Environment and Climate Change Canada
Environnement et Changement climatique Canada

ENVIRONMENT AND CLIMATE CHANGE CANADA'S FINAL SUBMISSION TO THE JOINT REVIEW PANEL REGARDING THE MARATHON PALLADIUM PROJECT PROPOSED BY GENERATION PGM INC.

FEBRUARY 25, 2022

Canada

Address for Communications:

Communications may be sent to Environment and Climate Change Canada at the Address below.

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Date

February 25, 2022

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EXECUTIVE SUMMARY

In its letter of December 17, 2021 the Joint Review Panel overseeing the Marathon Palladium Project requested that Environment and Climate Change Canada (ECCC):

> *…participate in the public hearing in accordance with section 8.1 of the Amended Joint Review Panel Agreement and section 20 of the Canadian Environmental Assessment Act, 2012. The Panel expects that ECCC will provide a technical written submission, make an oral presentation and participate actively in the public hearing.*
>
> *The Panel requests that ECCC provide a technical written submission on the potential environmental effects of the Project including recommendations as they relate to ECCC's expertise. In particular, the Panel requests that the following topics be discussed: air quality; water quality; metal speciation and treatment; Hydrology; species at risk; migratory birds; greenhouse gas emissions; climate change; effects from accidents and malfunctions; and, cumulative effects in the region, including impacts from forest harvesting on species at risk and migratory birds.*[1]

ECCC's review of Generation PGM Incorporated's ('GenPGM') proposed Marathon Palladium Project (the Project) is based on the Department's mandate and the federal legislation it administers.

ECCC's legislative framework for protecting and managing the environment is founded on various statutes, including the *Migratory Birds Convention Act*, the *Species at Risk Act*, the pollution prevention provisions of the *Fisheries Act*, and the *Canadian Environmental Protection Act, 1999*.

ECCC is participating in the environmental assessment process to provide the Joint Review Panel (the Panel) with:

- A review of GenPGM's characterization of effects to determine the potential environmental effects of the Project;
- A review of the predicted effectiveness of the proposed mitigation measures and considerations for additional mitigation measures;
- A review of the appropriateness of the proposed follow-up programs; and
- Advice on monitoring needs (either site specific, local or regional) in order to enable adaptive management of impacts experienced during the construction, operations and closure phases.

[1] From the Joint Review Panel to various Federal and Provincial Authorities re: Invitation to participate in the Public Hearing for the Marathon Palladium Project – Letter to Environment and Climate Change Canada 142414E.pdf (iaac-aeic.gc.ca)

During ECCC's technical review, departmental experts identified various issues with respect to GenPGM's assessment of the potential environmental effects of the Project and proposed mitigation measures. Some of these were resolved in whole or in part by GenPGM in their responses to Information Requests. ECCC has identified elements of GenPGM's assessment which may pose a risk to the environment if not appropriately characterized, including predicted effects to water quality, air quality, effects to migratory birds and on species at risk including Woodland Caribou, and the effects of climate change on the Project's design.

The submission provides advice and recommendations based on a review of the information provided by GenPGM within its application pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This submission also accounts for information posted on the Canadian Impact Assessment Registry (CIAR) and ECCC's supporting science. ECCC's recommendations to the Panel are summarized in Chapter 9. ECCC will be pleased to discuss these matters during the public hearings including the topics raised in the December 17, 2021 (CIAR #962) letter from the Panel to ECCC.

ECCC's submission provides information and recommendations pertaining to:

- The effects of the Project on the aquatic environment including a discussion on seepage and water quality predictions for mercury and methylmercury;
- The effects of the Project on air quality;
- The effects of the Project on wildlife, including migratory birds and species at risk, including caribou;
- Schedule 2 amendments under *Metal and Diamond Mining Effluent Regulations*
- The contribution of the Project to greenhouse gas emissions and the effects of climate change on the Project's design; and
- Spill response measures and programs.

ABBREVIATIONS

AAQC	Ambient Air Quality Criteria (criteria established by the Ontario Ministry of the Environment, Conservation and Parks)
AOC	Area of Concern
AQMS	Air Quality Management System
BAT/BEP	Best Available Technology/ Best Environmental Practice
BMP	Best Management Practices
CAAQS	Canadian Ambient Air Quality Standards
CACs	Criteria Air Contaminants
CCME	Canadian Council of Ministers of the Environment
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEPA, 1999	*Canadian Environmental Protection Act, 1999*
CIAR	Canadian Impact Assessment Registry
CMCs	Chemicals of Mutual Concern
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	CO_2 equivalent
COA	Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health, 2021
COPC	Contaminants of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
dB	Decibel
DFO	Department of Fisheries and Oceans
ECCC	Environment and Climate Change Canada
EDS	Environmental Design Storm
EEM	Environmental Effects Monitoring
EER	*Environmental Emergency Regulations 2019*
EI	Emissions Intensity

EIS	Environment Impact Statement
EPRP	Emergency Preparedness and Response Plan
FBMP	Forest Bird Monitoring Program
FHCOP	Fish Habitat Compensation and Offsetting Plan
FMU	Forest Management Unit
FRI	Forest Resource Inventory
GenPGM	Generation PGM Inc.
GHG	Greenhouse Gas
GLWQA 2012	Canada-United States Great Lakes Water Quality Agreement *2012*
ha	Hectare
IAAC	Impact Assessment Agency of Canada
IDF	Intensity-Duration-Frequency
IPCC	Intergovernmental Panel on Climate Change
IR	Information Request
Kt	Kilotonne
km	Kilometer
LAMP	Lakewide Action and Management Plan
LSA	Local Study Area
LSCR	Lake Superior Coast Range
m	Metres
m^3/d	Cubic Metres per Day
MAF	Mean Annual Flow
MBCA	*Migratory Birds Convention Act, 1994*
MBR	*Migratory Birds Regulations*
MDMER	*Metal and Diamond Mining Effluent Regulations*
MECP	Ontario Ministry of the Environment, Conservation and Parks
mg/l	Milligrams per litre
MMF	Mean Monthly Flows

MRSA	Mine Rock Storage Area
NAPS	National Air Pollution Surveillance
NDC	Nationally Determined Contribution
NDMNRF	Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPRI	National Pollutant Release Inventory
O. Reg 419/05	Ontario Regulation 419/05: Air Pollution – Local Air Quality
PAG	Potentially Acid Generating
PCA	Parks Canada Agency
PCBs	Poly Chlorinated Biphenyls
PCF	Pan-Canadian Framework on Clean Growth and Climate Change
PIL	Project Inclusion List
PM	Particulate Matter
PM_{10}	Airborne particulate matter with a mass median diameter less than 10 µm.
$PM_{2.5}$	Airborne particulate matter with a mass median diameter less than 2.5 µm.
PSMF	Process Solids Management Facility
PWQO	Provincial Water Quality Objective
RCP	Representative Concentration Pathway
RSA	Regional Study Area
SACC	Strategic Assessment of Climate Change
SAR	Species at Risk
SARA	*Species at Risk Act*
SO_2	Sulphur Dioxide
SSA	Site Study Area
t	Tonne
TIA	Tailings Impoundment Area

TSP	Total Suspended Particles
U.S.	United States
US EPA AP-42	United States Environmental Protection Agency Air Pollutant-42: Compilation of Air Pollutant Emission Factors
VC	Valued Component
VOC	Volatile Organic Compound
WMP	Water Management Pond
WNS	White-Nose Syndrome
WSER	*Waste Systems Effluent Regulations*

CHAPTER 1 - Introduction

This submission summarizes Environment and Climate Change Canada (ECCC)'s review of the environmental assessment material and supporting information provided by Generation PGM Inc. (Gen PGM) throughout the review process. It focuses on elements that are within ECCC's mandate and expertise. The submission includes outstanding concerns with the characterization of effects that ECCC has identified and provides recommendations for consideration by the Panel.

ECCC was established under the *Department of the Environment Act*. ECCC's mandate is determined by the statutes and regulations under the responsibility of the Minister of Environment and Climate Change. In delivering this mandate, ECCC is responsible for the development and implementation of policies, guidelines, codes of practice, inter-jurisdictional and international agreements, as well as related programs. ECCC's specialist advice is provided in the context of the *Canadian Environmental Protection Act, 1999* (CEPA, 1999), the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act* (MBCA), and the *Species at Risk Act* (SARA).

ECCC administers the pollution prevention provisions of the *Fisheries Act*, which prohibits the deposit of a deleterious substance into fish-bearing waters. ECCC also regulates toxic substances and develops environmental quality guidelines under CEPA, 1999. ECCC is responsible for protecting and conserving migratory bird populations and individuals under the MBCA. ECCC also administers SARA, in cooperation with Fisheries and Oceans Canada (DFO) and Parks Canada Agency (PCA), to prevent wildlife species from becoming extirpated or extinct; to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity; and to manage species of special concern to prevent them from becoming threatened, endangered or extirpated.

ECCC's review of GenPGM's assessment of the environmental effects and mitigation measures related to the Project is informed by the precautionary principle, meaning that when there is an absence of full scientific certainty ECCC has adopted a precautionary approach in providing expert advice to avoid, as much as possible, serious or irreversible harm to the environment.

A summary of ECCC's mandate and legislation is provided in Chapter 2. Chapters 3-8 provide information on topics where the effects of the project on the environment have not been fully characterized or mitigated. Chapter 9 summarizes ECCC's recommendations.

CHAPTER 2 - Environment and Climate Change Canada: Mandate, Roles and Responsibilities

The scope of specialist or expert information or knowledge provided by ECCC in this submission to the Panel is within the Department's mandate as defined by the *Department of the Environment Act* and through other legislation assigned to the Minister of Environment and Climate Change.

ECCC's comments and recommendations in relation to the Project are intended to provide specialist or expert information or knowledge to the Panel in accordance with ECCC's program related responsibilities and associated guidelines and policies. These comments are not to be interpreted as any type of acknowledgement, permission, approval, authorization, or release of liability related to any requirements to comply with federal statutes and regulations. Responsibility for achieving regulatory compliance lies solely with GenPGM.

The following information provides an overview of the legislative, policy or other directives under the responsibility of ECCC that may relate to the Project, or the environmental assessment. The summaries have been prepared for ease of reference and convenience, but for purposes of accuracy, interpretation and application of the legislation, regulation or policy, the Panel is invited to refer to the original documents including any subsequent amendments.

2.1 Environmental Protection

2.1.1 *Department of the Environment Act*

https://laws-lois.justice.gc.ca/eng/acts/E-10/

The *Department of the Environment Act* established ECCC as a department within the portfolio of the Minister of Environment and Climate Change responsible for preserving and enhancing the quality of the natural environment, providing meteorological services, and coordinating policies and programs to achieve environmental objectives.

2.2 Pollution Prevention

2.2.1 *Canadian Environmental Protection Act, 1999* (CEPA, 1999)

https://laws-lois.justice.gc.ca/eng/acts/c-15.31/

The *Canadian Environmental Protection Act, 1999* (CEPA, 1999) provides the Government of Canada with tools to protect the environment and human health and establishes strict deadlines for controlling certain toxic substances. A key aspect of CEPA, 1999 is the prevention and management of risks posed by toxic and other harmful substances. Substances that are declared "toxic" under CEPA, 1999 are added to the List of Toxic Substances in Schedule 1 of the Act. CEPA, 1999 regulates many of the substances that have a harmful effect on the environment; therefore, the Project may be subject to several

regulations under CEPA, 1999, including but not limited to those outlined in ECCC's submission.

2.2.2 National Pollutant Release Inventory Reporting

http://www.ec.gc.ca/inrp-npri/

Under the authority of section 46 of CEPA, 1999, ECCC collects information concerning the quantities of certain substances that are released or disposed of by regulated facilities and publishes this information in the National Pollutant Release Inventory (NPRI). Facilities must comply with the ministerial notice and communicate the required information concerning the substances they release.

2.2.3 *Fisheries Act* – Certain Provisions

http://laws.justice.gc.ca/eng/acts/F-14/

Under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), water quality is assessed under sections 5(1) (a) for its potential to impact fish, aquatic species and migratory birds; under 5(1) (b) (ii) for its potential to cause an environmental change outside the province of the Project; and under 5(1) (c) for its potential to affect Aboriginal uses and interests. Efforts taken under CEPA, 1999 are complemented by actions taken under other federal Acts administered by the Minister of Environment and Climate Change. ECCC's mandate for water quality stems from the pollution prevention provisions of the *Fisheries Act* (including section 26), which are administered and enforced by ECCC. The Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the *Fisheries Act* states that compliance with the federal *Fisheries Act* is mandatory. Subsection 36(3) of the *Fisheries Act* specifies that, unless authorized by federal regulation, no person shall deposit or permit the deposit of deleterious substances of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water. Proponents should note that only a federal regulation under the *Fisheries Act* or another Act of Parliament can authorize a discharge of a deleterious substance; no federal permit, provincial, territorial or municipal regulatory permit or approval allows for exemption from the *Fisheries Act*.

In the application of the *Fisheries Act*, court cases have accepted that a discharge or effluent that is acutely lethal to fish is deleterious. In other words, results of tests designed to determine whether fish will die in an effluent or discharge within a specified time period will determine one aspect of deleteriousness. However, any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat is also deleterious. For example, substances (such as sediment) that smother nesting areas or spawning grounds, or interfere with reproduction, feeding or respiration of fish at any point in their life cycle are also considered deleterious. In general, any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat may be considered deleterious. Heated discharges are also considered deleterious since the definition of deleterious (*Fisheries Act* section 34) also

includes water that has been so changed by heat that it can be deleterious to fish and fish habitat.

The act of depositing a deleterious substance should be considered a violation of the *Fisheries Act*, regardless of whether the water itself is made deleterious by the deposit. Subsection 36(3) of the *Fisheries Act* makes no allowance for a mixing or dilution zone. Any measurements or tests to determine whether something is deleterious should be done where the substance is at its highest concentration, typically at the point of discharge to the receiving water.

Compliance with the terms and conditions of provincial regulatory or permitting requirements does not absolve GenPGM from responsibility to comply with the requirements of the *Fisheries Act* or other federal legislation. Further, this submission does not constitute an authorization pursuant to subsection 36(4) of the *Fisheries Act.*

2.2.4 *Metal and Diamond Mining Effluent Regulations* (MDMER)

https://laws-lois.justice.gc.ca/eng/regulations/sor-2002-222/index.html

Subsection 36(3) of the *Fisheries Act* prohibits the deposit of a deleterious substance in waters frequented by fish unless authorized by regulations. The *Metal and Diamond Mining Effluent Regulations* (MDMER) is a regulation made under the *Fisheries Act* to help protect Canada's lakes and rivers by setting strict limits on the quality of effluent that can be discharged by metal and diamond mines. ECCC is responsible for the implementation of the MDMER pursuant to pollution prevention provisions of the *Fisheries Act*.

The MDMER requires effluent to meet concentration-based limits for arsenic, copper, cyanide, lead, nickel, zinc, suspended solids, radium 226 and un-ionized ammonia. Effluent must also have a pH that is between a minimum and maximum level, and must not be acutely lethal. The MDMER also requires effluent testing and reporting, as well as Environmental Effects Monitoring (EEM) studies.

The MDMER also includes for an authorization for the use of water frequented by fish for mine waste disposal. This type of authorization requires an amendment to Schedule 2 of the MDMER. Owners or operators of mines can request to have waters added to Schedule 2 of the MDMER, designating them as Tailings Impoundment Area (TIA) for the purpose mine waste disposal. It is expected that waterbodies frequented by fish shall be avoided to the extent practicable for the long-term disposal of mine waste; and that mine waste shall be managed to ensure the long-term protection of Canada's terrestrial and aquatic environment. The Governor in Council (Treasury Board), on the recommendation of the Minister of Environment and Climate Change, makes the final decision to list water bodies in Schedule 2 of the MDMER.

2.2.5 *Wastewater Systems Effluent Regulations* (WSER)

https://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-139/FullText.html

The *Wastewater Systems Effluent Regulations* (WSER) made under the *Fisheries Act*, permit the owner or operator of a wastewater system to discharge wastewater under specific conditions. The WSER were developed to protect the environment by lowering the level of harmful substances released through wastewater effluent. This reduces threats to fish, fish habitat and human health from fish consumption.

The WSER include mandatory minimum effluent quality standards that can be achieved through secondary wastewater treatment and prohibit the discharge of effluent that is acutely lethal to rainbow trout using prescribed methods. Requirements for monitoring, record-keeping, reporting and toxicity testing are specified in the WSER. The WSER apply to wastewater systems that collect or are designed to collect an average daily volume of 100 cubic metres (m^3).

Requirements under the WSER include:

- Effluent quality standards set out in Section 6.
- Acute lethality monitoring requirements set out in Section 11 for wastewater systems that deposit an annual average daily effluent volume of greater than 2,500 m^3 and are not covered by either a transitional or a temporary authorization.
- Effluent sampling and reporting requirements set out in sections 9 and 18, which vary depending on the average daily volume of the wastewater system.

Regulatees are required by the WSER to submit identification and other reports electronically in the form and format specified by the Minister of Environment and Climate Change. For information on the reporting requirements for the WSER, please consult – https://www.canada.ca/en/environment-climate-change/services/wastewater/system-effluent-regulations-reporting.html.

2.2.6 *Canada Water Act*

https://laws-lois.justice.gc.ca/eng/acts/c-11/page-1.html

The *Canada Water Act* provides the framework for cooperation with provinces and territories in the conservation, development and utilization of Canada's water resources. ECCC is the lead federal agency for establishing and operating the associated federal-provincial/territorial water monitoring networks. ECCC conducts or advises on the associated aquatic data and information management, protocols and bio-monitoring networks. ECCC also works with various partners on ecosystem approaches to ensure that Canadians have access to clean, safe and healthy water and that the country's water resources are used wisely, both economically and ecologically.

2.2.7 Canadian Environmental Quality Guidelines

https://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines

The Canadian Environmental Quality Guidelines provide nationally endorsed science based goals for the quality of atmospheric, aquatic and terrestrial ecosystems. The guidelines provide chemical-specific fact sheets that summarize the key scientific information and rationale for each substance, detailed summary tables of recommended guidelines for the different media and resource uses and the protocols used in developing the guidelines along with their associated implementation guidance. Indices of Water Quality, Soil Quality and Sediment Quality are also included.

2.3 Biodiversity and Conservation

ECCC's advice and recommendations related to migratory birds species at risk and wetlands are based on departmental responsibilities under the *Migratory Birds Convention Act* (MBCA) and *Species at Risk Act* (SARA).

2.3.1 *Migratory Birds Convention Act*, 1994 (MBCA) and *Migratory Birds Regulations* (MBR)

https://laws-lois.justice.gc.ca/eng/acts/m-7.01/

Migratory birds are also specifically referenced under Section 5(1) (a) (iii) of CEAA 2012:

> *'5. (1) For the purposes of this Act, the environmental effects that are to be taken into account in relation to an act or thing, a physical activity, a designated project or a project are*
>
> > *a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:*
> >
> > > *(iii) migratory birds as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994 ...'*

The purpose of the MBCA is to implement the Migratory Birds Convention between Canada and the United States by protecting and conserving migratory birds, as populations and individuals. Within this context, it is the responsibility of the Government of Canada to protect and conserve the roughly 500 species of migratory birds regularly occurring in Canada. ECCC provides the list of bird species protected under the MBCA, which derives from Article I of the Migratory Birds Convention.

Section 5.1 of the MBCA prohibits the deposit of a substance that is harmful to migratory birds in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. This Act also prohibits the possession of a migratory bird, nest or egg without lawful excuse. The *Migratory Birds Regulations* (MBR) provide for the conservation of migratory birds and for the protection of individuals, their nests and eggs. A prohibition against hunting is set out in section 5 of the MBR. The term 'hunt' is given a specific definition in section 2 of the MBR and includes attempting in any manner to kill, injure or harass migratory birds. A prohibition against the disturbance, destruction, or taking of a nest, egg or nest shelter of a migratory bird is set out in subsection 6(a) of the MBR.

Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear; this is known as incidental take. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoiding Harm to Migratory Birds website at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html

2.3.2 *Species at Risk Act* (SARA)

https://laws-lois.justice.gc.ca/eng/acts/s-15.3

Provisions of SARA refer specifically to impact assessment (formerly environmental assessment) of projects. Section 79 requires that the federal authorities responsible for the impact assessment notify the competent minister(s) in writing if the project is likely to affect a listed wildlife species or its critical habitat and to identify the adverse effects of the project. If the project is carried out, that authority must also "ensure that measures are taken to avoid or lessen those effects and to monitor them". The measures taken must be consistent with any applicable recovery strategy or action plan under SARA. Accordingly, the results of the impact assessment inform the Impact Assessment Agency of Canada (IAAC, formerly Canadian Environmental Assessment Agency) as the Responsible Authority in the context of fulfilling the obligations of section 79 of SARA.

Endangered and threatened migratory bird species at risk (species, subspecies, and distinct populations) have federal legislative protection under SARA.

The purpose of SARA is to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened. SARA supports the federal commitments under the 1996 Accord for the Protection of Species at Risk, which outlines commitments by federal, provincial and territorial ministers to designate species at risk, protect their habitats and develop recovery plans as well as complementary legislation, regulations, policies and programs, including stewardship.

ECCC has responsibilities for overall administration of SARA (subsection 8(1)). As well, SARA defines "competent ministers" as the Minister responsible for the Parks Canada Agency (PCA) (with respect to individuals[2] of a wildlife species in or on federal lands administered by that Agency); the Minister of Fisheries and Oceans (DFO) (with respect to aquatic species other than individuals on lands administered by the PCA); and, the Minister of Environment and

[2] As defined in SARA, "individual" means an individual of a wildlife species, whether living or dead, at any developmental stage and includes larvae, embryos, eggs, sperm, seeds, pollen, spores and asexual propagules.

Climate Change (with respect to all other individuals of a wildlife species). Competent ministers have responsibilities regarding recovery planning, protection, permitting, and other activities identified within the legislation.

SARA sets out a process for an independent assessment of species potentially at risk establishing the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as responsible for the assessment. Subsequently the Governor in Council, on the recommendation of the Minister of Environment and Climate Change makes recommendations for their listing on Schedule 1 of SARA as extirpated, endangered, threatened, or of special concern. SARA requires that recovery strategies and action plans be developed by the competent minister for species listed as extirpated, endangered or threatened. Management plans must be developed for species of special concern.

SARA also provides measures for the protection of listed threatened, endangered or extirpated species and their residences. Under section 32 and 33 of SARA, individuals and residences of aquatic species and birds protected by the MBCA are automatically protected anywhere they are found in Canada. These general prohibitions apply to all other extirpated, endangered or threatened species listed on Schedule 1 of SARA when they are on federal lands in the provinces and on land under the authority of the Minister of Environment and Climate Change or the PCA in the territories. These prohibitions can also apply on non-federal (provincial, territorial and private) lands if the Governor in Council makes an order to that effect, based on a recommendation from the federal Minister of Environment and Climate Change (SARA s. 34 and s. 35). In the case of the species at risk that may be affected by the Project, no such order has been made.

Based on the best available information, SARA requires an identification of critical habitat for threatened, endangered, and extirpated species to the extent possible in a recovery strategy or action plan. SARA defines the critical habitat of a species as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or an action plan for the species." Once critical habitat is identified in a final recovery strategy or action plan, SARA sets out a process to evaluate existing protection mechanisms, and if necessary, to put in place additional protection under SARA. The timelines and instruments which can be used to achieve critical habitat protection vary depending on land ownership and the species involved. SARA is designed to turn first to existing laws and initiatives before contemplating using SARA prohibitions directly, looking to federal laws when critical habitat occurs on federal land and to laws of the province or territory or Acts of Parliament including SARA when critical habitat occurs on non-federal lands.

Subsection 32(1) of SARA states that no person shall kill, harm, or harass an individual of a species listed as endangered or threatened. Section 33 states that no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada. A "residence" is defined as a dwelling-place such as a den, nest or other similar area or place that is occupied during all or part of the species life-cycle.

Under Section 61, there is an additional prohibition for destruction of critical habitat of a listed endangered or threatened species under SARA. The Act defines the critical habitat of a species as

> "*the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or an action plan for the species*."

2.4 Air Quality

ECCC has a broad mandate and policy framework with respect to air quality and climate change, including both national initiatives and international agreements. ECCC is also responsible for producing national emissions inventories of air pollution and climate change related emissions, for distribution both domestically and internationally, including under the United Nations Framework Convention on Climate Change.

2.4.1 Air Quality Management System

Air quality management is a shared responsibility among federal, provincial and territorial governments. The federal government in collaboration with provinces and territories is implementing an Air Quality Management System to improve air quality across the country and protect the health of Canadians and the environment. The system is an approach to air quality management across Canada where all levels of government work collaboratively to respond to different air quality challenges across the country and includes the basis for provincial and territorial governments to determine the level of action needed (which provide the drivers for air quality improvements), a framework for managing air quality through local air zones and regional airsheds, and the establishment of emission requirements for major industrial sectors and equipment types using regulatory and non-regulatory measures.

In 2013, the federal government established more stringent health-based ambient air quality standards for fine particulate matter and ground-level ozone (the main components of smog) using the authority of CEPA, 1999. New Canadian Ambient Air Quality Standards (CAAQS) were also established for sulphur dioxide and nitrogen dioxide in 2016 and 2017, respectively. In June 2014, the federal government proposed the *Multi-Sector Air Pollutants Regulations* to reduce air pollution from boilers and heaters, cement manufacturing, and stationary engines.

2.4.2 On-road Vehicles and Engines

On-road heavy-duty vehicles and engines produce emissions such as nitrogen oxides (NOx), volatile organic compounds (VOC), particulate matter (PM), carbon monoxide (CO), carbon dioxide (CO2) and a variety of other pollutants. ECCC regulates these emissions through the On-Road Vehicle and Engine Emission Regulations and the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations under CEPA, 1999. The fuels used in these vehicles and engines are also subject to ECCC's legislative authority, and ECCC has implemented a variety of environmental fuel quality regulations to limit pollution from these sources. The regulations impose requirements on companies which manufacture or import vehicles and

engines into Canada and not the individual equipment users. ECCC has recently published amendments to the Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations in Canada Gazette, Part II establishing more stringent emissions standards for model year 2021 on-road heavy-duty vehicles and engines.

2.4.3 Off-road Vehicles and Engines

Mobile machinery such as construction equipment & industrial equipment and their fuels are subject to ECCC's legislative authority. Air pollutant emissions from these products are covered by a variety of regulations such as the *Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations* and the *Off-Road Small-Spark Ignition Engine Emission Regulations*. The fuels used in these engines are subject to a variety of environmental fuel quality regulations. These off-road engine emission regulations impose requirements on companies which manufacture or import vehicles & engines into Canada, and not the individual equipment users.

As part of ECCC's normal regulatory development and amendment process, the department regularly evaluates the technical feasibility, cost effectiveness and market acceptance of technological advances within the off-road market. ECCC consults widely with stakeholders before, during and after the regulator development process to solicit stakeholder feedback and address concerns. This broad list of stakeholders includes, but is not limited to, other government departments, the U.S. government (because Canadian and U.S. regulations are often aligned), manufacturers and equipment users.

2.5 Hydrological, Meteorological and Climate Conditions

2.5.1 Hydrology

Under the *Department of the Environment Ac*t powers, duties and functions of the Minister of Environment and Climate Change extend to a number of matters including water. ECCC provides interpretation and dissemination of standardized water resource data and information. ECCC operates and maintains monitoring infrastructure including hydrometric networks.

2.5.2 Meteorology

Under the *Department of the Environment Act* powers, duties and functions of the Minister of Environment and Climate Change extend to a number of matters including meteorology. ECCC provides weather warnings, forecasts and information to help Canadians and a variety of economic sectors anticipate dangerous meteorological events and afford enough time to protect themselves, their livelihood and their property. ECCC operates and maintains monitoring infrastructure including surface weather and marine meteorology networks.

2.5.3 Greenhouse Gas Emissions and Climate Change

Climate change is caused by the increase in concentrations of greenhouse gases (GHGs) in the atmosphere. These increases are primarily due to human activities such as the use of fossil fuels or agriculture.

The effects of climate change are relevant to the Project because climate over the lifetime of the Project has been projected to be different from the current and past climate for the area. Implications of this change in climate on the Project should be considered. For example, climate change may alter the likelihood or magnitude of sudden weather events such as extreme precipitation that can contribute to flooding. If not properly considered, such changes may cause issues such as equipment failures that can threaten the environment, human health and safety, interrupt essential services, disrupt economic activity, and incur high costs for recovery and replacement.

2.6 Binational and Domestic Great Lakes Agreements

ECCC leads on the coordination of federal efforts to restore and protect the Great Lakes with the United States through the Canada-United States Great Lakes Water Quality Agreement (GLWQA), 2012 and with Ontario through the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA), 2021. In addition, ECCC delivers on the Government of Canada's commitments under the subject-specific annexes of these two agreements through national programs and through Great Lakes specific programs, such as the Areas of Concern and Lakewide Management programs (further discussed below).

2.6.1 Canada-U.S. Great Lakes Water Quality Agreement, 2012 (GLWQA)

https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/2012-water-quality-agreement.html

ECCC has overall lead responsibility for coordinating the implementation of the GLWQA on behalf of the Government of Canada. Canada and the United States (the Parties) have a long history of cooperation and coordination to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes through the GLWQA, first signed in 1972 and last amended in 2012. The agreement has provided a framework for ensuring binational cooperation and action to restore and maintain the water quality and ecological health of the Great Lakes for close to 50 years.

To achieve this purpose, the Parties agreed to "… maximize their efforts to: a) cooperate and collaborate, b) develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem; and c) eliminate or reduce, to the maximum extent practicable, environmental threats to the Waters of the Great Lakes".
The Articles of the GLWQA include common water quality objectives and commitments and outline provisions for the development of cooperative strategies and research. The Articles also identify specific commitments such as a commitment to notify the other Party of planned activities that could lead to a pollution incident or that could have a significant cumulative impact on the Waters of the Great Lakes.

2.6.1 The Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA)

https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/canada-ontario-agreement-water-quality-ecosystem.html

The COA is an agreement between the Government of Canada and Province of Ontario to restore, protect and conserve Great Lakes water quality and ecosystem health.

Canada and Ontario renewed their commitment to restore, protect and conserve the Great Lakes through a new COA, for the period 2021–2026, which came into force on June 1, 2021. The 2021 COA builds on the previous COA by bringing forward commitments to protect the lakes from excessive nutrients and harmful pollutants, improve wastewater and stormwater management, prevent and control discharges from vessels, clean up Areas of Concern, protect and conserve the Great Lakes on a lake-by-lake basis, prevent the entry of aquatic invasive species, conserve important fish and wildlife habitats, enhance understanding of groundwater quality and climate change impacts, as well as strengthen collaboration with the Great Lakes community and Indigenous Peoples.

Canada and Ontario work together through the agreement to implement a range of federal and provincial commitments, which support Canada's commitments under the GLWQA and provincial commitments under the Made-in-Ontario Environment Plan - https://www.ontario.ca/page/made-in-ontario-environment-plan, Ontario's Great Lakes Strategy - https://www.ontario.ca/page/ontarios-great-lakes-strategy and *Great Lakes Protection Act, 2015* - Great Lakes Protection Act, 2015, S.O. 2015, c. 24 (ontario.ca).

ECCC coordinates implementation of the COA on behalf of the Government of Canada and delivers ECCC-led commitments through the implementation of national programs and regional initiatives, such as the Great Lakes Protection Initiative - https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/funding.html.

2.7 Accidents and Malfunctions

ECCC's reviews of accidents and malfunctions are based on the Department's mandated interests as they relate to CEPA, 1999, the pollution prevention provisions of the *Fisheries Act*, and the MBCA. Section 19(1)(a) of CEAA 2012 requires that all designated projects consider: "the environmental effects of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out."

Proponents of all such designated projects must therefore take into account the projects' potential for unintentional spills and releases of hazardous substances and consequential harm to the environment and to human health and life.

ECCC's comments and recommendations to GenPGM are provided with a direct view to preventing and mitigating environmental effects that may occur as a result of an accident or malfunction.

2.7.1 Environmental Emergency Regulations (EER)

https://laws-lois.justice.gc.ca/eng/regulations/SOR-2019-51/

Authority to require emergency plans for toxic or other hazardous substances set out in Schedule 1 to the *Environmental Emergency Regulations, 2019* (EER) is provided in Part 8 of CEPA, 1999. The EER are aimed at enhancing the protection of the environment and human life and health by promoting the preparedness for response to and recovery from environmental emergencies at fixed facilities of a release of a substance on Schedule 1 to the EER. The EER require those who own, have charge, management or control of toxic and hazardous substances set out in Schedule 1 to the EER at or above the specified thresholds to provide required information on the substance(s), their quantities and to prepare and implement environmental emergency plans. The primary goal of preparing and implementing an environmental emergency plan is to prevent emergencies from occurring and provide appropriate response activities in the event that an emergency does occur. For additional details, see CEPA, 1999 Registry - Canada.ca at https://pollution-waste.canada.ca/environmental-protection-registry/regulations/view?Id=139.

CHAPTER 3 – Aquatic Environment

3.1 Effluent Seepage

Introduction and Importance of the Topic to Environmental Assessment

In the context of mining projects, ECCC's expertise on surface water quality relates principally to the administration of the pollution prevention provisions (subsection 36(3)) of the *Fisheries Act* and the MDMER under this *Act*. As set out in subsection 2(1), the MDMER applies to mines that:

- *"at any time on or after June 6, 2002, exceed an effluent flow rate of 50 m^3 per day, based on effluent deposited from all the final discharge points of the mine; and*
- *deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act."*

On this basis, the requirement to comply with the MDMER typically begins during mine construction, continues throughout mine operations and for a period of at least three years following the end of mine operations if the proponent pursues recognized closed mine status.

As defined by the MDMER:

*"***effluent** *means any of the following:*

- ***(a)*** *hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond effluent or treatment facility effluent other than effluent from a sewage treatment facility; or*
- ***(b)*** *any seepage or surface runoff containing any deleterious substance that flows over, through or out of the site of a mine. (effluent)"*

The definition includes seepage from: tailings, mine waste disposal facilities (e.g. waste rock, etc.), and ore stockpiles. As a result, any seepage deposited into "water frequented by fish or in any place under any conditions where the deleterious substance …may enter any such water" (*Fisheries Act*, subsection 36(3)), would be subject to the monitoring and reporting requirements of the MDMER. This includes the requirement for an accurate measurement of seepage flow, physical sampling to measure concentrations of contaminants and the release through a final discharge point. Accordingly, if seepage is deposited in a lake or stream that is fish-frequented, or deposited into surficial geological units (e.g., glacial till) or into underlying rock units which are hydraulically connected to nearby lakes or streams that are fish-frequented, then that seepage would be subject to the requirements of the MDMER. All substances not regulated by the MDMER are subject to subsection 36(3) of the *Fisheries Act*.

An amendment to Schedule 2 of the MDMER is required to authorize the use of waterbodies for mine waste disposal. Additional information on Schedule 2 of the MDMER including the results of ECCC's review are provided in Chapter 6.

Sources of Information

- EIS Addendum (CIAR #727)
    - Section 6.2.3.6.1 Change in Groundwater Quantity
    - Appendix D4- HYDROGEOLOGY UPDATED EFFECTS ASSESSMENT
    - 6.4 Predicted Groundwater Discharge Rates (m3 /d) from MRSA, Ore Stockpile, PSMF, and Water Management Pond to Receiving Environment at End of OperationAppendix D5 - SITE WATER BALANCE SUMMARY
        - Table 3 SITE WATER BALANCE SUMMARY ANNUAL BALANCE - PROCESS SOLIDS MANAGEMENT FACILITY - 50TH PERCENTILE RESULTS
    - Appendix D11 - SURFACE WATER QUALITY EFFECTS ASSESSMENT UPDATE

- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #24
- IR4-7 Overburden samples exceedances of Provincial Water Quality Guidelines (CIAR #917)

GenPGM's Conclusions

<u>Management of seepage from the Mine Rock Storage Area (MRSA) and Process Solids Management Facility (PSMF)</u>

GenPGM identified that during operations 138 m^3/d of seepage originating from the MRSA will be collected in the toe ditches at the MRSA. This seepage will be pumped back to the water management pond (WMP) and ultimately discharged through the final discharge point into Hare Lake. Table 6.4 of Appendix D4 (CIAR #727) identified that 52.1 m^3/d of seepage originating from the MRSA during operations will bypass the toe ditches and catch basins and discharge to WS101, which includes the entire reach of the Pic River within the model. Table 6.4 of Appendix D4 also identifies that 16.4 m^3/d of seepage originating from the MRSA during operations will bypass the toe ditches and catch basins and discharge to streams in WS102, which ultimately discharge to the Pic River. During the closure phase, MRSA seepage to the toe ditches increases to 507 m^3/d, and seepage that will bypass the ditches to WS101 and WS102 is 171 m^3/d and 18.8 m^3/d respectively.

GenPGM identified in Appendix D5 (CIAR #727) that during operations, as much as 1,354.5 m^3/d of seepage will be collected in the seepage collection basins around the PSMF and pumped back to the PSMF. Because this seepage effluent is pumped back to the PSMF, it will be retained there until it is discharged through the final discharge point into Hare Lake. GenPGM also notes in Table 6.4 of Appendix D4 that 155.6 m^3/d of seepage originating from the PSMF during operations will bypass the seepage collection basins and discharge to WS105, which discharges to Hare Lake and other watercourses. Similarly, 334.8 m^3/d of

seepage originating from the PSMF during operations will also bypass the seepage collection basins and discharge to WS106, which discharges to other watercourses and ultimately to Lake Superior.

Management of drainage around overburden storage piles

GenPGM identified five (5) soil and overburden stockpiles; one of which is located south of the MRSA within the Site Study Area (SSA). The majority of the stockpile is located in subwatershed 102, with a small portion located in subwatershed 101. Table 3 in Appendix D5 (CIAR #727) identifies that runoff from the portion of the overburden stockpile located in subwatershed 102 will be directed to the Stream 2 Catch Basin. The runoff from the small portion of the same overburden stockpile located in subwatershed 101 is likely to report to Lake 4.

In GenPGM's response to IR4-7 (CIAR #917), it is stated that *"The overall site water management system includes the collection of runoff that is associated with Project components, including the overburden stockpiles, in the SSA. Runoff will be collected by collection ditches and/or berms, report to catch basins and collection basins, and will be pumped back and managed through the Water Management Pond (WMP). Further, erosion and sediment control measures will be in place to manage runoff from the overburden stockpiles, the details of which will be confirmed in the Erosion and Sediment Control Plan."*

ECCC's Conclusions

The effect of the Project on surface water quality is a key consideration for the environmental assessment, and therefore, a high degree of confidence in the assessment and proposed measures to mitigate potential effects must be established. Based on review of the documentation provided, ECCC is of the view that it is likely that seepage has not been fully accounted for in the modelling as it relates to the PSMF and MRSA. For example, during operations GenPGM has not demonstrated that the 68.5 m^3/d of seepage that will bypass toe ditches and catch basins has been accounted for in the water quality model and associated water quality predictions. This uncertainty also applies to GenPGM's estimate that 189.8 m^3/d of seepage will bypass the ditches during the closure phase. Without this information, it is difficult to assess and evaluate the potential effects of seepage particularly for the small watercourses where seepage could become a major or dominant component of flow.

ECCC notes that the advective (transfer of a substance such as a contaminant by motion of a fluid) and mean travel times for seepage from the PSMF and MRSA to reach streams WS101, WS102, WS105 and WS106 were not provided for the operations and closure phases. Accounting for the movement of seepage and the time it takes to reach a surface waterbody is important to the understanding of when a potential impact may take place.

ECCC also notes that the predictions for changes to water quality in Hare Lake during operations and closure, as well as to stream WS106 during closure described in Appendix D11 (CIAR#727) may not have accounted for seepage from the PSMF. Additionally, ECCC notes that GenPGM has not demonstrated in Appendix D11 whether predictions for changes to water quality in the Pic River or WS102 during operations, the initial phase of closure and long-term

in post-closure, account for seepage from the MRSA. Accounting for seepage from the PSMF and MRSA in effects predictions is important to the understanding of potential impacts to Hare Lake, the Pic River and other waterbodies within the watershed.

ECCC also notes in Section 6.2.3.6.1 of the EIS Addendum (CIAR #727) and ECCC #24 (CIAR #893), GenPGM states: *"Dewatering for foundations and installation of infrastructure will be completed under a PTTW if pumping in excess of 50 m^3/day is required. The pumping will be short-term on an as-needed basis and may be required for minor supporting infrastructure for equipment storage and maintenance, and preparation of foundations for the ore stockpile, MRSA, and PSMF."*. GenPGM has not identified where the pumped water will be directed and to which watercourses it will be discharged to. ECCC reiterates that having this information would enable a better understanding of the potential effects associated with this pumped water.

ECCC also notes that GenPGM has not described how the drainage from the overburden stockpiles that will be stored in subwatershed 101 will be collected and directed to Lake 4. ECCC recommends that all overburden stockpile drainage flow to subwatershed 102, as subwatershed 101 is a tributary of the Pic River, a river of importance to Indigenous groups. If this is not technically feasible, GenPGM should collect the overburden stockpile drainage associated with the portions of the stockpile stored in subwatershed 101, and divert the drainage away from Lake 4.

ECCC's recommendations 3.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. As part of a waste water management plan, account for the advective and mean travel times for seepage from the PSMF and MRSA for all phases of the Project including post-closure. Update effects predictions for all watercourses that will receive seepage. Based on the results, GenPGM should be required to identify and implement additional mitigation and monitoring measures to protect aquatic life, where required.

2. As part of a follow-up and monitoring program, design and install a groundwater monitoring network to verify the predictions of the assessment. This program should include verification of the seepage capture and pump back wells to collect all seepage and direct it to flow through the final discharge point at Hare Lake.

3. Construct the overburden stockpiles such that they are located entirely in subwatershed 102 in order to avoid flow to subwatershed 101, a tributary of the Pic River, a river of importance to Indigenous groups. If this is not technically feasible, collect and divert flow away from Lake 4.

3.2 Mercury and Methylmercury

Introduction and Importance of the Topic to Impact Assessment

Methylmercury is a contaminant of particular concern given its neurotoxicity and its ability to bioaccumulate and biomagnify in freshwater aquatic food webs, which has adverse health implications for not only wildlife species occupying higher trophic positions within the aquatic food web, but also for humans who consume fish and other wildlife (CCME, 2003). Background mercury concentrations in the muscle tissue of some northern pike (*Esox lucius*) collected from Hare Lake (2009 to 2013 collections) were above Provincial human consumption guidelines. This indicates that Hare Lake already has elevated methylmercury production under pre-development conditions (Supplemental Information Request 5 – Impacts of PMSF discharge to Hare Lake (CIAR #587), Chapter 2.0 Baseline Information for Hare Lake, Section 2.10 Metals Levels in Fish Tissues in Hare Lake, Table 2.10-1 Mean Metal Concentrations in Fish Collected in Hare Lake, pg. 2.39 (CIAR #587); GenPGM Responses to IR Package 5, IR5-12 (CIAR #950)).

During operations, treated mine effluent will be discharged to Hare Lake. In order to evaluate potential impacts to Hare Lake, GenPGM modelled changes to water chemistry (CIAR #727) and addressed additional water quality issues specific to Hare Lake, and other waterbodies and watercourses within the regional study area (CIAR #921). The focus of that review was to evaluate changes in various water quality parameters and how they may impact the speciation and bioavailability of metals, including the production of methylmercury.

pH can affect metal speciation and bioavailability in lake ecosystems and can influence the degree to which certain metals bioaccumulate in aquatic organisms. Information was provided by GenPGM regarding the evaluation of water pH and alkalinity (CIAR #950) for Hare Lake, the Pic River, and Stream 106 during the operation and post-closure phases.

Hare Lake may receive phosphorous loadings from treated effluent during operations (CIAR #727), which could stimulate algal production in the lake. An increase in organic matter accumulation in the sediment will result in increased biological oxidation demand which, in turn, could lead to the development of anoxic conditions in lake sediments and the hypolimnion. Anoxia (and reducing conditions) in lakes affects metal speciation and bioavailability, including the production of methylmercury.

Small amounts of sulphate, which are expected to be deposited to Hare Lake from the final discharge point during operations, may increase the activity of sulfate reducing bacteria which can increase methylmercury bioaccumulation. (Gilmour *et al.* 1992).

Source of Information

- Supplemental Information Request 5 - Impacts of Process Solids Management Facility (PSMF) Discharge to Hare Lake (CIAR #587)
    - Chapter 2.0 Baseline Information for Hare Lake

    - Section 2.10 Metals Levels in Fish Tissues in Hare Lake
    - Table 2.10-1 Mean Metal Concentrations in Fish Collected in Hare Lake
- EIS Addendum (CIAR #727)
    - Table 6.2.3-6 Assessment Benchmarks for the Surface Water Quality Assessment
    - Table 6.2.3-9 Predicted constituent concentrations in the Pic River during the initial phase of post-closure following initial restoration of drainage from MRSA (post-five years after operations have ceased)
    - Table 6.2.3-10 Predicted constituent concentrations in the Pic River over the long term post-closure following controlled release of water from the open pit (post- thirty years after operations have ceased)
    - Appendix D11 SURFACE WATER QUALITY EFFECTS ASSESSMENT UPDATE
        - Section 6.2.2 – Hare Lake
- From the Joint Review Panel to Generation PGM re: Request for Information Package of August 20, 2021 (CIAR #921)
- Marathon Palladium Project – Aquatic Environment Baseline Report Update (CIAR #722)
- IR5-3 Water Quality Predictions and Monitoring (CIAR #950)
- IR5-11 Mercury Concentrations, Nutrient Enrichment, Phosphorus Loading (CIAR #950)
- IR5-12 Mercury in Fish (CIAR #950)

GenPGM's Conclusions

<u>Methylmercury Production</u>

GenPGM has committed to measures (such as additional effluent treatment as needed) to address outstanding issues pertaining to changes in water quality parameters and impacts to the speciation and bioavailability of metals, including methylmercury production (Responses to IR Package 5, IR5-3, IR5-11, IR5-12 (CIAR #950)).

With respect to predictions for pH, GenPGM concludes that no incremental change in pH is predicted to occur during the operations phase when excess water is discharged from the water management pond to Hare Lake (Responses to IR Package 5, IR5-3 (CIAR #950)). An incremental change in alkalinity was predicted for Hare Lake between the operation (average 14.6 mg/L $CaCO_3$) and post-closure (average 15.3 mg/L $CaCO_3$) phases. GenPGM concludes that subsequent changes to metal speciation and bioavailability are not expected to occur in the lake during any phase of the mine.

With respect to phosphorous loadings to Hare Lake during the operations phase, GenPGM notes that this issue has been identified as a management need in the Surface Water Quality Effects Assessment Update, and notes that "*Treatment technologies are readily available to reduce levels at the end of pipe…"* (Appendix D11 of the EIS Addendum, (CIAR #727). Additional context surrounding this issue is also provided in the GenPGM Responses to IR

Package 5, IR5-11 (CIAR #950) where GenPGM concludes that "*the risk of increased phosphorus loadings causing increased primary productivity and enrichment or eutrophication of Hare Lake is regarded as low"*. The goal of phosphorous management measures is to ensure that phosphorus levels remain at or below the Provincial Water Quality Objective (PWQO). While GenPGM agrees that if significant eutrophication were to occur in Hare Lake as a result of phosphorous loading, sediments and the hypolimnion could become anoxic, resulting in changes to metal speciation, bioavailability, and changes to mercury methylation rates, GenPGM emphasizes that management of phosphorous at the source will reduce the risk of such conditions developing (IR5-11, CIAR #950).

With respect to methylmercury, GenPGM provided details around various consumption guidelines utilized in their assessment, additional information on baseline fish collections, an update regarding additional fish collections that were completed in Hare Lake and the Pic River in 2021 in support of an on-going country foods study, and preliminary Environmental Effect Monitoring (EEM) studies - with additional collections anticipated for 2022 (CIAR #950). Historical mean fish tissue mercury levels collected from waterbodies near the proposed Project site were also included in their response. Additionally, GenPGM stated they were committed to *"conceptualizing a comprehensive monitoring program for the purpose of investigating the potential change in mercury and methyl mercury in the aquatic environment through the construction, operation and closure of the Project. This commitment is made in consideration of the feedback GenPGM has received through its consultation with local Indigenous communities in particular"* (IR5-12, CIAR#950).

Background and Water Quality Predictions for Mercury

GenPGM indicates that, generally, no incremental change in concentration relative to background is noted for the majority of water quality constituents of potential concern. No exceedances of water quality benchmarks in the Pic River as the result of drainage from the MRSA are predicted. Table 6.2.3-6: Assessment Benchmarks for the Surface Water Quality Assessment indicates that the assessment benchmarks for mercury in Hare Lake and the Pic River correspond to the PWQO and CCME guidelines, 0.0002 mg/L and 0.000026 mg/L respectively.

ECCC's Conclusions

Methylmercury Production

ECCC notes that GenPGM predicts that pH levels in Hare Lake are not expected to change as a result of the Project. GenPGM does predict that sulphate is expected to be deposited to Hare Lake during operations (baseline = 3.5 mg/L; mean predicted during operations = 4.5 mg/L; maximum predicted during operations = 5.9 mg/L) and that water sulphate concentrations in Hare Lake are predicted to increase during the operation phase. Small amounts of sulphate may stimulate sulphate reduction in systems where sulphate is limiting, which can lead to increased methylmercury production(CIAR #950).

ECCC recognizes that phosphorus treatment technologies exist and is in agreement with GenPGM with the need to mitigate for phosphorus at the source. GenPGM also notes, that if unmitigated, there is the potential for nutrient enrichment in Hare Lake and that this is also a concern to local Indigenous groups (IR5-11 (CIAR #950)). ECCC has provided a list of additional water quality parameters which will help to validate the effectiveness of GenPGMs phosphorus treatment measures (please refer to ECCC Recommendation 3.1.1).

ECCC recognizes that additional fish tissue collections were conducted in 2021 for Hare Lake and the Pic River (data not yet available) and that additional collection activities are planned for 2022. It is ECCC's position that the results of this data and these collections are needed, since the current sample sizes for baseline information on fish metal concentrations is insufficient to adequately monitor changes to metal bioaccumulation, including mercury, in fish during mine operations.

ECCC further notes that while GenPGM provided additional historical mercury fish tissue data in response to IR Package 5 (IR5-12 (CIAR #950)) from lakes situated within the vicinity of Hare Lake and the Pic River, the data provided should not be used as a substitute for baseline fish mercury data in the waterbodies of concern (e.g. Hare Lake, Pic River), since mercury bioaccumulation is a process specific to the conditions within the waterbodies in question.

Lastly, ECCC recommends that GenPGM, as part of the follow-up and monitoring program, and in consultation with Indigenous groups and stakeholders (e.g. appropriate agencies, interested parties), verify the predicted effects, such as, no changes in mercury and methylmercury concentrations as a result of the Project in the aquatic environment throughout the construction, operation and closure phases. Elements of this monitoring program, which GenPGM states were identified in consultation with local Indigenous communities, "*include the collection and analysis of fish tissues for forage (small-bodied) and sport fish (large-bodied), surface water quality, ground water quality, and soils/sediments"* (IR5-12 (CIAR #950)). ECCC recommends additional abiotic and biotic parameters be included as part of the proposed monitoring program. These additional measures have been included in ECCC's recommendation 3.1.1 below.

<u>Background and Water Quality Predictions for Mercury</u>

In IR5-11 GenPGM was asked to discuss the background concentrations of mercury in surface waters that exceeded CCME guidelines at S29 in Hare Creek and S30 in Angler Creek as demonstrated in the Water Quality Baseline Update. Coincidentally, mercury at PR1 and PR2 in the Pic River were both listed as having a mercury concentration of 0.0001 mg/L, which also exceeds CCME guidelines. No discussion of effects or significance of these higher existing background concentrations of mercury in local water bodies was given in GenPGM's response to the request.

Also in IR5-11 GenPGM was asked to provide further information on mercury concentrations reported as 0.0001 mg/L for most Pic River monitoring stations and verify if these values should have been <0.0001 mg/L. GenPGM responded with a summary of the total number of samples collected with total mercury results available (2008 to 2019), a count of the results that were above the method detection limit (i.e., 0.0001 mg/L and 0.00001 mg/L, 2008 to 2011

and 2012 to 2019, respectively), the total mercury concentrations in samples by sampling station for those exceeding detection limits, and a summary of the samples that exceeded provincial and federal water quality criteria. In this summary, mercury results for S29, S30, PR1, and PR2 are omitted. Not including these results impacts the overall quality and reliability of this analysis. Furthermore, the background concentration for mercury in the Pic River provided in Appendix D11, the Surface Water Quality Effects Assessment Update, is provided as <0.0001 mg/L. GenPGM's Aquatic Environment Baseline Report Update describes background mercury concentrations in the Pic River as 0.0001 mg/L. IR5-11 was meant to clarify the background concentrations of mercury in key water bodies such as the Pic River. Understanding of background mercury concentrations at the appropriate detection limits and in the Pic River is critical to ensuring potential project effects are understood, particularly as this river is of importance to local Indigenous groups.

EIS Addendum Table 6.2.3-9 shows water quality predictions for the Pic River during the closure phase after runoff and seepage from the MRSA are allowed to flow to the Pic River. The maximum concentration of mercury is predicted to be 0.0001 mg/L post-closure, greater than the <0.0001 mg/L in background identified in the table (note that the updated baseline studies provides that background for mercury is 0.0001 mg/L at both PR1 and PR2). There are similar results in Table 6.2.3-10 for the Pic River following 30 years of filling the open pit and its subsequent discharge. The geochemical analysis performed to derive loading rates for mercury used a high detection limit of 0.0001 mg/L, and as such, for the sake of model conservatism in the water quality predictions the higher detection limits were utilized.

ECCC is unable to fully assess effects to the aquatic environment because the geochemical analysis for mercury did not use a detection limit of 0.00001 mg/L. A detection limit of 0.00001 mg/L would have allowed a more accurate determination of loading rates. ECCC notes that mercury concentrations of 0.0001 mg/L are above the CCME guideline assessment benchmark of 0.000026 mg/L by an order of magnitude, thus indicating that during the closure phase of the project mercury concentrations in the Pic River could represent a potential risk to the aquatic environment through chronic and acute effects to fish that could potentially include impacts to growth, reproduction, development, and death. ECCC notes that GenPGM's conclusions in Tables 6.2.3-9 and 6.2.3-10 could be the result of selecting too high a method detection limit in the geochemical analysis of mercury and subsequent loading rates derivation as well as taking too conservative of an approach with the model. ECCC would have greater confidence in the water quality modelling results if GenPGM redid the geochemical analysis for mercury using a lower detection limit of 0.00001 mg/L and redid the water quality predictions using the same lower method detection limit. In the absence of this information, ECCC can only assume that the concentrations of mercury in the Pic River would exceed the CCME Water Quality Guidelines for the Protection of Aquatic Life and that this would represent a potential risk to the environment as the potential for chronic and/or acute effects to aquatic life including fish would exist.

ECCC's Recommendations 3.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop a Follow-Up and Monitoring Program to verify the accuracy of the baseline conditions and to identify the potential need for additional mitigation measures. The program should include:

    - Additional fish collection and analysis to characterize pre-development tissue metal concentrations, including, but not limited to mercury, of the main sport fish species (e.g. yellow perch, northern pike) in order to achieve sufficient sample sizes of fish, as are required per EEM guidelines (e.g. n = 20 male, n = 20 female, representative of 2 fish species) (ECCC, 2007). Ancillary biological information for fish (i.e. age, length, weight) should be measured to account for biological influences on fish metal tissue burdens.
    - Monitoring of phosphorus in the mine's effluent and receiving environment, including indicators of eutrophication in Hare Lake such as algal biomass and dissolved oxygen. These parameters will validate the effectiveness of GenPGM's phosphorous treatment/mitigation activities in order to protect and conserve the ecosystem against changes to water quality conditions in the lake that may affect metal speciation and bioavailability.
    - Further geochemical analysis using the lower method detection limit of 0.00001 mg/L for mercury. With the new mercury loading rates, re-do the water quality modelling for the predicted constituent concentrations of mercury in the Pic River during the post-closure following the initial restoration of drainage from the MRSA, and following 30 years of filling the open pit and its subsequent discharge.
    - Based on the results of the updated water quality modelling GenPGM should be required to identify and implement additional mitigation and monitoring measures to protect aquatic life.

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3.3 Canada-United States Great Lakes Water Quality Agreement (GLWQA), 2012

Introduction and Importance of the Topic to Environmental Assessment

Given the location of the Project within the Lake Superior watershed, various stakeholders have expressed interest in the Project and whether it will impact the objectives of the Great Lakes Water Quality Protocol of 2012, also known as the Great Lakes Water Quality Agreement (GLWQA 2012) (see Chapter 2 for description of the GLWQA 2012). The following information is provided to explain the provisions of the GLWQA 2012, as well as programs developed by the Government of Canada, that are relevant to the Project.

GLWQA 2012 Notification Provision

The GLWQA 2012 includes the following commitment:

- **Article 6 - Notification and Response** – paragraph (c), states that *"the Parties shall notify each other, through the Great Lakes Executive Committee, of planned activities that could lead to a pollution incident or that could have a significant cumulative impact on the waters of the Great Lakes, such as:… ii) mining and mining related activities"*.

As discussed in Chapter 2, the purpose of the GLWQA notification process is to alert the Parties to planned projects allowing them or others to participate should they so choose.

Canada provided formal notifications as required by Article 6 for the Project. On April 27, 2021, Canada notified the United States with respect to the opportunity to participate in a public comment period on the EIS Addendum and on January 4, 2022, Canada notified the United States with respect to the opportunity to participate in the public hearings. A list of other notifications made by Canada or the United States is available at https://binational.net/annexes/art-6/. No other action under the GLWQA 2012 is required as the GLWQA does not impose a separate review process.

Chemicals of Mutual Concern designated under the GLWQA 2012

Under the GLWQA 2012, Canada and the United States committed to identifying Chemicals of Mutual Concern (CMCs) that originate from anthropogenic sources that are potentially harmful to human health and the environment. In addition, Canada and the United States , in cooperation and consultation with State and Provincial Governments, Tribal Governments, Indigenous groups, Municipal Governments, watershed management agencies, other local public agencies, and the Public, committed to targeting these CMCs for action, including preparing binational strategies to address and reduce CMC releases.

In 2016, Canada and the United States designated eight chemicals as the first set of CMCs, which includes mercury (https://binational.net/annexes/a3-2/). Mercury was identified as a CMC that originates from anthropogenic sources and impacts fish and wildlife health. While

much of the point-source mercury pollution has been controlled, allowing partial ecosystem recovery, mercury is still detected at elevated concentrations such that fish consumption advisories are in effect in all of the Great Lakes. In 2021, Canada and the United States released the *Great Lakes Binational Strategy for Mercury Risk Management*. The strategy includes 22 management options to address threats to the Great Lakes by reducing mercury releases with a focus on pollution prevention, regulation, monitoring, surveillance, and research.

Peninsula Harbour Area of Concern

Peninsula Harbour is a Great Lakes Area of Concern (AOC) as described in the GLWQA 2012. This AOC is located on the northeastern shore of Lake Superior at the Town of Marathon and extends approximately four kilometres into Lake Superior. The environmental impairments in the AOC have resulted, almost exclusively, from the presence of a substantial area of contaminated sediments. Sediment contamination is particularly elevated in the inner harbour at Jellicoe Cove, and is largely the result of mercury and polychlorinated biphenyls (PCBs) from a former chlor-alkalai plant (closed in 1977) and pulp mill (closed in 2009) that operated next to the harbour. These legacy contaminants have been subject to remedial actions.

Lake Superior Lakewide Management

The binational Lakewide Action and Management Plans (LAMP) document and coordinate the shared ecosystem objectives, identified threats and priorities, implementation of strategies, coordinated action to be taken, and monitoring of environmental outcomes. The 2015-2019 LAMP, and the draft 2020-2024 LAMP identify mercury management among its priorities for the lake. This is consistent with mercury being a binational Chemical of Mutual Concern, under the GLWQA. The 2020-2024 LAMP will be released for public comment in early to mid- 2022.

The large surface area, year-round cool temperatures, and long water retention time of Lake Superior makes the lake very susceptible to the impacts of atmospheric deposition of toxic chemicals (Perlinger et al., 2004). As a result, Lake Superior's water has the highest concentrations of some legacy organochlorine pesticides, as well as mercury in Lake Trout when compared to the other Great Lakes (ECCC and U.S.EPA, 2021). The status of contaminants in edible Lake Superior fish is classified as 'fair' with an 'unchanging' trend over the past ten years, and fish consumption advisories are issued in an effort to avoid the negative effects of chemicals on human health (ECCC and U.S.EPA, 2021).

The management of toxic chemicals is primarily through regulatory means. LAMPs although voluntary, provide an important tool to coordinate efforts in identifying, reducing and reporting on accomplishments and challenges of managing anthropogenic inputs of chemicals and other threats to water quality and ecosystem health.

Sources of Information

- Environmental Impact Statement (EIS) (CIAR# 224)

- Comments from Environment Canada to Joint Review Panel on the Environmental Impact Statement (CIAR #303)
    - EC 13 – Water Quality – Mercury and the goals and objectives of the Lake Superior LaMP ZDDP
- Response from Stillwater to Information Requests - Section 5, Transportation of Concentrate (Response to IRs 5.3 and 5.4) (CIAR #421)
- Comments from Environment Canada to the Joint Review Panel on Additional Information (CIAR #547)
    - IR 12.10.2 Mercury Loadings
- EIS Addendum (CIAR #727)
    - Chapter 1 Background and Introduction
        - Section 1.5.4.4 Concentrate Handling, Storage and Transportation
        - Section 1.5.6.3 Concentrate Rail Load-Out Facility
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC 28
    - ECCC 29

GenPGM's Conclusions

GenPGM concludes that there are no potential interactions of the Project on the Peninsula Harbour Sediment Remediation Project (CIAR #421).

ECCC's Conclusions

Based on information submitted by GenPGM, ECCC understands that there will be no physical activities within Lake Superior such as transport of concentrate by vessel from the Peninsula Harbour. As a result, no impacts on the Peninsula Harbour AOC are anticipated.

During the review of the Project, ECCC raised comments and concerns related to the Project's potential impacts on water quality, some of which may affect Lake Superior. Refer to Section 3.1 for ECCC's conclusions and recommendations as they relate to effluent seepage and refer to Section 3.2 for ECCC's conclusions and recommendations as they relate to mercury and methylmercury.

Literature Cited

Drouillard, Ken. March 2019. Contaminants in Peninsula Harbour Fish. A report from an analysis of long-term monitoring data. University of Windsor. Under contract to Environment and Climate Change Canada.

Environment and Climate Change Canada and the U.S. Environmental Protection Agency. 2021. State of the Great Lakes 2019 Technical Report. Cat No. En161-3/1E-PDF. EPA 905-R-20-004.

North Shore of Lake Superior Remedial Action Plans Team. June 2021. Peninsula Harbour Area of Concern Remedial Action Plan: 2021 Status Report.

Perlinger, J.A., Simcik, M.F. and Swackhamer, D.L. (2004). Synthetic organic toxicants in Lake Superior. Aquatic Ecosystem Health & Management. 7 (4): 491-505. DOI: https://doi.org/10.1080/14634980490513373

3.4 Water Quantity Effects

Introduction and Importance of the Topic to Environmental Assessment

Water quantity effects to natural stream, waterbodies, and wetlands are important for assessing the potential impacts to fish habitat (*Fisheries Act*), species at risk (*SARA*), and migratory birds (*MBCA*), as well as potential impacts to Indigenous use of the land (e.g. medicinal plants, berries, fur-bearing animals). While water quantity itself is not a valued component (VC), it does contribute to the understanding of other areas of federal jurisdiction.

Sources of Information

- Environmental Impact Statement Guidelines
    - 2.7.2.3.1 Hydrology and Hydrogeology
    - 2.7.1.2 Mitigation Measures
    - 2.8.3 Monitoring and Follow-Up Programs
- EIS Addendum (CIAR #727)
    - Chapter 6.2.3 Water Quality and Quantity
- Appendix D3 – Hydrology
- Hydrology Updated Baseline Report (2020; section 5.4.1)
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #20
- Placeholder for Proponent Response (CIAR #950)
    - IR5-5 Effects to Stream Flow and Stream Restoration

GenPGM's Conclusions

In the EIS Addendum, a change in Mean Annual Flow (MAF) from pre-disturbance (baseline) conditions was used as a screening threshold to determine whether further assessment of changes in flow were required for each watershed and project phase. Watersheds with an expected change in MAF greater than 10% were carried forward to subsequent assessment

steps; for watersheds with increases from baseline, the change in expected flood flows Q100 (i.e. 100 year return period flood) was assessed; for watersheds with decreases from baseline, the project phase Mean Monthly Flows (MMF) were compared to the baseline minimum environmental flows as defined in Tessman (1980).

ECCC's Conclusions

ECCC provided comments (CIAR #893) related to the threshold used to identify impacts to streamflow which ultimately contributed to IR5-5 (CIAR#921). The threshold for an impacted stream according to the DFO requirements (DFO, 2013) is a 10% difference in instantaneous flow caused by the project; the intent is to allow seasonal characterization of effects so they may be matched with important fish lifecycle stages, survival in ice-cover and dry conditions, and river processes that affect fish habitat.

GenPGM's response (CIAR #950) breaks down the above effects in MAF to MMF, identifies months and streams with more than 10% difference in MMFs, and then further applies either the Tessman environmental flows or a comparison to baseline Q100 to identify impacts. ECCC views the Q100 comparison to be adequate for identifying streams that may have more erosion than baseline. ECCC also views the MMF assessment to be a reasonable interpretation of the intent of DFO requirements as seasonal variation is captured and further temporal precision would have significant uncertainty. However, ECCC's expert advice is that the application of Tessman environmental flows is not appropriate when DFO requirements are clearly communicated and met by the MMF assessment (i.e. a percent difference between project phases and baseline using the shortest viable timestep). Additionally, the MMF assessment is more conservative as it identifies more streams and more months with impacts than the Tessman environmental flows. ECCC defers to DFO as the federal lead on fish habitat and fish habitat offsets.

ECCC recommendations 3.4

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Incorporate areas into the Fish Habitat Compensation and Offsetting Plan, where the project-affected flow is more than a 10% difference from natural conditions to address potential impacts to fish and fish habitat. This plan should be included in mitigation and monitoring plans under the authority of DFO.

Literature Cited

Department of Fisheries and Oceans (2013). *Framework for assessing the Ecological Flow Requirements to Support Fisheries in Canada*. DFO Canadian Science Advisory Secretariat science advisory report 2013/017

Tessman, S.A. 1980. *Environmental Assessment, Technical Appendix E, In Environmental Use Sector Reconnaissance Elements of the Western Dakota Region of South Dakota Study*. Water Resources Research Institute, South Dakota State University, Brookings, South Dakota.

3.5 Water Management

Introduction and Importance of the Topic to Environmental Assessment

The design specifications for water management components are critical for water quality assessments (e.g. *MDMER*) related to contact water and maintaining saturation of potentially acid generating (PAG) materials. Reasonable estimates for design parameters give an indication of the risk for accidental discharges or for additional mitigation needs. While water management itself is not a VC, it does contribute to the understanding of other areas of federal jurisdiction. ECCC is the federal department with expertise related to surface water quantity.

Sources of Information

- Environmental Impact Statement Guidelines
    - 2.7.2.3.1 Hydrology and Hydrogeology
    - 2.7.1.2 Mitigation Measures
    - 2.8.3 Monitoring and Follow-Up Programs
- EIS Addendum (CIAR #727)
    - Chapter 6.4 Effects of the Environment on the Project
    - Appendix D5 – Site Waters Balance Summary
- Hydrology Updated Baseline Report (2020; section 6.1.2 and Appendix C) (CIAR #722)
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #21
    - ECCC #27
- Proponent response to IR 4-2 (CIAR #917)

GenPGM's Conclusions

The discussion in section 6.4.1.1 of the EIS Addendum (CIAR #727), on the potential effects of climate change on the project, are limited to mine closure activities.

The MRSA Catch Basins had been sized to contain an Environmental Design Storm (EDS) consisting of a 1 in 25-year 24-hour precipitation event in the EIS Addendum (section 6.4.2.1). The value of the EDS does not appear to be listed in the EIS Addendum, but is graphically represented in Figures 12 and 13 of the Site Waters Balance Summary (D5). These figures place the 1 in 25-year 24-hour precipitation value well below 100 mm and note that peak rainfalls have been estimated based on historical climate records.

GenPGM further commits to a 1 in 100-year 24-hour precipitation event in the response to IR4-2 (CIAR#917).

ECCC's Conclusions

GenPGM has designed many of the water management components based on an acceptable risk concept; for example, a 100 year event design would suggest that a 1% risk of exceedance in any year is acceptable. Climate change in the region is expected to increase the intensity and frequency of rainfall events (see chapter 7 for further discussion). Consequently, the expected risk of an emergency discharge may increase beyond the originally intended threshold. Due to the likely increase in rainfall event frequency and intensity near the end of mine life, the environmental design storms used for the contact water management system and based on current data may be inadequate.

According to the Panel's rationale in IR4-2, GenPGM proposed the size of the MRSA catch basins to contain an environmental design storm of 1 in 25-year (81 mm) 24-hr rainfall event. The total rainfall for a 1 in 25-year 24-hr rainfall that includes climate change would range from 97 mm to 102 mm (Table 6.4, C.1, and C.2 in the Hydrology Updated Baseline (CIAR# 722)). GenPGM has not incorporated this climate change range into the 24-hr rainfall event estimates used to design the MRSA catch basins. Furthermore, while GenPGM's response to IR4-2 (CIAR#917) commits to increasing the MRSA catch basin design to a 1 in 100-year 24-hr rainfall event, they neglect to provide a value for this new design.

ECCC Recommendations 3.5

Should the Project be approved, ECCC recommends that the Panel request that GenPGM to:

1. Incorporate a range of climate change projections into the environmental design storm estimates (see Recommendation 7.1 for method guidance). Alter designs as needed to ensure risk of exceedance remains similar to, or better, than the original intent (i.e. 100 year event design is expected to have a 1% risk of untreated discharge).

Chapter 4 – Atmospheric Environment

4.1 Baseline Air Quality Assessment

Introduction and Importance of the Topic to Environmental Assessment

The Project would contribute to air pollutants in the Thunder Bay District in northern Ontario. The closest community is the Town of Marathon, approximately 10 km south of the Project. Traffic along Highway 17 is currently the primary source of air pollutants in the immediate project area.

Other existing emissions sources in the area include residential, commercial, and institutional heating in the Town of Marathon, the municipal waste and transfer station, heating from nearby rural properties and communities, vehicle traffic, airport traffic, forestry activities, and other nearby industrial sources including the Hemlo Gold Camp located approximately 40 km east of the project site.

Air pollutant emissions from the Project such as particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) have the potential to adversely affect human health and the environment in the surrounding area. The Panel may refer to Health Canada's submission for information on the human health effects of air pollutants.

Taking into account mitigation measures proposed by GenPGM, ECCC assessed the potential for Project-related emissions, including proposed mitigation measures, to cause adverse environmental effects on the atmospheric environment. GenPGM's ambient air quality assessment was done, for the most part, by comparing the maximum model-predicted concentrations to ambient air criteria for each assessment case. ECCC reviewed the proponent's assessment to ensure it has been carried out properly and the presented results accurately reflect the findings of the model predictions.

Canadian Ambient Air Quality Standards

Federal, provincial and territorial governments are working collaboratively to improve air quality through the implementation of the Air Quality Management System (AQMS) (CCME, 2017). The Canadian Ambient Air Quality Standards (CAAQS) are a key element of the AQMS. For some criteria air contaminants (CACs), namely nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and $PM_{2.5}$, ECCC has considered GenPGM's predictions in comparison to the CAAQS. The CAAQS are based on the principles of "keeping clean areas clean" and "continuous improvement." CAAQS are reviewed every five years (starting in 2015) using the most recent scientific information about the effects of pollutants to ensure they are stringent enough to protect human health and the environment.

The CAAQS are supported by air quality management levels, which call for progressively more rigorous actions by jurisdictions as air quality approaches or exceeds the CAAQS, ensuring that the CAAQS are not "pollute-up-to" levels. The CAAQS are not intended to be used as an enforceable standard at the Project perimeter. However, ECCC uses comparisons to the

CAAQS to determine the nature and magnitude of project impacts on air quality levels, and to help identify the mitigation measures and monitoring to manage air quality levels. Use of the CAAQS in this manner is supported by Health Canada, ECCC's co-developer of these standards. ECCC applied the CAAQS to NO_2, SO_2 and $PM_{2.5}$ in this assessment.

Ambient Air Quality Criteria

The Ambient Air Quality Criteria (AAQC) set by the Ontario Ministry of the Environment, Conservation and Parks (MECP) is a concentration of a contaminant in air that is protective against adverse effects on health and/or the environment. AAQC are used to assess general (ambient) air quality resulting from all sources of a contaminant to air and ECCC used these criteria for those contaminants where a CAAQS does not exist. ECCC defers to MECP for further information on AAQC.

Source of Information

- EIS Addendum (CIAR #727)
    - Chapter 6.2.1 Atmospheric Environment
- Appendix D1- Air Quality Updated Effects Assessment (CIAR #727)
    - 4.4 Local Air Quality
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #32
    - ECCC #35
    - ECCC #36
- IR6-2 Air Quality Criteria (CIAR #950)

GenPGM's Conclusions

GenPGM used ambient monitoring data to characterize air quality in the local study area and to estimate existing ambient concentration levels, using data from the Canadian National Air Pollution Surveillance (NAPS) Network and on-site ambient monitoring. The ambient levels for all constituents of potential concern (CoPC) were determined to be below applicable provincial ambient air quality criteria, with the exception of the annual average for benzene, and the 24-hour and annual average for benzo(a)pyrene (CIAR #727).

GenPGM conducted dispersion modelling to assess impacts of the Project on air quality, providing predicted pollutant concentrations for baseline, construction and operations scenarios. Taking into account ambient concentrations, proposed mitigation and environmental protection measures, GenPGM predicts 6 CoPCs being above the applicable ambient air quality parameters (CIAR #727).

The maximum predicted exceedances are all modelled at the property boundary and vary between the construction phase, operations phase and various cumulative (phase + background) scenarios. These exceedances include:

- Cumulative scenarios for benzo(a)pyrene - Maximum predicted exceedances above the annual criteria 100% of the time during construction phase exceedance by 426% and 1048% respectively, and during operations by 417% and 1037% respectively;
- Cumulative scenarios for benzene - Maximum predicted exceedances above the applicable annual criteria during construction phase by 209% and during operations by 204% respectively;
- Operations phase and operations cumulative scenario for nickel - Maximum predicted exceedances above the applicable 24-hour and annual criteria during operations by 141% and 285% respectively and cumulative by 142% and 287% respectively;
- Construction and operations phases for crystalline silica – Maximum predicted exceedances above the 24-hour applicable criteria during construction phase by 702% and during operations 704%;
- Operations phase as well as cumulatively for construction and operations scenarios for dustfall - Maximum predicted exceedances above the applicable monthly criteria during operations exceedance by 125% as well as cumulative by 110% and 146% respectively; and,
- Construction cumulative scenario for NO_2 - Maximum predicted exceedances above the applicable hourly criteria by 115% (CIAR#727).

The background contribution to the cumulative scenarios include:

- Benzo(a)pyrene for 24-hour and annual criteria during construction at 412% and 1040% respectively, operations 412% and 1030% respectively;
- Benzene for annual criteria during construction and operations at 200% and 200% respectively;
- Nickel for 24-hour and annual criteria during operations at 1.3% and 2.5% respectively;
- Crystalline silica – No background was provided;
- Dustfall for applicable monthly criteria during construction and operations at 18.8% and 14.1% respectively; and
- NO_2 for applicable hourly criteria for construction at 13.8%.

GenPGM also provided frequency analyses based on special receptors (e.g., waterbodies, traditional gathering locations). For the project scenario for benzo(a)pyrene based on 5 years modelled, GenPGM predicted exceedances above 24-hour criteria 7.8% of the time at the special receptor and annual criteria 100% of the time at the special receptor. Nickel was predicted to exceed 24-hour criteria 5.2% of the time and annual criteria 100% of the time at the rail loadout facility property boundary. Crystalline silica was predicted to exceed 24-hour criteria <1.5% of the time at the special receptor based on 5 years modelled and dustfall was

predicted to exceed monthly criteria 13% of the time at the property boundary. GenPGM did not provide a frequency analysis for the remaining exceedances.

GenPGM states " …with mitigation and environmental protection measures implemented, residual effects on air quality are predicted to be not significant. For the majority of CoPCs, the magnitude of the change in residual effects will be low to medium. For the few CoPCs whose magnitude would be rated as high, either the Project contribution is small, predicted residual effects are infrequent at potentially susceptible receptors, or the geographic extent is low for potentially susceptible receptors. In all cases, residual effects are reversible." (CIAR #727).

GenPGM has not predicted transboundary effects or impacts on federal lands.

GenPGM provided updated maximum predicted NO_2 concentrations compared to the CAAQS in the IR6-2 response (CIAR #950). Modeled NO_2 predictions at the property boundary exceeded the 2020 NO_2 CAAQS in 5 of 8 scenarios for 1-hour and annual criteria. These exceedances included:

- Construction phase by 339% and 104% respectively;
- Construction cumulative scenario by 395% and 150% respectively; and
- Operations cumulative scenario at 1-hour criteria by 143%.

The background contribution to construction cumulative scenario for 1-hour and annual criteria are 14.1% and 34.4%. The background contribution to operations cumulative scenario for 1-hour criteria are 39.4%.

Modeled NO_2 predictions at the property boundary exceeded the 2025 NO_2 CAAQS for 7 of 8 scenarios for 1 hour and annual criteria. These exceedances included:

- Construction phase by 485% and 144% respectively;
- Construction cumulative scenario by 565% and 220% respectively;
- Operations phase at 1-hour criteria by 142%; and
- Operations cumulative scenario by 205% and 127% respectively.

The background contribution to the construction cumulative scenario for 1-hour and annual criteria are 14.1% and 34.4%. The background contribution to operations cumulative scenario for 1-hour criteria are 39.4%.

GenPGM notes that they included several elements into their NOx emissions estimations/modelling methodologies to ensure conservative estimates were used as part of the air quality assessment. They do not expect that the frequency or magnitude of exceedances will be as high as predicted. These elements of conservative estimates include:

- Using conservative or worst-case scenarios for ambient NO_2 concentrations in the Marathon area.

- Assuming the Project's diesel generators were continuously running at full power 100% of time, which would not be the case.
- Assuming the Project's propane comfort heaters were running year-round.
- NOx emissions from on-road mobile sources used an emission factor calculated for the worst case month, which was then applied year round. This approach ensures conservative estimates of emissions at other times of the year.
- Non-road mobile equipment such as dozers, excavators, loaders, etc. that typically operate 15 hours per day were modelled as operating 24 hours per day.
- All mining equipment was modelled as operating simultaneously. At any given time only a portion of the equipment will be operating.

GenPGM also noted that NO_2 mitigation measures will be dependent on how CAAQS criteria are applied by the Government of Ontario and that there is no indication that Ontario plans to adopt the current or future CAAQS. GenPGM's response in IR6-2 Air Quality Criteria (CIAR #950) notes that regulatory compliance for NO_2 in Ontario is currently based upon the criteria provided in O.Reg. 419/05. Depending on if/how NO_2 CAAQS are applied by Ontario, GenPGM plans on reassessing the need for ambient NO_2 monitoring for evaluating actual ambient NO_2 levels relative to the CAAQs.

GenPGM's mitigation measures being considered to address the NO_2 exceedances include on-site equipment meeting Tier 4 emissions standards, effective and timely vehicle maintenance to maintain mining equipment in good working condition and the application of a no idling policy to reduce mobile equipment and other use vehicle emissions.

ECCC's Conclusions

ECCC considers that, overall, GenPGM's modeling approach and methodology is acceptable and reasonable, and the air quality predictions are credible and suitably conservative. All air emission generating phases of the Project were considered in the air quality assessment, including construction, and year 2 of the operations phase, which is expected to have the highest mining and processing rate. Reliable sources such as USA EPA-42 emission factors were used to calculate emission rates and used as inputs to the model. Emission sources for each phase of the project were appropriately identified and included in the assessment including point and mobile sources. The inventory of equipment used for each phase was appropriate. The list of contaminants selected for assessment was suitable and a conservative approach (worst-case scenario) was used to model CoPCs.

In ECCC's review, 8 exceedances were predicted including 7 exceedances of Ontario's AAQC: benzene, benzo(a)pyrene, nickel, crystalline silica, dustfall, total suspended particles (TSP) and particulate matter (PM_{10}) and one exceedance of the federal CAAQs: NO_2.

ECCC notes that for all but two of the air pollutants with predicted exceedances, the predicted ambient concentrations drop off quickly shortly beyond the fence line. Exceedances of

benzo(a)pyrene, which has the highest magnitude and frequency of exceedances and benzene, are mostly related to background sources rather than the proposed project.

ECCC compared the PM_{10} concentrations with all particulate emission sources. Exceedances in the 24-hour criteria were identified as they relate to the construction phase by 150%; operations phase by 149%; in the construction cumulative scenario by 196%; and operations cumulative scenario by 194%. The background contribution to the cumulative scenario include 23.3% during construction and 23.5% during operation.

ECCC compared the TSP concentrations with all particulate emission sources. Exceedances in the 24-hour and annual criteria were identified as they relate to the construction phase by 203% and 128% respectively; operations phase by 229% and 134% respectively; in the construction cumulative scenario by 240% and 168%; and operations cumulative scenario by 266% and 175%. The background contribution to the construction and operation cumulative scenarios for 24-hour and annual criteria include 15.3% and 24.2% respectively, and 42.8% and 23.2% respectively.

GenPGM provided two separate calculations for PM_{10} and TSP. One calculation excluded fugitive emissions such as roads and stockpile wind erosion, and the other provided all particulate emission sources. ECCC recommends that monitoring PM_{10} and TSP during the construction and operations phases be incorporated into the Air Quality Management Plan and Follow-up and Monitoring Program to verify the accuracy of predictions, the effectiveness of any applied mitigation measures and to inform the potential need for additional mitigation measures.

ECCC reiterates that the Project's predicted NO_2 emissions, taking into account ambient NO_2 levels, should be compared to the CAAQS (CIAR #893). This is consistent with the approach ECCC has taken for other mining projects under the CEAA 2012 process. The CAAQS for NO_2 were introduced in December 2017 and are reviewed every five years using the most recent scientific information. ECCC relies on comparison with the CAAQS in determining ambient concentrations plus contributions expected by the Project to inform monitoring and mitigation measures that may be required to minimize air quality effects.

GenPGM provided frequency analyses for the project scenario for benzo(a)pyrene, nickel, crystalline silica and dustfall but did not provide a frequency analysis for the remaining exceedances.

GenPGM provided information on mitigation measures for the pollutants identified above, but did not provide detailed information on best management practices including when and how often mitigation measures would be implemented. The EIS Addendum did not propose or provide details regarding an air quality follow-up and monitoring program. An Air Quality Management Plan that incorporates a Follow-Up and Monitoring Program as well as a Best Management Plan and mitigation measures for air pollutants and dust is recommended to

verify the accuracy of predictions and to determine the effectiveness of any applied mitigation measures as they pertain to air quality.

The use of diesel throughout the life cycle of the mine will be a contributor to NO_2 emissions. Diesel use will be primarily for power generation, use in construction equipment, vehicle traffic, ore hauling activities, and blasting. Continuous NO_2 monitoring will allow for comparisons with the predicted ambient pollutant concentrations as well as 1-hour ambient standards. Comparison with the CAAQS will identify when exceedances occur. As a result, ECCC advises that the Air Quality Management Plan include, as part of the Follow-Up and Monitoring Program, continuous NO_2 monitoring during the construction and operation phases be implemented.

In addition, the Air Quality Management Plan should include as part of the Follow-Up and Monitoring Program other predicted air quality exceedances to verify that effects are consistent with predictions. The Follow-up and Monitoring Program should be used to assist in determining the effectiveness of mitigations and to facilitate the development of adaptive management measures, should there be any unanticipated environmental effects (CIAR #893).

Air quality monitoring duration, location and methodology undertaken as part of the Follow-Up and Monitoring Program should be developed in consultation with: ECCC, relevant regulatory agencies and Indigenous groups. Considering the proximity of the mine site to the Town of Marathon and Indigenous communities, ECCC recommends that air quality monitoring be undertaken throughout the duration of the construction and operations phases. The following air pollutants should be included: total suspended particles, dustfall, metals, PM_{10}, $PM_{2.5}$, NO_x, benzene and benzo(a)pyrene.

Adaptive management should be employed to ensure mitigation measures are effective and implemented immediately where necessary. If the Project is a source of or contributes to any exceedances of AAQC or CAAQS, then it is recommended that GenPGM develop and implement additional mitigation measures to mitigate the emissions of those air quality contaminants attributed to the Project.

ECCC's Recommendations 4.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop, in consultation with ECCC and other relevant regulatory agencies, an Air Quality Management Plan. The plan should include a Follow-up and Monitoring Program that incorporates air quality monitoring during all phases of the project. Monitoring locations should be based on GenPGM's air quality dispersion modeling results and prevailing winds. Parameters should include:
    - Dustfall (non continuously),
    - suspended particles and metals (non continuously),
    - particulate matter(PM_{10}) (continuously),

- fine particulate matter($PM_{2.5}$) (continuously),
- nitrogen dioxide (continuously),
- benzene and benzo(a)pyrene (non continuously).

2. Compare the results of air quality monitoring to the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards (CAAQS) or, in the absence of federal criteria, to the Ontario Ambient Air Quality Criteria; and commit to meeting the most stringent emission standards.
3. Develop and submit a Best Management Plan for dust and an adaptive management plan to mitigate air pollutants for all phases of the project for review by ECCC and other regulatory agencies prior to commencing work for the Site Preparation Phase. Adaptive management should be employed to ensure mitigation measures are performing as predicted and are implemented immediately, where necessary, if the Project is contributing to any exceedances.
4. Commit to having all major mining equipment be minimum Tier 4 compliant for the commencement of mining operations, and through all subsequent phases of the Project.

Literature Cited

AIR POLLUTION – LOCAL AIR QUALITY, O Reg 419/05, Schedule 3

[CCME] Canadian Council of Ministers of the Environment. (2017). Canada's Air. Canadian Council of Ministers of the Environment. https://ccme.ca/en/air-quality-report#slide-1

Chapter 5 - Terrestrial Environment

During the construction, operations and closure phases of the Project there will be potential impacts on migratory birds and species at risk that may use the project area due to the following:

- Loss of forest and wetland habitat within the footprint of the Marathon site, also referred to as the SSA;
- Increased linear disturbance outside of the SSA;
- Loss of connectivity both within the Coastal Range (ON6) herein referred to as the "Lake Superior Coast Range" (LSCR) and between the LSCR and the inland discontinuous and continuous ranges of Woodland Caribou, Boreal population, also referred to as "boreal caribou";
- Potential mortality of birds and other wildlife during land clearing activities, and;
- Disturbance of birds and other wildlife from noise during site preparation, construction, and operation activities.

ECCC has considered these impacts in the context of its legislated mandates under the MBCA and SARA. The conclusions and recommendations in the document are guided by the following:

- The MBCA and its regulations, including no disturbance or destruction of migratory birds or their nests;
- SARA, including the prohibition against the killing or harming of all species listed as Threatened and Endangered or the damage or destruction of residences of the individuals of a species or destruction of the species' critical habitat;
- Conservation of boreal caribou habitat within the LSCR and the discontinuous range, as necessary for the survival and recovery of the species;
- Mitigation and monitoring for adverse effects on species at risk that are consistent with recovery strategies, management plans and action plans;
- Maintenance of the regional stability of migratory bird populations, species at risk and species biodiversity.

5.1 Migratory Birds

Introduction and Importance of the Topic to Environmental Assessment

The terrestrial portion of the SSA is approximately 1,116 ha, of which 97% is covered by forest (CIAR# 950). Other than the rail loadout facility, the SSA contains all other Project components and linear disturbances (herein described as the footprint). It is expected that all of the vegetation in the SSA will be removed or substantially altered (CIAR# 950).

The SSA forested area is primarily mixed wood forest dominated by white birch and balsam fir, with some areas occupied by black spruce forest. The forest age class structure is generally mature to over-mature, with a few young hardwood dominated stands present, likely a result of forest harvesting operations.

The non-forested area is composed of small wetland features including fen, meadow marsh and thicket swamp habitat. These small wetland features along with eight small lakes provide limited habitat for migratory birds, including at least seven species of waterfowl.

A total of 97 bird species have been documented at the SSA, with an additional 35 species detected nearby in the RSA on past Breeding Bird Survey or Ontario Bird Atlas. This includes migratory birds and Species at Risk (SAR). The effects of the Project on SAR are described in Section 5.2.

Key resources that factored into ECCC's review include:

[ECCC] Environment and Climate Change Canada. 2014. Bird Conservation Strategy for Bird Conservation Region 8 in Ontario Region: Boreal Softwood Shield. Canadian Wildlife Service, Environment and Climate Change Canada. Ottawa, ON. 132 pp. + app. Available at https://www.canada.ca/en/environment-climate-change/services/migratory-bird-conservation/publications/strategy-region-8-boreal-softwood.html

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[ECCC] Environment and Climate Change Canada. 2020. Avoiding harm to migratory birds. Available at https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html

Sources of Information

- Environmental Impact Statement (EIS) (CIAR #224)
- Environmental Impact Statement - Supporting Information Documents (CIAR #227)
    - Supporting Information Document 24 - Marathon Project Terrestrial Baseline Environment Program
- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions

  - 6.6 Cumulative Effects Analysis
  - Appendix D8 WILDLIFE SUPPORTING INFORMATION
- Responses to Information Requests (CIAR #749)
  - Responses to Information Request #1: Alternative Means Assessment
- Responses to Information Requests (CIAR #950)
  - IR6-30 Noise Disturbance - Species at Risk & Migratory Birds

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that residual effects from direct loss of habitat in the SSA are expected to be greatest for forest-associated bird species, since forest habitats account for more than 90% of the SSA area and forest-dwelling species currently dominate the avian community of the SSA (CIAR #727). Individuals of these species will largely be displaced by forest clearing for the Project footprint, although direct mortality will be reduced by mitigation (e.g., clearing vegetation outside the breeding season).

The clearing of approximately 1,116 ha of the SSA will result in the temporary loss of habitat for about 8,700 forest birds of the 72 species found in the SSA for an approximate total density of 7.8 birds/ha or 391 pairs/km^2 (CIAR #727). This is a higher estimate than the density of 243 pairs/km^2 in the original EIS (2012). GenPGM states that the overall impact of loss of forest habitat on the bird populations is uncertain because breeding habitat is likely not limiting regionally, and displaced birds will likely occupy vacant suitable habitat nearby (CIAR #727). Habitat removal will affect local bird species at the SSA level, but the mature mixedwood forest habitat that will be removed is common in the LSA and RSA and located near proposed disturbed areas. GenPGM states that residual effects are expected to be at least partly reversible following the implementation of the mine decommissioning plan (CIAR #727).

For waterfowl, GenPGM states that the SSA provides limited waterfowl habitat, with only nine small waterbodies (between 0.5 ha and 5.0 ha in size) and a total of 17.7 ha of aquatic habitat when smaller ponds are included as well (CIAR #727). Assuming a density of 1-2 nesting pairs per waterbody, potentially 10-20 pairs of waterfowl could potentially be displaced by site development and construction activities in the SSA (CIAR #727). Some waterbodies will eventually be reestablished (e.g., filling of the pit), but will likely not have the same productivity and characteristics of the waterbodies lost during side development of the SSA (CIAR #727). However, GenPGM notes that similar habitat is widespread, with over 11,000 remaining waterbodies of similar size (i.e., <10 ha) in the Regional Study Area (RSA) that collectively cover 11,409 ha (CIAR #727).

The main mitigation and enhancement measures proposed by GenPGM to address this loss of habitat include progressive rehabilitation, to recover some area lost during mine operation, including the access road and transmission line, and return it to a vegetated state (CIAR #727). GenPGM estimates that approximately 900 ha of the SSA can be revegetated (CIAR# 950).

GenPGM states that cumulative habitat loss for migratory birds could be expected where land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration) (CIAR #727). However, they state that timber harvesting in the RSA will be the largest contributor to the direct loss of wildlife habitat based on planned cutovers. GenPGM concludes that the cumulative residual effect associated with timber harvesting will likely be the most substantial and the relative contributions of the Project and other activities will be relatively minor in comparison (CIAR #727).

Indirect Loss of Habitat Quality and Sensory Disturbance

GenPGM notes that during site development, construction and operations, effects could result from a variety of factors including sensory disturbance (e.g., dustfall, light pollution, and noise and vibration), encroachment of invasive plant species, and changes to local hydrological and hydrogeological conditions. These changes in wildlife habitat quality, or impairment of habitat, is assumed for the duration of the Project life from site preparation and construction, through operation, with levels generally declining at closure and after rehabilitation (CIAR #727).

With respect to the indirect habitat loss for migratory birds resulting from sensory disturbance, construction noise and vibration, GenPGM notes that levels will vary for specified locations as activities change in position and intensity. Sensory disturbance will be more pronounced during operation, with approximately 444 ha within the LSA expected to experience noise levels up to 50 Decibel (dB), it is expected that approximately 3,500 forest-dwelling birds could be disturbed by noise from the SSA (CIAR #727). Most of the affected area is within 500 m of the SSA, primarily along the southern periphery of the Project footprint and some to the northwest of the proposed pit and processing facility (CIAR #727).

Some general mitigation proposed by GenPGM include directional lighting, measures to address noise and vibration and additional mitigation measures necessary to address noise or other disturbance to breeding birds in the event nests are established during Project operations for species that are protected under the MBCA (CIAR #727).

GenPGM determined that residual effects will depend upon sensitivity to disturbance and site fidelity of affected species. Some species, particularly those that prefer edges, may be more tolerant of noise and more likely to use disturbed habitat compared to more sensitive forest interior species (CIAR #727). Additional mitigation, if required, will be employed on a case-specific basic to avoid disturbing nesting birds as per the MBCA. Limited residual effects are predicted on shorebirds, wetland birds, or waterfowl from sensory disturbance due to the low numbers of potentially impacted individuals and limited habitat in the LSA.

GenPGM concludes that the indirect cumulative loss for migratory birds associated with land clearing activities, development, and subsequent operation of site-related infrastructure, vehicles, and equipment are likely to be spatially confined to a localized area in the vicinity of the project/activity, not extending to a more regional scale. Given the combined footprints of the Project and other projects/activities, the combined effect in comparison to the RSA is expected to be relatively small in magnitude (CIAR #727).

Change in Mortality Risk

GenPGM indicates that incidental take of forest birds (i.e., destruction or disturbance of tree-, shrub-, or ground-nesting bird nests or nestlings) is a Project risk, particularly during initial site development and construction of the 1,116 ha SSA (CIAR #727). GenPGM states that this can be effectively mitigated by vegetation clearing outside the avian breeding season. GenPGM further notes that residual effects are expected to be negligible and will not affect forest bird populations in the RSA. They also conclude that with appropriate mitigation, mortality or injury from window bird strikes and vehicle collisions are expected to be negligible. Collisions with transmission lines is not expected to have an effect on populations outside the LSA given the Project is not on a major flyway and that small, agile passerines are less at risk (CIAR #727).

Waterfowl may be susceptible to adverse effects from transmission lines, particularly near Canoe Lake (CIAR #727). However, there are relatively few breeding waterfowl on Canoe Lake and other LSA waterbodies. The project is not on a major flyway, and the relatively small number of migratory waterfowl are likely to move primarily along the Pic River approximately 2.5 km to the east (CIAR #727). Therefore, GenPGM concludes that collisions with mine infrastructure and the transmission line should not have a substantial effect on the waterfowl populations outside of the LSA.

Some general mitigation measures proposed by GenPGM include:

- Clearing outside the main bird breeding window as determined by confirmed species present on site and guidance from ECCC's nesting calendars for Nesting Zone C5 and Birds Canada's Nesting Canada Query Tool.
- Where clearing outside this window is not practicable, and the area to be disturbed is relatively small and/or not complex, conducting nest surveys by trained biologists to identify the location of nests and thereby reduce the risk of incidental take (CIAR #727).

In the EIS Addendum, GenPGM states that cumulative effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected where some land clearing activities and/or development of site-related infrastructure is needed, and where operation of vehicles and equipment occurs (wind and hydro power developments, mineral exploration, timber harvesting). The overall adverse cumulative residual environmental effect on wildlife mortality risk is predicted by GenPGM to be not significant.

GenPGM's conclusion as it relates to significance

For loss of migratory bird habitat, GenPGM predicts the residual effects of the Project arise from the loss of approximately 1,116 ha of suitable habitat in the SSA. With remediation at closure, GenPGM expects some of this loss will be mitigated. As stated in the original EIS, the residual environmental effect of a change in habitat quantity is predicted to be not significant because the decrease in habitat is not expected to threaten the long-term viability of migratory birds in the RSA, where suitable habitat is abundant and widespread (CIAR #224).

With mitigation, GenPGM predicts that the residual effect of a change in the quality of migratory bird habitat and associated sensory disturbance will not threaten the long-term viability of wildlife, such as migratory birds in the RSA (CIAR #727). Potential effects from elevated sound, vibration, light, smells, and dustfall, as well as possible changes to wildlife habitat from invasive species, groundwater or surface hydrology, or edge effects will only effect a relatively small proportion of the RSA and GenPGM concludes that it will not result in the permanent impairment of habitat or its use by wildlife.

Lastly, using GenPGM's significance criteria GenPGM predicted that with mitigation, residual effects to migratory birds will not be significant because the effects of clearing, collisions with Project vehicles, transmission lines and other infrastructure will only effect few individuals and will not substantively effect the sustainability of migratory bird populations in the LSA or RSA (CIAR #727). The overall adverse cumulative residual environmental effect on migratory birds is predicted by GenPGM, using GenPGM's significance criteria, to be not significant.

ECCC's Conclusions

Direct Loss of Habitat

For forest birds, the clearing of approximately 1,116 ha of the SSA will result in the temporary loss of habitat for about 8,700 birds in the SSA. The Project is predicted to result in a permanent loss or conversion of approximately 216 ha of forest to open water, grassland, and rock barren habitat; the remaining 900 ha will be restored to a forested condition upon site closure (CIAR# 950). The temporary and permanent removal of migratory bird habitat by developing the Project will have an impact on the local bird population; however, it is anticipated that the birds will relocate to similar habitat that is adjacent to the site and that adjacent available habitat is sufficient to support the displaced birds.

The forest bird species assemblage in the remaining habitat will likely be impacted by site preparation, construction, and operation phases. A new transmission line corridor approximately 2.2 km in length with a corridor of 30 m wide will be cleared resulting in an immediate loss of approximately 6.6 ha (CIAR# 749). The habitat within the corridor will regenerate during the closure and post-closure phases, likely remaining in a shrub thicket condition with edge habitat provided in conjunction with the adjacent, predominately mature to over-mature mixed wood forest.

For waterfowl, a total of 17.7 ha of aquatic habitat will be lost within the SSA, which will result in displacing 10-20 pairs of waterfowl due to site development and construction in the SSA. The closure plan indicates that the pits will gradually fill with water, thereby creating the potential for up to 160 ha of aquatic habitat (CIAR# 950). It should be noted that the characteristics of these features may not make them suitable for use by waterfowl during any of their life stages.

Indirect Loss of Habitat Quality and Sensory Disturbance

Very little shrub thicket habitat can be found locally or regionally and where it does occur, it is generally associated with moist conditions, presenting as shrub swamp. The forest adjacent to all cleared land, largely associated with Project infrastructure, including roads, will provide edge habitat where predominately mature to over-mature forest habitat including interior habitat, previously existed. These structural changes to the existing forest habitat could result in a shift of the species assemblage favouring species which utilize forest edges. As identified in the EIS Addendum, there are other projects in the area (current and proposed) that will alter local habitat availability for migratory birds. Cumulatively these development projects have the potential to impact the migratory bird community including SAR. All projects may, at least temporarily, decrease the amount of mature to over-mature forest habitat while increasing shrub thicket habitat and young age class forest. The forest bird community species abundance could therefore decrease, however the community richness may increase, with increasing habitat diversity.

Upon closure, the proposed rehabilitation of the site is to develop approximately 900 ha of vegetation, with a regeneration time of approximately 100 years to reproduce the age class structure consistent with a mature to over-mature forest (CIAR# 950). There will be a significant lag between when the forest stands are removed and when the forest stands with habitat characteristics suitable for forest birds are available. Furthermore, if the entire site is remediated at the same time using the same prescription, the resulting even age class structure , and species composition will not produce the same habitat as currently exists without a silvicultural plan. While the Project site is predominately mixed wood, many different stand compositions and conditions exist in a matrix, providing diverse habitat for many forest bird species. Reclamation presents an opportunity to manage the forest composition for a variety of habitat requirements for forest birds including area sensitive species and SAR.

Noise effects from the Project site preparation, construction, and operation associated with heavy machinery and blasting are temporary until closure, and are reversible. Noise from ongoing operations, will be constant, and may influence waterfowl and forest bird use of suitable habitat in the immediate vicinity as well as impact the reproductive success of songbirds who use songs to attract mates.

Change in Mortality Risk

Project works or activities, such as, construction access, site grubbing, vegetation clearing and construction activities, are potentially destructive or disruptive activities to birds, their nests or eggs and should be avoided at key locations or during key periods, including the breeding periods and periods of high usage such as migration and/or feeding. These locations and periods vary by region and by species. While avoidance is the best approach, in order to minimize the risk of detrimental effects to migratory birds, appropriate mitigation measures should be developed and implemented to avoid incidental take and to help maintain sustainable populations of migratory birds. Additional information about incidental take and avoiding harm to migratory birds can be found at: (https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html).

From the perspective of ECCC's mandate under the MBCA, the most important potential effect associated with the Project is the short-term loss of forest and wetland habitat, and long-term conversion to other habitat types (e.g. open water, grassland). Overall, ECCC's expert advice is that the Project will cause a permanent loss of migratory bird habitat, directly impacting the local forest bird and waterfowl populations. However, ECCC also advises that displaced birds may relocate to adjacent similar habitats.

Therefore, ECCC believes that the Project will not likely disturb the regional stability of migratory bird populations provided that GenPGM meets the commitments that they have stated. ECCC advises that the effects of the Project on the regional bird populations can be effectively mitigated.

ECCC Recommendations 5.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop in consultation with ECCC and the Province of Ontario, a reclamation plan that describes the management of habitat requirements for a variety of forest birds and waterfowl.
2. Implement mitigation measures consistent with ECCC's guidance on Avoiding Harm to Migratory Birds.
3. Continue the Forest Bird Monitoring Program (FBMP) and Nightjar and Waterfowl surveys during the construction, operations and closure phases of the Project. Use that information along with baseline survey results to verify effects predictions and corresponding reclamation prescriptions.

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Yip, D.A., L. Leston, E.M. Bayne, P. Sólymos, and A. Grover. 2017. Experimentally derived detection distances from audio recordings and human observers enable integrated analysis of point count data. Avian Conservation and Ecology 12(1):11. Available at https://doi.org/10.5751/ACE-00997-120111

5.2 Species at Risk

Introduction and Importance of the Topic to Environmental Assessment

Potential adverse effects of the Project have been identified for two SARA listed Endangered species: Little Brown Myotis and Northern Myotis; five Threatened species: Common Nighthawk, Eastern Whip-poor-will, Canada Warbler, Olive-sided Flycatcher, and Boreal Caribou; and six Special Concern species: Eastern Wood-Pewee, Evening Grosbeak, Rusty Blackbird, Monarch, Peregrine Falcon, and Yellow-banded Bumble Bee.

Key resources that factored into ECCC's review include:

COSEWIC Status Reports. 2019. Developed by the Committee on the Status of Endangered Wildlife in Canada. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports.html

[ECCC] Environment and Climate Change Canada. 2020. Species at Risk Act Policies – Policy on Recovery and Survival. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/policies/Pg-RecoverySurvivalRetablissementSurvie-v00-2021Mar-eng.pdf

5.2.1 Boreal Caribou

Introduction and Importance of the Topic to Environmental Assessment

Woodland Caribou *(Rangifer tarandus caribou*), Boreal Population ("boreal caribou") are a medium-sized member of the deer family. Boreal caribou are forest-dwelling, sedentary caribou only found in Canada. Boreal caribou are distributed across Canada's boreal forest from the southeast corner of the Yukon to Labrador, and as far south as Lake Superior in Ontario. The boreal caribou is listed as Threatened on Schedule 1 of SARA.

In October 2012, the Government of Canada published the Recovery Strategy for the Woodland Caribou, Boreal population (Rangifer tarandus caribou) in Canada, which was replaced in 2020 by the Amended Recovery Strategy for the Woodland Caribou, Boreal

population (Rangifer tarandus caribou) in Canada. The amended recovery strategy identified critical habitat in the 51 identified ranges for the species in nine provinces and territories (ECCC, 2020). Boreal caribou ranges are the fundamental unit of conservation and management for boreal caribou recovery planning and actions from a federal perspective; each range includes a local boreal caribou population, considered unique and are managed independently from other populations. The recovery goal for boreal caribou is to achieve self-sustaining local populations in all ranges throughout their current distribution in Canada, to the extent possible. The population and distribution objective of the federal recovery strategy is to maintain or achieve self-sustaining local populations. The federal recovery strategy states that maintaining a long-term self-sustaining status for boreal caribou ranges depends on connectivity within and between ranges, and indicates that irreversible range retraction or permanent breaks in range connectivity should be avoided. Current evidence supports the conclusion that the recovery of all local populations is biologically and technically feasible (ECCC, 2012; ECCC, 2020).

Critical habitat under SARA means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy. Critical habitat is identified in the amended federal recovery strategy for all boreal caribou ranges, except for the northern Saskatchewan's Boreal Shield range (SK1), as:

- the area within the boundary of each boreal caribou range that provides an overall ecological condition that will allow for an ongoing recruitment and retirement cycle of habitat, which maintains a perpetual state of a minimum of 65% of the area as undisturbed habitat; and,
- biophysical attributes required by boreal caribou to carry out life processes.

The 65% undisturbed habitat threshold was based on a scientific analysis of 24 boreal caribou ranges across Canada, demonstrating the link between calf recruitment and total disturbance on a range (ECCC, 2011; Johnson et al., 2020). At 65% undisturbed habitat, it was estimated that local populations, on average, would have a 60% chance of maintaining or achieving a self-sustaining status.

Activities that are likely to result in the destruction of critical habitat include, but are not limited to, the following:

- Any activity resulting in the direct loss of boreal caribou critical habitat. Examples of such activities include: conversion of habitat to agriculture, forestry cut blocks, mines, and industrial and infrastructure development.
- Any activity resulting in the degradation of critical habitat leading to a reduced, but not total loss of both habitat quality and availability for boreal caribou. Examples of such activities include: pollution, drainage of an area, and flooding.
- Any activity resulting in the fragmentation of habitat by human-made linear features. Examples of such activities include: road development, seismic lines, pipelines, and hydroelectric corridors.

The likelihood that critical habitat will be destroyed is increased if any one of these activities, or combination thereof, were to occur in such a manner, place and time, that after appropriate mitigation measures are implemented any one of the following were to occur:

- Compromise the ability of a range to be maintained at 65% undisturbed habitat.
- Compromise the ability of a range to be restored to 65% undisturbed habitat.
- Reduce connectivity within a range.
- Increase predator and/or alternate prey access to undisturbed areas.
- Remove or alter biophysical attributes necessary for boreal caribou.

The federal recovery strategy states that, a single project/activity may or may not result in the destruction of critical habitat; however, when considered in the context of all current and future development activities within and among ranges, the cumulative impacts may result in the destruction of critical habitat.

The federal recovery strategy identifies that the primary threat to most boreal caribou local populations is unnaturally high predation rates resulting from human-caused and natural habitat loss, degradation, and fragmentation. Habitat loss, degradation, and fragmentation support conditions that favour higher alternate prey densities e.g. moose (*Alces alces*) and deer (*Odocoileus spp*.). This results in increased predator populations e.g. wolf (*Canis lupus*) and bear (*Ursus spp*.), that in turn increase the risk of predation to boreal caribou. This threat can be mitigated through coordinated land and/or resource planning, and habitat restoration and management, in conjunction with predator and alternate prey management where local population conditions warrant such action.

The Project

The Project is located entirely within the LSCR (ON6). The LSCR is unique in that it is isolated, small, linear, and the most southern range in Canada (Figure 1). In recent years, the majority of caribou in the range have resided on the offshore islands in Lake Superior, although recent use of the mainland has been demonstrated using camera traps (unpublished data, Province of Ontario).

Figure 1. Boreal Caribou Ranges in Canada including the Coastal Range (ON6) (ECCC, 2020).

Overall, habitat disturbance within the LSCR is relatively low, estimated at 85% total undisturbed habitat (ECCC, 2020).

The LSCR suffers from limited connectivity at both the intra-range and inter-range scales. The intra-ranges lies between islands and the mainland, or between the eastern and western parts of the mainland. The inter-range is isolated from other boreal caribou ranges in Ontario. Highway 17 and the associated infrastructure around the Town of Marathon represents a considerable barrier to east-west movement of boreal caribou within the LSCR. There is limited but occasional natural (e.g., ice bridges) and human assisted movements within the range. There exists genetic evidence from caribou from Pic Island that suggests at least some individuals within the LSCR were connected to northern ranges in the recent past (~30 years or so; Drake et al. 2018), but contemporary connectivity is unknown and likely limited. Based on typical home range sizes for boreal caribou, it would be expected individual caribou in the LSCR would use patches of high quality habitat that are separated by distances of >100 km without leaving their typical home ranges, provided that landscape connectivity allows them to do so. These behavioural traits highlight the need to maintain a high degree of connectivity within the LSCR as well as maintain connectivity with other boreal caribou ranges. An area Ontario refers to as the "discontinuous distribution" may facilitate caribou movement between the LSCR and the continuous distribution to the north.

The Province of Ontario has identified boreal caribou habitat within the LSCR. Category 1 habitat (boreal caribou habitat likely to have the lowest tolerance to alteration) has been identified on the islands and a portion of the mainland along the shoreline to the north and west of the town of Marathon (Figure 2). Category 1 habitat could include nursery areas, winter use areas and travel corridors.

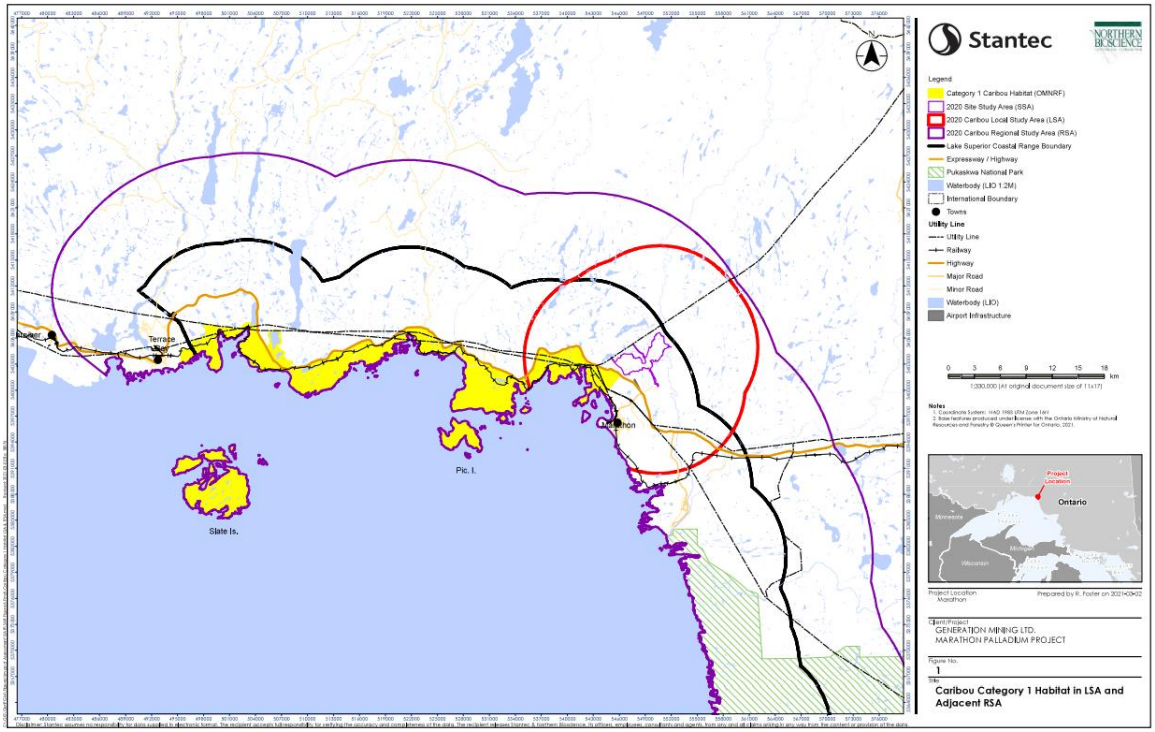

Figure 2. Caribou Category 1 habitat (EIS Addendum D9.3 Figure 1, CIAR #725).

As described in the federal recovery strategy, one of the most important parameters to consider besides habitat disturbance is population size and trend. The abundance of a species or population is intrinsically linked to the size of its range (Gaston et al. 2000). Populations with small ranges and low numbers are the most vulnerable to changes in land use (Sykes et al., 2020), stochastic events such as winter icing or heavy snowfalls, fire, disease (Smith et al., 2019) and ultimately to extinction (Purvis et al. 2000, Staude et al., 2020). Since the arrival of wolves on Michipicoten Island in 2014, population size in the LSCR has declined from 492 as described in the original federal recovery strategy, to a current estimate that is believed to be much less than 100 individuals. Caribou have low fecundity (compared to moose, for example) and calf survival is often reduced in highly-disturbed landscapes (e.g., Pinard et al. 2012). Additional disturbance to this range could exacerbate the situation.

Based on the current status of the species under SARA, the significant local population decline in the last 10 years due to wolf predation on the islands, the geographic isolation of the LSCR local population, and the importance of connectivity of habitat within and between ranges to maintaining self-sustaining status, the risk to recovery of the local population is considered high and any further effects should be considered with caution.

Key resources that factored into ECCC's review include:

[ECCC] Environment and Climate Change Canada. 2011. Scientific Assessment to Inform the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada: 2011 update. Ottawa, Ontario, Canada. 102 pp. + appendices.

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Sources of Information

- Caribou Habitat Off-Site Mitigation Report submitted by Stillwater Canada Inc. (CIAR #671)

- Marathon Palladium Project Terrestrial Environment Baseline Report Updated (CIAR #722)
- EIS Addendum (CIAR #727)
    - 1.0 Background and Introduction
    - 2.0 Project Scoping
    - 6.2.6 Vegetation
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.6 Cumulative Effects Analysis
    - Appendix D9 Species at Risk
- Responses to Information Request #1: Woodland Caribou Habitat Offsite Mitigation (CIAR #757)
    - IR2-1 Woodland Caribou Habitat Offsite Mitigation
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #01
    - ECCC #02
    - ECCC #03
    - ECCC #04
    - ECCC #05
    - ECCC #06
- From the Joint Review Panel to GenPGM re: Request for Information Package of September 13, 2021 (CIAR #931)
    - IR6-21
    - IR6-22
    - IR6-23
    - IR6-24
- Responses to Information Requests (CIAR #950)
    - IR6-21
    - IR6-22
    - IR6-23
    - IR6-24
- From Environment and Climate Change Canada to the Joint Review Panel re: Concerns with the Sufficiency of Information provided for the Marathon Palladium Project (CIAR #954)
- From the Joint Review Panel to GenPGM re: Notice of Sufficiency of Information (CIAR #955)
- From GenPGM to the Joint Review Panel re: Additional Information on the Caribou (CIAR #976)
- From GenPGM to the Joint Review Panel re: Meeting notes on topics related to Caribou and Engineering Design/LRIA (CIAR #1016)

GenPGM's Conclusions

GenPGM states that, due to the recent decline in the LSCR caribou population, it is less likely that caribou will interact with the project. They conclude that, with appropriate mitigation, no adverse effects on boreal caribou survival are anticipated from the Project given the lack of documented historical or current use of the SSA and the very low numbers of boreal caribou estimated to remain on the mainland portion of the LSCR (CIAR #722).

Caribou Habitat Connectivity

With respect to critical habitat connectivity, GenPGM predicts that the Project could potentially impair movement of caribou, but the effects are expected to be minor and more than compensated for by the proposed off-site mitigation measures that will rehabilitate forest access roads, reduce predation risk, and improve connectivity (CIAR #727). GenPGM suggests that there are ample ways for caribou to by-pass or traverse the site (CIAR #727). GenPGM describes the landscape north of the SSA as an area with "no forest harvesting occurring" and therefore suggest that caribou would have "virtually unimpeded passage through this landscape". They describe the area south of the Project, as being "already heavily impacted by human development and disturbance". In response to a request for more information regarding the proposed travel corridors through or around the site, GenPGM provided maps to demonstrate existing corridors north and south of the site (Figure 3, CIAR #950). Further, GenPGM states that avoidance of human infrastructure depends on local disturbance levels and perceived risk. GenPGM concludes that the closure activities will result in improved connectivity compared to the current state.

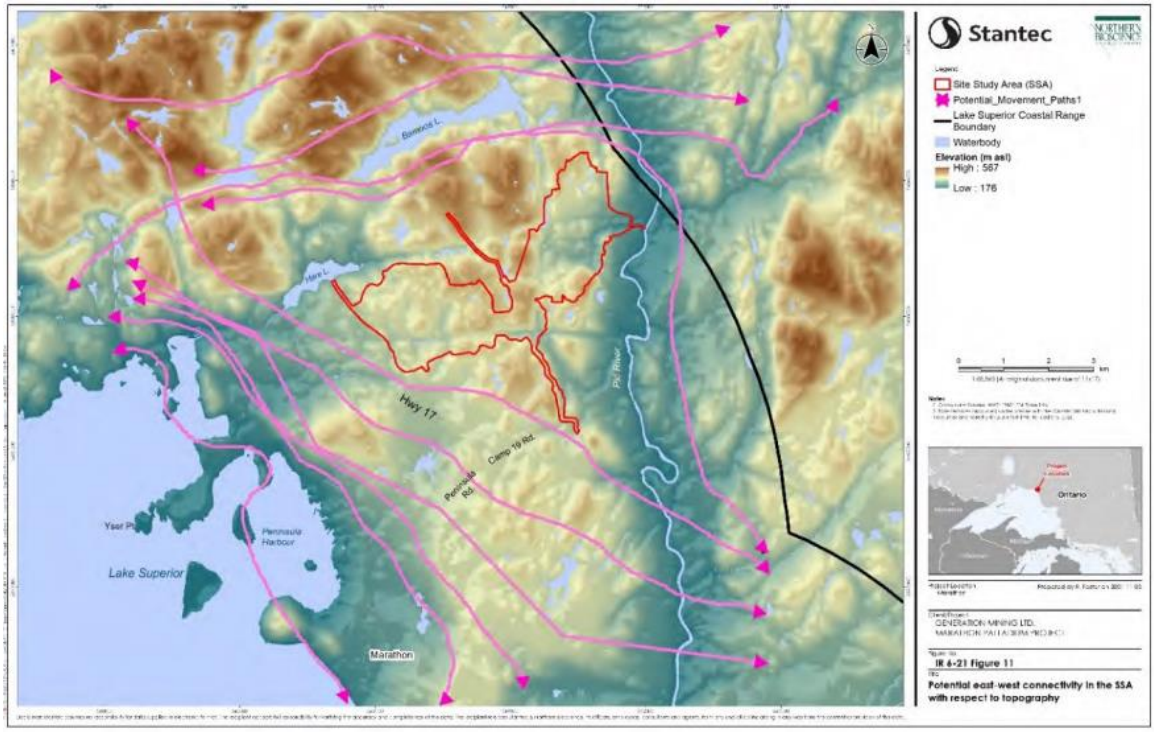

Figure 3. Potential east-west connectivity in the LSA with respect to topography (IR6-21 Figure 11, CIAR #950).

GenPGM provided justification for their findings (CIAR #976), including an analysis of intra-range landscape connectivity using semi-quantitative models. In GenPGM's results and discussion, it is stated that at the 500 ha and 50 ha hexagon scales, "resistance increases at the Project site during Project operation (Figure 5 and 7); particularly in the western portion of the SSA that currently has few trails or other disturbance." (CIAR #976). Specifically at the 50 ha hexagon scale, the effect of linear corridors on resistance to potential caribou movement is more apparent, as shown in Figure 4 and 5 (Figure 4 shows pre-Project resistance values; and Figure 5 shows Project operations). Note that GenPGM also provided additional figures for other scales (e.g., 500 ha hexagon scale).

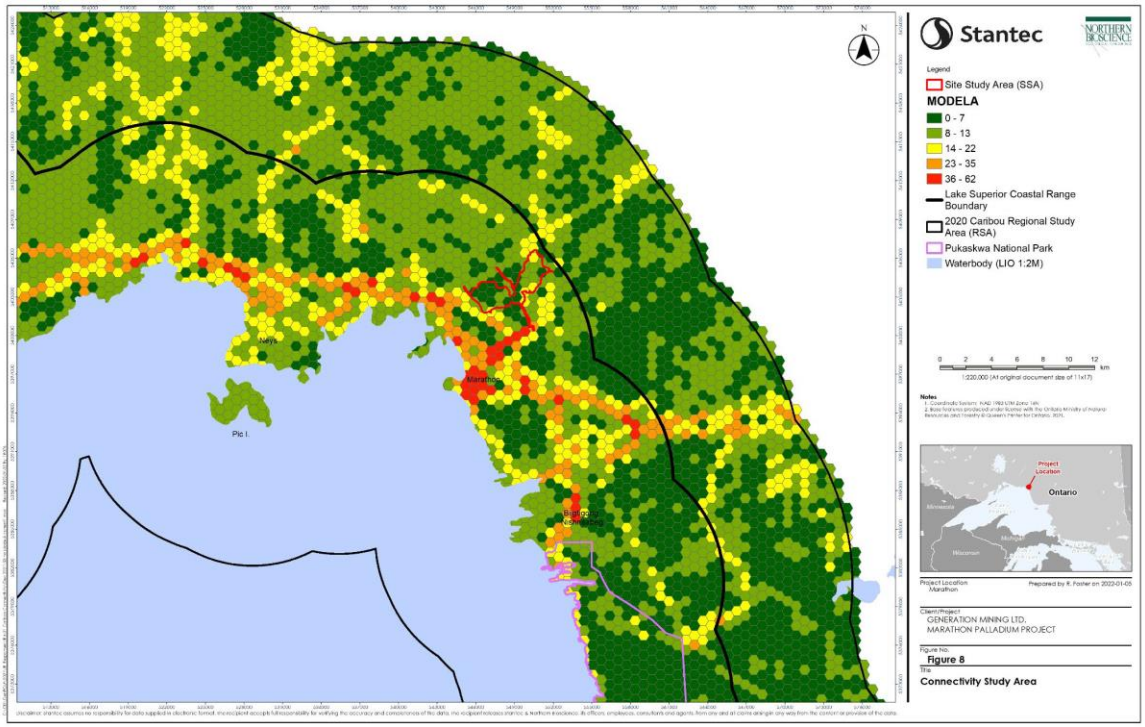

Figure 4. Resistance (green lowest, red highest) to potential caribou movement for 50 ha hexagons, pre-Project (CIAR #976).

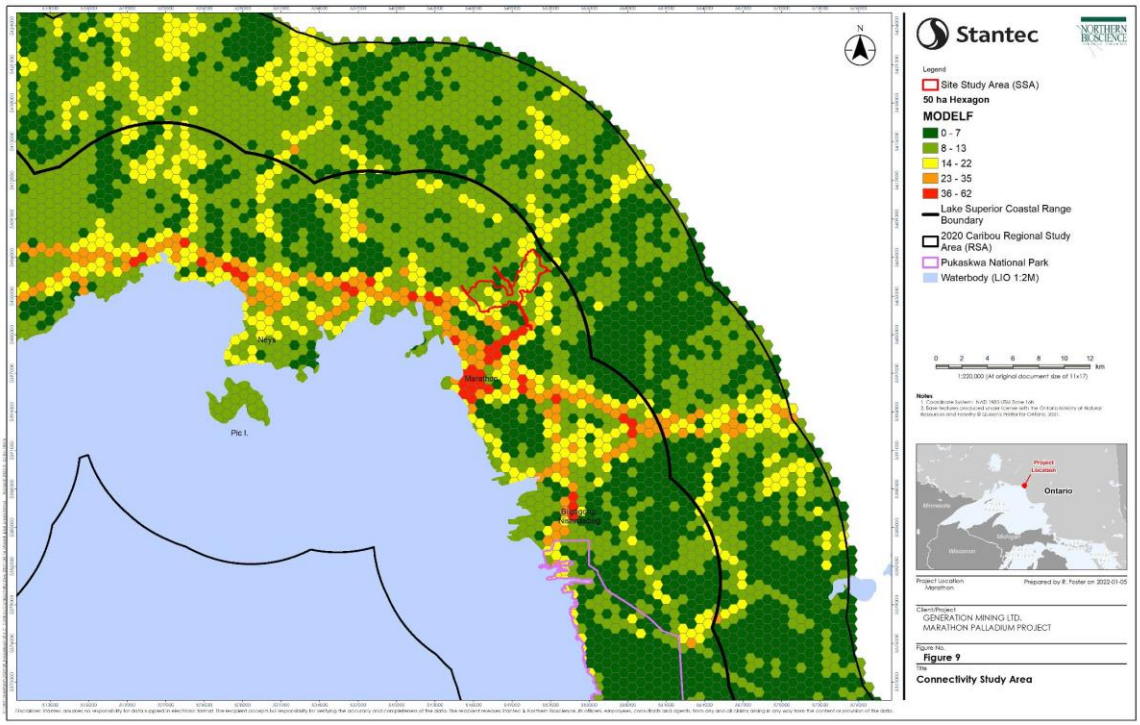

Figure 5. Resistance (green lowest, red highest) to potential caribou movement for 50 ha hexagons, during Project operations (CIAR #976).

Category 1 Habitat and Sensory Disturbance

GenPGM predicts that at the boreal caribou RSA level, the Project will result in an additional 45 ha of new disturbance for an estimated increase in range level habitat disturbance from 28.06% to 28.07% (CIAR #727). GenPGM goes on to state that, with remediation at closure, at least some of this loss may be mitigated in the long-term. GenPGM concluded using GenPGM's significance criteria that this loss of habitat is not significant to the species (CIAR #727).

GenPGM describes the potential for sensory disturbance to Category 1 habitat (habitat containing biophysical attributes of critical habitat; see Figure 6) given its proximity to the SSA. GenPGM states that there are only seven caribou records in the provincial caribou database within the LSA (CIAR #950). They claim that the lack of observations in recent years suggests that the previous observations were transient caribou, and therefore the area is unlikely occupied by caribou. Further, GenPGM is of the opinion that the 10 to 15 km buffer for sensory disturbance might be appropriate in the larger, remote northern ranges, but likely not applicable in the LSCR where caribou are more tolerant to disturbance. Additionally, they state that there are existing natural sound buffers afforded by local topography, and anthropogenic sound buffers provided by existing disturbances such as Highway 17. They conclude that given the lack of documented caribou nursery or winter use in the area and the existence of natural and anthropogenic sound buffers, no negative impacts are anticipated on Category 1 habitat.

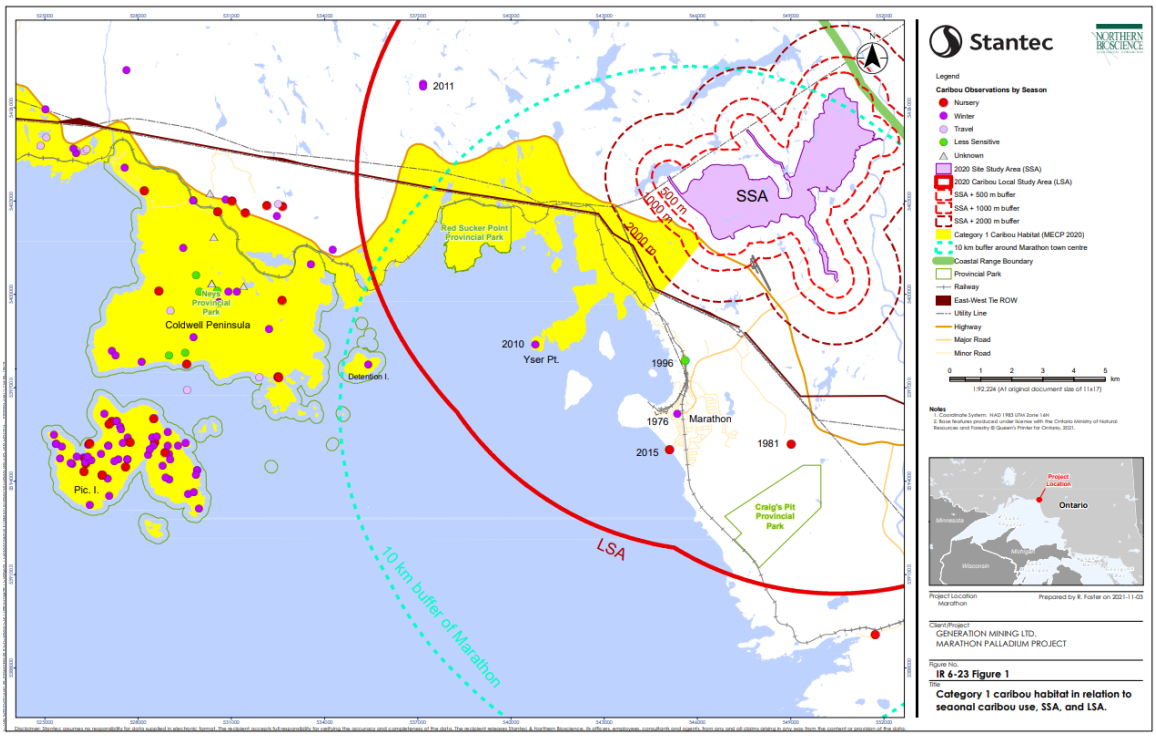

Figure 6. Category 1 caribou habitat in relation to seasonal caribou use, SSA, and LSA (IR6-23 Figure 1, CIAR #950).

GenPGM provided more information with respect to sound disturbance and the associated caribou avoidance (CIAR #976). GenPGM notes that ECCC's "*Environmental Code of Practice for Metal Mines* (2009) does provide guidance for noise thresholds on wildlife. It recommends that ambient noise from mining operations and its effect on wildlife, including caribou, should meet the objectives for residential areas which are that the sound pressure level from mining activities should not exceed 55 dB during the day and 45 dB at night (Health Canada 2017)." GenPGM modeled noise contours during both the construction and operation phases of the Project, showing areas where the noise from the project will exceed 50 dB and 45 dB, the daytime and nighttime thresholds (CIAR #976). They conclude that neither noise contour will reach Highway 17, which marks the northern boundary of the Category 1 caribou habitat as delineated by MECP, and as a result no significant effects from noise are expected in the Category 1 caribou habitat (CIAR #976).

GenPGM also notes that there are no legislated air blast overpressure limits that apply to wildlife. Using ECCC (2009) general noise guidance, they state that air blast overpressure limits for boreal caribou should meet the objectives for residential areas i.e., <120 dB as presented in IR6-11 (CIAR #976). They present overpressure contour maps for construction and operations and conclude that the 120 dB air blast overpressure contour does not reach Category 1 habitat, and using GenPGM's significance criteria GenPGM predicts no significant negative effects are anticipated if any caribou are using that habitat (CIAR #976).

<u>Progressive Rehabilitation and Post-Closure Restoration</u>

With regards to post-closure, GenPGM noted that, "at closure, even with rehabilitation, the SSA will likely be less suitable as habitat for caribou than it is currently." (CIAR #950).

GenPGM states that, as the Project proceeds, a more comprehensive closure plan will be developed with input from Indigenous communities, government agencies and public stakeholders (CIAR #950).

GenPGM identified some further details of their progressive rehabilitation and the post-closure plan (CIAR #976). The conceptual configuration of the project site at closure was provided, as well as a description and overall timeline for three phases of closure envisioned for the Project (CIAR #976). GenPGM notes that the "primary change in vegetation communities from pre-development to post-closure conditions will be the partial replacement of existing mixed wood forests with more open habitats", and the area is "anticipated to be able to eventually support similar species of animals to those identified during baseline studies". GenPGM also notes that only the decommissioned roads, transmission line, and processing plant will be potential locations for the development of even-aged conifer forest post-closure (CIAR #976).

Off-site Mitigation

GenPGM provided an updated draft version of the Proposed Caribou Habitat Off-site Mitigation report (CIAR#757). They compared the proposed mitigation opportunities to the 2021-2031 Pic Forest Management Unit (FMU) Forest Management Plan (McDonald 2021) to ensure consistency with current provincial management direction, particularly with respect to road decommissioning objectives. They concluded that opportunities identified in the 2014 Northern Bioscience report (CIAR #671) remained valid and may be suitable to achieve overall benefit for woodland caribou in the LSCR. GenPGM proposed to offset potential loss of critical habitat function through off-site mitigation consisting of enhanced silviculture, slash and landing remediation, stand improvement, and road and trail decommissioning and rehabilitation. GenPGM identified four strategic areas in the "Coastal" and "Discontinuous" ranges in or near the "Neys-Killala Linkage". The proposed off-site mitigation measures include the following:

1. Active decommissioning and planting of the approximately 55 km of the Nama Creek Road Network to reduce anthropogenic disturbance and improve future caribou habitat.
2. Active decommissioning of approximately 9 km "Neys" Retired Road to reduce anthropogenic disturbance and improve future caribou habitat.
3. Active road decommissioning of approximately 13 km of Vein Lake West Road Network with enhanced silviculture and slash pile remediation in adjacent roadside areas.
4. Active road decommissioning and enhanced silviculture, including vegetation management (e.g., herbicide/brush saw) and infill planting in the 80-ha Deadhorse Creek / McLaren Lake Block to increase the conifer component and improve future potential caribou habitat.

GenPGM states that the proposed off-site mitigation will result in the addition of approximately 115 ha of future conifer forest on the rehabilitated roadbeds and associated landings (CIAR #757). They conclude that this is approximately the amount of undisturbed potential refuge habitat lost on the Project site.

ECCC's Conclusions

GenPGM claims that, due to the recent decline in the LSCR caribou population, it is less likely that caribou will interact with the Project. However, the recent decline suggests that the small population is now facing greater risks of extirpation, which may warrant increased level of critical habitat protection to recover the local population. Given the elusive nature of caribou and the small population size, a lack of recent observations is expected. Regardless of whether or not caribou occupy the mainland portion of the range, critical habitat on the mainland will be required for intra- and inter-range connectivity in support of the federal recovery objectives.

ECCC uses the best available information to determine whether a project is likely to result in impacts to the species or its critical habitat. Using the most up to date information available from GenPGM and the Province of Ontario, and accounting for other existing disturbances, ECCC evaluated the impact of the Project on boreal caribou and their critical habitat.

Caribou Habitat Connectivity

ECCC noted in CIAR# 893 (ECCC-3 which helped inform IR6-21, CIAR #931), that "it is critical that the effects assessment consider connectivity within and between ranges, as loss of connectivity within the Lake Superior Coastal Range is a key concern". ECCC requested that more detail be provided in regards to range connectivity for all phases of the Project, specifically to "map and describe the proposed existing corridors for caribou to by-pass or traverse the site that would allow intra-range connectivity […]" (CIAR #893). Maps were provided in IR6-21 (CIAR #950), to portray "Potential movement paths that would permit continued east-west connectivity within the LSCR and immediately adjacent Discontinuous Distribution". GenPGM provided additional analyses on intra-range connectivity using semi-quantitative resistance models. The models identified "where the greatest potential barriers to caribou movement exist in the Project landscape" pre-Project and during Project operations (CIAR #976). GenPGM stated, "resistance increases at the Project site during Project operation" (CIAR #976), indicating that the Project will impact intra-range connectivity. The model output does not reflect this statement and shows that resistance to caribou movement will be low to medium within the project footprint during mining operations such as the green and yellow hexagons identified in the SSA on Figure 7, which suggests that these Project effects on range connectivity have been underestimated. For instance, no resistance values seem to have been attributed to major features such as open pits, which will likely be avoided by caribou (and should thus grant a high resistance in Figure 5 above). Further, the proposed travel corridors (see pink lines in Figure 7), do not align with GenPGM's modeled pathways of least resistance. The travel corridors identified by GenPGM were not adjusted to follow the resistance modelling that they completed and as a result, they are suggesting that caribou will move through areas with high resistance (red hexagons). GenPGM has not provided supporting information to demonstrate low resistant corridors through these areas. GenPGM had stated in IR6-21 that "to the south of the Project, caribou movement is less likely because the landscape is already heavily impacted by human development and disturbance […]" but go on to identify pathways for caribou movement in this area (CIAR #950). Finally, landscape post-closure modelling was not presented in their analyses.

It is ECCC's expert advice that the recent connectivity assessment completed by GenPGM is insufficient in characterizing the short and long-term impacts to intra-range connectivity during all phases of the Project. The updated analyses completed as part of GenPGM's response to IR6-21 did not account for how inter-range connectivity would be maintained throughout all Project phases (CIAR #931). Further, the mitigation measures proposed to compensate for effects to connectivity have not been outlined in sufficient detail to support GenPGM's conclusion that the residual environmental effect on caribou and its critical habitat will be minimal. For example, GenPGM do not provide sufficient information related to the amount, location and type of habitat that will be restored or how these measures will improve connectivity within and between ranges.

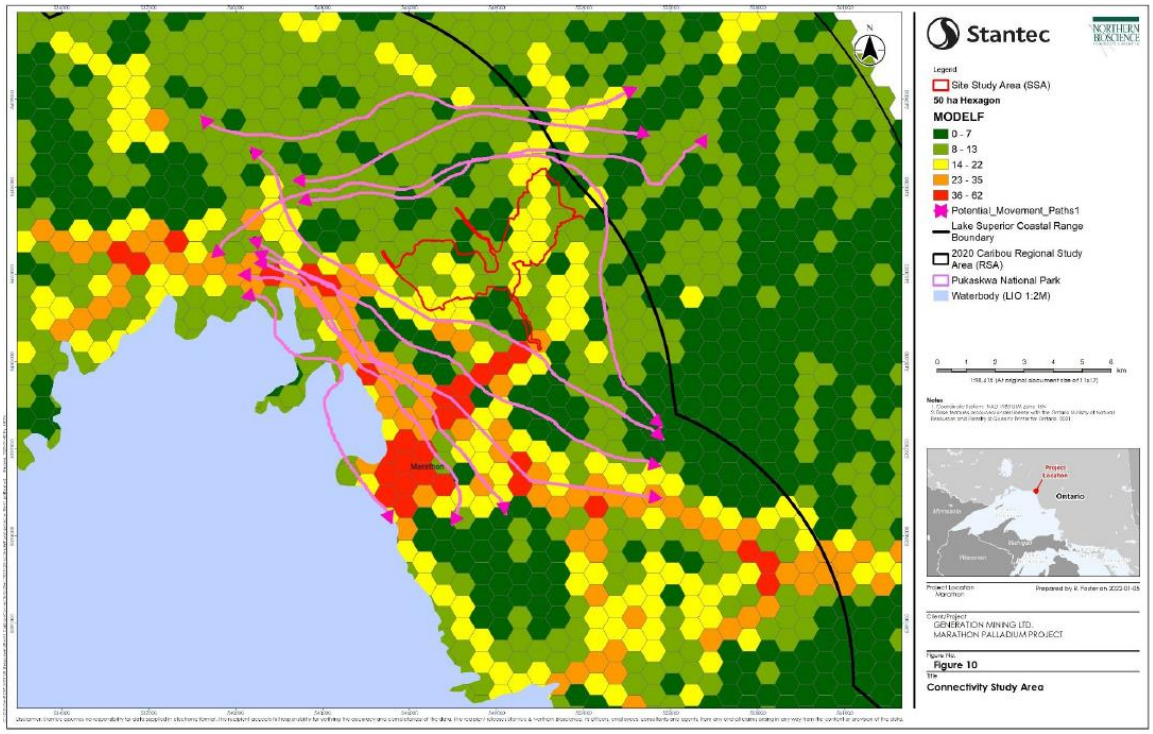

Figure 7. Resistance (green lowest, red highest) to potential caribou movement for 50 ha hexagons, during Project operations with pink lines indicating movement pathways for caribou (CIAR #976). Note that several movement pathways identified by GenPGM south of the Project footprint follow or cross, areas with high resistance to caribou movement.

Category 1 Habitat and Sensory Disturbance

ECCC noted in CIAR #893 (ECCC-4 which helped inform IR6-23, CIAR #931) regarding habitat disturbance, that "Category 1 habitat is within close proximity to the Project and requested that additional information be provided concerning sensory disturbance, including "measures for all phases of the Project to reduce sensory disturbance, with consideration of appropriate buffer distances".

GenPGM described the potential for sensory disturbance given proximity of the SSA to Category 1 habitat (see Figure 6 above). The threshold applied in GenPGM's analysis is not considered appropriate for assessment of sensory disturbance to boreal caribou. The Province of Ontario recommends that sensory disturbance be minimized within 10 km of known Category 1 habitat during sensitive periods (MECP, 2020a). Effects of roads, transmission

lines, cabins, or mines on caribou behaviour have been detected at distances of 1.5 to 10 km and beyond (Leblond et al. 2011, Boulanger et al. 2012). For example, Boulanger et al. (2012) found zones of influence of 11 to 14 km around a mine in the Northwest Territories. GenPGM also mention that the 10 to 15 km buffer for sensory disturbance might be appropriate in the larger, remote northern ranges, but likely not applicable in the LSCR where caribou are more tolerant to disturbance. However, GenPGM's assertion that boreal caribou are "more tolerant to disturbance" than boreal caribou in northern ranges was not substantiated by data.

The lack of recent caribou observations in the mainland portion of the LSCR does not confirm extirpation from the mainland, nor does it negate the need for critical habitat, including habitat critical to maintaining connectivity, to be conserved for range recovery. It is ECCC's expert advice that Project effects regarding sensory disturbance have been underestimated. Without mitigation, sensory disturbance has the potential to impact caribou movement within the range during the construction, operations and closure phases of the Project, should caribou be present on the mainland portion of the range. Therefore, mitigation measures are necessary during the construction and operations phases in order to reduce the sensory disturbance impact to caribou during the sensitive periods within their life cycle. Timing windows should be implemented to effectively address this sensory disturbance based on the anticipated sound travel and associated caribou avoidance. Without these details regarding the appropriate mitigation measures, ECCC is unable to substantiate GenPGM's conclusion that the Project will have minimal residual environmental effects on caribou.

Progressive rehabilitation and post-closure restoration

ECCC noted in CIAR #893 (ECCC-6 which helped inform IR6-21, CIAR #931) that, "In order to better understand if mitigation measures will restore the function of the area to allow for caribou movement throughout the range post-closure, more specific details on the post-closure site restoration plan are required". The request included specific points for clarity such as, "Describe the site rehabilitation activities including timing of activities" and, "Map and describe the approximate locations of progressive rehabilitation measures as well as the expected post-closure landscape within the Lake Superior Coastal Range".

In response, GenPGM provided additional information concerning post-closure (CIAR #976). However, it remains unclear how connectivity within the LSCR will be restored for caribou given the large amount of open water and other mining features (e.g., mine rock storage) that will prevent the areas from being reforested. ECCC recommends that as much of the mine site as possible should be reforested and not only revegetated. Further, it is not clear how the information presented aligns with the connectivity analyses that GenPGM recently completed. Specific details regarding progressive rehabilitation measures and the post-closure plan and the intended benefit to caribou and/or caribou critical habitat have not been provided. Without these projections for the future state of caribou critical habitat within the LSCR ECCC is unable to substantiate the extent to which boreal caribou habitat within the LSCR will be restored (CIAR #893).

ECCC's review applied guidance from the federal recovery strategy, which states that recovery of the LSCR local population is currently considered biologically and technically feasible. Further, the recovery strategy states that maintaining a long-term self-sustaining status for

boreal caribou ranges depends on connectivity *within and between ranges*, and irreversible range retraction or permanent breaks in range connectivity should be avoided. Permanent breaks in range connectivity may compromise recovery feasibility for boreal caribou in the LSCR.

It is ECCC's expert advice that the Project effects concerning range connectivity have been underestimated. Further, the post-closure landscape does not appear to provide suitable habitat that will enable caribou movement. It is likely that the Project will pose a barrier to caribou movement within the LSCR during the construction, operation and post-closure phases of the Project. As such, it is anticipated that the SSA post-closure will affect boreal caribou critical habitat connectivity within the LSCR.

Off-site Mitigation

ECCC has reviewed the updated draft version of the Proposed Caribou Habitat Off-site Mitigation report and notes that it has largely remained unchanged since the original 2014 report. The report states that off-site mitigation will result in the addition of approximately 115 ha of future conifer forest on the rehabilitated roadbeds and associated landings. However, the entire ~1,116 ha SSA is expected to impede east-west connectivity within the LSCR in both the short and long term. This area currently allows for relatively unimpeded caribou movement relative to surrounding obstacles and also supports caribou carrying out their life processes within the LSCR. This area will be completely unavailable to caribou during construction and operations and only a limited amount of forest reclamation through the removal of roads, processing plant, and transmission line can be potentially achieved (CIAR #1016).

ECCC's Biodiversity Offsetting approach is described in its Operational Framework for Use of Conservation Allowances (ECCC 2012; hereafter referred to as the 'Framework').

Biodiversity offsets are measurable and demonstrable conservation benefits designed to balance the residual adverse effects of a project after the implementation of all feasible avoidance, minimization, and on-site restoration measures. The goal of biodiversity offsetting is to achieve a balance against the residual adverse effects of a project so that No Net Loss is achieved. In the context of species at risk, the amount of offset, typically in the form of habitat measures though not always, aims to ensure that projects do not contribute to jeopardizing the survival or recovery of the species.

Biodiversity offsetting is the last step in the mitigation hierarchy, which establishes an order of preference that promotes project development designs with the least environmental impact. The mitigation hierarchy prioritizes avoidance of disturbance over minimization of adverse impacts, followed by on-site disturbance restoration and, lastly, offsetting.

'Equivalency' is a key consideration in the design of a biodiversity offset. Equivalency describes the type and amount of offsetting needed to balance against the residual adverse effects. Multipliers (ratios) are typically employed to manage to acceptable levels the uncertainties and risks associated with the offset. Larger ratios reflect situations that are riskier or more uncertain in their potential outcomes, or both.

ECCC typically recommends a minimum offset ratio of 4:1 (offset outcome: residual impact). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum; for

example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 ratio accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context. Offset ratios may be higher, or as determined by project-specific circumstances, and associated risks and uncertainties.

It is ECCC's expert advice that an off-site mitigation plan that explicitly addresses the removal of approximately 1,116 ha of LSCR critical habitat and connectivity during the construction, operations, closure and post closure phases as well as the permanent removal of LSCR critical habitat and connectivity that cannot effectively be reforested as a result of this Project is required. The current plan of 115 ha of proposed off-site mitigation is insufficient to address critical habitat removal within the LSCR and loss of intra-range connectivity. GenPGM should work with the Province of Ontario where possible to ensure that the final off-site mitigation plan will adequately address the loss of connectivity within the LSCR and the discontinuous range. GenPGM is also encouraged to consult ECCC and interested Indigenous communities as part of developing the final off-site mitigation plan.

Conclusion

ECCC's expert advice is that the Project effects concerning caribou and its critical habitat have been underestimated by GenPGM. ECCC's expert advice is that the current on-site rehabilitation and post-closure restoration plan and offsite mitigation (offsetting) plan are not sufficient to address the magnitude and severity of impacts that are likely to occur in the species critical habitat.

ECCC's expert advice is that this project poses a high risk to the recovery of the LSCR boreal caribou due to the high vulnerability of the population and the high severity of the projects' residual adverse effects to critical habitat connectivity during the construction, operation, closure and post-closure phases of the Project. Boreal Caribou require habitat connectivity through their range to access seasonal resources and maintain genetic diversity; connectivity of critical habitat is a necessary component of critical habitat, as described in the federal Recovery Strategy. In particular, the destruction of critical habitat that is expected to occur due to the loss of connectivity is not consistent with the species SARA recovery strategy. Therefore, ECCC is of the view that the project, as currently designed, including mitigation measures, will pose a high risk to the recovery of LSCR.

The high risk to caribou recovery posed by the project should be mitigated to the extent possible by developing and implementing rehabilitation and post-closure restoration measures to restore connectivity on-site. However, even with a comprehensive on-site mitigation plan and post-closure restoration plan, it is likely that connectivity issues created by the project (for both intra-range and inter-range connectivity) will persist. Therefore, residual adverse effects will need to be offset through measures that aim to improve the intra-range and inter-range connectivity.

ECCC advises on offset requirements on a case-by-case basis based on an assessment of risk. ECCC's general approach is to recommend a minimum 4:1 ratio for low risk projects to account for time-lags to restoration, uncertainty in outcomes, and to be precautionary in light of impacts to sensitive species. Offset ratios may be higher than 4:1 based on project-specific circumstances, proposed mitigation measures, risks and uncertainties. For example, in recent

federal review decisions for two high-risk projects to boreal caribou critical habitat an offset ratio of 30:1 was required in order to fully address cumulative adverse effects and have outcomes consistent with the species SARA recovery strategy. Offsetting ratios are a function of several factors including risk, the severity of the effects, the vulnerability of the species and/or habitat, time lags, probability of success and the quality of the proposed offsetting measures. In some cases, determining offsetting plans that achieve outcomes consistent with a species SARA recovery strategy are the result of dialogue and collaboration between regulatory agencies and project proponents.

In the absence of an updated on-site rehabilitation and post-closure restoration plan that demonstrates effects to critical habitat connectivity can be addressed through site restoration, ECCC is of the view that an offset ratio well above the minimum standard of 4:1 is required to ensure that the effects of the project are consistent with the species SARA recovery strategy. The specific details off the offset ratio would need to be developed in collaboration with MECP, Indigenous communities, ECCC and the proponent based on the details of the final post closure plan and other measures implemented by the Proponent to maintain critical habitat connectivity.

If the on-site rehabilitation and post-closure restoration plan can effectively address connectivity and reduce adverse effects to recovery, the offset ratio necessary to address effect could be lowered. In terms of offsetting, not every hectare of restored habitat or action should be considered equal because location, configuration and type of action can have varying impacts on connectivity. That is, when more problematic areas are dealt with that provide significant improvements to habitat connectivity those actions are worth more in terms of an offsetting ratio. An improved on-site rehabilitation and post-closure restoration plan would address the long-term effects of the project to critical habitat connectivity thereby reducing the risk to boreal caribou recovery. ECCC remains available to discuss and work with GenPGM to develop a suitable on-site rehabilitation and post-closure restoration plan and offset plan that reflects the risk of the Project and the risk to the recovery of this herd.

ECCC's Recommendations 5.2.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Update the connectivity analysis, on-site rehabilitation and post-closure restoration plan and the offset plan before concluding the assessment process to support decision making and including requirements.
2. Update their assessment of Project impacts (which represent a high risk to Boreal Caribou recovery) and connectivity analysis (e.g. that reflects caribou avoidance behaviour and physical barriers), so that it demonstrates how long-term intra- and inter-range connectivity will be made possible. The connectivity analysis and corresponding mitigation measures should be designed and implemented to manage any Project effects to connectivity including:

- Develop a mine site rehabilitation and post-closure restoration plan that provides for low-resistance corridors that will allow for caribou movement and habitat use throughout the mine site (east-west and north-south), post mine closure.
- The identification of problematic areas for caribou movement such as Hwy 17 and Town of Marathon related infrastructure, and recommendations for priority areas for mitigation including offsetting measures. Note that for any residual loss of connectivity, offsetting requirements related to the Project footprint can be directed to address other off-site barriers to caribou movement as part of an overall mitigation plan.

3. Implement mitigation measures including timing windows for mine activities such as the use of explosives, in order to decrease sensory disturbance to sensitive category 1 boreal caribou habitat as identified by the Province of Ontario. This includes following the Ontario Ministry of the Environment, Conservation and Parks (2020) Best Management Practices for Mineral Exploration and Development Activities and Woodland Caribou in Ontario.

4. Update the off-site mitigation (offsetting) plan to provide more detail to address the removal of approximately 1,116 ha of Coastal Range critical habitat and resultant impacts to connectivity during the construction, operation, closure and post-closure phases. This should include working with the Province of Ontario and Indigenous communities to develop a plan that adequately address the loss of connectivity (including developing the specific offset ratio) within the Coastal Range and the discontinuous range. The plan should consider ECCC's Biodiversity Offsetting approach as described in its Operational Framework for Use of Conservation Allowances.

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5.2.2 Little Brown Myotis and Northern Myotis

Introduction and Importance of the Topic to Environmental Assessment

Little Brown Myotis (*Myotis lucifugus*) and Northern Myotis (*Myotis septentrionalis*) are small, insectivorous species of the Family Vespertilionidae (ECCC, 2018). These species were emergency listed as Endangered on Schedule 1 of SARA in 2014 because of sudden and dramatic declines across the eastern portions of their ranges.

The primary threat to Little Brown Myotis and Northern Myotis is white-nose syndrome (WNS). In areas already affected by WNS, the significance of threats that result in additive mortality to the these species of bats is heightened because the mortality of a small number of the remaining individuals (particularly juveniles and adults) has the ability to impact the survival of local populations, their recovery, and, perhaps, the development of resistance to the fungus that causes WNS (ECCC, 2018). WNS was first detected in bats near Wawa in 2010-2011 and along the north shore of Lake Superior in 2013-2014.Threats other than WNS include residential and commercial development, energy production and mining, biological resource use, human intrusions and disturbance, natural system modifications and pollution (ECCC, 2018). Potential threats with unknown impacts include climate change and severe weather (ECCC, 2018).

The habitat requirements Little Brown Myotis and Northern Myotis vary by season. The habitat is composed of (1) overwintering habitat (i.e., hibernacula, such as caves, abandoned mines, and wells) used for hibernation and overwinter survival, (2) summering habitat that includes

roosting habitat (for maternity roosts and males) and foraging habitat within commuting range of the roosts, and (3) swarming habitat used in the late summer and early fall for mating and socializing (ECCC, 2018).

Little Brown Myotis has been detected in the LSA throughout the multiple years of acoustic monitoring, which indicates that the LSA provides suitable roosting habitat (CIAR #722). For Northern Myotis however, only one individual was tentatively identified during these surveys. GenPGM suggests that this may indicate that this species is not present in the LSA (CIAR #722). No hibernacula for Little Brown Myotis and Northern Myotis have been located in the LSA or SSA. The loss of approximately 1,000 ha of potential bat foraging and day roost habitat in the SSA is expected as a result of this Project (CIAR #727). An estimated 39 ha of potential bat maternity roost habitat will also be removed (CIAR #727). This Project is also predicted to affect Little Brown Myotis and Northern Myotis through sensory disturbances such as lighting, noise and vibrations as well as potential incidental take through collisions and habitat removal.

Key resources that factored into ECCC's review include:

[ECCC] Environment and Climate Change Canada. 2018. Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored Bat (*Perimyotis subflavus*) in Canada. Species at Risk Act Recovery. Available at https://publications.gc.ca/collections/collection_2018/eccc/En3-4-308-2018-eng.pdf

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Sources of Information

- Environmental Impact Statement (EIS) (CIAR #224)
- Environmental Impact Statement - Supporting Information Documents (CIAR #227)
    - Supporting Information Document 24 - Marathon Project Terrestrial Baseline Environment Program
- Marathon Palladium Project Terrestrial Environment Baseline Report Updated (CIAR #722)
- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.6 Cumulative Effects Analysis
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)

  - ECCC #09
  - ECCC #10
  - ECCC #11
  - ECCC #12
  - ECCC #14
- From the Joint Review Panel to GenPGM re: Request for Information Package of September 13, 2021 (CIAR #931)
  - IR6-27
  - IR6-30
- Responses to Information Requests (CIAR #950)
  - Responses to Information Request #27: Maternity Roost - Suitable habitats

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that there are no hibernacula in the LSA or SSA and, therefore, no Project-related effects are expected on overwintering or swarming habitat (CIAR #727). Acoustic monitoring in the study area indicated only one potential Northern Myotis, suggesting little if any use of the LSA (CIAR #727).

GenPGM indicates that forest clearing and site development will result in loss of foraging habitat for Little Brown Myotis, particularly along the margins of the streams and small waterbodies in the SSA (CIAR #727). Nine small waterbodies (0.5-5.0 ha in size) will be lost within the SSA and Little Brown Myotis were detected foraging near most of them in 2020, as well as along streams and the main access road (CIAR #727).

Forest clearing in the SSA could also result in the loss of potential roosting habitat. Although maternity roosts have not been confirmed in the SSA, they could be present. Without appropriate mitigation (i.e., clearing outside the maternity roosting season), this clearing could potentially cause mortality of pups of either species found in maternity roosts (CIAR #727). Clearing of forest could also destroy day roosts of non-reproductive Little Brown Myotis and Northern Myotis, as trees with crevices, hollows, or exfoliating bark may be present in the SSA. Potential roosts in <1 ha of talus, cliff, and rock barren habitat in the SSA could also be affected by Project activities. Not only could clearing potentially result in the loss of suitable trees for maternity colonies but if felling of trees occurs during the maternity season i.e., May 15 through August 31, it could potentially result in the death of non-volant pups in those roosts (CIAR #727 – adjusted to May 1 in IR6-27; CIAR #950). If limited clearing must be done during this window, GenPGM would conduct bat maternity surveys using the Ministry of Northern Development, Mines, Nature Resources and Forestry (NDMNRF) protocol to confirm bat presence/absence in suitable tress (e.g., large diameter cavity trees) and appropriate protection measures would be applied (CIAR #727).

In order to mitigate the loss of potentially suitable roost trees in the SSA, GenPGM proposed to install multiple bat boxes and bat rocket boxes in the LSA and adjacent RSA prior to clearing of

the SSA (CIAR #727). They will preferentially be installed along south-facing shorelines of waterbodies to maximize passive heating, since recent research suggests that increased ambient temperatures of bat boxes may be beneficial in northern climates, particularly for bats recovering from WNS (CIAR #727).

GenPGM states that the eventual remediation within the SSA as per the Conceptual Closure Plan (CIAR #727) will at least partially mitigate the loss of foraging habitat, particularly for Little Brown Myotis.

The loss of 1,000 ha of possible bat foraging and day roost habitat in the SSA during the construction and operations phases of the mine, as well as the loss of an estimated 39 ha of potential bat maternity roost habitat in the SSA are predicted by GenPGM to be the only residual effects to Little Brown Myotis and Northern Myotis (CIAR #727). Based on the Project Inclusion List (PIL), cumulative effects on Little Brown Myotis and Northern Myotis within the Pic FMU (i.e., RSA) could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as potentially the most spatially extensive activity in the RSA (#727). GenPGM states that forest operations under an approved Forest Management Plan are considered to not adversely affect the sustainability of SAR bat populations in the RSA. Given that actual harvest on the Pic FMU typically achieves much less than the planned (sustainable) harvest, the additional clearing of approximately 1,000 ha of forest in the Project's SSA plus other clearing that is contemplated by other projects/activities in the PIL is likely well within levels considered sustainable by NDMNRF. Therefore, GenPGM concludes, using GenPGM's significance criteria, that the cumulative effects are predicted to be not significant (CIAR #727).

Sensory Disturbance and Change in Mortality Risk

GenPGM states that there are potential effects on Little Brown Myotis and possibly Northern Myotis through disturbance in the LSA from noise, light, or dust, potential collisions with Project infrastructure or vehicles, as well as habitat fragmentation and changes to the predator-prey community (CIAR #727). Specifically, artificial lighting can have an effect upon a range of bat behaviour such as foraging and commuting, emergence, roosting, breeding and hibernation. The Project access road and transmission line will not be lit, so effects would be primarily associated with the mine site, where adequate lighting is required for human safety concerns (CIAR #727). Depending on the types of lights used at the Project site, GenPGM indicates that they either may be repelled or may benefit from increased insect densities near artificial lighting. However, lighting inside roosts has caused partial abandonment by Little Brown Myotis.

Noise may affect bat foraging, movement, or roosting depending on the timing, magnitude, and frequency of the noise generated by Project activities. Low frequency sounds (i.e., audible to humans) are unlikely to adversely affect myotis as most bats can only perceive sounds from 15-90 kHz, although they may have lower frequency social calls (CIAR #727). Noise effects are likely to be most strongly felt during foraging, or late in the day when bats are coming out of daily torpor (CIAR #727). Noise effects from roads may differently affect species depending on foraging strategies (CIAR #727).

Roads, particularly large highways with high traffic volumes, can have adverse effects on bats from collisions with vehicles, road avoidance, and road barrier effects (Fensome and Mathews 2016). However, GenPGM notes that the risk of collisions for bats and other wildlife depends upon traffic volume, vehicle speed, and animal crossing speed and behaviour, and well as landscape e.g., sight lines (CIAR #727). Generalist species such as Little Brown Myotis that are more tolerant of noise and artificial lighting may be more at risk since they are less likely to avoid roads. Northern Myotis may also be at risk for collisions due to its characteristic low and slow flight behaviour (CIAR #727).

Generation PGM did not consider sensory disturbance or collisions with Project infrastructure or vehicles cumulative effects.

GenPGM's conclusions as it relates to significance

GenPGM concludes that the main residual effects of the Project arise from the loss of approximately 1,000 ha of possible bat foraging and day roost habitat in the SSA during the development and operation of the mine, as well as the loss of an estimated 39 ha of potential bat maternity roost habitat. Bat boxes and rocket boxes in the LSA will partially mitigate this loss of potential roosting habitat. They further note that similar habitat is abundant and widespread in the RSA and the Project-associated loss is well within the range of annual disturbance considered sustainable in boreal ecosystems. With remediation at closure, GenPGM expects that at least some of this habitat loss will be mitigated by forest regeneration. As with the original EIS (2012; CIAR #224, #227), the residual environmental effect on SAR bats and their habitat is predicted using GenPGM's significance criteria to be not significant (CIAR #727).

ECCC's Conclusions

As mentioned in the EIS Addendum, Section 6.2.8.1.10 (CIAR #727), although there is evidence that Northern Myotis hibernated in large, deep cracks in limestone and shale in Nebraska where mines and caves are rare and localized, there are no reports of this behaviour in Ontario. ECCC is of the view that there is still a possibility of discovering a hibernaculum at the Project site. Little Brown Myotis and Northern Myotis are both federally listed Endangered species, and ECCC recommends an avoidance and mitigation plan be put in place (CIAR #893).

GenPGM's proposed mitigation measures to address the loss of 1,000 ha of bat foraging and day roost habitat and 39 ha of potential bat maternity roost habitat in the SSA have not been well-defined. The number and location of bat boxes and rocket boxes in the SSA post-closure was not provided. In addition, there was no monitoring plan to identify which bat and rocket boxes were successful or commitment to implement adaptive mitigation if necessary (CIAR #893; CIAR #931). In addition, after the closure phase, regenerating forested stands will not provide the stand structure required for bats, specifically Little Brown Myotis and Northern Myotis.

The avoidance of tree clearing in the SSA only includes the maternity period - May 1 through August 31. If maternity roost trees are removed after pregnant females have established a roost area, there is a higher likelihood of abortion than there would be otherwise (Brigham and Fenton, 1986). As a result, clearing of trees should be limited during the period when females are establishing roost areas. To account for this, clearing should be limited between April 15 and August 31 in order to correspond with the timing of emergence from hibernation and the maternity period. If limited clearing must be done between April 15 – August 31, then exit surveys using the NDMNRF protocol should be conducted to confirm bat presence/absence in suitable trees (e.g., large diameter cavity trees) and that appropriate protection measures are applied (CIAR #893).

Noise, specifically from blasting activities from ongoing construction and operations may influence Little Brown Myotis and Northern Myotis to leave the area as well as potentially influence reproductive success (CIAR#893; CIAR #931). In the absence of federal and Province of Ontario guidelines, ECCC recommends the Province of British Columbia Best Management Practices (BMP) for bats (Holroyd et al., 2016). This BMP summarizes mining activities with potential impact on bats, noting that noise and physical disturbance from blasting, dust, or noise (vibrations) as a result of site preparation and construction or from mine activities can affect adjacent bat colonies in summer or winter. Blasting is considered a high impact activity and the guidance provides a list of conditions under which it is and is not acceptable to conduct blasting. Key conditions include:

- Not acceptable in the 100 m core area around the blasting site at any time
- Possibly acceptable in a 1 km special management zone around the blasting at any time, with review by an experienced bat biologist
- Not acceptable within specific timing windows. In Ontario, these include:
    - Maternity sites – avoid activities between April 15 to August 31
    - Hibernation sites – avoid activities between October and April

In terms of thresholds for blasting, the following is provided in the BMP: ensure sound concussion of <150 dB, shock wave <15 psi and peak particle velocity <15 mm/s or maintain a setback of 2 km from occupied significant roost sites (Holroyd et al., 2016). Blasting may occur during periods when bats are not occupying the roost but proponents should ensure that nearby roost habitat is not degraded (Holroyd et al., 2016).

There is empirical data to show that bats tend to avoid noisy areas, where "noise" can include natural or anthropogenic sounds. This includes potential roost sites for torpor/hibernation (Schaub et al., 2008). Bats also tend to avoid crossing roads, and will cross more frequently where there is the least amount of noise and light (Bennett and Zurcher, 2013; Zurcher et al., 2010). Noise can disrupt foraging behaviours in some bat species. Foraging habitat near highways is degraded in its suitability because of the ambient noise generated by traffic. As well, traffic noise or other loud sounds can negatively affect foraging efficiency for those species that rely on prey sounds to hunt (Allen et al., 2021; Siemers and Schaub, 2011). Noise disturbances can also provoke arousals during torpor and hibernation; however, torpid bats will habituate to prolonged and repeated noises (Luo et al., 2014).

ECCC advises that the Project will cause a permanent loss of Little Brown Myotis and Northern Myotis roosting and foraging habitat though a direct loss of these habitat types, directly impacting the local populations that are already affected by WNS. However, these bat species may relocate to adjacent similar habitats. Provided that GenPGM meets the commitments that they have stated as well as the recommendations provided by ECCC below, the effects of the Project on the regional Little Brown Myotis and Northern Myotis populations can be effectively mitigated.

ECCC's Recommendations 5.2.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Provide details on the avoidance and/or mitigation measures that will be in place should a hibernaculum be discovered within the SSA.
2. Avoid tree clearing from April 15 to August 31 in order to correspond with the timing of emergence from hibernation and the maternity period. If limited clearing must be completed between April 15 and August 31, then bat maternity surveys using the NDMNRF protocol should be conducted to confirm bat presence/absence in suitable trees (e.g., large diameter cavity trees) and that appropriate protection measures be applied. Timing of tree removals will also need to take into account potential impacts to migratory birds.
3. Implement a monitoring program to identify which bat and rocket boxes are occupied (with a focus on Little Brown Myotis and Northern Myotis) as well as any potential adaptive mitigation if necessary.
4. Consult the Best Management Practices for Bats in British Columbia: Mine Developments and Inactive Mine Habitats to inform the mitigation and enhancement measures implemented to reduce impacts of blasting activities for bats

Literature Cited

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Holroyd, S., Craig, V.J., and P. Govindarajulu. 2016. Best management practices for bats in British Columbia: mine developments and inactive mine habitats. British Columbia Mine Reclamation Symposium. Available at: http://dx.doi.org/10.14288/1.0354475

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Siemers, B.M. and A. Schaub. 2011. Hunting at the highway: traffic noise reduces foraging efficiency in acoustic predators. Proceedings of the Royal Society 278(1712): 1646–1652. Available at http://doi.org/10.1098/rspb.2010.2262

Zurcher, A.A., Sparks, D.W., and V.J. Bennett. 2010. Why the Bat Did Not Cross the Road? Acta Chiropterologica 12(2): 337-340. Available at https://doi.org/10.3161/150811010X537918

5.2.3 Canada Warbler

Introduction and Importance of the Topic to Environmental Assessment

Canada Warbler (*Cardellina canadensis*) is a small forest songbird. It generally breeds in deciduous-coniferous mixed wood or deciduous forests with a dense, complex understory, with geographic variation in the composition of tree species and the importance of topography and wet areas across its Canadian range (ECCC, 2016). Canada Warbler was listed as Threatened in 2010 under Schedule 1 of the SARA. The primary threats to Canada Warbler include land conversion of breeding and nonbreeding habitat, forest harvesting and silviculture, removal of shrubs, energy and mining exploration and extraction, overbrowsing, reduced availability of insect prey, and collisions with windows (ECCC, 2016). The significance of each threat varies across Canada Warbler's geographical range.

For Canada Warbler, ECCC has responsibilities related to conservation and protection through both SARA and the MBCA. General prohibitions under the MBCA and its regulations protect Canada Warbler nests and eggs anywhere they are found in Canada, regardless of land ownership. Nevertheless, nests and eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees. During the breeding period, potential destructive or disruptive activities should be avoided at locations where Canada Warbler is likely to be encountered or known to occur (ECCC, 2016).

Canada Warblers have been detected during GenPGM SAR surveys over multiple years in the study area for this Project and there is suitable habitat found within the SSA. Virtually all the SSA is potential Canada Warbler habitat, of which 771 ha (72%) are preferred ecosites (CIAR #727). As a result, this Project is estimated to displace approximately 92 breeding Canada Warblers from the SSA due to the loss of habitat from vegetation clearing operations. This

Project is also predicted to affect Canada Warbler through sensory disturbances such as lighting, noise and vibrations as well as potential incidental take through collisions and habitat removal.

Key resources that factored into ECCC's review include:

[ECCC] Environment and Climate Canada. 2016. Recovery Strategy for the Canada Warbler (*Cardellina canadensis*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vii + 56 pp. Available at: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_canada%20warbler_e_final.pdf

Sources of Information

- Response from Stillwater to Information Requests - Section 23, Wildlife (Response to IRs 23.4.3, 23.4.5, and 23.5) (CIAR #428)
- Marathon Platinum Group Metals and Copper Mine Project Responses from Stillwater Canada Inc. to Information Requests (Received between February 28, 2013 to June 27, 2013) (CIAR #489)
    - 20.1 Assessment of Cumulative Effects
    - 20.4 Transparency of Conclusions
    - 23.4.1 Migratory Bird Surveys
    - 23.4.3 Loss of Nesting Habitat for Listed Species
    - 23.4.5 Displacement of Migratory Birds
- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions
    - 6.6 Cumulative Effects Analysis
    - Appendix D9 Species at Risk - D9.5 Canada Warbler Habitat Model
- Responses to Information Requests (CIAR #950)
    - IR6-19: Species at Risk Significance Determination
    - IR6-30: Noise Disturbance - Species at Risk & Migratory Birds

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that habitat loss, particularly shrub-rich mixed woods with abundant coarse woody debris is the primary effects pathway for Canada Warbler as with other non-SAR songbirds. The Project is projected to remove approximately 1,071 ha of potential Canada Warbler habitat and GenPGM has stated that virtually all of the SSA is potential Canada

Warbler habitat and approximately 771 ha (72%) are preferred ecosites (CIAR #727). As a result, the Project is estimated to displace approximately 92 breeding Canada Warblers in the SSA due to the loss of habitat from land clearing (CIAR #727). Based on the same modelling, potentially suitable habitat is abundant in the RSA, with over 443,000 ha of preferred habitat and an additional 302,000 ha of used habitat. Preferred Canada Warbler habitat in the SSA represents only about 0.17% of the available habitat in the RSA. As discussed in IR 23.4.5 (CIAR #428), breeding habitat for this species may not be limiting.

The mitigation and enhancement measures that are proposed by GenPGM are similar for Canada Warbler as for other non-SAR songbirds, which include progressive rehabilitation will be used to recover some of the area lost during mine operation, including the access road and transmission line, and return it to a vegetated state (CIAR #727). GenPGM notes of particular relevance is the stockpiling of non-merchantable coarse woody debris during site clearing for use during future rehabilitation efforts in the SSA as per the Conceptual Closure Plan (CIAR #727; CIAR# 950). Canada Warblers are ground-nesters, often using downed logs and other coarse woody debris as cover for their nests (ECCC, 2016). Redistribution of these habitat features during rehabilitation, combined with shrub growth and tree planting will enhance eventual suitability of the site for Canada Warbler.

GenPGM states that cumulative effects on Canada Warbler within the Pic FMU (i.e. RSA) could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as potentially the most spatially extensive activity in the RSA as it relates to direct habitat loss. However, they conclude that the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison (CIAR #727).

Sensory Disturbance

GenPGM also states that habitat quality in the LSA may also be impaired from sensory disturbance as a result of the Project. Collisions with infrastructure or vehicles is a risk to Canada Warbler. Approximately 444 ha of the LSA (outside the SSA) could potentially be affected by noise during operations of greater than 50 dB (CIAR #727). This includes 326 ha of ecosites that are modelled as preferred Canada warbler habitat.

Based on these observed densities, potentially another 36 Canada warblers in the LSA could be disturbed by noise greater than 50 dB. In general, the relationships between anthropogenic disturbance and habitat quality for Canada warbler are poorly understood (ECCC, 2016). Some general mitigation proposed by GenPGM include directional lighting, measures to address noise and vibration and additional mitigation measures necessary to address noise or other disturbance to breeding birds in the event nests are established during Project operations for species that are protected under the MBCA (CIAR #727).

GenPGM states the indirect effects of the aforementioned activities are likely to be spatially confined to the local area in the vicinity of the project/activity, not extending to a more regional

scale. Given the combined footprints of the Project and other projects/activities in comparison to the RSA, the combined effect is expected to be relatively small in magnitude (CIAR #727).

Change in Mortality Risk

With appropriate mitigation, the risk of injury or mortality to Canada Warblers from collisions with Project infrastructure of vehicles is expected to be low. Some mitigation measures proposed include: (1) conduct vegetation clearing operations outside the main bird breeding window (as determined by confirmed species present on site and guidance from ECCC's nesting calendars for Nesting Zone C5 and Birds Canada's Nesting Canada Query Tool); and (2) if this is not practicable and the area to be disturbed is relatively small and/or not complex, then conducting nest surveys by trained biologists to avoid incidental take (CIAR #727).

Project residual effects on Canada Warbler mortality could result from collisions with vehicles and/or collisions with infrastructure. In consideration of the potential additive incremental change in risks to mortality that are associated with the Project and the other projects/activities in the PIL that are in the RSA, a cumulative residual effect can be identified. Mortality risk on Canada Warbler associated with interactions with vehicles, equipment, and infrastructure are expected to differ somewhat for the different projects/activities; however, when viewed cumulatively in a larger context, the risks of mortality associated with these sources are expected to be low in magnitude (CIAR #727).

GenPGM's conclusions as it relates to significance

GenPGM predicts based on GenPGM's significance criteria and with mitigation, residual effects on Canada Warbler will be not significant. The change in Canada Warbler habitat quantity and quality is not expected to threaten the long-term viability of populations of this species in the RSA. Potential forest habitat for this species is abundant and widespread in RSA and the Project-associated loss is well within the range of annual disturbance considered sustainable in boreal ecosystems (CIAR #727).

ECCC's Conclusions

Approximately 92 Canadian Warbler individuals will likely be displaced in the SSA during the construction and operations phases of the Project. Linear disturbances may provide a small amount of habitat when the shrub community regenerates in the transmission line corridor and along the edges of the access road. Canada Warblers will use edges where suitable shrub layers exist adjacent to mature hardwood and mixedwood forest stands. After the closure phase, regenerating forested stands will likely provide vegetation composition and structural characteristics required for Canada Warbler, provided a well-developed shrub layer is either created or maintained. Approximately 36 Canadian Warbler individuals in the LSA are predicted to be affected by sensory disturbances such as noise and vibrations. Noise from ongoing construction and operations will be constant, but temporary, and may influence the use of suitable habitat by Canada Warblers in the immediate vicinity as well as potentially influence reproductive success if the songs broadcast by the males to attract females cannot be heard.

ECCC advises that the Project will cause a permanent loss of Canada Warbler breeding habitat, directly impacting the local Canada Warbler population; however displaced birds will likely relocate to adjacent similar habitats. Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional Canada Warbler population can be effectively mitigated.

ECCC's Recommendations 5.2.3

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Canada Warbler habitat in the SSA and use that information with baseline survey results to determine appropriate mitigation as part of the overall reclamation plan.

5.2.4 Rusty Blackbird

Introduction and Importance of the Topic to Environmental Assessment

The Rusty Blackbird is a medium-sized passerine that occurs exclusively in North America and breeds in boreal wetland habitats in every Canadian province and territory. Rusty Blackbird has been observed in many riparian habitats including (but not limited to) wetlands associated with recent burns, peat bogs, riparian scrub, open moss- and lichen-spruce woodlands, sedge meadows, marshes, alder and willow thickets, and estuaries (ECCC, 2015). Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (ECCC, 2015). Rusty Blackbird was listed as Special Concern in 2009 under Schedule 1 of the SARA. Rusty Blackbird is not listed under the MBCA, so no prohibitions under the MBCA or its regulations apply to this species. The primary threats to Rusty Blackbird include conversion of boreal wooded wetlands in the breeding and migratory range, forest clearing, anthropogenic changes to surface hydrology, pollution in the form of mercury contamination, wetland acidification, and agricultural pesticides, climate change and drying of wetlands, and the altered predator and competitor species compositions, as well as disease and parasites (ECCC, 2015).

A family group of Rusty Blackbirds were observed in 2009 within the SSA and there is suitable habitat found within the LSA. Since Rusty blackbirds were not detected on any point counts in the study area, density estimates could not be calculated using the Blancher et al. method. However, the Project is anticipated to cause a permanent habitat loss of 17.7 ha of Rusty Blackbird breeding habitat, specifically small waterbodies with adjacent conifer forest. The Project is also predicted to affect Rusty Blackbird through sensory disturbances such as lighting, noise and vibrations as well as avoid potential incidental take through collisions and habitat removal.

Key resources that factored into ECCC's review include:

[ECCC] Environment Canada. 2015. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. iv + 26 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/mp_rusty_blackbird_e_final.pdf

Sources of Information

- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions
    - 6.6 Cumulative Effects Analysis
- Responses to Information Requests (CIAR #950)
    - IR6-19: Species at Risk Significance Determination
    - IR6-30: Noise Disturbance - Species at Risk & Migratory Birds

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that habitat loss is the primary effect pathway, particularly small waterbodies with adjacent conifer forest. Rusty blackbirds may also be sensitive to changes in hydrology in the LSA, based on their propensity for foraging in wet habitats. The Project is projected to remove approximately 17.7 ha of potential Rusty Blackbird habitat (CIAR #727). The mitigation and enhancement measures that are proposed by GenPGM are similar for Canada Warbler as for other non-SAR songbirds, which include progressive rehabilitation to recover some of the area lost during mine operation, including the access road and transmission line, and return it to a vegetated state (CIAR #727).

GenPGM has noted that there is suitable breeding habitat for Rusty Blackbird in the LSA, although it may not always be occupied. There are nine small waterbodies (between 0.5 ha and 5.0 ha in size) in the SSA which will be lost during site development (CIAR #727). GenPGM goes on to state that some waterbodies will eventually be reestablished (e.g., filling of the pit) but will not have the same productivity and characteristics as the waterbodies lost during site development and may not be suitable for Rusty Blackbird habitat (CIAR# 950). GenPGM also states that breeding habitat for this species is likely not limiting for this species and similar habitat is widespread in the RSA.

The cumulative effects that are predicted on Rusty Blackbird within the RSA could be expected where land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat lost. GenPGM further explains that the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance

associated with the Project and PIL activities and projects are expected to be minor in comparison (CIAR #727).

Sensory Disturbance and Change in Mortality Risk

Potential effects from collisions with Project infrastructure or vehicles, sensory disturbance, or indirect effects from the Project are expected to be minimal for Rusty Blackbird given their infrequent use of the LSA and habitat preference for riparian conifer forests (CIAR #727).

GenPGM did not consider sensory disturbance or collisions with Project infrastructure or vehicles cumulative effects.

GenPGM's conclusions as it relates to significance

With mitigation and based on GenPGM's significance criteria and, GenPGM concludes that residual effects on Rusty Blackbird will be not significant, as they have found only limited use of the LSA by this species. Suitable forest habitat adjacent to small waterbodies is abundant and widespread in the RSA, and the limited loss of such habitat within the SSA is not expected to threaten the long-term viability of Rusty Blackbird populations in the RSA.

ECCC's Conclusions

The loss of approximately 17.7 ha of potential Rusty Blackbird habitat is expected as a result of this Project. However, the habitat requirements for Rusty Blackbird are challenging to quantify using Forest Resource Inventory (FRI) data alone. The existing habitat estimate could be supplemented by water and wetland inventory data, and adjacency analyses (i.e. shrub thicket adjacent to water) to better predict suitable habitat. Rusty Blackbirds are tolerant of human activity and constant, but temporary noise from ongoing operations may not limit their use of adjacent suitable habitat. Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional Rusty Blackbird population can be effectively mitigated.

ECCC's Recommendations 5.2.4

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Rusty Blackbird habitat in the SSA and use the results to identify areas to be targeted for FBMP surveys as well as appropriate mitigation as part of the overall reclamation plan.

5.2.5 Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak

Introduction and Importance of the Topic to Environmental Assessment

Olive-sided Flycatcher (*Contopus cooperi*) is a medium-sized songbird. The species breeds in open coniferous or mixedwood forests, often located near water or wetlands with the presence

of tall snags (ECCC, 2016). Olive-sided Flycatcher was listed as Threatened in 2010 under Schedule 1 of the SARA. The causes of the population decreases are not well understood, although probable significant threats include reduced availability of insect prey, fire suppression, deforestation and land conversion in nonbreeding habitat, forest harvesting and silviculture, energy and mining exploration and extraction, and residential and commercial development (ECCC, 2016). The significance of each threat varies across Olive-sided Flycatcher's geographical range.

The Eastern Wood-pewee (*Contopus virens*) is a small forest bird about the same size as a House Sparrow. The Eastern Wood-pewee breeds mostly in mature and intermediate-age deciduous and mixed forests (less often in coniferous forest) having an open understory (COSEWIC, 2012). This species is often associated with forests dominated by Sugar Maple, elm and oak as well as with forest clearings and edges within the vicinity of its nest (COSEWIC, 2012). Eastern Wood-pewee was listed as Special Concern in 2017 under Schedule 1 of the SARA. Threats and limiting factors for Eastern Wood-pewees on the breeding grounds are poorly known, but threats include reduced availability of insect prey, nest predation, and over-browsing of breeding habitat by White-tailed Deer (COSEWIC, 2012).

Evening Grosbeak (*Coccothraustes vespertinus*) is a stocky, boldly coloured songbird, with a massive greenish-yellow bill. Evening Grosbeak breeding habitat generally includes open, mature mixedwood forests, where fir species and/or White Spruce are dominant, and Spruce Budworm is abundant (COSEWIC, 2016). Nesting habitat of Evening Grosbeak generally features large mature and old mixedwood forest stands with a high proportion of fir, White Spruce or Trembling Aspen, with a diversified structure and a relatively open canopy (COSEWIC, 2016). Evening Grosbeak was listed as Special Concern in 2019 under Schedule 1 of the SARA. Known threats to Evening Grosbeak include mortality caused by window strikes while birds are visiting feeders in winter, reduction of mature and old-growth mixedwood forests due to commercial forest management, and mortality due to road collisions as they are attracted to roads to feed on grit and road salt (COSEWIC, 2016).

For Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak, ECCC has responsibilities related to conservation and protection through both SARA and the MBCA. General prohibitions under the MBCA and its regulations protect Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak nests and eggs anywhere they are found in Canada, regardless of land ownership. Nevertheless, nests and eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees. During the breeding period, potential destructive or disruptive activities should be avoided at locations where Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak are likely to be encountered or known to occur.

Based on GenPGM survey efforts, a single Olive-sided Flycatcher was observed in 2009 outside the current SSA footprint and there is likely suitable breeding habitat within the LSA. A single Eastern Wood-pewee was heard on a point count in the LSA in 2010 and there is potentially suitable breeding habitat within the LSA. A single Evening Grosbeak individuals were observed in the LSA during point counts in both 2008 and 2009 and the LSA may provide potentially suitable breeding habitat for this species. Since there is likely suitable habitat for all three of these species, the Project is predicted to also affect these birds through sensory

disturbances such as lighting, noise and vibrations as well as avoid potential incidental take through collisions and habitat removal.

Key resources that factored into ECCC's review include:
COSEWIC. 2012. COSEWIC assessment and status report on the Eastern Wood-pewee *Contopus virens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 39 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Eastern%20Wood-pewee_2013_e.pdf

COSEWIC. 2016. COSEWIC assessment and status report on the Evening Grosbeak *Coccothraustes vespertinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 64 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf

[ECCC] Environment and Climate Change Canada. 2016. Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vii + 52 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_olive-sided%20flycatcher_e_final.pdf

Sources of Information

- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions
    - 6.6 Cumulative Effects Analysis

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that habitat loss is the primary effect pathway for Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak as for other non-SAR songbirds (CIAR #727). Loss of forest habitat is the primary effect pathway for these species. They indicate that general mitigation and enhancement measures are similar for Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak as for other non-SAR songbirds, as mentioned in Section 6.2.7.6.1 of the EIS Addendum (CIAR #727). With appropriate mitigation (e.g., clearing of trees outside of the breeding season), GenPGM predicts that no habitat-related effects are anticipated.

Conifer forests with snags or other suitable perches adjacent to open areas for hawking insects is the preferred habitat for Olive-sided Flycatcher in Ontario (ECCC, 2016) and GenPGM has noted that there is suitable breeding habitat for this species in the LSA, although

it may not always be occupied. This species was observed within the previous SSA for this Project and found throughout the RSA (CIAR #727).

Eastern Wood-pewee was not listed under SARA during the original submission of this Project. Previous surveys detected an individual in the LSA and based on this observation, the density of Eastern Wood-pewees in the LSA was calculated as 0.00105 birds/ha; which translates to a total of 1.2 birds in the SSA (CIAR #727). This species prefers gaps and edges of deciduous and mixedwood forests (COSEWIC, 2012), which are abundant in the LSA. Although this species is relatively uncommon along the north shore of Lake Superior and is near the northern limits of its distribution, GenPGM notes there is potentially suitable breeding habitat in the LSA (CIAR #727).

Evening Grosbeak was also not listed under SARA during the original submission of this Project. Individuals were observed in the LSA during point counts surveys. GenPGM concluded that although the LSA may provide potentially suitable breeding habitat for Evening Grosbeaks, it may be occupied only sporadically (CIAR #727).

The cumulative effects that are predicted on these SAR songbirds within the RSA could be expected where land clearing activities and/or development of site-related infrastructure is needed, for example for wind and hydro power developments, mineral exploration. In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat loss. Similar to other SAR birds, GenPGM explains that the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison (CIAR #727).

Sensory Disturbance and Change in Mortality Risk

GenPGM states that standard mitigation for sensory disturbance, collisions, and other indirect effects should sufficiently reduce potential effects on survival for these species, particularly given the limited number of individuals potentially affected (CIAR #727).

GenPGM did not consider sensory disturbance or collisions with Project infrastructure or vehicles cumulative effects for these species.

GenPGM's conclusions as it relates to significance

Based on GenPGM's significance criteria and with mitigation, GenPGM has concluded that residual effects on Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak will be not significant. They state that there is limited use of the LSA by these species and the change in wildlife habitat quantity and quality is not expected to threaten the long-term viability of their populations in the RSA. Potential forest habitat for these species is abundant and widespread in RSA and the Project-associated loss is well within the range of annual disturbance considered sustainable in boreal ecosystems.

ECCC's Conclusions

Olive-sided Flycatchers were observed in the SSA and, in the previous assessment there was 1.4 ha of suitable habitat identified. ECCC notes there is likely more available. Development of the Project will likely remove all suitable habitat within the SSA. The edges created by the regenerating transmission line corridor adjacent to the predominately mature to over-mature mixedwood forest may provide a limited amount of suitable habitat for Olive-sided Flycatcher. Noise from ongoing operations will be constant, but temporary and may influence Olive-sided Flycatcher use of suitable habitat in the immediate vicinity as well as potentially influence the reproductive success when the songs broadcast by males to attract females cannot be heard. Based on the previous assessment, there will be a temporary loss of at least 1.4 ha of Olive-sided Flycatcher habitat.

Based on the limited observations of both Eastern Wood-pewee and Evening Grosbeak, GenPGM concluded that approximately 1.2 Eastern Wood-pewee individuals and an unknown number of Evening Grosbeak could potentially be displaced by habitat removal in the SSA. They further note that there is potentially suitable breeding habitat within the LSA, which may result in sensory disturbances from activities associated with this Project.

Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional Olive-sided Flycatcher, Eastern Wood-pewee and Evening Grosbeak populations can be effectively mitigated.

ECCC's Recommendations 5.2.5

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Olive-sided Flycatcher, Eastern-Wood-pewee, and Evening Grosbeak habitat in the SSA and use the results to identify areas to be targeted for FBMP surveys as well as appropriate mitigation as part of the overall reclamation plan.

5.2.6 Peregrine Falcon

Introduction and Importance of the Topic to Environmental Assessment

The Peregrine Falcon *anatum/tundrius* is a medium-to-large falcon that breeds in all Canadian provinces and territories except Prince Edward Island. The Peregrine Falcon *anatum/tundrius* breeds in a wide range of habitats, from Arctic tundra to coastal islands, and major urban centres (ECCC, 2017). Peregrine Falcons generally nest on cliff ledges or in crevices. Cliffs ranging from 50 to 200 m high are preferred (ECCC, 2017). The species is highly adaptable in nest site selection. It can nest on top of pingos on the tundra, on escarpments, in quarries, in trees and on various human-made structures (e.g., transmission towers, skyscrapers, churches, bridges, open-pit mines, industrial stacks) (ECCC, 2017). The species demonstrates a high degree of breeding site fidelity (ECCC, 2017). Peregrine Falcon was listed as Special Concern in 2012 under Schedule 1 of the SARA. Peregrine Falcon is not listed under the MBCA, so no prohibitions under the MBCA or its regulations apply to this species. The primary

threats to the species are avicide use, recreational activities, construction and maintenance of infrastructure such as bridges and buildings, and collisions with infrastructure or means of transportation (ECCC, 2017).

Based on GenPGM survey efforts, no Peregrine Falcons have been observed in the study area. Four potential nesting cliffs were identified in 2009 just outside the study area but they have not been found to be occupied. Loss of forest habitat and mortalities from collision with project infrastructure (e.g., transmission line) or vehicles are potential effects on this species.

Key resources that factored into ECCC's review include:
[ECCC] Environment and Climate Change Canada. 2017. Management Plan for the Peregrine Falcon *anatum/tundrius* (*Falco peregrinus anatum/tundrius*) in Canada. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 28 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Mp-PeregrineAnatumTundrius-v00-2017Oct-Eng.pdf

Sources of Information

- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions
    - 6.6 Cumulative Effects Analysis

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that loss of forest habitat is the primary effect pathway, similar for other raptors (CIAR #727). They have no documented nests for this species in the LSA, so they concluded that effects pathways are limited to foraging or migrating individuals. General mitigation and enhancement measures are similar for Peregrine Falcon as for other non-SAR birds, particularly raptors, as mentioned in the EIS Addendum, Section 6.2.8.1.13 (CIAR #727).

Although there are some Peregrine Falcon nests along the nearby shores of Lake Superior, as discussed in the updated terrestrial baseline report (CIAR #727), GenPGM concluded that there is no documented use of the LSA by Peregrine Falcon and, therefore, no residual effects are anticipated.

Since no residual effects were predicted for Peregrine Falcon, GenPGM did not consider cumulative effects for this species.

Sensory Disturbance and Change in Mortality Risk

Mortality from collision with project infrastructure (e.g., transmission line) or vehicles, particularly if scavenging roadkill is another potential risk. Standard mitigation measures to reduce the risk of collision mortality with transmission lines and project vehicles. Proper waste disposal at the Project site will also reduce risk to health and survival from accidental poisoning or bird strike with Project infrastructure (CIAR #727).

GenPGM did not consider sensory disturbance or collisions with Project infrastructure or vehicles cumulative effects for this species.

GenPGM's conclusions as it relates to significance

GenPGM concludes using GenPGM's significance criteria that residual effects on Peregrine Falcon will be not significant. These species are not known to currently nest in the LSA. With appropriate mitigation, no adverse effects, such as potential collisions with Project vehicles or infrastructure, are anticipated during potential foraging or other use within the LSA by this species.

ECCC's Conclusions

Based on the information presented by GenPGM, it appears that there is no suitable habitat for Peregrine Falcon within the RSA. Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional Peregrine Falcon population can be effectively mitigated.

5.2.7 Common Nighthawk and Eastern Whip-poor-will

Introduction and Importance of the Topic to Environmental Assessment

Common Nighthawk (*Chordeiles minor*) is a medium-sized mottled grey-brown bird usually seen or heard overhead at dusk and dawn, with long pointed white-barred wings and unique bounding flight (ECCC, 2016). The species is listed as Threatened in 2010 on Schedule 1 of the federal SARA, because of significant long- and short-term declines across the portion of its range covered by bird population monitoring programs. The species is known to breed in every province and territory except Nunavut. Many threats to Common Nighthawk have been identified, but none have been directly linked to population declines of the species. The threats to the species are found within the following categories: natural system modifications (e.g., reduced insect prey and fire suppression), habitat loss and degradation, climate change and severe weather, accidental mortality, pollution, and problematic native and invasive non-native species (ECCC, 2016).

The Eastern Whip-poor-will (*Antrostomus vociferous*) is a nocturnal insectivorous bird that breeds in sparse forests or at the edge of forests adjacent to open habitats required for foraging (ECCC, 2018). Eastern Whip-poor-will was listed as Threatened in 2011 under Schedule 1 of the SARA. Although our understanding of the causes of the decline of the

Eastern Whip-poor-will may be limited, the main threats include reduced availability of insect prey, agricultural expansion and intensification (wintering and breeding grounds), urban expansion, as well as energy development and mineral extraction (ECCC, 2018).

For Common Nighthawk and Eastern Whip-poor-will, ECCC has responsibilities related to conservation and protection through both SARA and the MBCA. General prohibitions under the MBCA and its regulations protect these species' nests and eggs anywhere they are found in Canada, regardless of land ownership. Nevertheless, nests and eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees. During the breeding period, potential destructive or disruptive activities should be avoided at locations where these species are likely to be encountered or known to occur.

Both Eastern Whip-poor-will and Common Nighthawk have not been observed within the LSA based on GenPGM survey efforts. Common Nighthawk has infrequently been observed in the Marathon area including a 2011 observation within the RSA (just south of the LSA). It is expected that the Project will remove approximately 48 ha of potential Common Nighthawk and Eastern Whip-poor-will habitat.

Key resources that factored into ECCC's review include:
[ECCC] Environment and Climate Change Canada. 2016. Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vii + 49 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_common%20nighthawk_e_final.pdf

[ECCC] Environment and Climate Change Canada. 2018. Recovery Strategy for the Eastern Whip-poor-will (*Antrostomus vociferus*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vi + 107 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_eastern_whip_poor_will_e_final.pdf

Sources of Information

- EIS Addendum (CIAR #727)
    - 6.2.2 Acoustic Environment
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.3 Accidents and Malfunctions
    - 6.6 Cumulative Effects Analysis

GenPGM's Conclusions

Direct Loss of Habitat

GenPGM states that there has been no documented use of the LSA by either Common Nighthawk or Eastern Whip-poor-will but if either species were to use the LSA in the future, habitat loss, primarily sparsely-treed rock barren and other open communities is the primary effect pathway (CIAR #727). The general mitigation and enhancement measures proposed are similar for Common Nighthawk and Eastern Whip-poor-will as for other non-SAR birds, as discussed in Section 6.2.8.1.13. of the EIS Addendum (CIAR #727).

GenPGM has noted that there is potential breeding habitat for both Common Nighthawk and Eastern Whip-poor-will in the SSA, LSA and RSA (CIAR #727). Within the SSA, there is about 6 ha of non-treed upland habitat and 42 ha of treed conifer habitat that is potentially suitable for these species (CIAR #727). There has been no observed use of these habitats and they represent less than 0.1% of the potentially suitable habitat for these species within the RSA, not including cutovers, burns, and anthropogenic features such as transmission line rights-of-way (CIAR #727).

The cumulative effects that are predicted for both Common Nighthawk and Eastern Whip-poor-will within the RSA could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat loss. They further explain that the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. They also note that potential suitable Common Nighthawk and Eastern Whip-poor-will habitat is abundant and widespread in the RSA, stating more than 52,000 ha of suitable habitat is available (CIAR #727).

Sensory Disturbance

Given the lack of documented use of the LSA by GenPGM, sensory disturbance is not considered an issue. As a result, GenPGM did not consider sensory disturbance cumulative effects for these species.

Change in Mortality Risk

Although GenPGM did not observe any Common Nighthawk and Eastern Whip-poor-will in the LSA, these species may be particularly susceptible to mortality from vehicle collisions since they may land on gravel roads at dusk or through the night, to rest between foraging bouts. SAR training, signage, and speed limits will serve to mitigate this risk, however, should either common nighthawk or eastern whip-poor-will use the LSA (CIAR #727).

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected to occur principally through operation of vehicles and equipment on roads (wind and

hydro power developments, mineral exploration, timber harvesting). In all cases, mortality risk is perceived to be low based on the relative low numbers of Common Nighthawk and Eastern Whip-poor-will in the RSA. Nevertheless, in consideration of the potential additive incremental change in risks to wildlife mortality that is associated with the Project and the other projects/activities in the PIL that are in the RSA, a cumulative residual effect can be identified. However, GenPGM notes that interactions are likely to be rare regardless of the project/activity since they had very few observations of these species (CIAR #727).

GenPGM's conclusions as it relates to significance

GenPGM concludes using GenPGM's significance criteria that residual effects on Common Nighthawk and Eastern Whip-poor-will will be not significant. They state that there is no current use of the LSA by these species and, with appropriate mitigation, no adverse effects (e.g., potential collisions with Project vehicles) are anticipated in the event of future use. With rehabilitation of the SSA at closure, open and semi-treed habitat suitable for nesting and foraging by these species will likely become more abundant than is currently available.

ECCC's Conclusions

Common Nighthawk and Eastern Whip-poor-will are part of a group often referred to collectively as "nightjars" which actively feed during dawn and dusk, and throughout the night. They require extensive open areas, including open forest or rocky areas (outcrops, barrens, gravel roads, mines, and quarries). Nesting habitat such as rock barrens with scattered trees, and young burns and cutovers (less than 15 years in age) do occur in the SSA, interspersed within a predominately mature to over-mature mixed wood forest. An estimated 48 ha of potential habitat for both Common Nighthawk and Eastern Whip-poor-will is predicted to be lost as a result of the Project. Nightjars can return annually to their approximate nesting location, and therefore may be permanently displaced from their nesting site by developing the Project. Surveys completed to date have not detected either species within the SSA or LSA. Nightjar surveys should be continued and if either species is detected then appropriate mitigation procedures must be put in place to reduce the likelihood mortality to individuals, or of destroying nests or young. Noise from ongoing operations will be constant, but temporary and may influence nightjar use of suitable habitat in the immediate vicinity. There is the potential that mine site lighting may increase the abundance of foraging nightjars, because their prey (insects) are attracted to lights.

Forest management activities, along with natural disturbances such as fires, will continue to create suitable habitat for nightjars. Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional nightjar populations (Common Nighthawk and Eastern Whip-poor-will) populations can be effectively mitigated.

ECCC's Recommendations 5.2.7

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Common Nighthawk and Eastern Whip-poor-will in the SSA and use the results to identify areas to be targeted for Nightjar surveys as well as appropriate mitigation as part of the overall reclamation plan.
2. Continue nightjar surveys and ensure occupied nesting areas are not disturbed during the core breeding period until the young have naturally and permanently left the vicinity of the nest.

5.2.8 Monarch and Yellow-banded Bumble Bee

Introduction and Importance of the Topic to Environmental Assessment

The Monarch (*Danaus plexippus*) is an insect that was listed as Special Concern on Schedule 1 pursuant to the SARA in 2003. As Monarch larvae feed solely on the leaves, flowers and fruits of the milkweed, a member of the dogbane family (*Apocynaceae*), their breeding habitat is dependent on the presence of these plants (ECCC, 2016). Threats currently affecting Monarchs in Canada include succession and/or conversion of breeding and nectaring habitat, herbicide and pesticide use, and severe weather events (ECCC, 2016).

The Yellow-banded Bumble Bee (*Bombus terricola*) is a medium-sized bumble bee with a short head and tongue length relative to other species. This species is an important pollinator of a variety of agricultural crops and native plant species (COSEWIC, 2015). Yellow-banded Bumble Bee occurs in a diverse range of habitats, including mixed woodlands, farmlands, urban areas, montane meadows, prairie grasslands and boreal habitats (COSEWIC, 2015). Like many bumble bees, it usually nests underground in pre-existing cavities such as abandoned rodent burrows and rotten logs and queens will overwinter underground and in decomposing organic material (COSEWIC, 2015). Yellow-banded Bumble Bee was listed as Special Concern in 2018 under SARA and the factors responsible for the decline are not known with certainty, however possible threats include introduced pathogens from managed bumble bees, pesticide use, climate change and habitat loss (COSEWIC, 2015).

Both Monarch and Yellow-banded Bumble Bee have been observed within the SSA and LSA, along the main access road through the Project site (Environment Updated Baseline Report, 7.2.1, 7.2.2; CIAR #722). It is expected that the Project will remove approximately 1,116 ha of potential Monarch and Yellow-banded Bumble Bee habitat (EIS Addendum, Table 6.6-1).

Key resources that factored into ECCC's review include:

[ECCC] Environment and Climate Change Canada. 2016. Management Plan for the Monarch (*Danaus plexippus*) in Canada. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 45 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/mp-monarch-e-final.pdf

COSEWIC. 2015. COSEWIC assessment and status report on the Yellow-banded Bumble Bee *Bombus terricola* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 60 pp. Available at https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Yellow-banded%20Bumble%20Bee_2015_e.pdf

Sources of Information

- Marathon Palladium Project Terrestrial Environment Baseline Report Updated (CIAR #722)
- EIS Addendum (CIAR #727)
    - 6.2.7 Wildlife
    - 6.2.8 Species at Risk
    - 6.6 Cumulative Effects Analysis

GenPGM's Conclusions

Direct Loss of Habitat
GenPGM predicts the loss of potential nectaring (foraging) habitat on roadside wildflowers as the primary effects pathway for both species. Loss of potential nest habitat is also possible within the SSA for Yellow-banded Bumble Bee (CIAR #727).

GenPGM observed numerous Monarch adults (15+) during 2020 field surveys along the main access road through the Project site (CIAR #727). However, the obligate host plants of larval monarchs i.e., milkweed (Asclepias spp.) have not been located in the LSA (CIAR #727). Small numbers of Yellow-banded Bumble Bees were also observed during 2020 field surveys foraging for nectar and/or pollen on goldenrods and other roadside flowers along the main access road through the SSA and LSA. GenPGM states that although 1,116 ha of potential habitat for these species will be lost during site clearing and operations, at least some will be rehabilitated upon closure. Given the broad habitat requirements for this species and abundant potential habitat in the RSA, this habitat loss is not expected to affect regional populations (CIAR #727).

General mitigation and enhancement measures are similar for Monarchs and Yellow-banded Bumble Bees as for other wildlife (CIAR #727). Of particular relevance to these species are the use of native seed mixes during rehabilitation of the SSA at closure as per the Conceptual Closure Plan (CIAR #727). Inclusion of selected wildflower species in the seed mixes to provide additional nectar sources throughout the growing season will benefit both migrant Monarchs and resident Yellow-banded Bumble Bees. Although not currently found on site, inclusion of common milkweed (*Asclepias syriaca*) in the rehabilitation efforts would provide larval food sources for monarch caterpillars; this approach could be considered assuming agency approval (CIAR #727).

Cumulative effects on Monarch and Yellow-Banded Bumble Bee within the Pic FMU (i.e. RSA) could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). Specifically for Monarch, these activities may reduce the amount of roadside nectar sources for adult monarchs, at least in the short term. No impacts are expected on the larval host plant, milkweed, which has not been observed in the LSA. There are no natural occurrences of milkweed in the RSA either; where occurrences do occur, they are of anthropogenic origin. No

cumulative impacts are expected on larval habitat. For Yellow-Banded Bumble Bee, timber harvesting activities are seen as potentially the most significant activity in the RSA as it concerns direct habitat loss (i.e., potential loss of nesting habitat). However, they state that the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison (CIAR #727).

Sensory Disturbance and Change in Mortality Risk

GenPGM predicts that sensory effects (e.g., light, noise) will be less of an issue for these insects. However, there is a risk of mortality to these species from collision with Project vehicles and/or collisions with infrastructure. For Monarch, risk of collision with project vehicles is a potential risk to migrating adults, particularly if nectaring along roadside wildflowers (CIAR #727). Based on GenPGM observations, this risk is expected to be minimal and can be mitigated by training, signage, and speed limits, and generally north-south alignment of the road (CIAR #727). For Yellow-Banded Bumble Bee, there is the potential mortality of a few individuals, if they are nesting in the SSA during site clearing and development (CIAR #727). There is also a minor risk of mortality from vehicle collisions, although this can largely be mitigated with the same strategies presented for Monarch.

GenPGM found that effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected where development of site-related infrastructure is needed and operation of vehicles and equipment will occur (wind and hydro power developments, mineral exploration, timber harvesting). Considerations of the relative contributions from the Project and other proposed projects/activities are as follows. Mortality risk on Monarch and Yellow-Banded Bumble Bee associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects/activities; however, when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude (CIAR #727).

GenPGM's conclusions as it relates to significance

With mitigation and applying GenPGM's significance criteria that residual effects on Monarch and Yellow-banded Bumble Bee will be not significant. Loss of habitat and collisions with Project vehicles will affect few individuals and will not substantively affect the sustainability of their populations in the LSA or RSA. With rehabilitation of the SSA at closure, suitable open habitat may be more abundant than is currently available.

ECCC's Conclusions

There may be suitable Monarch breeding habitat adjacent to existing roads and within transmission corridors. With development of the Project, there is an opportunity to create additional breeding habitat, where forest reclamation is not possible. While the SSA is predominately forest habitat, it is clear that not all of the footprint, beyond what will be retained as water features, can be returned to a forested condition. Where feasible, forb mixes

(including milkweed) could be used to promote the use of these areas by breeding and migrating Monarchs.

The loss of approximately 1,116 ha of potential Monarch and Yellow-banded Bumble Bee habitat is expected as a result of the Project. Both Monarch and Yellow-banded Bumble Bee have been observed within the SSA and LSA, specifically along the main access road through the Project site.

ECCC's expert advice is that the Project will cause a permanent loss of Monarch and Yellow-banded Bumble Bee habitat, directly impacting the local populations; however, these displaced species should be able to relocate to adjacent similar habitats. Provided that GenPGM meets the commitments that they have stated, the effects of the Project on the regional Monarch and Yellow-banded Bumble Bees populations can be effectively mitigated.

ECCC's Recommendations 5.2.8

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Create additional breeding habitat for both Monarch and Yellow-banded Bumble Bee where forest reclamation is not possible as part of the overall reclamation plan.

5.2.9 Wetlands

Introduction and Importance of the Topic to Environmental Assessment

The Project would contribute to the direct loss of approximately 31.2 ha of open wetlands and sparsely vegetated open water habitat. Wetlands serve many important ecological functions.

Taking into account mitigation measures proposed by GenPGM, ECCC assessed the potential for Project-related effects to wetlands, including as they relate to adverse environmental effects on migratory birds and SAR.

Sources of Information

- Marathon Palladium Project Terrestrial Environment Baseline Report Updated (CIAR #722)
- EIS Addendum (CIAR #727)

GenPGM's Conclusions

GenPGM found that in general, wetlands in the SSA are rather small and limited in development, in part due to the small waterbodies, rugged topography, and thin soils (CIAR #722). None of the wetlands in the SSA have been formally evaluated for provincial significance but would not meet the criteria due to their very small size, low diversity, limited hydrological function, and paucity of special features (CIAR #722). GenPGM states that most of the impacts to non-forested wetlands are from direct loss within the SSA, accounting for

21.4 ha of open wetlands and an additional 9.8 ha of sparsely vegetated open water habitat (CIAR #727). Shore fens were found to be one of the most abundant wetland communities in the SSA, accounting for approximately 4.5 ha (CIAR #722).

During closure, GenPGM states rehabilitation efforts will encourage native vegetation community growth, although it is unlikely that wetland communities lost due to the Project will be restored to their original state (CIAR #727). Some wetland communities will likely be converted to upland communities resulting in a net loss of wetlands in the SSA. Although new areas of wetland communities may develop in low-lying areas, most of the reclaimed areas in the SSA are anticipated to develop into upland vegetation communities (CIAR #727).

GenPGM concludes using GenPGM's significance criteria that residual effects on wetlands from direct loss or indirect impairment are predicted to be not significant due to the small area potentially impacted. Within the LSA, this represents less than 0.2% of the 11,430 ha of these ecosites found within Ecodistrict 3W-5 (CIAR #727). GenPGM also note that this is still likely a substantial underestimate of available open wetland abundance in the RSA since there are 8,500 mapped waterbodies <10 ha in size that encompass more than 10,000 ha total in Ecodistrict 3W-5, none of which have shallow marshes or open water marshes (Ecosites B148 to B152) delineated in the FRI (CIAR #727).

ECCC's Conclusions

The direct loss of approximately 31.2 ha of open wetlands and sparsely vegetation open water habitat is expected as a result of this Project. Specifically for wildlife, there appears to be a low density of wetland birds in the SSA given the limited wetland habitat. It is expected that 10-20 pairs of waterfowl will be displaced due to site development and construction in the SSA. Rusty Blackbird also could use some of these small waterbodies with adjacent conifer forest that will be removed as a result of this Project.

ECCC concludes that the Project will cause a direct loss or indirect impairment of wetlands in the SSA. However, a majority of the wetlands to be lost are classified as open wetlands, which appears to be abundant in the LSA and RSA. Provided that GenPGM meets the commitments that they have stated in their Fisheries Act, Paragraph 35(2)(b) Authorization, Offset Plan and MDMER Schedule 2 Fish Habitat Compensation Plan, the effects of the Project on wetlands can be effectively mitigated.

CHAPTER 6 - Use of Waters Frequented by Fish for the Disposal of Mine Waste

6.1 Schedule 2 of Metal and Diamond Mining Effluent Regulations (MDMER)

Introduction and Importance of the Topic to Impact Assessment

GenPGM has proposed the use of several natural, waterbodies frequented by fish for mine waste disposal. A listing on Schedule 2 of the MDMER will be required for all water frequented by fish into which deposits may be made of waste rock, acutely lethal effluent, or effluent of pH or prescribed deleterious substances that do not meet the limits set out in the MDMER. Mine waste and effluent may include, for example, contact water from open pits, Mine Rock Storage Areas (MRSAs), and stormwater runoff. It is GenPGM's responsibility to identify all waterbodies impacted by the mine waste disposal that may require listing in Schedule 2; provide the methodology used to document the presence or absence of fish; and provide information related to the connectivity of these waterbodies to other waterbodies frequented by fish.

An assessment of alternatives for mine waste disposal is a key factor in the government's decision as to whether or not to amend Schedule 2 of the MDMER. It is GenPGM's responsibility to conduct an assessment of alternatives for mine waste disposal that objectively and rigorously evaluates all feasible options for mine waste disposal. GenPGM must demonstrate through this assessment that the proposed use of the waterbody for mine waste disposal is the most appropriate option available from environmental, technical and socio-economic perspectives.

Providing as much detail as possible during the environmental assessment can reduce the time required for the regulatory amendment. ECCC however acknowledges that GenPGM ultimately determines the timing of the submissions, as part of the Schedule 2 of the MDMER regulatory process.

Source of Information

- Environmental Impact Statement (EIS) (CIAR #224)
    - Supporting Documents 11, Alternatives Assessments Report for the Process Solids Storage Facility and the Mine Rock Storage Area for the Marathon PGM-Cu Project (CIAR #227)
- Submission to the Panel from Stillwater Canada Inc. of the Proposed Fish Habitat Offset Strategy and Compensation Plan for the Marathon Platinum Group Metals and Copper Mine Project (CIAR #678)
- EIS Addendum (CIAR #727)
- Fisheries Act, Paragraph 35(2)(b) Authorization, Offset Plan and MDMER Schedule 2 Fish Habitat Compensation Plan (Draft), Marathon PGM-Copper Project (CIAR #983)

ECCC's Conclusions

ECCC has reviewed GenPGM's assessment of alternatives for mine waste disposal. ECCC's comments have been included to highlight mine waste components that may still require an assessment of alternatives for mine waste disposal as well as highlight some inconsistencies within GenPGM's updated draft Offset Plan and MDMER Schedule 2 Fish Habitat Compensation Plan dated January 14, 2022. ECCC has also included comments on GenPGM's assessment of alternatives for the PSMF and the MRSA.

ECCC notes additional mine waste components may still require the completion of an assessment of alternatives including:

- The overburden stockpiles - GenPGM has not provided the information necessary to determine whether these stockpiles will overprint waters frequented by fish.
- The Stream 1 watershed headwaters that is to be impounded (i.e. sealed off) for the purposes of stormwater management and water collection provides spawning - GenPGM has indicated in the Proposed Fish Habitat Offset Strategy and Compensation Plan (2014) that these Stream 1 headwater segments may provide spawning, nursery or foraging habitat for small-bodied cool water species.

ECCC has also reviewed the updated draft Offset Plan and MDMER Schedule 2 Fish Habitat Compensation Plan (FHCOP) dated January 14, 2022. Some details provided in this latest draft FHCOP are inconsistent including:

- Watercourse segment 101-S1-T1 is shown in Table 6-1 (page 29) as being intended for listing on Schedule 2, but Figure 3-1 (page 18) does not indicate any portion of that tributary as being intended for Schedule 2.
- Segments 103-S1-L13 and 103-S1-L13a are shown in Table 6-1 as being intended for listing on Schedule 2, but are shown only as "Non Fish Bearing Water" on Figure 3-1.
- A portion of watercourse segment 106-AC is shown on Figure 3-1 to be overprinted by the proposed Water Management Pond, but indicated as "Anticipated Section 35 Authorization". A Section 35 Authorization will be required in this case.
- Similarly, a portion of watercourse segment 101-S1-T1 is proposed to be overprinted by the proposed Stormwater Management Pond, but shown as "Anticipated Section 35 Authorization". A Section 35 Authorization will be required in this case.

In addition, figures provided in the 2012 Process Solids Management Facility and Mine Rock Storage Area Alternatives Assessment report (CIAR# 227) show several water bodies that have not been identified in the areas of mine waste placement shown in the draft FHCOP. For example, tributaries can be seen on Figure 4.7 of the 2012 report that are within the area of PSMF Cells 2A and 2B, but are not shown on Figure 3-1 of the draft FHCOP. Similar examples exist in the area of the MRSA on the same figures. ECCC is not aware of any rationale for the omission of those waterbodies from the FHCOP.

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Chapter 7 - Effects of Climate Change on the Project and Greenhouse Gases

7.1 Effects of Climate Change on the Project

Introduction and Importance of the Topic to Impact Assessment

The Environmental Impact Statement Guidelines (EIS Guidelines; CIAR#150) state that the effects of the environment on the Project shall be considered. In particular, the guidelines state: "The EIS shall consider any change to the Project that may be caused by the environment. The assessment shall take into account how local water conditions and natural hazards, such as severe weather conditions and external events could adversely affect the Project. Longer-term effects of climate change shall also be discussed up to the end of the projected post-closure phase of the Project". The guidelines also specify that the EIS should "provide details of planning, design, and construction strategies intended to minimise the potential environmental effects of the environment on the Project" (p.71). Furthermore, Section 2.7.2.3.1 (Hydrology and Hydrogeology, p. 53) specifies that the EIS should "include consideration of the effects of climate change and variability on the future flow regime and water balance assessment, hydrology, such as peak flow rates and the location of ice jams that could affect the environment or project infrastructure."

The climate (precipitation and temperature) of the Project area is projected to be different from current and past climate over the project lifetime, including the closure/post-closure period. Therefore, climate change considerations are relevant to the environmental assessment of the Project. The implications of climate change on the Project, as well as the Project's potential impacts on the environment, should be identified and considered.

Extreme precipitation events are expected to occur with more frequency and intensity in the future, due to climate change (IPCC, 2012; IPCC, 2013; IPCC, 2021; Kharin et al., 2013; Zhang et al, 2019). The identification and appropriate interpretation of climate change data and projections is therefore important for the assessment of possible climate related risks to the Project and in turn, to the environment. This is particularly important with respect to the Project's design considerations. For example, GenPGM has identified design components that may be affected by climate change, such as:

- the reclamation and restoration of landscape (including water bodies) to productive capacity;
- the management of flooded pits to submerge Type 2 material and to protect groundwater and surface water quality during flooding and pit overflow; and
- the proposed PSMF closure design for the long-term management of Type 2 materials and stability of the facility as being primary sensitivities during mine closure activities.

Source of Information

- Environmental Impact Statement Guidelines (CIAR #150)

    - 2.7.2.3.1 Hydrology and Hydrogeology
    - 2.7.7 Effects of the Environment on the Project
- Environmental Impact Statement (EIS) (CIAR #224)
    - Chapter 6, Assessment of Potential Effects of the Proposed Project
        - Section 6.4.1 Climate Change
    - Supporting Information – Document No. 8 – Greenhouse Gas and Climate Change Assessment for the Marathon PGM-Cu Project (CIAR #227)
- Hydrology Updated Baseline Report (CIAR #722)
    - 6.1.2 Climate Change
    - Appendix C Climate Change Data
- EIS Addendum (CIAR #727)
    - 6.4 Effects of the Environment on the Project
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #21
    - ECCC #27

GenPGM's Conclusions

GenPGM has provided information on climate change projections in the Project area in the EIS (2012: Section 6.4) and in the supporting greenhouse gas and climate change assessment [SID 8] (CIAR #227). Projected changes in maximum, minimum and mean temperatures as well as total annual and seasonal precipitation were provided in these documents. The projections, based on a single run from a single climate model, are provided for a range of scenarios (A1B, A2 and B1 as used in IPCC fourth assessment report). The strongest warming in the temperature projections was 1.5^{o}C in the 2041-2070 period. Updates to these projections were not provided in Section 6.4.1. of the EIS Addendum (p. 6.602).

In the Hydrology Updated Baseline Report (2020; section 6.1.2 and Appendix C), the proponent provided projections of extreme precipitation "for the next 20 years" (i.e. for the 2010-2040 period) for a number of different precipitation durations and return periods. These values are derived for a local station from a single climate model using a statistical tool. Results are provided for three future emissions scenarios representing low forcing with limited warming to high forcing with large and rapid warming. The proponent concluded that:

> *" … even under the best-case scenario, climate change is expected to have some significant changes to precipitation events, with higher total rainfall and rainfall intensities occurring more frequently. It is recommended that the RCP4.5 IDF curves be used to estimate Project conditions as they reflect realistic precipitation changes due to climate change for an intermediate stabilization scenario"* (from Hydrology Updated Baseline Report, 2020, section 6.1.2, p 6.7)

ECCC's Conclusions

ECCC's review of the EIS identified concerns with GenPGM's use of a "low" temperature projection (i.e. 1.5^{o}C in the 2041-2070 period). For example, higher temperatures could potentially affect evaporation rates and thus water balance. For Ontario as whole, multi-model ensemble projections of annual mean temperature for 2031-2050 range from a median value of 1.5^{o}C (1.1, 2.1)[3] for low forcing to 2.3^{o}C (1.7, 2.9) for a high forcing scenario. Values are higher for end of century: 1.7 ^{o}C (1.0, 2.1) and 6.3 ^{o}C (5.3, 6.9) for low and high forcing respectively. The projections provided for precipitation were also based on the single model. At present, there is no objective way to identify the 'best' model from among the selection of available climate models, with respect to quality of future simulations. Use of a single model does not account for uncertainty related to climate model selection.

In the EIS Addendum, GenPGM has provided estimates of changes in extreme precipitation that are based on a statistical method and recommend using a mid-range (Representative Concentration Pathway (RCP) 4.5 in this case) emissions scenario. It is not known which forcing scenario is most likely because they are not ascribed a probability and available scenarios that GenPGM describe increasingly diverge after mid-century. GenPGM should therefore consider projections from a range of plausible future forcing scenarios.

As GenPGM notes, increases in precipitation extremes are expected for Ontario. For example, increases in annual maximum 24-hour precipitation for 10, 20 and 50 year return periods may exceed 20%[4] by end of century under a high emission scenario (Zhang et al., 2019; Table 4.6). However, ECCC notes that in general there is considerable uncertainty in projected changes to short duration precipitation extremes, particularly at the local scale. Furthermore, estimates of future short duration precipitation extremes that are based on statistical relationships fitted between local-scale observed extreme precipitation and the modelled simulations described in the EIS Addendum are unlikely to be robust because the changes in local observed extreme precipitation are small compared with the natural variability of extreme precipitation (Li et al., 2019). This lack of information on observed extremes means that a statistical model, like the one used by GenPGM, are unlikely to identify statistical relationships robustly (Li et al., 2019). ECCC suggests GenPGM consult the 2019 Canadian Standards Association Guidance on Intensity Duration Frequency for Canadian Water Resources practitioners, which provides examples of appropriate methodologies to estimate return values for design.

ECCC Recommendations 7.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Where it is necessary or appropriate, utilise best-available climate change projections (temperature and precipitation) from an ensemble of climate models for a range of plausible future emissions scenarios (low to high forcing) to evaluate future

[3] The number in brackets represent the 25th and 75th percentile values in the ensemble of projections (given in ^{o}C).
[4] This is based on the median values for the 10, 20 and 50-year return periods for the 2081-2100 time period. Refer to Table 4.6 in Zhang et al. (2019) for additional details on the range of future projections for the various scenarios and future time periods, including the 25th and 50th percentile values.

climate changes where they are relevant for design and reclamation considerations. Where projected climate changes are relevant to the project design values related to potential changes in short-duration precipitation extremes, ECCC recommends that the proponent utilise scientifically appropriate best-available methodologies such as those outlined in the recent CSA guidance (CSA, 2019) to characterise potential future changes.

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7.2 Greenhouse Gas Emissions

Introduction and Importance of the Topic to Environmental Assessment

Climate change is caused by the increase in concentrations of greenhouse gases (GHGs) in the atmosphere which produces a warming effect. These increases are primarily due to human activities such as the use of fossil fuels and agriculture. A wide variety of impacts may result from climate change, which have been documented by the Intergovernmental Panel on Climate Change (IPCC).

Since 2016, the Government of Canada has been working with provinces, territories, and Indigenous Peoples, to implement the Pan-Canadian Framework on Clean Growth and Climate Change (PCF). The framework outlines over 50 concrete measures to reduce carbon pollution, measures to adapt to the impacts of climate change and build resilience, and actions to accelerate clean technology solutions and create good jobs that contribute to a stronger economy.

Building on the progress under the PCF, in December 2020, the Government of Canada announced *A Healthy Environment and a Healthy Economy*, Canada's strengthened climate plan to accelerate the fight against climate change.

Acknowledging the need for even greater ambition in the fight against climate change, in April 2021, the Prime Minister announced an enhanced emissions reduction target of 40-45 percent below 2005 levels, by 2030. This enhanced target has been submitted to the United Nations Framework Convention on Climate Change as Canada's Nationally Determined Contribution (NDC).

In addition, in June 2021, the Government of Canada enacted the Canadian Net-Zero Emissions Accountability Act, that enshrines in legislation Canada's commitment to achieve net-zero emissions by 2050, and establishes a legally-binding process to achieve this goal.

The publication of the final strategic assessment of climate change (SACC) in 2020, which works in conjunction with the new *Impact Assessment Act*, provides guidance on how to consider climate change throughout federal impact assessments. While the SACC does not apply directly to projects under CEAA 2012, such as the Marathon Palladium Project, proponents may find the technical guidance of the SACC helpful in assessing the impacts to climate change and in ensuring consistent, predictable, efficient and transparent consideration of impacts to climate change.

Source of Information

- EIS Addendum (CIAR #727)

  - Section 6.2.1.6.2 - Change in Greenhouse Gas
  - Section 6.6.6.6.1 - Change in Forest Cover
  - Section 6.6.6.6.2 - Change in Non-forest Cover
- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
  - ECCC #40
  - ECCC #41
- IR6-4 Greenhouse Gas Emissions (CIAR #950)

GenPGM's Conclusions

Project GHG Emissions and Emissions Intensity

GenPGM quantified the GHG emissions from the construction, operation, decommissioning and abandonment phases of the Project (IR6-4, CIAR #950). According to GenPGM, net GHG emissions associated with the construction phase of the project, which is expected to last 2 years, are estimated to be a maximum of 240.3 kt CO_2 equivalent (CO_2e) per year. The GHG emissions associated with the operation phase of the project, which is expected to last 12.7 years, are estimated to be up to a maximum of 105.3 kt CO_2e per year. The GHG emissions for the decommissioning and abandonment phase are estimated to be 40.2 kt CO_2e per year maximum.

Table 1 below provides a breakdown of the direct and acquired emissions over the lifetime of the project, based on information GenPGM provided. ECCC was unable to differentiate between the decommissioning and the abandonment phases in GenPGM's response to IR6-4. Therefore, the emissions from these 2 phases were combined in the table.

Table 1. ECCC's summary of direct and acquired GHG emissions over the lifetime of the Project

Phase/Source		Highest Annual Emissions (kt CO_2e)	Project Lifetime Emissions (kt CO_2e)
Construction	Fuel Combustion	23.9	29.7
	Blasting	1.1	1.4
	Land use change	206.1	412.2
	Acquired energy	9.2	9.5
	Total	240.3	452.8
Operation	Fuel Combustion	70.1	841.6
	Blasting	3.0	22.0
	Land use change	4.8	57.6
	Acquired energy	27.4	149.6
	Total	105.3	1070.8
Decommissioning and abandonment	Total	45.0	153.8

Project Total	1677.5

GenPGM estimated the maximum emission intensity of 0.017 t CO_2e/tonne of ore during operations.

Mitigation Measures

GenPGM has proposed the following measures to mitigate GHG emissions:

- Optimizing the mine design to reduce travel distances
- Using energy efficient equipment
- Land reclamation and revegetation
- Fuel use management
- Vehicle and equipment maintenance

GenPGM is exploring the use of a trolley assist system, an electrical trolley system that assists haul trucks on steep grades thereby reducing emissions, for key haulage segments and CO_2 capture by employing CO_2 in construction concrete and processed solids stream. However, no timelines were provided for when the results of the feasibility study to determine the economic feasibility of these mitigation measures would be completed.

ECCC's Conclusions

The Minister of Environment and Climate Change will consider the extent to which the Project will contribute to or hinder Canada's ability to meet its climate change commitments, including the 2030 targets and net-zero by 2050 goal. To do so, it will consider GHG emissions, the Project's emissions intensity (EI) and mitigation measures, as well as how the Project may impact federal and international GHG reduction efforts.

With regards to GenPGM's quantification of GHG emissions, ECCC considers that overall the approach to GHG emissions estimates were acceptable and reasonable. However, outstanding issues were identified, including the need to differentiate between GHG emissions in the years of the Project that correspond to the decommissioning and abandonment phases. Furthermore, as part of ECCC comments on the EIS Addendum and information requests to the Panel, ECCC had encouraged GenPGM to provide an explanation of how the Project may impact Canada's ability to reduce GHG emissions or a description of how the Project could impact global GHG emissions (CIAR#893).

In addition, GenPGM states "The GHG emissions from the Project are small in comparison to provincial or national emission rates", and "Overall, with mitigation and environmental protection measures to be implemented, residual effects on GHG emissions are predicted to be not significant". The Project's GHG emissions needs to align with Canada's targets and international commitments, as GHG emissions are of concern due to their cumulative nature. The total GHG emissions over the lifetime of the project are 1677.5 kt CO_2e. It is recommended that the Proponent identify and incorporate additional GHG mitigation measures, where technically and economically feasible, to avoid or reduce the potential adverse effects related to GHG emissions.

In general comparing EI for a specific project with similar high-performing energy efficient projects would support the determination of whether or not the proposed project is high-performing energy efficient. However, as an open pit palladium mine like this Project is not a common project type, no similar energy efficient projects in Canada were found. In addition, under the federal Output-based Pricing System, the EI standard for new palladium mines is to be set based on the first years of operation of the mine instead of providing a specific EI standard to compare with. Therefore, a comparison of the project's EI to similar projects could not be performed.

Mitigation Measures

ECCC considers the mitigation measures proposed by GenPGM to reduce GHG emissions to be minimal. The proposed practices of optimizing mine design and management of fuel use are standard practices that are not typically considered mitigation measures. In addition, the proposed use of energy efficient equipment is provided with no details regarding the anticipated level of energy efficiency of the equipment and the associated GHG emission reductions.

ECCC acknowledges that GenPGM has committed to completing a feasibility study to explore the possibility of additional mitigation measures such as, electrical trolley assist for haul trucks on grades and CO_2 capture. However, without the detailed information on the feasibility and potential for GHG emission reductions from these proposed measures ECCC is unable to determine the extent to which GHG emissions would be reduced. For instance, with respect to CO_2 capture technology, supporting documentation would be necessary to demonstrate that the CO_2 sequestered in any products will be stored permanently (for a minimum of 100 years) if this measure is implemented.

ECCC recommends that GenPGM conduct further analysis to identify additional mitigation measures to further reduce GHG emissions throughout the lifetime of the Project. GenPGM may wish to refer to refer to section 5.1.3 of the SACC which provides technical guidance to support Proponents in determining Best Available Technologies / Best Environmental Practices (BAT/BEP) that could be applied to a project. BAT/BEP are defined as the most effective technologies, techniques, or practices, including emerging technologies that can be technically and economically feasible for reducing GHG emissions during the lifetime of the project. Examples of BAT/BEP include the use of low carbon fuels and electrification. Additionally, emission reduction targets should also be established over the life of the Project to evaluate the performance of the mitigation measures that will be implemented.

Impact on Carbon Sinks

GenPGM identified that the Project would result in the loss of approximately 1,081 hectares (ha) of forest in the site study area and 842 ha in the adjacent local study area. The Project would also result in the loss of non-forested wetland (including 21.4 ha of open wetland and 9.8 ha of sparsely vegetated open water habitat), and non-forested upland (approximately 6.8

ha). GenPGM did not complete a quantitative and qualitative description of the Project's impact on these carbon sinks. ECCC requested GenPGM provide a qualitative and quantitative description of the Project's positive or negative impact on carbon sinks in order to better understand impacts on carbon sinks (CIAR #893). The consideration of habitat loss and impact on carbon sinks is an important element in the quantification of the Project's direct GHG emissions.

Impact in Canada and abroad

The Project will extract palladium, a critical mineral for Canada's economy and a necessary component to battery manufacturing. Critical minerals may prove indispensable to global efforts' to reaching net-zero economies by 2050. However, it is unclear if Canada will benefit from GHG emission reductions associated to the palladium produced by the Project.

ECCC Recommendation 7.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Identify and implement additional mitigation and monitoring measures to reduce GHG emissions throughout the lifetime of the Project.
2. Develop a Follow-up and Monitoring Program to verify the performance of the mitigation measures implemented and to implement adaptive management should the mitigation measures not perform as expected.

CHAPTER 8 - Accidents and Malfunctions

8.1 Spill Response Measures and Program

Introduction and Importance of the Topic to Environmental Assessment

The following information is provided in response to the Panel's request that ECCC's submission address accidents and malfunctions (CIAR #962).

ECCC's reviews of accidents and malfunctions are based on the Department's mandate as they relate to CEPA, 1999, the pollution prevention provisions of the *Fisheries Act*, and the MBCA. ECCC's comments and recommendations to project proponents are provided with a direct view to preventing and mitigating environmental effects that may occur as a result of an accident or malfunction.

The *Environmental Emergency Regulations, 2019* apply to any person or company that owns or has the charge, management or control of any of the 249 listed hazardous substances located at any fixed land-based facility in Canada. Facilities that have a regulated substance and meet the concentration, total quantity and/or container capacity thresholds may have to submit notices to ECCC, prepare, implement and test an Environmental Emergency Plan, keep records or report environmental emergencies.

The EIS (CIAR #224) identifies propane, diesel fuel, gasoline and ammonium nitrate as products that may pose risk to the surrounding environment and workers' safety. These substances are listed in Schedule 1 of the *Environmental Emergency Regulations, 2019*.

Spills of process-affected water, process chemicals, hydrocarbons and other substances have the potential to affect water quality and harm fish and aquatic organisms, as well as migratory birds. These environmental effects may also directly impact human health via the consumption of contaminated water, fish or wildlife.

Sources of Information

- Environmental Impact Statement Guidelines
    - 2.7.6 Accidents and Malfunctions
- Environmental Impact Statement (EIS)(CIAR #224)
    - Chapter 6.3 Accidents and Malfunctions
- EIS Addendum (CIAR #727)
    - Chapter 6.3 Accidents and Malfunctions
        - 6.3.2.7 Chemical Incident during Transport
        - Table 6.3-2 Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

- From Environment and Climate Change Canada to the Joint Review Panel re: Comments on the EIS Addendum for the Marathon Palladium Project (CIAR #893)
    - ECCC #43
    - ECCC #44

GenPGM's Conclusions

The assessment of potential accident and malfunction scenarios was conducted based on experience with other similar projects; internal risk assessment discussions; the EIS Guidelines; and, comments received through Indigenous and public consultation sessions (CIAR #224). Table 6.3.2 Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions, in the EIS addendum, provides a summary of potential environmental issues, mitigation and response procedures for accidents and malfunctions identified during the risk assessment step (CIAR #727).

GenPGM identified a chemical spill and fuel release during transportation as sources of potential adverse environmental effects to the surrounding environment. GenPGM identified that a full transport truck can carry as much as 40 tonnes of mill reagents. In section 6.3.2.7 of the EIS Addendum, GenPGM states that "Because the potential scenarios are so varied, no attempt to define a single event has been made; rather, a more conceptual approach to the evaluation of a chemical release during transport to site has been taken." Regarding a fuel release, GenPGM identified this as a potential source of water contamination with the potential to affect aquatic life at relatively low concentration. GenPGM has committed to posting and monitoring speed limits along the site access road and all roads within the site to reduce the risk of on-road vehicular accidents.

GenPGM identifies that in order to ensure the risk associated with a chemical spill and fuel release is reduced, chemicals and fuels will be delivered by qualified, licensed third-party contractors who will be responsible for first-level response and reporting (CIAR #727).

ECCC's Conclusions

GenPGM evaluated a variety of accident and malfunction scenarios. Although GenPGM was able to identify potential accidents and malfunction scenarios using a qualitative risk assessment methodology, ECCC would encourage GenPGM to use a risk matrix system to provide a quantitative risk assessment of the likelihood and severity of a potential hazard and assign it a risk rating. Using a quantitative risk assessment approach would give scenarios with the highest risk rating priority and provide information on appropriate mitigation measures to avoid, eliminate or reduce a significant adverse effect to the environment. For example, Section 6.3.2.7 of the EIS Addendum states "The severity of a release of any chemicals being transported to the mine site would depend on several factors, including the nature of the material, the location, the time of year and the volume. The largest amounts of chemicals transported to the site will be the mill reagents, which will arrive at the facility in both dry and

liquid form. A full transport truck can carry as much as 40 tonnes of mill reagents." GenPGM adds in the same section that "Because the potential scenarios are so varied, no attempt to define a single event has been made; rather, a more conceptual approach to the evaluation of a chemical release during transport to site has been taken." ECCC disagrees with GenPGM's conclusion; a single event can be identified given the nature of the products that will be stored at the project site. For example, four mill reagents will be stored, including:

- PAX= Class 4.2 (spontaneously combustible) according to various MSDSs (Brenntag Canada, 2009), (CAMACHEM, n.d.), (Flottec, 2009).
- MIBC= Class 3 (flammable) according to various MSDSs (Kemtec , 2012), (LobaChemie, 2016), (Shell Chemicals , 2009).
- AeroFroth= Class 3 (flammable) according to various MSDSs (CYTEC INDUSTRIES INC., 2018), (CYTEC INDUSTRIES INC., 2019).
- Lime = Not classified as a dangerous goods.

The EIS guidelines require the identification of potential worst-case scenarios and impacts. Based on the reagents used on site and according to the safety datasheets, the reagents are classified as flammable and spontaneously combustible. Furthermore, the assessment should be guided by the need to be in compliance with the general prohibitions against the deposit of a deleterious substance into waters frequented by fish (Section 36(3), *Fisheries Act*).

GenPGM's emergency preparedness and response plan (EPRP) is only conceptual at this stage. ECCC recommends GenPGM prepare an EPRP prior to construction and that it reflect all plausible types of accidents and malfunctions and take into account site-specific conditions and sensitivities associated with the Project. For emergency planning purposes, and to ensure preparedness for a "worst-case" accident scenario, plans should assume that a major incident is not only possible, but rather likely to occur during the lifespan of a project. Therefore, it is recommended that GenPGM commit to mitigation strategies, contingency plans and response capabilities that are commensurate with the environmental risks that this Project may pose, including, but not limited to, contingency plans based on "worst-case" and "alternative" accident scenarios. Final emergency response plans should demonstrate GenPGM's ability to prevent, prepare for, respond to and recover from accidents and malfunctions. GenPGM stated that licensed third-party contractors would be responsible for first level response and reporting (CIAR #727). It is important that emergency response procedures prepared by third-party contractors are aligned with the information that will be included in the EPRP and that notification procedures between third party contractors and the on-site incident response team is in place in order to reduce response time in the event that additional support is necessary.

ECCC Recommendations 8.1

Should the Project be approved, ECCC recommends that the Panel require GenPGM to:

1. Conduct a quantitative risk assessment associated with a chemical release during transport and identify potential environmental issues. As part of this risk assessment

GenPGM should commit to mitigation strategies, contingency plans and response capabilities that are commensurate with the environmental risks that this Project may pose, including, but not limited to, contingency plans based on "worst-case" and "alternative" accident scenarios.

2. Ensure that the emergency response procedures prepared by third-party contractors are aligned with the information that will be included in the EPRP and that notification procedures between third party contractors and the on-site incident response team are in place in order to reduce response time in the event that additional support is necessary.

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CHAPTER 9 – Summary of Recommendations

3.1 Effluent Seepage

ECCC Recommendations 3.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. As part of a waste water management plan, account for the advective and mean travel times for seepage from the PSMF and MRSA for all phases of the Project including post-closure. Update effects predictions for all watercourses that will receive seepage. Based on the results, GenPGM should be required to identify and implement additional mitigation and monitoring measures to protect aquatic life, where required.
2. As part of a follow-up and monitoring program, design and install a groundwater monitoring network to verify the predictions of the assessment. This program should include verification of the seepage capture and pump back wells to collect all seepage and direct it to flow through the final discharge point at Hare Lake.
3. Construct the overburden stockpiles such that they are located entirely in subwatershed 102 in order to avoid flow to subwatershed 101, a tributary of the Pic River, a river of importance to Indigenous groups. If this is not technically feasible, collect and divert flow away from Lake 4.

3.2 Mercury and Methylmercury

ECCC Recommendations 3.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop a Follow-Up and Monitoring Program to verify the accuracy of the baseline conditions and to identify the potential need for additional mitigation measures. The program should include:
    - Additional fish collection and analysis to characterize pre-development tissue metal concentrations, including, but not limited to mercury, of the main sport fish species (e.g. yellow perch, northern pike) in order to achieve sufficient sample sizes of fish, as are required per EEM guidelines (e.g. n = 20 male, n = 20 female, representative of 2 fish species) (ECCC, 2007). Ancillary biological information for fish (i.e. age, length, weight) should be measured to account for biological influences on fish metal tissue burdens.
    - Monitoring of phosphorus in the mine's effluent and receiving environment, including indicators of eutrophication in Hare Lake such as algal biomass and dissolved oxygen. These parameters will validate the effectiveness of GenPGM's phosphorous treatment/mitigation activities in order to protect and conserve the ecosystem against changes to water quality conditions in the lake that may affect metal speciation and bioavailability.

- Further geochemical analysis using the lower method detection limit of 0.00001 mg/L for mercury. With the new mercury loading rates, re-do the water quality modelling for the predicted constituent concentrations of mercury in the Pic River during the post-closure following the initial restoration of drainage from the MRSA, and following 30 years of filling the open pit and its subsequent discharge.
- Based on the results of the updated water quality modelling GenPGM should be required to identify and implement additional mitigation and monitoring measures to protect aquatic life.

3.4 Water Quantity Effects

ECCC Recommendations 3.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Incorporate areas into the Fish Habitat Compensation and Offsetting Plan, where the project-affected flow is more than a 10% difference from natural conditions to address potential impacts to fish and fish habitat. This plan should be included in mitigation and monitoring plans under the authority of DFO.

3.5 Water Management

ECCC Recommendations 3.2.1

Should the Project be approved, ECCC recommends that the Panel request that GenPGM to:

1. Incorporate a range of climate change projections into the environmental design storm estimates (see Recommendation 7.1 for method guidance). Alter designs as needed to ensure risk of exceedance remains similar to, or better, than the original intent (i.e. 100 year event design is expected to have a 1% risk of untreated discharge).

4.1 Baseline Air Quality Assessment

ECCC Recommendations 4.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop, in consultation with ECCC and other relevant regulatory agencies, an Air Quality Management Plan. The plan should include a Follow-up and Monitoring Program that incorporates air quality monitoring during all phases of the project. Monitoring locations should be based on GenPGM's air quality dispersion modeling results and prevailing winds. Parameters should include:
    - Dustfall (non continuously),
    - suspended particles and metals (non continuously),

- particulate matter(PM_{10}) (continuously),
- fine particulate matter($PM_{2.5}$) (continuously),
- nitrogen dioxide (continuously),
- benzene and benzo(a)pyrene (non continuously).

2. Compare the results of air quality monitoring to the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards (CAAQS) or, in the absence of federal criteria, to the Ontario Ambient Air Quality Criteria; and commit to meeting the most stringent emission standards.

3. Develop and submit a Best Management Plan for dust and an adaptive management plan to mitigate air pollutants for all phases of the project for review by ECCC and other regulatory agencies prior to commencing work for the Site Preparation Phase. Adaptive management should be employed to ensure mitigation measures are performing as predicted and are implemented immediately, where necessary, if the Project is contributing to any exceedances.

4. Commit to having all major mining equipment be Tier 4 compliant for the commencement of mining operations, and through all subsequent phases of the Project.

5.1 Migratory Birds

ECCC Recommendations 5.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Develop in consultation with ECCC and the Province of Ontario, a reclamation plan that describes the management of habitat requirements for a variety of forest birds and waterfowl.

2. Implement mitigation measures consistent with ECCC's guidance on Avoiding Harm to Migratory Birds.

3. Continue the Forest Bird Monitoring Program (FBMP) and Nightjar and Waterfowl surveys during the construction, operations and closure phases of the Project. Use that information along with baseline survey results to verify effects predictions and corresponding reclamation prescriptions.

5.2.1 Boreal Caribou

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Update the connectivity analysis, on-site rehabilitation and post-closure restoration plan and the offset plan before concluding the assessment process to support decision making and including requirements.

2. Update their assessment of Project impacts (which represent a high risk to Boreal Caribou recovery) and connectivity analysis (e.g. that reflects caribou avoidance behaviour and physical barriers), so that it demonstrates how long-term intra- and inter-range connectivity will be made possible. The connectivity analysis and corresponding mitigation measures should be designed and implemented to manage any Project effects to connectivity including:

    - Develop a mine site rehabilitation and post-closure restoration plan that provides for low-resistance corridors that will allow for caribou movement and habitat use throughout the mine site (east-west and north-south), post mine closure.
    - The identification of problematic areas for caribou movement such as Hwy 17 and Town of Marathon related infrastructure, and recommendations for priority areas for mitigation including offsetting measures. Note that for any residual loss of connectivity, offsetting requirements related to the Project footprint can be directed to address other off-site barriers to caribou movement as part of an overall mitigation plan.

3. Implement mitigation measures including timing windows for mine activities such as the use of explosives, in order to decrease sensory disturbance to sensitive category 1 boreal caribou habitat as identified by the Province of Ontario. This includes following the Ontario Ministry of the Environment, Conservation and Parks (2020) Best Management Practices for Mineral Exploration and Development Activities and Woodland Caribou in Ontario.

4. Update the off-site mitigation (offsetting) plan to provide more detail to address the removal of approximately 1,116 ha of Coastal Range critical habitat and resultant impacts to connectivity during the construction, operation, closure and post-closure phases. This should include working with the Province of Ontario and Indigenous communities to develop a plan that adequately address the loss of connectivity (including developing the specific offset ratio) within the Coastal Range and the discontinuous range. The plan should consider ECCC's Biodiversity Offsetting approach as described in its Operational Framework for Use of Conservation Allowances.

5.2.2 Little Brown Myotis and Northern Myotis

ECCC's Recommendations 5.2.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Provide details on the avoidance and/or mitigation measures that will be in place should a hibernaculum be discovered within the SSA.
2. Avoid tree clearing from April 15 to August 31 in order to correspond with the timing of emergence from hibernation and the maternity period. If limited clearing must be completed between April 15 and August 31, then bat maternity surveys using the NDMNRF protocol should be conducted to confirm bat presence/absence in suitable trees (e.g., large diameter cavity trees) and that appropriate protection measures be applied. Timing of tree removals will also need to take into account potential impacts to migratory birds.
3. Implement a monitoring program to identify which bat and rocket boxes are occupied (with a focus on Little Brown Myotis and Northern Myotis) as well as any potential adaptive mitigation if necessary.
4. Consult the Best Management Practices for Bats in British Columbia: Mine Developments and Inactive Mine Habitats to inform the mitigation and enhancement measures implemented to reduce impacts of blasting activities for bats.

5.2.3 Canada Warbler

ECCC's Recommendations 5.2.3

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Canada Warbler habitat in the SSA and use that information with baseline survey results to determine appropriate mitigation as part of the overall reclamation plan.

5.2.4 Rusty Blackbird

ECCC's Recommendations 5.2.4

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Rusty Blackbird habitat in the SSA and use the results to identify areas to be targeted for FBMP surveys as well as appropriate mitigation as part of the overall reclamation plan.

5.2.5 Olive-sided Flycatcher, Eastern Wood-pewee, and Evening Grosbeak

ECCC's Recommendations 5.2.5

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Olive-sided Flycatcher, Eastern-Wood-pewee, and Evening Grosbeak habitat in the SSA and use the results to identify areas to be targeted for FBMP surveys as well as appropriate mitigation as part of the overall reclamation plan.

5.2.7 Common Nighthawk and Eastern Whip-poor-will

ECCC's Recommendations 5.2.7

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Continue to characterize Common Nighthawk and Eastern Whip-poor-will in the SSA and use the results to identify areas to be targeted for Nightjar surveys as well as appropriate mitigation as part of the overall reclamation plan.
2. Continue nightjar surveys and ensure occupied nesting areas are not disturbed during the core breeding period until the young have naturally and permanently left the vicinity of the nest.

5.2.8 Monarch and Yellow-banded Bumble Bee

ECCC's Recommendations 5.2.8

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Create additional breeding habitat for both Monarch and Yellow-banded Bumble Bee where forest reclamation is not possible as part of the overall reclamation plan.

7.1 Effects of Climate Change on the Project

ECCC Recommendations 7.1

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Where it is necessary or appropriate, utilise best-available climate change projections (temperature and precipitation) from an ensemble of climate models for a range of plausible future emissions scenarios (low to high forcing) to evaluate future climate changes where they are relevant for design and reclamation considerations. Where projected climate changes are relevant to the project design values related to potential changes in short-duration precipitation extremes, ECCC recommends that the proponent utilise scientifically appropriate best-available methodologies such as those outlined in the recent CSA guidance (CSA, 2019) to characterise potential future changes.

7.2 Greenhouse Gas Emissions

ECCC Recommendations 7.2

Should the Project be approved, ECCC recommends that the Panel request GenPGM to:

1. Identify and implement additional mitigation and monitoring measures to reduce GHG emissions throughout the lifetime of the Project.
2. Develop a Follow-up and Monitoring Program to verify the performance of the mitigation measures implemented and to identify the potential need for additional mitigation measures.

8.1 Spill Response Measures and Program

ECCC Recommendations 8.1

Should the Project be approved, ECCC recommends that the Panel require GenPGM to:

1. Conduct a quantitative risk assessment associated with a chemical release during transport and identify potential environmental issues. As part of this risk assessment GenPGM should commit to mitigation strategies, contingency plans and response capabilities that are commensurate with the environmental risks that this Project may pose, including, but not limited to, contingency plans based on "worst-case" and "alternative" accident scenarios.
2. Ensure that the emergency response procedures prepared by third-party contractors are aligned with the information that will be included in the EPRP and that notification procedures between third party contractors and the on-site incident response team are in place in order to reduce response time in the event that additional support is necessary.

ROBERT CLAVERING

RELEVANT EXPERIENCE

Senior Environmental Assessment Officer
Environment and Climate Change Canada
December 2018 to present
Toronto, ON

- Lead on environmental / impact assessments for designated projects.

Project Manager
Impact Assessment Agency of Canada
May 2014 to December 2018
Toronto, ON

- Lead on environmental assessments for designated projects.

Environmental Specialist
Indigenous Services Canada
August 2007 to May 2014
Edmonton, AB & Ottawa, ON

- Provided expertise in support of the environmental assessment program and projects.
- Lead on the contaminated sites program in Alberta.

Park Planner/Biologist
Ontario Ministry of Natural Resources and Forestry
May 2004 to August 2007
Kingston, Ontario

- Developed and implemented ecological studies, resource management plans and monitoring programs.

EDUCATION

2004 HBSc. Biology - Lakehead University, Thunder Bay ON

2000 Integrated Resource Management Technologist - Sault College of Applied Arts & Science, Sault Ste. Marie ON

1999 Fish and Wildlife Technician - Sault College of Applied Arts & Science, Sault Ste. Marie ON

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EDUCATION

- PhD, Département de Sciences biologiques, Université de Montréal (2004-2009)
- MSc, Department of Biology, University of Ottawa (1997-1999)
- BSc, Department of Biology, University of Ottawa (1992-1996)

PROFESSIONAL EXPERIENCE

- **Research Scientist**, Ecotoxicology and Wildlife Health Division, Environment and Climate Change Canada, Ottawa, ON (2009 to present)
- **Adjunct Research Professor**, Department of Geography and Environmental Studies, Carleton University, Ottawa, ON (2014 to present)
- **Aquatic Biologist**, Golder Associates Ltd., Yellowknife, NT (2002-2004)
- **Environmental Scientist**, Rescan Environmental Services Ltd., Yellowknife, NT (2001-2002)

RELEVANT EXPERIENCE - MERCURY

2018 to Present:	Co-chair of the Mercury Expert Group for the Arctic Monitoring and Assessment Programme (AMAP) and co-lead of the 2021 AMAP Mercury Assessment report, with international participation of over 50 scientists from circumpolar Arctic countries
2017 to 2018:	Member of the International Technical Expert Team and contributor to a chapter on mercury in biota for the United Nations Environment Global Mercury Assessment
2013 to Present:	Reviewer of over 80 manuscripts for scientific journals
2010 to Present:	Lead investigator of 7 research projects on environmental contamination of metals, funded by the Northern Contaminants Program and the NWT Cumulative Impact Monitoring Program
2009 to 2013	Co-lead of the Canadian Arctic Contaminants Assessment Report III: Mercury in Canada's North. Northern Contaminants Program, Aboriginal Affairs and Northern Development Canada. Ottawa. pp xxiii + 276.

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13. Macmillan, G.A., Clayden, M.G., **Chételat, J**., Richardson, M.C., Ponton, D.E., Perron, T., Amyot, M., 2019. Environmental Drivers of Rare Earth Element Bioaccumulation in Freshwater Zooplankton. *Environmental Science and Technology* 53, 1650–1660.
14. **Chételat, J**., Cott, P.A., Rosabal, M., Houben, A., McClelland, C., Rose, E.B., Amyot, M., 2019. Arsenic bioaccumulation in subarctic fishes of a mine-impacted bay on Great Slave Lake, Northwest Territories, Canada. *PLoS ONE* 14.
15. **Chételat, J.**, Richardson, M.C., Macmillan, G.A., Amyot, M., Poulain, A.J., 2018. Ratio of Methylmercury to Dissolved Organic Carbon in Water Explains Methylmercury Bioaccumulation Across a Latitudinal Gradient from North-Temperate to Arctic Lakes. *Environmental Science and Technology* 52, 79–88.
16. **Chételat, J.**, Hickey, M.B.C., Poulain, A.J., Dastoor, A., et al., 2018. Spatial variation of mercury bioaccumulation in bats of Canada linked to atmospheric mercury deposition. *Science of the Total Environment* 626, 668–677.
17. MacMillan, G.A., **Chételat, J.**, Heath, J.P., Mickpegak, R., Amyot, M., 2017. Rare earth elements in freshwater, marine, and terrestrial ecosystems in the eastern Canadian Arctic. Environmental Science: Processes and Impacts 19, 1336-1345.

18. **Chételat, J**., et al., 2015. Mercury in freshwater ecosystems of the Canadian Arctic: Recent advances on its cycling and fate. *Science of the Total Environment* 509-510:44–66.
19. Braune B., **J. Chételat** et al., 2015. Mercury in the marine environment of the Canadian Arctic: Review of recent findings. *Science of the Total Environment* 509-510:67–90.
20. Gamberg, M., **J. Chételat** et al., 2015. Mercury in the Canadian Arctic terrestrial environment: An update. *Science of the Total Environment* 509-510:28–40

Emma Watson, Ph.D.

Senior Science Advisor
Climate Research Division, Science and Technology Branch
Environment and Climate Change Canada
4905 Dufferin Street, Toronto, Ontario, M3H 5T4

EDUCATION

Ph.D. Physical Geography
University of Western Ontario, London, Ontario, 2002

M.Sc. Physical Geography
University of Western Ontario, London, Ontario, 1998

B.A. Honours Geography in Environmental Resource Management
University of Windsor, Windsor, Ontario, Canada, 1996

WORK EXPERIENCE

April 2020 – present
Senior Science Advisor
Climate Research Division, Science and Technology Branch, Environment Canada

Mar 20 - Oct 13, 2017 and Jul 30 - Aug 31, 2018
Acting Manager, Climate Data Analysis Section (CDAS)
Climate Research Division, Science and Technology Branch, Environment Canada

July 2012 – April 19, 2020
Environmental Assessment Climate Data Analyst
Climate Research Division, Science and Technology Branch, Environment Canada

July 2011 - July 2012
Atmospheric Science Advisor (Climate Change)
Atmospheric Science Assessment and Integration (ASAI), Science and Technology Branch, Environment Canada

April 2010 - July 2011
Atmospheric Science Officer (Climate Change)
Atmospheric Science Assessment and Integration, Science and Technology Branch, Environment Canada

Nov. 2009 - April 2010
Data Analyst
Data Analysis and Archives Division,
Weather and Environmental Monitoring, Environment Canada

Aug. 2009 - Oct 2009
Support to Climate Change Science Advisor
Atmospheric Science Assessment and Integration, Science and Technology Branch, Environment Canada

Jul. 2007 - Sep 2007
Research Associate
Dendrogeomorphology Laboratory, University of Western Ontario,
London, Ontario, Canada

Jan. 2007 - May 2007
Sessional Instructor - Course: Climate Change (3rd year course)
Department of Earth and Environmental Sciences, University of Windsor,
Windsor, Ontario, Canada

Jan. 2007 - Apr 2007
Research Contract
Climate Research Division, Meteorological Service of Canada
Environment Canada, Toronto, Ontario

Jan. 2004 - Jan 2007
Canadian Government Laboratory Visiting Fellow (NSERC VF)
Climate Research Branch, Meteorological Service of Canada, Environment Canada, Toronto, Ontario

Jan.-Feb. 2003
Post-Doctoral Research Fellow
Department of Geography, University of British Columbia, Canada

Nov. 2002 - Dec 2003
Post-Doctoral Research Fellow
Dendrogeomorphology Laboratory
Department of Geography, University of Western Ontario, Canada

2000-2001
Part-time contract work: Dendroclimatologist
Climate Research Branch, Meteorological Service of Canada, Environment Canada, Toronto, Ontario

1997-2000
Teaching Assistant
Department of Geography, University of Western Ontario, Canada

1996-2002
Research Assistant
Dendrogeomorphology Laboratory
Department of Geography, University of Western Ontario, Canada

PUBLICATIONS

Stahle, D.W., Cook, E.R., Burnette, D.J., Torbensen, M.C.A, Howard, I.M., Griffin, D., Villanueva Diaz, J., Cook, B.I., Williams, P.A., **Watson, E**., Sauchyn, D.J., Pederson, N., Woodhouse, C.A., Pederson, G.T., Meko, D., Crawford, C.J., (2020). Dynamics, variability, and change in seasonal precipitation reconstructions for North America. *Journal of Climate, 33 (8): 3173–3195.*

Bush, E., Gillett, N., **Watson, E**., Fyfe, J., Vogel, F. and Swart, N. (2019): Understanding Observed Global Climate Change; Chapter 2 in *Canada's Changing Climate Report*, (ed.) E. Bush and D.S. Lemmen; Government of Canada, Ottawa, Ontario, p. 25-72.

Cohen, S., Bush, E., Zhang, X., Gillett, N., Bonsal, B., Derksen, C., Flato, G., Greenan, B., **Watson, E**. (2019): Synthesis of Findings for Canada's Regions; Chapter 8 in *Canada's Changing Climate Report*, (ed.) E. Bush and D.S. Lemmen; Government of Canada, Ottawa, Ontario, p. 424-443.

Watson, E., and Luckman, B.H. 2016. An investigation of the snowpack signal in moisture-sensitive trees from the Southern Canadian Cordillera. *Dendrochronologia*, 38: 118-130.

Pederson, G.T., Gray, S.T., Woodhouse, C.A., Betancourt, J.L., Fagre, D.B., Littell, J.S., **Watson, E**., Luckman, B.H. and Graumlich, L.J. 2011. The Unusual Nature of Recent Snowpack Declines in the North American Cordillera. *Science*, DOI: 10.1126/science.1201570.

Villalba, R. Luckman, B.H., Boninsegna, J., D'Arrigo, R.D., Lara, A., Villanueva-Diaz, J., Masiokas, M., Argollo, J., Soliz, C., LeQuesne, C., Stahle, D., Roig, F., Aravena, J.C., Wiles, G., Jacoby, G., Hartsough, P., Wilson, R.J.S., **Watson, E**., Cook, E.R., Cerano-Paredes, J., Therrell, M., Cleaveland, M., Morales, M.J., Moya, J., Pacajes, J., Massacchesi, G., Biondi, F., Urrutia, R. and Martinez Pastur, G. (2011). *Dendroclimatology from regional to continental scales: Understanding regional processes to reconstruct large-scale climatic variations across the Western Americas*. In Hughes, M.K., Swetnam, T.W. and Diaz, H.F. (eds.) Dendroclimatology: Progress and Prospects, Springer.

Matulla, C., **Watson, E.**, Wagner, S. and Schoner, W. 2009. Downscaled GCM projections of winter and summer mass balance for Peyto Glacier, Alberta, Canada (2000-2100) from ensemble simulations with ECHAM5-MPIOM. *International Journal of Climatology*, DOI: 10.1002/joc.1796.

St. George, S., Meko, D.M., Girardin, M.-P., Nielsen, E., Pederson, G., Sauchyn, D.J., Tardif, J., **Watson, E**. (2009) The tree-ring record of drought on the Canadian Prairies. *Journal of Climate*, 22: 689-710.

MacDonald, G.M., Stahle, D.W., Villanueva-Diaz, J., Beer, N., Busby, S.J., Cerano-Paredes, J., Cole, J.E., Cook, E.R., Endfield, G., Gutierrez-Garcia, G., Hall, B., Magana, V., Meko, D.M., Méndez Pérez, M., Sauchyn, D.J., **Watson, E**. and Woodhouse, C.A. 2008. Climate Warming and the Early 21st Century Drought in Southwestern North America. *EOS, Transactions, American Geophysical Union*, 89 (9): 82-84.

Pederson, G.T., Whitlock, C., **Watson, E**., Luckman, B.H. and Graumlich, L.J. 2007. Climate change and ecosystem history. In: D. Fagre and T. Prato (Eds.) *Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent Ecosystem*, RFF Press, Washington D.C.

Watson, E., Pederson, G.T., Luckman, B.H. and Fagre, D.B. 2007. Glacier mass balance in the northern U.S. and Canadian Rockies: paleo-perspectives and 20th century change. In B. Orlove, E. Weigand and B.H. Luckman (Eds.) *Darkening Peak: Glaciers, Science and Society*, University of California Press.

Watson, E. and Luckman, B.H. 2006. Long hydroclimate records from tree-rings in western Canada: potential, problems and prospects. *Canadian Water Resources Journal*, 31: 205-228.

Watson, E., Luckman, B.H. and Yu, B. 2006. Long-term relationships between reconstructed seasonal mass balance at Peyto Glacier, Canada and Pacific sea surface temperatures. *The Holocene*, 16: 783-790.

Watson, E. and Luckman, B.H. 2005. Spatial patterns of pre-instrumental moisture variability in the southern Canadian Cordillera. *Journal of Climate*, 18: 2847-2863.

Watson, E. and Luckman, B.H. 2005. An exploration of the controls of pre-instrumental streamflow using multiple tree-ring proxies. *Dendrochronologia*, 22: 225-234.

Watson, E. and Luckman, B.H. 2004. Tree-Ring based mass-balance estimates for the past 300 years at Peyto Glacier, Alberta, Canada. *Quaternary Research*, 62: 9-18.

Watson, E. and Luckman, B.H. 2004. Tree-Ring based reconstructions of precipitation for the Southern Canadian Cordillera. *Climatic Change*, 65: 209-241.

Watson, E. and Luckman, B.H. 2002. The dendroclimatic signal in Douglas-fir and ponderosa pine tree-ring chronologies from the southern Canadian Cordillera. *Canadian Journal of Forest Research*, 32: 18581874.

Watson, E. and Luckman, B.H. 2001. The development of a moisture-stressed tree-ring chronology network for the southern Canadian Cordillera. *Tree-Ring Research*, 57(2): 149-168.

Watson, E. and Luckman, B.H. 2001. Dendroclimatic reconstruction of precipitation for sites in the Canadian Rockies. *The Holocene*, 11(2): 203-213.

Stahle, D.W., Cook, E.R., Cleaveland, M.K., Therrell, M.D., Meko, D.M., Grissino-Mayer, H.D., **Watson, E**. and Luckman, B.H. 2000. Epic 16th century drought over North America. *EOS, Transactions, American Geophysical Union*, 81 (12): 121, 125.

JENNIFER PELLERIN

SUMMARY OF QUALIFICATIONS

- Almost two years of hydrology review experience for Impact/Environmental Assessments, primarily for mine projects.
- Overall, six years of research and work experience in hydrology.

RELEVANT EXPERIENCE

May 2020 - present

Hydrologist, *Meteorological Service of Canada (ECCC),* Ottawa ON

Provide expertise on surface water quantity in relation to Impact/Environmental Assessments. Review of hydrological assessments such as water balances, hydrological models, and estimates of at-site hydrology, often for mining projects.

July 2019 - May 2020

Physical Science Officer, *Meteorological Service of Canada (ECCC)*, Ottawa ON

Complete update of the *Reference Hydrometric Basin Network*, a set of stations that would be appropriate for climate studies due to the minimal impacts in their watersheds. Project required deep thought on the multiple uses for hydrometric data in Canada.

Feb 2012 – Aug 2015

Geophysicist, *Southwestern Energy,* Houston TX

Mapping drilling targets and hazards using seismic data while communicating uncertainties to ensure a realistic expectation of accuracy.

EDUCATION

Sep 2016 - May 2019

MASc Civil Engineering, Waterloo ON, *University of Waterloo*

Hydrology-focused coursework and thesis. Cumulative grade = 84%

Sep 2007 - Dec 2011

BSc Geological Engineering, Fredericton NB, *University of New Brunswick*

Environmental option with a concentration in water resources. CGPA = 3.6

Lesley Carpenter

Senior Environmental Specialist
Canadian Wildlife Service
Environment and Climate Change Canada (ECCC)

EDUCATION

Master of Science - University of Guelph, Ontario - 2008
Honours Bachelor of Science, Biology - University of Guelph, Ontario - 2006

SELECTED PROFESSIONAL EXPERIENCE

Senior Environmental Specialist

Canadian Wildlife Service, Environment and Climate Change Canada
2017 – Present

- One of the Ontario leads for supporting the implementation of the *Species at Risk Act* (SARA), *Migratory Birds Convention Act*, and habitat conservation program, which includes providing scientific advice and recommendations for projects under the *Impact Assessment Act*, *Canadian Environmental Assessment Act*, National Energy Board and Canadian Nuclear Safety Commission as well as permitting under SARA.

Senior Habitat Biologist, Ecological Gifts Program and Habitat Stewardship Program

Canadian Wildlife Service, Environment and Climate Change Canada
2014

- Ontario lead for the Ecological Gifts Program, which included evaluating applications and assessing and certifying lands as ecologically sensitive; participating in the assessment of the market value of the 'gifted' land for income tax purposes; and maintaining strong working relationships with environmental non-profits, conservation bodies, municipalities, provincial government, and interdepartmental federal departments.
- Ontario lead for the Habitat Stewardship Program for Species at Risk, which included reviewing and evaluating proposals; allocating funds to support projects that conserve and protect species at risk and their habitats; managing project files; and building partnerships with proponents.

Landscape Ecologist

Canadian Wildlife Service, Environment and Climate Change Canada
2010 – 2017

- Ontario lead for developing and carrying out site and program level invasive species management (specifically *Phragmites australis*) on our National Wildlife Areas.
- Chair of the Great Lakes Wetlands Conservation Action Plan (GLWCAP)

- Supported the development of landscape and habitat reports, including How Much Habitat is Enough?
- Provided advice on Ontario landscape issues and conservation planning, including delivering presentations and reports addressing habitat conservation.

Environmental Assessment Officer
Environmental Assessment and Marine Programs Division, Environment and Climate Change Canada
2008 – 2010

- Headquarters regional liaison for all environmental assessments in Ontario and Pacific and Yukon regions.
- ECCC lead for organizing our Department's responses to the Major Projects Management Office.
- Compiled and audited standard advice for air quality and emissions, climate change impacts, water quality, greenhouse gases, and waste management within six sectors across Canada: Mining and Processing, Waste Reduction and Management, Electricity and Combustion, Transportation, Oil Sands and Refineries, and Pipelines and Upstream Oil and Gas.
- Evaluated ECCC's environmental assessment program and identified best practices to support the development and implementation of policy and regulations.

RECENT PROJECT EXPERIENCE

- Springpole Gold Project
- Near Surface Disposal Facility Project
- Nuclear Power Demonstration Closure Project
- Replacement of Big Creek Bridge on Long Point Causeway
- Magino Gold Project
- East-West Tie Transmission Line Project
- Wataynikaneyap Transmission Line Project
- Darlington New Nuclear Project
- Victor Diamond Mine
- Detour Lake Gold Project

SELECTED SCIENTIFIC PUBLICATIONS, REPORTS AND CONFERENCE PROCEEDINGS

Carpenter, L. 2016. A Five-year Operational Plan for Non-Native Phragmites (*Phragmites australis*) Management at Long Point National Wildlife Area (NWA). Canadian Wildlife Service, Toronto, Ontario. 72pp.

Davy (Carpenter), L. 2013. A Five-year Operational Plan for Non-Native Phragmites (*Phragmites australis*) Management on the Bear Creek and St. Clair Units in St. Clair National Wildlife Area (NWA). Canadian Wildlife Service, Toronto, Ontario. 26pp.

Davy (Carpenter), L. 2012. Non-Native Phragmites (*Phragmites australis*) Management on the Bear Creek and St. Clair Units in St. Clair National Wildlife Area (NWA). Canadian Wildlife Service, Toronto, Ontario. 35pp.

Environment Canada. 2013. How Much Habitat is Enough? Third Edition. Environment Canada, Toronto, Ontario. 127pp.

Great Lakes Wetlands Conservation Action Plan. 2012. Great Lakes Wetlands Conservation Action Plan Highlights Report 2005-2010. Peterborough, Ontario. 36pp.

Gedalof, Z., J. Franks, T. Maertens and **L. Davy (Carpenter)**. 2009. The growth-climate relations of Oregon white oak (*Quercus garryana*) – context, competition and climatic change. Association of American Geographers, AGM. March 20-27, 2009.

Davy (Carpenter), L. and Z. Gedalof. 2008. The Influence of Soil Moisture Dynamics on Competitive Interactions in an Invaded Garry Oak (*Quercus garryana*) Savanna. Association of Canadian Geographers, Université Laval. May 20-24, 2008.

Davy (Carpenter), L. 2008. The Influence of Competitive Interactions on Soil Moisture Dynamics in an Invaded Garry Oak Savanna. M.Sc. Thesis, University of Guelph.

Allison Kroeze, M.Sc.

WORK EXPERIENCE:

Species at Risk Protection Biologist, April 2017-Present
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

Acting Wildlife Biologist, December 2016-March 2018
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

Acting Species at Risk Protection Biologist, October 2015-October 2016
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

Wildlife Recovery Biologist, April 2013-December 2016
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

Habitat Stewardship Coordinator, September-March 2013
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

Landscape Assessment Science Officer, May-August 2013
Canadian Wildlife Service-Ontario, Environment and Climate Change Canada

EDUCATION:

University of Toronto, 2013
Master of Environmental Science

Queen's University, 2012
Bachelor of Science (Honours), Major in Environmental Science

Mathieu Leblond, Ph.D.

Environment and Climate Change Canada
Science & Technology Branch
National Wildlife Research Center
1125 Colonel By Drive, Ottawa, ON, Canada, K1S-5B6

ACADEMIC TRAINING

2007 – 2013 Ph.D. Biology, Université du Québec à Montréal, QC, Canada.

2004 – 2007 M.Sc. *Gestion de la faune et de ses habitats*, Université du Québec à Rimouski, QC, Canada.

2001 – 2004 B.Sc. Biology, Université du Québec à Rimouski, QC, Canada.

1998 – 2001 D.C.S. Natural sciences, CÉGEP de Rimouski, QC, Canada.

PROFESSIONAL EXPERIENCE

Jan 2017 – Now Research Scientist. Environment and Climate Change Canada, Science & Technology Branch, Landscape Science and Technology Division, Ottawa, ON, Canada.

Jun 2017 – Now Adjunct Professor. Université du Québec à Rimouski, Rimouski, QC, Canada.

Nov 2014 – Jan 2017 Postdoctoral researcher (NSERC – FRQNT). Project: Evaluating the effects of climate change on the movements of migratory caribou in northern Quebec. Université Laval, Quebec, QC, Canada.

May 2013 – Nov 2014 Postdoctoral researcher. Project: Development and validation of a habitat suitability model for boreal caribou in Quebec. Université du Québec à Rimouski, Rimouski, QC, Canada.

MICHAEL HINGSTON P.ENG., MBA

Head, Environmental Assessment Atlantic Region
Environment and Climate Change Canada
<contact information removed>

EXPERIENCE

ENVIRONMENT and CLIMATE CHANGE CANADA

Acting, National Environmental Assessment Operations Manager, January, 2021 to November 2021, January 2022 to March 2022

- Oversaw the national environmental assessment program ensuring that ECCC's environmental assessment reviews are carried out effectively and consistently across the country.

Head, Environmental Assessment Unit (Atlantic), September 2011 to present

- Supervise 5 staff (3 in Dartmouth and 2 in St. John's) responsible for the coordination of Environment Canada's reviews of environmental assessments.
- Work with the other Environmental Assessment Unit Heads across the country to ensure consistency of reviews and to help solve problems related to program delivery.
- Work with my counterparts in other programs to identify technical and scientific needs for upcoming environmental assessments.
- Ensure that senior management is briefed on upcoming Environmental Assessment decisions, and notify them of any potential problems early in the process.
- While in this position, carried out technical reviews of air issues in environmental assessments in a number of sectors including offshore oil and gas, metal and coal mining, electricity production and contaminated site remediation.

Head, Air Issues Unit/Energy and Transportation Unit, March 2005 to September 2011

- Coordinated the work of the EC Atlantic Air Issues Unit (became Energy and Transportation Unit in fall of 2008), including budgeting and financing, covering a wide range of issues including, the review of air aspects of environmental assessments, marine emissions, offshore oil and gas emissions, sustainable transportation activities, residential wood combustion, electricity and transboundary air pollution. This included program and financial planning, as well as program delivery.
- Supported the development of the Clean Air Regulatory Framework.
- Accessed and incorporated scientific information to support policy decisions related to air issues.
- Supported the Department's Tar Ponds group on a variety of air issues related to monitoring and remediation activities at the Tar Ponds and Coke Ovens sites.
- Worked closely with the Environmental Assessment Section to both carry out technical reviews of proposed projects, and to develop procedures to help ensure reviews are carried out more consistently.
- Worked closely with MSC science staff on issues such as marine emissions and air issues related to offshore oil and gas activities.
- Have led or participated on multi-partner projects such as the Sable Offshore Monitoring Program (federal, provincial, industrial, NGO), and Atlantic Coastal Action Programs (NGO, industry, municipality).

Air Quality Engineer, Dec. 2002 to March 2005

- Provided support to jurisdictions in the region to aid in the implementation of the Canada-wide Standards (CWS) for PM and Ozone. Led the development of an Atlantic Region Pilot project on CWS Achievement Determination.
- Developed an emission inventory for marine emissions in Halifax Harbour and completed a report on this work. Presented preliminary information from this work to the American Association of Port Authorities.
- Worked with MSC, and ECB, provide support in the development of the Atlantic Region's Acid Rain Business Case.
- Supported the Department's Tar Ponds group on a variety of air issues related to monitoring and remediation activities at the Tar Ponds and Coke Ovens sites.
- Provided air quality expertise to the Environmental Assessment section on a variety of projects, including metal mining, a proposed oil refinery, and offshore oil and gas.

NOVA SCOTIA DEPARTMENT OF ENVIRONMENT AND LABOUR, HALIFAX, NOVA SCOTIA

Air Quality Engineer/Supervisor of Monitoring and Reporting, Sept. 1998 to Dec. 2002

- Provided technical, management and policy advice to the Department, industry, and the general public on outdoor air quality and related issues including acid rain, climate change, ozone depleting substances, ground level ozone, particulate matter, and air toxics.
- Led the Department's submission to the provincial Energy Strategy, resulting in significant commitments to reduce air pollution in Nova Scotia.
- Managed Nova Scotia's ambient air monitoring program and supervised the work of the Department's monitoring technician.
- Presented technical and policy information to senior staff, technical staff, and politicians within the Department, to technical and policy staff in other departments and jurisdiction, to industry representatives and to the general public.
- Developed implementation plans to help Nova Scotia meet its air quality commitments including the Canada-wide Acid Rain Strategy for Post 2000, and the Canada-wide Standards for Particulate Matter and Ground Level Ozone.
- Co-ordinated the exchange of air quality information in my role as Co-chair of the New England Governors/Eastern Canadian Premiers Data Exchange Group resulting in the development of regional real time ozone maps.
- Have participated in reviews of science programs which support national and international air quality programs.
- Represented Nova Scotia and the Department of Environment and Labour on a number of multistakeholder committees and work groups including the Emissions and Projections Work Group, Sub-committees 1 and 2 under the Canada-US Air Quality Agreement, New England Governors/Eastern Canadian Premiers Acid Rain Working Groups on Data Exchange and Fine Particulates, Development Committee for the Canada-wide Standards for PM and ozone, and the Analysis and Modelling Group of the Canadian Climate Change Program.
- Represented Nova Scotia on the National Air Pollution Surveillance Network working group and participated in the negotiation of a federal provincial agreement to share resources.
- Participated on a multi-departmental committee tasked to better incorporate social and environmental issues into provincial economic development strategies.
- Briefed senior management, Deputy Ministers and Ministers, both within the department and in other provincial departments as required.

EDUCATION

SAINT MARY'S UNIVERSITY

Master of Business Administration, October 1996

TECHNICAL UNIVERSITY OF NOVA SCOTIA (associated with Dalhousie University)
Bachelor of Engineering, Chemical Engineering, 1984

PERSONAL

Member in good standing of the Association of Professional Engineers of Nova Scotia as a Professional Engineer

Snehal Lakhani, P.Eng

Senior Program Engineer, EPOD, ESB
Environment Canada
401 Burrard Street
Vancouver, British Columbia
V6C 3R2
Curriculum Vitae

SUMMARY

Mr. Snehal Lakhani is the Senior Program Engineer, Environmental Operation Division, Environmental Stewardship Branch with Environment Canada.

As Senior Engineer, Mr. Lakhani has had experience in resource extraction projects and environmental impacts as they relate to ECCC mandate areas. Since 2012, Mr. Lakhani has been reviewing various environmental assessment projects with a specific focus on air emissions and impacts.

EXPERIENCE

October 2012 – Present, Senior Program Engineer (Air Quality)
EA and EIS Reviews:

- Conducts air quality review of EA's and EIS's for the Pacific and Yukon Region.
- Provides technical air quality advice to EPD programs.
- Collaborates with experts within EPOD and other Directorates on air quality issues related to a project.

Environmental Hearings:

- Participated in environmental hearings various projects.

April 2009- October 2012. Senior Program Engineer (Municipal)
As the regional lead (BC and Yukon) for the municipal wastewater effluent file:

- Lead two national working groups to assist in the development of proposed *Wastewater Systems Effluent Regulations (WSER*) under the *Fisheries Act*.
- Developed the compliance strategy for the proposed WSER.
- Developed a national approach on work plans for the municipal wastewater sector which included rationalizing costs for program activities.

EDUCATION

1986-1988	Bachelor of Engineering Degree, Chemical Lakehead University, Thunder Bay, Ontario
1984-1986	Diploma of Engineering Technology, Chemical Lakehead University, Thunder Bay, Ontario

PROFESSIONAL CERTIFICATIONS

Registered Professional Engineer in BC (APEGBC) 1995

K. JERRY PULCHAN (PHD)

Relevant Experience

09/2010 - Present: Environmental Assessment (EA) Analyst
ECCC (Environmental Protection Operations Division – Atlantic Region), Mount Pearl, NL

09/2018-01/2019; 05/2016 - 08/2016: A/Environmental Assessment Coordinator
ECCC (National Environmental Emergencies Program [remote reporting]), Mount Pearl, NL

04/2008 - 08/2010: Regional Hazardous Waste Advisor / Compliance Promotion Officer
ECCC (Environmental Protection Operations Division), Mount Pearl, NL

10/2016 - 02/2017: A/Senior Compliance Promotion Officer - *Environmental Emergency Regulations*
ECCC (Environmental Protection Operations Division – Atlantic Region [remote reporting]), Mount Pearl, NL

04/2008 - 08/2010: Regional Hazardous Waste Advisor / Compliance Promotion Officer
ECCC (Environmental Protection Operations Division), Mount Pearl, NL

03/2004 to 04/2008: Environmental Emergencies Officer (EEO)
ECCC (Environmental Protection Operations Division), Mount Pearl, NL

Education

2001: Ph.D. - Earth Sciences/Environmental Biogeochemistry; member of an interdisciplinary consortium (the MUN Eco-Research Program) involved in the study of Sustainability in a Changing Cold Ocean Coastal Environment.

Rich Russell

Environment and Climate Change Canada
Canadian Wildlife Service (Ontario Region)
335 River Road, Ottawa, ON, Canada, K1V 1C7

ACADEMIC TRAINING

1990 – 1995 B.Sc. Biology, University of Guelph, ON, Canada.

PROFESSIONAL EXPERIENCE

Mar 2006 – Now **Boreal Landbirds Biologist**. Environment and Climate Change Canada, Canadian Wildlife Service (Ontario Region), Ottawa, ON, Canada.