle residency [64].

The following works and activities were identified in the initial screening as potentially directly interacting with bald eagle because of either (i) limiting habitat utilization opportunities, or (ii) injury/mortality from collisions with buildings and vehicle strikes:

- site preparation;
- construction with surface facilities; and
- workers, payroll and purchasing.

Habitat Utilization Opportunities

Bald eagles have never been recorded utilizing the habitat provided by the Project Area; however, they are observed fishing within the warm water discharge associated with the operating Bruce Power stations during winter months. Additionally, the Local Study Area is home to a few breeding pairs. Since bald eagle do not regularly use and are in no way reliant on habitat that could be influenced by the DGR Project, no change to their habitat utilization patterns is expected as a result of the DGR Project. As such, no further consideration is warranted.

Collisions with Buildings and Vehicle Strikes

As noted in the previous paragraph, the on-land portion of the Site Study Area (and in particular the Project Area) does not provide habitat utilized by bald eagle. This indicates that it would be extremely unlikely for any individual bird to be struck by a project-related vehicle. Accordingly, no project-related direct losses of bald eagle are expected, and no further assessment is warranted.

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on site are shaft headframes, exhaust fans, intake fans and heaters. These structures are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the DGR Project site is not expected to cause a measurable change to the local population and is not considered further.

7.3.2 Indirect Changes

7.3.2.1 Changes in Air Quality

As described in Section 6.2.2.1, changes in air quality have the potential to affect wildlife species VECs. Changes in air quality at the ecological receptors have been predicted in Appendix J of the Atmospheric Environment TSD. As shown in Tables 7.2.2-2 and 7.2.2-3, increases in concentrations of air quality indicators at the ecological receptor locations were identified for NO_2, SO_2 and SPM during the site preparation and construction phase, and NO_2 and SPM during the operations phase. The emissions during decommissioning phase are expected to be similar to, or less than the emissions during the site preparation and construction phase. Therefore, the potential measurable changes would be bounded by those for the site preparation and construction phase presented in Table 7.2.2-2.

Therefore, this measurable change in air quality is advanced for assessment of effects on the wildlife species VECs in Section 8.

7.3.2.2 Changes in Noise and Vibrations Levels

During the excavation and construction of underground facilities, blasting of bedrock will be required. For the most part the blasting will be deep underground to the extent of a nominal 680 m below ground level (as described in Appendix I of the Atmospheric Environment TSD). Wildlife that dwell on the surface or burrow a few feet underground in the soils are not likely to affected by the vibrations from the blasting activity because the effect will be localized spatially and temporally. Thus, there will not be any measurable changes to wildlife VECs from the indirect interaction of vibration.

As described in Section 6.2.2.2, changes in noise levels have the potential to interact with wildlife species VECs. Changes in noise levels at the ecological receptors have been predicted in the appendices to the Atmospheric Environment TSD. Increases in noise levels at the ecological receptor locations were identified during the site preparation and construction, and operations phases. Noise levels during the decommissioning phase are expected to be similar to the site preparation and construction phase. Predicted changes in linear noise levels (as dB_{lin}) are summarized in Table 7.3.2-1. The locations of ecological receptors are shown on Figure 7.2.2-1.

Table 7.3.2-1: Likely Measurable Changes in Noise Levels at Ecological Receptors

Receptor	Predicted Ambient Noise Levels (dB_{lin})	Existing Noise Levels (dB_{lin})	Project-related Change Relative to Existing Noise Levels (dB)	Measurable Change?
Site Preparation and Construction Phase				
ER1	69	68	+1	No
ER2	72	71	+1	No
ER3	71	61	+10	**Yes**
ER4	85	65	+20	**Yes**

Table 7.3.2-1: Potential Adverse Effects to Noise Levels at Ecological Receptors (continued)

Receptor	Predicted Ambient Noise Levels (dB_{lin})	Existing Noise Levels (dB_{lin})	Project-related Change Relative to Existing Noise Levels (dB)	Measurable Change?
ER5	80	67	+13	**Yes**
ER6	73	67	+6	**Yes**
ER7	74	70	+4	**Yes**
Operations Phase				
ER1	68	68	0	No
ER2	71	71	0	No
ER3	64	61	+3	No
ER4	68	65	+3	No
ER5	73	67	+6	**Yes**
ER6	69	67	+2	No
ER7	71	70	0	No

Note: Receptor locations shown on Figure 7.2.2-1.
Source: Appendix J, Table J1.2.1-1 of the Atmospheric Environment TSD

The Atmospheric Environment TSD indicates that changes in noise levels of 3 dBA or lower would not be perceptible to humans. Hearing characteristics are species-specific and acoustic communication is important to a number of species, and therefore it is expected that each species will react differently to changes in noise levels. Existing noise conditions indicate that daytime noise levels vary by as much as 39 dB and night time noise levels vary by as much as 21 dB. Therefore, it is expected that the wildlife that are currently using the habitat on site would have adapted to changes beyond the 3 dB magnitude. However, for the purpose of this study, it is assumed that a change of 3 dB or more in linear noise levels is likely to produce a measurable change to wildlife. In the above table, only receptors that experienced changes in linear noise levels of more than 3 dB are considered to experience measurable changes.

With the exception of the bald eagle, all of the wildlife species VECs are known to be at least semi-permanently found within the Site Study Area. Therefore, this indirect project-environment interaction is likely to result in a measurable displacement of and/or disruption to wildlife on-site and is advanced to Section 8 for assessment of effects.

7.3.2.3 Changes in Light Levels

As described in Section 6.2.2.3, changes in light levels have the potential to interact with wildlife species VECs. Changes in light levels have been predicted in the Atmospheric Environment TSD. In Appendix H of the Atmospheric Environment TSD, potential changes in light levels at the ecological receptor locations were identified during the site preparation and construction, and operations phases.

Measurable increases to light levels within the Project Area and Site Study Area during all phases of the DGR Project have been advanced to Section 8 to determine any adverse effects on wildlife species VECs using these areas as habitat.

7.3.2.4 Changes in Surface Water Quantity and Flow

As discussed in Section 6.2.2.4, changes in surface water quantity and flow could indirectly interact with wildlife species VECs which depend on open bodies of water for at least a portion of their life cycle (i.e., muskrat, Midland painted turtle, northern leopard frog, mallard, wild turkey and yellow warbler) and those that require water to drink (northern-short-tailed shrew, white tailed deer). The assessment on surface water resources was completed in the Hydrology and Surface Water Quality TSD. Measurable changes in flow in the North Railway Ditch and drainage ditch to MacPherson Bay were identified, and are advanced to Section 8 to determine any adverse effects on wildlife VECs.

7.3.2.5 Changes in Surface Water Quality

As discussed in Section 6.2.2.5, changes in surface water quality could indirectly interact with all of the wildlife species VECs. The assessment on surface water quality was completed in the Hydrology and Surface Water Quality TSD. It was concluded that taking stormwater management into account, no adverse effects on water quality are expected as a result of the DGR Project. Furthermore, no effects were predicted on plant VECs. Accordingly, there is no potential for measurable indirect effects on wildlife species VECs via the surface water quality pathway and no further consideration is warranted.

7.3.2.6 Changes in Soil Quality

As discussed in Section 6.2.2.6, changes in soil quality could indirectly interact with wildlife species VECs through contact with the soil, burrowing in the soil or consuming species that come in direct contact with the soil (e.g., earthworms).

The assessment on soil quality was completed in the Geology TSD. No measurable changes were identified in the Geology TSD for soil quality as a result of the DGR Project outside of the waste rock management area footprint. Changes in soil quality beneath the waste rock management area were not assessed to be adverse in the Geology TSD. Because soil quality will not be adversely affected, organisms such as earthworms that come into contact with the soil will not be adversely affected. Therefore, there is no potential for measurable indirect effects to the wildlife species VECs through this pathway, and no further consideration is warranted.

7.3.2.7 Changes in Groundwater Flow

Wild turkeys rely on groundwater seeps/springs in forested swamp communities as winter foraging areas and as such a potential pathway of effects was determined. However, the wetland communities within the Project Area appear to be maintained by seasonal and surface water flow. Additionally, the Geology TSD does not predict a change in groundwater flow regimes; therefore, this potential interaction is not considered further.

7.3.2.8 Changes in Aquatic Environment VECs

The diets of bald eagle, Midland painted turtle and mallard consist of aquatic species represented by the VECs selected in the Aquatic Environment TSD. There are residual adverse effects predicted for redbelly dace, creek chub, burrowing crayfish and variable leaf pondweed in the aquatic assessment. However, the residual adverse effects were determined to be of a low consequence, limited to the South Railway Ditch, and not significant. Therefore, the effects on terrestrial VECs would not be measurable, and is not considered further.

7.4 SUMMARY OF THE SECOND SCREENING

Table 7.4-1 provides a summary of the second screening for the DGR Project. Squares (■) on this matrix represent likely DGR Project-environment interactions resulting in a measurable change in VECs. These interactions are advanced to Section 8 for assessment to determine those interactions that may result in a likely effect on terrestrial environment VECs.

Table 7.4-1: Matrix 2 – Summary of the Second Screening for Measurable Change on VECs

Project Work and Activity	Eastern White Cedar			Heal-all			Common Cattail		
	C	O	D	C	O	D	C	O	D
Direct Changes									
Site Preparation	■	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing									
Indirect Changes									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels									
Changes in Light Levels									
Changes in Surface Water Quantity and Flow	•	•	•				■	■	■
Changes in Surface Water Quality	•	•	•				•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow	•	•	•						
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase;
O = Operations Phase;
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

— Not Applicable
• Potential project-environment interaction
■ Measurable change
Blank No potential interaction

Table 7.4-1: Matrix 2 – Summary of the Second Screening for Measurable Change on VECs (continued)

Project Work and Activity	Northern Short-tailed Shrew			Muskrat			White-tailed Deer		
	C	O	D	C	O	D	C	O	D
Direct Changes									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—	•	—	—	•	—	—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—	•	—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Changes									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels	■	■	■	■	■	■	■	■	■
Changes in Light Levels	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase;
O = Operations Phase;
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

— Not Applicable
• Potential project-environment interaction
■ Measurable change
Blank No potential interaction

Table 7.4-1: Matrix 2 – Summary of the Second Screening for Measurable Change on VECs (continued)

Project Work and Activity	Midland Painted Turtle			Northern Leopard Frog			Mallard		
	C	O	D	C	O	D	C	O	D
Direct Changes									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—	•	—	—	•	—	—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Changes									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels	■	■	■	■	■	■	■	■	■
Changes in Light Levels	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes in Aquatic Environment VECs	•	•	•				•	•	•

Notes:
C = Site Preparation and Construction Phase;
O = Operations Phase;
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

— Not Applicable
• Potential project-environment interaction
■ Measurable change
Blank No potential interaction

Table 7.4-1: Matrix 2 – Summary of the Second Screening for Measurable Change on VECs (continued)

Project Work and Activity	Red-eyed Vireo			Wild Turkey			Yellow Warbler			Bald Eagle		
	C	O	D	C	O	D	C	O	D	C	O	D
Direct Changes												
Site Preparation	■	—	—	■	—	—	•	—	—	•	—	—
Construction of Surface Facilities	•	—	—	•	—	—	•	—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—	•		—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—		—	—	
Presence of the DGR Project												
Waste Management												
Support and Monitoring of DGR Life Cycle												
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•	•	•	•
Indirect Changes												
Changes in Air Quality	■	■	■	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels	■	■	■	■	■	■	■	■	■	•	•	•
Changes in Light Levels	■	■	■	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow				■	■	■	■	■	■			
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality												
Changes in Groundwater Flow				•	•	•						
Changes in Aquatic Environment VECs										•	•	•

Notes:
C = Site Preparation and Construction Phase;
O = Operations Phase;
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the table because there no works or activities that have the potential to interact with the terrestrial environment. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

— Not Applicable
• Potential project-environment interaction
■ Measurable change
Blank No potential interaction

Following the screening for measurable changes, all VECs identified had a measurable change as a result of the DGR Project. Therefore, as summarized in Table 7.4-2, all of the VECs proposed in Table 4-1 will be carried forward for assessment.

Table 7.4-2: Advancement of Terrestrial VECs

VEC	Retained?	Rationale
Eastern white cedar	Yes	There is a direct measurable change during site preparation. There is an indirect measurable change as a result of changes in air quality.
Heal-all	Yes	
Common cattail	Yes	There is an indirect measurable change as a result of changes in air quality and in surface water quality and flow.
Northern short-tailed shrew	Yes	There are indirect measurable changes as a result of changes in air quality, noise levels, light levels and in surface water quality and flow.
Muskrat	Yes	
White-tailed deer	Yes	
Midland painted turtle	Yes	
Northern leopard frog	Yes	
Mallard	Yes	
Red-eyed vireo	Yes	There is a direct measurable change during site preparation. There are indirect measurable changes as a result of changes in air quality, noise levels and in light levels.
Wild turkey	Yes	There is a direct measurable change during site preparation. There are indirect measurable changes as a result of changes in air quality, noise levels, light levels and in surface water quantity and flow.
Yellow warbler	Yes	There are indirect measurable changes as a result of changes in air quality, noise levels, light levels and in surface water quantity and flow.
Bald eagle	Yes	There are indirect measurable changes as a result of changes in air quality and in light levels.

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8. IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL EFFECTS

The assessment of effects predicts and describes the likely environmental effects, mitigation measures and residual adverse effects on the terrestrial environment VECs that could reasonably be expected as a result of the DGR Project.

8.1 ASSESSMENT METHODS

8.1.1 Identify Likely Environmental Effects

All measurable changes identified in the second screening (Section 7) are advanced for assessment within the framework of the applicable VECs. Consistent with accepted EA practice, quantitative and qualitative methods, including professional expertise and judgement, are used to predict and describe the DGR Project-specific effects to allow for a detailed assessment.

If a likely environmental effect is identified, the effect is assessed as either beneficial or adverse. Any adverse effects on VECs attributable to the DGR Project are advanced for consideration of possible mitigation measures. Beneficial effects, if any, are also identified during this step and marked with a '+' on the matrix, but are not considered further in this TSD. The results of the assessment are recorded in Matrix 3 (Section 8.5).

8.1.1.1 Direct Effects

Effects on Plant Species VECs

Changes to plant species were measured by comparing the presence, relative abundance and community dominance of the VEC species at baseline levels with the predicted levels during the site preparation and construction and operation phases of the DGR Project. The relative abundance is defined as the ratio of predicted future abundance of a species to its current baseline abundance. Community dominance is defined as the compositional abundance of a particular species at levels above 25% of the total population of individuals or vegetation cover within a particular community. Using the community classifications developed from the present and previous studies, the DGR Project site was overlaid on the existing vegetation to identify the plant communities and areas that would be directly affected by the DGR Project. Changes between baseline values and predicted values that result in local extirpation or large changes in population values are considered adverse and lead to recommendations for avoidance or mitigation of those effects. The thresholds for magnitude of effects are based on threshold levels of removal within the Project Area and Site Study Area. For example, a removal of 5 to 10% of a species habitat would be considered low within the Project Area, whereas a 5 to 10% removal of existing habitat in the Site Study Area would be of medium magnitude.

Effects on Wildlife Species VECs

The presence of wildlife species, which may potentially be affected by the DGR Project, can act as surrogate indicators of effects on wildlife habitat in which they occur. The wildlife species metrics include species distributions, numbers and activities, habitat area and quality, and foraging opportunities. Effects that lead to a local extirpation of species would be considered

'adverse' and prompt recommendations for avoidance or mitigation. Effects that lead to measurable reductions in population status, as benchmarked against available quantitative data, are also considered 'adverse'.

8.1.1.2 Indirect Effects

Potential indirect effects are passed to the terrestrial environment from other environmental components. The discussion of air quality referring to locally occurring species is largely literature-based and reflects the state of scientific studies conducted in the province or nearby jurisdictions. Predicted air quality concentrations are presented in Appendix J of the Atmospheric Environment TSD.

The acoustic environment varies with both time and distance from noise sources and the effects upon wildlife are varied. For such groups as birds and mammals, sensitivities may vary during the year with the breeding season being the period of greatest sensitivity. The mobility of animals enables them to avoid areas where the acoustic environment is unsatisfactory and, in addition to the literature that has been reviewed, an assessment of VEC species distributions has been made to identify areas of apparently suitable habitat that may show some effects of unfavourable noise levels. Predicted noise levels are presented in Appendix J of the Atmospheric Environment TSD.

Changes to the lighting conditions within the Project Area a result of construction site lighting, lighting of new structures and lighting of parking areas has the potential to have effects on wildlife species VECs (see Appendix H of the Atmospheric Environment TSD for more information). As discussed above, the discussion on the indirect effects of light on wildlife species VECs is based entirely upon available literature sources, focussing on studies completed in the province or within North America.

The discussion of potential surface water quantity and flow effects is completed based on the knowledge of the conditions on-site, review of available literature and professional judgement, as required.

8.1.2 Consider Mitigation Measures

When the assessment of effects indicates that an adverse effect on one of the terrestrial environment VECs is likely, technically and economically feasible mitigation measures are proposed to address the identified effect.

8.1.3 Identify Residual Adverse Effects

Once mitigation measures are proposed, the likely adverse effect is re-evaluated with the mitigation measures in place to identify any residual adverse effects. If a residual adverse effect on a VEC is identified, it is marked with a '◆' on Matrix 3 (Table 8.5-1). Residual adverse effects are advanced to Section 11 for an assessment of significance.

8.2 PLANT SPECIES

8.2.1 Linkage Analysis

As part of the second screening process, site preparation activities, including the clearing of vegetation communities and species was determined to have a likely measurable change on the plant species and communities located within the Project Area (i.e., eastern white cedar). Measurable indirect changes in air quality and surface water quantity and flow were identified as having a potential effect on plant species VECs. Direct and indirect effects are evaluated using the methodology described in Section 8.1.1 and a number of indicators and measures.

8.2.2 Likely Effects

8.2.2.1 Direct Effects

The proposed DGR Project site includes the removal of 8.9 ha of Mixed Forest (FOM) communities documented within the Project Area. This accounts for 77% of the 11.5 ha of Mixed Forest documented within the Project Area. Additionally, 21.7 ha of the Industrial Barren will be removed, accounting for 72% of the 30.1 ha of Industrial Barren documented in the Project Area. The removal of the forested areas will result in a direct effect to eastern white cedar (VEC) and an indirect effect to wildlife habitat availability within the Project Area, which is discussed in further detail in Section 8.3.2.

Direct effects to plant species and communities will be limited to clearing of 11% of the total Mixed Forest area within the Site Study Area. While this is a measurable effect to both eastern white cedar (a VEC) and the Mixed Forest community, it will not result in a measurable effect to any VEC species within the Local Study Area. Eastern white cedar is a common and abundant species of tree both within the designated study areas of the DGR Project and on a provincial level. This species accounts for the dominant coniferous tree cover found in both upland forested areas and lowland swamps in the Local Study Area and Regional Study Area. The removal of forested habitat within the proposed DGR Project site will be limited to forested areas isolated from larger habitat units within the Site Study Area. Higher quality contiguous forested features and swamp communities will not be cleared as part of the proposed development.

8.2.2.2 Indirect Effects

Changes in Air Quality

Changes in air quality at the ecological receptor locations may occur from an increase in nitrogen dioxide (NO_2) and suspended particulate matter (SPM) emissions during the site preparation and construction phase of the DGR Project. SPM is airborne particulate matter (i.e., airborne dust). The 1-hour and 24-hour criteria are suitable for evaluating acute exposures (i.e., high concentration, short-term exposure), whereas the annual criteria is suitable for evaluating chronic exposures (i.e., lower concentrations, long-term exposure). As shown in Table 8.2.2-1, the maximum 1-hour NO_2 concentration during site preparation and construction phase is 125% of the potential effects threshold of 400 µg/m³. The maximum 24-hour SPM concentration during site preparation and construction phase is 152% of the potential ecological effects threshold of 120 µg/m³. All other indicator compounds are within the thresholds.

Table 8.2.2-1: Maximum Predicted Concentration at Ecological Receptors During the Site Preparation and Construction Phase

Indicator	Maximum Existing Concentrations (µg/m³)	Maximum Predicted Site Preparation and Construction Phase Concentrations (µg/m³)	Criteria (µg/m³)
1-hour NO_2	81.6	499.5	400 [a,b]
24-hour NO_2	22.9	154.1	200 [a]
Annual NO_2	7.1	32.6	100 [a]
24-hour SO_2	40.5	40.6	150 [a]
Annual SO_2	5.7	5.8	30 [a]
24-hour SPM	63.3	182.5	120 [a,c,d]
Annual SPM	25.0	46.5	70 [a]

Notes:
a National Ambient Air Quality Objectives
b Exceeds the criteria less than 1% of the time
c O.Reg.419 Schedule 3
d Exceeds the SPM criteria less than 5.5% of the time
Source: Appendix J, Table J1.1.1-1 of the Atmospheric Environment TSD

Based upon incidental observations from past construction at the Bruce nuclear site, vegetation and individual plant species have not been greatly affected by the airborne dust and emissions generated during on-site construction activities. The maximum predicted 1-hour NO_2 concentration exceeds the Federal acceptable objective of 400 µg/m³ less than 1% of the time. However, vegetation is less sensitive than mammals to short-term exposures of NO_2, and effects are not observed below hourly concentrations of 940 µg/m³ [65]. Therefore, effects to vegetation are unlikely from the predicted concentrations.

Regulated standards for deposition of particulate matter on plants species and communities do not currently exist in Ontario. The 24-hour predicted SPM levels are higher than the Ontario criteria established to protect ecological receptors. However, this criteria will be exceeded only 5.5% of the time during site preparation and construction and the annual SPM is far lower than the criteria. All other indicator compounds are within the criteria.

Therefore, it is unlikely that there would be an adverse effect on the plant species populations on the site during the site preparation and construction phase, and no further consideration is warranted.

As shown in Table 8.2.2-2, all measurable changes during the operations phase fall within regulatory criteria; therefore, it is unlikely that there would be an adverse effect on plant species.

Table 8.2.2-2: Maximum Predicted Concentration at Ecological Receptors During the Operations Phase

Indicator	Maximum Existing Concentrations (µg/m³)	Maximum Predicted Operations Phase Concentrations (µg/m³)	Criteria (µg/m³)
1-hour NO_2	81.6	184.0	400 [a]
24-hour NO_2	22.9	96.8	200 [a]
Annual NO_2	7.1	11.1	100 [a]
Annual SO_2	5.7	5.8	30 [a]
24-hour SPM	63.3	63.5	120 [a]
Annual SPM	25.0	25.1	70 [a]

Notes:
a National Ambient Air Quality Objectives
b O.Reg.419 Schedule 3
Source: Appendix J, Table J1.1.1-1 of the Atmospheric Environment TSD

The emissions during decommissioning phase are expected to be similar to, or less than the emissions during the site preparation and construction phase. Therefore, the potential effects would be bounded by those for the site preparation and construction phase presented in Table 8.2.2-1.

Changes in Surface Water Quantity and Flow

The Hydrology and Surface Water Quality TSD predicted a decrease in flow of approximately 31% compared with existing conditions in the North Railway Ditch. As observed during field investigations, sections of this ditch are dry during low flow conditions. Therefore, this reduction is not expected to have any effect on common cattail since this emergent species requires only wetted substrate, and can often be found growing in areas where flows and water levels fluctuate.

The increase in flow to the drainage ditch at Interconnecting Road is predicted in the Surface Water and Hydrology TSD to be 114% of the existing flows during site preparation and construction, and 61% during operations. This increase in flow will coincide with storm events and spring runoff. These are the periodic flow conditions to which the common cattails within the drainage ditch would be adapted. Therefore, no adverse effect to common cattail in the drainage ditch is predicted.

8.2.3 Mitigation Measures

Suitable mitigation measures to minimize the loss of both species and habitat associated with the mixed forest (FOM) clearing on the site should include a combination of several methods. Opportunities to retain tree cover could be investigated where possible. Where retention is not possible, exclusionary fencing to prevent additional loss of specimens and habitat during construction is recommended surrounding the DGR Project site within the Project Area. Temporary construction fencing to protect vegetation and exclude wildlife will help prevent incidental mortality. Generally accepted Best Management Practices (BMPs) for construction

would be used to minimize the transfer of soils from the DGR Project site to natural features within the Project Area and Site Study Area. Rehabilitation after decommissioning of the DGR Project may include both active and passive naturalization of the Project Area to provide additional suitable habitat.

8.2.4 Residual Adverse Effects

As the mitigation measures will not sufficiently reduce or eliminate the effect, there is a residual adverse effect of the DGR Project on eastern white cedar. The significance of this effect is assessed in Section 11.

8.3 WILDLIFE SPECIES

8.3.1 Linkage Analysis

The evaluation of the effects of the DGR Project on the wildlife species VECs used the changes in habitat availability and suitability, and changes in distribution of species to measure DGR Project effects.

Site preparation was identified as having a direct measurable change on those VECs known to use mixed wood forest in the Project Area (i.e., red-eyed vireo, wild turkey). Changes in noise and light levels, air quality, and surface water quantity and flow were identified as causing an indirect effect on all of the wildlife species VECs that may be measurable. The one exception is the bald eagle, since this species only infrequently fishes in the waters off the Bruce nuclear site, generally during the winter months. These indirect effects were evaluated using the methodology described in Section 8.1.1.2 and a number of indicators and measures.

8.3.2 Likely Effects

8.3.2.1 Direct Effects

Changes in Habitat Availability

The proposed clearing and site preparation activities associated with the DGR Project site are expected to result in a total loss of forested habitat of 8.9 ha of mixed forest. This area accounts for 77% of the mixed forest within the Project Area and 11.4% of the total mixed forest area within the Site Study Area. This potential loss of habitat may affect some of the wildlife species VECs as they are currently moving between habitat units within the Project Area and Site Study Area, with the large more contiguous habitat located on the uncleared portion of the Project Area and in the Site Study Area. The clearing of the mixed forest within the Project Area may result in the loss of individuals or breeding pairs of wild turkey and/or red-eyed vireo; however, it is more likely to result in the displacement of these species to other suitable habitat located within the Site Study Area. The loss of 11.4% of the mixed forest within the Site Study Area accounts for a portion of the suitable habitat for these species. Habitat preferences for these species include mixed, deciduous and coniferous forests, therefore a loss of 11.4% of the mixed forest within the Site Study Area accounts for 2.9% of all forests, a small portion of all available forest habitat units within the Site Study Area (i.e., <10%). This will not result in an

adverse effect because it is not likely to result in local extirpation or measurable reductions in population status.

8.3.2.2 Indirect Effects

Changes in Air Quality

Changes in air quality at ecological receptors during site preparation and construction phase are shown in Table 8.2.2-1, as compared to available criteria. The maximum 1-hour NO_2 concentration is 125% of the potential ecological effects threshold of 400 µg/m³. Concentrations in excess of 400 µg/m³ are expected to occur less than 1% of the time. The maximum 24-hour SPM concentration is 152% of the potential effects threshold of 120 µg/m³, but these exceedances are expected to occur less than 5.5% of the time.

Animal toxicology studies suggest that peak concentrations contribute more to the toxicity of nitrogen dioxide than does duration, although duration is still important. The lowest observed adverse effects level to wildlife species for one to two hour periods is in the order of 940 µg/m³ [65]. Additionally, available data from animal toxicology experiments rarely indicate effects of acute exposure to NO_2 concentrations of less than 1,880 µg/m³ [66].

As the predicted peak 1-hour NO_2 concentration is below the lowest observed effects levels in animals, it is unlikely that there will be an adverse effect on wildlife species.

Suspended particulate matter is primarily a concern with deposition, and potential effects on vegetation. Since the majority of SPM will be too large to be inhaled, it is not expected to have an adverse effect on wildlife.

Therefore, no adverse effects on wildlife species VECs are likely because of changes in air quality during site preparation and construction phase.

As shown in Table 8.2.2-2, all measurable changes during the operations phase fall within regulatory criteria; therefore, it is unlikely that there would be an adverse effect on wildlife species.

The emissions during decommissioning phase are expected to be similar to, or less than the emissions during the site preparation and construction phase. Therefore, the potential effects would be bounded by those for the site preparation and construction phase presented in Table 8.2.2-1.

Changes in Noise Levels

As described in Section 7.3.2.2, potential adverse effects on wildlife VECs are possible because of measurable changes in noise levels at ecological receptors during the site preparation and construction phase of the DGR Project. The changes in noise levels during decommissioning phase are expected to be similar to, or less than those during the site preparation and construction phase. Therefore, the potential effects would be bound by those for the site preparation and construction phase. The change in noise levels is summarized in Table 7.3.2-1. There are no provincial or federal guidelines for wildlife exposure to sound.

Habituation of wildlife to disturbance is believed to occur primarily when the disturbance is frequent, regular, and the result of identical stimulus types [67]. Therefore, it is reasonable to assume that even if species initially display an escape response to the increased disturbance that is predicted to occur in the vicinity of the DGR Project, they may habituate and resume current behaviours at the affected locations. Additionally, if the change in noise levels does displace wildlife from the Project Area for the duration of the DGR Project it is not likely that the loss of this habitat will affect local populations of VECs. If habituation does not occur and species exhibit an escape response on an on-going basis, they will most likely relocate to adjacent habitats in the Site Study Area.

The number of individuals using the built environment and adjacent areas that will be subjected to DGR Project-related increases in noise levels is limited when compared with the populations found elsewhere in the Site Study Area. It should be noted that most of the wildlife that currently range throughout the Bruce nuclear site are exposed to industrial activities including noise disturbances associated with the ongoing large-scale project for refurbishment units at the Bruce A generating station. Additionally, habitat exists in the Site and Local Study Areas that can accommodate displaced wildlife and are close enough to not likely require large energetic costs for animals to relocate. Therefore, changes in noise levels that may arise from the DGR Project are judged not likely to adversely affect the terrestrial environment wildlife species VECs.

Changes in Light Levels

As described in Section 7.3.2.3, changes in light levels may affect wildlife species VECs. For context, Table 8.3.2-1 outlines the measures of light and relative brightness used for the DGR Project.

Table 8.3.2-1: Standard Measures of Light Intensity

Example	Illuminance Level (lx)
Sun	1.2×10^{5}
Sunlight at ground level on a clear day	1×10^{5}
Average street lighting levels	3 – 10
Moonlight at ground level	0.1
60 W incandescent lamp at 1 km	6.4×10^{-5}
Sirius – brightest star	9×10^{-6}

Source: [68] and Appendix H of the Atmospheric Environment TSD.

Table 8.3.2-2 summarizes the environmental zone limits for light trespass. The Bruce nuclear site would be considered an area of low ambient brightness.

Table 8.3.2-2: Environmental Zone Limits Established by the Commission Internationale de l'Eclairage (CIE)

Classification	Description of Environmental Light Classification	Recommended Light Trespass Limits (mlx)
E1	Area with intrinsically dark landscapes	0
E2	Areas of low ambient brightness	1,000
E3	Areas of medium ambient brightness	2,000
E4	Areas of high ambient brightness	5,000

Source: Appendix H of the Atmospheric Environment TSD.

Table 8.3.2-3 presents the predicted light trespass levels at the ecological receptor locations during the site preparation and construction phase, and the operations phase. For details on how the light levels were predicted refer to Appendix H of the Atmospheric Environment TSD. The ecological receptor locations are the same as those shown on Figure 7.2.2-1.

Table 8.3.2-3: Results of Light Trespass Surveys

Location	Max Existing Level (mlx)	Maximum Predicted Project-related Increase During Site Preparation and Construction (mlx)	Maximum Predicted Project-related Increase During Operations (mlx)
ER1	16	0.05	4
ER2	1,424	0	59
ER3	1	1	67
ER4	22	15	340
ER5	21	4	1,241
ER6	1	1	0
ER7	82	14	227

Source: Appendix H, Table H7.2-1 of the Atmospheric Environment TSD.

The results indicate low changes to existing light levels at all ecological receptors during the site preparation and construction phase. During the operations phase, the results indicate low changes to existing light levels at the majority of the ecological receptor locations. The only exceptions to this are receptors ER4, ER5 and ER7.

Receptor ER4 is located in a small block of forest which will be retained as part of the proposed development within the Project Area. This location would be considered to have low levels of ambient brightness. The Commission Internationale de l'Eclairage (CIE) recommends that light trespass limits for this type of area should not exceed 1,000 mlx in order to maintain existing conditions. Therefore, the predicted increase of ambient light of 340 mlx should not result in an adverse effect to VEC species located within this habitat unit. Additionally, it is expected that the trees found in this location, which will not be affected by increases in ambient light levels, will act to shield the wildlife species at this location from some of the additional light. The

potential for vegetation screening of light was not considered, as a conservative measure, in the prediction of light trespass.

Receptor ER5, which is located within an industrial barren area of the Project Area is predicted to have an increase of 1,241 mlx. This change exceeds the CIE recommended light trespass limit for areas with low ambient light; however, this area currently provides very limited habitat for VEC species. Additionally, this is the location within the Project Area that has been designated for the waste rock management area. Therefore, the proposed changes to light levels are not expected to have any effect on VEC species.

Receptor ER7, which is located within a Cultural Barren area of the Project Area is predicted to have changes in ambient light levels of 227 mlx. This area currently provides limited habitat for tolerant species of plants and wildlife. The predicted change falls within guidelines provided for areas with low levels of ambient light, in a tolerant VEC area not expected to be affected by the change. Additionally, this receptor is located at the top of a hill which would provide some shielding of light for VEC species using the habitat provided by the low ground vegetation in this area, potentially including northern short-tailed shrew (a VEC).

Nighttime roosting could be interrupted by the lighting associated with the DGR Project. In addition to the above, the existing conditions within the Project Area and Site Study Area would indicate that wildlife species currently using these areas are habituated to lighting associated with human land uses. Additionally, the location of the DGR Project within the site is such that forest areas that currently provide darker nighttime roosting areas (e.g., the forest block south of Bruce B) will not be affected by lighting associated with the DGR Project. Accordingly, no adverse effect to habitat utilization opportunities, and in turn, bird species VECs populations are anticipated to occur as a result of changes in light levels. No further assessment is warranted.

Changes in Surface Water Quantity and Flow

As described in Section 7.3.2.4, measurable changes in flow are predicted as a result of redirecting drainage to MacPherson Bay. There was a predicted decrease in flow of approximately 31% in the North Railway Ditch just before the confluence with Stream C and an increase in flow to the drainage ditch at the discharge from the DGR Project site, as summarized in Table 8.3.2-4.

Table 8.3.2-4: Summary of Stream Flow Locations with Measurable Changes

Location	Existing Drainage (ha)	Proposed Drainage (ha)	Measurable Change
North Railway Ditch at Stream C	26.1	17.9	-31%
Drainage ditch at point of discharge from DGR Project Site (Interconnecting Road)	41.3	49.5	+114%[a] +61%[b]

Notes:
a Change includes an increase in catchment area and an increase from shaft sump pumping during construction.
b Change includes an increase in catchment area and an increase from shaft sump pumping during operation.
Source: Hydrology and Surface Water Quality TSD.

The assessment for each VEC is described in the following section.

Muskrat

As described in Section 8.2.2, no indirect effects to common cattail associated with changes in surface water flow and quantity are identified. As common cattail is both a main food source and shelter for muskrat, no effects to muskrat habitat availability are similarly predicted. Additionally, the North and South Railway Ditches experiences water flow and level fluctuations throughout the seasons under existing conditions with some portions drying up during summer drought conditions. As muskrat currently utilize the North and South Railway Ditches, it is reasonable to assume they are tolerant of these fluctuations and are likely to continue to tolerate reductions in flow because of the DGR Project. Accordingly, no adverse indirect effect to muskrat is expected and no further assessment is warranted.

Northern Short-tailed Shrew

The North and South Railway Ditches experience water flow and level fluctuations throughout the seasons under existing conditions with some portions drying up during summer drought conditions. It is reasonable to assume that shrews are tolerant of these fluctuations and are likely to continue to tolerate reductions in flow because of the DGR Project. Accordingly, no adverse indirect effect to northern short-tailed shrew is expected and no further assessment is warranted.

White-tailed Deer

The North and South Railway Ditches experience water flow and level fluctuations throughout the seasons under existing conditions with some portions drying up during summer drought conditions. It is reasonable to assume that deer, if they do use the ditches as a water source, are tolerant of these fluctuations and are likely to continue to tolerate reductions in flow because of the DGR Project. Accordingly, no adverse indirect effect to white-tailed deer is expected and no further assessment is warranted.

Midland Painted Turtle

The North Railway Ditch and drainage ditch do not provide suitable habitat for Midland painted turtle (i.e., lacks areas of open water and basking structures); therefore, the potential indirect effects on this species are not considered further.

Northern Leopard Frog

The North and South Railway Ditches and drainage ditch experience water flow and level fluctuations throughout the seasons under existing conditions with some portions drying up during summer drought conditions. As northern leopard frog currently utilize the North and South Railway Ditches and often move to moist grassy fields to forage, it is reasonable to assume they are tolerant of these fluctuations and are likely to continue to tolerate reductions in flow because of the DGR Project. Accordingly, no adverse indirect effects to northern leopard frog are expected and no further assessment is warranted.

Wild Turkey

Wild turkeys utilize forest seeps for drinking water needs throughout the year. No changes to surface water drainage throughout the forested communities that this species frequent are expected. Accordingly, no adverse indirect effects to wild turkey are expected, and no further assessment is warranted.

Mallard

While a reduction in surface water quantity and flow is predicted to occur in the North Railway Ditch and an increase in surface water quantity and flow is predicted to occur in the drainage ditch, it is not expected to affect mallard duck as they do not use these ditches. The North Railway Ditch and the drainage ditch do not currently provide open water habitat for mallard. Accordingly, no adverse indirect effects to mallard are expected and no further assessment is warranted.

Yellow Warbler

As discussed in Section 7.2.2.2, the predicted changes in surface water quantity and flow are not expected to affect riparian vegetation. Accordingly, no changes in habitat availability for yellow warbler are expected and no further assessment is warranted.

8.3.3 Mitigation Measures

Although no adverse effects were identified, in order to protect nesting migratory birds, in accordance with the Migratory Birds Convention Act, the site preparation activities will avoid vegetation clearing during the breeding bird season (May 1st to July 31st), wherever possible. If clearing cannot be scheduled outside the prime nesting season, a nest survey should be conducted to ensure there are no active nests in the trees to be felled. If found, no active nests will be removed or disturbed in accordance with the Migratory Birds Convention Act.

8.3.4 Residual Adverse Effects

There are no residual adverse effects.

8.4 BIODIVERSITY

Within the Project Area and Site Study Area adverse effects to eastern white cedar have been identified within the Project Area, but not within the Site Study Area. This does not mean that there will be no loss of species or species habitat as part of the DGR Project; however, the effects are not considered to be measurable or to warrant mitigation measures. As the biodiversity directly correlates to increases in size of the study areas, it is expected that if there is no effect on the biodiversity within the Site Study Area, there will be no effect on the biodiversity of the Local or Regional Study Areas.

8.5 SUMMARY OF ASSESSMENT

Table 8.5-1 provides a summary of the third screening for the DGR Project. Diamonds (◆) on this matrix represent likely DGR Project-environment interactions resulting in a residual adverse effect on a VEC. These interactions are advanced to Section 11 for a consideration of significance. A residual adverse effect on eastern white cedar was identified and advanced for a consideration of significance.

8.5.1 Application of a Precautionary Approach in the Assessment

In the Terrestrial Environment TSD, conservatism has been built into the assessment. Baseline data collection for characterization of the Project and Site Study Areas was scoped to both assess the habitat potential within the terrestrial environment, the number of individual species using these habitats and the population or community associations of the VECs.

Losses of individual specimens and specific habitat elements have been considered throughout the screening process for the DGR Project, so as to accurately assess any effects that the DGR Project may have on the natural heritage features and functions of the study areas. The assessment of the DGR Project incorporates historic data collected from within the study areas identified for the EA. Accordingly, the parameters required to present a sound scientific basis for the technical studies that support the EA are well established.

8.5.2 Application of Traditional Knowledge in the Assessment

No specific Aboriginal traditional knowledge and traditional ecological knowledge was available for inclusion in this TSD. Some of the VECs chosen (e.g., bald eagle, eastern white cedar) are known to have historically been of importance to Aboriginal communities and were considered explicitly in the effects assessment. No other Aboriginal input was available relative to the terrestrial environment. However, opportunities were provided to, and taken by, representatives of SON and their consultants to accompany the staff completing some of the field studies described in Section 5.3.

8.5.3 Cumulative Effects

Effects of the DGR Project have the potential to act cumulatively with those of other projects. The EIS Guidelines require that the EA considers the cumulative effects of past, present and reasonably foreseeable future projects. The description of the existing environmental conditions presented in Section 5 includes the cumulative effects of past and existing projects. The assessment completed in Section 8 considers the effects of the DGR Project in combination with those of past and present projects.

One residual adverse effect was identified during the assessment, namely, the loss of eastern white cedar resulting from the clearing of mixed forests within the Project Area. The potential for this residual adverse effect to act cumlatively with past, present and reasonably foreseeable future projects is presented in Section 10 of the EIS.

Table 8.5-1: Matrix 3 – Summary of the Third Screening for Residual Adverse Effects on VECs

Project Work and Activity	Eastern White Cedar			Heal-all			Common Cattail		
	C	O	D	C	O	D	C	O	D
Direct Effects									
Site Preparation	◆	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing									
Indirect Effects									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels									
Changes in Light Levels									
Changes in Surface Water Quantity and Flow	•	•	•				■	■	■
Changes in Surface Water Quality	•	•	•				•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow	•	•	•						
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the matrix as there are no activities during this phase. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

• Potential project-environment interaction
■ Measurable change
♦ Residual adverse effect
— Activity does not occur during this phase
Blank No potential interaction

Table 8.5-1: Matrix 3 – Summary of the Third Screening for Residual Adverse Effects on VECs (continued)

Project Work and Activity	Northern Short-tailed Shrew			Muskrat			White-tailed Deer		
	C	O	D	C	O	D	C	O	D
Direct Effects									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—		—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste	—	•	—	—	•	—	—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—	•	—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Effects									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels	■	■	■	■	■	■	■	■	■
Changes in Light Levels	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes in Aquatic Environment VECs									

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the matrix as there are no activities during this phase. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

• Potential project-environment interaction
■ Measurable change
♦ Residual adverse effect
— Activity does not occur during this phase
Blank No potential interaction

Table 8.5-1: Matrix 3 – Summary of the Third Screening for Residual Adverse Effects on VECs (continued)

Project Work and Activity	Midland Painted Turtle			Northern Leopard Frog			Mallard		
	C	O	D	C	O	D	C	O	D
Direct Effects									
Site Preparation	•	—	—	•	—	—	•	—	—
Construction of Surface Facilities		—	—		—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—
Above-ground Transfer of Waste		•			•		—	•	—
Underground Transfer of Waste	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—	
Presence of the DGR Project									
Waste Management									
Support and Monitoring of DGR Life Cycle									
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•
Indirect Effects									
Changes in Air Quality	■	■	■	■	■	■	■	■	■
Changes in Noise and Vibration Levels	■	■	■	■	■	■	■	■	■
Changes in Light Levels	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality									
Changes in Groundwater Flow									
Changes is Aquatic Environment VECs	•	•	•				•	•	•

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the matrix as there are no activities during this phase. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

• Potential project-environment interaction
■ Measurable change
♦ Residual adverse effect
— Activity does not occur during this phase
Blank No potential interaction

Table 8.5-1: Matrix 3 – Summary of the Third Screening for Residual Adverse Effects on VECs (continued)

Project Work and Activity	Red-eyed Vireo			Wild Turkey			Yellow Warbler			Bald Eagle		
	C	O	D	C	O	D	C	O	D	C	O	D
Direct Effects												
Site Preparation	■	—	—	■	—	—	•	—	—	•	—	—
Construction of Surface Facilities	•	—	—	•	—	—	•	—	—	•	—	—
Excavation and Construction of Underground Facilities		—	—		—	—		—	—		—	—
Above-ground Transfer of Waste	—		—	—	•		—		—	—		—
Underground Transfer of Waste	—		—	—		—	—		—	—		—
Decommissioning of the DGR Project	—	—		—	—		—	—		—	—	
Abandonment of DGR Facility	—	—		—	—		—	—		—	—	
Presence of the DGR Project												
Waste Management												
Support and Monitoring of DGR Life Cycle												
Workers, Payroll and Purchasing	•	•	•	•	•	•	•	•	•	•	•	•
Indirect Effects												
Changes in Air Quality	■	■	■	■	■	■	■	■	■	■	■	■
Changes in Noise and/or Vibration Levels	■	■	■	■	■	■	■	■	■	•	•	•
Changes to Light Levels	■	■	■	■	■	■	■	■	■	■	■	■
Changes in Surface Water Quantity and Flow				■	■	■	■	■	■			
Changes in Surface Water Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Soil Quality	•	•	•	•	•	•	•	•	•	•	•	•
Changes in Groundwater Quality												
Changes in Groundwater Flow				•	•	•						
Changes in Aquatic Environment VECs										•	•	•

Notes:
C = Site Preparation and Construction Phase
O = Operations Phase
D = Decommissioning Phase
The matrices are meant to indicate when the effect occurs and do not imply how long the effect will last. The duration of the effect is assessed in Section 11.

The abandonment and long-term performance phase is not included in the matrix as there are no activities during this phase. The abandonment of the DGR facility work and activity occurs immediately following decommissioning within the decommissioning phase and does not encompass the entirety of the abandonment and long-term performance phase.

• Potential project-environment interaction
■ Measurable change
♦ Residual adverse effect
— Activity does not occur during this phase
Blank No potential interaction

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9. EFFECTS OF THE ENVIRONMENT ON THE PROJECT

9.1 ASSESSMENT METHODS

The EA must include a consideration of how the environment could adversely affect the DGR Project. For example, the EA evaluates how hazards such as severe weather are likely to affect the DGR Project.

The DGR Project EIS Guidelines require that the EA consider the likely effects of the environment on the DGR Project. This assessment was accomplished using the method on Figure 9.1-1. To facilitate this assessment, potential conditions in the environment that may affect the DGR Project were identified based on past experience at the site and professional judgement of the technical specialists conducting the EA. For each environmental condition that could potentially affect the DGR Project, the design and contingency measures incorporated into the DGR Project to mitigate effects of the condition were identified and their likely effectiveness judged, also on the basis of experience and judgement of the study team.

Identified residual adverse effects, if any, are then advanced to Section 11 for an assessment of significance.

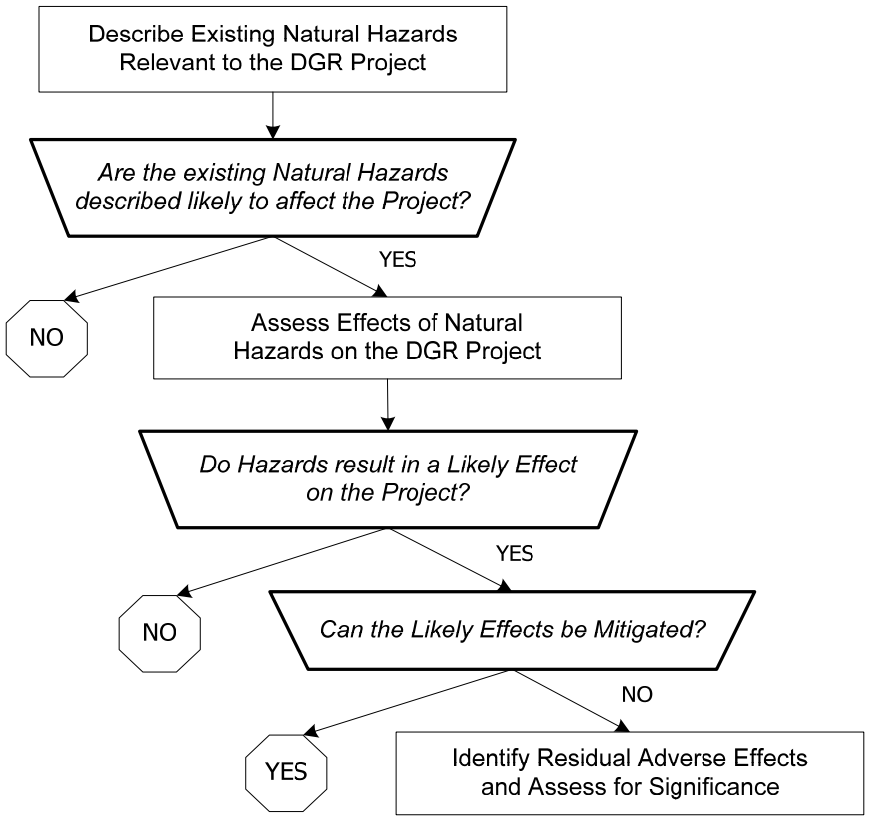

Figure 9.1-1: Method to Assess Effects of the Environment on the DGR Project

9.2 ASSESSMENT OF EFFECTS OF THE CURRENT TERRESTRIAL ENVIRONMENT ON THE DGR PROJECT

The components of the environment and their associated VECs are related to terrestrial plant and animal species and their habitats. These components, unlike floods, earthquakes, or severe storms, could not have an effect on the DGR Project during any of its phases. Accordingly, considerations of how hazards could affect the DGR Project are not addressed further in this TSD.

9.3 SUMMARY

There are no residual adverse effects on the DGR Project as a result of the terrestrial environment.

10. CLIMATE CHANGE CONSIDERATIONS

The DGR Project EIS Guidelines require a consideration of whether the DGR Project and EA conclusions are sensitive to changes in climatic conditions. For the purpose of this TSD, climate change is considered over the life of the DGR Project spanning the site preparation and construction, operations, and decommissioning phases only. Shifts in climate that occur from one epoch to the next have been considered as part of the Postclosure Safety Assessment [2], and their effects on the DGR Project are described in the EIS (Section 9).

The requirement of the guidelines to consider climate change is addressed through the following considerations:

- How will the future environment affect the DGR Project?
- How will the DGR Project affect the future environment? and
- How will the DGR Project affect climate change (e.g., contribution to climate change by the emission of greenhouse gases)?

The methods used to consider the effects of climate change are described in the following sections. Establishing how the climate may change over the life of the DGR Project is an initial requirement for addressing the first two considerations. A determination of how climate has been changing and how it might change over the DGR Project life considered in this TSD is based on 30-year climate normals, literature review and the professional experience of the study team. The climate models used to predict high, medium and low climate change scenarios for the Regional Study Area are described in the Atmospheric Environment TSD. These predicted climate change scenarios are used by all environmental disciplines for the assessment of the consequences of climatic conditions on the first two considerations.

10.1 DESCRIPTION OF PREDICTED CHANGES IN CLIMATE

Climate represents the long-term expected values for parameters such as temperature, precipitation and winds. The climate of an area is described using normals, which are averages calculated over a 30 year period (the latest accepted normals period is from 1971 to 2000) [69]. It is now widely accepted that climate is changing; therefore, consideration of these changes needs to be incorporated in the EA carried out for the DGR Project. Traditionally, scientists looked to past weather records to provide guidance for predicting future conditions. Historic climate trends for the DGR Project are determined using the temperature archives observed at Wiarton Airport over the period from 1971 through 2000. While past trends have traditionally been used to provide guidance to the future, reliance is shifting to global climate models, which incorporate accepted understandings of climate mechanisms and standardized scenarios reflecting potential human development in the future.

Tables 10.1-1 and 10.1-2 provide a summary of the past and future trends for temperature and precipitation, respectively. The tables describe how climate in the region has been changing, as well as how it is projected to change over the life of the DGR Project through the end of the decommissioning phase. These data will be used to evaluate how climate change may affect the conclusions reached regarding the assessment of the effects of the DGR Project on the selected VECs. The Atmospheric Environment TSD provides further detail on the predicted changes in climate.

Table 10.1-1: Historic and Future Temperature Trends

Criteria	1971-2000 Normals (°C)	1971-2000 Trend (°C/decade)	2011-2040 Forecast (°C/decade)			2041-2070 Forecast (°C/decade)			2071-2100 Forecast (°C/decade)		
			Low	Average	High	Low	Average	High	Low	Average	High
Annual	6.1	+0.31	+0.00	+0.41	+1.05	+0.15	+0.34	+0.66	+0.20	+0.33	+0.51
Spring	4.5	+0.50	+0.00	+0.45	+1.09	+0.14	+0.35	+0.69	+0.19	+0.34	+0.54
Summer	17.4	+0.26	+0.00	+0.43	+1.10	+0.15	+0.34	+0.69	+0.21	+0.34	+0.52
Fall	8.3	+0.05	+0.00	+0.36	+1.02	+0.12	+0.30	+0.63	+0.19	+0.32	+0.49
Winter	-5.7	+0.68	+0.00	+0.40	+0.99	+0.16	+0.33	+0.63	+0.21	+0.33	+0.50

Note: The low and high data correspond to the forecasts for the scenario with the smallest and largest respective changes in temperature for each forecast horizon. The average represents the arithmetic average of the available forecasts.
Source: Appendix D of the Atmospheric Environment TSD.

Table 10.1-2: Historic and Future Precipitation Trends

Season	1971-2000 Normals (mm)	1971-2000 Trend (mm/decade)	2011-2040 Forecast (%/decade)			2041-2070 Forecast (%/decade)			2071-2100 Forecast (%/decade)		
			Low	Average	High	Low	Average	High	Low	Average	High
Annual	1,041.3	+0.13%	+0.00%	+1.44%	+3.57%	+0.36%	+1.11%	+2.09%	+1.39%	+1.30%	+2.25%
Spring	216.8	+3.23%	+0.00%	+2.59%	+5.39%	+0.62%	+1.51%	+2.72%	+1.88%	+2.24%	+4.05%
Summer	230.8	-0.51%	+0.00%	-1.65%	-3.40%	-0.95%	-1.13%	-0.42%	-0.68%	-0.85%	-0.61%
Fall	310.9	+4.41%	+0.00%	+2.09%	+4.35%	+2.28%	+1.67%	+2.75%	+2.11%	+1.65%	+1.85%
Winter	282.8	-4.65%	+0.00%	+2.39%	+7.30%	-0.27%	+1.82%	+3.08%	+2.05%	+1.92%	+3.32%

Note: The low and high data correspond to the forecasts for the scenario with the smallest and largest respective changes in temperature for each forecast horizon. The average represents the arithmetic average of the available forecasts.
Source: Appendix D of the Atmospheric Environment TSD.

10.2 EFFECTS OF THE FUTURE ENVIRONMENT ON THE DGR PROJECT

10.2.1 Methods

Changes to the climate are predicted to occur over the lifetime of the DGR Project; therefore, it is also necessary to assess how the predicted future environment may affect the DGR Project. For example, climate change might result in new or more severe weather hazards. The method used to assess these changes is shown on Figure 10.2.1-1.

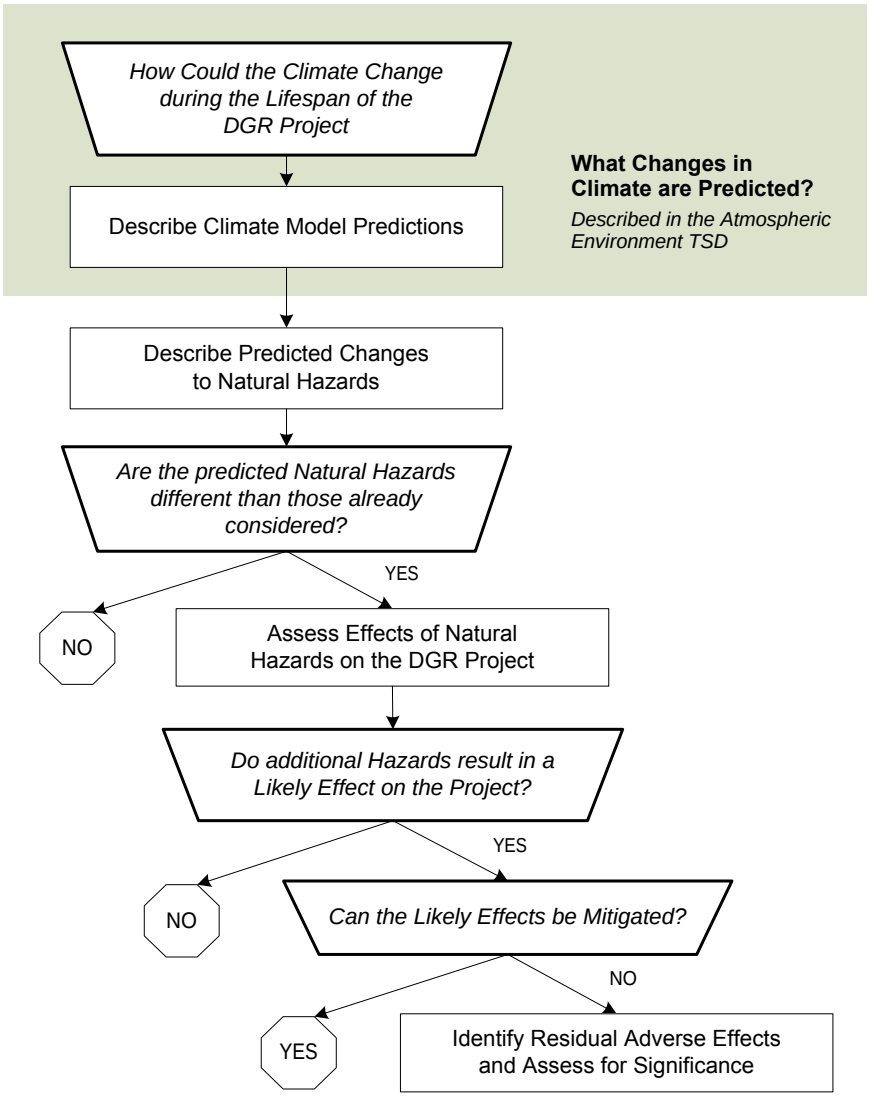

Figure 10.2.1-1: Method to Assess Effects of the Future Environment on the DGR Project

Once the future environment is established, the evaluation of changed and/or additional natural hazards on the DGR Project is carried out in a similar fashion to the assessment of effects of the current environment on the DGR Project (Section 9). The assessment addresses only predicted hazards that are different or in addition to those considered in the assessment of

existing natural hazards. The EA predictions of future hazards as a result of a changing climate relies upon both qualitative and quantitative evaluations based on available data and technical experience, with consideration for the design and contingency measures incorporated into the DGR Project to mitigate likely effects. Identified residual adverse effects are advanced to Section 11 for an assessment of significance.

10.2.2 Assessment of Effects of Future Terrestrial Environment on the DGR Project

As described in Section 9.2, the terrestrial environment and its associated VECs do not represent any hazard to the DGR Project.

10.3 EFFECTS OF THE DGR PROJECT ON THE FUTURE ENVIRONMENT

10.3.1 Methods

Climate change may result in an environment that is different from the current environment as less severe winters or increased precipitation might alter the habitat or behaviour of VECs. Climate-related changes to VECs may result in changed or additional effects of the DGR Project compared with those predicted on the current environment. The method used to assess these changes is shown on Figure 10.3.1-1.

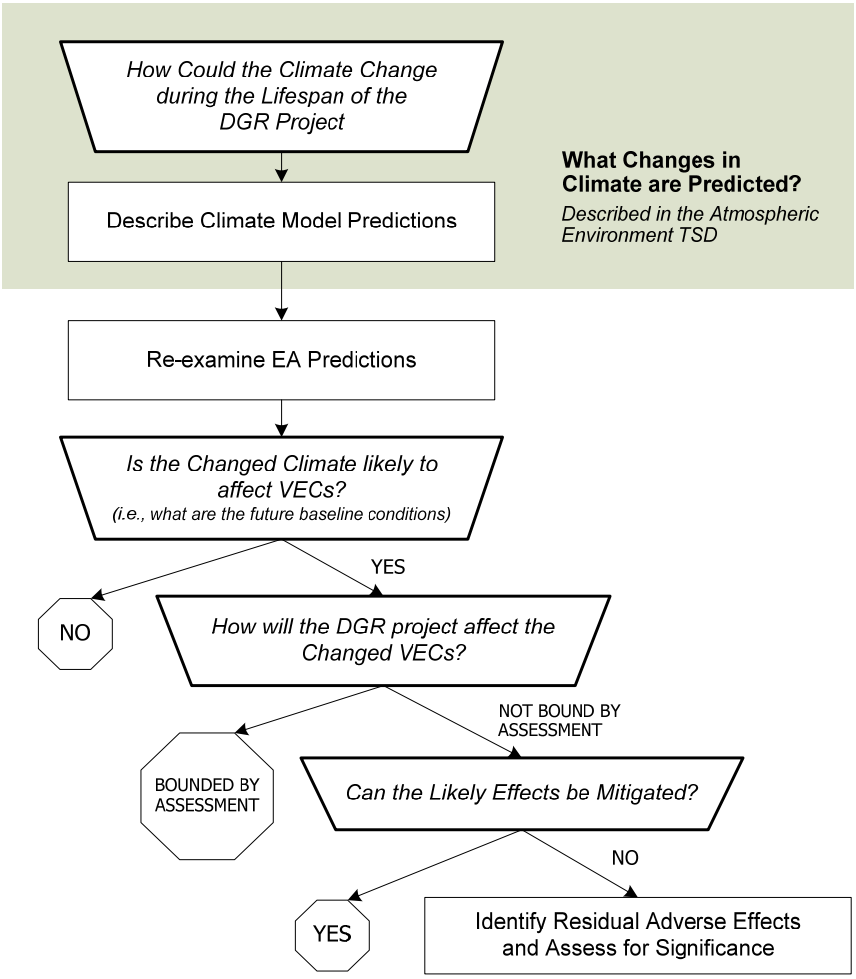

Figure 10.3.1-1: Method to Assess Effects of the DGR Project on the Future Environment

The assessment of the effects of the DGR Project on VECs in a changed future environment begins with re-examining the EA predictions for the current environment by identifying whether or not the VECs might be altered as a result of climate change. The effects of the DGR Project on the altered VECs are then assessed to determine whether they are bounded by the predictions made for the effects assessment for the current environment (Section 8). All additional or different effects are fully assessed, using a similar method to that followed for assessing effects of the DGR Project on the current environment. Effects that cannot be fully mitigated will result in residual adverse effects which are forwarded for an assessment of significance in Section 11.

10.3.2 Assessment of the DGR Project of the Future Terrestrial Environment VECs

As described in Section 8, one residual adverse effects of the DGR Project on the terrestrial environment was identified. Changes in climate have the potential to alter the existing environment. Table 10.3.2-1 summarizes the potential changes in the terrestrial environment that could result from climate change, and describes whether these changes could affect the conclusions of the assessment.

Table 10.3.2-1: Effects of Climate Change on Terrestrial Environment VECs

VECs	Potential Interaction of Climate Change with VEC	Likely Effect	Change to EA Conclusion?
Eastern white cedar	Increased precipitation and increasing temperatures could alter the ecology, resulting in a positive or negative effect on individual VECs, species distributions and abundance.	Shifts in climate may gradually alter ecosystems of an area.	None. While changing climate may gradually alter the ecosystem of a region, it is unlikely to alter how the DGR Project interacts with VECs.
Heal-all			
Common cattail			
Northern short-tailed shrew			
Muskrat			
White-tailed deer			
Red-eyed vireo			
Wild turkey			
Yellow warbler			
Mallard			
Bald eagle			
Midland painted turtle			
Northern leopard frog			

Climate change may affect terrestrial environment VECs by shifting the composition of plant communities to species that are better adapted to warmer and wetter conditions, which would, in turn, shift the location of available habitat for wildlife communities. However, the response of any single species to possible climate change cannot be reasonably predicted because of the complexity of the response to environmental parameters. Species distributions are based upon both intrinsic and extrinsic factors, most of which have a broad range of acceptable conditions. In addition, ecological inertia will likely ensure that, except in the event of catastrophic change, there will be a substantial lag between the change in physical environmental parameters and any change in the composition of plant communities. As a result, the predicted climatic changes (Tables 10.1-1 and 10.1-2) will not be sufficiently substantial during the DGR Project lifecycle to affect the health of vegetation and wildlife considered in the assessment.

10.4 EFFECTS OF THE DGR PROJECT ON CLIMATE CHANGE

10.4.1 Methods

The DGR Project may also contribute to how the climate is changing (e.g., through changes in the levels of greenhouse gas emissions). The DGR Project can affect greenhouse gases as a result of changes in the terrestrial environment. Specifically, changes in vegetation and land cover can have a direct and indirect effect on the overall greenhouse gas (GHG) emissions. However, the GHG emissions associated with changes in land use have been quantified in the

Atmospheric Environment TSD, and then put into context on a sector, provincial and national basis.

10.4.2 Assessment of Effects of the DGR Project on Climate Change

The DGR Project involves the removal of a very small area of vegetation during the site preparation and construction phase, which results in a decrease in the available carbon sink in the area. The resulting decrease in the carbon sink results in an indirect increase in greenhouse gas emissions since the quantity of vegetation available to remove carbon from the atmosphere is reduced. This indirect increase in greenhouse gas emissions as a result of vegetation removal is discussed in the Atmospheric Environment TSD.

10.5 SUMMARY

No adverse effects of climate change related to the terrestrial environment and the DGR Project are advanced to Section 11 for an evaluation of significance.

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11. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

This section includes an evaluation of the significance of the residual adverse effects identified for the DGR Project on the terrestrial environment VECs. An assessment of the cumulative effects associated with the DGR Project is addressed in Section 10 of the EIS.

11.1 ASSESSMENT METHODS

One residual adverse effect was identified in the assessment (Sections 8 through 10). It is assessed to determine if the residual adverse effect is significant. Significance is rated using criteria applicable to the terrestrial environment. The criteria used for judging and describing the significance of effects are shown in Table 11.1-1.

Table 11.1-1: Effects Criteria and Levels for Determining Significance

Effects Criteria	Effects Level Definition		
Magnitude (of effect)	**Low**	**Medium**	**High**
	The effects level definitions for magnitude are provided in Table 11.1-2.		
Geographic Extent (of effect)	**Low**	**Medium**	**High**
	Effect is within the Site Study Area	Effect extends into the Local Study Area	Effect extends into the Regional Study Area
Timing and Duration (of conditions causing effect)	**Low**	**Medium**	**High**
	Conditions causing effect are evident during the site preparation and construction phase, or decommissioning phase	Conditions causing effect are evident during the operations phase	Conditions causing effect extend beyond any one phase
Frequency (of effect)	**Low**	**Medium**	**High**
	Conditions or phenomena causing the effect occur infrequently (i.e., several times per year)	Conditions or phenomena causing the effect occur at regular, although infrequent intervals (i.e., several times per month)	Conditions or phenomena causing the effect occur at regular and frequent intervals (i.e., daily or continuously)
Degree of Irreversibility (of effect)	**Low**	**Medium**	**High**
	Effect is readily (i.e., immediately) reversible	Effect is reversible with time	Effect is not reversible (i.e., permanent)

The criteria used to evaluate magnitude are specific to each of the VECs under consideration. As described in Section 8, one residual adverse effect on eastern white cedar is identified. Table 11.1-2 summarize the effects level definition for magnitude for the eastern white cedar. Only non-negligible (i.e., measurable) effects are carried forward for an assessment of significance. The criteria in these tables were developed based upon a review of criteria from previous nuclear EAs, and professional judgment using knowledge of the local populations and habitat availability for the VECs.

Table 11.1-2: Effects Levels for Assigning Magnitude

VEC	Magnitude Level Definition		
	Low	Medium	High
Eastern White Cedar	Loss of some trees at several locations leading to reduction in conifer woodlands by 5 to 10% or mixed woodlands by 10 to 25% in the Project Area compared with baseline	Loss of many trees at numerous locations associated with large-scale clearing of vegetation in the Project Area; reduction in conifer woodlands by >10% or mixed woodlands by >25% in the Project Area compared with baseline	Local population decrease of >25% in conifer woodlands or >40% of mixed woodlands attributed to loss of forest communities throughout the Site Study Area

Probability of occurrence was not explicitly included as a criterion for the assessment of significance of residual adverse effects. The assessment recognizes the widest, reasonable range of likely residual adverse effects without specific regard for their respective probability of occurrence[16]. The focus is on evaluating the possible impact of such effects on the environment and VECs, and the consideration of feasible mitigation measures that can be incorporated to control, reduce or eliminate the effect.

The level of significance is assigned by using a decision tree model illustrated on Figure 11.1-1. Firstly, magnitude, geographic extent, timing and duration, frequency, and degree of irreversibility are combined to identify an environmental consequence. Then the social and/or ecological importance of the VEC being affected is considered to determine the overall significance of the effect.

In selecting the VECs for assessing the effects of the DGR Project, consideration was given both to the ecological importance of a species as well as the species relevance from a social perspective. Therefore, all of the residual adverse effects (i.e., non-trivial adverse changes) were considered to be of either a social or ecological importance.

This decision tree is specific to the terrestrial environment and the effects level criteria defined in Tables 11.1-1 and 11.1-2. Some of the guiding principles are:

- all effects within a 5 to 10% decrease in the Project Area (i.e., low magnitude) would result in a low environmental consequence and would not be considered significant;
- generally, if the effect is immediately reversible (i.e., low irreversibility) it would result in a low environmental consequence and would not be considered significant; and
- effects with a high magnitude and extent and/or high irreversibility would result in a high environmental consequence and may be considered significant.

[16] As noted in Section 2.2 in regards to the application of a precautionary approach, all identified residual adverse effects, with the exception of malfunctions, accidents and malevolent acts, are assumed to occur for the purposes of this assessment.

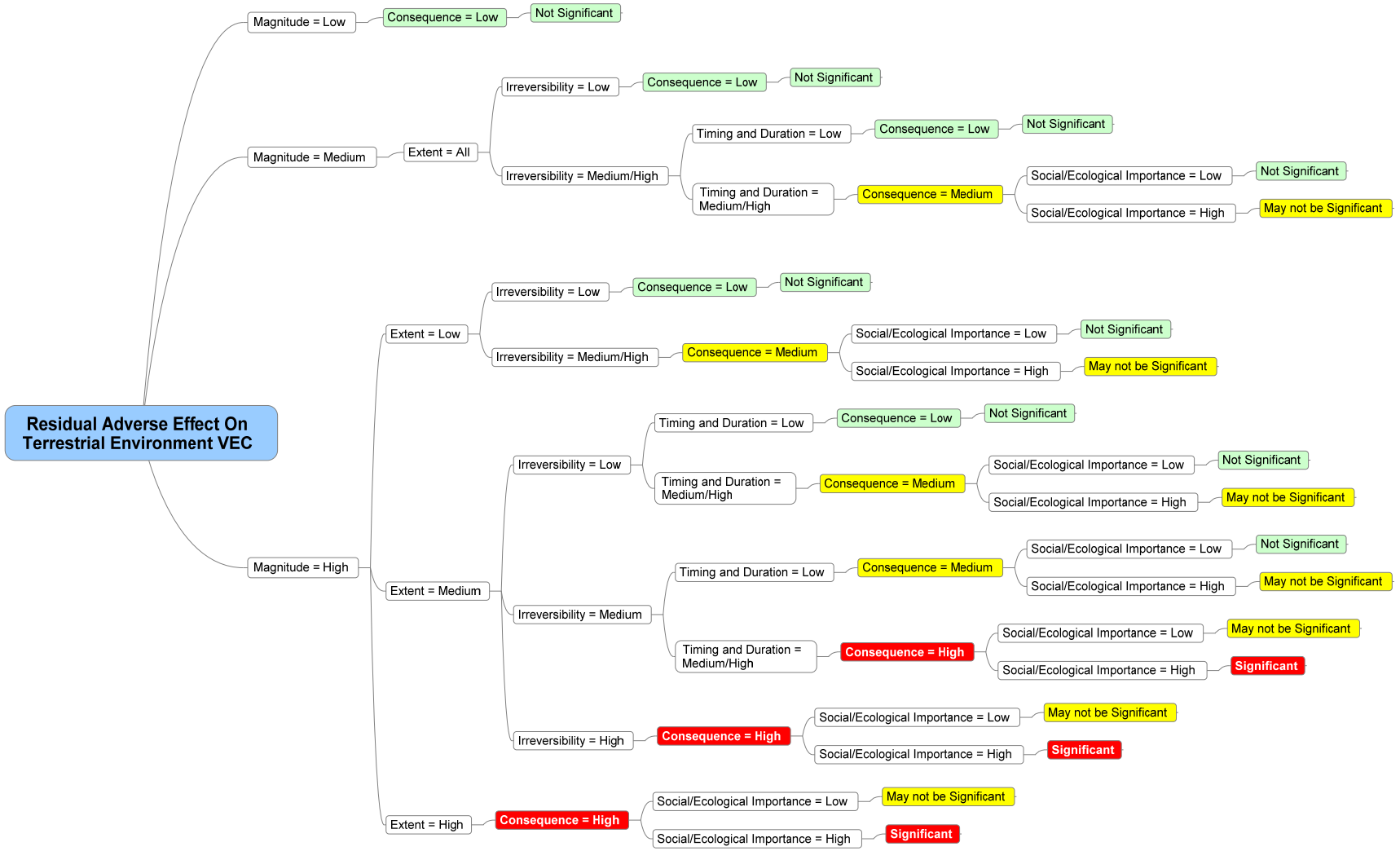

Figure 11.1-1: Determination of Significance of Residual Adverse Effects

The residual adverse effect can be determined to be:

- not significant;
- may not be significant; or
- significant.

An effect that “may not be significant” is one that in the professional judgement of the specialists would not be significant; however, follow-up monitoring should be implemented to confirm that significant adverse effects do not occur.

11.2 ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

A residual adverse effect is 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. All other plant species VECs will not be measurably affected by the proposed clearing and site preparation activities on the site, as common heal-all is limited to the grassland, cultural meadow and cultural barren areas of the Project Area and common cattail is limited to the wetland and ditch areas on the site which are not expected to experience measurable changes as a result of the proposed site preparation and clearing activities.

Table 11.2-1 summarizes the residual adverse effect expected as a result of the site clearing. As shown in Table 11.2-1, and based on the decision flow shown on Figure 11.1-1, the clearing of eastern white cedar was assessed as not significant because of the medium magnitude, low extent (limited to the Project Area), medium irreversibility and low timing and duration.

Table 11.2-1: Summary of Residual Adverse Effects and Significance Levels

Residual Adverse Effect	Magnitude	Geographic Extent	Timing and Duration	Frequency	Degree of Irreversibility	Overall Assessment
Clearing of eastern white cedar in the Project Area	Medium • Loss of greater than 25% of the Mixed Forest within the Project Area (77% loss) • Loss of less than 25% of the Mixed Forest within the Site Study Area (11% loss)	Low • Effect is limited to the Site Study Area	Low • Effect occurs during the site preparation and construction phase	High • The effect will persist continuously	Medium • Effect is reversible with time	**Not significant**

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12. EFFECTS OF THE PROJECT ON RENEWABLE AND NON-RENEWABLE RESOURCES

The DGR Project EIS Guidelines (Appendix A of the EIS) require the EA to consider the effects of the DGR Project on resource sustainability. For context, non-renewable resources are also discussed in this section.

12.1 METHODS

Potential DGR Project-environment interactions (as identified for the assessment of effects of the DGR Project) are reconsidered in a context of their likelihood of affecting resource sustainability or availability through all time frames. Likely effects were predicted, described and their significance assessed by considering "renewable resources" and "non-renewable resources" as VECs. In addition, the ability of the present generation and future generations to meet their own needs is evaluated, based on the professional judgement of the technical specialists.

One goal of the assessment is to determine whether renewable and non-renewable resources would be affected by the DGR Project to the point where they are not sustainable or appreciably depleted. Sustainability is defined in a manner consistent with the United Nation's definition of sustainable development as "*economic development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

Potential DGR Project-environment interactions identified in the screening matrices were reviewed to determine the likelihood of interactions between the DGR Project and resource sustainability and availability. For the purpose of this assessment, the likely residual adverse effects of the DGR Project's physical works and activities on the environment were considered as having the potential to adversely affect the sustainability of associated resources (i.e., local and regional forestry resources).

12.2 LIKELY EFFECTS

12.2.1 Non-renewable Resources

Non-renewable resource use associated with the DGR Project is expected to include use of aggregate and fuels. However, the use of non-renewable resources is not applicable to the terrestrial environment and is not be considered any further.

12.2.2 Renewable Resources

A residual adverse effect to the terrestrial environment has been identified as a result of the DGR Project. The removal of mixed forest, which will include the removal of eastern white cedar specimens, will have a residual adverse effect on this VEC species. However, there is no intention of managing the cedar forest in the Project Area as a harvestable resource to produce lumber. Therefore, the removal of the mixed forest will not have an effect on renewable resources. There are no other renewable resources potentially affected by the DGR Project and this is not advanced for further consideration.

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13. PRELIMINARY FOLLOW-UP PROGRAM

The DGR Project EIS Guidelines stipulate that the need for, and the requirements of, any follow-up program for the DGR Project be identified. A follow-up program may be required to determine that the environmental and cumulative effects of the DGR Project are consistent with predictions reported in the EIS. It can also be used to verify that mitigation measures are effective once implemented and determine whether there is a need for additional mitigation measures. A preliminary follow-up program development plan is provided below. The follow-up program is designed to be appropriate to the scale of the DGR Project and the effects identified through the EA process.

Follow-up monitoring programs are generally required to:

- verify the key predictions of the EA studies; or
- confirm the effectiveness of mitigation measures, and in so doing, determine if alternate mitigation strategies are required.

The CNSC will provide regulatory oversight to ensure that OPG has implemented all appropriate mitigation measures and that the follow-up monitoring is designed and carried out. The CNSC compliance program can be used as the mechanism for ensuring the final design and implementation of the follow-up program and reporting of the follow-up program results.

13.1 INITIAL SCOPE OF THE FOLLOW-UP PROGRAM

The removal of Mixed Forest communities, which will result in the removal of eastern white cedar, a VEC species, has been identified as a residual adverse effect for the terrestrial environment. Monitoring of plant species communities and wildlife habitat use adjacent to the areas which have been cleared is recommended once following the site preparation and construction phase of the DGR Project. The loss of habitat during the site preparation and construction activities may result in an initial increase in road mortality of species known to use Mixed Forest, including white-tailed deer, wild turkey and small mammals, as they relocate to other habitat units within the Project Area and the Site Study Area. It would be expected that the road mortality conditions would return to current baseline conditions post site preparation and construction phase of the DGR Project. The preliminary follow-up monitoring program has been prepared and is submitted along with the EIS.

13.2 PERMITTING REQUIREMENTS

The follow-up program described above may be a requirement of the CNSC licence. In addition, it is expected that the DGR Project will be subject to a number of additional permitting requirements (e.g., Development, Interference with Wetlands and Alterations to Shorelines and Watercourses-O. Reg. 169/09). Additional federal acts and regulations that do not require an authorization, but will be considered and adhered to, include the following:

- Species at Risk Act;
- Fish and Wildlife Conservation Act; and
- Migratory Birds Convention Act.

In addition to the federal and provincial project requirements, the DGR Project will require a Tree Cutting Permit from Bruce County to ensure compliance with Bruce County Forest Conservation Bylaw No. 4071(73).

14. CONCLUSIONS

Based on the assessment provided in this TSD, the following conclusions are provided:

- A residual adverse effect to plant species VECs (i.e., eastern white cedar) is expected as the result of the construction of the DGR Project from site clearing activities. This effect is expected to be not significant.
- No direct or indirect adverse effects to wildlife species VECs are expected as the result of the site preparation and construction, operation or decommissioning of the DGR Project from either direct or indirect effects.
- Climate change is not expected to have any effect on the conclusions reached regarding the effects of the DGR Project on plant or wildlife species VECs, or the environment on the DGR Project.
- Biodiversity within any of the study areas is not expected to be affected as the result of the construction, operation or decommissioning of the DGR Project.
- The DGR Project is not expected to have any effects on renewable and non-renewable resources with regards to the terrestrial environment.

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15. REFERENCES

[1] Canadian Nuclear Safety Commission (CNSC). 2006. *Record of Proceedings re EA Track Report Regarding OPG's Proposal to Construct and Operate a DGR within the Bruce Nuclear Site*.

[2] Quintessa Ltd., Intera Engineering Ltd., and SENES Consultants Ltd. 2011. *Postclosure Safety Assessment Report*. NWMO DGR-TR-2011-25.

[3] Nuclear Waste Management Organization (NWMO). 2011. *Geosynthesis*. NWMO DGR-TR-2011-11.

[4] Ontario Power Generation (OPG). 2011. *Deep Geologic Repository for Low and Intermediate Level Waste - Preliminary Safety Report*. 00216-SR-01320-00001 R000.

[5] Canadian Privy Council Office. 2003. *A Framework for the Application of Precaution in Science-based Decision Making about Risk*. ISBN 0-662-67486-3 Cat. no. CP22-70/2003.

[6] Canadian Environmental Assessment Agency. 2009. *Considering Aboriginal Traditional Knowledge*. In: Environmental Assessments Conducted under the Canadian Environmental Assessment Act - Interim Principles.

[7] Usher, P. 2000. *Traditional Ecological Knowledge in Environmental Assessment and Management*. Arctic. 53(2):183-193.

[8] Ontario Ministry of Natural Resources (OMNR). 1999. *Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement*.

[9] Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling, and D. Stalker. 1999. *Cumulative Effects Assessment Practitioners Guide*. AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency.

[10] Bruce Power. 2008. *Terrestrial Environment Technical Support Document*. Bruce New Build Project Environmental Assessment. Prepared by Golder Associates. May 2008.

[11] Bruce Power. 2005. *Terrestrial Environment Technical Support Document*. Bruce A Refurbishment for Life Extension and Continued Operations Project. Prepared by Golder Associates Ltd. December 2005.

[12] Bruce Power. 2001. *Terrestrial Environment Technical Support Document*. Bruce A Units 3&4 Restart Environmental Assessment. Prepared by Golder Associates Ltd. December 2001.

[13] Ontario Power Generation (OPG). 2005. *Terrestrial Environment Technical Support Document.* Western Waste Management Facility Refurbishment Waste Storage Project. June 2005.

[14] Ontario Hydro. 1997. *Bruce Used Fuel Dry Storage Facility EA*. A Submission to the Atomic Energy Control Board in fulfilment of the requirements under the Canadian EA Act. December 1997.

[15] Ontario Power Generation (OPG). 2002. *Bruce Heavy Water Plant Decommissioning EA Study Report*. Nuclear Waste Management Division. December 2002.

[16] Ontario Power Generation (OPG), ESG International, and BEAK International Inc. 2000. *Bruce Nuclear Power Development Ecological Effects Review*.

[17] LGL Ltd. 2002. *Bruce Nuclear Power Development Bioinventory Study - Final Report*. LGL Ltd Project No. TA2522.

[18] Lee, H. T., W.F.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. *Ecological Land Classification for Southern Ontario*. Ontario Ministry of Natural Resources Southcentral Science Division.

[19] Birds Ontario. 2006. *Ontario Breeding Bird Atlas*. Accessed in November 2006 from http://www.birdsontario.org/atlas/atlasmain.html.

[20] Bird Studies Canada. 2003. *MMP Training Kit and Instructions for Surveying Marsh Birds, Amphibians and their Habitats*.

[21] Droege, S. 1990. *The North American Breeding Bird Survey*. In: J. R. Sauer and S. Droege, eds. Survey designs and statistical methods for the estimation of avian population trends. U. S. Fish. Wildl. Serv., Biol. Rept. 90 (1).

[22] Rowe, J. S. 1972. *Forest Regions of Canada*. Canadian Forestry Service. Publication No. 1300.

[23] Kaiser, J. 1994. *The Flora of the Bruce Peninsula National Park and Vicinity, Including the Tobermory Islands*. Prepared for Bruce Peninsula National Park and Canadian Parks Service.

[24] Kinectrics Inc. 2005. *Western Waste Management Facility Integrated EA Follow-up Program*. Phase III - Operational Phase. Report No. K-010669-001-RA-0001-R00. Prepared for the Nuclear Waste Management Division, Ontario Power Generation. June 2005.

[25] Ontario Parks. 2005. *MacGregor Point Visitors Centre Preliminary Environmental Study Report*. Accessed on September 13, 2006 from http://www.ontarioparks.com/english/planning_pdf/macg_ESR.pdf .

[26] Bruce Power LP. 2004. *New Fuel Project for Bruce B Environmental Assessment Study Report*. Prepared by Golder Associates Ltd. October 2004.

[27] Natural Heritage Information Centre. 2006. *Species, and Communities and Natural Heritage Areas Information*. Accessed on September 15, 2006 from https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do.

[28] Riley, J. L. and P. Mohr. 1994. *The Natural Heritage of Southern Ontario's Settled Landscapes*. Ontario Ministry of Natural Resources.

[29] Wildlands League. 2005. *North Bruce Peninsula Ecosystem Community Atlas*. Accessed on September 15, 2006 from http://www.wildlandsleague.org/display.aspx?pid=72&cid=225 .

[30] The Bruce-Grey Plant Committee (Owen Sound Field Naturalists). *Rare and Endangered Species of Grey and Bruce Counties*. Stan Brown Printers Limited.

[31] Coalition on the Niagara Escarpment. 2006. *About the Niagara Escarpment*. Accessed on September 12, 2006 from http://www.niagaraescarpment.org/.

[32] Summer House Park. 2006. *Enthnobotany – Medicinal and Edible Plants of the Bruce*. Accessed on September 13, 2006 from http://www.summerhousepark.ca/packages/plants.htm .

[33] Lake Huron Centre for Coastal Conservation. 2005. *Biodiversity and Water Quality*. Accessed on September 12, 2006 from http://www.lakehuron.on.ca/biodiversity/woodlands.asp.

[34] Ministry of Natural Resources (OMNR). 2000. *Baie du Doré, Southern Ontario Wetland Evaluation, Data and Scoring Record*.

[35] Government of Ontario. 2007. *Endangered Species Act, Chapter 6*. Consolidation Period from June 30, 2008.

[36] Cadman, Eagles, and Helleiner. 1987. *Atlas of the Breeding Birds of Ontario*. Federation of Ontario Naturalists. University of Waterloo Press.

[37] Bruce Power. 2005. *Surface Water Resources Technical Support Document*. Bruce A Refurbishment for Life Extension and Continued Operations Project. Revision 0D2. Prepared by Golder Associates Ltd. December 2005.

[38] Parks Canada. 2006. *Bruce Peninsula National Park of Canada*. Natural Wonders & Cultural Treasures. Accessed on September 15, 2006 from http://www.pc.gc.ca/pn-np/on/bruce/natcul/natcul2_e.asp.

[39] Ontario Ministry of Natural Resources (OMNR). 2000. *Significant Wildlife Habitat Technical Guide*.

[40] Hamilton Naturalists Club. 2006. *Escarpment Animals*. Accessed on September 15, 2006 from http://www.hamiltonnature.org/habitats/escarpment/escarpment_animals.htm.

[41] Ontario Ministry of Municipal Affairs and Housing (MMAH). 2005. *Provincial Policy Statement*.

[42] Birdlife International. 2006. *Important Bird Area - Chantry Island*. Accessed on September 15, 2006 from http://www.ibacanada.com/ .

[43] Bird Studies Canada BirdLife International. 2004. *Important Bird Area - Cabot Head Upper Bruce Peninsula, Ontario*. Accessed on September 15, 2006 from http://www.bsc-eoc.org/iba/site.jsp?siteID=ON099http://www.bsc-eoc.org/.

[44] Ministry of Natural Resources (MNR). 2005. *Inverhuron Provincial Park Backgrounder*. Accessed on September 14, 2006 from http://www.mnr.gov.on.ca/OMNR/csb/news/2005/aug25bg_05.html.

[45] Natural Heritage Information Centre. 2009. *Ontario Ministry of Natural Resources NHIC Database*. Accessed in September 2010 from http://nhic.mnr.gov.on.ca/MNR/nhic/glossary.cfm.

[46] Bruce Power. 2005. *2004 Annual Monitoring Report Environmental Assessment*. Bruce A Units 3&4 Restart Follow-up Program.

[47] Bruce Power. 2005. *Aquatic Environment Technical Support Document*. Bruce A Refurbishment for Life Extension and Continued Operations Project Environmental Assessment. Prepared by Golder Associates Ltd. December 2005.

[48] Lake Huron Centre for Coastal Conservation. 2006. *Birds Beached by Botulism*. Accessed on October 11, 2006 from http://www.lakehuron.on.ca/biodiversity/birds-botulism.asp.

[49] Ontario Power Generation (OPG). 1999. *Bruce 5-8 Environmental Effects Report*. Report No. NK29-REP-07010.011-0001-R00. January 1999.

[50] Cavallo, J. 2001. *Bruce Nuclear Power Development Deer Pellet Group Survey*. LGL Limited.

[51] Couturier, A. 1999. *Conservation Priorities for the Birds of Southern Ontario*. Bird Studies Canada.

[52] Sutton, S., K. Robinson, and J. Lusted. 1999. *Ongoing Research on the Black Bear Population on the Bruce Peninsula*.

[53] Dobbyn, J. 1994. *Atlas of the Mammals of Ontario.* Federation of Ontario Naturalists.

[54] Francis, G. and G. Whitlaw. 2002. *Niagara Escarpment Biosphere Reserve (NEBR) 2002 Periodic Review Report*. Canadian Biosphere Reserves Association, Prepared for the Canadian Commission for UNESCO.

[55] Bruce Power. 2002. *Bruce A Units 3 & 4 Restart Environmental Assessment Study Report*. Prepared by Golder Associates Ltd. August 2002.

[56] Marathe, V.M. 2004. *Bogs*. Niagara Region Environmental Advisory Committee. Accessed on 15 September, 2006 from http://www.regional.niagara.on.ca/government/committees/eeac/eeac-info.aspx.

[57] The Bruce Pennisula. 2006. *Wild Flowers & Orchids of the Bruce Peninsula*. Accessed on October 5, 2006 from http://www.thebrucepeninsula.com/bruce_peninsula/flowers/flora_bruce_peninsula.htm.

[58] Niagara Escarpment Commission. 2001. *A Review of the Niagara Escarpment Ancient Tree Atlas Project; 1998-2001*. Leading Edge.

[59] The Friends of MacGregor Point Park. 2006. *Huron Fringe Birding Festival*. Accessed on October 5, 2006 from http://www.friendsofmacgregor.org/hfbf/hfbf.htm.

[60] McCormick Rankin Corporation. 2010. *Traffic Report Deep Geological Repository for Low and Intermediate Level Waste – Traffic Impact Study*.

[61] Jaeger, J. A., J. Bowman, and J. Brennanet. al. 2005. *Predicting when Animal Populations are at Risk from Roads: An Interactive Model of Road Avoidance Behaviour*. Ecological Modelling. pp. 329-348.

[62] Natural Resources Canada. 2007*. Amphibians and Reptiles of Ontario*. Accessed in July 2008 from http://cfs.nrcan.gc.ca/subsite/glfc-amphibians .

[63] Cornell Lab of Ornithology. 2007. *All About Birds*. Accessed in July 2008 from http://www.birds.cornell.edu/AllAboutBirds.

[64] Laing. 2006. *Southern Ontario Bald Eagle Monitoring Program 2005 Final Report*. Bird Studies Canada.

[65] Federal-Provincial Advisory Committee on Air Quality. 1987. *Review of National Ambient Air Quality Objectives for Nitrogen Dioxide (Desirable and Acceptable Levels).*

[66] World Health Organization. 2000. *Air Quality Guidelines for Europe*. Second Edition. World Health Organization Regional Office for Europe Copenhagen. ISBN13583.

[67] Fox, A. D. and J. Madsen. 1997. *Behavioural and Distributional Effects of Hunting Disturbance on Waterbirds in Europe: Implications for Refuge Design*. Journal of Applied Ecology. pp. 341-13.

[68] Crawford, D. L. 2000. *Light Pollution, an Environmental Problem for Astronomy and for Mankind*. Societa Astronomica Italiana. pp. 11-40.

[69] Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: Synthesis Report*. Summary for Policy Makers.

[70] Morton, J. K. and J.M. Venn. 1990. *A Checklist of the Flora of Ontario Vascular Plants*. Biology Series No. 34. University of Waterloo.

[71] Varga, S. and et.al. 2000. *Distribution and Status of the Vascular Plants of the Greater Toronto Area*. Ontario Ministry of Natural Resources.

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APPENDIX A: LIST OF ACRONYMS, UNITS AND TERMS

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LIST OF ACRONYMS

Acronym	Descriptive Term
ANSI	Area of Natural and Scientific Interest
CEAA	*Canadian Environmental Assessment Act*
CGM3	Canadian Climate Change Centre Model
CIE	Commission Internationale de l'Eclairage
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee of the Status of Species at Risk in Ontario
CNSC	Canadian Nuclear Safety Commission
DGR	Deep Geologic Repository
EA	Environmental Assessment
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
EST	Eastern Standard Time
GHG	Greenhouse Gas
GPS	Global Positioning System
IBA	Important Bird Area
IBP	International Biological Program
ILW	Intermediate Level Waste
IPCC	Intergovernmental Panel on Climate Change
LLW	Low Level Waste
L&ILW	Low and Intermediate Level Waste
OMNR	Ontario Ministry of Natural Resources
NARS	Natural Area of Regional Significance
NHIC	Natural Heritage Information Centre
NO_2	Nitrogen Dioxide
NWMO	Nuclear Waste Management Organization
OPG	Ontario Power Generation Inc.
PSW	Provincially Significant Wetland
QA/QC	Quality Assurance/Quality Control
RA	Responsible Authority
SAR	Species at Risk
SARA	*Species at Risk Act*

LIST OF ACRONYMS (continued)

Acronym	Descriptive Term
SON	Saugeen Ojibway Nation
SPM	Suspended Particulate Matter
SVCA	Saugeen Valley Conservation Authority
TSD	Technical Support Document
UTM	Universal Transverse Mercator
VEC	Valued Ecosystem Component
WPRB	Waste Package Receiving Building
WWMF	Western Waste Management Facility

LIST OF UNITS

Symbol	Units
°C	Degrees Celsius
cm	Centimetre
g	Grams
g/L	Grams per Litre
ha	Hectares
hlx	Hectalux
in	Inch
klx	Kilolux
km	Kilometres
km²	Square Kilometres
km/h	Kilometres per Hour
lx	Lux
mlx	Millilux
µlx	Microlux
m	Metres
m³	Cubic Metres (volume)
mASL	Metres above sea level
mBGS	Metres below ground surface
µg/m³	Microgram per Cubic Metre
mg/L	Milligrams per Litre
mm	Millimetres

GLOSSARY OF TERMS

Aboriginal traditional knowledge – Knowledge that is held by, and unique to, Aboriginal peoples.

Aboriginal traditional knowledge – body of knowledge built up by a group of people through generations of living in close contact with nature. It is cumulative and dynamic and builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change.

Acute exposure – exposure to a toxicant less than 24 hours in duration.

Alvar – bedrock controlled sites on more or less level expanses of limestone.

Anthropogenic – human made of human modified materials and communities, such that their initial properties or characteristics have been drastically altered.

Anuran – is an order of animals in the class Amphibia that includes frogs and toads.

Apex predator – predators residing at the top of the food chain with no predators of their own.

Avifauna – bird species found in a specific area

Biomagnification – the increase in the concentration of a substance that occurs in the food chain as a result of persistence (cannot be broken down).

Biosphere – The physical media (atmosphere, soil, surface waters and associated sediments) and the living organisms (including humans) that interact with them.

Bruce nuclear site – The 932 hectare (9.32 km2) parcel of land located within the administrative boundaries of the Municipality of Kincardine in Bruce County. Two operating nuclear stations are located on the site. The site is owned by OPG but has been leased to Bruce Power since May 2001. However, parts of the site, including land on which WWMF is located, have been retained by OPG. See also OPG-retained lands.

Bruce Power – The licensed operator of the Bruce A and Bruce B nuclear generating stations.

Canadian Environmental Assessment Agency (CEAA) – The federal body accountable to the Minister of the Environment. The Agency works to provide Canadians with high-quality environmental assessments that contribute to informed decision making, in support of sustainable development.

Canadian Nuclear Safety Commission (CNSC) – The Canadian federal agency responsible for regulating nuclear facilities and materials, including management of all radioactive waste in Canada.

Chronic exposure – exposure to a toxicant greater than three months in duration.

Culturally significant – species, habitats, locations or objects that have aesthetic, historic, scientific or social value to a specific group of people.

Cultural Meadow – a vegetation community originating from, or maintained by anthropogenic influences and culturally based disturbances. Dominated by herbaceous species of plants including grasses and broad-leaved flowering plants, often with a high percentage of non-native species.

Decommissioning – Those actions taken, in the interest of health, safety, security and protection of the environment, to retire a licensed activity/facility permanently from service and render it to a predetermined end-state condition.

Deep Geologic Repository (or DGR, or Repository) – The underground portion of the deep geologic repository facility for low- and intermediate-level waste. Initially, the repository includes the access-ways (shafts, ramps and/or tunnels), underground service areas and installations, and emplacement rooms. In the postclosure phase it also includes the engineered barrier systems. The repository includes the waste emplaced within the rooms and excludes the excavation damage zone.

Devonian – The fourth period of the Paleozoic Era extending from 417 to 354 million years ago; also refers to rocks formed, or sediments laid down, during this period (e.g., Devonian shales).

Direct Effect – A direct effect occurs when the VEC is affected by a change that results from a project work and activity.

DGR Project Site – The portion of the Project Area that will be affected by the site preparation and construction of surface facilities (i.e., the surface footprint).

Dolostone – A sedimentary rock of which more than 50 percent by weight consists of the mineral dolomite (magnesium carbonate). Dolostone is generally thought to form when magnesium ions replace some of the calcium ions in limestone by the process of dolomitization. Migrating fluids along some faults and fractures may locally dolomitize limestone, the resulting rock being more porous may become a host for oil and gas deposits.

Drumlin – A low, smoothly rounded, elongated oval hill, mound, or ridge, of compact glacial till or drift, built under the margin of glacial ice and shaped by fluid flow beneath the glacier. The long axis of a drumlin is oriented parallel to the direction of ice movement.

Emergent – a plant that has a photosynthetic surface extending above the normal water level.

Ephemeral ponds – temporary pools of water often devoid of fish that allow for development of natal amphibians and insects. See also vernal pool.

Foreshore – portion of a shore that lies between the low water limit and the high water wave wash.

Geosynthesis – The assembly of all the geologically-based evidence relevant to the repository safety case; the integration of multi-disciplinary geoscientific data relevant to the development of a descriptive conceptual geosphere model; explanation of a site-specific descriptive conceptual geosphere model within a systematic and structured framework.

Herpatofaunal – of the group of animals known as reptiles and amphibians.

Herpetofauna – reptiles and amphibians.

Hibernacula – shelter where a single or group of mammals, reptiles, amphibians or insects overwinters.

Indirect Effect – An indirect effect occurs when the VEC is affected by a change in another VEC.

Intermediate-Level Waste (ILW) – Radioactive non-fuel waste, containing significant quantities of long-lived radionuclides (generally refers to half-lives greater than 30 years).

Karst – A type of topography that is formed in limestone, gypsum or other rocks, primarily by dissolution, and that is characterized by sinkholes, caves and underground drainage. The most common type of karst is associated with the dissolution of limestone by meteoric waters when the carbonate rocks are exposed to the atmosphere at the Earth's surface, forming an unconfined aquifer. This most commonly occurs when shallow-marine limestones have become exposed because of a fall in sea-level. Karst can also be formed in coastal settings where fresh and marine waters mix, or as a result of limestone dissolution by sulphuric acid during deep burial of sediments.

Limestone – A sedimentary rock composed of the mineral calcite (calcium carbonate). Where it contains appreciable magnesium carbonate it is called dolomitic limestone. The primary source of this calcite is usually the shells of marine organisms. See also Dolostone.

Low Level Storage Building (LLSB) – Refers to a series of buildings at OPG's Western Waste Management Facility for the interim storage of low-level waste.

Low-Level Waste (LLW) – Radioactive waste in which the concentration or quantity of radionuclides is above the clearance levels established by the regulatory body (CNSC), and which contains primarily short-lived radionuclides (half-lives shorter than or equal to 30-years).

Marsh – a wetland with a mineral or peat substrate inundated with nutrient-rich water and characterized by emergent vegetation.

Measurable Change – a measurable change in the environment is one that is real, observable or detectable compared with existing conditions. A predicted change that is trivial, negligible or indistinguishable from background conditions will not be considered measurable.

Moraine – A glacially formed accumulation of unconsolidated glacial debris (soil, rock). Moraines are deposited as sheets or piles of debris directly from the ice of the glacier on/in which the debris is carried. Various types of moraines exist and their classification is based on where they were deposited with regards to the front of the glacier.

OPG-retained Land – The parcels of land at the Bruce nuclear site for which control has been retained by OPG. This includes the WWMF, certain landfills, and the Heavy Water Plant Lands.

Prairie – an area of native grassland controlled by a combination of moisture deficiency and fire. Usually containing a distinctive assemblage of species, often including a number of rare, threatened or endangered species, or species at the northern limits of their North American range.

Precautionary Approach – The precautionary approach is ultimately guided by judgement, based on values and is intended to address uncertainties in the assessment. This approach is consistent with Principle 15 of the 1992 Rio Declaration on Environment and Development.

Receptor – Any person or environmental entity that is exposed to radiation, or a hazardous substance, or both. A receptor is usually an organism or a population, but it could also be an abiotic entity such as surface water or sediment.

Red eft – the strikingly coloured juvenile phase of the eastern spotted newt, which is terrestrial or land-dwelling.

Risk – A multi-attribute quantity expressing hazard, danger or chance of harmful or injurious consequences associated with actual or potential exposures. It relates to quantities such as the probability that specific deleterious consequences may arise and the magnitude and character of such consequences.

Safety Report – A key licensing document which provides an overview of the facility design and operations, summarizes the integrated results of individual safety assessments, and demonstrates that a facility can be constructed, operated, or continue to be operated, without undue risk to health and safety of the workers and the public, and the environment.

Preliminary Safety Report (PSR) is the Safety Report submitted to CNSC in support of an application for a Site Preparation/Construction Licence.

Final Safety Report (FSR) is the Safety Report submitted to CNSC in support of an application for a Licence to Operate.

Swamp – a mineral rich wetland characterized by a cover of deciduous or coniferous trees.

Talus Slope – a collection of fallen, disintegrated rock material that has formed a pile at the foot of a steep slope.

Traditional Ecological Knowledge – Traditional ecological knowledge is a subset of Aboriginal traditional knowledge. Traditional ecological knowledge refers specifically to all types of knowledge about the environment derived from the experience and traditions of a particular group of people. There are four traditional ecological knowledge categories: knowledge about the environment; knowledge about the use of the environment; values about the environment; and the foundation of the knowledge system.

Valued Ecosystem Component (VEC) – VECs are features of the environment selected to be a focus of the environmental assessment because of their ecological, social, or economic value, and their potential vulnerability to the effects of the DGR project.

Vernal Pools – temporary pools of water often devoid of fish allow for development of natal amphibians and insects. Tend to dry out for at least portion of the year with water levels peaking in spring ("vernal"). See also ephemeral pool.

Waste Package – The waste material, the container, and any external barriers (e.g. shielding material), as prepared in accordance with requirements for handling, transfer and emplacement in the repository. It is a discrete unit that can be individually identified and handled at the repository facility.

Waste Package Receiving Building (WPRB) – The building at the DGR surface where waste packages arrive for transfer underground.

Western Waste Management Facility (WWMF) – The centralized processing and storage facility at the Bruce nuclear site for OPG's L&ILW and for the dry storage of used fuel from Bruce nuclear generating stations.

APPENDIX B: BASIS FOR THE EA

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Table B-1: Basis for the EA of the DGR Project

Project Works and Activities	Description
Site Preparation	Site preparation would begin after receipt of a Site Preparation Licence and would include clearing approximately 30 ha of the DGR Project site and preparing the construction laydown areas. Activities would include: • Removal of brush and trees and transfer by truck to on-site storage; • Excavation for removal and stockpiling of topsoil and truck transfer of soil to stockpile on-site; • Grading of sites, including roads, construction laydown areas, stormwater management area, ditches; • Receipt of materials including gravel, concrete, and steel; • Installation of construction roads and fencing; • Receipt and installation of construction trailers and associated temporary services; and • Install and operate fuel depot for construction equipment.
Construction of Surface Facilities	Construction of surface facilities will include the construction of the waste transfer, material handling, shaft headframes and all other temporary and permanent facilities at the site. Activities would include: • establish a concrete batch plant; • receipt of construction materials, including supplies for concrete, gravel, and steel by road transportation; • excavation for and construction of footings for permanent buildings, and for site services such as domestic water, sewage, electrical; • construction of permanent buildings, including headframe buildings associated with main and ventilation shafts; • receipt and set up of equipment for shaft sinking; • construction of abandoned rail bed crossing between WWMF and the DGR site; • fuelling of vehicles; and • construction of electrical substation and receipt and installation of standby generators.
Excavation and Construction of Underground Facilities	Excavation and construction of underground facilities will include excavation of the shafts, installation of the shaft and underground infrastructure (e.g., ventilation system) and the underground excavation of the emplacement and non-storage rooms. Activities will include: • drilling and blasting (use of explosives) for construction of main and ventilation shafts, and access tunnels and emplacement rooms; • receipt and placement of grout and concrete, steel and equipment; • dewatering of the shaft construction area by pumping and transfer to the above-ground stormwater management facility; • temporary storage of explosives underground for construction of emplacement rooms and tunnels; • receipt and installation of rock bolts and services; and • installation of shotcrete.

Table B-1: Basis for the EA for the DGR Project (continued)

Project Works and Activities	Description
Above-ground Transfer and Receipt of Waste	Above-ground handling of wastes will occur during the operations phase of the DGR Project and will include receipt of L&ILW from the WWMF at the staging area in the DGR Waste Package Receiving Building (WPRB) and on-site transfer to shaft. Above-ground handling of wastes includes: • receipt of disposal-ready waste packages from the WWMF by forklift or truck • offloading of waste packages at the WPRB; • transfer of waste packages within the WPRB by forklift or rail cart; • temporary storage of waste packages inside the WPRB.
Underground Transfer of Waste	Underground handling of wastes will take place during the operations phase of the DGR Project and will include: • receipt of waste packages at the the main shaft station; • offloading from cage and transfer of waste packages by forklift to emplacement rooms; • rail cart transfer of some large packages (Heat Exchangers/Shield Plug Containers) to emplacement rooms; • installation of end walls on full emplacement rooms; • remedial rock bolting and rock wall scaling; • fuelling and maintenance of underground vehicles and equipment; • receipt and storage of fuel for underground vehicles. Emplacement activities will be followed by a period of monitoring to ensure that the DGR facility is performing as expected prior to decommissioning.
Decommissioning of the DGR Project	Decommissioning of the DGR Project will require a separate environmental assessment before any activities can begin. Decommissioning of the DGR Project will include all activities required to seal shafts and remove surface facilities including: • removal of fuels from underground equipment; • removal of surface buildings, including foundations and equipment; • receipt and placement of materials, including concrete, asphalt, sand, bentonite for sealing the shaft; • construction of concrete monolith at base of two shafts, removal of shaft infrastructure and concrete liners, and reaming of some rock from the shafts and shaft stations; • sealing the shaft; and • grading of the site. The waste rock pile (limestones) will be covered and remain on-site.
Abandonment of the DGR Facility	Timing of abandonment of the DGR facility will be based on discussion with the regulator. Activities may include removal of access controls.
Presence of the DGR Project	Presence of the DGR Project represents the meaning people may attach to the existence of the DGR Project in their community and the influence its operations may have on their sense of health, safety and personal security over the life cycle of the DGR Project. This includes the aesthetics and vista of the DGR facility.

Table B-1: Basis for the EA for the DGR Project (continued)

Project Works and Activities	Description
Waste Management	Waste management represents all activities required to manage waste during the DGR Project. During construction waste management will include managing the waste rock along with conventional waste management. During operations, waste management would include managing conventional and radiological wastes from the underground and above-ground operations. Decommissioning waste management may include management of conventional and construction wastes. Activities include: • transfer of waste rock, by truck to the WRMA; • placement of waste rock on the storage pile; • collection and transfer of construction waste to on-site or licensed off-site facility; • collection and transfer of domestic waste to licensed facility; • collection, processing and management of any radioactive waste produced at the DGR facility; • collection, temporary storage and transfer of toxic/hazardous waste to licensed facility.
Support and Monitoring of DGR Life Cycle	Support and monitoring of DGR life cycle will include all activities to support the safe construction, operation, and decommissioning of the DGR Project. This includes: • operation and maintenance of the ventilation fans, heating system, electrical systems, fire protection system, communications services, sewage and potable water system and the standby generator; • collection, storage, and disposal of water from underground sumps, and of wastewater from above-and below ground facilities; • management of surface drainage in a stormwater management facility; • monitoring of air quality in the facility, exhaust from the facility, water quality of run-off from the developed area around the shafts and Waste Rock Management Area, water quality from underground shaft sumps and geotechnical monitoring of various underground openings; • maintenance and operation of fuel depots above-ground (construction only) and below-ground; and • administrative activities above- and below-ground involving office space, lunch room and amenities space.
Workers, Payroll and Purchasing	Workers, payroll and purchasing will include all workers required during each phase to implement the DGR Project. Activities include: • spending in commercial and industrial sectors; • transport of materials purchased to the site; and • workers travelling to and from site.

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APPENDIX C: NHIC SPECIES SEARCH RESULTS

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Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006)

Vegetation Community	Representative Species	Conservation Status	Description
Shrubby Cinquefoil Coastal Meadow Marsh Type	Shrubby Cinquefoil (*Potentilla fruticosa*)	S1	Variable flooding with water depths less than two metres; represents the wetland/terrestrial interface; occurs only in nearshore areas of the Great Lakes; calcareous, coarse textured substrates; mineratrophic with low nutrient levels; short and sparse vegetation cover and high incidence of rare and uncommon species.
White Cedar - Jack Pine - Shrubby Cinquefoil Treed Alvar Pavement	Eastern White Cedar (*Thuja occidentalis*) Jack Pine (*Pinus banksiana*) Shrubby Cinquefoil (*Potentilla fruticosa*)	S1	Level limestone bedrock possibly with some fractures, featuring patchy deposits of shallow substrates (less than 15 cm); seasonal fluctuation of drought and submersion; cover varies from patchy and barren to closed; tree cover between 25-60%; trees occur in areas with greater substrate accumulation or where limestone is more fractured.
Jack Pine - White Cedar - Low Calamint Treed Alvar Grassland Type	Jack Pine (*Pinus banksiana*) Eastern White Cedar (*Thuja occidentalis*) Low Calamint (*Calamintha arkansana*)	S1	Level limestone bedrock possibly with some fractures, featuring patchy deposits of shallow substrates (less than 15 cm); seasonal fluctuation of drought and submersion; cover varies from patchy and barren to closed; tree cover between 25-60%; trees occur in areas with greater substrate accumulation or where limestone is more fractured.
Little Bluestem - Long-leaved Reed Grass - Great Lakes Wheat Grass Dune Grassland Type	Graminoids such as: Little Bluestem (*Schizachyrium scoparium*) Sand Reed Grass (*Calamovilfa longifolia var. magna*) Great Lakes Wheatgrass (*Elymus lanceolatus ssp. psammophilus*)	S2	Active rolling sand hills; unstable substrate; little to no organic material; droughts and temperature extremes common; vegetation cover from patchy and barren to continuous meadow.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
Shrubby Cinquefoil Limestone Beach Type	Shrubby Cinquefoil (*Potentilla fruticosa*)	S2	Substrate of coarse carbonate parent material; average substrates are greater than 15 cm in depth; subject to active shoreline processes (e.g. erosion, deposition); cover from patchy to continuous meadow with exposed bedrock covering greater than 50% of the surface.
Graminoid Coastal Meadow Marsh Type	Rushes and reeds	S2	Variable flooding with water depths less than two metres; represents the wetland/terrestrial interface; occurs only in nearshore areas of the Great Lakes; calcareous, coarse textured substrates; mineratrophic with low nutrient levels; short and sparse vegetation cover and high incidence of rare and uncommon species.
Sand Cherry Dune Shrubland Type	Dominated by graminoids with scattered to dense shrub cover, including Sand Cherry (*Prunus pumila*)	S2	Active rolling sand hills; more stable substrate; little to no organic material; droughts and temperature extremes common; vegetation cover from patchy and barren to continuous thicket – tree cover less than 35%, shrub cover greater than 25%.
Open Limestone/Dolostone Cliff Rim Type	Lichen	S2	Vertical or near-vertical exposed carbonate bedrock greater than three metres in height; sharp edges, faces, and rims; highly exposed and subject to extremes in temperature and moisture; patchy to barren cover, both tree and shrub cover less than 25%.
Basswood - White Ash - Butternut Moist Treed Limestone Talus Type	American Basswood (*Tilia americana*) White ash (*Fraxinus americana*) Butternut (*Juglans cinerea*)	S2	Slopes of rock rubble at the base of cliff; carbonate rock; between 25-60% tree covered; high quantities of accumulated substrate between rocks; moist to fresh moisture regime.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
Dry Herbaceous Limestone/Dolostone Talus	Herb Robert (*Geranium robertianum*) Poison Ivy (*Rhus radicans*) Canada Bluegrass (*Poa compressa*) Maidenhair Spleenwort (*Asplenium trichomanes*)	S2	Slopes of rock rubble at the base of cliff; carbonate rock; less than 25% tree covered, greater than 25% shrub covered; bare rock surfaces with limited substrate; dry to fresh moisture regime.
Wet Herbaceous Limestone/Dolostone Talus	Herb Robert (*Geranium robertianum*) Spotted Touch-me-not (*Impatiens capensis*) White Snakeroot (*Eupatorium rugosum*)	S2	Slopes of rock rubble at the base of cliff; carbonate rock; between 25-60% tree covered; high quantities of accumulated substrate between rocks; moist to fresh moisture regime.
Shrubby Cinquefoil - Creeping Juniper - Scirpus-like Sedge Alvar Pavement Type	Shrubby Cinquefoil (*Potentilla fruticosa*) Creeping Juniper (*Juniperus horizontalis*) Scirpus-like Sedge (*Carex scirpoidea*)	S2	Typically restricted to bare rock pavement and patchy shallow substrates.
Common Juniper - Creeping Juniper - Shrubby Cinquefoil Alvar Shrubland Type	Common Juniper (*Juniperus communis*) Creeping Juniper (*Juniperus horizontalis*) Shrubby Cinquefoil (*Potentilla fruticosa*)	S2	On very shallow substrates or in fractures; cover varies from patchy and barren to continuous thicket.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
Common Juniper - Fragrant Sumac - Hairy Beardtongue Alvar Shrubland Type	Common Juniper (*Juniperus communis*) Fragrant Sumac (*Rhus aromatica*) Hairy Beardtongue (*Penstemon hirsutus*)	S2	On very shallow substrates or in fractures; cover varies from patchy and barren to continuous thicket.
Jack Pine - White Cedar - Common Juniper Treed Alvar Shrubland Type	Jack Pine (*Pinus banksiana*) Eastern White cedar (*Thuja occidentalis*) Common Juniper (*Juniperus communis*)	S2	Level limestone bedrock possibly with some fractures, featuring patchy deposits of shallow substrates (less than 15 cm); seasonal fluctuation of drought and submersion; cover varies from patchy and barren to closed; tree cover between 25-60%; trees occur in areas with greater substrate accumulation or where limestone is more fractured.
Common Juniper Open Limestone/Dolostone Cliff Rim Shrubland Type	Common Juniper (*Juniperus communis*)	S2S3	Vertical or near-vertical exposed carbonate bedrock greater than three metres in height; sharp edges, faces, and rims; highly exposed and subject to extremes in temperature and moisture; cover varies from patchy to thicket, less than 25% tree cover, greater than 25% shrub cover.
Northern Dropseed - Little Bluestem - Scirpus-like Sedge Alvar Grassland Type	Northern Dropseed (*Sporobolus heterolepis*) Little Bluestem (*Schizachyrium scoparium*) Scirpus-like Sedge (*Carex scirpoidea*)	S2S3	Typically restricted to bare rock pavement and patchy shallow substrates.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
White Cedar Treed Limestone Cliff Type	Eastern White Cedar (*Thuja occidentalis*)	S3	Rim of vertical or near-vertical exposed carbonate bedrock greater than three metres in height; dependant on degree of fracture of face and rim of cliff; highly exposed and subject to extremes in temperature and moisture; cover varies from patchy to closed, 25-60% tree cover.
Mountain Maple Open Limestone Talus Shrubland Type	Mountain Maple (*Acer spicatum*)	S3	Slopes of rock rubble at the base of cliff; carbonate rock; less than 25% tree covered, greater than 25% shrub covered; intermediate quantities of accumulated substrate between rocks compared with bare rock; cover from patchy to continuous thicket.
White Cedar Dry Treed Limestone Talus Type	Eastern White Cedar (*Thuja occidentalis*)	S3	Slopes of rock rubble at the base of cliff; carbonate rock; between 25-60% tree covered; high quantities of accumulated substrate between rocks; dry to fresh moisture regime.
Prairie Slough Grass Mineral Meadow Marsh Type	Dominated by grasses and sedges, including Fresh Water Cordgrass (*Spartina pectinata*); richer areas dominated by clonal species	S3	Seasonal flooding; water depth below two metres; mineral substrates (sand/gravel/cobble); exposed area with shoreline disturbance; disturbed areas sparsely vegetated.
Prairie Slough Grass Organic Meadow Marsh Type	Dominated by grasses and sedges, including Fresh Water Cordgrass (*Spartina pectinata*); richer areas dominated by clonal species	S3	Seasonal flooding; water depth below two metres; organic substrates; sheltered area.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
Cliffbrake - Lichen Open Unshaded Limestone/Dolostone Cliff Face Type	Cliffbrake Lichen	S3	Vertical or near vertical exposed carbonate bedrock greater than three metres in height; sharp edges, faces, and rims; highly exposed and subject to extremes in temperature and moisture; patchy to barren cover, both tree and shrub cover less than 25%.
Bulblet Fern - Herb Robert Open Shaded Limestone/Dolostone Cliff Face Type	Bulblet Fern (*Cystopteris bulbifera*) Herb Robert (*Geranium robertianum*)	S3	Vertical or near-vertical exposed carbonate bedrock greater than three metres in height; sharp edges, faces, and rims; highly exposed and subject to extremes in temperature and moisture; patchy to barren cover, both tree and shrub cover less than 25%.
White Birch Dry Treed Limestone Talus Type	White Birch (*Betula papyrifera*)	S3	Slopes of rock rubble at the base of cliff; carbonate rock; between 25-60% tree covered; high quantities of accumulated substrate between rocks; dry to fresh moisture regime.
Sugar Maple Moist Treed Limestone Talus Type	Sugar Maple (*Acer saccharum*)	S3	Slopes of rock rubble at the base of cliff; carbonate rock; between 25-60% tree covered; high quantities of accumulated substrate between rocks; moist to fresh moisture regime.
Round-leaved Dogwood Limestone/Dolostone Shrubland Barren Type	Round-leaved Dogwood (*Cornus rugosa*)	S3	Variable rock formation from knob and hollow to block and fissure; patchy soil development, less than 15 cm; carbonate bedrock, rock may be broken; tree cover patchy and barren to continuous thicket but less than 25%, shrubs greater than 25% cover.
White Cedar - White Spruce - Philadelphia Panic Grass Treed Alvar Grassland Type	Eastern White Cedar (*Thuja occidentalis*) White Spruce (*Picea glauca*) Philadelphia Panic Grass (*Panicum philadelphicum*)	S3	Level limestone bedrock possibly with some fractures, featuring patchy deposits of shallow substrates (less than 15 cm); seasonal fluctuation of drought and submersion; cover varies from patchy and barren to closed; tree cover between 25-60%; trees occur in areas with greater substrate accumulation or where limestone is more fractured.

Table C-1: Significant Vegetation Communities in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Vegetation Community	Representative Species	Conservation Status	Description
Silky Dogwood Mineral Thicket Swamp Type	Silky Dogwood (*Cornus amomum*)	S3S4	Short flooding season; water depth below two metres, but standing water greater than 20% of ground cover; mineral and peaty phase mineral substrates.
White Cedar - Hemlock Coniferous Mineral Swamp Type	Eastern White Cedar (*Thuja occidentalis*) Eastern Hemlock (*Tsuga canadensis)* Balsam Fir (*Abies balsamea)* White Spruce (*Picea glauca)* Eastern White Pine (*Pinus strobes)*	S3S4	Short flooding season; water depth less than two metres, but standing water is greater than 20% of ground cover; mineral and peaty phase mineral substrate; understorey and species richness dependant on degree of canopy closure; tree cover less than 25% and trees less than five metres in height; approximately 75% of cover is conifer species.

Notes:

Conservation Status:

S1: Critically imperilled - critically imperilled in the nation or province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.

S2: Imperilled - Imperilled in the nation or province because of rarity attributed to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or province.

S3: Vulnerable - Vulnerable in the nation or state/province attributed to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S#S#: Rank Range - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4, where SU is currently unrankable arttributed to lack of information or because of substantially conflicting information about status or trends).

Source: [27]

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Point Clark	80.0 185.8	Life Science Area of Natural or Scientific Interest (ANSI) International Biological Program (IBP)	Lake Nippissing beach ridges – upland and lowland deciduous, mixed, and coniferous forests. Rolling sand and cobble plain with mosaic of upland and lowland deciduous, mixed, and coniferous forests.
Eighteen Mile South Shorecliff	30.0	Life Science Area of Natural or Scientific Interest (ANSI)	Clay bluff and ravines with shorecliff vegetation communities.
Stewart Swamp	47.5	Regionally Significant Wetland	Wetland composed of swamp and marsh.
Stoney Island Conservation Area	40.0	Provincial Park/Conservation Area	Upland coniferous and deciduous forest with some poorly drained low lying areas and several creeks. Includes small grove of nut trees.
Lorne Beach Swamp	28.0	Regionally Significant Wetland	Coastal wetland complex including fen and swamp.
South Lorne Shoreline	38.0	International Biological Program (IBP)	Old beach cliff of Glacial Lake Nippissing along Lake Huron shoreline with good representation of lake coastal vegetation.
North Lorne Shoreline	42.5	International Biological Program (IBP)	Old beach cliff of Glacial Lake Nippissing with relatively undisturbed lake shoreline vegetation community.
Lothian (Lake Warren Shorecliff)	Not reported	Earth Science Area of Natural and Scientific Interest (ANSI)	One of best examples of beach ridges older than Lake Nippissing.
Inverhuron Provincial Park	220.6 288.1	International Biological Program (IBP) Provincial Park – Historical	Sandland with beaches and dunes with a mix of forested and open communities and parkland uses. Human-influenced early successional communities, including second growth mixed forest, old fields, and wet areas.
Baie du Doré Wetland	95.0	Provincially Significant Wetland (PSW)	PSW complex with coastal wetlands including fen, swamp, and marsh.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Scott Point Wetland Complex	201.8	Provincially Significant Wetland (PSW)	PSW coastal wetland including fen, swamp, and marsh.
Scott Point	310.0	Life Science Area of Natural or Scientific Interest (ANSI)	Sand and boulder beach-Lake Huron shoreline with fen habitat and some sandy backshore.
St. Helen's Beech-Maple Forest	57.0	Life Science Area of Natural or Scientific Interest (ANSI)	Upland sugar maple-beech forest with small wetland pockets and brook trout stream.
Melancthon #36 Wetland	304.0	Regionally Significant Wetland	Wetland including carr[a] and swamp.
MacGregor Point Wetland Complex	420.2	Provincially Significant Wetland (PSW)	Coastal wetland complex including 71 individual wetlands composed of three wetland types: fen, swamp, and marsh.
St. Helen's North Complex Wetland	47.0	Regionally Significant Wetland	Wetland complex including two individual swamps.
MacGregor Point Provincial Park	1204.34	Life Science Area of Natural or Scientific Interest (ANSI) Provincial Park-Natural Environment	Sand dunes, wetlands (ponds, marly[b] fens, marshes, shrub carr, and swamp), mosaic of upland and lowland forests.
MacGregor Point Wildlife Management Area	804.9	International Biological Program (IBP)	Coastline of Lake Huron including sand, gravel and rock beaches and inland dunes and cliffs.
Anderson's Creek Complex Wetland	368.0	Provincially Significant Wetland Complex (PSW)	PSW complex consisting of five individual wetlands and two wetland types: swamp and marsh.
West Kinlough Complex Wetland	129.0	Regionally Significant Wetland	Complex made up of 15 individual wetlands and two wetland types: bog and swamp.
Kingarf Complex Wetland	111.0	Regionally Significant Wetland	Wetland complex made up of nine individual swamp wetlands.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Kinloss Creek Complex Wetland	917.0	Provincially Significant Wetland Complex (PSW)	PSW made up of 22 individual wetlands composed of two types: swamp and marsh.
Langside Bog	33.6	International Biological Program (IBP)	Moraine basin with associated mixed and deciduous upland forest, deciduous and thicket swamp, heath, and marsh.
Whitechurch Complex Wetland	321.0	Regionally Significant Wetland	Wetland complex containing five individual swamp communities.
Dickies Creek Complex Wetland	784.0	Provincially Significant Wetland Complex (PSW)	PSW made up of 10 individual wetlands and composed of three community types: bog, swamp, and marsh.
Greenock Swamp – Silver Lake	397.4	International Biological Program (IBP)	Poorly drained basin containing ponds and seven vegetation community types: lowland deciduous and mixed forests, submergent and emergent aquatics, marshes and thickets.
Westford Complex Wetland	19.0	Regionally Significant Wetland	Wetland complex made up of two individual wetlands, both swamps.
Glammis Bog	79.3 230.0	Provincially Significant Wetland (PSW) Life Science Area of Natural or Scientific Interest (ANSI)	PSW complex made up of five individual wetlands types including bog, swamp, and marsh. Moraine landform including a stream, deciduous forest, forested swamps, and bog within a kettle.
East Holyrood Complex Wetland	50.0	Regionally Significant Wetland	Wetland complex including five individual swamps.
Greenock Swamp	8300.0 8947.6	Life Science Area of Natural or Scientific Interest (ANSI) Provincially Significant Wetland (PSW)	One of largest wetlands in southern Ontario; includes swamp, marsh, bog, and fen and some upland forested communities. PSW made up of 41 individual wetlands including bog, fen, swamp, and marsh.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Gresham Woodlot	Not reported	Life Science Area of Natural or Scientific Interest (ANSI)	Series of upland intermediate to young forests.
Wingham Complex Wetland	741.8	Provincially Significant Wetland (PSW)	PSW made up of 38 individual wetlands including swamp and marsh.
Teeswater Complex Wetland	862.0	Provincially Significant Wetland (PSW)	PSW made up of 17 individual wetland including swamp and marsh.
Saugeen River – East of Southampton	160.0	Life Science Area of Natural or Scientific Interest (ANSI)	Sand dunes and knolls with mature deciduous forests and rare plant species.
North Teeswater Complex Wetland	18.0	Regionally Significant Wetland	Wetland made up of swamp.
Saugeen River	Not reported	Life Science Area of Natural or Scientific Interest (ANSI)	20 km length of Saugeen River valley including forested terraces, floodplain, islands (forest, thicket and meadow) and farmland, important wildlife movement corridor.
Chepstow Swamp	308.6	Provincially Significant Wetland (PSW)	PSW complex made up of 12 individual wetlands, including fen, swamp, and marsh.
Sangs Creek Fen	179.1	Provincially Significant Wetland (PSW)	PSW complex made up of two individual wetlands including fen and swamp.
Arran Lake Wetland	1235.6	Provincially Significant Wetland (PSW)	PSW complex made up of three individual wetlands including fen, swamp, and marsh.
Arran Lake South	250.0	Life Science Area of Natural or Scientific Interest (ANSI)	Large wetland complex at south end of Arran Lake, including mixed swamp, thicket swamp, marsh, open water, stream, and forested drumlin formation.
Muskrat Creek Complex Wetland	251.0	Regionally Significant Wetland	Wetland complex made up of 13 wetlands, including swamp and marsh.
Nuttley Fen	7.5	Provincially Significant Wetland (PSW)	PSW complex made up of two wetlands, including fen, swamp, and marsh.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Arran Lake North	450.0	Life Science Area of Natural or Scientific Interest (ANSI)	Wetland complex at north end of Arran Lake, including lowland forest along Sauble River, marsh and shrub carr, forested drumlin slopes. Also Environmentally Significant Area.
Elsinore Bog Complex	40.0	Life Science Area of Natural or Scientific Interest (ANSI)	Open bog and mixed treed bog encircling open water of small lake.
Glenannan Complex Wetland	426.0	Regionally Significant Wetland	Wetland complex with 10 individual wetlands, including swamp and marsh.
Williscroft Moraine	675.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Representative landform of subdued moraine deposition in water.
Formosa North Road Cut	0.3	Earth Science Area of Natural and Scientific Interest (ANSI)	Best representation of exposed Formosa Reef Limestone containing an abundance of fossils.
Chesley Lake South Bog	20.0	Life Science Area of Natural or Scientific Interest (ANSI)	Interdrumlin depressional small bog including open and treed bog and swamp fringe.
Elderslie Swamp	280.0	Life Science Area of Natural or Scientific Interest (ANSI) Regionally Significant Wetland	Swamp complex representative of Saugeen Clay Plain, includes Snake Creek. Wetland complex made up of 19 individual wetlands, of which are all swamps.
Saugeen River Section (1)	6.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Best section of river available showing Devonian and Silurian geologic periods, and an abundance of fossils.
Edengrove Wetland Complex	105.8	Provincially Significant Wetland (PSW)	PSW made up of four individual wetlands including fen, swamp and marsh.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
North Saugeen River Swamp and Oxbow	250.9	International Biological Program (IBP)	Extensive poorly drained river valley basin formed on a moraine. Well developed valley terrace and ox-bow[c] channel deciduous and mixed forests, thicket swamp and marsh.
Dunkeld Saugeen Oxbow	Not reported	Life Science Area of Natural or Scientific Interest (ANSI)	Meandering river in glacial delta, gravel terraces, ox-bows, drumlinized hill and deciduous lowland and mixed upland forests.
North Saugeen River and Swamp	Not reported	Life Science Area of Natural or Scientific Interest (ANSI)	Saugeen River floodplain basin with moraine ridge surrounding swamp and upland forests.
East Saugeen Northeast of Dunkeld	110.0	Life Science Area of Natural or Scientific Interest (ANSI)	Large floodplain forested complex containing wetlands and upland valley slope forests.
Dunkeld-Saugeen Oxbow	316.9	International Biological Program (IBP)	Incised river valley with meander scars, cores, deciduous and mixed terrace forest, slope and lowland forest, ox-bow thicket, marshes and riparian aquatic habitat.
Arkwright Drumlins	654.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Drumlins of the Aaron Drumlin field, Tara Moraines, meltwater channel and terraces.
Belmore Creek Complex Wetland	254.0	Regionally Significant Wetland	Wetland complex made up of 11 individual swamp wetlands.
East Saugeen East - Northeast of Dunkeld	120.0	Life Science Area of Natural or Scientific Interest (ANSI)	Upland forest on east and west banks of Saugeen River, and floodplain forest on both sides of river.
South Walkerton Complex Wetland	92.0	Regionally Significant Wetland	Wetland complex made up of five individual swamp wetlands.
East Saugeen Oxbows	160.0	Life Science Area of Natural or Scientific Interest (ANSI)	River valley rim carved into sandplain that supports valley rim and slope forests and broad floodplain with abandoned river channel – including deciduous and mixed forest, wet meadow, and old fields.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Tara Moraine and Esker	35.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Moraine and esker feature deposited underwater, showing distinctive depositional features.
East Formosa Wetland Complex	83.0	Regionally Significant Wetland	Wetland complex made up of three individual swamps.
Allenford Station Wetland	446.4	Provincially Significant Wetland (PSW)	PSW complex made up of three individual wetlands, composed of swamp and marsh.
Howick Bog	581.4	Provincially Significant Wetland (PSW)	PSW complex made up of 12 individual wetlands, composed of bog, swamp, and marsh.
Dobbinton Esker	127.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Three separate sites; discontinues esker with subdued esker topography likely due its association with retreating ice sheet.
Bog North of Gorrie	50.0	Life Science Area of Natural or Scientific Interest (ANSI)	Small bog with deciduous and mixed swamp surrounding oval open bog depression.
Tara Moraine A	814.0	Earth Science Area of Natural and Scientific Interest (ANSI)	Moraine with distinct, thin-ridged, hummocky topography; deposited in water.
Huntingfield Agreement Forest - East Half	163.1	International Biological Program (IBP)	Broad poorly drained kame moraine[d] basin with swamp depression, low ridges with mixed and deciduous lowland forests, thickets, heaths, and meadows.
Huntingfield Agreement Forest	160.0	Life Science Area of Natural or Scientific Interest (ANSI)	Mixed forest on kame ridges and mixed swamp in depressions, swamp thicket on organic shoreline fringe and pond feature.
Tara Wetland	131.2	Provincially Significant Wetland (PSW)	PSW composed of two wetland types including swamp and marsh.
Murray Bog	90.0	Life Science Area of Natural or Scientific Interest (ANSI)	Kame moraine depression holding a swamp and bog (open and treed) complex surrounded by upland forest.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Fordwich North Complex Wetland	104.0	Regionally Significant Wetland	Wetland complex made up of seven individual swamp wetlands.
Carlsruhe East Complex Wetland	Not reported	Regionally Significant Wetland	Wetland complex made up of three individual wetlands including swamp and marsh.
Lakelet Lake Bog	92.3 110.0	International Biological Program (IBP) Life Science Area of Natural or Scientific Interest (ANSI)	Peat basin with bog, upland and lowland deciduous and mixed forest, and pond. Bog, swamp, and upland forest on kame moraine, surrounding Blind Lake.
Lakelet Lake Complex Wetland	740.0	Provincially Significant Wetland (PSW)	PSW complex made up of 12 individual wetlands including bog, swamp, and marsh.
North Lakelet Complex Wetland	289.5	Regionally Significant Wetland	Wetland complex made up of 17 individual wetlands, including swamp and marsh.
Habermehl Lake	70.0 66.0	Life Science Area of Natural or Scientific Interest (ANSI) International Biological Program (IBP)	Forest on spillway deposits on north side of Habermehl Lake feeding Habermehl Creek, including mixed forest and swamp, pond fringe, and marsh. Poorly drained basin with small lake edge, low moraine, open water lake, marsh, thicket, lowland mixed swamp, and upland deciduous forest.
West Neustadt Complex Wetland	41.0	Regionally Significant Wetland	Wetland complex made up of seven individual wetlands, including swamp and marsh.
Louise Swamp	54.7	Regionally Significant Wetland	Wetland complex made up of two individual wetlands including swamp and marsh.
Westfall's Lake	50. 0	Life Science Area of Natural or Scientific Interest (ANSI)	Three small kettle lakes with floating fen shoreline surrounded by lowland forest.
Saugeen Valley Headquarters Conservation Area	Not reported	Conservation Authority Area	Upland deciduous forest, bog, sulphur spring, fish hatchery, and a network of streams and ponds including a waterfowl sanctuary, exotic wildlife pens and shelters.

Table C-2: Summary of Natural Heritage System in the Regional Study Area Based on Review of the Natural Heritage Information Centre Database (2006) (continued)

Site Name	Size (ha)	Type of Natural Heritage Feature	Site Description
Allan Park Ice-Marginal Delta	80.0	Earth Science Area of Natural and Scientific Interest (ANSI)	The temporary standstill of an ice front dammed its own waters, which produced an ice-marginal delta[e] fed by eskers[f].
Kinghurst Swamp	507.5	Regionally Significant Wetland	Wetland complex made up of seven individual wetlands, including swamp and marsh.
Desboro East Forest	350.0	Life Science Area of Natural or Scientific Interest (ANSI)	Large upland forest tract on rolling till moraine and small kettle wetland depression.
Louise Creek – Louise Lake	Not reported	Life Science Area of Natural or Scientific Interest (ANSI) Natural Area of Regional Significance (NARS)	Two-part natural feature consisting of a wetland complex, made up of marly ponds and open fens, surrounded by a coniferous swamp and upland deciduous forest on the moraines.
Kinghurst West	550.0	Life Science Area of Natural or Scientific Interest (ANSI)	Diverse habitats including kettle lake with floating fen and marsh boarder, upland deciduous forest on till moraine, small kettles and extensive lowland swamp.
Sydenham River Lowlands Wetland	500.4	Regionally Significant Wetland	Wetland complex made up of three individual wetlands including swamp and marsh.
Inglis Falls Forests	140.0	Life Science Area of Natural or Scientific Interest (ANSI)	Bedrock mixed forests associated with escarpment plain, cliff vegetation communities, open water and marsh communities associated with head pond, falls and river.

Notes:
a Deciduous woodland on a permanently wet organic soil.
b Marl is a calcareous clay, or impure fine-grained limestone. As the name suggests, marly ferns are fern systems that abound with marl.
c U-shaped bend in a river or stream.
d Kame moraine is defined as “an extended ridge consisting mainly of kames and outwash” where kames are “knobby hills of irregularly stratified sand and gravel, formed at the edge of a melting glacier” [98].
e A delta created at the edge of a glacier as a result of debris deposit from meltwater.
f A knobby, crooked ridge of coarse gravel and sand considered to be deposited by meltwater from a glacier.
Source: [27]

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2010)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Tree						
Juglans cinerea	Butternut	Forest and forest edge	END	END	S3?	G3G4
Shrub, small tree and woody vine						
Salix myricoides var. myricoides	Blue-leaf Willow	Sand Dunes	—	—	S2S3	G4T4
Ferns and Allies						
Asplenium ruta-muraria	Wallrue Spleenwort	Cliff, rock outcrop, and talus slopes	—	—	S2	G5
Asplenium scolopendrium var. americanum	American Hart's-tongue Fern	Cliff, rock outcrops, talus slopes, and forest	SC	SC	S3	G4T3
Gymnocarpium robertianum	Limestone Oak Fern	Rock outcrops and wetlands	—	—	S2	G5
Pellaea atropurpurea	Purple-stemmed Cliffbrake	Alvar, cliff, rock outcrops, and talus slopes	—	—	S3	G5
Phegopteris hexagonoptera	Broad Beech Fern	Forest	SC	SC	S3	G5
Forb						
Adenocaulon bicolor	Trail-plant	Forest	—	—	S1	G5?
Agalinis gattingeri	Gattinger's Agalinis	Alvar and open grassland	END	END	S2	G4
Aplectrum hyemale	Puttyroot	Forest	—	—	S2	G5

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Arnoglossum plantagineum	Tuberous Indian-plantain	Riparian, shoreline, and wetland	SC	SC	S3	G4G5
Astragalus neglectus	Cooper's Milkvetch	Alvar, riparian area, forest, and forest edge	—	—	S3	G4
Cirsium hillii	Hill's Thistle	Alvar, sand dune, and forest	THR	THR	S3	G3
Cirsium pitcheri	Pitcher's Thistle	Sand dune and shoreline	END	END	S2	G3
Cypripedium arietinum	Ram's-head Lady's-slipper	Alvar, wetland, forest, and forest edge	—	—	S3	G3
Cypripedium candidum	Small White Lady's-slipper	Open grassland and wetland	END	END-R	S1	G4
Drosera linearis	Slenderleaf Sundew	Wetland	—	—	S3	G4
Erigeron philadelphicus ssp. provancheri[c]	Provancher's Philadelphia Fleabane[c]	Open grassland and forest*	SC	—	SU	G5T2?
Gentianella quinquefolia	Stiff Gentian	Open grassland, riparian, and forest edge	—	—	S2	G5
Hybanthus concolor	Green Violet	Riparian and forest	—	—	S2	G5
Hymenoxys herbacea	Lakeside Daisy	Alvar	THR	THR	S2	G2

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Iris lacustris	Dwarf Lake Iris	Alvar, sand dunes, shoreline, wetland, and forest	THR	THR	S3	G3
Liatris cylindracea	Slender blazing-star	Alvar, open grassland, and forest	—	—	S3	G5
Linum medium var. medium	Stiff Yellow Flax	Shoreline and wetland	—	—	S3	G5T?
Lithospermum caroliniense	Plains Puccoon	Sand dunes and open grassland*	—	—	S3	G4G5
Monarda didyma	Bee-balm	Wetlands, riparian area, and forest	—	—	S3	G5
Packera obovata	Roundleaf Ragwort	Alvar and forest	—	—	S3	G5
Panax quinquefolius[d]	American Ginseng[d]	Forest	END	END[e]	S3[e]	Not available
Peltandra virginica	Arrow-arum	Alvars, open water, and wetland	—	—	S2	G5
Platanthera leucophaea	Eastern Prairie Fringed-orchid	Open grassland and wetland	END	END	S2	G2
Platanthera macrophylla	Goldie's Round-leaved Orchid	Forest	—	—	S2	G5?T4
Pterospora andromedea	Giant Pinedrops	Forest and forest edge	—	—	S2	G5

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Sagittaria graminea var. cristata	Crested Arrowhead	Open water	—	—	S3	G4?
Solidago houghtonii	Houghton's Goldenrod	Alvar, shoreline, and wetland	SC	—	S2	G3
Solidago simplex ssp. Randii	Rand's Goldenrod	Cliff, sand dune, shoreline, and forest	—	—	S3	G5T5?
Spiranthes magnicamporum	Great Plains Ladies'-tresses	Open grassland and shoreline	—	—	S3	G4
Zizia aptera	Heartleaf Alexanders	Riparian, forest, and forest edge	—	—	S1	G5
Graminoid						
Ammophila breviligulata	American Beachgrass	Sand dune and shoreline	—	—	S3	G5
Bromus inermis ssp. pumpellianus	Pumpell's Brome Grass	Open grassland and riparian	—	—	SH	G5T?
Calamovilfa longifolia var. magna	Sand Reed Grass	Sand dune	—	—	S3	G5T3T5
Carex haydenii	Cloud Sedge	Riparian and wetland	—	—	S3	G5
Carex tetanica	Rigid Sedge	Open grassland, riparian, seep, and shoreline	—	—	S3	G4G5

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Eleocharis rostellata	Beaked Spike-rush	Shoreline and wetland	—	—	S3	G5
Elymus lanceolatus ssp. psammophilus	Great Lakes Wheatgrass	Sand dune and shoreline	—	—	S3	G5T3
Juncus greenei	Greene's Rush	Sand dune, open grassland, and shoreline	—	—	S3	G5
Poa secunda	Canby Blue Grass	Cliff	—	—	S1	G5
Scleria verticillata	Low Nutrush	Shoreline	—	—	S3	G5
Sparganium androcladum	Branching Bur-reed	Shoreline and wetland	—	—	S1	G4G5
Sporobolus asper	Longleaf Dropseed	Open grassland and shoreline	—	—	S1S2	G5
Sporobolus heterolepis	Northern Dropseed	Alvar and open grassland	—	—	S3	G5
Stipa spartea	Porcupine Grass	Sand dune, open grassland, and rock outcrop	—	—	S3	G5
Moss						
Amblyodon dealbatus	Moss sp.	All habitats where moisture regime permits growth*	—	—	S1	G3G5

Table C-3: Significant Plants in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	Habitat[b]	COSEWIC Status[a]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Bryum gemmiparum	Moss sp.	—	—	—	S1	G3G5
Grimmia teretinervisa	Moss sp.	—	—	—	S2	G3G5
Pseudocalliergon turgescens	Moss sp.	—	—	—	S2	G3G5
Tortula cainii	Moss sp.	—	—	—	S1	G1

Notes:

Shading indicates species found within the Regional Study Area boundary.

— No designation

a Based on records in the NHIC database unless otherwise noted.
b Habitat designations are based on those provided in *Significant Wildlife Habitat Technical Guide* [39], except where noted with *.
c It should be noted that there is ongoing debate regarding the occurrence of this taxon in Ontario at the present time [27].
d This record is from the MacGregor Point Provincial Park where the species is considered to have been extirpated since 1997 [25].
e This ranking is based on a review of the *Significant Wildlife Habitat Technical Guide* [39]; NHIC does not provide ranking information for American ginseng on its searchable database.

Global Ranks:

G1 Extremely rare
G2 Very rare
G3 Rare to Uncommon
G4 Common
G5 Very Common
G#G# A numeric range rank (e.g., G2G3) is used to indicate any range of uncertainty about the status of the species or community,
T Denotes that the rank applies to a subspecies or variety.
G? Unranked, or, if following a ranking, rank tentatively assigned (e.g. G3?).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:

END Endangered
THR Threatened
SC Special Concern

Provincial Ranks and OMNR Status:

S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
SU Unrankable - Currently unrankable attributed to lack of information or because of substantially conflicting information about status or trends.
S#S# Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S? Not Ranked Yet; or if following a ranking, Rank Uncertain (e.g. S3?). S? species have not had a rank assigned.
THR Threatened
SC Special Concern
END-R Endangered (Regulated under the *Ontario Endangered Species Act*)
END Endangered (not regulated)

Source: [27;39;25]

Table C-4: Significant Wildlife Species in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Bird					
Ammodramus henslowii	Henslow's Sparrow	END	END-R	S1B,SZN	G4
Aquila chrysaetos[e]	Golden Eagle	NAR	END-R	S1,SZN	G5
Asio flammeus	Short-eared Owl	SC	SC	S3S4B, SZN	G5
Aythya americana[e]	Redhead	—	—	S2, SZN	G5
Aythya marila[f]	Greater Scaup	—	—	S2B, SZN	G5
Aytha valisineria	Canvasback	—	—	S1B,S2N	G5
Baeolophus bicolor	Tufted Titmouse	—	—	S2S3	G5
Bucephala albeola[f]	Bufflehead	—	—	S3B, SZN	G5
Buteo lagopus[e]	Rough-legged Hawk	NAR	NAR	S1,SZN	G5
Buteo lineatus	Red-shouldered Hawk	NAR	SC	S4B,SZN	G5
Calidris alpina[e]	Dunlin	—	—	S3B, SZN	G5
Calidris melanotos[e]	Pectoral Sandpiper	—	—	SHB, SZN	G5
Calidris pusilla[e]	Semipalmated Sandpiper	—	—	S3S4B, SZN	G5
Casmerodius albus	Great Egret	—	—	S2B,SZN	G5
Charadrius melodus	Piping Plover	END	END-R	S1B,SZN	G3
Chlidonias niger	Black Tern	NAR	SC	S3B,SZN	G4
Dendroica cerulea	Cerulean Warbler	SC	SC	S3B,SZN	G4
Dendroica discolor	Prairie Warbler	NAR	NAR	S3S4B, SZN	G5

Table C-4: Significant Wildlife Species in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Falco peregrinus[e]	Peregrine Falcon	THR	END	S2S3,SZN	G4
Haliaeetus leucocephalus[e]	Bald Eagle	NAR	END-R	S4, SZN	G4
Icteria virens[e]	Yellow-breasted Chat	SC	SC	S2S3,SZN	G5
Ixobrychus exilis	Least Bittern	THR	THR	S3B,SZN	G5
Lanius excubitor[f]	Northern Shrike	—	—	S2S3B, SZN	—
Lanius ludovicianus	Loggerhead Shrike	END	END-R	S2B,SZN	G4
Larus marinus	Great Black-backed Gull	—	—	S2B,SZN	G5
Loxia leucoptera[h]	White-winged Crossbill	—	—	S1S2B, SZN	G5
Melanerpes erythrocephalus[e]	Red-headed Woodpecker	SC	SC	S3, SZN	—
Melanitta fusca[g]	White-winged Scoter	—	—	S1S2B, SZN	—
Nycticorax nycticorax	Black-crowned Night-heron	—	—	S3B,SZN	G5
Phalaropus tricolor	Wilson's Phalarope	—	—	S3B,SZN	—
Pica pica	Black-billed Magpie	—	—	S3?	G5
Pinicola encleator[f]	Pine Grosbeak	—	—	S3S4B, SZN	—
Podiceps auritus[g]	Horned Grebe	—	—	S1B, SZN	—
Rallus elegans	King Rail	END	END-R	S2B,SZN	G4G5
Sterna caspia	Caspian Tern	NAR	NAR	S3B,SZN	G5
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	—	—	S2S3B, SZN	G5

Table C-4: Significant Wildlife Species in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Mammal					
Myotis leibii	Small-footed Bat	—	—	S2S3	G3
Myotis septentrionalis	Northern Long-eared Bat	—	—	S3?	G4
Taxidea taxus	American Badger	END	END	S2	G5
Urocyon cinereoargenteus	Grey Fox	THR	THR	SZB?	G5
Herpetofauna					
Ambystoma hybrid population 1 (jeffersonianum genome dominates)	Jefferson X Blue-spotted Salamander, Jefferson genome dominates	See note below[d]	See note below[d]	S2	Hybrid
Clemmys guttata	Spotted Turtle	END	Not available	S3[C]	G5
Elaphe gloydi	Eastern Foxsnake	THR	THR	S3	G3
Emydoidea blandingii	Blanding's Turtle	THR	THR	S3	G4
Graptemys geographica	Northern Map Turtle	SC	SC	S3	G5
Lampropeltis triangulum	Eastern Milksnake	SC	SC	S3	G5
Thamnophis sauritus	Eastern Ribbonsnake	SC	SC	S3	G5
Regina septemvittata	Queen Snake	THR	THR	S2	G5
Sistrurus catenatus	Eastern Massassauga Rattlesnake	THR	THR	S3	G3G4
Insect					
Aeshna verticalis	Green-striped Darner	—	—	S2	G5

Table C-4: Significant Wildlife Species in Bruce County Based on a Review of the Natural Heritage Information Centre Database (2006) (continued)

Scientific Name	Common Name	COSEWIC Status[b]	COSSARO Status[a]	OMNR Provincial Ranking[a]	Global Ranking[a]
Amphiagrion saucium	Eastern Red Damsel	—	—	S3	G5
Boyeria grafiana	Ocellated Darner	—	—	S3	G5
Brychius hungerfordi	Hungerford's Crawling Water Beetle	—	—	S1	G1
Cicindela hirticollis	Beach-dune Tiger Beetle	—	—	S2?	G5
Erynnis brizo	Sleepy Duskywing	—	—	S1	G5
Somatochlora tenebrosa	Clamp-tipped Emerald	—	—	S2	G5
Somatochlora walshii	Brush-tipped Emerald	—	—	S3	G5
Somatochlora williamsoni	Williamson's Emerald	—	—	S3	G5
Stylogomphus albistylus	Least Clubtail	—	—	S3	G5
Stylurus scudderi	Zebra Clubtail	—	—	S3	G4
Sympetrum danae	Black Meadowhawk	—	—	S4	G5

Notes:
Shading indicates species found within the Regional Study Area boundary.
— No designation
a Based on records in the NHIC database unless otherwise noted.
b Based on records in the COSEWIC database.
c This ranking is based on a review of the *Significant Wildlife Habitat Technical Guide* [39]; NHIC does not provide ranking information for spotted turtle on its searchable database.
d When jeffersonianum dominated hybrids are present, this indicates that pure *A. jeffersonianum* is almost certainly present also. Jefferson salamander (*A. jeffersonianum*) is designated as THR by COSEWIC and the OMNR.
e Based on records in the Ontario Breeding Bird Atlas [19].
f Presence based on field study conducted for *Bruce A Units 3&4 Restart Environmental Assessment Study Report* [55].
g Presence based on field study conducted for *2004 Annual Monitoring Report Environmental Assessment Bruce A Units 3 & 4 Restart Follow-up Program* [46].
h Presence based on field study conducted for *Bruce Nuclear Power Development Bioinventory Study – Final Report* [17].

Global Ranks:
G1 Extremely rare
G2 Very rare
G3 Rare to Uncommon

G4 Common
G5 Very Common
G#G# A numeric range rank (e.g., G2G3) is used to indicate any range of uncertainty about the status of the species or community.
T Denotes that the rank applies to a subspecies or variety.
G? Unranked, or, if following a ranking, rank tentatively assigned (e.g., G3?).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Designations:
END Endangered
THR Threatened
SC Special Concern
NAR Not at Risk

Provincial Ranks and OMNR Status:
S1 Critically Imperilled
S2 Imperilled
S3 Vulnerable
S4 Apparently Secure
SH Possibly Extirpated (Historically)
S#S# Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4, where SU is currently unrankable attributed to lack of information or because of substantially conflicting information about status or trends).
S#B – Indicates breeding and rank
SZB - Breeding migrants/vagrants
SZN - Non-breeding migrants/vagrants
NAR – Not at Risk
THR Threatened
SC Special Concern
END-R Endangered (Regulated under the *Ontario Endangered Species Act*)
END Endangered (not regulated)

Source: [27;19;55;46;17]

Table C-5: Species of Conservation Priority in Bruce County found within the Regional Study Area

Scientific Name	Common Name	Habitat[a]	Conservation Priority Level in Bruce County
Aegolius acadicus	Northern Saw-whet Owl	Forest	1
Asio otus	Long-eared Owl	Forest	1
Buteo lineatus	Red-shouldered Hawk	Forest	1
Caprimulgus vociferus	Whip-poor-will	Forest	1
Dendroica cerulea	Cerulean Warbler	Forest	1
Dendroica magnolia	Magnolia Warbler	Forest	1
Dendroica pensylvanica	Chestnut-sided Warbler	Forest	1
Melanerpes erythrocephalus	Red-headed Woodpecker	Forest	1
Sphyrapicus varius	Yellow-bellied Sapsucker	Forest	1
Vermivora chrysoptera	Golden-winged Warbler	Forest	1
Vermivora pinus	Blue-winged Warbler	Forest	1
Asio flammeus	Short-eared Owl	Marsh	1
Botaurus lentiginosus	American Bittern	Marsh	1
Chlidonias niger	Black Tern	Marsh	1
Cistothorus platensis	Sedge Wren	Marsh	1
Fulica americana	American Coot	Marsh	1
Gavia immer	Common Loon	Marsh	1
Ixobrychus exilis	Least Bittern	Marsh	1
Nycticorax nycticorax	Black-crowned Night-Heron	Marsh	1
Porzana carolina	Sora	Marsh	1
Rallus limicola	Virginia Rail	Marsh	1
Chordeiles minor	Common Nighthawk	Open Country	1
Lanius ludovicianus	Loggerhead Shrike	Open Country	1
Mimus polyglottos	Northern Mockingbird	Open Country	1
Sialia sialis	Eastern Bluebird	Open Country	1
Spiza americana	Dickcissel	Open Country	1
Spizella pallida	Clay-coloured Sparrow	Open Country	1
Sturnella neglecta	Western Meadowlark	Open Country	1
Toxostoma rufum	Brown Thrasher	Open Country	1

Table C-5: Species of Conservation Priority in Bruce County found within the Regional Study Area (continued)

Scientific Name	Common Name	Habitat[a]	Conservation Priority Level in Bruce County
Accipiter gentilis	Northern Goshawk	Forest	2
Accipiter striatus	Sharp-shinned Hawk	Forest	2
Archilochus colubris	Ruby-throated Hummingbird	Forest	2
Buteo platypterus	Broad-winged Hawk	Forest	2
Carpodacus purpureus	Purple Finch	Forest	2
Catharus fuscescens	Veery	Forest	2
Certhia americana	Brown Creeper	Forest	2
Coccyzus erythropthalmus	Black-billed Cuckoo	Forest	2
Contopus borealis	Olive-sided Flycatcher	Forest	2
Dendroica caerulescens	Black-throated Blue Warbler	Forest	2
Dendroica virens	Black-throated Green Warbler	Forest	2
Dryocopus pileatus	Pileated Woodpecker	Forest	2
Oporornis philadelphia	Mourning Warbler	Forest	2
Pipilo erythrophthalmus	Eastern Towhee	Forest	2
Piranga olivacea	Scarlet Tanager	Forest	2
Seiurus noveboracensis	Northern Waterthrush	Forest	2
Setophaga ruticilla	American Redstart	Forest	2
Strix varia	Barred Owl	Forest	2
Vermivora ruficapilla	Nashville Warbler	Forest	2
Wilsonia canadensis	Canada Warbler	Forest	2
Zonotrichia albicollis	White-throated Sparrow	Forest	2
Anas discors	Blue-winged Teal	Marsh	2
Anas rubripes	American Black Duck	Marsh	2
Aythya affinis	Lesser Scaup	Marsh	2
Cistothorus palustris	Marsh Wren	Marsh	2
Melospiza georgiana	Swamp Sparrow	Marsh	2
Podilymbus podiceps	Pied-billed Grebe	Marsh	2
Progne subis	Purple Martin	Marsh	2

Table C-5: Species of Conservation Priority in Bruce County found within the Regional Study Area (continued)

Scientific Name	Common Name	Habitat[a]	Conservation Priority Level in Bruce County
Bartramia longicauda	Upland Sandpiper	Open Country	2
Dolichonyx oryzivorus	Bobolink	Open Country	2
Falco sparverius	American Kestrel	Open Country	2
Passerculus sandwichensis	Savannah Sparrow	Open Country	2
Riparia riparia	Bank Swallow	Open Country	2
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Open Country	2
Sturnella magna	Eastern Meadowlark	Open Country	2
Accipiter cooperii	Cooper's Hawk	Forest	3
Bonasa umbellus	Ruffed Grouse	Forest	3
Cathartes aura	Turkey Vulture	Forest	3
Catharus guttatus	Hermit Thrush	Forest	3
Catharus ustulatus	Swainson's Thrush	Forest	3
Coccothraustes vespertinus	Evening Grosbeak	Forest	3
Coccyzus americanus	Yellow-billed Cuckoo	Forest	3
Dendroica coronata	Yellow-rumped Warbler	Forest	3
Dendroica pinus	Pine Warbler	Forest	3
Empidonax alnorum	Alder Flycatcher	Forest	3
Empidonax minimus	Least Flycatcher	Forest	3
Melanerpes carolinus	Red-bellied Woodpecker	Forest	3
Mniotilta varia	Black-and-white Warbler	Forest	3
Regulus satrapa	Golden-crowned Kinglet	Forest	3
Sayornis phoebe	Eastern Phoebe	Forest	3
Sitta canadensis	Red-breasted Nuthatch	Forest	3
Troglodytes troglodytes	Winter Wren	Forest	3
Vireo philadelphicus	Philadelphia Vireo	Forest	3
Vireo solitarius	Blue-headed Vireo	Forest	3
Anas americana	American Wigeon	Marsh	3
Anas strepera	Gadwall	Marsh	3

Table C-5: Species of Conservation Priority in Bruce County found within the Regional Study Area (continued)

Scientific Name	Common Name	Habitat[a]	Conservation Priority Level in Bruce County
Aythya collaris	Ring-necked Duck	Marsh	3
Pandion haliaetus	Osprey	Marsh	3
Actitis macularia	Spotted Sandpiper	Open Country	3
Ammodramus savannarum	Grasshopper Sparrow	Open Country	3
Carduelis tristis	American Goldfinch	Open Country	3
Eremophila alpestris	Horned Lark	Open Country	3
Hirundo rustica	Barn Swallow	Open Country	3
Petrochelidon pyrrhonota	Cliff Swallow	Open Country	3
Pooecetes gramineus	Vesper Sparrow	Open Country	3
Tyrannus tyrannus	Eastern Kingbird	Open Country	3
Aix sponsa	Wood Duck	Forest	4
Corvus corax	Common Raven	Forest	4
Dendroica tigrina	Cape May Warbler	Forest	4
Dumetella carolinensis	Gray Catbird	Forest	4
Icterus spurius	Orchard Oriole	Forest	4
Junco hyemalis	Dark-eyed Junco	Forest	4
Lophodytes cucullatus	Hooded Merganser	Forest	4
Poecile atricapilla	Black-capped Chickadee	Forest	4
Regulus calendula	Ruby-crowned Kinglet	Forest	4
Scolopax minor	American Woodcock	Forest	4
Seiurus aurocapilla	Ovenbird	Forest	4
Vireo flavifrons	Yellow-throated Vireo	Forest	4
Butorides virescens	Green Heron	Marsh	4
Circus cyaneus	Northern Harrier	Marsh	4
Gallinula chloropus	Common Moorhen	Marsh	4
Grus canadensis	Sandhill Crane	Marsh	4
Phalaropus tricolor	Wilson's Phalarope	Marsh	4

Table C-5: Species of Conservation Priority in Bruce County found within the Regional Study Area (continued)

Scientific Name	Common Name	Habitat[a]	Conservation Priority Level in Bruce County
Sterna hirundo	Common Tern	Marsh	4
Spizella pusilla	Field Sparrow	Open Country	4

Notes:
a Habitat designations are based on those provided in *Conservation Priorities for the Birds of Southern Ontario* [51].
Source: [51;19]

APPENDIX D: VASCULAR PLANTS ON AND AROUND THE PROJECT AREA

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Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Trees (16 taxa)					
Abies balsamea	Balsam fir	N	—	G5	S5
Acer rubrum	Red maple	N	—	G5	S5
Betula papyrifera	White birch	N	—	G5	S5
Fraxinus americana	White ash	N	—	G5	S5
Fraxinus pennsylvanica	Red ash	N	—	G5	S5
Picea glauca	White spruce	N	—	G5	S5
Picea pungens	Blue spruce	I	—	G5	SE1
Picea rubens	Red spruce	N	—	G5	S3
Pinus nigra	Austrian pine	I	—	G?	SE2
Pinus strobus	White pine	N	—	G5	S5
Pinus sylvestris	Scots pine	I	—	G5?	SE5
Populus balsamifera	Balsam poplar	N	—	G5	S5
Populus x canadensis	Carolina poplar	I	—	HYB	SE1
Populus deltoides	Eastern cottonwood	N	—	G5T4T5	S5
Populus tremuloides	Trembling aspen	N	—	G5	S5
Thuja occidentalis	Eastern white cedar	N	—	G5	S5
Small trees, shrubs and woody vines (19 taxa)					
Berberis vulgaris	Common barberry	I	—	G?	SE5
Caragana arborescens	Peashrub	I	—	G?	SE1
Cornus rugosa	Round-leaved dogwood	N	—	G5	S5
Cornus stolonifera	Red osier dogwood	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Elaeagnus angustifolia	Russian olive	I	—	G?	SE3
Hypericum kalmianum	Kalm's St. John's-wort	N	—	G4	S4
Juniperus communis	Common juniper	N	—	G5	S5
Potentilla fruticosa	Shrubby cinquefoil	N	—	G5	S5
Prunus virginiana	Choke cherry	N	—	G5	S5
Rhus radicans	Poison-ivy	N	—	G5T5	S5
Rosa multiflora	Multiflora rose	I	—	G?	SE4
Rubus idaeus	Red raspberry	N	—	G5T5	S5
Rubus pubescens	Dwarf raspberry	N	—	G5	S5
Salix exigua	Sandbar willow	N	—	G5	S5
Salix pedicellaris	Bog willow	N	—	G5	S5
Salix petiolaris	Slender willow	N	—	G5	S5
Shepherdia canadensis	Soapberry	N	—	G5	S5
Syringa vulgaris	Lilac	I	—	G?	SE5
Vitis riparia	Riverbank grape	N	—	G5	S5
Ferns and allies (5 taxa)					
Equisetum arvense	Field horsetail	N	—	G5	S5
Equisetum variegatum	Variegated scouring-rush	N	—	G5	S5
Onoclea sensibilis	Sensitive fern	N	—	G5	S5
Pteridium aquilinum	Bracken	N	—	G5	S5
Thelypteris palustris	Marsh fern	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Graminoids (50 taxa)					
Agrostis gigantea	Red top	I	—	G4G5	SE5
Agrostis stolonifera	Creeping bent	I	—	G5	S5
Bromus inermis	Smooth brome	I	—	G5T?	SE5
Carex aurea	Golden sedge	N	—	G5	S5
Carex bebbii	Sedge	N	—	G5	S5
Carex cryptolepis	Sedge	N	—	G4	S4
Carex eburnea	Sedge	N	—	G5	S5
Carex flava	Sedge	N	—	G5	S5
Carex granularis	Sedge	N	—	G5	S5
Carex pellita	Sedge	N	—	G5	S5
Carex pseudocyperus	Sedge	N	—	G5	S5
Carex retrorsa	Sedge	N	—	G5	S5
Carex tenera	Sedge	N	—	G5	S5
Carex viridula	Sedge	N	—	G5	S5
Carex vulpinoidea	Fox sedge	N	—	G5	S5
Cladium mariscoides	Twig-rush	N	—	G5	S5
Dactylis glomerata	Orchard grass	I	—	G?	SE5
Danthonia spicata	Poverty oat-grass	N	—	G5	S5
Eleocharis elliptica	Spike-rush	N	—	G5	S5
Eleocharis erythropoda	Spike-rush	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Eleocharis smallii	Spike-rush	N	—	G5?	S5
Elymus repens	Quack grass	I	—	G5	SE5
Eragrostis minor	Little love-grass	I	—	G?	SE5
Festuca pratensis	Meadow fescue	I	—	G5	SE5
Glyceria borealis	Northern manna grass	N	—	G5	S5
Glyceria striata	Fowl manna grass	N	—	G5T5	S4S5
Juncus alpinoarticulatus	Alpine rush	N	—	G5	S5
Juncus articulatus	Jointed rush	N	—	G5	S5
Juncus balticus	Baltic rush	N	—	G5	S5
Juncus dudleyi	Path rush	N	—	G5	S5
Juncus effusus	Soft rush	N	—	G5	S5
Juncus nodosus	Knotted rush	N	—	G5	S5
Juncus tenuis	Path rush	N	—	G5	S5
Leersia oryzoides	Rice cut-grass	N	—	G5	S5
Panicum acuminatum	Panic grass	N	—	G5T5	S4S5
Phalaris arundinacea	Reed canary grass	N	—	G5	S5
Phleum pratense	Timothy	I	—	G?	SE5
Phragmites australis	Common reed	N	—	G5	S5
Poa compressa	Canada bluegrass	I	—	G?	SE5
Schoenoplectus acutus	Hardstem bulrush	N	—	G5	S5
Schoenoplectus pungens	Common three-square	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Schoenoplectus tabernaemontani	Softstem bulrush	N	—	G?	S5
Scirpus atrovirens	Black bulrush	N	—	G5?	S5
Scirpus cyperinus	Wool-grass	N	—	G5	S5
Scirpus pendulus	Bulrush	N	—	G5	S5
Setaria pumila	Yellow foxtail	I	—	G?	SE5
Sorghastrum nutans	Indian grass	N	—	G5	S4
Sporobolus neglectus	Dropseed	N	—	G5	S4
Typha angustifolia	Narrow-leaved catttail	N	—	G5	SE5
Typha latifolia	Common cattail	N	—	G5	S5
Forbs (91 taxa)					
Achillea millefolium	Common yarrow	I	—	G5T?	SE
Agrimonia gryposepala	Common agrimony	N	—	G5	S5
Alisma plantago-aquatica	Water plantian	N	—	G5	S5
Anagallis arvensis	Scarlet pimpernel	I	—	G?	SE4
Anaphalis margaritacea	Pearly everlasting	N	—	G5	S5
Aquilegia canadensis	Wild columbine	N	—	G5	S5
Aralia nudicaulis	Wild sarsaparilla	N	—	G5	S5
Asclepias syriaca	Common milkweed	N	—	G5	S5
Aster	see *Eurybia, Symphyotrichum*				
Bidens frondosa	Beggar-ticks	N	—	G5	S5
Campanula rotunidfolia	Harebell	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Centaurea jacea	Brown knapweed	I	—	G?	SE5
Centaurea stoebe	Spotted knapweed	I	—	G?	SE5
Centaurium pulchellum	Branched centaury	I	—	G?	SE3
Cerastium fontanum	Mouse-ear chickweed	I	—	G?	SE5
Chaenorrhinum minus	Dwarf snap-dragon	I	—	G?	SE5
Chrysanthemum	see *Leucanthemum*				
Cichorium intybus	Chicory	I	—	G?	SE5
Cirsium arvense	Canada thistle	I	—	G?	SE5
Cirsium vulgare	Bull thistle	I	—	G5	SE5
Clinopodium vulgare	Wild basil	N	—	G5	S5
Comandra umbellata	Bastard toad-flax	N	—	G5	S5
Coronilla varia	Crown vetch	I	—	G?	SE5
Cynoglossum officinale	Hound's-tongue	I	—	G?	SE5
Daucus carota	Wild carrot	I	—	G?	SE5
Dianthus armeria	Deptford pink	I	—	G?	SE5
Echium vulgare	Viper's bugloss	I	—	G?	SE5
Erigeron annuus	Daisy fleabane	N	—	G5	S5
Erigeron philadelphicus	Philadelphia fleabane	N	—	G5T5	S5
Erucastrum gallicum	Dog-mustard	I	—	G5	SE5
Erysimum cheiranthoides	Wormseed mustard	I	—	G5	SE5
Eurybia macrophylla	Large-leaved aster	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Euthamia graminifolia	Grass-leaved goldenrod	N	—	G5	S5
Fallopia convolvulus	Black bindweed	I	—	G?	SE5
Fragaria virginiana	Common strawberry	N	—	G5	S5
Galium palustre	Marsh bedstraw	N	—	G5	S5
Gentianopsis virgata	Fringed gentian	N	—	G5	S4
Hypericum perforatum	Common St. John's-wort	I	—	G?	SE5
Lactuca canadensis	Canada lettuce	N	—	G5	S5
Leucanthemum vulgare	Ox-eye daisy	I	—	G?	SE5
Linaria vulgaris	Butter-and-eggs	I	—	G?	SE5
Lobelia kalmii	Kalm's lobelia	N	—	G5	S5
Lobelia spicata	Spiked lobelia	N	—	G5	S4
Lotus corniculatus	Bird's-foot trefoil	I	—	G?	SE5
Lycopus americanus	American water-horehound	N	—	G5	S5
Lycopus uniflorus	Northern water-horehound	N	—	G5	S5
Lysimachia quadriflora	Four-flowered loosestrife	N	—	G5?	S4
Lythrum salicaria	Purple loosestrife	I	—	G5	SE5
Maianthemum canadense	Canada mayflower	N	—	G5	S5
Matricaria chamomilla	Stinking mayweed	I	—	G?	SE
Matricaria discoidea	Pineapple-weed	I	—	G5	SE5
Melilotus alba	White sweet clover	I	—	G5	SE5
Mentha arvensis	Field mint	N	—	G5	S5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Mimulus ringens	Square-stemmed monkey-flower	N	—	G5	S5
Nasturtium microphyllum	Water-cress	I	—	G?	SE5
Nepeta cataria	Catnip	I	—	G?	SE5
Oenothera biennis	Common evening-primrose	N	—	G5	S5
Pedicularis canadensis	Canada wood-betony	N	—	G5	S5
Persicaria amphibium	Water smartweed	N	—	G5	S5
Persicaria lapathifolia	Pale smartweed	N	—	G5	S5
Plantago lanceolata	Narrow-leaved plantain	I	—	G5	SE5
Plantago major	Common plantain	I	—	G5	SE5
Platanthera aquilonis	Northern green bog orchid	N	—	G5	S5
Polygonum amphibium	see *Persicaria*				
Polygonum convolvulus	see *Fallopia*				
Potamogeton	see also *Stuckenia*				
Potamogeton gramineus	Variable leaf (common) pondweed	N	—	G5	S5
Potamogeton natans	Floating-leaved pondweed	N	—	G5	S5
Potentilla anserina	Silverweed	N	—	G5	S5
Proserpinaca palustris	Mermaidweed	N	—	G5	S4
Prunella vulgaris lanceolata	Heal-all	N	—	G5T5	S5
Ranunculus acris	Common buttercup	I	—	G5	SE5
Rumex crispus	Curled dock	I	—	G?	SE5
Sanguisorba minor	Lesser burnet	I	—	G5	SE4

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Scutellaria lateriflora	Mad-dog scullcap	N	—	G5	S5
Senecio viscosus	Sticky groundsel	I	—	G?	SE3
Silene vulgaris	Bladder campion	I	—	G?	SE5
Sinapis arvensis	Charlock	I	—	G?	SE5
Sisyrinchium mucronatum	Blue-eyed grass	N	—	G5	S4S5
Solidago altissima	Tall goldenrod	N	—	G5T?	S5
Solidago caesia	Blue-stemmed goldenrod	N	—	G5	S5
Solidago canadensis	Canada goldenrod	N	—	G5T5	S5
Solidago flexicaulis	Zig-zag goldenrod	N	—	G5	S5
Solidago hispida	Hairy goldenrod	N	—	G5	S5
Solidago nemoralis	Gray goldenrod	N	—	G5T5	S5
Solidago ohioensis	Ohio goldenrod	N	—	G4	S4
Sonchus arvensis	Common sow-thistle	I	—	G?T?	SE5
Sonchus asper	Spiny sow-thistle	I	—	G?	SE5
Stuckenia pectinata	Sago pondweed	N	—	G5	S5
Symphyotrichum lanceolatum	Panicled aster	N	—	G5T?	S5
Taraxacum officinale	Common dandelion	I	—	G5	SE5
Tragopogon dubius	Goat's-beard	I	—	G?	SE5
Tussilago farfara	Colt's-foot	I	—	G?	SE5
Urtica dioica	Stinging nettle	N	—	G5T?	S5
Verbascum thapsus	Common mullein	I	—	G?	SE5

Table D-1: Vascular Plants on and Around the Proposed DGR Project Area, Based on Field Work in 2007 and 2009 (continued)

Scientific Name[a]	Common Name[b]	Origin[b]	Status[b]	G Rank[c]	S Rank[c]
Veronica officinalis	Common speedwell	I	—	G5	SE5

Notes:
a Scientific names follow Morton & Venn [70] and published volumes of the Flora of North America (1993-2006).
b Common names and origin based upon Varga et al. [71] and NHIC.
Origin: N = Native; (N) = Native but not in study area region; I = Introduced.
Status: P = Provincial; R = Regional (OMNR Central Region); L = Local (County or R.M.).
END= Endangered; SC = Special Concern; THR = Threatened.
c Ranks based upon determinations made by the NHIC.
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
E = Exotic; Q = Taxonomic questions not fully resolved; T = sub-specific taxon (taxa) present in the province.

APPENDIX E: INCIDENTAL OBSERVATIONS DURING FIELD STUDIES

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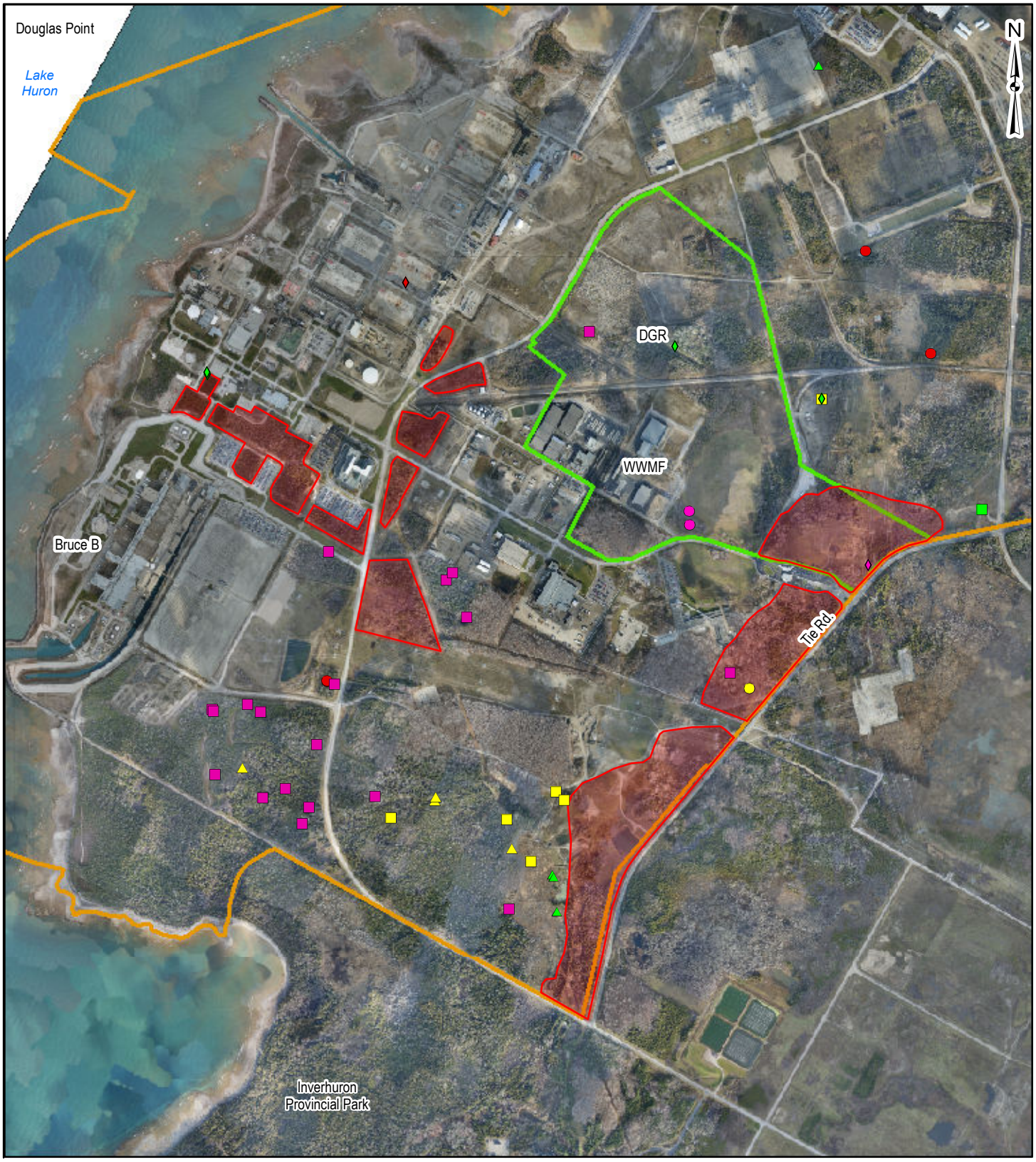

LEGEND

- Beaver
- Cottontail Rabbit
- Coyote
- Downy Woodpecker
- Eastern Grey Squirrel
- Pileated Woodpecker
- Ruffed Grouse
- Snowshoe Hare
- Striped Skunk
- Unknown Duck Species
- Weasel
- Project Area (OPG- retained lands that encompass the DGR Project)
- Site Study Area [1]
- Significant Turkey Habitat

0 250 500 1,000

Metres

NOTES

1. Site Study Area is defined by EIS Guidelines as: "includes the facilities, buildings and infrastructure at the Bruce nuclear site, including the existing licensed exclusion zone for the site on land and within Lake Huron, and particularly the property where the Deep Geologic Repository is proposed.

REFERENCE

Base Data Provided by 4DM, November 2007. Imagery and Topo Collected and Processed by Terrapoint Canada Inc., Acquisition Date: Nov. 12, 14, and 15, 2006, Ground Resolution: 0.25m, Datum: NAD 83 Projection: UTM Zone 17N

PROJECT

TERRESTRIAL ENVIRONMENT
TECHNICAL SUPPORT DOCUMENT

TITLE

INCIDENTAL WINTER WILDLIFE OBSERVATIONS IN THE SITE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 06-1112-037			SCALE: AS SHOWN	R000
DESIGN	ASB	17 Oct. 2007	APPENDIX E-1	
GIS	BC	20 Apr. 2010		
CHECK	NS	20 Apr. 2010		
REVIEW	AB	20 Apr. 2010		

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