Coffee Gold Mine

YESAB Project Proposal

Appendix 17-B Birds and Bird Habitat Valued Component Assessment Report

VOLUME III

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File: 1658-003.01

Ver. 1.0

March 2017

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ARD/ML	Acid Rock Drainage and Metal Leaching
BCR	Bird Conservation Region
BEM	Broad Ecosystem Mapping
BMPs	Best Management Practices
CEA	Cumulative Effects Assessment
ICMC	International Cyanide Management Code
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EC	Environment Canada
EDI	Environmental Dynamics Inc.
ELC	Ecological and Landscape Classification
FNNND	First Nation of Na-cho Nyäk Dun
GIS	Geographic Information System
HLF	Heap Leach Facility
Proponent	Kaminak Gold Corporation
LAA	Local Assessment Area
LSA	Local Study Area
MBCA	*Migratory Birds Convention Act*
NAR	Northern Access Route
Project	Coffee Gold Mine Project
RAA	Regional Assessment Area
SARA	*Species at Risk Act*
SFN	Selkirk First Nation
TH	Tr'ondëk Hwëch'in
TK	Traditional Knowledge
TWG	Technical Working Group
VC	Valued Component
WPP	Wildlife Protection Plan
WRFN	White River First Nation
WRSF	Waste Rock Storage Facilities
YCDC	Yukon Conservation Data Center
YESAA	*Yukon Environmental and Socio-economic Assessment Act*
YESAB	Yukon Environmental and Socio-economic Assessment Board
YG	Yukon Government
ZOI	Zone of Influence

UNITS AND MEASURES

Abbreviation	Measurement
%	Percent
dBA	A-weighted decibel
dm^2	Square decimeter
ha	Hectare
hr	Hour
km	Kilometre
km^2	Square Kilometre
m	Metre
mg	Milligram

1.0 INTRODUCTION

This report provides an assessment of the potential project-related and cumulative effects of the proposed Coffee Gold Mine Project (the Project) on the Valued Component (VC) Birds and Bird Habitat. Valued subcomponents (i.e., representative bird species) and indicators are used to focus the assessment on information known to be important or of key interest to First Nations, government, and other technical reviewers. The report identifies and characterizes potential interactions between the Project and Birds and Bird Habitat, and describes the mitigation measures and protection plans that Kaminak Gold Corporation, a wholly-owned subsidiary of Goldcorp Inc. (the Proponent or Goldcorp) will implement to eliminate, reduce, or otherwise control adverse Project-related effects on Birds and Bird Habitat.

This report is structured so that reviewers can find the information required to review the assessment of the Project's potential effects on Birds and Bird Habitat. The Introduction section provides the rationale for the selection of Birds and Bird Habitat as a VC, explains the selection of Bird and Bird Habitat subcomponents, and describes the scope of the assessment. It also identifies the indicators used to quantitatively and qualitatively assess the potential effects of the Project on Birds and Bird Habitat. The spatial, temporal, and technical boundaries of the Birds and Bird Habitat assessment are identified.

The Assessment Methods section describes the quantitative and qualitative approaches used to assess potential Project-related and cumulative effects on Birds and Bird Habitat. The methods used to predict effects on Birds and Bird Habitat rely on use of the best available information, environmental assessment best practices, and Project-specific technical analyses. While general methods of the overall assessment are described in **Volume 1, Section 5.0** — Assessment Methodology, the methods described in this section are specific to those used for Birds and Bird Habitat.

The Existing Conditions section describes baseline conditions for Birds and Bird Habitat within the region surrounding the Project that are relevant to potential Project interactions and to set the context for the effects assessment. The section includes a summary discussion of the regulatory context in which the Proponent assessed effects and proposed management and mitigation actions to reduce effects on Birds and Bird Habitat. There is a summary section describing how traditional knowledge (TK), scientific and other information, and the results of baseline studies conducted for the Project informed the description of existing conditions.

The Assessment of Project-Related Effects section provides the technical details that describe the potential effects of the Project on Birds and Bird Habitat. The section identifies mitigation measures incorporated into Project design and outlines other bird and habitat-specific mitigation measures to be implemented during Project design and management. The section describes the Proponent's commitments related to the elimination or reduction of adverse effects to Birds and Bird Habitat. Potential residual effects (i.e., adverse effects remaining following the application of mitigation measures) are identified and a determination of the

significance of those effects is presented. The technical details of the effects assessment on bird species selected as subcomponents are provided in subsections.

The Assessment of Cumulative Effects section provides a broader overview of the potential combined effects of other past, present, and reasonably foreseeable future projects and activities on Birds and Bird Habitat. The section characterizes the combined residual Project-related effects with the residual effects of other projects and activities that have occurred, are currently occurring, or are likely to occur to Birds and Bird Habitat. Where necessary, and if separate from Project-related effects, mitigation actions to address potential cumulative effects are described.

The Summary of Effects Assessment on Birds and Bird Habitat section provides an overview of the technical assessments described in the Project-related Effects and Cumulative Effects sections.

The Effects Monitoring and Adaptive Management section describes the actions that the Proponent will implement during the Project's Construction, Operation, Reclamation and Closure, and Post-closure phases. The section describes the approach that the Proponent will take to verify effects assessment findings and the effectiveness of mitigation measures, and to actively respond to and manage unexpected effects as the Project proceeds. It identifies how mitigation techniques may be modified in the event of unexpected Project-related or cumulative effects, and provides for continued collaboration with First Nations and regulators during Project monitoring and effects management decision-making. It demonstrates the Proponent's commitment to regular monitoring and re-assessment, and the Proponent's willingness to implement changes necessary to effectively mitigate Project-related effects or cumulative effects on Birds and Bird Habitat.

1.1 ISSUES SCOPING

The scope of this assessment is based on various guidelines provided by the Yukon Environmental and Socio-economic Assessment Board (YESAB) and by input from regulatory agencies. Available information regarding other existing and proposed quartz mining projects in Yukon and other parts of northern Canada, including environmental assessments, were also reviewed. Issues and concerns were also identified through consultation and engagement activities with communities, stakeholders and First Nations, and the professional judgement and experience of the Project team.

The scope of assessing Birds and Bird Habitat considered the Project's potential direct and indirect effects, residual effects, and cumulative effects associated with Construction, Operation, Reclamation and Closure, and Post-closure phases. The initial step in the effects assessment process was the completion of the Bird Baseline Report (**Appendix 17-A**). The baseline report characterizes the existing bird and habitat conditions upon which the Project may have an effect.

Issues scoping for Birds and Bird Habitat required knowledge of the Project design and bird species likely to occur in the region, including those considered to be at-risk or of conservation concern, as well as an understanding of species' sensitivities and their appropriateness as representative species (i.e., VC subcomponents). Bird-related information of relevance to the assessment was identified through discussions with Environment Canada (EC) and Yukon Government (YG) biologists, and review of various published and unpublished sources, including Breeding Bird Survey (EC 2014), Bird Conservation Strategy (EC 2013), YG data (e.g., YG 2015b), data from other projects undertaken in the region (e.g., Casino Mining Corporation 2013), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) species online search tool, and available TK and scientific literature.

The Proponent has undertaken an engagement and consultation process, as defined under Section 50(3) of the *Yukon Environmental and Socio-economic Assessment Act* (YESAA), to support the scoping of issues for the Project (Refer to **Volume I, Section 3.0** — Consultation). The Proponent continues to consult and engage with affected First Nations and communities, government agencies, and persons and/or other stakeholders who may be interested in the Project and its related activities. This consultation and engagement process included meetings with First Nations and government departments (e.g., YG and EC), community meetings, one-on-one and small group meetings, and ongoing communications such as print communication, newsletter, and website updates, including specific presentations and discussions regarding birds and exploration of Birds and Bird Habitat as a candidate VC. The consultation and engagement process also included the establishment of the Tr'ondëk Hwëch'in (TH) Technical Working Group (TWG) which was formed during the Project scoping stage to provide the Proponent with ongoing advice and detailed information to better inform their environmental baseline and effects assessment programs for the Project. Comments received through the consultation and engagement process from the TH TWG, YG, EC, and Project stakeholders were generally supportive of the identification of Birds and Bird Habitat as a VC for the Project.

Several concerns relevant to the assessment of Birds and Bird Habitat were identified through the consultation and engagement process. The YG raised specific concerns regarding potential Project-related effects to Sharp-tailed Grouse (*Tympanuchus phasianellus*), particularly around lek sites along the Northern Access Route (NAR), and potential effects to cliff-nesting raptors (Suitor 2015). Discussions with EC biologists outlined concerns around potential effects to nesting birds, effects to wetlands and wetland-associated species, and effects to bird species at risk, as well as bird species identified as priority species within Bird Conservation Region (BCR) 4 (EC, Pers. Comm., 2015). Certain bird species are identified as species at risk at the federal level and, pursuant to the federal *Species at Risk Act* (SARA), subsection 79, must be protected from potential Project-related effects. Similarly, migratory birds are protected under the *Migratory Birds Convention Act, 1994* (MBCA), which aims to protect and conserve migratory birds (as individuals and populations) and their nests. A migratory bird is defined as any bird included in Article I

of the MBCA including the sperm, embryos, eggs, tissue cultures, and parts of a bird (Environment and Climate Change Canada 2016a).

Meetings with the TH TWG included discussions of bird baseline studies and the inclusion of passerines, Sharp-tailed Grouse, cliff-nesting raptors, and bird species at risk as candidate subcomponents for the Bird and Bird Habitats VC (TH TWG, Pers. Comm., 2016). During these meetings, the TH TWG also raised concerns around potential Project-related effects to game birds (i.e., waterfowl, grouse, ptarmigan). Available TK identified the importance of subsistence harvesting for smaller game such as ducks, geese, swans, grouse, and ptarmigan (Mishler and Simeone 2004; Tr'ondëk Hwëch'in 2012; Bates and DeRoy 2014).

1.2 BIRDS AND BIRD HABITAT AS A VALUED COMPONENT

The selection of Birds and Bird Habitat as a VC followed the process set out in **Volume I, Section 5.1.1** Assessment Methodology, Selecting Intermediate Components and Valued Components. Birds and Bird Habitat was selected as a VC due to the potential for the Project to adversely affect individual birds, populations, and habitats. As discussed above, birds are a component of biodiversity and are important because of their value to First Nations and other local people who may rely on certain species as a subsistence and economic resource.

1.2.1 CANDIDATE VCS

Birds and Bird Habitat was identified as a VC for the reasons discussed above in issues scoping and because the Project occurs in an area where birds are known to occur. There are distinct interactions between the Project and Birds and Bird Habitat, particularly habitat loss from clearing required for the Project footprint and reduced habitat effectiveness due to sensory disturbance from Project activities. The Project's potential effects on Birds and Bird Habitat can be measured and there are distinct pathways of effects (**Table 1.2-1**). There are also protection measures and guidelines in place to protect Birds and Bird Habitat in Yukon (relevant measures are described further in **Section 3.1**).

Table 1.2-1 Candidate Valued Components for Birds and Bird Habitat – Evaluation Summary

Candidate VC	Project Interaction			Third Party Input		Supports the Assessment of Which Other VC?	Selected as a VC?	Decision Rationale
	Interaction?	Project Phase / Project Component / Activity	Nature of Interaction	Source	Input			
Birds and Bird Habitat	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	TH, EC, YG	Concerns regarding risks to various bird species and habitat including species at risk priority species, game birds, cliff-nesting raptors, wetlands and wetland-associated birds, and all nesting birds	Social Economy, Land and Resource Use, and Community Health and Well-Being	Yes	The type of Project-related effects will be similar for all birds and bird habitat and this VC encompasses several groups of birds and individual bird species identified by third party input
Species at risk	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	TH, EC	Discussions with EC biologists and Meetings with the TH TWG raised concerns regarding Project effects on species at risk	None	No	Effects to Species at Risk are encompassed under effects to Birds and Bird Habitat subcomponents of Wetland-Associated Species at Risk and Upland-Associated Species at Risk

Candidate VC	Project Interaction			Third Party Input		Supports the Assessment of Which Other VC?	Selected as a VC?	Decision Rationale
	Interaction?	Project Phase / Project Component / Activity	Nature of Interaction	Source	Input			
Game birds	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	TH	Concerns regarding harvested species (e.g. waterfowl, grouse, ptarmigan)	None	No	Various habitat requirements for game birds as a VC, therefore grouping into one VC was not considered practical. Wetland-associated Species at Risk subcomponent and Passerine subcomponent encompass Project-related effects on game birds
Sharp-tailed Grouse	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness and mortality risk from vehicle collisions.	YG	Concerns regarding lek sites and potential interaction with the Project	None	No, identified as a subcomponent of Birds and Bird Habitat	Birds and Bird Habitat VC encompasses Project-related effects to Sharp-tailed Grouse
Upland-associated species at risk	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness and mortality risk from vehicle collisions.	TH, EC	Discussions with EC biologists and meetings with the TH TWG raised concerns regarding Project effects on passerines and species at risk	None	No, identified as a subcomponent of Birds and Bird Habitat	Birds and Bird Habitat VC encompasses Project-related effects to Upland-associated Species at Risk

Candidate VC	Project Interaction			Third Party Input		Supports the Assessment of Which Other VC?	Selected as a VC?	Decision Rationale
	Interaction?	Project Phase / Project Component / Activity	Nature of Interaction	Source	Input			
Wetland-associated species at risk	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	TH, EC	Discussions with EC biologists and meetings with the TH TWG raised concerns regarding Project effects on species at risk and wetland associated species	None	No, identified as a subcomponent of Birds and Bird Habitat	Birds and Bird Habitat VC encompasses Project-related effects to Wetland-associated Species at Risk
Cliff-nesting raptors	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	YG	Concerns regarding Project effects on cliff-nesting raptors	None	No, identified as a subcomponent of Birds and Bird Habitat	Birds and Bird Habitat VC encompasses Project-related effects to Cliff-nesting raptors
Passerines (i.e., songbirds)	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness and mortality risk from vehicle collisions.	EC, TH	Discussions with EC biologists and meetings with the TH TWG raised concerns regarding Project effects on passerines and nesting birds	None	No, identified as a subcomponent of Birds and Bird Habitat	Birds and Bird Habitat VC encompasses Project-related effects to passerines

Candidate VC	Project Interaction			Third Party Input		Supports the Assessment of Which Other VC?	Selected as a VC?	Decision Rationale
	Interaction?	Project Phase / Project Component / Activity	Nature of Interaction	Source	Input			
Bird Conservation Region 4 Priority Species	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness, mortality risk from vehicle collisions, and contaminants uptake from mine site attractants.	EC	Discussions with EC biologists raised concern regarding Project effects on Priority species	None	No	Includes 77 Priority Species for bird conservation therefore not a practical VC. Project –related effects are encompassed in the Birds and Bird Habitat VC and associated subcomponents
Bank Swallow	Yes	Construction, Operation, Reclamation and Closure	Land clearing and grubbing causing habitat loss and mortality risk. Project activities causing reduced habitat effectiveness and mortality risk from vehicle collisions.	TH, EC	Discussions with EC biologists and meetings with the TH TWG raised concerns regarding Project effects on passerines and species at risk	None	No, identified as a subcomponent	Birds and Bird Habitat VC encompasses Project-related effects to Bank Swallow

1.2.2 BIRDS AND BIRD HABITAT SUBCOMPONENTS

While all bird species present within the region surrounding the Project have the potential to interact with the Project, specific species were identified and grouped, if appropriate, as VC subcomponents. The reason for focussing the effects assessment in this manner is that it is not practical to assess the potential effects of the Project on all individual bird species that occur or may occur within the region surrounding the Project. Sharp-tailed Grouse, Peregrine Falcon (*Falco peregrinus*), Golden Eagle (*Aquila chrysaetos*), Gyrfalcon (*Falco rusticolus*), passerines (i.e., songbirds), Common Nighthawk (*Chordeiles minor*), Olive-sided Flycatcher (*Contopus cooperi*), Short-eared Owl (*Asio flammeus*), Horned Grebe (*Podiceps auritus*), Red-necked Phalarope (*Phalaropus lobatus*), Rusty Blackbird (*Euphagus carolinus*), and Bank Swallow (*Riparia riparia*; **Table 1.2-2**) were selected because they are considered representative of other bird species in the region based on similar habitat requirements; therefore, the potential effects to these species are considered representative of the potential effects to other bird species in the region with similar habitat requirements.

Sharp-tailed Grouse — Sharp-tailed Grouse are known to be sensitive to disturbance around lek sites during the spring breeding period, particularly females, which can easily be displaced (Baydack and Hein 1987). Sharp-tailed Grouse was selected as a representative of game bird species because of its specific habitat requirements, particularly for lek sites, that have potential for interaction with the Project. No grouse or ptarmigan species potentially found within the Regional Assessment Area (RAA) are of national or global conservation concern; however, Sharp-tailed Grouse are listed as Vulnerable in Yukon (Yukon Conservation Data Center (YCDC; 2015a)).

Cliff-nesting raptors — Cliff-nesting raptors have established long-term nest sites on cliff habitats within or near the Project footprint, are sensitive to disturbance, and are a species group identified during the consultation and engagement process as a Project-related concern.

Passerines (i.e. songbirds) — Passerines are a species group that are known to interact with the Project due to their diverse habitat requirements and are protected under the MBCA. This species group represents all migratory songbirds in the area.

Upland-associated species at risk — Upland-associated species at risk represents all upland-associated migratory bird species protected under the MBCA. This subcomponent is focussed on Species at Risk which were identified during the consultation and engagement process as a Project concern. Focal species include Common Nighthawk and Olive-sided Flycatcher, which are Threatened under SARA, and Short-eared Owl, which is a species of Special Concern under SARA.

Wetland-associated species at risk — Wetland-associated species at risk represents all wetland-associated species and migratory species protected under the MBCA expected to interact with the Project. This subcomponent is focussed on Species at Risk which were identified during the consultation and engagement process as a Project concern. Focal species include Horned Grebe and Red-necked Phalarope, which are species of Special Concern under COSEWIC, and Rusty Blackbird, which is a species of Special Concern under SARA.

Bank Swallow — Bank Swallow is a Threatened species under COSEWIC and was identified during the consultation and engagement process as a Project-related concern. Bank Swallow is also a migratory species protected under MBCA and is a habitat specialist that has established long-term nesting colonies in specific habitats (i.e., steep bluffs or embankments comprised of friable soils) within and near the Project footprint.

Table 1.2-2 Bird and Bird Habitat Subcomponents

Subcomponent	Representative of/Focus on	Rationale for Selection
Sharp-tailed Grouse	Upland game birds	• Potential for interaction with the Project footprint • Sensitive to disturbance around leks during the spring breeding period (particularly females)
Cliff-nesting raptors	Peregrine Falcon Golden Eagle Gyrfalcon	• Peregrine Falcon is a species of Special Concern under SARA • Peregrine Falcon, Golden Eagle, and Gyrfalcon are habitat specialists that have established long-term nest sites in specific habitats (i.e., cliffs) within and near Project infrastructure
Passerines (i.e., songbirds)	Overall songbird diversity	• Includes migratory species protected under the MBCA
Upland-associated species at risk	Representative of all species of upland-associated birds. Focal species include: Common Nighthawk Olive-sided Flycatcher Short-eared Owl	• Common Nighthawk and Olive-sided Flycatcher are Threatened species under SARA • Short-eared Owl is Special Concern under SARA • Includes migratory species protected under the MBCA
Wetland-associated species at risk	Representative of all species of wetland-associated birds. Focal species include: Horned Grebe Red-necked Phalarope Rusty Blackbird	• Horned Grebe and Red-necked Phalarope are species of Special Concern under COSEWIC • Rusty Blackbird is Special Concern under SARA • Includes migratory species protected under MBCA
Bank Swallow	Not Applicable	• Threatened species under COSEWIC • Migratory species protected under the MBCA • Habitat specialist that has established long-term nesting colonies in specific habitats (i.e., steep bluffs or embankments comprised of friable soils) within and near the Project footprint.

Several additional candidate subcomponents were considered for the assessment of effects on Birds and Bird Habitat but were excluded because they are unlikely to interact with the Project in substantial numbers (e.g., alpine-associated birds) or because effects could be addressed by another subcomponent (e.g., waterfowl). Additional candidate subcomponent considerations for the effects assessment included Barn Swallow (*Hirundo rustica*) and alpine-associated birds. Barn Swallow was excluded as a subcomponent because it was not detected during the Project's baseline field studies or other breeding bird surveys conducted in the surrounding area (e.g., Chevreux 2014). Barn Swallows also use artificial structures for nesting habitat and open areas for foraging; therefore, it is anticipated that this species will either not interact with or would be positively affected by the Project. Alpine-associated birds (e.g., White-tailed Ptarmigan (*Lagopus leucura*), Surfbird (*Calidris virgate*)) were excluded as a subcomponent because the Local Assessment Area (LAA) contains no true alpine habitat; therefore, it is unlikely that alpine-associated birds will interact with or be adversely affected by the Project. Additional upland game species, Ruffed Grouse (*Bonasa umbellus*) and Spruce Grouse (*Falcipennis canadensis*), were documented within the LAA but were excluded as a subcomponent because they are not a species at risk.

1.2.3 BIRDS AND BIRD HABITAT INDICATORS

Indicators are quantitative or qualitative measures that can be compared to baseline values or conditions to evaluate potential Project-related effects and cumulative effects on VCs. The indicators identified for each Birds and Bird Habitat subcomponent are summarized in **Table 1.2-3**.

For Sharp-tailed Grouse, cliff-nesting raptors, and Bank Swallow, the indicators are the number of available lek sites, cliff nest sites, or colony sites, respectively. These indicators are quantitative and will involve an assessment of each lek/nest/colony site in relation to Project infrastructure and activities to determine if the number of viable lek/nest/colony sites may change from baseline conditions as a result of the Project.

For passerines and upland- and wetland-associated species at risk, the indicator is the amount (i.e., hectares (ha)) of high suitability habitat. This indicator is also quantitative and will involve an assessment of the breeding habitat for each VC subcomponent in relation to Project infrastructure and activities to determine if the amount of high suitability habitat may change from baseline conditions as a result of the Project.

Table 1.2-3 Bird and Bird Habitat Subcomponent Indicators

Indicator	Rationale for Selection
Sharp-tailed Grouse	
Number of available lek sites	Potential effect on the availability of Sharp-tailed Grouse habitat if Project infrastructure or activities result in a change to the number of suitable lek sites.
Cliff-nesting Raptors	
Number of available nest sites	Potential effect on the availability of cliff-nesting raptor habitat if Project infrastructure or activities result in a change to the number of suitable nest sites.
Passerines	
Amount of high suitability habitat (ha)	Potential effect on habitat suitability for passerines if Project infrastructure or activities result in a change to the amount of high suitability habitat.
Upland-Associated Species at Risk	
Amount of high suitability habitat (ha)	Potential effect on habitat suitability for upland-associated birds if Project infrastructure or activities result in a change to the amount of high suitability habitat.
Wetland-Associated Species at Risk	
Amount of high suitability habitat (ha)	Potential effect on habitat suitability for wetland-associated birds if Project infrastructure or activities result in a change to the amount of high suitability habitat.
Bank Swallow	
Number of available colony sites	Potential effect on the availability of Bank Swallow nesting habitat if Project infrastructure or activities result in a change to the number of suitable colony sites.

1.3 ASSESSMENT BOUNDARIES

The spatial and temporal boundaries for the Birds and Bird Habitat effects assessment encompass the areas within, and times during which, the Project is expected to interact with Birds and Bird Habitat. The administrative and technical boundaries represent any constraints that may be placed on the effects assessment due to political, social, and economic realities (i.e., administrative boundaries), or limitations in predicting or measuring changes (i.e., technical boundaries).

1.3.1 SPATIAL BOUNDARIES

The LAA encompasses the maximum geographic area within which the Project is expected to interact with, and potentially have a direct or indirect effect on, Birds and Bird Habitat. The LAA is generally defined by the extent of Terrestrial Ecosystem Mapping and encompasses an area of approximately 473 km² (**Figure 1.3-1**). It includes the proposed mine site area and the proposed NAR to its junction with the North Klondike Highway. Around the proposed mine site, the LAA is delineated based on the height of land while encompassing a minimum buffer of 1 km around the proposed Project footprint. Along the NAR, the LAA includes a 1 km buffer on either side of the route.

The RAA encompasses the LAA and provides a larger regional context when quantifying the potential effects of the Project on Birds and Bird Habitat. Project-related residual effects on Birds and Bird Habitat are assessed at the level of the RAA. The RAA also encompasses the area within which the residual effects of the Project are likely to interact with the residual effects of other past, present, or reasonably foreseeable future projects; therefore, it also defines the boundaries of the cumulative effects assessment (CEA) on Birds and Bird Habitat. The RAA encompasses an area of approximately 5,166 km² and is generally defined by a 10 km buffer around the Local Study Area (LSA) used during bird baseline field studies, which includes all alternate route alignments suggested for assessment by the Proponent. North of the Stewart River, the RAA includes the Maisy May, Black Hills, Eureka, Sulphur, Bonanza, and Hunker creek watersheds in their entireties; portions of the Henderson Creek, Indian River, and Dominion Creek watersheds are also included. Between the Stewart and Yukon rivers, the entire Ballarat and Barker creek watersheds are included. The boundary of the RAA south of the Yukon River follows a less constrained path. From the eastern edge, the boundary extends beyond the 10 km buffer southward towards the proposed Casino Mine Project and then westward to include all of the Coffee and Excelsior creek watersheds and portions of the Doyle Creek watershed. Along the southern edge, the boundary is delineated based on the height of land until it intersects the Independence Creek valley and extends northward toward the Yukon River, where it once again assumes a 10 km buffer based on the LSA. The spatial boundaries for the Birds and Bird Habitat effects assessment are summarized in **Table 1.3-1** and shown in **Figure 1.3-1**.

Table 1.3-1 Spatial Boundaries Used for the Birds and Bird Habitat Effects Assessment

Spatial Boundary	Description of Assessment Area
LAA	Delineated using buffers around the proposed mine site area and NAR to the junction with the North Klondike Highway: • Around the proposed mine site, delineated based on the height of land while encompassing a minimum buffer of 1 km around the proposed Project footprint • Along the NAR, includes a 1 km buffer on either side of the route.
RAA	Generally defined by a 10 km buffer around the LSA used during bird baseline field studies: • Includes the Maisy May, Black Hills, Eureka, Sulphur, Bonanza, and Hunker creek watersheds in their entireties north of the Stewart River. Portions of the Henderson Creek, Indian River, and Dominion Creek watersheds are also included. • Includes the entire Ballarat and Barker creek watersheds between the Yukon and Stewart rivers. The boundary of the RAA south of the Yukon River follows a less constrained path: • From the eastern edge, the boundary extends beyond the 10 km buffer southward towards the proposed Casino Mine Project and then westward to include all of the Coffee and Excelsior creek watersheds and portions of the Doyle Creek watershed. • Along the southern edge, the boundary is delineated based on the height of land until it intersects the Independence Creek valley and extends northward toward the Yukon River, where it once again assumes a 10 km buffer based on the LSA.
CEA Area	Same as RAA

1.3.2 TEMPORAL BOUNDARIES

The temporal characteristics of the Project's Construction, Operation, Reclamation and Closure, and Post-closure phases are described in **Volume I**, **Section 2.0** — Project Description. The temporal boundaries established for the assessment of Project effects on Birds and Bird Habitat encompass these Project phases. The temporal characteristics specific to birds (e.g., breeding season) are described in **Section 3.3**.

1.3.3 ADMINISTRATIVE BOUNDARIES

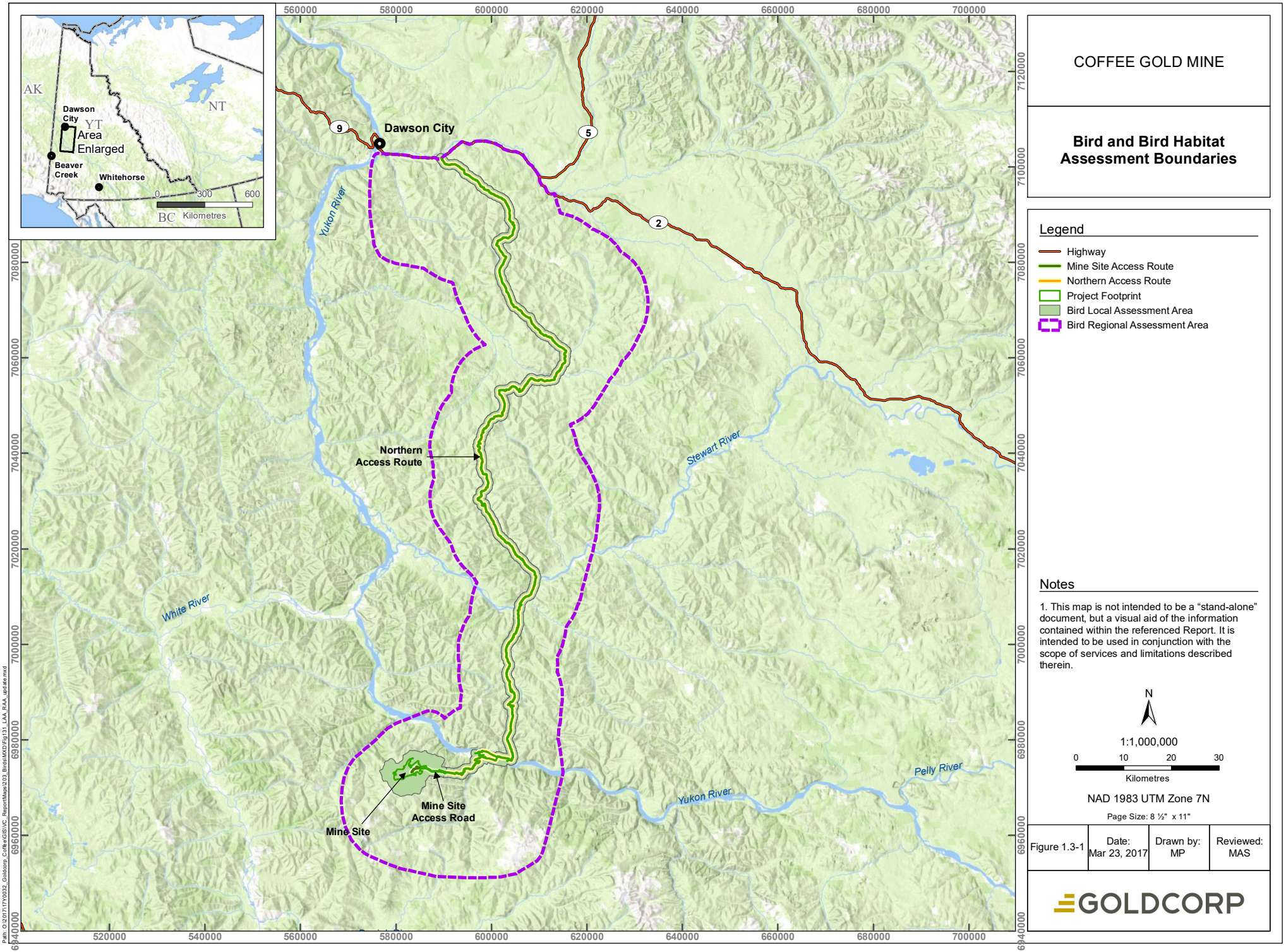
No administrative boundaries that might interfere with the ability to identify or assess potential effects on Birds and Bird Habitat were identified.

1.3.4 TECHNICAL BOUNDARIES

Several constraints were identified that may impose limitations in predicting or measuring potential effects to Birds and Bird Habitat within the RAA. These constraints include the following:

- Limited information on species ranges and population numbers in the region
- Limited knowledge of habitat requirements for species at risk and species that rarely occur in the region
- Limited knowledge of species and individual response to disturbance, and unknown implications at the population level
- Using habitat suitability models to predict potential Project-related effects for passerines and upland- and wetland-associated species at risk.

Limited information or knowledge regarding species ranges, population numbers, habitat requirements, and responses to disturbance(s) at the species and individual level could lead to uncertainties regarding the extent of potential Project-related effects and the overall implications at the population level. Challenges associated with surveying difficult terrain for nest sites, or locating inconspicuous nest sites, could lead to data gaps for certain subcomponents (e.g., cliff-nesting raptors). Using habitat suitability models may impose constraints on the effects assessment due to data limitations. The habitat suitability models for passerines and upland- and wetland-associated species at risk were based on ecological land classification mapping for the region, which is only defined to the subzone level and not to the ecological community level (e.g., ecosites and vegetation association); therefore, it is not possible to compare amounts of suitable habitat for these subcomponents in the context of the RAA or with respect to adjacent projects (e.g., the proposed Casino Mine Project). In addition, base mapping for ecosites and vegetation associations are not standardized, and are therefore difficult to compare.



COFFEE GOLD MINE

Bird and Bird Habitat Assessment Boundaries

Legend

- Highway
- Mine Site Access Route
- Northern Access Route
- Project Footprint
- Bird Local Assessment Area
- Bird Regional Assessment Area

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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2.0 ASSESSMENT METHODS

The methods used to identify and assess potential Project-related and cumulative effects were developed pursuant to assessment requirements identified in YESAA and YESAB guidance documents (e.g., YESAB 2005) and are consistent with *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada* (Canadian Wildlife Service 2004). The assessment of Project-related effects and cumulative effects to Birds and Bird Habitat was conducted according to the methods set out in **Volume I, Section 5.0 Assessment Methodology**. As described in each section of the report, the assessment was informed by input provided during consultation and engagement with government agencies, affected First Nations, and the public, in addition to a review of TK, scientific and other information.

The effects assessment places bird habitat potentially affected by the Project footprint in the context of habitat available regionally in the RAA. Fine-scale habitat suitability mapping was completed within the LAA based on Ecological and Landscape Classification (ELC) and Broad Ecosystem Mapping (BEM) units developed for the Vegetation Baseline Report (**Appendix 15-A**). Land cover data available for the RAA was not directly comparable with land cover mapping in the LAA. Therefore, to assess change in habitat area, broad-scale habitat components were used as surrogates to represent high value habitat available in the LAA compared to the RAA. Habitat modeling in the LAA was used to define which habitat components represented high value habitat. The data sources available for the RAA that were used were fire history (YG 2016) and Dawson Land Cover Classification (YG 2014) supplemented by Land Cover (Canadian Forest Service 2006). This approach allowed the effects assessment for habitat change to be completed using a quantitative and repeatable method.

A limitation of this assessment of Project-related effects on Birds and Bird Habitat is the lack of regionally available detailed ecosystem mapping. The Project's ecosystem mapping extent was limited to a 1 km buffer surrounding the Project footprint to provide detailed mapping with potential to mitigate site-specific locations of ecosystems such as wetlands, and to inform future reclamation activities on site. Detailed or broad ecosystem mapping within the RAA does not exist for comparison.

3.0 EXISTING CONDITIONS

A summary of existing regulatory and baseline conditions is provided to provide local context and to enable the reviewer to identify and understand the potential interactions between the Project and Birds and Bird Habitat. Existing conditions are described based on available information, including the following:

- Federal, territorial, First Nation, and local government jurisdictions, mandates, agreements, and interests of specific relevance to Birds and Bird Habitat, including the legislation and/or policy through which regulation and management occurs, and any associated reports or plans that are or may be developed (e.g., Recovery Strategy under the federal SARA).
- Baseline reports describing desktop and field studies, including the collection, analysis, and documentation of data and its treatment according to appropriate territorial or federal guidelines and standards.
- Subject to any confidentiality constraints that may apply, available TK relevant to Birds and Bird Habitat. References to this information will include the source and an explanation of how it informed the understanding of existing conditions.
- Scientific and other information, including existing reports in popular, grey, or published literature, databases, remote sensing imagery and data, monitoring programs, and previous environmental assessments or associated technical reports, including a discussion of the quality and relevance of the information.

The descriptions refer to the quality and reliability of the baseline data and its applicability for the purpose used, including any uncertainty or gaps in knowledge associated with existing Birds and Bird Habitat conditions.

3.1 REGULATORY CONTEXT

The following legislation and regulations are relevant to the Project's effects assessment and mitigation and monitoring for Birds and Bird Habitat.

3.1.1 FEDERAL GOVERNMENT

3.1.1.1 Yukon Act (SC 2002, c.7)

The *Yukon Act* gives authority to the Yukon Legislature to make laws in relation to the conservation of wildlife habitat within Yukon, other than in a federal conservation area.

3.1.1.2 Yukon Environmental and Socio-economic Assessment Act (SC 2003, c.7)

The YESAA gives authority and rules to the YESAB to administer the assessment process that applies to all lands within Yukon. The Board's mission is to protect the environment and social integrity of Yukon, while fostering responsible development. YESAA does not specifically identify Birds or Bird Habitat as a valued environmental component, but states the Act's purpose is to "…*protect and maintain environment quality…*" (YESAA, section 5.2[c]), and "…*ensure that projects are undertaken in accordance with principles that foster beneficial socio-economic change without undermining the ecological… systems on which communities, their residents, and societies in general, depend*" (YESAA, section 5.2[e]).

3.1.1.3 Species at Risk Act (SC 2002, c.29) and Committee on the Status of Endangered Wildlife in Canada

The SARA implements in part Canada's obligations under the United Nations Convention of Biological Diversity. It provides for the legal protection of plant and wildlife species and the conservation of their biological diversity. Under SARA, the COSEWIC, an independent body of experts, is responsible for identifying and assessing plant and wildlife species considered at risk, which may then qualify for legal protection and recovery under SARA. Once listed under SARA, species plans are legal requirements to secure the necessary actions for species recovery and management. The schedules of the Act were used to identify SARA listed species in the Project area that are of particular conservation concern, which may require additional levels of protection.

3.1.1.4 Migratory Birds Convention Act, 1994 (SC 1994, c. 22)

The MBCA, created in 1917 and updated in 1994, protects and conserves migratory birds (as individuals and populations), their eggs, and their nests through the implementation of the Migratory Birds Regulations and the Migratory Birds Sanctuary Regulations. According to the MBCA, removal of migratory birds, their eggs, or nests from a site is only permissible if the migratory birds are causing or may cause damage to property and equipment (subject to permitting). Deposit of harmful substances to birds in areas or waters frequently visited by migratory birds is prohibited. No migratory bird sanctuaries fall within the region surrounding the Project.

3.1.2 TERRITORIAL GOVERNMENT

3.1.2.1 Environment Act (RSY 2002, c.50)

Yukon's *Environment Act* and regulations provide for the protection of land, water, and air. The Act applies on lands throughout Yukon, including private property, Crown lands, lands within municipal boundaries, and First Nation settlement lands where the First Nation has not developed equivalent laws. This Act is primarily used for regulations related to air quality, waste, recycling, spills, and contaminated sites; however, the Act also provides for natural resource planning and management, and conservation easements for conserving and enhancing vegetation communities that provide habitat for wildlife.

3.1.2.2 Wildlife Act (R.S.Y. 2002, c*.229)*

The Act defines "wildlife" as any vertebrate animal of any species or type that is wild by nature, and includes wildlife in captivity, but does not include fish. The Act provides rules for hunting and trapping, outfitting and guiding, licensing, enforcement, and habitat protection. It also gives authority to make various regulations. Regulations include prescribing specially protected wildlife and measures to protect, areas to be wildlife sanctuaries and measures for management, methods of hunting and trapping wildlife, licensing and permitting conditions, zoning the Yukon to administer the Act, and the submission of harvest information. The Act is typically amended every 10 to 20 years while regulations can be updated annually.

Relevant to Birds and Bird Habitat, the *Wildlife Act* states that a person shall not:

- *"…destroy, take or possess any egg or nest of a bird that belongs to a species that is wild by nature" (Wildlife Act 17[1])*
- *"…damage or interfere with a beaver dam, or the den, lair or nest of any wildlife" (Wildlife Act 91[1])*
- "…harass any wildlife" *(Wildlife Act 91[1]). "A person shall be deemed to harass wildlife if the person operates a vehicle or boat in a manner that might reasonably be expected to harass any wildlife; or attempts to interfere with the movement of any wildlife across any road or watercourse*" (*Wildlife Act* 92[2] c and d).

3.1.3 FIRST NATION GOVERNMENTS

The Project is located on Crown land within the traditional territory of the TH and the asserted traditional territory of the White River First Nation (WRFN). Sections of the proposed NAR also overlap the traditional territory of the Selkirk First Nation (SFN) and the First Nation of Na-cho Nyäk Dun (FNNND).

The WRFN have not signed a Final Agreement with the Government of Canada. While the WRFN current land use of the Coffee Project area is limited, the First Nation has expressed an interest in the area for future use. The remaining three First Nations have Final Agreements negotiated with the Government of Canada. As such, boards and councils have been established under the Umbrella Final Agreement (UFA, Council for Yukon Indians 1993) which have advisory and management responsibilities related to Birds and Bird Habitat both throughout Yukon and within specific First Nation Traditional Territories. There is First Nation representation on all of the management council and boards established through the UFA (**Table 3.1-1**). Through the UFA, First Nations are provided with the ability to draft acts to manage Birds and Bird Habitat on their Settlement Lands. To date, only the TH have exercised this right with the *Tr'ondëk Hwëch'in Fish and Wildlife Act* enacted in 2009. The Act provides authority to TH to manage and administer subsistence harvest of wildlife in their Traditional Territory.

Table 3.1-1 Bird and Bird Habitat-related Management Boards and Councils Established under the Umbrella Final Agreement

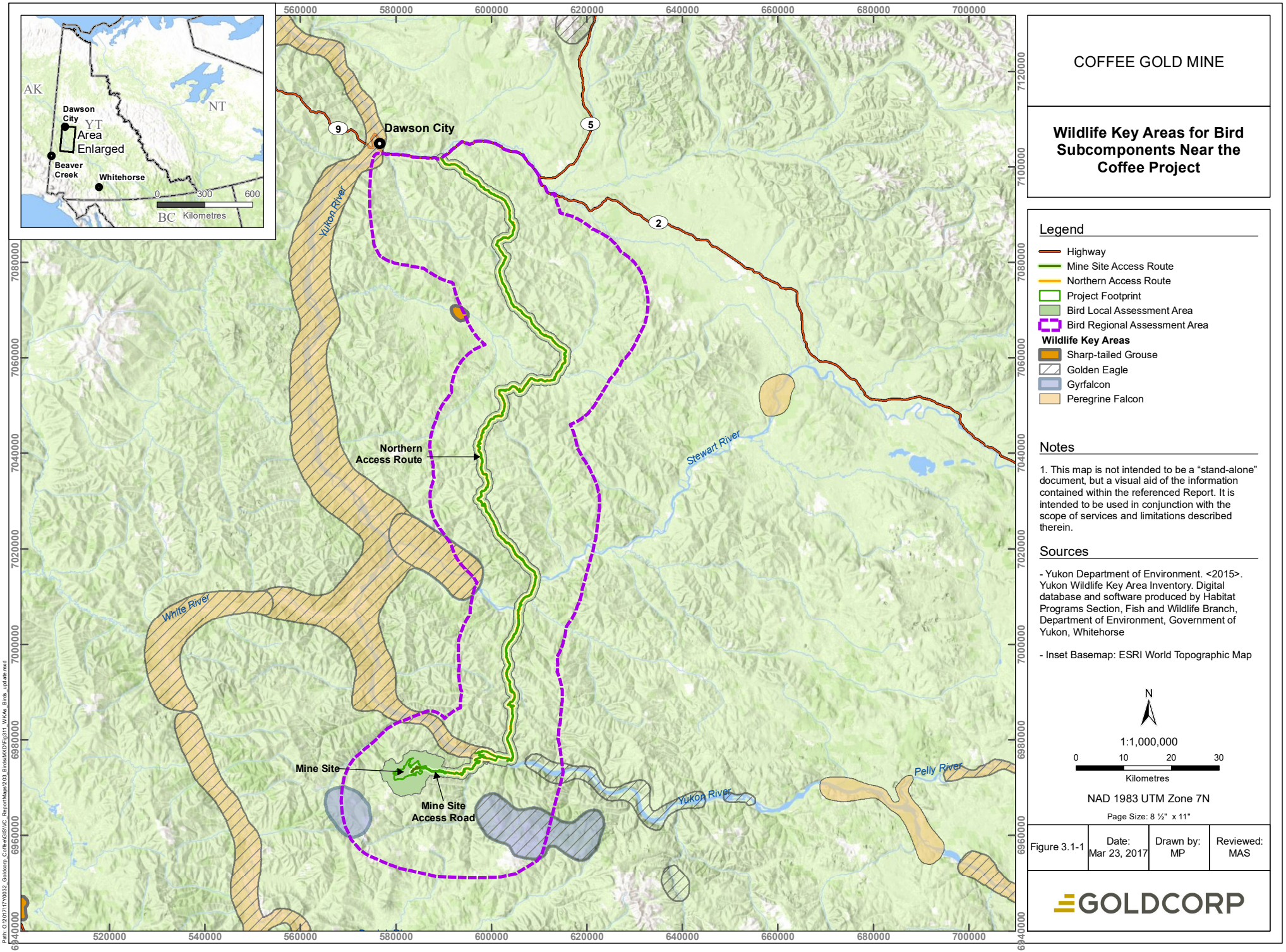
Name of Board or Council	Intended Role
Yukon Fish and Wildlife Enhancement Trust	Supports restoration and enhancement of Yukon wildlife populations and their habitats
Dawson District Renewable Resource Council	Primary local management instrument for bird and bird habitat in the Traditional Territory of the TH
Selkirk Renewable Resources Council	Primary local management instrument for bird and bird habitat in the Traditional Territory of the SFN
Mayo District Renewable Resources Council	Primary local management instrument for bird and bird habitat in the Traditional Territory of the FNNND
Fish and Wildlife Management Board	Primary instrument of bird and bird habitat management in Yukon

3.1.4 OTHER RELEVANT GUIDELINES/DOCUMENTS

The Environmental Code of Practice for Metal Mines (EC 2009) — The Environmental Code of Practice describes operational activities and associated environmental concerns of metal mines. The document outlines recommendations to mitigate identified environmental concerns, including clearing of vegetation throughout the life of the mine, from design and construction to operations and mine closure.

Yukon Mineral and Coal Exploration Best Management Practices and Regulatory Guide (Yukon Chamber of Mines 2010) — The document provides a practical overview to implement Best Management Practices (BMPs) when planning and conducting exploration projects; from preliminary stages through to the advanced exploration stage. Environmental BMPs including vegetation and habitat considerations are identified for a variety of project construction elements including airstrip and road construction.

Fish & Wildlife Branch of Environment Yukon Key Wildlife Areas (YG 2015a) — There are no parks, special management areas, or conservation areas within the region surrounding the Project area. However, the Project footprint and RAA overlap several Wildlife Key Areas for birds including Sharp-tailed Grouse, Peregrine Falcon, Golden Eagle, and Gyrfalcon (**Figure 3.1-1**; YG 2015a). Wildlife Key Areas (WKAs) are designated by the YG and represent locations that are used by specific wildlife species for critical seasonal life functions (e.g., breeding sites, winter ranges, fall rut areas, mineral licks, and migration corridors). These areas are often used seasonally by relatively large numbers of animals. WKAs have no legal designation. The WKA inventory is currently used in the development assessment process by Environment Yukon and YESAB. Depending on the land use activity, specific recommendations are made to maintain key areas and reduce impacts. In addition, the assessment process through YESAB is improved, because land use proponents that obtain key area information can tailor proposals to reduce conflicts and shorten review times. (Yukon Environment, 2014).



COFFEE GOLD MINE

Wildlife Key Areas for Bird Subcomponents Near the Coffee Project

Legend

- Highway
- Mine Site Access Route
- Northern Access Route
- Project Footprint
- Bird Local Assessment Area
- Bird Regional Assessment Area

Wildlife Key Areas

- Sharp-tailed Grouse
- Golden Eagle
- Gyrfalcon
- Peregrine Falcon

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Yukon Department of Environment. <2015>. Yukon Wildlife Key Area Inventory. Digital database and software produced by Habitat Programs Section, Fish and Wildlife Branch, Department of Environment, Government of Yukon, Whitehorse

- Inset Basemap: ESRI World Topographic Map

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3.2 BACKGROUND INFORMATION AND STUDIES

3.2.1 TRADITIONAL KNOWLEDGE

As a part of Project data collection, available TK from the TH, SFN, FNNND, and WRFN was compiled (i.e., the Project TK database). This TK was reviewed for this assessment; however, information pertinent to the assessment of Birds and Bird Habitat was limited. Available information was primarily related to harvest species which includes ducks (including various species of the genus *Aix*, *Anas*, *Aythya*, *Bucephala*, and *Melanitta*), Canada Geese (*Branta candensis*), swans, Dusky Grouse (*Dendragapus obscurus*), Ruffed Grouse, Spruce Grouse, Sharp-tailed Grouse, Willow Ptarmigan (*Lagopus lagopus)*, and Rock Ptarmigan (*Lagopus muta;* Dawson Indian Band 1988, Pearse and Weinstein 1988, Mishler and Simeone 2004, InterGroup Consultants Ltd. 2009, Calliou Group 2012, Bates and DeRoy 2014).

3.2.2 SCIENTIFIC AND OTHER INFORMATION

The types of references used for this assessment include data on bird species expected to occur in the region (e.g., YCDC, YG 2015b, EC 2013, EC 2014), recent scientific literature, previous environmental assessments, associated technical reports or monitoring programs in the region, YG guidance documents, and BMPs. Information sources included regulatory agencies (e.g., Habitat Programs, YG), stakeholders, local government, and the public.

3.2.3 BASELINE STUDIES

The Bird Baseline Report (**Appendix 17-A**) provides a comprehensive overview on all previous field surveys and Project-specific knowledge on bird distribution and abundance within the region surrounding the Project area. Baseline field studies were conducted throughout the LAA and RAA in 2014 and 2015 for all bird subcomponents, with additional surveys for Sharp-tailed Grouse, Short-eared Owl, and cliff-nesting raptors in 2016. Relevant baseline information specific to each subcomponent is provided in **Section 3.3**.

3.3 EXISTING CONDITIONS

Pre-Project conditions for each subcomponent are described specifically within the LAA and conceptually in the RAA. Pre-Project conditions are defined as conditions prior to interaction with the Project and are summarized for each subcomponent based on regulatory context, TK, scientific and other information, and baseline studies undertaken for the Project.

3.3.1 SHARP-TAILED GROUSE

Sharp-tailed Grouse are listed as vulnerable in Yukon (YCDC 2016) largely due to limited information on distribution and population numbers/trends. (Connelly et al. 1998; YCDC 2015a). No population estimates exist for any grouse or ptarmigan species in Yukon including Sharp-tailed Grouse; however, based on available records and information, they appear to be well distributed and relatively abundant within their

known Yukon ranges (Sinclair et al. 2003). Much of the existing information about Sharp-tailed Grouse in Yukon comes from work conducted by Mossop et al. (1979) in southwest Yukon where the species is found in burned areas and undisturbed aspen parkland habitat. More recently, Chevreux (2014) conducted a bird baseline study in the Indian River area and observed Sharp-tailed Grouse several times in both placer mined and unmined areas during the spring, summer, and fall. In 2015, Environment Yukon initiated a research project in the Dawson Goldfields to collect more information on Sharp-tailed Grouse in central Yukon; the geographical extent of this research includes portions of the Project LAA, particularly along Dominion Creek. Sharp-tailed Grouse populations are cyclical (Sinclair et al. 2003), and based on regional observations (M. Suitor, Dawson District Regional Biologist. Pers. Comm. 2015), the population within the Dawson Goldfields appears to be experiencing increased population growth as of 2015. The reason for this population high is unknown, although it is possible that extensive wildfires in the region in 2004 and 2007 created optimal habitat for this species. During times when populations are in a cyclical low, Sharp-tailed Grouse can be relatively rare with small groups of individuals scattered across a large area.

Sharp-tailed Grouse are year-round residents in Yukon (i.e., non-migratory; EC 2015). They inhabit early-successional plant communities dominated by relatively dense cover of grasses and shrubs (Connelly et al. 1998). In the far north, these habitats are typically created by wildfires and logging activities (EC 2015). Sharp-tailed Grouse are well-known for their elaborate courtship displays at communal breeding sites called leks (Connelly et al. 1998). In early spring, multiple males congregate and display to attract females for the opportunity to breed. Lek sites are generally located on elevated areas with less vegetation and can be used year after year. Breeding on lek sites generally occurs from March to July, with an initial peak from mid- to late-April to early May; females will breed again if they lose their first nest. In the southwest Yukon, Mossop et al. (1979) documented that the first grouse began to attend lek sites by mid-March when weather conditions were favorable, and that the peak of courtship behaviour occurred between the last week of April and first week of May. Females generally nest between 0.4 and 1.8 km from a lek site under dense vegetation cover; males are not involved in incubation or brooding (Connelly et al. 1998).

Sharp-tailed Grouse surveys were conducted in April 2015 and 2016 to document the presence of probable lek sites in suitable habitats within 3 km of the NAR. The extent of Sharp-tailed Grouse surveys is displayed in the baseline report, and at the request of the YG, probable lek sites are considered confidential and are not displayed. An initial aerial reconnaissance survey was conducted within the focal study area (i.e., within 3 km of the NAR) to identify suitable lek habitat for Sharp-tailed Grouse (e.g., burns and other open/disturbed areas). That survey was followed by more intensive aerial and ground surveys wherever a probable lek site was identified. All surveys were completed within three hours of official sunrise to coincide with the daily timing when Sharp-tailed Grouse attend lek sites. Aerial surveys included flying a helicopter slowly over probable lek sites while observers watched for flushing grouse and track marks in the snow. Ground surveys included point counts and were conducted to confirm a probable lek and if possible, obtain a count of the number of grouse attending a lek. During 2016 field surveys, aerial infrared surveys were

attempted for inaccessible portions of the NAR and focused on high habitat suitability areas where probable lek sites may occur. Although the infrared camera was successful in viewing Sharp-tailed Grouse and obtaining a count on two of the previously documented lek sites, no new lek sites were located using this method and the surveys were discontinued in favour of the other survey methods outlined above.

During baseline field studies in 2015, a total of six probable lek sites were identified; however all identified lek sites were located more than 3 km from the Project footprint (**Table 3.3-1**). No new lek sites were identified during the 2016 field surveys. The lek sites identified were located in both natural and disturbed habitats, and located on flat areas (i.e., valley bottoms or subalpine ridges) with minimal vegetation, aside from grasses and sparse shrubs. Incidental observations of Sharp-tailed Grouse were also recorded.

Table 3.3-1 Sharp-tailed Grouse Lek Sites Identified in the Coffee Gold Mine Project RAA

Lek Identifier	General Location	Habitat Type	Number of Sharp-tailed Grouse Observed	Located within LAA?
BH-01	Black Hills Creek	Appears to be an old fire break with natural vegetation (mostly grasses) and a few short trees/shrubs	Approximately 10 birds counted but most flushed prior to arrival; considered a minimum count	No
DOM-01	Dominion Creek	Ridge adjacent to existing roadway; mostly bare ground; some grasses and willows	Approximately 20, including at least 8 males	No
DOM-02	Dominion Creek	Disturbed ground (old placer mining area); mostly covered by grasses; some bare ground and willows up to 2 m high	Obtained a minimum count of 19, including 6 males and 7 females positively identified	No
DOM-03	Dominion Creek	On a ridge of disturbed ground; some grasses and bare ground, but mostly short willows	Could not access to obtain count	No
DOM-04	Dominion Creek	Actual lek site not determined; site appears to be located in a natural bog habitat	Unable to obtain count	No
EUR-01	Eureka Ridge	Subalpine ridge; 100 percent (%) snow covered during survey	Approximately 8 birds counted	No

3.3.2 CLIFF-NESTING RAPTORS

Cliff-nesting raptors in this region primarily include Peregrine Falcon, Golden Eagle, and Gyrfalcon. Red-Tailed Hawks also occur in the region and will occasionally nest on cliffs. Common Ravens (*Corvus corax*) also frequently nest on cliffs in the region. Their nests can be difficult to distinguish from other stick nesting species under some circumstances and, over time, stick nests may be taken over and used by species other than the original occupant. Peregrine Falcon is listed federally as a species of Special Concern by COSEWIC and is included on Schedule 1 of SARA (COSEWIC 2007c). Golden Eagle and Gyrfalcon are not listed federally by COSEWIC or SARA. Peregrine Falcon and Golden Eagle are also considered priority species for conservation in BCR 4 and Vulnerable in Yukon because regional population

trends are unknown (EC 2013; YCDC 2015a; YCDC 2015b). Gyrfalcon is not considered a priority species for conservation in BCR 4, but is considered Vulnerable in Yukon (YCDC 2015b). Current information from monitoring elsewhere in Yukon indicates that Gyrfalcon numbers are declining in the region, presumably due to destabilization of the ptarmigan population cycle, which is an important prey species (Mossop 2011).

Peregrine Falcon and Golden Eagles are typically summer residents in Yukon (Sinclair et al. 2003). Peregrine Falcons arrive in late April and breed from May to August with birds heading back to their wintering grounds by late August (Rousseu and Drolet 2015). Golden Eagles are similar, but arrive in late March and begin to breed in April (Rousseu and Drolet 2015). Gyrfalcons are year-round residents in Yukon (Sinclair et al. 2003). They typically start nesting in early April and nestlings leave the nest by mid-June; however, since Gyrfalcons are year-round residents in Yukon, their nest sites may be occupied at any time throughout the year. Peregrine Falcon, Golden Eagle, and Gyrfalcon typically nest on cliff ledges and are known to reuse nest sites in subsequent years; each species also typically has more than one alternate nest site located within their territories (Sinclair et al. 2003; Hayes and Reid 2014). Peregrine Falcon nest sites are scraped in substrate on cliff ledges or occasionally on cliff tops. Golden Eagles build large stick nests almost exclusively on cliff faces in remote mountainous terrain, but a few tree nests have been reported in Yukon. Gyrfalcon nest sites are always on cliff ledges; they do not build their own nests but instead will nest in a scrape or use the abandoned stick nests of Golden Eagle and Common Raven (*Corvus corax*).

Aerial surveys for cliff-nesting raptors were conducted in June 2014, April 2015, June 2015, and June 2016 to document the location and status of any nest sites within the RAA. At the request of the YG, nest sites are considered confidential and are not displayed. All aerial surveys were conducted by helicopter and consisted of a visual search of suitable cliff-nesting habitats for raptors, particularly Peregrine Falcon, Golden Eagle, and Gyrfalcon. Prior to the commencement of raptor surveys, Project biologists compiled a list of all known raptor nests based on previous surveys conducted in the area for the Casino Mine Project (EDI 2013) and by the YG, Department of Environment (Environment Yukon; YG 2015b, O'Donoghue 2013). In addition to searching suitable habitats within the RAA for new nest sites, the raptor surveys also included monitoring of all previously documented sites within 5 km of the proposed Project footprint to document the current status of the nests.

Baseline raptor surveys documented 42 nests within 25 nest areas (Bird Baseline Report, **Appendix 17-A**). These included six Golden Eagle nest areas, five Peregrine Falcon nest areas, four Common Raven nest areas, and 10 nest areas where the species was unknown (**Table 3.3-2**).

Areas with suitable cliff-nesting habitats included the cliff faces along the Yukon and Stewart rivers and rock outcroppings (tors) in alpine and subalpine areas. Along the Yukon River, two Golden Eagle nest areas, one Peregrine Falcon nest area, and two Common Raven nest areas were recorded within the LAA. Along the Stewart River, two nest areas were recorded within the LAA for the NAR, but the species were

unknown. In addition, one potential Peregrine Falcon perch or historic nest was observed near the proposed barge crossing on the north side of the Stewart River. This site was not classified as a nest area due to lack of additional sign or adults during Project surveys; however, it is noted due to its close proximity to the Project footprint. Overall annual occupancy rates at nest areas, excluding Common Raven, were 30% over the three years of study. Several nest areas did not have confirmed occupancy during the three years of study. However, these nest areas were considered potentially active for this assessment because raptors have strong fidelity to established nest areas and they can be reused after several years of apparent inactivity.

Gyrfalcon have not been observed within the LAA or RAA to date (no individuals or nest sites); however, the southern margin of the RAA does overlap a WKA for gyrfalcon and signs of past raptor use (i.e., whitewash and potential perch sites) were observed at a small number of alpine/subalpine sites during baseline field studies. Suspected Gyrfalcon nests were also documented south of the RAA within the Casino Mine Project Local Study Area (EDI 2013), and a YG survey of alpine raptors in portions of the Dawson Range outside of the RAA documented one active Gyrfalcon nest on tors and evidence of alpine raptors (i.e., whitewashed droppings on rock faces) in a number of locations (O'Donoghue 2013).

Table 3.3-2 Raptor Nest Areas Identified in the Coffee Gold Mine Project RAA

General Location	Nest Area	Species[1]	No. Nests	Within LAA	Distance to Project Footprint (km)	Breeding Status[2]		
						2014	2015	2016
Dawson Range Alpine Tors	001	Golden Eagle	1	No	19.9	Iact	NS	Iact
Yukon River	002	Golden Eagle	3	No	11.4	Act	NS	NS
	003	Unknown (Common Raven)	1	No	9.5	Iact	Iact	NS
	004	Unknown	1	No	5.9	NL	NL	Iact
	005	Golden Eagle	1	No	4.8	Iact	Iact	Iact
	006	Common Raven	4	No	3.8	Iact	Iact	Act
	007	Peregrine Falcon	1	No	2.4	NL	Occ	Occ
	008	Unknown (Bald Eagle)	1	No	2.2	Iact	Iact	NS
	009	Golden Eagle	3	Yes	0.3	Occ	Iact	Iact
	010	Peregrine Falcon	1	Yes	0.4	Occ	Iact	Iact
	011	Common Raven	4	Yes	0.4	Act	Iact	Iact
	012	Golden Eagle	1	Yes	0.8	Iact	Iact	Iact
	013	Common Raven	2	Yes	0.9	NL	Act	Iact
	014	Unknown (Bald Eagle)	1	No	6.8	Iact	Iact	Iact
	015	Unknown (Common Raven)	1	No	8.2	Iact	NL	Iact
	016	Golden Eagle	1	No	9.4	NS	NS	Iact
	017	Peregrine Falcon	1	No	2.5	NL	Occ	Occ

General Location	Nest Area	Species[1]	No. Nests	Within LAA	Distance to Project Footprint (km)	Breeding Status[2]		
						2014	2015	2016
Stewart River	100	Peregrine Falcon	1	No	4.5	NS	Occ	Act
	101	Unknown	1	No	2.6	NS	Iact	Iact
	102	Unknown (Common Raven)	1	Yes	0.3	NS	Iact	Iact
	103	Unknown (Golden Eagle)	3	Yes	0.0	NS	Iact	Iact
	104	Common Raven	4	No	11.8	NS	Occ	Act
	105	Unknown	2	No	4.4	NS	Iact	Iact
	106	Peregrine Falcon	1	No	8.3	NS	Iact	Act
	107	Unknown (Common Raven)	1	No	8.3	NS	NL	Iact

[1] The nest sites provided by Environment Yukon were identified to species previous to the Project surveys. For nests identified by Project biologists, active nests were identified to species, inactive nests were described as 'Unknown' species and the suspected species was identified based on nest structure when possible.

[2] Status: NL = Not Located; area surveyed but nest not present or not detected at the time of survey

NS = Not Surveyed; extent of survey did not cover the nest area

Act = Active; breeding activity detected (adult on nest, eggs, juveniles, etc)

Occ = Occupied; adult birds present but no breeding activity detected

Iact = Inactive; no birds observed and no breeding activity detected

3.3.3 PASSERINES

Passerine species within the region surrounding the Project include flycatchers, shrikes and vireos, jays and crows, larks, swallows, chickadees, kinglets, thrushes, waxwings, warblers, longspurs and sparrows, blackbirds, and finches. There are 57 passerine species expected to occur within the region surrounding the Project area based on Project field surveys, previous studies in the region, and other background information on bird distributions within Yukon. Forty-eight of these species were detected during Project baseline field studies including three species listed by COSEWIC, one species listed on the YCDC Track-List, two species listed on the YCDC Watch-List, and 14 species identified as priority species for conservation in BCR 4.

Systematic point count surveys were conducted over three consecutive years to assess species occurrence, abundance, distribution, and diversity of passerines within the region surrounding the Project area. Both the number of individual birds detected per point count and number of species was highest in the boreal forest zone, where the most common species detected were Dark-eyed Junco (*Junco hyemalis*) and Swainson's Thrush (*Catharus ustulatus*). The number of upland birds detected within the subalpine bioclimate zone was similar to the boreal forest zone, with the most common species detected being White-crowned Sparrow (*Zonotrichia leucophrys*). Within the alpine bioclimatic zone, the number of point counts was relatively low and the corresponding number of birds detected was considerably lower than the boreal forest and subalpine zones. Given that bird densities were relatively low and there was a small amount of this habitat present in the LAA, many of the species detected in alpine habitat were documented by incidental observation.

Virtually all areas of the LAA provide habitat for breeding birds, although there is considerable variation in the density and diversity of birds across habitat types. Habitats with the highest density of breeding birds included placer mined areas and burned areas; these areas are dominated by regenerating vegetation and typically involve a large component of shrubs. In the case of the placer mined areas, these areas are located almost exclusively in lowland areas, are often in proximity to water (placer mined ponds and streams), and contain extensive edge habitat. Upland coniferous and riparian forest (coniferous, deciduous, and mixed) also had notable densities of birds and contained habitat specialists (e.g., Townsend's Warbler (*Setophaga townsendi*)) and species at the northern extent of their breeding range in Yukon (e.g., Warbling Vireo (*Vireo gilvus*)). The habitats with the lowest density of breeding birds included subalpine/alpine areas such as the felsenmeer, subalpine/alpine shrub, and high elevation sparse/open forest.

Habitat modelling identified burns ≤30 years old, placer mined areas, upland coniferous forest, riparian forest, high/low elevation shrubby areas, and swamps and marshes as high suitability habitats. High suitability habitat for passerine birds constituted 49% of the LSA used during baseline field studies (**Maps D10**–**D12** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**). These habitats are located throughout the LAA, but are most extensive in the upper Maisy May Creek/Eureka Ridge/Henderson Dome and the Coffee areas due to the expanse of disturbed habitats (burns ≤30 years old and placer mining) in these areas. The portions of the LAA that cover the Yukon and Stewart river floodplains are also dominated by high suitability habitats, due to the presence of riparian forests and wetlands in these areas.

3.3.4 UPLAND-ASSOCIATED SPECIES AT RISK

Upland-associated species at risk include Common Nighthawk, Olive-sided Flycatcher, and Short-eared Owl. These species are representative of all bird species that use upland terrestrial habitats such as open areas (e.g., tundra, logged areas, burned areas), forested areas (i.e., coniferous, deciduous, mixed wood), or grassland areas.

Common Nighthawk — Common Nighthawk is listed federally as a Threatened species by COSEWIC due to both short-term and long-term population declines, and is included on Schedule 1 of SARA (COSEWIC 2007a). Common Nighthawks are summer residents in Yukon; the first spring migrants arrive in early June and breeding occurs throughout June and July with birds heading back to their wintering grounds at the beginning of August (Rousseu and Drolet 2015). Nesting habitat for Common Nighthawk in Yukon includes Lodgepole Pine (*Pinus contorta*) forests, old burned areas, and open mixed forests, with wetlands also providing important foraging areas (Sinclair et al. 2003).

There were 23 Common Nighthawk detections over the course of baseline bird surveys for the Project, with seven detected in the LAA. Nighthawks were encountered most frequently along the NAR, particularly in the areas near Henderson Dome/Black Hills Creek and lower Dominion Creek. Encounters near the mine site were limited to a single incidental observation near the existing camp location. All detections of territorial boom calls, which indicate proximity to nest sites (Brigham et al. 2011), were located outside of the LAA.

High suitability habitats for Common Nighthawk are extensive in the LAA (29% of the total area; **Map D7**-**D9** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**). This is due in large part to the extensive amount of disturbed habitat (burns ≤ 30 years old and placer mined areas), which are rated as high suitability for this species.

Olive-sided Flycatcher — Olive-sided Flycatcher is listed federally as a Threatened species by COSEWIC due to a widespread and consistent population decline over the last 30 years (COSEWIC 2007b). Olive-sided Flycatchers are summer residents in Yukon; the first spring migrants arrive in early June and breeding occurs throughout June, July, and early August with birds heading back to their wintering grounds by mid-August (Rousseu and Drolet 2015). Olive-sided Flycatchers inhabit open to semi-open areas in mature coniferous or mixedwood forests with tall trees or snags for perching (Altman and Sallabanks 2012; COSEWIC 2007b; Kotliar 2007). Open areas include natural forest openings (e.g., openings created by forest fires), forest edges near natural openings (e.g., rivers or wetlands), and artificial openings (e.g., harvested areas). Breeding habitat for Olive-sided Flycatcher in Yukon includes a wide range of habitats such as Black Spruce (*Picea mariana*), White Spruce (*P. glauca*), Lodgepole Pine, and deciduous forests across a wide range of elevations. These are often found in proximity to wetlands, bogs, and older burns (Sinclair et al. 2003). Olive-sided Flycatcher is a widespread breeding species throughout Yukon that is expected to occur at low densities throughout much of the RAA. Breeding density for this species in Yukon within BCR 4 is estimated at 0.1 males/ha (Cumming et al. 2010).

There were 13 detections of Olive-sided Flycatcher during baseline studies, including five detections within the LAA. Habitats rated as high suitability for this species include burns ≤30 years old, fens, stunted coniferous forests, and high elevation sparse/open coniferous forests. Thirty-four percent of the LAA is considered high suitability habitat for Olive-sided Flycatchers (**Map D13–D15** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**). High suitability habitat was concentrated in the Coffee and upper Maisy May creek and Eureka Ridge/Henderson Dome areas, where there is a prevalence of older burns and stunted coniferous forests.

Short-eared Owl — Short-eared Owl is listed federally as a species of Special Concern by COSEWIC due to a persistent population decline over the last 40 years, and is included on Schedule 1 of SARA (COSEWIC 2008). It is also a priority species for conservation in BCR 4 and is considered Vulnerable in Yukon (EC 2013; YCDC 2015a). Short-eared Owls are summer residents in Yukon; the first spring migrants arrive in early May and breeding occurs throughout May, June, and early July with birds heading back to their wintering grounds by the end of July (Rousseu and Drolet 2015). Short-eared Owls are associated with a wide variety of open habitats including bogs, marshes, grasslands, fallow pastures, and alpine and Arctic tundra (Sinclair et al. 2003; COSEWIC 2008; Wiggins et al. 2006). They occasionally breed in agricultural fields, but their breeding success is generally lower. Although Short-eared Owls show a clear preference for open habitats, the primary factor influencing nest site selection is prey abundance. The species is widespread across Yukon Arctic tundra, from the Coastal Plain and Hershel Island to the Old Crow Flats.

During the Project baseline studies, one Short-eared Owl was observed during the 26 Short-eared Owl surveys conducted in 2014 (three surveys), 2015 (22 surveys), and 2016 (7 surveys) of the mine area and NAR. All surveys were conducted in mid- to late-June. The one Short-eared Owl detected was observed flying high over the Java Road ridge (i.e. the current exploration road between the Yukon River and the proposed mine site), heading southwest. The nature of the flight appeared to be a long-distance movement, and there was no evidence to suggest the owl was actively using the area. Subalpine and alpine shrub areas dominated by dryas/sparse herbs, low/dwarf shrubs, or ground cover were rated as high suitability for this species. Habitat modelling identified only 372 ha of these habitat types within the LAA (1% of the total area; **Map D4–D6** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**); this habitat is almost entirely limited to the Coffee area in the southern portion of the baseline field study LSA.

3.3.5 WETLAND-ASSOCIATED SPECIES AT RISK

Wetland-associated species at risk include Horned Grebe, Red-necked Phalarope, and Rusty Blackbird. These species are representative of all bird species that use wetland or riverine habitats such as marshes, bogs, swamps, fens, ponds, lakes, small streams, or large rivers.

Horned Grebe — The western population of Horned Grebe is listed federally as a species of Special Concern by COSEWIC due to both short-term and long-term population declines (COSEWIC 2009). Horned Grebe are summer residents in Yukon; the first spring migrants arrive in late May and breeding occurs throughout June and July with birds heading back to their wintering grounds by the end of July (Rousseu and Drolet 2015). Breeding habitat for Horned Grebe in Yukon consists of small lakes and ponds with marshy margins (Sinclair et al. 2003). Suitable breeding ponds require open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young at breeding sites (COSEWIC 2009; Stedman 2000). Horned Grebe use a range of pond sizes for breeding, but typically prefer ponds between 0.3 ha and 2 ha in size. Pairs are territorial and defend an area <1 ha in size; most pairs are solitary, but colonies of up to 20 pairs have been found on large ponds with abundant food resources.

Horned Grebes were detected at two ponds along lower Dominion Creek during baseline studies, including one active nest located on an old placer mining pond and a pair of likely breeders at a natural pond along Dominion Creek. There were no detections within the LAA. Surveys in the Indian River Valley noted four breeding pairs of Horned Grebe on old placer mining ponds (Chevreux 2014). Wetland mapping was used to identify potential breeding habitat for Horned Grebes. Due to the relatively small number of suitable ponds for breeding, all ponds and marshes (natural and artificial) were assumed to be suitable for these species. There are 35 marshes and small ponds within the LAA, with a total area of 140 ha (<1% of LAA; **Map D1–D3** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**), that could provide suitable nesting habitat for Horned Grebe.

Red-necked Phalarope — Red-necked Phalarope is listed federally as a species of Special Concern by COSEWIC, based primarily on expert opinion that there has been a long-term population decline (COSEWIC 2014). Notable declines have been observed at a key staging ground in eastern Canada and also on the Arctic breeding grounds, including the Yukon North Slope. Red-necked Phalarope are summer residents in Yukon; the first spring migrants arrive in late May and breeding occurs throughout June and early July with birds heading back to their wintering grounds by mid-July (Rousseu and Drolet 2015). Red-necked Phalaropes breed in the low arctic and subarctic in wetlands and near lakes, pools, or small streams in areas dominated by grasses and sedges, emergent aquatic vegetation, and open freshwater (COSEWIC 2014; Rubega et al. 2000). Primary breeding habitat in Yukon includes wet sedge tundra with small scattered ponds (Sinclair et al. 2003).

Red-necked Phalarope was not detected within the region surrounding the Project area during baseline studies. Bird surveys in the Indian River Valley, adjacent to the LAA, documented two pairs of Red-necked Phalaropes on an “unmined pond” that were probable breeders (Chevreux 2014). Habitat mapping for Red-necked Phalarope was the same as for Horned Grebe (described above) based on overlapping habitat requirements for breeding.

Rusty Blackbird — Rusty Blackbird is listed federally as a species of Special Concern by COSEWIC due to a population decline of approximately 86% between 1966 and 2003 (COSEWIC 2006). Rusty Blackbirds are summer residents in Yukon; the first spring migrants arrive in mid-May and breeding occurs throughout late May, June, and early July with birds heading back to their wintering grounds by mid-July (Rousseu and Drolet 2015). Rusty Blackbirds in Yukon breed in wetland habitats such as marshes, swamps, peat bogs, beaver ponds, slow-moving streams, and back channels (Sinclair et al. 2003; COSEWIC 2006). Nests are often in close proximity to water in areas with dense marsh vegetation including grasses, shrubs, and standing dead trees. Wetlands suitable for nesting are generally larger than 0.5 ha (Powell et al. 2010b). In the Dempster Highway region, Frisch (1987) described its habitat as “brushy bog near still water” and at Swan Lake near Whitehorse, Grunberg (1994) noted that it was typically located along the forest edge adjacent to the lake.

Rusty Blackbirds were detected at eight different sites during baseline studies. All detections were outside of the LAA, although there were five detections at two wetlands along the Stewart River that are within 2 km of the LAA. During breeding bird surveys along the Indian River during 2014, Chevreux (2014) noted that the species was encountered frequently in both post-mined and unmined habitats with evidence of probable breeding in both habitat types. Habitats rated as high suitability for Rusty Blackbirds include swamps and marshes with fens. In addition to these habitat ratings, all areas located with 75 m of wetlands and ponds (marsh, swamp, pond, placer pond) were also rated as high suitability. Habitat mapping identified <1% (394 ha) of the LAA as high suitability habitat for Rusty Blackbird (**Map D16**–**D18** in **Appendix D** of the Bird Baseline Report, **Appendix 17-A**).

3.3.6 BANK SWALLOW

Bank Swallow is listed federally as Threatened by COSEWIC due to a population decline of approximately 98% between 1970 and 2011 (COSEWIC 2013). Bank Swallow is also considered a species of conservation concern in Yukon (YCDC 2015a). Bank Swallows are summer residents in Yukon; the first spring migrants arrive in late May and breeding occurs throughout June and July with birds heading back to their wintering grounds in early August (Rousseu and Drolet 2015). As with other portions of its breeding range, Bank Swallows in Yukon use both natural and artificial habitats for nesting. Natural nesting sites typically include steep embankments comprised of sand, silt, or clay where the swallows can excavate burrows for nesting sites. These nesting areas are typically located adjacent to waterways, particularly large rivers; nesting colonies can range from less than half a dozen burrows to hundreds of burrows. Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse). In Yukon, nesting colonies in artificial habitats are much less frequent than those in natural habitats. With all colonies, it is not uncommon to observe some that are inactive or portions of some colonies not being used; the reason for this pattern is unknown and it is unclear if inactive colonies may become active in the future. The observation of large foraging flocks away from breeding areas is a common occurrence, particularly in wetland habitats up to 2 km away from nesting colonies.

Bank Swallow surveys were conducted between 2014 and 2016 to document the location and status of colonies that might be influenced by Project activities. Surveys were conducted on foot and consisted of standardized point counts during the breeding season, incidental observations, and a visual search of suitable habitats for Bank Swallow colonies (e.g., river banks, cut banks, road embankments). Twelve Bank Swallow colonies were recorded within the RAA, seven of which were also located within the LAA (**Table 3.3-3; Maps C10**–**C12** in **Appendix C** of the Bird Baseline Report, **Appendix 17-A**). Of the seven colonies recorded within the LAA, one was located in natural habitats (river or stream bank) and six were found in man-made habitats such as road embankments and cut banks. The colonies recorded near the Indian and Eureka rivers and Baker Creek Road were located within the proposed NAR footprint. Bank Swallows were also detected within the LAA and RAA during point counts and incidental observations. These observations mostly included single birds or small groups of birds up to four individuals. One observation of >10 individuals was made on a point count in an area disturbed by placer mining activity near the Indian River bridge.

Table 3.3-3 Bank Swallow Colony Sites Identified in the Coffee Gold Mine Project RAA

Colony ID	Colony Status	General Location	Habitat Type	Located within LAA
BANS_1	Active	Stewart River	Natural river bank	No
BANS_2	Active	Upper Ballarat Creek	Stream bank, placer mined area	No
BANS_3	Active	Upper Ballarat Creek	Stream bank, placer mined area	No
BANS_4	Unknown	Black Hills Creek	Cutbank, placer mined area	No
BANS_5	Unknown	Lower Sulphur Creek	Road embankment	Yes
BANS_6[1]	Inactive	Eureka Creek	Cutbank, placer mined area	Yes
BANS_7[1]	Active	Indian River	Cutbank, placer mined area	Yes
BANS_8	Active	Bullfrog Creek	Cutbank, placer mined area	No
BANS_9[1]	Inactive	Coffee Creek Airstrip	Road embankment	Yes
BANS_10	Inactive	Ballarat Creek Barge Landing	Stream bank	Yes
BANS_12[1]	Unknown	Barker Creek Road	Road embankment	Yes
BANS_13[1]	Unknown	Barker Creek Road	Road embankment	Yes

[1] Located within the proposed Project footprint for the mine site or NAR.

4.0 ASSESSMENT OF PROJECT-RELATED EFFECTS

This section evaluates potential Project-related interactions with Birds and Bird Habitat, identifies the potential adverse effects expected to arise from those interactions, describes mitigation measures that will be implemented to eliminate, reduce, or otherwise control the effects, and identifies and evaluates residual effects, including their significance. The assessment of effects involved the following steps:

- **Section 4.1**: Identification of potential Project-related interactions on Birds and Bird Habitat
- **Section 4.2**: Introduction to potential Project-related effects on the Birds and Bird Habitat
- **Section 4.3**: Identification of mitigation measures relevant to all Birds and Bird Habitat
- **Section 4.4**: For each subcomponent, an assessment of potential effects, subcomponent specific mitigation measures, residual effects, and a summary of Project-related residual effects.

4.1 POTENTIAL PROJECT-RELATED INTERACTIONS WITH BIRDS AND BIRD HABITAT

Potential Project-related interactions were assessed for Birds and Bird Habitat as a VC because subcomponents are expected to share similar mechanisms for effects. Each potential interaction between Birds and Bird Habitat and Project activities was considered and rated using the terms defined in **Table 4.1-1**. The rating of each Project-related interaction is shown in **Table 4.1-2**. Available TK was incorporated into this assessment. As an example, Bates and DeRoy (2014) identified the following as potential Project-related interactions that could be applicable for Birds and Bird Habitat:

- "*Land clearing for Project operations and road construction potentially causing animal habitat destruction and fragmentation and limiting animal movement across the landscape*
- *Potential disturbance of animals due to noise and traffic during Project operation, causing them to move away from the area or change movement patterns*
- *Construction work on the Project bringing more people into the area, and familiarizing them with good hunting locations, which would potentially increase hunting pressure on wildlife populations."*

The potential effects resulting from the Project-related interactions are discussed further in **Section 4.2**.

Table 4.1-1 Potential for an Interaction between Birds and Bird Habitat and the Project

Term	Definition
No Interaction	Project activity will not interact with the Birds and Bird Habitat.
Negligible Interaction	Interaction with the Project activity will not have a substantive influence on the short- or long-term integrity of Birds and Bird Habitat (i.e., not measurable / not detectable using the identified indicator(s)).
Potential Interaction	Interaction between the Project activity and Birds and Bird Habitat may have a substantive influence on the short- or long-term integrity of Birds and Bird Habitat (i.e., measurable or detectable using the identified indicator). The potential effect(s) of the interaction is considered further in the effects assessment.

Table 4.1-2 Potential Project Interactions with Birds and Bird Habitat

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Construction				
Overall Mine Site	C-0	Confirmatory geotechnical drilling in select areas at the mine site, as necessary	Potential interaction	Areas in which drilling will occur overlap spatially with wildlife habitat and adverse effects reduced use of adjacent habitat due to sensory disturbances (e.g., noise, equipment movement) while drills are mobilized and operating.
	C-1	Mobilization of mobile equipment and construction materials	Potential interaction	Adverse effects include potential increased mortality risk due to bird collisions with vehicles, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with hauling.
	C-2	Clearing, grubbing, and grading of areas to be developed within the mine site	Potential interaction	Areas in which clearing will occur overlap spatially with bird habitat and adverse effects include loss of habitat within the footprint, reduced use of adjacent habitat due to sensory disturbances (e.g., noise, equipment movement, dust), and potential disruption to natural movement patterns due to habitat loss and sensory disturbances during clearing, grubbing and grading.
	C-3	Material handling	Potential interaction	Adverse effects include potential increased mortality risk due to bird collisions, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with material handling.
Open Pits	C-4	Development of Latte pit and Double Double pit	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to development of the open pits.
	C-5	Dewatering of pits (as required)	No interaction	Areas in which activities occur overlap with wildlife habitat, but no Project-related changes to bird habitat or behaviour are anticipated from this activity.
Waste Rock Storage Facilities	C-6	Development and use of Alpha WRSF	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include loss of habitat and reduced use of habitat due to sensory disturbances from operational activities at the facilities.
Stockpiles	C-7	Development and use of temporary organics stockpile for vegetation and topsoil	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from machinery operation during construction of the stockpile areas.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
	C-8	Development and use of frozen soils storage area	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from machinery operation during construction of the stockpile areas.
	C-9	Development and use of run-of-mine (ROM) stockpile for temporary storage of ROM ore	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from machinery operation during construction of the stockpile areas.
Crusher System	C-10	Construction and operation of crushing circuit	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from construction and operation of the crushing circuit.
	C-11	Construction and operation of crushed ore stockpile	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from construction and operation of the crushing circuit.
Heap Leach Facility	C-12	Staged heap leach facility (HLF) construction, including associated event ponds, rainwater pond, piping, and water management infrastructure	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to staged construction.
	C-13	Heap leach pad loading	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with heap leach pad loading.
Plant Site	C-14	Construction and operation of process plant	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with installation of process plant.
	C-15	Construction and operation of reagent storage area and on-site use of processing reagents	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the storage area.
	C-16	Construction and operation of laboratory, truck shop, and warehouse building	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the facilities.
	C-17	Construction and operation of power plant	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the facilities.
	C-18	Construction and operation of bulk fuel/LNG storage and on-site use of diesel fuel or LNG	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the facilities.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Camp Site	C-19	Construction and operation of dormitories, kitchen, dining, and recreation complex buildings; mine dry and office complex; emergency response and training building; fresh (potable) water and fire water use systems; and sewage treatment plant	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the facilities.
	C-20	Construction and operation of waste management building and waste management area	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities associated with construction of the facilities.
Bulk Explosive Storage Area	C-21	Construction of storage facilities for explosives components and on-site use of explosives	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from construction and blasting noise and operational activities associated with construction of the facilities.
Mine Site and Haul Roads	C-22	Upgrade, construction, and maintenance of mine site service roads and haul roads	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from dust, noise and movement associated with road servicing.
Site Water Management Infrastructure	C-23	Development and use of sedimentation ponds and conveyance structures, including discharge of compliant water	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to development of ponds and conveyance structures.
	C-24	Initial supply of HLF process water	No interaction	Areas in which activities occur overlap with bird habitat, but no Project-related changes to bird habitat or behaviour are anticipated from this activity.
	C-25	Ongoing use of site contact water (i.e., precipitation, stored rainwater) as HLF process water	No interaction	No Project-related changes to bird habitat or behaviour are anticipated from this activity within the footprint of the Mine Site.
Ancillary Components	C-26	Upgrade of existing road sections for Northern Access Route (NAR), including installation of culverts and bridges	Potential interaction	Areas in which upgrades will occur overlap spatially with bird habitat and adverse effects include loss of habitat within the footprint, reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement, dust), and potential disruption to natural movement patterns due temporary barriers and sensory disturbances during upgrading activities.
	C-27	Construction of new road sections for NAR, including installation of culverts and bridges	Potential interaction	Areas in which new construction will occur overlap spatially with bird habitat and adverse effects include loss of habitat within the footprint, reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement, dust), and potential disruption to natural movement patterns due to barriers and sensory disturbances during construction activities.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
	C-28	Development, operation, and maintenance of temporary work camps along road route	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and activities associated with construction and presence of the camp. Potential reduced use of site-specific features such as mineral licks or game trails.
	C-29	Vehicle traffic, including mobilization and re-supply of freight and consumables	Potential interaction	Adverse effects include potential increased mortality risk due to bird collisions, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with road traffic.
	C-30	Development, operation, and maintenance of barge landing sites on Yukon River and Stewart River	Potential interaction	Areas in which development and operation will occur overlap spatially with bird habitat and adverse effects include loss of riparian habitat within the footprint, reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement) during construction and operation of the barge landings.
	C-31	Barge traffic on Stewart River and Yukon River, including barge mobilization of equipment for NAR construction	Negligible interaction	Infrequent sensory disturbance in habitat adjacent to Stewart and Yukon Rivers will not be a substantive influence on the short or long-term integrity on the habitat adjacent to the river.
	C-32	Annual construction, operation, maintenance, and removal of Stewart River and Yukon River ice roads	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with annual construction, operation, maintenance and removal of ice roads on Stewart and Yukon rivers.
	C-33	Annual construction and operation of winter road on the south side of the Yukon River	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with annual construction, operation, maintenance and removal of winter road.
	C-34	Construction, operation, and maintenance of permanent bridge over Coffee Creek	Potential interaction	Areas in which construction will occur overlap spatially with bird habitat and adverse effects include loss of habitat within the footprint, and reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement) during construction.
	C-35	Construction and maintenance of gravel airstrips	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from dust, noise and movement associated with construction and maintenance of gravel airstrip.
	C-36	Air traffic	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise on approach and take-off, dust, noise and movement associated with air traffic operations.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
	C-37	Use of all laydown areas	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with use of areas.
	C-38	Use of Coffee Exploration Camp	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with use of the camp.
Operation				
Overall Mine Site	O-1	Material handling	Potential Interaction	Adverse effects include potential increased mortality risk due to bird collisions, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with material handling.
	O-2	Excavation of contaminated soils followed by on-site treatment or temporary storage and off-site disposal	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with excavation, and potential increased mortality risk from bird collisions associated with off-site transport for disposal.
	O-3	Progressive reclamation of disturbed areas within mine site footprint	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to reclamation activities.
Open Pits	O-4	Development of Kona pit and Supremo pit and continued development of Double Double pit and Latte pit	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to development of the open pits.
	O-5	Cessation of mining at Double Double pit, Latte pit, Kona pit, and Supremo pit	Negligible interaction	Considering that most effects on birds are realized during construction and development of the pits, there is likely reduced sensory disturbances in adjacent habitats as development activities (e.g., blasting, heavy equipment operation) are reduced during temporary and permanent closure.
	O-6	Partial backfill of Latte pit and Supremo pit	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to backfill of the open pits.
	O-7	Backfill of Double Double pit and Kona pit	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to backfill of the open pits.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
	O-8	Dewatering of pits (as required)	No interaction	Areas in which activities occur overlap with bird habitat, but no Project-related changes to bird habitat or behaviour are anticipated from this activity.
Waste Rock Storage Facilities	O-9	Continued development and use of Alpha WRSF	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include loss of habitat and reduced use of habitat due to sensory disturbances from operational activities at the facilities.
	O-10	Development and use of Beta WRSF	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include loss of habitat and reduced use of habitat due to sensory disturbances from operational activities at the facilities.
Stockpiles	O-11	Continued use of temporary organics stockpile for vegetation and topsoil	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include reduced use of habitat due to sensory disturbances from operational activities at the stockpile.
	O-12	Continued use of frozen soils storage area	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include reduced use of habitat due to sensory disturbances from operational activities at the storage area.
	O-13	Continued use of ROM stockpile for temporary storage of ROM ore	Potential interaction	Areas in which this activity will occur overlap spatially with bird habitat and adverse effects include reduced use of habitat due to sensory disturbances from operational activities at the stockpile.
Crusher System	O-14	Crusher operation	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances, like noise, from construction and operation of the crushing circuit.
	O-15	Continued use of crushed ore stockpile	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise and dust associated with machinery activity during use of crushed ore stockpile

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Heap Leach Facility	O-16	Continued staged HLF construction, including related water management structures and year-round operation	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to staged construction, addition of event pond and site activities.
	O-17	Progressive closure and reclamation of HLF	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with closure and reclamation.
Plant Site	O-18	Process plant operation	Negligible interaction	The operation of the plant itself (e.g., regular activities within an enclosed structure), within the context of sensory disturbances associated with combined site activities, will not have an influence on use of adjacent habitats.
	O-19	Continued on-site use of processing reagents	Negligible interaction	Continued use of reagents within the constructed footprint of the Project will not interact with birds.
	O-20	Continued on-site use of diesel fuel or LNG	Negligible interaction	Continued use of fuel within the footprint of the Project will not interact with birds.
Camp Site	O-21	Continued use of facilities	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from blasting noise.
Bulk Explosive Storage Area	O-22	Continued on-site use of explosives	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from blasting noise.
Mine Site and Haul Roads	O-23	Use and maintenance of mine site service roads and haul roads	Potential interaction	Adverse effects include potential increased mortality risk due to bird collisions with vehicles, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with traffic.
Site Water Management Infrastructure	O-24	Continued use of sedimentation ponds conveyance structures	Negligible interaction	Considering that most effects on birds are realized during construction of the conveyance structures within the footprint, their continued use has no interaction with birds in adjacent habitat.
	O-25	Ongoing use of site contact water (i.e., precipitation, stored rainwater) as HLF process water	No interaction	No Project-related changes to bird habitat or behaviour are anticipated from this activity within the footprint of the Mine Site.
	O-26	Installation and operation of water treatment facility for HLF rinse water	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and operational activities related to construction and operation of the water treatment facility.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Ancillary Components	O-27	NAR road maintenance (e.g., aggregate re-surfacing, sanding, snow removal)	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement, dust), and potential disruption to natural movement patterns due to seasonal barriers (e.g., snow banks).
	O-28	NAR vehicle traffic, including mobilization and re-supply of freight and consumables	Potential Interaction	Adverse effects include potential increased mortality risk due to bird collisions, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with road traffic.
	O-29	Operation and maintenance of barge landing sites on Stewart River and Yukon River	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement) during operation and maintenance at the barge landings.
	O-30	Barge traffic on Stewart River and Yukon River	Negligible interaction	Infrequent sensory disturbance in habitat adjacent to Stewart and Yukon Rivers will not habitat a substantive influence on the short or long-term integrity on the habitat.
	O-31	Annual construction, operation, maintenance, and removal of Stewart River and Yukon River ice roads	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with annual construction, operation, maintenance and removal of ice roads on Stewart and Yukon rivers.
	O-32	Annual construction and operation of winter road on the south side of the Yukon River	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with annual construction, operation, maintenance and removal of winter road.
	O-33	Operation and maintenance of gravel air strips	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from dust, noise and movement associated with operation and maintenance of gravel airstrip.
	O-34	Air traffic	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise on approach and take-off, dust, noise and movement associated with air traffic operations.
	O-35	Use of all laydown areas	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with use of areas.
	O-36	Use of Coffee Exploration Camp	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with use of the camp.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Reclamation and Closure				
Overall Mine Site	R-1	Reclamation of disturbed areas within mine site footprint	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with closure and reclamation of the Mine Site footprint. Positive effects include use of early successional habitats for foraging by birds.
	R-2	Excavation of contaminated soils followed by on-site treatment or temporary storage and off-site disposal	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with excavation.
Open Pits	R-3	Reclamation of Double Double pit, Latte pit, Supremo pit, and Kona pit	Negligible interaction	Considering that most effects on birds are realized during construction and development of the pits, there is likely reduced sensory disturbances in adjacent habitats as development activities (e.g., blasting, heavy equipment operation) are reduced.
Waste Rock Storage Facilities	R-4	Reclamation of Alpha WRSF	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with reclamation.
	R-5	Reclamation of Beta WRSF	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with reclamation.
Stockpiles	R-6	Reclamation of temporary organics stockpile, frozen soils storage area, and ROM stockpile	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with reclamation and dismantling of stockpiles.
Crusher System	R-7	Dismantling and removal of crusher facility and stockpile	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with dismantling and removal of the crusher.
Heap Leach Facility	R-8	Closure of HLF and related water management structures	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with closure of the HLF and related structures.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
Plant Site	R-9	Dismantling and removal of process plant, reagent storage area, laboratory, truck shop and warehouse building, power plant, and bulk fuel storage	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with dismantling of the structure.
Camp Site	R-10	Dismantling and removal or dormitories and kitchen, dining, and recreation complex buildings, mine dry and office complex, emergency response and training building, fresh (potable) water and fire water systems, sewage treatment plant, and waste management building	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with dismantling and removal.
Bulk Explosive Storage Area	R-11	Dismantling and removal of explosives storage facility	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with dismantling and removal.
Mine Site and Haul Roads	R-12	Decommissioning and reclamation of mine site service roads and haul roads	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with decommissioning and reclamation of roads.
Site Water Management Infrastructure	R-13	Decommissioning and reclamation of selected water management infrastructure, construction of long-term water management infrastructure, including water deposition to creek systems	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with decommissioning of infrastructure, construction on long term infrastructure.
	R-14	Operation and maintenance of HLF water treatment facility	Negligible interaction	The operation of the facility itself (e.g., regular activities within an enclosed structure) will not have an influence on use of adjacent habitats.
	R-15	Decommissioning and removal of HLF water treatment plant	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with dismantling and removal.
Ancillary Components	R-16	NAR road maintenance (e.g., aggregate re-surfacing, sanding, snow removal)	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement, dust), and potential disruption to natural movement patterns due to seasonal barriers (e.g., snow banks).
	R-17	NAR vehicle traffic	Potential Interaction	Adverse effects include potential increased mortality risk due to bird collisions, and reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with road traffic.

Project Component	Project Activities		Interaction Rating	Nature of Interaction and Potential Effect on Wildlife
	#	Description		
	R-18	Operation and maintenance of barge landing sites on Stewart River and Yukon River	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances (e.g., noise, movement) during operation and maintenance at the barge landings.
	R-19	Annual resupply of consumables and materials for active closure via barge on the Yukon River	Negligible Interaction	Infrequent sensory disturbance in habitat adjacent to Stewart and Yukon Rivers will not habitat a substantive influence on the short or long-term integrity on the habitat.
	R-20	Annual construction, maintenance, and decommissioning of Stewart River and Yukon River ice roads	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise associated with annual construction, operation, maintenance and removal of ice roads on Stewart and Yukon rivers.
	R-21	Decommissioning of new road portions	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with decommissioning of road.
	R-22	Air traffic	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise on approach and take-off, dust, noise and movement associated with air traffic operations.
	R-23	Decommissioning and reclamation of airstrip	Potential Interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances like noise, dust and movement from activities associated with decommissioning of airstrip. Longer-term benefit of early seral stage habitats for foraging.
	R-24	Re-opening and operation of pre-existing Yukon River exploration camp and airstrip to support post-closure monitoring activities	Potential interaction	Adverse effects include reduced use of adjacent habitat due to sensory disturbances from noise and movement associated with use of the camp.
Post-Closure				
Overall Mine Site	P-1	Long-term monitoring	Negligible Interaction	Occasional presence of humans on site will have an adverse effect on some birds due to sensory disturbance (e.g., movement, noise).

4.2 POTENTIAL PROJECT-RELATED EFFECTS

Potential Project-related adverse effects on Birds and Bird Habitat were identified based on Project-related interactions (**Table 4.1-2**). The potential effects are described below as they relate to the subcomponents: Sharp-tailed Grouse, cliff-nesting raptors, passerines, upland-associated species at risk, wetland-associated species at risk, and Bank Swallow. Potential effects that only relate to some of these subcomponents are identified. The phases during which each potential effect is expected to occur are identified. Effects assessments were completed specifically for each subcomponent in **Section 4.4**.

4.2.1 HABITAT LOSS

Habitat loss will result from the ground clearing and vegetation removal required for the Project footprint during the Construction Phase and during the Operation Phase with the continued development of WRSFs and of habitat compensation areas (e.g., fish, vegetation), if required. Habitat loss is considered a potential Project-related effect for all Birds and Bird Habitat subcomponents. The effects assessment was focussed on breeding habitat. Breeding habitat was anticipated to be the most limiting habitat and is expected to have the greatest potential consequence to the subcomponents as a result of Project-related effects. Therefore, the potential Project-related effect of habitat loss is in relation to potential loss of breeding habitat for all Birds and Bird Habitat subcomponents. For cliff-nesting raptors and Bank Swallow, breeding habitat was considered in the context of individual nest sites or colony sites, whereas for passerines and upland- and wetland-associated species at risk, breeding habitat was considered in the context of breeding habitat suitability, based on habitat suitability modeling (Bird Baseline Report, **Appendix 17-A**).

Note: Since the assessment of Project effects to Birds and Bird Habitats was completed, minor shifts in the location of Project infrastructure at the proposed Mine Site have occurred. The final Project footprint differs from the assessed footprint by:

- 0.26 km^2 assessed as loss no longer overlap the Project footprint;
- 1.73 km^2 not assessed as loss are now located within the footprint.

The affected areas overlap the boreal high – subalpine transition zone and are primarily located within zonal and nutrient poor sites dominated by scrub birch, black spruce, white spruce and other shrub species. Review by VC report authors indicated that the minor shifts in Project infrastructure have no effect on the assessment of cliff-nesting raptors and Bank Swallow, and would not alter the Project effects assessment in any meaningful way for any of the other Bird Subcomponents assessed.

4.2.2 REDUCED HABITAT EFFECTIVENESS

Reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust, potential emissions, air, and barge traffic) may result in areas adjacent to the Project footprint being avoided or used less for breeding by birds or may increase the risk of stress or abandonment of already established nest

sites. Reduced habitat effectiveness is an anticipated effect for all Birds and Bird Habitat subcomponents and may occur during Construction, Operation, and Reclamation and Closure phases when Project activities are occurring. For cliff-nesting raptors and Bank Swallow, breeding habitat was considered in the context of individual nest sites or colony sites, whereas for passerines and upland- and wetland-associated species at risk, breeding habitat was considered in the context of breeding habitat suitability, based on habitat suitability modeling (Bird Baseline Report, **Appendix 17-A**).

4.2.3 MORTALITY RISK

Mortality risk due to collisions with all types of vehicles associated with the Project on mine site roads and the NAR is considered a potential Project-related effect on all Birds and Bird Habitat subcomponents since all birds have the potential to encounter vehicles. Since vehicles will be in use for the majority of the Project life, mortality risk is a potential Project-related effect during Construction, Operation, and Reclamation and Closure phases. Risk of collision with aircraft is considered unlikely due to Project design features (**Section 4.3.1**) and the lack of open water habitat in proximity to the airstrip.

4.2.4 CONTAMINANTS UPTAKE

Contaminants uptake and risk of illness or mortality from birds using event ponds as resting areas is a potential Project-related effect that may occur during the Construction and Operation phases (Project design does not include barren or pregnant solution ponds). Wetland-associated species at risk may interact with these Project-related facilities; other subcomponent species and bird groups do not use open water.

Contaminants uptake and risk of illness or mortality from birds landing in wastewater ponds or scavenging in the Project landfill will be eliminated via Project design. Wastewater will be managed within containers and will not provide a potential attractant to wetland-associated birds. In addition, only non-organic, non-hazardous waste will be placed in the Project landfill, which will eliminate the potential attraction of scavenger birds to the landfill and the potential uptake of hazardous materials. Hazardous waste will be sorted by material type and temporarily stored in sealed containers in an enclosure prior to being hauled off-site.

4.2.5 DAMAGE OR DESTRUCTION OF NESTS

The risk of damage or destruction of active nests during clearing activities and road upgrades is considered a potential Project-related effect for all Birds and Bird Habitat subcomponents. Activities that could risk damage or destruction of active nests will occur during the Construction and Operation phases of the Project.

4.3 MITIGATION MEASURES

Mitigation measures comprise any practical means used for the elimination, reduction, or control of potential adverse effects and may include applicable standards, guidelines, and BMPs supported by specific guidance documents. The mitigation measures identified for Birds and Bird Habitat were informed by a review of mitigation and follow-up programs undertaken for past projects, with emphasis on mining projects in Yukon. Input was received through the consultation and engagement process described in **Section 1.1**. Tr'ondëk Hwëch'in provided input (N. Becker, pers. comm. 2016) on the Wildlife Protection Plan (WPP; **Appendix 31-F**), which is a key conceptual plan that directs how mitigation would be implemented for the Project. The WPP details the main mitigation actions and compliance and follow-up monitoring relevant to reducing effects on Birds and Bird Habitat. The WPP will be used and updated as an operational document as the Project moves through Construction, Operation, and Reclamation and Closure.

In addition to the WPP, the following documents also have components that provide mitigation measures that will minimize effects on Birds and Bird Habitat:

- Conceptual Reclamation and Closure Plan (**Appendix 31-C**) — provides guidance and best practices for revegetation and reclamation of habitat for future bird use, including the removal of infrastructure, waste rock pile re-contouring, and decommissioning of settling ponds, ditches, and roads.
- A dust management plan will provide information on fugitive dust dispersal as well as management and mitigation measures. Reducing effects to habitat adjacent to the Project footprint involves controls on dust that might settle on vegetation used as habitat for birds.
- Access Route Construction (**Appendix 31-A**) and Operational (**Appendix 31-B**) Management Plans — provide details on the construction and operation of the NAR including mitigation and monitoring for dust control measures, and habitat management along the proposed road alignment. Also includes traffic management measures to reduce mortality risk related to vehicle collisions with wildlife, including birds.
- A fish and aquatic habitat management plan will provide information on mitigation and management measures to reduce effects to fish and aquatic habitat. Measures to protect fish and aquatic habitat will benefit birds (e.g. cliff-nesting raptors and wetland-associated species at risk) that use this habitat for foraging and nesting.
- A noise management plan will provide information on mitigation and management measures and a noise monitoring plan to reduce Project-associated noise which will avoid unnecessary potential disturbance to birds.
- A spill contingency plan will provide information on operational procedures and mitigation and management measures related to spills and how these measures will reduce effects to wildlife and wildlife habitat, including birds.
- A vegetation management plan will provide information on the mitigation measures and monitoring relevant to reducing effects on vegetation which is used as foraging and nesting habitat for birds.

- A waste management plan will provide information on waste management related to the Project landfill and wastewater treatment plant including mitigation and management procedures for storing and disposing of waste and reducing effects to wildlife (including birds) that are attracted to these areas.

To inform the Proponent, First Nations, regulators, and stakeholders about mitigation effectiveness and Project effects, the mitigation framework is supported by a Project effects monitoring framework, described in **Section 7.0**, and described further in the WPP (**Appendix 31-F**).

The Proponent recognizes that there will be disturbances and effects on Birds and Bird Habitat as a result of Construction, Operation, and Reclamation and Closure of the Project. To reduce or eliminate potential Project effects on Birds and Bird Habitat, the Proponent commits to a number of mitigation measures. Each of the following subsections provides a brief list of the pertinent mitigation measures and makes reference to relevant management or protection plans where details are provided on how the mitigation will be implemented. When relevant, a description of the feasibility and expected effectiveness of the mitigation measure, including its suitability for Project- and site-specific application is provided. When possible, supporting evidence (including how long it will take to become effective), any associated uncertainty, and the potential risks and consequences if the mitigation measure is not effective are also identified.

4.3.1 PROJECT DESIGN

Mitigation through project design is one of several approaches the Proponent is proposing to eliminate, reduce, or control potential effects to birds. Minimizing the Project footprint will be achieved through multiple elements, in particular by routing the NAR to overlap with existing roads. The design elements with direct relevance to mitigating potential Project effects on Birds and Bird Habitat are: Project siting to avoid sensitive/important bird habitat, use of a HLF to minimize the area required for ore processing, progressive reclamation, selective siting of WRSF, timing of first lifts, and minimizing vehicle traffic.

Project Siting

- To minimize habitat loss, the Mine Site footprint is designed to be as small as possible. Examples of considerations to minimize the footprint include the backfill of pits and WRSF design.
- To minimize disturbance to birds, where Project design allows, infrastructure areas, laydown areas and borrow sources will be constructed away from identified environmentally sensitive areas (e.g., open-water wetlands).

  Avoiding sensitive habitat will reduce direct habitat loss and sensory disturbance to birds
- Avoiding clearing wildlife trees where practicable will reduce direct habitat loss because these features provide nesting and roosting sites for many bird species. Leaving wildlife trees standing where practicable addresses input provided by TH (N. Becker, Pers. Comm. 2016).
- Proximity to open water habitats can increase the risk of collisions; gulls, terns, and waterfowl are the species most commonly involved in reported bird strikes in Canada and the US (Transport Canada 2004).

The airstrip is located more than 4 km from and approximately 700 metres above the Yukon River, which is the dominant open water habitat in the area. This location will reduce the risk of mortality to birds caused by air traffic by preventing air traffic from being centered near locations likely to host a high density of birds.

Heap Leach Facility

- A smaller footprint will reduce direct habitat loss to birds and will minimize reduced habitat effectiveness.
- To prevent process solution (contact water) affecting bird habitat retained in the Project footprint, a redundant system of liners, drainage layers, leak detection and monitoring systems will be in place (refer to the Water Management Plan, **Appendix 31-E**).

Progressive Reclamation

- Progressive reclamation and closure activities will begin as early as Year 2 and continue throughout the mine life. An early and progressive approach to reclamation will reduce the duration of direct habitat loss and sensory disturbance to birds.
- Natural vegetation will be maintained where possible to minimize direct habitat loss and limit erosion and sedimentation. Retained vegetation also decreases the amount of reclamation required at closure.

Waste Rock Storage Facilities

- WRSF sites were selected to minimize haul distances and extent of ground disturbance.
- Minimizing haul distance will reduce the risk of mortality to birds caused by vehicles. It will reduce the level of dust and noise, thereby minimizing reduction to habitat effectiveness.

Minimizing Vehicle Traffic

- Adverse effects to birds from vehicle collisions are specifically addressed through Project design mitigation measures including minimizing vehicle traffic, setting speed limits along the NAR, and siting of the airstrip. These considerations have multiple mitigation outcomes for birds for the following reasons:

  Traffic volume and speed are strongly correlated with wildlife collision rates (Bishop and Brogan 2013) and adverse effects to birds in this regard are addressed within the Project proposal. Managing vehicle traffic at low levels (i.e., eight truck loads per day) and setting speed limits (50 km/hr) will effectively minimize vehicle collision risk for birds.

  Flight take-offs and landing at the airstrip also have the potential to cause collisions with birds. There is little published information on the magnitude of avian mortality in Canada from aircraft-strikes. Relative to other sources of mortality, the number of birds killed annually by this source is expected to be small (Calvert et al. 2013).

Waste Management

- Incineration and recyclable sorting of materials that could pose as attractants to wildlife (e.g. food waste, beverage containers), will occur in a designated and contained waste management area, that will either be housed in a building or surrounded by animal-proof fencing.

- Food waste will be incinerated daily or composted in a fashion that does not attract birds.
- Only non-hazardous, non-leaching, inorganic garbage will be disposed of in on-site landfill or where practical, transported off site for recycling.
- Sewage will be treated by an enclosed membrane bioreactor (MBR) plant. Sludge will be disposed of in a fashion that does not attract birds.

The anticipated level of success of Project design mitigation measures is high because these measures avoid and eliminate pathways for potential effects which is the most effective approach for mitigation.

4.3.2 PROJECT PERSONNEL WILDLIFE AWARENESS ORIENTATION

Project personnel wildlife awareness programs will help to increase awareness of the Proponent's commitment to the protection of wildlife and wildlife habitat in the Project area. Wildlife awareness orientation will be provided to all workers on the site through all phases of the Project. A wildlife sighting log will be maintained through all phases of the Project. The objectives of wildlife awareness will be as follows:

- Provide workers with knowledge of why interactions with wildlife are important
- Provide workers with an understanding of the course of action to be taken in a variety of circumstances
- Emphasize the role of adaptive management in realizing effective mitigation for wildlife and the workers' role in recording their observations on the wildlife sighting log, or as part of the monitoring programs described in the WPP (**Appendix 31-F**).
- Create awareness for birds to enhance the conservation of this large group of wildlife as a whole as suggested in the region's Bird Conservation Strategy (EC 2013).

The anticipated likelihood of success of this mitigation measure is high. Creating awareness is recommended by EC (EC 2013) and is known to be effective because it strengthens the level of anticipated success of all other mitigation measures that rely on site personnel for successful implementation. Orientation for wildlife will be incorporated into the site orientation and records will be kept to document completion of the orientation by all site personnel.

4.3.3 MINIMIZE HABITAT DISTURBANCE

Habitat disturbance includes vegetation clearing and ground disturbance. Minimizing clearing and ground disturbance as much as practicable within the Project footprint and maintaining key habitat features (e.g. cliff nest sites, Sharp-tailed Grouse leks, wildlife trees) will reduce habitat loss. Minimizing disturbance reduces the potential Project-related effect of reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust) adjacent to the Project footprint. Reduced habitat effectiveness due to sensory disturbance would potentially occur during Construction, Operation, and Reclamation and Closure phases. Therefore, this mitigation measure applies to those Project phases.

This mitigation measure encompasses a series of actions where the most effective mitigation is applied first, followed by other actions until habitat loss and reduced habitat effectiveness are minimized as much as possible. In particular, sensitive habitats such as those suitable for cliff-nesting raptors or riparian habitats are highest priority for minimizing disturbance. When features such as wildlife trees and snags are incorporated into reclamation planning they can provide habitat for cavity-nesting birds in a short time frame such as the following year depending on level of tree decay.

Mitigation to reduce habitat disturbance includes the following measures:

- Minimize vegetation clearing and ground disturbance, particularly in sensitive habitats
- Retain wildlife trees and snags where possible
- Incorporate wildlife features into reclamation where feasible.

These mitigation measures guide the implementation of specific mitigation provided in monitoring and adaptive management programs such as in the WPP (**Appendix 31-F**). For example, setbacks around sensitive habitats are specified in the WPP.

The anticipated likelihood of success of this mitigation measure is moderate because it is likely not feasible that all potential wildlife trees or snags will be protected due to potential overlap with the Project footprint. Safety of workers will be a priority and will override protecting a potentially hazardous tree.

4.3.4 AVOID DISTURBANCE DURING BREEDING BIRD SEASON

Avoiding clearing of vegetation and new ground disturbance in the breeding season is the most effective way of eliminating or reducing damage or destruction of active nests. Judicious timing of vegetation clearing is recommended by EC to mitigate effects of industrial developments on birds. This includes timing ground disturbance outside the breeding season, because works on non-vegetated ground will have potential effects on ground-nesting birds. The Project's WPP (**Appendix 31-F**) provides protocols that include consideration of timing of Project activities to minimize potential disturbance during the breeding bird season.

The anticipated likelihood of success of this mitigation measure is moderate because there will likely be some level of clearing and ground disturbance required during the spring and summer months.

4.3.5 PROTECT ACTIVE AND IDENTIFIED NESTS

When disturbance in the breeding season is required for the Project, and near specific nest sites identified during baseline studies, it will be necessary to conduct additional mitigation to protect nests as follows:

- Establish no disturbance setbacks around active nests as described in the WPP.
- When vegetation clearing is required during the breeding bird season, conduct pre-clearing nest surveys as described in the WPP. Identify and protect active nests with no-disturbance buffers.
- Reclaim riparian vegetation in areas affected by barge landing construction (restore shoreline habitat).

Nests of certain species such as raptor nest sites identified during baseline surveys will be protected year round regardless if they are actively being used. The Project's WPP provides protocols that include timing of breeding season, setback distances around active nests, and methods for conducting pre-clearing nest surveys.

The anticipated likelihood of success of this mitigation measure is moderate because it is not possible to verify that all active nests will be found during nest surveys.

4.3.6 MANAGE TRAFFIC

In addition to the mitigation outcomes associated with minimal traffic volume as part of the Project design (**Section 4.3.1**), additional measures to manage traffic will further reduce sensory disturbance and mortality risk due to bird collisions with vehicles. Temporary traffic restrictions for mine-related vehicles (i.e., reductions at certain times of day) may be implemented as required to mitigate adverse effects on Birds and Bird Habitat. For Sharp-tailed Grouse, the sensitive timing is mid-April to mid-May. Currently there are no known lek sites within 3 km of the NAR. If additional lek sites are discovered, they would be assessed for potential of disturbance and, if warranted, traffic could be restricted during the sensitive timing period to avoid Sharp-tailed Grouse lek sites disturbance.

Posted speed limits will be in place for road safety and to reduce mortality risk for other bird and wildlife species. All trucks will have a wildlife sightings log to record bird and wildlife observations. These data will be used to identify wildlife trends occurring along the haul road. Refer to the Project's WPP (**Appendix 31-F**) for further details.

The anticipated likelihood of success of this mitigation measure is high. The measures are achievable and the combined influence of road controls as needed, posted speed limits, and monitoring will reduce mortality risk to a non-measureable effect. The rationale is based on review of traffic summarized in **Section 4.3.1**.

4.3.7 SUMMARY OF MITIGATION MEASURES

Table 4.3-1 provides a high level summary of mitigation measures that are proposed to minimize potential Project interactions and reduce potential effects on Birds and Bird Habitat.

Table 4.3-1 Summary of Potential Effects and Proposed Mitigation Measures for Birds and Bird Habitat

Summary of Potential Effect	Contributing Project Activities	Proposed Mitigation Measure	Applicable Subcomponent	Detectable / Measurable Residual Effect (Yes/No)
Construction Phase				
Habitat loss	Removing vegetation, ground disturbance within the Project footprint	• Project personnel awareness orientation • Minimize disturbance/protect habitat and habitat features	• Sharp-tailed Grouse • Passerines • Upland-associated species at risk • Wetland-associated species at risk	Yes
Reduced habitat effectiveness	All activities causing noise, movement, dust, etc.	• Project personnel awareness orientation • Minimize disturbance	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	Yes
Damage or destruction of active nests	Clearing, grubbing, and grading of areas to be developed within the mine site; upgrade of existing road sections	• Project design elements • Project personnel awareness orientation • Minimize disturbance • Avoid disturbance in breeding season • Protect nests	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No
Contaminants uptake	Waste management facilities and disposal areas	• Project personnel awareness orientation • Attractants management	• Cliff-nesting raptors • Wetland-associated species at risk	No
Mortality risk	Hauling and vehicle traffic related to mobilization and re-supply of freight and consumables and supply of water from aquifer, trucked to site for potable use and fire protection	• Project design elements • Project personnel awareness orientation • Traffic management	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No

Summary of Potential Effect	Contributing Project Activities	Proposed Mitigation Measure	Applicable Subcomponent	Detectable / Measurable Residual Effect (Yes/No)
Operation Phase				
Habitat loss	Continued development of Project footprint, including WRSFs and potential development and maintenance of habitat compensation areas (e.g. fish, vegetation), if required	• Project personnel awareness orientation • Minimize disturbance	• Sharp-tailed Grouse • Passerines • Upland-associated species at risk • Wetland-associated species at risk	Yes
Reduced habitat effectiveness	All activities causing noise, movement, dust, etc.	• Project personnel awareness orientation • Minimize disturbance	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	Yes
Damage or destruction of active nests	Continued development of Project footprint, including WRSFs and potential development and maintenance of habitat compensation areas (e.g. fish, vegetation), if required	• Project design elements • Project personnel awareness orientation • Minimize disturbance • Avoid disturbance in breeding season • Protect nests	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No
Contaminants uptake	Operation and maintenance of waste management and disposal facilities. Continued staged HLF construction, including related water management structures and year-round operation	• Project personnel awareness orientation • Attractants management	• Cliff-nesting raptors • Wetland-associated species at risk	No

Summary of Potential Effect	Contributing Project Activities	Proposed Mitigation Measure	Applicable Subcomponent	Detectable / Measurable Residual Effect (Yes/No)
Mortality risk	Vehicles within: Hauling, Support Infrastructure, NAR, Overall Mine, Fuel and Hazardous Materials Facilities, Waste Management Facilities and Disposal Areas	• Project design elements • Project personnel awareness orientation • Traffic management	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No
Reclamation and Closure Phase				
Reduced habitat effectiveness	All activities causing noise, movement, dust, etc.	• Project personnel awareness orientation • Minimize disturbance	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk	Yes
Mortality risk	Collisions with vehicles travelling to and through site.	• Project design elements • Project personnel awareness orientation • Traffic management	• Sharp-tailed Grouse • Cliff-nesting raptors • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No
Damage or destruction of active nests	Equipment use in potential nest habitat.	• Project design elements • Project personnel awareness orientation • Avoid disturbance in breeding season • Protect nests	• Sharp-tailed Grouse • Passerines • Upland-associated species at risk • Wetland-associated species at risk • Bank Swallow	No

4.4 RESIDUAL EFFECTS AND SIGNIFICANCE OF RESIDUAL EFFECTS

Project-related residual effects were assessed for each subcomponent based on potential interactions identified in **Table 4.1-2**, and in relation to the indicators listed in **Table 1.2-3**. Since no probable lek sites were identified within 3 km of the NAR during baseline field studies in 2015 and 2016 (**Section 3.3.1**), no Project-related residual effects are anticipated on Sharp-tailed Grouse. For the remaining subcomponents, following the successful implementation of all mitigation measures described in **Section 4.3** and the WPP (**Appendix 31-F**), two Project-related residual effects are likely to remain: 1) habitat loss due to the Project footprint for passerines and upland- and wetland-associated species at risk, and 2) reduced habitat effectiveness due to sensory disturbance for cliff-nesting raptors, Bank Swallow, passerines, and upland--and wetland-associated species at risk. Habitat loss and reduced habitat effectiveness are assessed in the context of habitat suitability for passerines and upland- and wetland-associated species at risk, and are analyzed separately. For cliff-nesting raptors and Bank Swallow, reduced habitat effectiveness is assessed in the context of individual nest sites or colony sites.

The following potential Project-related effects will not be residual effects and are therefore not considered further in the assessment: 1) habitat loss due to the Project footprint for cliff-nesting raptors and Bank Swallow; 2) damage or destruction of active nests; 3) contaminants uptake; and 4) mortality risk due to collisions with vehicles. Rationale is as follows:

Habitat loss for cliff-nesting raptors and Bank Swallow — All known nest sites and colony sites are anticipated to remain intact throughout the life of the Project.

Damage or destruction of active nests — Vegetation clearing will be conducted outside the breeding window as much as practicable and if clearing is conducted in the breeding window, nest surveys will be completed and active nests will be protected. There is still the potential that individual nests may be affected by the Project if some clearing is performed during the breeding window; however, this effect would not result in species or population level effects. Adaptive management, including monitoring of the effectiveness of nest surveys, will be implemented and if any nests are determined to be damaged or destroyed due to Project activities, mitigation measures will be adapted to reduce risks to bird nests. The Proponent will demonstrate due diligence to protect active nests and reduce the risk of damaging or destroying nests.

Contaminants uptake — Project design measures (e.g., HLF instead of open tailing ponds) will minimize exposure to and uptake of contaminants. The likelihood of wetland-associated birds using the open water of the event ponds as resting areas is anticipated to be low given the short-term nature of events ponds and adaptive management measures and is not considered further in the assessment. Project design does not include barren or pregnant solution ponds.

Mortality risk due to collisions with vehicles — The low traffic levels (i.e., eight truck loads per day) and speed limits (50 km/hr) combined with Project design including airstrip siting is likely to control increased mortality risk of birds from collisions. Project personnel wildlife awareness orientation will further increase awareness of Project personnel and increase vigilance when driving to reduce harm to birds and other wildlife.

4.4.1 RESIDUAL EFFECTS CHARACTERISTICS

Residual effects are characterized based on the criteria defined in **Table 4.4-1.**The characterization of residual effects is based on the following and when available: published regulatory or industry standards, non-regulated but widely-recognized standards, TK, or professional judgement. As the thresholds differ for each indicator used for assessment of Bird and Bird Habitat subcomponents, a detailed rationale for effects characterization is provided where relevant.

Table 4.4-1 Effect Characteristics Considered When Determining the Significance of Residual Effects on Birds and Bird Habitat

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect would be positive or adverse.	• Positive • Adverse
Magnitude	Size or severity of the residual effect relative to the existing conditions of each bird subcomponent. Generally measured in terms of the proportion of each bird subcomponent affected within the LAA, relative to the range of natural variation. For habitat-based measures, the magnitude of the effect was assessed using the following thresholds for predicted change in high suitability habitat: • Low: Less than 10% decline • Moderate: 10 to15% decline • High: More than 15% decline	• Low • Moderate • High
Geographic Extent	Geographic area over which the residual effect to each bird subcomponent is expected to occur. Direct effects to birds (e.g., habitat loss) occur primarily at the Site level at specific locations within the Project footprint. Indirect effects to birds (i.e., sensory disturbance) occur primarily at the Local level (sometimes at the Regional level for certain species). Effects on birds at the population level occur at the Regional and Territorial levels.	• Site (specific location within Project footprint) • Project footprint • Local (limited to LAA) • Regional (limited to RAA) • Territorial (beyond RAA)
Timing	Occurrence of the residual effect with respect to a temporal attribute important to each bird subcomponent (e.g., breeding season).	• Breeding season • Year-round
Frequency	How often the residual effect is expected to occur, taking into account temporal characteristics specific to each bird subcomponent.	• Infrequent • Frequent • Continuous

Residual Effect Characteristic	Definition	Rating
Duration	Length of time over which the residual effect is expected to persist, taking into account temporal characteristics specific to each bird subcomponent.	• Short-term • Long-term • Permanent
Reversibility	Degree to which the residual effect to each bird subcomponent can be reversed once the causal factors cease. Irreversible effects are considered to be permanent.	• Fully reversible • Partially reversible • Irreversible
Likelihood	Likelihood that the residual effect will occur, taking into account how probable it is that a disturbance will actually be caused by the Project or that a specific mitigation will be successful.	• Likely • Unlikely
Context	The extent to which each subcomponent has been affected by past and present environmental processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience). For example: High: subcomponent has a natural resilience and can respond or adapt to the disturbance before an effect can be detected within the population. Moderate: subcomponent has neutral resilience and may be able to respond or adapt to the disturbance, and low likelihood that an effect can be detected within the population. Low: subcomponent has low resilience and will not easily adapt to the disturbance, and an effect can be readily detected within the population.	• High • Moderate • Low

4.4.2 SIGNIFICANCE DEFINITION

When determining significance, each of the ratings used to characterize the residual effect are considered to inform the final decision. The level of each residual effect will be rated as “Significant” or “Not Significant” as follows:

Significant Residual effects determined to be “Significant” are those that would result in a measurable adverse effect that would pose a risk to the long-term persistence and viability of vegetation subcomponents/indicators at the regional level (i.e., RAA). The level at which the combination of effects characteristics would represent a significant adverse effect varies depending on the subcomponent/indicator. Residual effects determined to be “Significant” are carried forward to the CEA.

Not Significant Residual effects determined to be “Not Significant” are those that are greater than “negligible” but that do not meet the definition of “Significant”. Residual effects determined to be “Not Significant” are still carried forward to the CEA.

The level of confidence in the significance determination is rated as low, medium or high as follows:

Low A low level of confidence is assigned to effects predictions with little or no empirical site-specific data and little to no published information or examples from similar assessments or Project effects monitoring programs.

Medium A moderate level of confidence is assigned to effects predictions that are based on published literature and empirical site-specific data from other projects of a similar scale with similar Bird and Bird Habitat indicators; however, baseline data may not be entirely sufficient for the Project.

High A high level of confidence is assigned to effects predictions that have direct, site-specific quantitative data to support the prediction, either from the Project or existing similar projects with similar Bird and Bird Habitat indicators. Baseline data are also considered sufficient for the Project.

No threshold or standards currently exist for the Bird and Bird Habitat subcomponent indicators. The significance of changes in the indicators is determined using a professional opinion based on current understanding of the biology of each of the indicators and experience with similar projects and related literature.

4.4.3 SHARP-TAILED GROUSE SUBCOMPONENT

As noted in **Section 3.3.1**, extensive baseline field studies were conducted in 2015 and 2016 in areas with suitable habitat for Sharp-tailed Grouse lek sites. No lek sites were identified within 3 km of the NAR. Therefore, the potential residual effects of habitat loss and reduced habitat effectiveness on Sharp-tailed Grouse lek sites can be fully mitigated using the mitigation measures described in **Section 4.3**, particularly those identified as part of Project Design and implemented in the WPP (**Appendix 31-F**). Should Project monitoring locate any new lek sites within 3 km of the NAR during the life of the Project, those sites will be protected by mitigation measures provided in **Section 4.3** and the WPP. Based on lek sites not being found in the LAA and mitigation measures being in place in case new lek sites should be found during the life of the Project, no residual effects on Sharp-tailed Grouse lek sites in regards to habitat loss or reduced habitat effectiveness are anticipated to occur.

4.4.4 CLIFF-NESTING RAPTORS SUBCOMPONENT

This section describes the nature of Project-related residual effects identified for cliff-nesting raptors (i.e., Peregrine Falcon, Golden Eagle, and Gyrfalcon), including an assessment of significance.

4.4.4.1 Potential Project-related Effects

Potential effects to cliff-nesting raptors include habitat loss due to the Project footprint, reduced habitat effectiveness due to sensory disturbance, and mortality risk due to collisions with vehicles. Refer to **Section 4.2** for a description of potential Project-related effects.

4.4.4.2 Mitigation Measures

The potential adverse effects of the Project on Birds and Bird Habitat are addressed by a combination of mitigation measures described in **Section 4.3** and the WPP (**Appendix 31-F**). Mitigation measures that will minimize adverse effects to cliff-nesting raptors include minimizing habitat disturbance and protecting cliff-nesting habitat, avoiding disturbance during the breeding season, and protecting active and identified nests. All identified cliff-nesting raptor nests will remain intact throughout the Project and will not be physically damaged or destroyed due to Project activities. Following the successful implementation of these mitigation measures, the residual effect of reduced habitat effectiveness from sensory disturbance (e.g., noise, movement, dust) is expected to remain for a small number of cliff-nesting raptors.

4.4.4.3 Project-related Residual Effects and Significance of Residual Effects

Background Information

This section is a detailed summary of background information to support the residual effects assessment of cliff-nesting raptors in regards to reduced habitat effectiveness due to sensory disturbance.

Reduced habitat effectiveness due to sensory disturbance to cliff-nesting raptors may result from blasting and mining operations, vehicular traffic (e.g., trucks, ATVs, UTVs, aircraft, boats), or the presence of humans and infrastructure. Visually or aurally disturbed raptors may react in several different ways depending on species, previous experience of individuals, geographic location, proximity to the nest site, and type and duration of the disturbance (EDI 2011). Regardless of the reaction, raptors are typically most sensitive to disturbances during the breeding season, particularly during the nest initiation, incubation, and nestling stages (Fyfe and Olendorff 1976, Cade et al. 1996). Raptors respond to disturbance in several different ways including increased alertness, agitation, vocalizations, and flushing from a nest, which may interrupt incubation and brooding, causing thermoregulation stress to eggs or nestlings, reduce opportunities for feeding and foraging of nestlings, or increase the risk of predation on eggs or nestlings (Ontario Peregrine Falcon Recovery Team 2010). If disturbance is severe enough, raptors will ultimately abandon their nests. Golden Eagles are particularly sensitive to human disturbances (Sinclair et al. 2003; Hayes and Reid 2014). A study conducted by Steidl et al. (1993) in Alaska concluded that adult Golden Eagles were less likely to visit their nests and feed their young when observers were camped 400 m versus 800 m from the nests. Several studies have also concluded that disturbed raptors may be more likely to move to alternative nest sites or not breed at all the following year (Fyfe and Olendorff 1976, Platt 1977, Harmata 2002; EC 2007). A literature review by Hayes and Reid (2014) in Yukon identified Peregrine Falcon, Golden Eagle, and Gyrfalcon as the top three cliff-nesting raptors most vulnerable to disturbance by helicopter overflights. A study conducted by Platt (1977) on Gyrfalcons in Alaska found that experimental helicopter overflights reduced nest site occupancy and increased the likelihood of nest site switching in the following year.

Some raptors are relatively tolerant of disturbances caused by humans. Peregrine Falcons have been observed successfully nesting on artificial structures in high volume traffic areas such as concrete ledges on city bridges and buildings (Cade and Bird 1990), smokestacks (Cade et al. 1994), transmission line towers (Ruddock and Whitfield 2007), and power generating stations (Septon 1994). A tolerance to blasting and mining operations has been demonstrated by the successful nesting of Peregrine Falcons and Gyrfalcons on the open pit walls of Ekati diamond mind in the NWT (IEMA 2013). Research conducted by Holthuijzen et al. (1990) indicated that Prairie Falcon displayed no observable effects to 140 dB mining blasts occurring 500 to 1,000 m away from nests. Furthermore, although blasts occurring 250 to 500 m away from nests did flush adults from their nests, the average return time was only 1.4 min after each blast. In regards to aircraft, Palmer et al. (2003) concluded that although Peregrine Falcon activity budgets and nest attendance patterns were affected by over-flights 150 m above nests, overall food provisioning rates to nestlings did not change. Similarly, Ellis et al. (1991) concluded that Peregrine Falcons were tolerant to aircraft noise between 85 to 140 dB, and although over-flights of <1,000 m above nests caused some pairs to flush from their nests, reproductive failure or nest abandonment did not occur.

Cliff-nesting raptors may become habituated to non-threatening disturbance (e.g., haul trucks regularly passing by a nest site) over time, which may reduce effects to disturbed raptors; however, habituation may take several years to occur (Ratcliffe 1962) and vary by species. Cliff-nesting raptors that reside in remote locations far removed from human activities and associated disturbances are most likely to be sensitive to human intrusions (Pyke 1997; White et al. 2002).

To mitigate the potentially adverse effects of reduced habitat effectiveness due to sensory disturbance for cliff-nesting raptors, several researchers have suggested protective buffer zones of varying size. Following a review of recommended buffers zones for nesting raptors, Richardson and Miller (1997) concluded that an average size of 500 to 1,000 m was appropriate for mid to large sized raptors; a specific nesting buffer of 800 m was identified for Peregrine Falcon and Golden Eagle. Steidl et al. (1993), Romin and Muck (2002), and seismic operations in the Northwest Territories (AANDC 2011) also recommend a nesting buffer of 800 m for Golden Eagle. Management plans for Peregrine Falcon in the United States prescribe nesting buffers between 150 to 1,600 m; however, one state recommends a 4,800 m no-disturbance buffer zone (USFWS 1982; Ellis 1982; Hayes and Buchanan 2002; Romin and Muck 2002). In western Canada, recommended minimum setback distances from Peregrine Falcon and Golden Eagle nesting sites range from 500 m in British Columbia for activities in undeveloped areas (Government of British Columbia 2013) to 1,000 m in Alberta, Saskatchewan, and Manitoba for high disturbance activities such as road construction or mining (Government of Alberta 2011; GAAER 2013; SCDC 2015, MCDC 2014). BirdLife International's International Species Action Plan for Gyrfalcon (BirdLife International 1999) recommended a 1 to 3 km nesting buffer depending on the surrounding terrain. In regards to aircraft, Fyfe and Olendorff (1976) suggested a minimum flying buffer of 500 m above ground for raptor nest sites. For exploration activities in

British Columbia, a minimum flying buffer of 500 m above ground was also recommended for cliff nesting raptors, in addition to a 2000 m horizontal buffer distance around nest sites (Hayes and Reid 2014).

Nest Area Effects Assessment

The assessment of potential residual effects on cliff-nesting raptors was focussed on the nest area, because that is the primary functional unit that is relevant to breeding activities of raptors. Discussion of individual nest sites within a nest area is in the context of nest sites being subcomponents of a nest area. The assessment of residual effects on known nest areas for cliff-nesting raptors within the RAA was completed in two stages. The first stage was classification of each nest area into three priority classes based on their proximity to the Project footprint relative to recommended buffer distances for cliff-nesting raptors (**Section 4.3.5**).

- Priority 1 nests are located within 500 m of proposed Project infrastructure and are expected to be most at risk from Project activities;
- Priority 2 nests are located between 500 and 1,000 m from proposed Project infrastructure and are expected to be at moderate risk from Project activities; and
- Priority 3 nests are located beyond 1,000 m from proposed Project infrastructure and are expected to be the least at risk from Project activities.

The second stage of the assessment was a site-specific assessment of the nest areas rated as Priority 1 or 2 (**Table 4.4-2**). In addition to four confirmed nest areas that met the criteria for Priority 1 and 2, a potential Peregrine Falcon nest area near the Stewart River barge crossing was also assessed. Site-specific factors included in the assessment were species-specific considerations, occupancy history, spatial pattern of nest sites (e.g. number, proximity and visual screening relative to the Project), and types of Project features and activities (e.g. type of development and associated disturbances).

Table 4.4-2 Priority 1 and 2 Cliff-nesting Areas within the Coffee Gold Mine Project RAA

General Location	Nest Area	Species[1]	No. Nests	Priority	Distance to Project Footprint (km)	Project Element
Yukon River	009	Golden Eagle	3	1	0.3	NAR, Yukon R. barge crossing, exploration airstrip
	010	Peregrine Falcon	1	1	0.4	NAR, Yukon R. barge crossing, exploration airstrip
	012	Golden Eagle	1	2	0.8	NAR, Yukon R. barge crossing, exploration camp and airstrip
Stewart River	103	Unknown (Golden Eagle)	3	1	0.1	NAR along Stewart R.
	n/a	Peregrine Falcon	0	1	0.1	NAR and Stewart R. barge

1 The nest sites provided by Environment Yukon were identified to species previous to the Project surveys. For nests identified by Project biologists, active nests were identified to species, inactive nests were described as 'Unknown' species and the suspected species was identified based on nest structure when possible.

Nest Areas 009 and 010 are Golden Eagle and Peregrine Falcon areas, respectively, that occur in the same location on the north side of the Yukon River, above the proposed barge crossing. These areas were assessed together due to their high degree of spatial overlap. A Common Raven nest area also occurs in the same area but was not included in the assessment. The area consists of an extensive, south aspect cliff approximately 4 km long, with broken cliff bands 200–400 m in height. The Golden Eagle area contains three nests spaced 50–1300 m apart and was active in 2014. The distance of the nests from the proposed NAR ranges 260–1100 m. The Peregrine Falcon area contains two possible historic nest ledges spaced 200 m apart and 420–600 m away from the NAR. During baseline surveys, the Peregrine Falcon area was assumed to be active in 2014 due to the observation of an adult falcon within the nest area. None of the eagle or falcon nests will be physically disturbed during road construction or operation activities; however, reduced habitat effectiveness due to sensory disturbance from the road may occur and could inhibit raptors from breeding at this area during the period the NAR is in operation. The risk of negative effects occurring to these two nest areas is reduced by the extensive amount of alternative nesting habitat in the vicinity, which would allow the birds to relocate nests farther away from, or visually screened from, the NAR.

Nest Area 012 is a Golden Eagle area located on the north side of the Yukon River, downstream of the barge crossing. The area consists of an extensive, south aspect cliff approximately 2.8 km long, with broken cliff bands 200–400 m in height. The area contains one nest that was reported as actively used by Golden Eagle in a historic survey by YG. The distance of the nest to the NAR is 820 m. Over the three years monitored by Environmental Dynamics Inc. (EDI), that nest was not occupied, although fresh whitewash was noted on adjacent perches. In addition to the Golden Eagle nesting record, an active Common Raven nest area and possible Peregrine Falcon perches were observed in the same area during baseline surveys. Neither the known eagle nest or adjacent potential alternative nesting habitat within the nest area will be physically disturbed during road construction or operation activities; however, reduced habitat effectiveness due to sensory disturbance from the road or barge operations may occur and could inhibit raptors from breeding at this area during the period the NAR is in operation. The risk of negative effects occurring to this nest area is reduced by the relatively far distance of the known nest to the Project footprint and the extensive amount of alternative nesting habitat in the vicinity, which would allow the birds to relocate nests farther away from, or visually screened from, the NAR.

Nest Area 103 is a suspected Golden Eagle area located along the NAR just north of the Stewart River. The area consists of a steep, east aspect hillslope approximately 900 m long, with discontinuous cliff bands 30–80 m in height. The area contains three nests spaced 40–745 m apart. The nest area was not occupied in 2015 and 2016. It is difficult to estimate the date the area was last occupied, but based on the relatively well-defined structure of two of the nests, the area was probably used within the last few years. Although the area was not occupied during the survey period, occurrence by Golden Eagle in the past could be inferred reliably for two nests based on their large size and the size of branches within the nest. One nest that was partially fallen may have belonged to a smaller species, such as a Common Raven or Red-tailed

Hawk. The distance of the nests from the proposed NAR ranges 40–150 m. None of the three nests will be physically disturbed during road construction or operation activities; however, reduced habitat effectiveness due to sensory disturbance from the road may occur and could inhibit raptors from breeding at this area during the period the NAR is in operation.

The final raptor area assessed was for a possible historic Peregrine Falcon nest on the north side of the Stewart River near the proposed barge crossing. The area consists of a relatively small cliff approximately 20 m tall and 250 m long forming the bank of the Stewart River. The status of this area as an active nest area is uncertain; however, it was included in this assessment due to its proximity to the NAR. A single possible historic nest ledge was recorded during baseline surveys; however, no Peregrine Falcons were observed in the area to confirm occupancy. The possible nest ledge is located approximately 50 m from the NAR just upstream of the proposed barge crossing. Although the possible nest ledge will not be physically disturbed during road construction or operation activities, reduced habitat effectiveness due to sensory disturbance from the road may occur and could inhibit raptors from breeding at this area during the period the NAR is in operation.

Nest area-specific management plans will be developed for all known cliff nests identified within 1000 m of the Project footprint to help minimize potential adverse effects on cliff-nesting raptors. Reduced habitat effectiveness due to sensory disturbance could occur at five nest areas, and may inhibit individual raptors (particularly Golden Eagles) from attempting to nest at these areas during the life of the mine.

Effects characteristics ratings are summarized in **Table 4.4-3**. Reduced habitat effectiveness due to sensory disturbance is considered likely due to the proximity of some nest areas to proposed Project infrastructure. This could have an adverse effect of causing affected raptors to abandon or relocate their nest areas. The magnitude of this effect is considered low because it affects a small number of individuals and those individuals may be able to relocate their nests without any impacts to breeding productivity. The effect is expected to persist through to the Post-Closure phase when sensory disturbance will no longer occur, at which time the effect will be reversible. The effect would occur during the breeding season, when raptors are occupying their nest areas. The context for the residual effect of reduced habitat effectiveness for cliff-nesting raptors is considered moderate due to the varying sensitivities of cliff-nesting raptors and their ability to adapt to habitat disturbance. Although Peregrine Falcons are known to be relatively tolerant of human disturbances, Golden Eagles are particularly sensitive to human disturbances and cliff-nesting raptors that reside in remote locations far removed from human activities and associated disturbances are likely sensitive to human intrusions. Based on the information presented above and summarized in **Table 4.4-3**, the potential for a residual effect on cliff-nesting raptor habitat effectiveness within the RAA is not significant.

Table 4.4-3 Effect Characteristics Ratings for Cliff-nesting Raptors

Residual Effects Characteristic	Rating	Rationale for Rating
Reduced Habitat Effectiveness		
Direction	Adverse	Sensory disturbance results in reduced habitat effectiveness at sites adjacent to the footprint, which might result in nest sites being unoccupied or abandoned and may reduce overall reproductive output for individual cliff-nesting raptors.
Magnitude	Low	A measurable effect will occur at the individual level if specific nest sites were abandoned, but the effect would be unlikely to pose a risk to the long-term persistence and viability of the population at the regional level. Although nest area abandonment and lost breeding productivity are possible, a more likely outcome is that affected raptors would relocate their nest area away from the Project and continue breeding. Peregrine Falcon, Golden Eagle, and Gyrfalcon are known to have more than one nest site located within their territories.
Geographic Extent	LAA	The effect will extend beyond the Project footprint to certain nest areas within the LAA. Raptors are known to be sensitive to disturbance and recommended buffer zones have been suggested (**Appendix 31-F**).
Timing	Breeding	The combined nesting period for cliff-nesting raptors in the region extends from April 1 to August 31; therefore the timing period is breeding season. Peregrine Falcon, Golden Eagle, and Gyrfalcon are known to reuse nest sites.
Frequency	Continuous at mine site Frequent on NAR	Disturbance will be continuous at the mine site through to end of the Reclamation and Closure phase (i.e., continuous presence of mine site infrastructure and noise). Disturbance will be frequent along the NAR through to end of the Reclamation and Closure phase. Disturbance would be greatest during the Construction phase (i.e., potential blasting and heavy equipment), but will lessen during the Operation and Reclamation and Closure phases, becoming negligible during the Post-closure phase (i.e., traffic will be limited to eight haul trucks per day and mine-site personnel will fly in and out).
Duration	Long-term	Reduced habitat effectiveness due to sensory disturbance would be a long-term loss that would be detectable through to end of the Reclamation and Closure phase.
Reversibility	Fully reversible	Potential effects are fully reversible because any reduction to habitat effectiveness due to sensory disturbance would cease following Reclamation and Closure.
Likelihood	Likely	Reduced habitat effectiveness will likely occur at the five nest areas along the NAR, which could inhibit raptors (particularly Golden Eagles) from attempting to nest at these sites during the life of the mine.

4.4.4.4 Summary of Project–related Residual Effects and Significance of Residual Effects on Cliff-nesting Raptors

All known nest sites and the features they are located on are anticipated to remain intact throughout the life of the Project (i.e., no direct habitat loss anticipated). Although nest areas within 1000 m of proposed Project infrastructure may experience reduced habitat effectiveness due to sensory disturbance, this residual effect is not expected to have population-level effects on cliff-nesting raptors. Furthermore, nest-specific management plans will be developed for all cliff nests identified within 500 m of the Project footprint to help minimize potential adverse effects on cliff-nesting raptors. Based on the information presented above and summarized in **Table 4.4-4**, there is no potential for a significant residual effect of reduced habitat effectiveness on cliff-nesting raptors within the RAA. The confidence in this prediction is moderate, reflecting the uncertainty regarding the exact size and state of the cliff-nesting raptor population in the region, and variable responses of individual raptors to disturbance.

Table 4.4-4 Summary of Project-related Residual Effects on Cliff-nesting Raptors

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Reduced habitat effectiveness	Construction Operation Reclamation and Closure	• Project Personnel Awareness Orientation • Minimize Habitat Disturbance • Avoid Disturbance During Breeding Bird Season • Protect Active and Identified Nests	A	L	LAA	B	C/F	L	F	L	M	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

4.4.5 PASSERINES SUBCOMPONENT

This section describes the nature of Project-related residual effects identified for passerines, including an assessment of significance.

4.4.5.1 Potential Project-related Effects

Potential effects to passerines include habitat loss due to the Project footprint, reduced habitat effectiveness due to sensory disturbance, damage, or destruction of active nests due to clearing activities, and mortality risk due to collisions with vehicles. Refer to **Section 4.2** for a complete list of potential Project-related effects.

4.4.5.2 Mitigation Measures

The potential adverse effects of the Project on Birds and Bird Habitat are addressed by a combination of mitigation measures as described in **Section 4.3** and the WPP (**Appendix 31-F**). Mitigation measures that will minimize adverse effects to passerines include minimizing habitat disturbance, avoiding disturbance during the breeding season, protecting active nests, and traffic management planning. Following the successful implementation of these mitigation measures, two residual effects are expected to remain for passerines: (1) habitat loss due to the Project footprint, and (2) reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust).

4.4.5.3 Project-related Residual Effects and Significance of Residual Effects

Background Information

This section is a detailed summary of background information to support the residual effects assessment of passerines in regards to habitat loss due to the Project footprint and reduced habitat effectiveness due to sensory disturbance.

Passerines include a wide range of bird species that occupy a variety of habitat types. Within the region surrounding the Project area, burns (≤30 years old), placer mined areas, upland coniferous forest, riparian forest, high/low elevation shrubby areas, swamps, and marshes were identified as high suitability habitats for passerines. The highest priority conservation objective for BCR 4 is ensuring adequate habitat for bird species (EC 2013). Four threat categories were identified for birds in BCR 4, and all categories were assessed by EC as low magnitude threats:

- Energy production and mining — habitat loss and degradation; contamination from tailings ponds
- Transportation and service corridors — habitat fragmentation and degradation from roads; collisions with vehicles
- Pollution — ingestion of garbage; decreased insect prey populations due to pesticides
- Invasive and other problematic species and genes — increased populations of competing species or predators; increased occurrences of pest outbreaks and diseases.

Declines in population size of species living within a habitat appears to be linearly related to the proportion of original habitat lost during the initial stages of habitat fragmentation; at some threshold of fragmentation, patch size and isolation may further influence the population size in the original habitat (Andren 1994). Landscape models of habitat loss demonstrate that there are rapid changes in the size and isolation of habitat patches at critical proportions of the original habitat. Habitat patch size begins to decline rapidly once less than 60% of the original habitat in a landscape remains, and patch isolation increases exponentially once less than 20% of the original habitat remains. Reduced forest cover on the landscape has been associated with higher rates of nest predation and nest parasitism for forest dwelling passerine species, particularly species that nest on or close to the ground (Robinson et al. 1995). Patterns of increased nest predation resulting from habitat fragmentation may only emerge at large spatial scales once a substantial proportion of the forest cover has been removed (Zanette and Jenkins 2000).

Response to sensory disturbance varies among songbird species and individuals and can lead to a decline in bird density and/or a change in the bird community within a Zone of Influence (ZOI) around the source of the disturbance. In Alberta, the density of passerine birds was significantly lower within 300 m of continuous noise-generating oil and gas compressor stations, and there was evidence of reduced site occupancy out to 700 m from compressor stations for multiple passerine species (Bayne et al. 2008). A similar study in New Mexico found reduced species richness and changes in community composition of breeding birds close to noise-generating compressor stations (Francis et al. 2009). A study in Alberta on ovenbirds conducted by Habib et al. (2007) found that pairing success was reduced within 200 m of compressor stations; they also found more first-time breeders within 200 m of compressor stations, which may indicate lower quality habitat.

Noise can alter the ability of predators to locate prey, or to detect predators, which can further exacerbate changes in community composition resulting from avoidance (Francis et al. 2009, Barber et al. 2009). This interference with bird communication is known as masking and can occur at threshold levels of 55 – 60 dBA (Dooling and Popper 2007). According to noise modelling completed for this project, the area where sustained noise is predicted to occur at this level is primarily within the Project footprint of the mine site and is completely within 300 m of the LAA. The effects of roads and road traffic on bird habitat use have primarily been studied on larger, paved roads with a much higher traffic volume than what is expected in this Project. In the Netherlands on a road with 10,000 vehicles per day, Reijnen and Foppen (1997) estimated the maximum size of the ZOI in woodland and grassland habitats to be 125 m and 190 m, respectively, for all species combined; the size of the ZOI in woodland and grassland habitats increased up to 305 m and 365 m, respectively, for certain species.

Breeding Habitat Assessment

Habitat loss was assessed within the LAA, assuming that all habitat within the mine site footprint and along new portions of the NAR will become unsuitable (i.e., nil habitat suitability) for passerine birds following mine construction. Reduced habitat effectiveness due to sensory disturbance was assessed within a 300 m

ZOI around the Project footprint. This was based on knowledge of similar disturbances and considering noise and air quality modelling completed for the Project. Potential effects of air quality on bird habitat were not evident based on the literature review. However, the majority (89%) of the highest dust fall concentrations (1.370 mg/dm^2 /day) modelled for the mine site are contained within the 300 m ZOI (Air Quality and Greenhouse Gas Emission Intermediate Component Analysis Report, **Section 9**). Air quality modeling was not performed for the NAR; however, due to the minimal traffic (i.e., eight truck loads/day) and speed restrictions for the NAR (i.e., 30–50 km/hr) high concentrations of dust fall that would have an effect on Birds and Bird Habitat along the NAR beyond the 300 m ZOI is unlikely. Therefore, any potential effects of dust deposition are considered to be captured by the analysis of reduced habitat effectiveness due to sensory disturbance. All habitat ratings (as derived in the Bird Baseline Report, **Appendix 17-A**) within the ZOI were downgraded by one class to a minimum of low (i.e. high becomes medium; medium becomes low; low stays low; and nil remains nil). The resulting habitat values at maximum disturbance were then summarized and compared to the baseline values.

Approximately 6% of the high suitability habitat within the LAA lies within the Project footprint. Only 1.23 km² of this high suitability habitat is associated with the mine site; the majority of this habitat is along the NAR. Habitat loss from the Project footprint is a residual effect since the habitat cannot be reclaimed within a generation of these bird species. An additional 75.30 km² of high suitability habitat could have reduced effectiveness within the ZOI. This represents potential reduced effectiveness for 31.48% of the high suitability habitat within the LAA as a result of sensory disturbance, the majority of which is associated with the NAR. The combined effect of habitat loss and reduced habitat effectiveness could result in a 37.74% reduction in the amount of high suitability habitat within the LAA (**Table 4.4-5**).

Burns (≤30 years old) provide most of the high suitability habitat for passerines and coniferous forests are the second most dominant broad habitat type that is a component of high suitability habitat for passerines. High suitability habitat modeled for the LAA (**Table 4.4-5**) is the dominant habitat type in the LAA as are burns (127.58 km²) and coniferous forests (181.12 km²) combined (**Table 4.4-6**). Therefore, old burns and coniferous forest were used as habitat components of high suitability habitat to assess effects in the context of the RAA. These broad habitat types are similarly common throughout the RAA and broader regional ecosystems of West-Central Yukon (Grods 2012, GeoYukon 2014a, GeoYukon 2014b).

Results of the habitat loss (6.26%) and reduced habitat effectiveness (31.48%) analysis for the high suitability rating habitat in the LAA (**Table 4.4-5**) were applied to burns and coniferous forest habitat components in the RAA (**Table 4.4-6**). The change in habitat represents a low (0.53%) amount of high quality habitat loss in the RAA, and a low (2.67%) amount of reduced habitat effectiveness in the RAA due to sensory disturbance.

Table 4.4-5 Summary of Passerine Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Project Footprint		Reduced Habitat Effectiveness In ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Low	8.15	0.35	4.31	3.12	38.34	3.48	42.65
Medium	224.71	17.21	7.66	53.44	23.78	70.64	31.44
High	239.21	14.99	6.26	75.30	31.48	90.29	37.74

Table 4.4-6 Summary of Passerine High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Burns ≤30yrs + coniferous forest	308.70	3,644.66	19.32	97.18	0.53	2.67

1. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 6.26% loss of high quality habitat available in the LAA (0.0626*308.70 km²).
2. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 31.48% effect on high quality habitat available in the LAA (0.3148*308.70 km²).
3. Loss to footprint/Baseline habitat within RAA*100.
4. Reduced habitat effectiveness in ZOI/Baseline habitat within RAA*100.

The context for the residual effects of habitat loss and reduced habitat effectiveness for passerine birds is considered high because the dominant habitat types used by passerine birds (burns and coniferous forest) are common within the region and it is likely that passerine birds have already adapted to sensory disturbance in several areas of the ZOI near existing sections of the NAR.

The effects characteristics ratings for passerine habitat are summarized in **Table 4.4-7**. Habitat effects from habitat loss are expected to have a low magnitude effect and be localized to portions of the Project footprint. This residual effect will occur during the Construction phase of the project; habitat loss will persist over the long-term, lasting beyond the life of the Project. Reclamation will restore some of the habitat value for passerine birds within the Project footprint; however, it is unlikely to return to pre-disturbance conditions — for this reason, habitat loss was rated as partly reversible. Based on the effects characteristics summarized in **Table 4.4-7**, the residual effect of passerine bird habitat loss is not significant.

The majority of potential habitat effects will come from reduced habitat effectiveness due to sensory disturbance along the NAR, not as habitat loss. Reduced habitat effectiveness is likely; however, it is a low magnitude residual effect within the RAA. Reduced habitat effectiveness due to sensory disturbance is a

reversible effect that will cease following Reclamation and Closure. Most of the NAR consists of existing resource roads (177 km), while mine activities will marginally increase the amount of vehicle traffic on these portions of the road it is likely that passerine birds have already responded to or adapted to sensory disturbance in these areas. Based on the effects characteristics summarized in **Table 4.4-7**, the residual effect of reduced habitat effectiveness for passerines is not significant.

Passerines are a diverse group of birds with a wide range of habitat requirements. While the habitat model used in this assessment was intended to represent the habitat types used by the greatest diversity and abundance of birds within the region surrounding the Project, this coarse-scale approach to assessing habitat loss for passerines may not capture effects to individual species within this group. Due to the uncertainty in how individual species will be affected by habitat loss and reduced habitat effectiveness, confidence in the predictions for both habitat loss and reduced habitat effectiveness is moderate.

Table 4.4-7 Effects Characteristics Ratings for Passerine Habitat

Residual Effects Characteristic	Rating	Rationale for Rating
Habitat Loss		
Direction	Adverse	Habitat loss could reduce size of breeding populations of passerine birds.
Magnitude	Low	Low proportion of high suitability habitat change within the RAA.
Geographic Extent	Site	Confined to areas within the Project footprint.
Timing	Breeding season (46 spp.) Year-round (9 spp.)	Majority of passerine species only present during breeding season (May – August).
Frequency	Infrequent	Only occurs once at any location.
Duration	Long-term	Effects will persist beyond the life of the mine (>20 years).
Reversibility	Partially reversible	Reclamation will improve habitat suitability; however, it is unlikely to return to pre-disturbance conditions.
Likelihood	Likely	Project development will result in some habitat loss within Project footprint.
Reduced Habitat Effectiveness		
Direction	Adverse	Potential to reduce density of breeding birds and change community composition.
Magnitude	Low	Low proportion of high suitability habitat change within the RAA.
Geographic Extent	LAA	Reduced habitat effectiveness is only expected to occur within 300 m of the Project Footprint.
Timing	Breeding Season (46 spp.) Year-round (9 spp.)	Majority of passerine species only present during breeding season (May – Aug).

Residual Effects Characteristic	Rating	Rationale for Rating
Frequency	Continuous (mine)/ Frequent (road)	Reduced habitat effectiveness around the mine footprint will be continuous. Disturbance along the access road will occur multiple times per day during the breeding season.
Duration	Long-term	Effects will occur throughout the Construction, Operation, and Reclamation and Closure phases beyond the life of the mine (20 years).
Reversibility	Fully reversible	Sensory disturbance will cease following project completion and habitat may return to the baseline level of habitat effectiveness.
Likelihood	Likely	Project activities will create sensory disturbances.

4.4.5.4 Summary of Project–Related Residual Effects and Significance of Residual Effects on Passerines

Based on the information presented above and summarized in **Table 4.4-8**, there is no potential for a significant residual effect of habitat loss or reduced habitat effectiveness for passerines within the RAA. In consideration of the uncertainty regarding the coarse-scale approach to assessing habitat for passerines and how individual species will be affected by habitat loss and reduced habitat effectiveness, confidence in the predictions for both habitat loss and reduced habitat effectiveness is moderate.

Table 4.4-8 Summary of Project-related Residual Effects on Passerines

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Habitat loss	Construction	• Project Design	A	L	Site	B	I	L	P	L	H	N	M
Reduced habitat effectiveness	Construction Operation Reclamation and Closure	• Project Personnel Awareness Orientation • Minimize Habitat Disturbance • Avoid Disturbance During Breeding Bird Season • Protect Active and Identified Nests	A	L	LAA	B	C/F	L	F	L	H	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

4.4.6 UPLAND-ASSOCIATED SPECIES AT RISK SUBCOMPONENT

This section describes the nature of Project-related residual effects identified with respect to upland-associated species at risk (i.e., Common Nighthawk, Olive-sided Flycatcher, and Short-eared Owl), including an assessment of significance.

4.4.6.1 Potential Project-related Effects

Potential effects to upland-associated species at risk include habitat loss due to the Project footprint, reduced habitat effectiveness due to sensory disturbance, damage or destruction of active nests due to clearing activities, and mortality risk due to collisions with vehicles. Refer to **Section 4.2** for a complete list of potential Project-related effects.

4.4.6.2 Mitigation Measures

The potential adverse effects of the Project on Birds and Bird Habitat are addressed by a combination of mitigation measures as described in **Section 4.3** and the WPP (**Appendix 31-F**). Mitigation measures that will minimize adverse effects to upland-associated species at risk include minimizing habitat disturbance, avoiding disturbance during the breeding season, protecting active nests, and traffic management planning. Following the successful implementation of these mitigation measures, two residual effects are expected to remain for upland-associated species at risk: (1) habitat loss due to the Project footprint, and (2) reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust).

4.4.6.3 Project-related Residual Effects and Significance of Residual Effects

Background Information

This section is a detailed summary of background information to support the residual effects assessment of upland-associated species at risk in regards to habitat loss and reduced habitat effectiveness.

Common Nighthawk — There has been no research conducted on the threats to Common Nighthawk populations in Canada; however, data from the United States suggests that habitat loss and alteration are the main threats to Common Nighthawk populations in North America (Brigham et al. 2011; COSEWIC 2007a). Common Nighthawks breed in open areas with bare ground (e.g., clear-cuts, recently burned areas, forest clearings, rocky outcrops, pastures). European colonization had an initial positive effect on the amount of available breeding habitat via the creation of newly opened areas from deforestation and the proliferation of flat gravel roofs in urban areas. However, starting in the early 1900s, reforestation activities, harvesting practices that reduced the amount of open areas, forest fire suppression, intensive agricultural land use, and the replacement of flat gravel roofs with tar-covered roofs resulted in the steady loss of available open habitat.

Other factors that may be contributing to Common Nighthawk population declines include collisions with motor vehicles and aircraft, insect population declines, and climate change. Current reports indicate that collisions with motor vehicles and aircraft are responsible for relatively high mortality rates among several nighthawk populations in North America (Brigham et al. 2011; Campbell et al. 2006; COSEWIC 2007a). Common Nighthawks that roost or nest on gravel roads face a higher risk of collisions with motor vehicles and possible nest destruction, especially as the amount of traffic increases (motor vehicles includes all-terrain vehicles). Common Nighthawks can also be killed by motor vehicles while foraging over busy roads, as is the case over some highways in Florida (Brigham et al. 2011). In a study conducted in British Columbia, of 477 incidents of Common Nighthawk mortality, 38.6% were attributed to roadkill (Campbell et al. 2006). Collisions with aircraft can also be significant source of mortality, particularly during migration events; 82% of aircraft strikes between August and October at McConnell Air Force Base in Kansas involved nighthawks (Brigham et al. 2011; Campbell et al. 2006). In British Columbia, Common Nighthawks have been reported at several airports foraging around artificial lights and roosting on runways, roads, and fields (Campbell et al. 2006).

Insect population declines on breeding and wintering grounds may also be contributing to the overall decline in Common Nighthawk populations; however, no specific research has been conducted on this topic to date (Campbell et al. 2006; COSEWIC 2007a). In Europe, large-scale pesticide spraying programs are believed to be partly responsible for the decline of the Eurasian Nightjar (*Caprimulgus europaeus*). In several urban areas in North America, mosquito control programs are believed to be responsible for the declines in several species of aerial insectivores, including nighthawks. Similar to insect population declines, no specific research has been conducted to assess the effect of climate change on Common Nighthawks (COSEWIC 2007a). It is speculated that extreme climatic fluctuations in the spring could adversely affect adult survival and breeding success, and that more frequent tropical storms in the Gulf of Mexico could adversely affect nightjar migration in the fall.

Common Nighthawks have been known to adapt well to urban areas that provide suitable nest sites (e.g., flat gravel rooftops) and abundant insect food sources (e.g., treatment ponds, especially those that are well-lit and attract insects in great numbers; Campbell et al. 2006; COSEWIC 2007a). However, elevated levels of human disturbance, particularly vehicular traffic, may cause nighthawks to abandon known nesting sites, as was the case at Island View Beach on Vancouver Island (Campbell et al. 2006). To mitigate the potentially negative effects of human-related activities on Common Nighthawk, the Government of Saskatchewan and the Northwest Territories have established recommended setback distances from nest sites. For high disturbance activities such as road construction or mining, the Government of Saskatchewan recommends a minimum setback distance of 200 m from nest sites (SCDC 2015). In the Northwest Territories, a minimum setback distance of 200 m is recommended for seismic operations (AANDC 2011).

Olive-sided Flycatcher —The close association between Olive-sided Flycatchers and open habitats suggests that this species might benefit from timber harvesting and other land clearing activities; however, research conducted throughout western North America indicates that overall breeding success is significantly lower in harvested areas compared to fire origin stands. It is not yet apparent why this trend occurs. It has also been suggested that forest fire suppression may reduce the amount of available habitat for Olive-sided Flycatcher. Since Olive-sided Flycatchers exhibit a preference for nesting in burned areas, natural disturbance regimes should be used as general guidelines for management until a better understanding of the effects of timber harvesting and forest fire suppression on Olive-sided Flycatcher populations can be achieved. It has been speculated that the current decline in Olive-sided Flycatcher populations may be partly attributed to habitat loss and alteration on wintering grounds; however, no research has been conducted to examine this possibility.

Other factors that may be contributing to Olive-sided Flycatcher population declines include insect population declines and extreme weather (Altman and Sallabanks 2012). Pesticides may be detrimental to insect prey abundance in some areas, but no data are available to substantiate this. Extreme weather (i.e., rain, snow, cold temperatures) could adversely affect nighthawks by limiting insect activity and/or abundance, which may delay reproductive activities or affect nestling survival.

Limited information is available on the effects of human disturbance on Olive-sided Flycatcher breeding success. One study in Oregon documented premature fledging from a nest that was being closely monitored (Altman and Sallabanks 2012). To mitigate the potentially negative effects of human-related activities on Olive-sided Flycatchers, Saskatchewan and the Northwest Territories have established recommended setback distances from nest sites. For high disturbance activities such as road construction or mining, the government of Saskatchewan recommends a minimum setback distance of 300 m from nest sites (SCDC 2015). In the Northwest Territories, a minimum setback distance of 300 m is recommended for seismic operations (AANDC 2011).

Short-eared Owl — Relatively little is known about the factors responsible for the population declines of Short-eared Owls; however, several hypotheses have been proposed. The major threat is most likely winter habitat degradation and loss. Secondary threats likely include habitat degradation and loss on breeding grounds, increased nest predation due to habitat fragmentation, and decreased prey abundance due to habitat changes. Pesticide use and collisions with vehicles, utility lines, and barbed wire fences may also be contributing to population declines to a lesser extent, along with extensive livestock grazing and mowing/harvesting activities in agricultural areas.

Short-eared Owls are classified as moderately tolerant of human activities because they are known to forage in habitats close to human developments, but are susceptible to disturbance by humans at the nest site (Government of British Columbia 2013). They have been known to forage in wetlands and fallow pastures close to human developments, and their nests are difficult to locate as they are well-concealed

within thick vegetative cover (Government of British Columbia 2013; Wiggins et al. 2006). However, because they are ground nesters, their nests are more vulnerable to predation. To mitigate the potentially negative effects of human-related activities on Short-eared Owls, several provinces have recommended setback distances from nest sites. For high disturbance activities such as road construction or mining, the governments of British Columbia, Saskatchewan, and Manitoba recommend a minimum setback distance of 500 m from nest sites (Government of British Columbia 2013; SCDC 2015; MCDC 2014). For high disturbance activities within grassland and parkland natural regions in Alberta, the recommended minimum setback distance is 100 m from nest sites (Government of Alberta 2011).

Nest Habitat Assessment

For each upland-associated species at risk, habitat loss was assessed within the LAA, assuming that all habitat within the mine site footprint and along new portions of the access road will become unsuitable (i.e. nil habitat suitability) for the focal species following mine development. Reduced habitat effectiveness due to sensory disturbance was assessed for each subcomponent using a 300 m ZOI around the Project footprint. The ZOI was based on literature review and considered noise and air quality modelling for the Project. All habitat ratings within the ZOI were downgraded by one class to a minimum of low (i.e. high becomes medium; medium becomes low; low stays low; and, nil remains nil). The resulting habitat values at maximum disturbance were then summarized and compared to the baseline values.

Common Nighthawk — The habitat assessment found that 6.72% of the high suitability Common Nighthawk habitat within the LAA would be lost as a result of the Project footprint (**Table 4.4-9**). Within the ZOI, 33.38% of the high suitability habitat in the LAA may have reduced effectiveness due to sensory disturbance. Approximately 3% of the high suitability Common Nighthawk habitat within the ZOI is associated with the mine; the remaining high suitability habitats in the ZOI are associated with the NAR.

Burned forest (≤30 years old) is a component of high suitability habitat that can be quantified with available land cover data throughout the RAA. Results of the analysis of habitat loss (6.72%) and reduced habitat effectiveness due to sensory disturbance (33.38%) in the LAA were applied to burns ≤30 years old in the RAA (**Table 4.4-10**). The predicted change in habitat represents a low habitat loss in the RAA (0.60%), and a low amount of reduced habitat effectiveness in the RAA due to sensory disturbance (2.97%).

Table 4.4-9 Summary of Common Nighthawk Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Footprint		Reduced Habitat Effectiveness in ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Low	321.08	22.69	7.07	79.62	24.80	102.31	31.86
Medium	14.41	0.68	4.69	6.66	46.21	7.33	50.90
High	136.59	9.17	6.72	45.59	33.38	54.77	40.10

Table 4.4-10 Summary of Common Nighthawk High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Burns (≤30yrs)	127.58	1,432.85	8.57	42.59	0.60	2.97

1. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 6.72% loss of high quality habitat available in the LAA (0.0672*127.58 km²).
2. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 33.38% effect on high quality habitat available in the LAA (0.3338*127.58 km²).
3. Loss to footprint/Baseline habitat within RAA*100.
4. Reduced habitat effectiveness in ZOI/Baseline habitat within RAA*100.

Olive-sided Flycatcher — The habitat assessment indicated that 8.86 km² of high suitability Olive-sided Flycatcher habitat will be lost as a result of developing the Project footprint; this represents a loss of 5.58% of the high suitability habitat within the LAA (**Table 4.4-11**). An additional 42.65 km² of high suitability habitat is within the ZOI. This represents reduced habitat effectiveness within 26.83% of the LAA as a result of sensory disturbance. Approximately 13% of the high suitability habitat potentially affected by the Project is associated with the mine; the remaining high suitability habitat is associated with the NAR.

Burns (≤30 years old) are a component of high suitability habitat for Olive-sided Flycatcher that can be measured throughout the RAA. Rate of habitat loss (5.58%) and habitat change due to sensory disturbance (26.83%) in the LAA were applied to burns ≤30 years old in the RAA. The predicted change in habitat represents a small loss in the RAA (0.50%), and a low amount of reduced habitat effectiveness in the RAA due to sensory disturbance (2.39%; **Table 4.4-12**).

Table 4.4-11 Summary of Olive-sided Flycatcher Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Footprint		Reduced Habitat Effectiveness in ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Low	138.16	13.38	9.69	43.91	31.78	57.29	41.47
Medium	174.95	10.30	5.89	45.30	25.89	55.60	31.78
High	158.97	8.86	5.58	42.65	26.83	51.52	32.41

Table 4.4-12 Summary of Olive-sided Flycatcher High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Burns (≤30yrs)	127.58	1,432.85	7.12	34.23	0.50	2.39

1. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 5.58% loss of high quality habitat available in the LAA (0.0558*127.58 km²).
2. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 26.83% effect on high quality habitat available in the LAA (0.2683*127.58 km²).
3. Loss to footprint/Baseline habitat within RAA*100.
4. Reduced habitat effectiveness in ZOI/Baseline habitat within RAA*100.

Short-eared Owl — Based on habitat modelling for Short-eared Owl from baseline studies, 21.68% of the high suitability Short-eared Owl habitat within the LAA will be lost as a result of the Project footprint (**Table 4.4-13**). Most of the habitat that will be affected by the Project footprint lies within a single contiguous patch. An additional 20.56% of the high suitability habitat could have reduced habitat effectiveness because it is located within the ZOI of the Project footprint. The majority (approximately 93%) of the high suitability habitat that could be affected by the Project is associated with the mine site; the remaining high suitability habitat within the ZOI is associated with the NAR.

Subalpine (Dryas dominated, sparse shrub/herb), burns (≤30 years old), and wetlands are habitat components of high suitability habitat for Short-eared Owl that can be measured throughout the RAA. The amount of habitat loss (21.68%) and reduced habitat effectiveness (20.56%) in the LAA were applied to these habitat components in the RAA. The predicted change in habitat represents a low amount of habitat loss in the RAA (1.93%), and a low amount of reduced habitat effectiveness in the RAA due to sensory disturbance (1.83%; **Table 4.4-14**).

Table 4.4-13 Summary of Short-eared Owl Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Footprint		Reduced Habitat Effectiveness in ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Nil	7.85	0.34	4.35	3.07	39.10	3.41	43.45
Low	345.30	26.06	7.55	93.64	27.12	119.70	34.67
Medium	115.20	5.33	4.63	34.39	29.85	39.72	34.48
High	3.72	0.81	21.68	0.77	20.56	1.57	42.24

Table 4.4-14 Summary of Short-eared Owl High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Burns (≤30yrs)	127.58	1,432.85	27.66	26.23	1.93	1.83

1. Subalpine defined as ≥1,290 metres elevation based on extent of ecological communities dominated by Dryas and sparse shrub/herbs
2. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 21.68% loss of high quality habitat available in the LAA (0.2168*127.58 km²).
3. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 20.56% effect on high quality habitat available in the LAA (0.2056*127.58 km²).
4. Loss to footprint/Baseline habitat within RAA*100
5. Reduced habitat effectiveness in ZOI/Baseline habitat within RAA*100

The context for the residual effects of habitat loss and reduced habitat effectiveness for upland-associated species at risk is moderate. Habitat for these species is widely distributed within the RAA and the broader ecological region. Based on their widely distributed habitat and existing sources of sensory disturbance, it is expected that upland-associated species at risk will be resilient to habitat loss and reduced habitat effectiveness; however, because they are species at risk, a moderate context rating was assigned.

Effects characteristics ratings for upland-associated species at risk habitat are summarized in **Table 4.4-15**. The magnitude of habitat loss is considered low because overall the proportion of the RAA adversely affected was small (<10%). Habitat loss due to the Project footprint has a very limited geographic extent, restricted to those areas of high suitability habitat that overlap with the Project footprint. This residual effect will only occur during the Construction phase and the effect will be long-term, persisting beyond the life of the mine. Habitat loss was rated as partially reversible because reclamation will restore some habitat suitability for these species, but is unlikely to completely restore baseline conditions. Based on the

information presented above and summarized in **Table 4.4-15**, the residual effect of habitat loss is considered to be not significant for upland-associated species at risk.

The magnitude for reduced habitat effectiveness is also considered to be low because of the small proportion of regional habitat affected by the Project (<10%).The geographical extent of reduced habitat effectiveness will occur within the LAA, but will be primarily localized to the NAR where majority of the high suitability habitat occurs. Most of this road (177 km) is already developed and birds using these habitats may already have responded to or adapted to sensory disturbance from the road. Reduced habitat effectiveness will be continuous during Construction, Operation, and Reclamation and Closure phases and is considered long-term; however, it is a fully reversible effect that will end with mine closure. This effect is likely to occur because Project activities will create sensory disturbance; however, there is uncertainty in the extent of reduced habitat effectiveness as there is variability in how each species and individual birds will respond. Based on the information presented above and summarized in **Table 4.4-15**, the residual effect of reduced habitat effectiveness is considered to be not significant for upland-associated species at risk.

Table 4.4-15 Effect Characteristics Ratings for Upland-Associated Species at Risk

Residual Effects Characteristic	Rating	Rationale for Rating
Habitat Loss		
Direction	Adverse	Habitat loss could reduce size of breeding populations of upland-associated species at risk.
Magnitude	Low	Low proportion of habitat available in the RAA would be affected (<10% of RAA).
Geographic Extent	Site	Confined to areas within the Project footprint.
Timing	Breeding season	Only present in the region during the breeding season.
Frequency	Infrequent	Only occurs once at any location.
Duration	Long-term	Effects will persist beyond the life of the mine (>20 years)
Reversibility	Partially reversible	Post-closure reclamation will improve habitat suitability; however, it is unlikely to return to pre-disturbance conditions.
Likelihood	Likely	Project development will result in some direct habitat loss within Project footprint.
Reduced Habitat Effectiveness		
Direction	Adverse	Sensory disturbance can reduce habitat effectiveness by reducing the amount of habitat available for upland-associated species at risk and/or reduce nesting success within the ZOI.
Magnitude	Low	Less than 10% of habitat available in the RAA could be affected by sensory disturbance.
Geographic Extent	LAA	Reduced habitat effectiveness is only expected to occur within 300 m of the Project footprint.

Residual Effects Characteristic	Rating	Rationale for Rating
Timing	Breeding season	Focal species are only present in the region during the breeding season.
Frequency	Continuous (mine) Frequent (road)	Sensory disturbance around the mine footprint will be continuous. Disturbance along the access road will occur multiple times per day during the breeding season.
Duration	Long-term	Reduced habitat effectiveness will occur through the mine life-cycle.
Reversibility	Fully reversible	Sensory disturbance will cease following project completion.
Likelihood	Likely	Project activities will reduce habitat effectiveness around the mine site and the access road.

4.4.6.4 Summary of Project–Related Residual Effects and Significance of Residual Effects on Upland-associated Species at Risk

Habitat loss and reduced habitat effectiveness resulting from Project activities within the LAA are unlikely to affect regional populations. Based on the information presented above and summarized in (**Table 4.4-16**), the residual effects of habitat loss and reduced habitat effectiveness are considered to be not significant for upland-associated species at risk within the RAA. Confidence for the significance rating for habitat loss and reduced habitat effectiveness is moderate, partly because baseline habitat data is not available for the larger region. There is also uncertainty in how habitat for these species will be altered through the Project life cycle due to natural disturbance regimes (e.g. fire and climate).

Table 4.4-16 Summary of Project-related Residual Effects on Upland-associated Species at Risk

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Habitat loss	Construction	• Project Design	A	L	Site	B	I	L	P	L	M	N	M
Reduced habitat effectiveness	Construction Operation Closure Post-closure	• Project Personnel Awareness Orientation • Minimize Habitat Disturbance • Avoid Disturbance During Breeding Bird Season • Protect Active and Identified Nests	A	L	LAA	B	C/F	L	F	L	M	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

4.4.7 WETLAND-ASSOCIATED SPECIES AT RISK SUBCOMPONENT

This section describes the nature of Project-related residual effects identified with respect to wetland-associated species at risk (i.e., Horned Grebe, Red-necked Phalarope, and Rusty Blackbird), including an assessment of significance.

4.4.7.1 Potential Project-related Effects

Potential Project-related effects on wetland-associated species at risk were considered at the overall Birds and Bird Habitat VC level because subcomponents are expected to experience similar effects. Potential effects to wetland-associated species at risk include habitat loss due to the Project footprint, reduced habitat effectiveness due to sensory disturbance, damage or destruction of active nests due to clearing activities, contaminants uptake, and mortality risk due to collisions with vehicles. Refer to **Section 4.2** for a complete list of potential Project-related effects.

4.4.7.2 Mitigation Measures

The potential adverse effects of the Project on Birds and Bird Habitat are addressed by a combination of mitigation measures as described in **Section 4.3** and the WPP (**Appendix 31-F**). Mitigation measures that will minimize adverse effects to wetland-associated species at risk include minimizing habitat disturbance, avoiding disturbance during the breeding season, protecting active nests, and traffic management planning. Following the successful implementation of these mitigation measures, two residual effects are expected to remain for wetland-associated species at risk: (1) habitat loss due to the Project footprint, and (2) reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust).

4.4.7.3 Project-related Residual Effects and Significance of Residual Effects

Background Information

This section is a detailed summary of background information to support the residual effects assessment of wetland-associated species at risk in regards to habitat loss and reduced habitat effectiveness.

Horned Grebe — It is currently unknown why Horned Grebe populations are declining in North America (COSEWIC 2009). Probable threats to this species include the degradation or permanent loss of wetlands to agriculture and other development activities, and increased predation due to habitat changes (COSEWIV 2009; Stedman 2000). Horned Grebes are vulnerable to changes in water quality on their breeding grounds; the species generally occupies small, shallow ponds that are susceptible to drought, drainage, and eutrophication. Horned Grebes may also forage at sites outside of their breeding ponds; therefore, loss of foraging sites around breeding ponds could affect breeding success or site occupancy (COSEWIC 2009; Stedman 2000). No studies have been conducted on the foraging range of this species during the breeding season. Horned Grebes are also vulnerable to oiling and contaminant exposure, and since they are an upper trophic predator that spends their entire life cycle in aquatic habitats, they are more susceptible to

contamination through bioaccumulation. No information is available on collision risk for this species (Stedman 2000).

Horned Grebes are sensitive to human disturbance (Stedman 2000). To mitigate the potentially negative effects of human-related activities on Horned Grebe nesting sites, EC and the provinces of Alberta and Manitoba established recommended setback distances from nesting sites. Environment Canada recommends an initial setback distance of 10 to 50 m or more for waterfowl nests with the recognition that further review may be necessary to establish an appropriate buffer for large industrial operations or species at risk (Environment and Climate Change Canada 2016b). For high disturbance activities such as road construction or mining, the governments of Alberta and Saskatchewan recommend minimum setback distances of 500 m and 400 m, respectively, from Horned Grebe nesting sites (GAAER 2013; SCDC 2015).

Red-necked Phalarope — Relatively little is known about the factors responsible for the population declines in Red-necked Phalaropes; however, several hypotheses have been proposed (COSEWIC 2014). Based on expert opinion, the primary threat to Red-necked Phalarope on their breeding grounds is likely climate change and the associated habitat and food-web effects. The build-up of contaminants, increasing industrial activities, and overabundant snow geese are also likely limiting factors on their breeding grounds (COSEWIC 2014; Rubega et al. 2000). Changes in the availability and distribution of prey during migration and over-wintering; oil spills and chronic oiling at sea or exposure to contaminants in tailings ponds during over-wintering and migration; and ingestion of micro-plastics at sea during over-wintering and migration are other possible threats. Collisions with stationary, well-lit objects are also a potential threat; an unknown number of migrating Red-necked Phalaropes collided with buildings, signs, and lights in downtown Reno, Nevada in 1964, and eight specimens were collected in New York in 1892 after striking Montauk Lighthouse (Rubega et al. 2000).

No data are available on the disturbance response of Red-necked Phalaropes to humans at nest sites; however, it is expected that regular disturbance at nest sites would increase the risk of abandonment and predation (Rubega et al. 2000). To mitigate the potentially negative effects of human-related activities on shorebird nesting sites, the governments of Alberta, Saskatchewan, and Manitoba established recommended setback distances for several shorebird species, some of which are species at risk (i.e., Long-billed Curlew (*Numenius americanus*), Mountain Plover (*Charadrius montanus*), and Red Knot (*Calidris canutus*)); there is currently no specific setback distance for Red-necked Phalarope. For high disturbance activities such as road construction or mining, recommended minimum setback distances range from 100 to 600 m for Long-billed Curlew, Upland Sandpiper (*Bartramia longicauda*), Mountain Plover, Snowy Plover (*Charadrius nivosus*), and Piping Plover (*Charadrius melodus*) (Government of Alberta 2011; SCDC 2015; MCDC 2014). The recommended minimum setback distance for Red Knot is 1,000 m (SCDC 2015).

Rusty Blackbird — Although conversion of wetland forests on wintering grounds is considered to be the most significant factor contributing to the declines of Rusty Blackbirds, loss of breeding habitat was also identified as a limiting factor (COSEWIC 2006). Nationally it has been estimated that 5% of the breeding habitat for this species has already been lost and another 4% habitat loss is anticipated over the next 50 years (COSEWIC 2006). Most of the current breeding habitat loss is attributed to conversion of wetlands to agriculture and urban development. Clearing of forested wetlands and riparian areas removes habitat for this species and provides opportunities for the invasion of competing species like Red-winged Blackbirds (*Agelaius* phoeniceus; Avery 2013).

A study in Maine found that logging at the edges or into wetlands did not influence nest site selection by Rusty Blackbirds; however, nests in unlogged wetlands were 2.3 times more likely to fledge young (Powell et al. 2010b). Those authors suggest that the cues Rusty Blackbirds use to select nest sites may be maladaptive when habitat within or adjacent to wetlands has been harvested, and that preserving a 75 m buffer around wetlands will increase nest survival. This 75 m buffer should be adequate to protect all nesting habitat, but likely does not cover all foraging habitat (Powell et al. 2010a). Buckley (2013) found a negative association between nest success and distance from roads, which was attributed to a concentration of nest predators along roads. Collisions with vehicles are not known to be a substantial source of mortality for this species (Avery 2013).

To mitigate the potentially negative effects of human-related activities on Rusty Blackbird nesting sites, EC and the governments of Saskatchewan, Manitoba, and the Northwest Territories established recommended setback distances from nesting sites. Environment Canada recommends an initial setback distance of 10 to 50 m or more for most songbird nests with the recognition that further review may be necessary to establish an appropriate buffer for large industrial operations or species at risk (Environment and Climate Change Canada 2016b). For high disturbance activities such as road construction or mining, the governments of Saskatchewan and Manitoba recommend a minimum setback distance of 300 m for Rusty Blackbird nesting sites (SCDC 2015). In the Northwest Territories, a minimum setback distance of 300 m is recommended for seismic operations (AANDC 2011).

Breeding Habitat Assessment

A quantitative assessment of habitat loss and reduced habitat effectiveness was conducted for three wetland-associated species at risk: Horned Grebe, Red-necked Phalarope, and Rusty Blackbird. As with the previous subcomponents, habitat components that could be mapped across the RAA were used to assess the magnitude of effects. The availability of detailed wetland mapping is limited and it is acknowledged that the data sources used likely underestimate the amount of wetland habitat. By comparing wetland area as habitat using broad regionally-available data, the assumption is that any data imprecision will be parallel between the RAA and the LAA. Reduced habitat effectiveness due to sensory disturbance was assessed for each subcomponent using a 300 m ZOI around the Project footprint.

The effects assessments for Horned Grebe and Red-necked Phalarope were combined because those two species use broadly overlapping habitat types, which were modeled using the same parameters. See the Bird Baseline Report (**Appendix 17-A**) for a detailed description of species-specific habitat modelling.

Horned Grebe and Red-necked Phalarope — All of the suitable habitat (1.40 km²) for Horned Grebe and Red-necked Phalarope was located along the NAR. One small (<1 ha), natural marsh along the Yukon River intersects the Project footprint; representing 3.32% of the suitable breeding habitat within the LAA that may be lost to the Project footprint (**Table 4.4-17**). An additional 0.64 km² of suitable habitat could have reduced habitat effectiveness due to sensory disturbance, representing 45.82% of the suitable habitat for these two species within the LAA. Most of the suitable breeding habitat within the 300 m ZOI is located in placer mined areas in the Indian River road section, adjacent to the existing NAR. Only 0.1 km² is undisturbed marsh habitat near the Stewart and Yukon river crossings, adjacent to areas planned for new construction.

Wetlands and open water are two broad habitat types that comprise suitable habitat for these species and are available as spatial data throughout the RAA. Percentage of habitat loss (3.32%) and percentage of reduced habitat effectiveness due to sensory disturbance (45.82%) resulting from detailed analysis in the LAA (**Table 4.4-17**) were applied to wetlands and open water in the RAA. The predicted change in habitat represents a low amount of habitat loss in the RAA (0.63%), and a low amount of reduced habitat effectiveness in the RAA due to sensory disturbance (8.60%; **Table 4.4-18**).

Table 4.4-17 Summary of Horned Grebe and Red-necked Phalarope Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Project Footprint		Reduced Habitat Effectiveness in ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Not suitable	470.67	32.50	6.90	131.22	27.88	163.72	34.78
Suitable	1.40	0.05	3.32	0.64	45.82	0.69	49.13

Table 4.4-18 Summary of Horned Grebe and Red-necked Phalarope High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Open water and wetlands	6.83	36.40	0.23	3.13	0.63	8.60

1. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 3.32% loss of high quality habitat available in the LAA (0.0332*6.83 km²).
2. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 45.82% effect on high quality habitat available in the LAA (0.4582*6.83 km²).
3. Loss to footprint/Baseline habitat within RAA*100.
4. Reduced effective effectiveness in ZOI/Baseline habitat within RAA*100.

Rusty Blackbird — All of the high suitability Rusty Blackbird habitat within the LAA is associated with the NAR. There are 0.28 km² of Rusty Blackbird high suitability habitat within the Project footprint, representing 8.34% of the high suitability habitat within the LAA (**Table 4.4-19**). This includes a marsh and surrounding riparian habitat on the north side of the Yukon River. Another 1.80 km², within the ZOI, representing 53.13% of the high suitability habitat within the LAA, could be affected by sensory disturbance. Combined, 61.48% of the high suitability Rusty Blackbird habitat within the LAA could experience direct habitat loss or sensory disturbance.

Wetlands and open water are two habitat components that are associated with suitable habitat for Rusty Blackbird and are available as spatial data for the RAA. Effects due to habitat loss (8.34%) and sensory disturbance (53.13%) were applied to these habitat components in the RAA. The predicted change in habitat represents a small loss in the RAA (1.57%), and a moderate amount of reduced habitat effectiveness in the RAA due to sensory disturbance (9.97%; **Table 4.4-20**).

Table 4.4-19 Summary of Rusty Blackbird Habitat Change in the LAA

Habitat Suitability Rating	Baseline Habitat within LAA	Habitat Loss in LAA from Project Footprint		Reduced Habitat Effectiveness in ZOI		Total Habitat Change in LAA	
	km²	km²	%	km²	%	km²	%
Nil	432.60	30.52	7.05	116.82	27.00	147.33	34.06
Low	36.09	1.74	4.83	13.25	36.71	14.99	41.54
Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High	3.39	0.28	8.34	1.80	53.13	2.08	61.48

Table 4.4-20 Summary of Rusty Blackbird High Suitability Habitat Change in the RAA

High Suitability Habitat	Baseline Habitat within LAA	Baseline Habitat within RAA	Loss to Footprint[1]	Reduced Habitat Effectiveness in ZOI[2]	Proportion of Habitat Loss in RAA from Footprint[3]	Proportion of Reduced Habitat Effectiveness in RAA[4]
	km²	km²	km²	km²	%	%
Open water and wetlands	6.83	36.40	0.57	3.63	1.57	9.97

1. Using proportions of high suitability habitat from detailed mapping in LAA to scale to available coarse scale habitat data in the RAA: A 8.34% loss of high quality habitat available in the LAA (0.0834*6.83 km²).
2. Using proportion of high quality reduced habitat effectiveness from detailed habitat mapping in the LAA to scale to available coarse scale habitat data in the RAA: A 53.13% effect on high quality habitat available in the LAA (0.5313*6.83 km²).
3. Loss to footprint/Baseline habitat within RAA*100
4. Reduced habitat effectiveness in ZOI/Baseline habitat within RAA*100

Effects characteristics ratings for wetland-associated species at risk habitat are provided in **Table 4.4-21**. Due to the existing sections of the NAR and activities (e.g. placer mining) already occurring in the LAA, the current conditions in the LAA present some level of sensory disturbance and reduced habitat effectiveness and there is a limited amount of habitat actually used in the LAA. However, because the species being assessed are species at risk, which may be less resilient to habitat disturbance, the context for habitat loss and reduced habitat effectiveness is considered to be moderate.

Habitat loss for wetland-associated species at risk is assessed as low magnitude. The amount of habitat loss is <1% of that available in the RAA. Only 1% of the available habitat within the LAA is lost for any of the wetland species evaluated. This minor habitat loss is associated with potential footprint effects within a marsh near the Yukon River. The wildlife management plan requires that wetlands be avoided whenever possible during construction. The potential residual effect will only occur once during the Construction phase and the effect will be long-term, persisting beyond the life of the mine. Habitat loss was rated as partially reversible because reclamation will restore some habitat suitability for these species, but is unlikely to completely restore baseline conditions.

Reduced habitat effectiveness is low for Horned Grebe and Red-necked Phalarope (8.60%) and moderate for Rusty Blackbird (9.97%) in the context of the RAA. Much of the affected habitat is most likely already subject to some level of sensory disturbance due to the existing conditions within the RAA (e.g. placer mining near the existing sections of the road). The geographic extent of reduced habitat effectiveness will occur within the LAA. Along the NAR, sensory disturbance will be continuous during the Construction phase and frequent (multiple vehicles per day) during the Operation and Reclamation and Closure phases; therefore, reduced habitat effectiveness will be a long-term effect that persists throughout the life of the Project; however, it is fully reversible that will end with mine closure. This effect was rated as likely to occur,

because Project activities will create sensory disturbance; however, there is uncertainty in the extent of reduced habitat effectiveness as there is variability in how each species and individual birds will respond.

Table 4.4-21 Effect Characteristics Ratings for Wetland-associated Species at Risk

Residual Effect Characteristic	Rating	Rationale for Rating
Habitat Loss		
Direction	Adverse	Habitat loss could reduce size of breeding populations of wetland-associated species at risk.
Magnitude	Low	Less than 1% of suitable habitat will be lost to the Project footprint.
Geographic Extent	Site	Confined to areas within the Project footprint.
Timing	Breeding	Only present in the region during the breeding season.
Frequency	Infrequent	Only occurs once at any location.
Duration	Long-term	Effects will persist beyond the life of the mine (>20 years).
Reversibility	Partially reversible	Reclamation will improve habitat suitability; however, it is unlikely to return to pre-disturbance conditions.
Likelihood	Likely	Project development may result in some direct habitat loss within Project footprint.
Reduced Habitat Effectiveness		
Direction	Adverse	Sensory disturbance can reduce habitat effectiveness by reducing the amount of habitat available for wetland-associated species at risk and/or reduce nesting success within the ZOI.
Magnitude	Low/Moderate	For Horned Grebe and Red-necked Phalarope, 8.60% of suitable habitat may be affected. For Rusty Blackbird, 9.97% of suitable habitat may be affected by sensory disturbances.
Geographic Extent	LAA	Reduced habitat effectiveness is only expected to occur within 300 m of the Project Footprint.
Timing	Breeding	Only present in the region during the breeding season.
Frequency	Continuous (mine) Frequent (road)	Reduced habitat effectiveness around the mine site footprint will be continuous. Disturbance along the NAR will occur multiple times per day during the breeding season.
Duration	Long-term	Reduced habitat effectiveness will occur through the mine life-cycle.
Reversibility	Fully reversible	Reduced habitat effectiveness will cease following Project completion.
Likelihood	Likely	Project activities will reduce habitat effectiveness around the mine site and the NAR.

4.4.7.4 Summary of Project–Related Residual Effects and Significance of Residual Effects on Wetland-associated Species at Risk

Based on the information above and summarized in **Table 4.4-22**, the residual effects of habitat loss and reduced habitat effectiveness on wetland-associated species at risk is considered to be not significant within the RAA. Confidence for the significant rating for habitat loss and reduced habitat effectiveness is moderate because comparable habitat baseline is not available for the larger region. There is also uncertainty in how habitat for wetland-associated species at risk will be altered through the Project life cycle due to natural disturbance regimes (e.g. fire and climate).

Table 4.4-22 Summary of Project-related Residual Effects on Wetland-associated Species at Risk

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Habitat loss	Construction	• Project Design	A	L	Site	B	I	L	P	L	M	N	M
Reduced habitat effectiveness	Construction Operation Closure Post-closure	• Project Personnel Awareness Orientation • Minimize Habitat Disturbance • Avoid Disturbance During Breeding Bird Season • Protect Active and Identified Nests	A	L/M	LAA	B	C/F	L	F	L	M	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

4.4.8 BANK SWALLOW SUBCOMPONENT

This section describes the nature of Project-related residual effects identified with respect to Bank Swallow, including an assessment of significance.

4.4.8.1 Potential Project-related Effects

Potential effects to Bank Swallow include habitat loss due to the Project footprint, reduced habitat effectiveness due to sensory disturbance, damage or destruction of active nests due to road upgrades, and mortality risk due to collisions with vehicles. Refer to **Section 4.2** for a complete list of potential Project-related effects.

4.4.8.2 Mitigation Measures

The potential adverse effects of the Project on Birds and Bird Habitat are addressed by a combination of mitigation measures as described in **Section 4.3** and the WPP (**Appendix 31-F**). Mitigation measures that will minimize adverse effects to Bank Swallow include minimizing habitat disturbance and protecting colony habitat, avoiding disturbance during the breeding season, protecting active and identified colonies, and traffic management. All identified Bank Swallow colony sites will remain intact throughout the Project and will not be physically damaged or destroyed due to Project activities[1]. Following the successful implementation of these mitigation measures, the residual effect of reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust) is expected to remain for Bank Swallow.

4.4.8.3 Project-related Residual Effects and Significance of Residual Effects

Background Information

This section is a detailed summary of background information to support the residual effects assessment of Bank Swallows in regards to reduced habitat effectiveness due to sensory disturbance.

Bank Swallows use both natural and man-made habitats for nesting (Sinclair et al. 2003). Nesting colonies are typically located in steep embankments comprised of friable soils (i.e., sand, silt, or clay) where the swallows can easily excavate burrows for nesting. Natural habitats include vertical banks along rivers and streams; artificial habitats include road embankments, cut banks, and gravel pits. Due to the nature of Bank Swallow nesting habitats, they are extremely vulnerable to natural and human-caused erosive forces (Garrison 1998). Erosion is necessary to a certain degree to maintain the vertical faces at colony sites, but too much erosion will cause the vertical faces to breakdown and collapse, rendering the colony unsuitable for breeding.

[1] Project activities will be managed to avoid physical damage to identified Bank Swallow colonies. If it is determined that physical damage cannot be avoided (e.g., due to site constraints during road construction/upgrades), a site-specific mitigation and monitoring plan will be developed in consultation with the appropriate authorities (**Appendix 31-F**).

Bank Swallow colonies are most affected by flooding and erosion disturbances (Garrison 1998). Flooding can cause erosion, resulting in the need for bank protection, channelization, and/or flood control, all of which can reduce the amount of suitable nesting habitat (Garrison 1998; COSEWIC 2013). Strong winds, waves generated by boat traffic, or rapidly fluctuating water levels caused by freshet, storm events, or flood control programs can lead to erosion that undercuts swallow colonies and results in bank collapse and egg/nestling mortality. For swallows nesting in artificial habitats, land clearing or gravel pit management activities can result in bank destabilization, which can also lead to colony collapse and egg/nestling mortality.

Bank Swallows are relatively insensitive to moderate levels of human disturbance as long as the integrity of their nesting habitat remains intact (Garrison 1998). In California, successful colonies have been located in agricultural lands, in busy recreational coastal locations with substantial human activity, along major roads through towns, and in reservoirs with recreational boat traffic.

To mitigate the potentially negative effects of human-related activities on swallow nesting sites, EC and Manitoba established recommended setback distances from nesting sites. Environment Canada recommends an initial setback distance of 10 to 50 m or more for swallow colonies with the recognition that further review may be necessary to establish an appropriate buffer for large industrial operations or species at risk (Environment and Climate Change Canada 2016b). For high disturbance activities such as road construction or mining, the Manitoba Conservation Data Center recommends a minimum setback distance of 300 m for Bank Swallow nesting colonies (MCDC 2014).

Colony Site Assessment

The assessment of Project-related residual effects on known colony sites for Bank Swallows within the RAA was completed in two stages. During baseline field studies, Project biologists compiled a list of all known Bank Swallow colonies currently located within the RAA. Geographic Information System (GIS) was then used to assign each known colony to one of three risk categories:

- Priority 1 colonies are located within 300 m of proposed Project infrastructure and are expected to be most at risk from Project activities;
- Priority 2 colonies are located between 300 and 600 m from proposed Project infrastructure and are expected to be at moderate risk from Project activities; and
- Priority 3 colonies are located beyond 600 m from proposed Project infrastructure and are expected to be the least at risk from Project activities.

These risk categories were determined based the review of recommended buffer distances described above. The second stage of the assessment was a site-specific assessment of all nest sites rated as Priority 1 or 2.

During baseline field studies, 12 Bank Swallow nesting colonies were recorded within the RAA. Assessment of these colony sites in relation to proposed Project infrastructure concluded that six colonies are Priority 1 sites located within 300 m of Project infrastructure (**Table 4.4-23**). There is one Priority 2 site located between 300 and 600 m from proposed Project infrastructure. Of the six colonies located within 300 m of Project infrastructure, five were located within the proposed Project footprint for the NAR, while the one Priority 2 colony was located near the Ballarat Creek barge landing. All of these colonies are expected to remain intact throughout the Construction and Operation phases; however, sensory disturbance to nesting individuals may occur.

Colony site BANS_5 was located in a road embankment along an existing section of the NAR approximately 71 m from the NAR footprint. The status of this site is currently unknown, but was assumed to be active. This colony is located on a spur road off the proposed NAR and is expected to remain intact. If Bank Swallows attempt to nest at this colony again, the proximity to disturbance could result in moderate levels of sensory disturbance, but it is unlikely the swallows would abandon the colony site.

Colony site BANS_6 was identified as an inactive colony in 2015, and was located in a cut bank within an actively mined placer area within 20 m from existing road centerline. During a recent field survey in April 2016, this colony could not be found by Project biologists and it is likely it was destroyed by ongoing placer mining activities in the area and is therefore not considered further in the assessment.

Colony BANS_7 was identified as an active colony in 2015, and was located in a cut bank within an actively mined placer area approximately 70 m from the existing road centerline. Adult Bank Swallows were observed entering the colony, but Project biologists could not access the area to count the number of burrows. The colony is expected to remain intact. If Bank Swallows attempt to nest at this colony again, the proximity to disturbance could result in moderate levels of sensory disturbance; however, the level of disturbance would likely be more strongly associated with ongoing placer mining activity in the area than Project activities.

Colony site BANS_9 was identified in 2015; adult Bank Swallows were observed flying in the area; however, no adults were observed using the burrows. The colony was revisited in 2016 and was determined to be inactive. It was located in an embankment near the existing airstrip. If Bank Swallows attempt to nest at this colony again, the proximity to disturbance could result in moderate levels of sensory disturbance, but it is unlikely the swallows would abandon the colony site.

Colony site BANS_10 is located in a bank on the north side of the Yukon River, near the Ballarat Creek landing. The colony was identified as an inactive colony in 2016. The colony is expected to remain intact. If Bank Swallows attempt to nest at this colony again, the proximity to disturbance could result in moderate levels of sensory disturbance, but it is unlikely the swallows would abandon these colony sites.

Colony sites BANS_12 and BANS_13 were located in existing road embankments and were identified as unknown in 2015. The colonies are expected to remain intact. If Bank Swallows attempt to nest at these colonies again, the proximity to disturbance could result in moderate levels of sensory disturbance, but it is unlikely the swallows would abandon the colony sites.

Table 4.4-23 Priority 1 and 2 Bank Swallow Colonies within the Coffee Gold Mine Project RAA

Colony ID	Colony Status	Habitat Type	Distance to Infrastructure	Priority
BANS_5	Unknown	Road embankment	71 m from Project footprint	1
BANS_6	Inactive	Cut bank, placer mined area	Within Project footprint	1
BANS_7	Active	Cut bank, placer mined area	Within Project footprint	1
BANS_9	Unknown	Road embankment	Within Project footprint	1
BANS_10	Unknown	Stream bank	352 m from Project footprint	2
BANS_12	Unknown	Road embankment	Within Project footprint	1
BANS_13	Unknown	Road embankment	Within Project footprint	1

Effect characteristics for Bank Swallow are summarized in **Table 4.4-24**. The context for the residual effect of reduced habitat effectiveness on Bank Swallow is moderate. Bank Swallows are known to be relatively insensitive to moderate levels of human disturbance as long as the integrity of their nesting habitat remains intact. Furthermore, habitat suitability is highly ephemeral and may change during the life of the Project.

The Project is not expected to have population-level effects on Bank Swallows but may affect individual colonies in close proximity to Project infrastructure. All known colonies are expected to remain intact throughout the Construction and Operation phases; however, reduced habitat effectiveness due to sensory disturbance is likely to occur at six individual colonies within close proximity to Project infrastructure. This effect is considered low magnitude as it is unlikely to pose a risk to the long-term persistence and viability of the entire population of breeding Bank Swallows at the regional level. Reduced habitat effectiveness would be a long-term loss that would be detectable through to the end of the Reclamation and Closure phases; however, following Reclamation and Closure, baseline conditions are expected to return and habitat that had reduced effectiveness due to sensory disturbance may become viable once again for occupancy by Bank Swallows.

Colony-specific management plans will be developed for all colonies identified within 300 m of the Project footprint to help minimize potential adverse effects on breeding Bank Swallows. Particular care will be made during Project construction to avoid destroying any known colony sites; additionally during construction, if any of the colony sites are identified as active, an appropriate no-disturbance setback distance will be established around the colony to minimize disturbance (WPP; **Appendix 31-F**), and any high disturbance activities in the area will be completed outside of the breeding season when possible.

Based on the information presented above and summarized in **Table 4.4-24**, there is no potential for a significant residual effect of reduced habitat effectiveness on Bank Swallow within the RAA.

Table 4.4-24 Effects Characteristics Ratings for Passerine Habitat

Residual Effects Characteristic	Rating	Rationale for Rating
Reduced Habitat Effectiveness		
Direction	Adverse	The effect will result in reduced habitat effectiveness which might result in colony site abandonment.
Magnitude	Low	A measurable effect will occur at the individual level if reduced habitat effectiveness due to sensory disturbance resulted in colony site abandonment, but the effect will be unlikely to pose a risk to the long-term persistence and viability of the entire population at the regional level.
Geographic Extent	LAA	The effect will extend beyond the Project footprint into the LAA. Bank Swallows are known to be relatively insensitive to moderate levels of human disturbance as long as the integrity of their nesting habitat remains intact. A minimum setback distance of 50 m has been recommended for Bank Swallow nesting colonies.
Timing	Breeding season	Breeding occurs throughout June and July. Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse). The total duration of the Project including Construction, Operation, Reclamation and Closure, and Post-closure is 20 years.
Frequency	Continuous at mine site Frequent on NAR	Disturbance will be continuous at the mine site through to Post-closure (i.e., continuous presence of mine site infrastructure and noise). Disturbance will be frequent along the NAR through to Post-closure. Disturbance will be greatest during Construction (i.e., potential blasting and heavy equipment), but will lessen during Operation, Reclamation and Closure, and Post-closure (i.e., traffic will be limited to eight haul trucks per day and mine-site personnel will fly in and out).
Duration	Long-term	Reduced habitat effectiveness due to sensory disturbance will be a long-term loss that will be detectable through to end of Reclamation and Closure.
Reversibility	Fully Reversible	Following Reclamation and Closure, baseline conditions are expected to return and habitat that had reduced effectiveness due to sensory disturbance may become viable once again for occupancy by Bank Swallows.
Likelihood	Likely	Reduced habitat effectiveness will likely occur at colony sites BANS_5, BANS_6, BANS_7, BANS_9, BANS_12, and BANS_13, which are all located within 300 m of the Project footprint.

4.4.8.4 Summary of Project–Related Residual Effects and Significance of Residual Effects on Bank Swallow

All known Bank Swallow colonies are expected to remain intact throughout the Construction and Operation phases (i.e., no direct habitat loss anticipated). Although reduced habitat effectiveness due to sensory disturbance is likely to occur at six individual colonies within close proximity to Project infrastructure, the effects are expected to be minimal at the regional level. Based on the information above and summarized in **Table 4.4-25**, the residual effect of reduced habitat effectiveness on Bank Swallow is not significant. Considering uncertainty regarding the exact size and state of the breeding Bank Swallow population in the region, the confidence in this prediction is moderate.

Table 4.4-25 Summary of Project-related Residual Effects on Bank Swallow

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Reduced habitat effectiveness	Construction Operation Closure	• Project Personnel Awareness Orientation • Minimize Habitat Disturbance • Avoid Disturbance During Breeding Bird Season • Protect Active and Identified Nests	A	L	LAA	B	C/F	L	F	L	M	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

5.0 ASSESSMENT OF CUMULATIVE EFFECTS

This section presents an assessment of potential cumulative effects to Birds and Bird Habitat. Cumulative effects result from interactions between Project-related residual effects and the incremental effects on Birds and Bird Habitat from other past, present, and reasonably foreseeable future projects and activities. The full Project and Activity Inclusion List for this CEA is provided in the Project Proposal (**Section 5.0 Assessment Methodology, Appendix 5-B**).

This section describes the total anticipated residual cumulative effects on Birds and Bird Habitat that may remain after implementation of technically feasible mitigation measures. The anticipated residual cumulative effects are described using the effects characteristics identified in **Table 4.4-1**. The determination of significance for the anticipated residual cumulative effects on Birds and Bird Habitat is based on a consideration of the residual effects characteristics and environmental context of Birds and Bird Habitat as presented in **Section 4.4**. This section also describes the Project's contribution to any anticipated residual cumulative effects.

This assessment does not separate the residual cumulative effects on Birds and Bird Habitat into the subcomponents identified in **Section 1.2** because residual cumulative effects are expected to be similar for all birds. As such, the anticipated residual cumulative effects are described in the following sections for all birds as a VC collectively.

5.1 PROJECT-RELATED RESIDUAL EFFECTS

A list of Project-related residual effects on Birds and Bird Habitat, and rationales for their inclusion in (or exclusion from) the CEA, is provided in **Table 5.1-1**. Project-related residual effects that were assessed as negligible (not measureable) are not considered likely to interact cumulatively, and consequently are not carried forward into the CEA.

The Project-related residual effects that will be included in the CEA are habitat loss due to the Project footprint and reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust). These potential residual effects relate to direct and indirect adverse effects on the amount of available breeding habitat for birds. Habitat loss and reduced habitat effectiveness can be minimized through Project design, but cannot be completely eliminated. The Project-related residual effects on Birds and Bird Habitat are not significant for each of the subcomponents (**Section 4.4**). However, all residual effects are carried through to the CEA to evaluate the potential for significance given the combined outcomes of residual effects of this Project with other past, present, and reasonably foreseeable future projects in the region. Potential risks to the health and mortality of all subcomponents via damage/destruction of active nests, contaminants uptake, or collisions with vehicles were considered negligible for the Project following successful implementation of mitigation measures (**Section 4.3**), and are therefore unlikely to interact with other projects and activities.

Table 5.1-1 Project-Related Residual Effects Considered in the CEA for Birds and Bird Habitat

Project-related Residual Effect	Included in CEA	Rationale
Habitat loss due to the Project footprint	Yes	Combined habitat loss from multiple projects and activities could have an adverse cumulative effect on Birds and Bird Habitat.
Reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust)	Yes	Combined sensory disturbance from multiple projects and activities could have an adverse cumulative effect on Birds and Bird Habitat by making otherwise suitable habitat adjacent to human projects and activities unsuitable for some species.

5.2 Spatial and Temporal Scope of the Cumulative Effects Assessment

The spatial boundary of the CEA for birds is the RAA described in **Section 1.3.1** (**Table 1.3-1**). The temporal boundaries of the CEA are the same as those described in **Section 1.3.2**.

5.3 Other Projects and Activities

Other relevant projects and activities within the spatial and temporal scope of the CEA that may result in residual adverse effects to Birds and Bird Habitat that could interact with the Project-related residual effects are identified in **Figure 5.3-1**. Relevant projects and land use activities were selected from the Project and Activity Inclusion List in the Project Proposal (**Section 5.0 Assessment Methodology**, **Appendix 5-B**) and are illustrated in **Figure 5.3-1**.

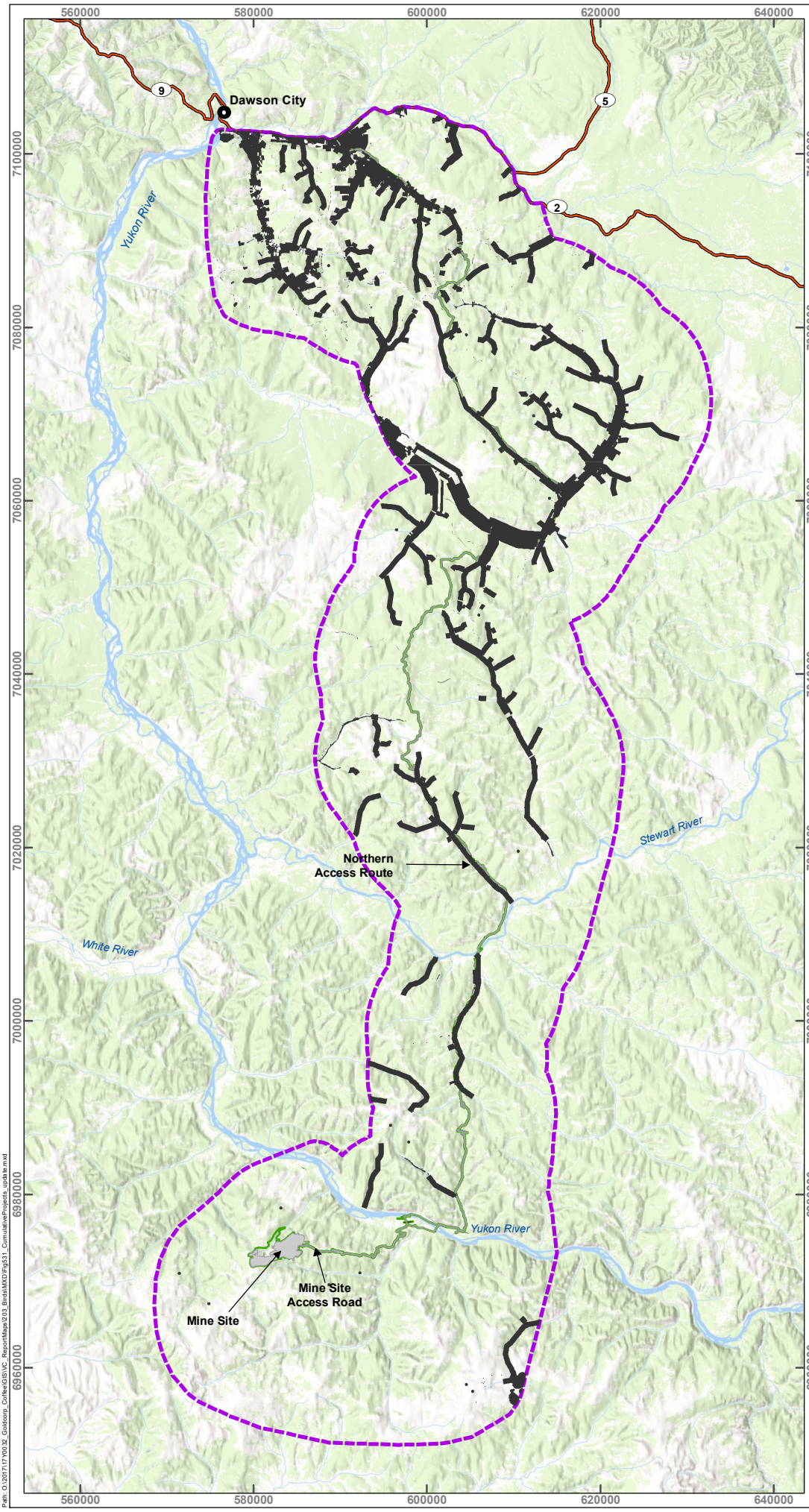
The following definitions were used to classify the status of projects and activities that could interact with the Project:

- Past — projects and land use activities that occurred in the past and are no longer active
- Present — existing and active projects and land use activities; all projects or land use activities that applied for approval or permitting prior to 2015 are assumed to be present projects or land use activities
- Future — reasonably foreseeable future projects or land use activities for which proposals have been submitted to YESAA (subsection 50(1)), or have entered into a formal approval or permitting process; applications submitted in 2015 and 2016 are assumed to be future projects or land use activities.

Mineral exploration and placer mining projects have occurred in, and are likely to continue to occur in, the RAA. There are no known areas that are excluded from mineral exploration, and there are a number of placer claims that will likely exist and be active either continuously or intermittently into the foreseeable future. Although the claim blocks can be very extensive and numerous, actual works are likely to be limited to a few focal areas for either a short period of time, or seasonally for many years, as is the case for several quartz claims in the area. Projects and activities in each category (e.g., quartz mining and exploration, placer mining, industrial, transportation) are assumed to cause similar types of residual effects and are therefore assessed as a category.

Table 5.3-1 Potential Residual Adverse Effects of Other Projects and Activities on Birds and Bird Habitat

Project or Activity	Status	Description	Potential Residual Effects
Quartz Mining	Future	There are two future quartz mining projects in the operation stage within the RAA (i.e., Casino and Lonestar). These projects are likely to have similar residual effects as the Project, which are described in **Section 4**.	Localized habitat loss and reduced habitat effectiveness
Quartz Exploration (multiple permits)	Present	There are 18 present quartz exploration permits within the RAA. Exploration for these permits is likely to continue either continuously or intermittently throughout the life of the Project. None of these exploration permits are expected to be developed within the life of the Project.	Localized habitat loss and reduced habitat effectiveness
Placer Mining (multiple permits)	Past, Present, and Future	There are 241 present placer permits within the RAA. Exploration and mining for these permits is likely to continue either continuously or intermittently throughout the life of the Project. Although the claim blocks can be very extensive and numerous, actual works are likely to be limited in extent to a few focal areas for either a short period of time, or seasonally for many years.	Localized habitat loss and reduced habitat effectiveness
Industrial	Present	Development of Quarry Resources at Km 674.5 on the Klondike Highway — development of a rip-rap quarry 40 km east of Dawson City on the Klondike Highway. This quarry lease is for five years and the estimated volume of quarry material is 100,000 m^3.	Localized habitat loss and reduced habitat effectiveness
Utilities	Present	Dawson Airport CDMA IX Cell Site Build — construction of an 80 m access road and power line.	Localized habitat loss and reduced habitat effectiveness
Energy	Present	Proposed Power Line to Cellular Tower — Clearing of a 1 ha area of vegetation to install a power line to a cellular tower. There is likely seasonal maintenance, including removal of vegetation within the right-of-way.	Localized habitat loss and reduced habitat effectiveness
Transportation	Present	Laskey Access — Establish road access to a placer claim and construct a pipe or water line to provide sufficient water for placer mining activities throughout the year.	Localized habitat loss and reduced habitat effectiveness
Forestry	Past	Two forestry projects have occurred in the past within the Bonanza Creek watershed. Project activities included road construction and upgrades, fuel wood harvesting, salvage logging, road de-commissioning, and restoration.	Localized habitat loss
Settlements	Present	Three small-scale settlement activities are presently occurring within the RAA. Two activities involve the construction of rural residences and access roads, and one activity involves the construction and maintenance of a power line to a rural residence.	Localized habitat loss and reduced habitat effectiveness
Existing road network	Present	There are 836 km of paved and unpaved roads within the RAA (GeoYukon 2015).	Localized habitat loss and reduced habitat effectiveness
Trapping and hunting	Present	Multiple Trapline Concession Areas and one Guide Outfitter Concession Area overlap with the RAA. Trapping and hunting occurs seasonally.	Reduced habitat effectiveness



COFFEE GOLD MINE

Disturbances Considered in the Cumulative Effects Assessment for Birds and Bird Habitat

Legend

- Highway
- New Disturbance
- Existing Disturbance
- Bird Regional Assessment Area

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Yukon Department of Environment. <2015>. Yukon Surface Disturbance. Digital database and software produced by Information Management and Technology Branch, Department of Environment, Government of Yukon, Whitehorse

- Inset Basemap: ESRI World Topographic Map

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5.4 POTENTIAL CUMULATIVE EFFECTS

The potential interactions between Project-related residual effects on Birds and Bird Habitat and those of other projects and activities are identified in **Table 5.4-1**. For each identified interaction, the potential residual cumulative effects were assessed using the same process for the assessment of Project-related residual effects, including consideration of mitigation measures and characterization of residual effects. All potential cumulative effects on Birds and Bird Habitat were carried forward for assessment. If an interaction resulted in no potential for a cumulative effect or a negligible cumulative effect, it was not carried forward for assessment beyond **Table 5.4-1**.

Table 5.4-1 Potential Cumulative Effects on Birds and Bird Habitat Due to Interactions between the Project and Other Projects and Activities

Other Project / Activity	Potential Residual Adverse Effect	Potential for Interaction Resulting in Cumulative Effect (see Note) and Rationale
Quartz mining	Localized habitat loss and reduced habitat effectiveness	Yes — There are two reasonably foreseeable future quartz mines within the RAA that may interact cumulatively with the Project. Other quartz mine activities are likely to have similar residual effects on Birds and Bird Habitat including habitat loss within portions of the permitted areas and reduced habitat effectiveness due to sensory disturbance.
Quartz Exploration (multiple permits)	Localized habitat loss and reduced habitat effectiveness	Yes — There are multiple quartz exploration permits that could interact cumulatively with Birds and Bird Habitat. Exploration activities create localized habitat loss within portions of the permitted area and reduced habitat effectiveness due to sensory disturbance.
Placer Mining (multiple permits)	Localized habitat loss and reduced habitat effectiveness	Yes — There are numerous past, present, and reasonably foreseeable future placer permits within the RAA that may interact cumulatively. Placer mining creates localized habitat loss within portions of the permitted area and reduced habitat effectiveness due to sensory disturbance.
Industrial	Localized habitat loss and reduced habitat effectiveness	No — the development of quarry resources approximately 34 km east of Dawson City at km 674 5 on the Klondike Highway is not likely to interact with Birds and Bird Habitat in the RAA.
Utilities	Localized habitat loss and reduced habitat effectiveness	No — the construction of an 80 m access road and power line at the Dawson City Airport are not likely to interact with Birds and Bird Habitat in the RAA.
Energy	Localized habitat loss and reduced habitat effectiveness	No — the clearing of 1 ha of vegetation near the Dawson City Airport to install a power line to a cellular tower (and associated seasonal maintenance) is not likely to interact with Birds and Bird Habitat in the RAA.
Transportation	Localized habitat loss and reduced habitat effectiveness	No — the establishment of road/water access to a placer mine in the Dominion Creek watershed is not likely to with Birds and Bird Habitat in the RAA.
Forestry	Localized habitat loss	No — forestry activities are not likely to interact cumulatively because they occurred in the past and the resulting regenerating forest likely provides breeding habitat for many bird species. The roads built for accessing cut blocks will be captured by effects related to the existing road network.

Other Project / Activity	Potential Residual Adverse Effect	Potential for Interaction Resulting in Cumulative Effect (see Note) and Rationale
Settlements	Localized habitat loss and reduced habitat effectiveness	No — small-scale settlement activities in and around Dawson City are not likely to interact with Birds and Bird Habitat in the RAA.
Existing road network	Localized habitat loss and reduced habitat effectiveness	Yes — There are 836 km of existing paved and unpaved roads within the RAA that may interact cumulatively. Roads result in direct habitat loss and increased habitat fragmentation. Vehicle traffic also creates sensory disturbance and has the potential to increase collision-related bird mortalities.
Trapping and hunting	Reduced habitat effectiveness	No – Any disturbance from this activity would be short-term and localized and is not likely to interact with Birds and Bird Habitat in the RAA.

Note: **No**: no interaction or not likely to interact cumulatively; **Yes**: potential for cumulative effect.

5.5 MITIGATION MEASURES FOR CUMULATIVE EFFECTS

There are no additional mitigation measures proposed beyond what the Proponent has already committed to at the Project-specific level, and those mitigation measures are described in **Section 4.3** of this effects assessment and in the WPP (**Appendix 31-F**).

Other land users have the potential to cause adverse effects to Birds and Bird Habitat within the region surrounding the Project area. The Proponent does not have the ability to manage the public's ability to hunt or the actions of other businesses (e.g., outfitting, trapping, mining) operating within the RAA. Furthermore, proponents of other projects in the area may have conditions in their operating permits that are inconsistent with the Proponent's Project mitigation measures. To mitigate potential adverse effects that are outside of the Proponent's control and ensure the long-term health of regional bird populations, a landscape level planning process that includes updated Wildlife Management Plan(s) or Habitat Management Plan(s) could be developed by management authorities. This management plan could be developed through a multi-stakeholder working group that includes those parties that have the responsibility for wildlife and land management. Working group members could include the YG, First Nations, and the Proponent. While the Proponent cannot develop or implement the plan independently, it can participate as a stakeholder member of the working group.

5.6 RESIDUAL CUMULATIVE EFFECTS AND SIGNIFICANCE OF RESIDUAL CUMULATIVE EFFECTS

This section describes the nature of the residual cumulative effects identified with respect to Birds and Bird Habitat, including an assessment of significance, at the regional level (i.e., RAA) arising from potential interactions identified in in **Table 5.4-1**. For the purpose of the CEA, habitat for all subcomponents was evaluated together. The primary reason for this was the absence of detailed ecological mapping for the entire RAA that could be used to develop species-specific habitat models throughout the RAA.

5.6.1 BACKGROUND INFORMATION

Refer to **Section 4.4** for a detailed summary of background information for each subcomponent to support the residual CEA on Birds and Bird Habitat in regards to habitat loss due to project/activity footprints and reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust). For the purposes of the CEA, habitat includes cliff-nesting raptor nest sites, Bank Swallow colony sites, and high suitability habitat for passerines and upland- and wetland-associated species at risk.

5.6.2 BREEDING HABITAT EFFECTS ASSESSMENT

Birds use a wide range of vegetated and non-vegetated habitats for breeding, foraging, and wintering. The CEA examines the cumulative effects of habitat loss due to project/activity footprints and reduced habitat effectiveness due to sensory disturbance. This assessment assumes that birds are using all natural habitats within the RAA and that any habitat converted to anthropogenic uses has minimal habitat value for birds.

Habitat Loss

Habitat loss due to disturbance footprints was estimated based on the available information on present and future habitat disturbance within the RAA. All Projects or activities that are expected to have an interaction were included in the CEA. The CEA for bird habitat used the following data and assumptions about the spatial and temporal boundaries of other projects and activities.

- **Quartz mining (future):** Reasonably foreseeable future mines considered in this assessment were the Casino and Lonestar projects. The proposed mine footprint for the Casino Mine, obtained from YESAB submissions, was used to define expected disturbance areas for this project. A proposed footprint was not available for Lonestar, therefore, a probable disturbance area was inferred by digitizing areas of concentrated exploration activity within this mining claim from satellite imagery.
- **Quartz Exploration:** All past, present, and future quartz exploration projects were assumed to be active throughout the life of the Coffee Project. Each project was assumed to have a 10 ha footprint around the project center, based on the project coordinates from the YESAB On-line Registry.
- **Placer mining**: All past, present, and future placer projects were assumed to be active throughout the life of this Project. Disturbance areas were based on the placer land used permit areas for each project. Timing of placer mining is seasonal (ice free, summer).
- **Roads:** The spatial extent of disturbance due to roads was based on roads data from the YG. All features classified as roads or limited-use-roads were included. Roads were categorized as paved all-season, unpaved all-season, or unpaved seasonal according to shapefile attributes. Each road category was assigned a width following EDI 2013 (i.e., 20 m for paved roads and 8 m for unpaved roads), and lines were converted to polygons using these widths.
- **General disturbance:** Data from the YG that maps existing surface disturbances based on high resolution satellite imagery was included to capture spatial footprints of settlements and forestry projects (Unpublished data, YG 2016). Including this spatial layer also ensures that estimates in the CEA incorporate any present and past habitat effects associated with other projects and activities that were not captured in the Project and Activity Inclusion List in the Project Proposal (**Section 5.0** — Assessment Methodology, **Appendix 5-B**).

When various projects and/or activities overlapped spatially, the worst case would be considered (e.g., habitat loss from a footprint would supersede reduced habitat effectiveness due to a ZOI). For each assessment, we created a non-overlapping spatial layer including footprint, ZOI, and RAA to use for overlay operations (e.g. intersecting with habitat effectiveness) or direct area summaries (e.g. reporting total area of sensory disturbance).

Given the assumptions identified above, past, present, and reasonably foreseeable future projects results in 416.54 km² of habitat loss within the RAA (excluding the Coffee Project), which represents approximately 8.06% of the potential bird habitat within the RAA (**Table 5.6-1**). This 8.06% of potential bird habitat may include habitat that is rated as high, medium, low, and/or nil suitability for birds; it is unlikely that the entire 8.06% is high suitability habitat for birds. The Coffee Project contributes 32.54 km² (0.63% of the RAA) to the cumulative disturbance footprint.

Reduced Habitat Effectiveness

Reduced habitat effectiveness due to sensory disturbance from projects and activities was estimated following the analysis used for habitat effects in **Section 4.4**: A 300 m ZOI around all disturbed areas was used to quantify indirect habitat effects.

An additional 553.74 km² of habitat in the ZOI (i.e., within 300 m of project/activity footprints) could experience reduced habitat effectiveness due to sensory disturbance, which represents 10.72% of potential bird habitat within the RAA. This 10.72% of potential bird habitat may include habitat that is rated as high, medium, low, and/or nil suitability for birds; it is unlikely that the entire 10.72% is high suitability habitat for birds. Coffee Project activities reduce habitat effectiveness within an additional 132.31 km² (2.56% of the RAA) of the RAA. Approximately 78% of the existing habitat remains undisturbed by human activities.

Table 5.6-1 Cumulative Habitat Loss and Reduced Habitat Effectiveness in the Regional Assessment Area

Total Area in RAA	Existing/Future				Coffee Project				Remaining Undisturbed Bird Habitat	
	Habitat Loss		Reduced Habitat Effectiveness		Habitat Loss		Reduced Habitat Effectiveness			
km²	km²	%	km²	%	km²	%	km²	%	km²	%
5165.90	416.54	8.06	553.74	10.72	32.54	0.63	132.31	2.56	4030.77	78.03

The majority of cumulative habitat loss in the RAA is associated with placer claims (i.e., placer claims cover 443 km² of the RAA). Not all of the placer claims within the RAA will be developed during the life of this Project. Placer claims that are developed are unlikely to convert the entire claim area to placer mining. The estimates for habitat loss and reduced habitat effectiveness in this CEA are considered extremely conservative. Even if all of the placer claims within the RAA were developed during the life of the Coffee Project, the actual habitat loss and ZOIs from those developments would likely be much smaller than the

areas used for this CEA. Finally, the RAA for birds is focused on the area immediately around the mine footprint and the NAR. The NAR takes advantage of existing access roads used in placer mining; therefore, the RAA is biased towards more heavily developed areas within the larger region.

Ratings for each predicted residual cumulative effect on bird habitat (i.e., habitat loss and reduced habitat effectiveness) were assigned following the effects characteristics outlined in **Table 4.4-1**. Detailed rationale for each residual effects characterization is provided (**Table 5.6-2**). Thresholds for assessing the magnitude of cumulative effects on habitat loss followed those outlined in **Table 4.4-1** with the assumption that all habitat suitability ratings (i.e., high, medium, low, and nil) may occur within the areas that interact cumulatively with the Project (detailed habitat suitability mapping for birds is not available for the RAA):

- Low: <10% of habitat affected
- Moderate: 10–15% of habitat affected
- High: >15% of habitat affected.

There would be a cumulative effect on bird habitat within the RAA via habitat loss and reduced habitat effectiveness; however, this effect could be partially reversed following successful reclamation of disturbed areas. Some of the disturbed habitat could be reclaimed to baseline conditions, which would fully reverse the effects of habitat loss and reduced habitat effectiveness, while other projects and activities (e.g., primary roads and highways) are expected to persist indefinitely. However, the cumulative loss of habitat in areas that cannot be fully reclaimed could be mitigated by the collective actions of individual project proponents, which could include minimizing/mitigating disturbances to Birds and Bird Habitat and reclaiming key habitat areas if they are disturbed by project activities. In addition, based on current known past, present, and reasonably foreseeable future projects within the RAA, it is unlikely that there will be enough large-scale anthropogenic disturbances to reduce population viability as a result of habitat loss and reduced habitat effectiveness. Anthropogenic disturbances can act cumulatively with natural disturbances such as fire, but the scale at which fires occur would mask any effect of industrial-related habitat losses. Considering mitigation and the low likelihood of large-scale anthropogenic disturbances on this landscape, the residual cumulative effects on Birds and Bird Habitat are expected to be not significant at the regional level (i.e., RAA). In consideration of uncertainty regarding the exact size and state of the breeding bird population in the region, and the lack of precise spatial data regarding the size of past, present, and reasonably foreseeable future projects and activities, the confidence in this prediction is moderate.

Table 5.6-2 Cumulative Effects Characteristics Ratings for Birds and Bird Habitat

Residual Effects Characteristic	Rating	Rationale for Rating
Habitat Loss		
Direction	Adverse	The effect would result in direct habitat loss.
Magnitude	Low	Up to 8.06% of the potential bird habitat within the RAA could be affected by past, present, and reasonably foreseeable future projects within the RAA. This 8.06% may include habitat that is rated as high, medium, low, and/or nil suitability for birds; it is unlikely that the entire 8.06% is high suitability habitat.
Geographic Extent	RAA	The effect would occur at the regional level.
Timing	Year-round	Habitat loss could occur year-round. The majority of bird species are only present during the breeding season (April to August); however, a small number of species are year-round residents.
Frequency	Infrequent	Most of the potentially interacting projects identified are already active. New habitat loss would occur relatively infrequently when new projects are developed. Most of these projects will likely be limited in spatial extent, located in areas that are already previously disturbed, and/or occur on a seasonal basis.
Duration	Long-term	The direct loss of habitat would be a long-term loss.
Reversibility	Partially reversible	Some of the disturbed habitat could be reclaimed when projects or activities are completed, while other projects and activities (e.g., primary roads and highways) are expected to persist indefinitely.
Likelihood	Likely	Direct habitat loss has already occurred or is currently occurring due to a number of other projects and activities operating within the RAA. Future projects are currently planned and will likely result in direct habitat loss.
Context	Moderate	The ability of each bird species to adapt to direct habitat loss will vary – some species are more resilient than others.
Reduced Habitat Effectiveness		
Direction	Adverse	The effect would result in reduced habitat effectiveness due to sensory disturbance.
Magnitude	Moderate	Up to 10.72% of the potential bird habitat within the RAA could be affected by past, present, and reasonably foreseeable future projects within the RAA. This 10.72% may include habitat that is rated as high, medium, low, and/or nil suitability for birds; it is unlikely that the entire 10.72% is high suitability habitat.
Geographic Extent	RAA	The effect would occur at the regional level.
Timing	Year-round	Sensory disturbance could occur year-round. The majority of bird species are only present during the breeding season (April to August); however, a small number of species are year-round residents.
Frequency	Frequent	Most of the potentially interacting projects identified are already active. Sensory disturbance associated with mining, exploration, and roads could occur multiple times per day.
Duration	Long-term	Reduced habitat effectiveness due to sensory disturbance would be a long-term effect.

Residual Effects Characteristic	Rating	Rationale for Rating
Reversibility	Partially Reversible	Some of the disturbed habitat could be reclaimed when projects or activities are completed, while other projects and activities (e.g., primary roads and highways) are expected to persist indefinitely.
Likelihood	Likely	Reduced habitat effectiveness due to sensory disturbance has already occurred or is currently occurring due to a number of other projects and activities operating within the RAA. Future projects are currently planned and will likely reduce habitat effectiveness.
Context	Moderate	The ability of each bird species to adapt to reduced habitat effectiveness will vary — some species are more resilient than others.

5.6.3 SUMMARY OF RESIDUAL CUMULATIVE EFFECTS AND SIGNIFICANCE OF CUMULATIVE EFFECTS ON BIRDS AND BIRD HABITAT

The CEA was conducted at the scale of the RAA for Birds and Bird Habitat. Project-related residual effects considered in the CEA include direct habitat loss due to the Project footprint and reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust). The projects and activities considered in the CEA included quartz projects, placer projects, and existing road networks. These projects and activities were selected based on their potential to interact cumulatively with other projects and activities within the RAA, including the Project. Given the assumptions about likely footprint size identified in **Section 5.6.2**, past, present and reasonably foreseeable future projects and activities could result in the loss of 416.54 km² of habitat within the RAA, which represents approximately 8.06% of the potential bird habitat within the RAA. The Coffee Project contributes an additional loss of 32.54 km² (0.63% of the RAA; **Table 5.6-1**). An additional 553.74 km² (10.72%) of habitat in the ZOI (i.e., within 300 m of project/activity footprints) could experience reduced habitat effectiveness within the RAA. The Coffee Project contributes and additional 132.31 km² (2.56% of the RAA; **Table 5.6-1**). All habitat suitability ratings (i.e., high, medium, low, and nil) may occur within the areas that may interact cumulatively with the Project; it is unlikely that adverse habitat effects due to habitat loss or reduced habitat effectiveness would occur solely within high suitability habitat for birds.

Although there will be a cumulative loss of bird habitat within the RAA via habitat loss and reduced habitat effectiveness, this loss could be partially reversed following successful reclamation of disturbed areas. The cumulative loss of habitat in areas that cannot be fully reclaimed could be mitigated by the collective actions of individual project proponents, which could include minimizing/mitigating disturbances to Birds and Bird Habitat and reclaiming key habitat areas if they are disturbed by project activities. In addition, based on current known past, present, and reasonably foreseeable future projects within the RAA, it is unlikely that there will be enough large-scale anthropogenic disturbances to reduce population viability as a result of habitat loss and reduced habitat effectiveness. Considering mitigation and the low likelihood of large-scale anthropogenic disturbances in this landscape, the residual cumulative effects of habitat loss and reduced habitat effectiveness on Birds and Bird Habitat are expected to be not significant at the regional

level (i.e., RAA; **Table 5.6-3**). In consideration of uncertainty regarding the exact size and state of the breeding bird population in the region, and the lack of precise spatial data regarding the size of past, present, and reasonably foreseeable future projects and activities within the RAA, the confidence in this prediction is moderate.

Table 5.6-3 Summary of Potential Residual Cumulative Effects for Birds and Bird Habitat

Potential Residual Adverse Effects	Contributing Project Activities	Proposed Mitigation Measures	Residual Effects Characterization (see Notes for details)										
			Direction	Magnitude	Geographic Extent	Timing	Frequency	Duration	Reversibility	Likelihood	Context	Significance	Level of Confidence
Habitat loss	Quartz Projects Placer Projects Existing Road Network	• Project Design	A	L	RAA	Y	I	L	P	L	M	N	M
Reduced Habitat Effectiveness	Quartz Projects Placer Projects Existing Road Network	• Use existing roads; minimize vehicle traffic; establish no disturbance setbacks around active nest sites; conduct highest disturbance activities outside breeding season.	A	M	RAA	Y	F	L	P	L	M	N	M

Notes: The following ratings are used for effects characteristics, as defined in **Table 4.4-1:**

Direction: P = Positive, A = Adverse
Magnitude: L = Low, M = Moderate, H = High
Geographic Extent: Site = Specific location within Project footprint, PF = Project Footprint, LAA = Local, RAA = Regional, T = Territorial
Timing: B = Breeding season, Y = Year-round
Frequency: I = Infrequent, F = Frequent, C = Continuous
Duration: S = Short-term, L = Long-term, P = Permanent
Reversibility: F = Fully reversible, P = Partially reversible, I = Irreversible
Likelihood: U = Unlikely, L = Likely
Context: H = High, M = Moderate, L = Low
Significance: N = Not significant, S = Significant
Level of Confidence: L = Low, M = Moderate, H = High

6.0 SUMMARY OF EFFECTS ASSESSMENT ON BIRDS AND BIRD HABITAT

Birds and Bird Habitat were selected as a VC because of potential Project-related effects to individuals, populations, and bird habitats. Birds are important because of their value to First Nations and other local people who may rely on certain species as a subsistence and economic resource, and for their value as a large group of wildlife representing biodiversity. Birds and their associated habitats are also important because some species are identified as species at risk and must be assessed where potential Project-related effects can occur (SARA, subsection 79). In addition, migratory birds are protected under MBCA and associated regulations, which aim to protect and conserve migratory birds (as individuals and populations), their eggs, and their nests.

The following bird species were selected to represent the likely range of potential Project-related effects on birds: Sharp-tailed Grouse; cliff-nesting raptors (i.e., Peregrine Falcon, Golden Eagle, and Gyrfalcon); passerines (i.e., songbirds); upland-associated species at risk (i.e., Common Nighthawk, Olive-sided Flycatcher, and Short-eared Owl); wetland-associated species at risk (i.e., Horned Grebe, Red-necked Phalarope, and Rusty Blackbird); and Bank Swallow. These species were selected for a variety of reasons including SARA or COSEWIC designations (i.e., species at risk), migratory bird status, a clear interaction with the Project footprint, sensitivity to disturbance, specific habitat requirements, cultural importance, or identification in engagement meetings or otherwise documented as a concern.

The assessment of potential Project-related effects and significance of these effects on Birds and Bird Habitat was conducted at the regional level (i.e., RAA). Potential Project-related effects that were considered included direct loss of available breeding habitat due to the Project footprint, reduced habitat effectiveness of adjacent breeding habitat due to sensory disturbance (e.g., noise, movement, dust), mortality risk due to collisions with vehicles, contaminants uptake, and damage or destruction of nests during clearing activities and road upgrades. To mitigate habitat loss, disturbance within the Project footprint will be minimized, existing roads will be used, and critical habitat and habitat features (e.g., leks, cliffs, wetlands, nest sites) will be protected via the establishment of appropriate no-disturbance setback distances. To mitigate mortality risk and damage or destruction of nests, Project activities will be scheduled to occur outside of the breeding season when possible. Furthermore, active nests will be protected via the establishment of appropriate no-disturbance setback distances and will be periodically monitored throughout the breeding season to ensure mitigation measures are effective; adaptive management measures will be implemented if mitigation is not effective. To mitigate reduced habitat effectiveness, existing roads will be used, traffic will be minimized, and appropriate no-disturbance setback distances will be implemented. Furthermore, high disturbance activities will be scheduled to occur outside of the breeding season when possible. To mitigate mortality risk due to vehicle collisions, vehicle traffic will be minimized and speed restrictions will be imposed. In addition to the mitigation measures identified above, all site personnel will be required to participate in a Wildlife Awareness Orientation, and a wildlife sighting log will be maintained throughout all phases of the Project.

Following the successful application of these mitigation measures, detectable/measureable Project-related residual effects for all subcomponents (except Sharp-tailed Grouse) are anticipated to occur from habitat loss and reduced habitat effectiveness; however, no significant effects were identified for any of the subcomponents at the regional level. Although a detectable/measurable residual effect might occur at the individual level if Project-related activities resulted in habitat loss and reduced habitat effectiveness, the effect would be unlikely to pose a risk to the long-term persistence and viability of the entire bird population at the regional level. For Sharp-tailed Grouse, no probable lek sites were located within 3 km of the NAR; therefore, no residual effects are anticipated for this subcomponent.

Residual cumulative effects due to interactions with other projects and activities were assessed for the Project at the scale of the RAA. Project-related residual effects considered included habitat loss due to Project footprint and reduced habitat effectiveness due to sensory disturbance (e.g., noise, movement, dust). The projects and activities considered in the CEA included quartz projects, placer projects, and existing road networks. These projects and activities were selected based on their potential to interact cumulatively with other projects and activities within the RAA, including the Project. Past, present, and reasonably foreseeable future projects and activities, combined with the Coffee Project, could account for 9.5% of habitat loss of the potential bird habitat within the RAA. An additional 12.3% of potential bird habitat may experience reduced habitat effectiveness due to sensory disturbances from human activities.

The CEA predictions are based on several assumptions and represent a conservative approach. It is unlikely that all quartz projects would operate to the same spatial extent as the Project during the life of the Project. The estimated project footprint for each placer footprint is also conservative and may over-represent the area actually affected within each placer claim. Furthermore, the likelihood of these projects occurring consecutively and year-round with the Project is unknown; however, based on mining history in Yukon, consecutive operation is unlikely. Detailed habitat mapping is not available for the entire RAA; therefore, the estimates of the amount of habitat loss and reduced habitat effectiveness represent a mosaic of high, medium, low, and nil rated habitat suitability for birds. Although there will be a cumulative change of bird habitat within the RAA via habitat loss and reduced habitat effectiveness, this could be partially reversed following successful reclamation of disturbed areas. The cumulative loss of habitat in areas that cannot be fully reclaimed could be mitigated by the collective actions of individual project proponents, which could include minimizing/mitigating disturbances to Birds and Bird Habitat and reclaiming key habitat areas if they are disturbed by project activities. In addition, based on current known past, present, and reasonably foreseeable future projects within the RAA, it is unlikely that there will be enough large-scale anthropogenic disturbances to reduce population viability as a result of habitat loss and reduced habitat effectiveness. Considering mitigation and the low likelihood of large-scale anthropogenic disturbances in this landscape, the cumulative effect of habitat loss on Birds and Bird Habitat is expected to not be significant at the regional level (i.e., RAA).

Potential residual effects due to accidents or malfunctions were also assessed for the Project (refer to **Section 28** of the **Project Proposal**). An accident is an unexpected occurrence or unintended action that may cause an adverse environmental effect. A malfunction is the failure of a piece of equipment, device, or system to function as intended, which may also cause an adverse environmental effect. Accidents or malfunctions may occur during any phase of the Project. The objective of the Proponent is to minimize the likelihood of accidents or malfunctions and the associated consequences that might affect Birds and Bird Habitat. Potential accident and malfunction scenarios that may interact with, and result in potential adverse effects to, Birds and Bird Habitat include the following: a hazardous material spill into water (i.e., cyanide or diesel fuel); a release of off-specification effluent into a watercourse; failure of the HLF and corresponding release of cyanide-contaminated water into the downstream receiving environment; failure of a waste rock storage facility and stockpile slope; and an on-site or off-site fire or explosion leading to a stand-replacing wildfire at the regional level. Although all of these potential scenarios could have disastrous consequences (i.e., significant residual effects) for Birds and Bird Habitat, particularly if they occur during the spring and/or fall when the dilution capacity in rivers would be lowest and migratory birds would be stopping over, the occurrence is unlikely following the successful implementation of Project design measures, BMPs, and mitigation measures intended to minimize the risk of potential accidents or malfunctions.

7.0 EFFECTS MONITORING AND ADAPTIVE MANAGEMENT

7.1 EFFECTS MONITORING PRINCIPLES

Although the effects of the Project will be minimized by mitigation measures described in **Section 4.3** where uncertainty in Project-related effects exists due to limited data or where the effectiveness of proposed mitigation measures is uncertain, monitoring programs provide a means to gain certainty in predicted Project-related effects and determine the effectiveness of mitigation measures. Specifically, the goals of the monitoring programs are to:

- Monitor and verify potential Project-related effects
- Ensure monitoring efforts are able to detect natural and Project-related changes to the environment.
- Monitor and evaluate the effectiveness of mitigation measures
- Identify unanticipated effects
- Provide an early warning of undesirable change in the environment
- Inform adaptive management measures.

The monitoring and adaptive management approach is fully described in the WPP (**Appendix 31-F**). This section identifies the main components of the effects monitoring program relevant to Birds and Bird Habitat.

7.2 EFFECTS MONITORING AND ADAPTIVE MANAGEMENT

Monitoring will be focused on three key parameters to ensure mitigation measures are effective at minimizing or eliminating risks to birds and that any unforeseen Project-related effects are identified and adaptively managed based on monitoring results.

Site Personnel: Building awareness of Project effects on birds is a key mitigation measure that should be monitored on a regular basis. Monitoring will include tracking the number of attendants at wildlife orientation sessions, tracking and reviewing any Project-related incidents involving birds (e.g., bird mortality from ground clearing activities), and monitoring vehicle speeds and adherence to traffic management procedures on the NAR. Adapting these mitigation measures based on monitoring results will be necessary to improve their effectiveness at minimizing or eliminating Project effects on birds.

Project Design and Activities: Monitoring Project developments and the area of disturbance relative to the planned Project footprint will indicate how much bird habitat is affected by the Project. Continuous monitoring of new Project developments, including timing of Project activities will be necessary to minimize Project effects on Birds and Bird Habitat.

Bird Habitat: Minimizing Project effects on bird habitat and bird nests is an important component of mitigating effects on birds. Monitoring to determine if no-disturbance setbacks have been established around important habitat features and how effective the setbacks area at minimizing or eliminating Project effects is necessary to determine if mitigation measures need to be adapted to improve their effectiveness.

Monitoring programs will be implemented once mitigation measures are in place and the monitoring program design, including monitoring methods, identification of thresholds, monitoring locations and frequency of monitoring will be developed for each monitoring program. An adaptive management approach will require that the results of monitoring programs, including incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes will be continuously reviewed so that mitigation measures and monitoring programs can be adapted.

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