Appendix H-9

Raptors Report

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Background

Terms and conditions related to management and mitigation for birds and bird habitat (including raptorial species) are outlined in Nunavut Impact Review Board Project Certificate for the Meliadine Gold Mine Project Certificate (NIRB 2019), as follows:

- *Term and Condition 59; Species at Risk — If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.*
- *Term and Condition 60;* Species at Risk *— The Proponent shall ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans and management plans that may become available during the duration of the Project.*
- *Term and Condition 61; Construction/clearing activities — Prior to bird breeding season, the Proponent shall either conduct clearing activities or identify and install nesting deterrents (e.g., flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities. If clearing is to take place during the nesting season, a nest survey should take place to identify nests and any identified nests must remain undisturbed until the young have fledged or left the nest. Any nests identified shall be included as part of the annual reporting for the Terrestrial Environmental Mitigation and Monitoring Plan (TEMMP).*
- *Term and Condition 62; Construction/clearing activities — The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.*
- *Term and Condition 71; Monitoring — The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Kivalliq Inuit Association and communities.*
- *Term and Condition 72; Monitoring — The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Protection Plan and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) prior to construction. The key indicators for follow up monitoring under this plan will include upland birds (including migratory birds), waterbirds, raptors, and seabirds including migration and wintering.*

Monitoring indicators for nesting raptors are outlined in the Agnico Eagle Meliadine Division Terrestrial Environment Mitigation and Management Plan (see Appendix H6), as follows:

- *Monitoring Indicator 1; Disturbance of nesting raptors — To be determined in consultation with GN and Alastair Franke, related to occupancy and productivity.*
- *Monitoring Indicator 2; Projected-related mortality — To be determined in consultation with GN and* Arctic Raptors Inc.

Species Descriptions

Peregrine Falcon (*Falco peregrinus tundrius*)

The Arctic peregrine falcon (PEFA; Figure 1) is medium- to large-sized falcon. It has a dark hood and face with distinct dark malar stripe, cream to white throat, slate-grey back; barred belly, legs, and tail. Long pointed wings, stocky body. Plumage of immature birds brown rather than grey, and the breast is streaked rather than barred. In adults, the cere and orbital ring are yellow, and bluish in immature birds. Compared with gyrfalcons, the peregrine is smaller and less stocky. In flight, the wings of peregrines appear narrower and more pointed. In peregrine falcons, wing tips extend to bottom of the tail when perched, while in gyrfalcons, wing tips extend two-thirds down the length of tail.

F. p. tundrius breeds mainly north of the treeline from Alaska east throughout northern Canada to Greenland. It breeds throughout the taiga and tundra wherever suitable nesting habitat and sufficient prey are present. In Nunavut, peregrines appear to have their highest densities in the Kivalliq and Kitikmeot regions. Highest breeding density on record is on the western shores of Hudson Bay in the Kivalliq Region.

F. p. tundrius is a long-distance migrant, wintering mainly throughout South and Central America, but also in southern United States and Mexico. Northern-breeding American and Arctic peregrines are highly migratory (Yates et al. 1988, Schmutz et al. 1991, Fuller et al. 1998), and although fall migration occurs over a broad geographic range (Fuller et al. 1998), Yates et al. (1988) indicated that “separate and distinct autumn migratory populations pass through the east and Gulf coasts” of the United States.

Peregrine falcons usually nests on cliffs and rocky outcrops, but also nest on hilltops, river canyons, rock screes, and on occasion directly on the ground (Court et al. 1988, Ratcliffe 1993). They prefer nesting in locations close to water in south-facing, rugged terrain. Hunting habitat includes rugged coastline areas and rolling tundra that consists of raised beaches, dry tundra, sedge meadows, wetlands, and lakes that are inhabited by a diversity of breeding songbirds and shorebirds.

Peregrine Falcons do not build a nest but make a depression (called a scrape) in the substrate on a cliff ledge. Scrapes are usually approximately 20 cm in diameter and 4 cm deep. Females usually do the majority of incubation, and brooding of small young. Males provision incubating females and provide most of the prey when nestlings are small. Thereafter, females do most of the feeding, beginning to hunt after young are large enough to thermoregulate on their own. Clutch size is typically 3 or 4 eggs in Nunavut. In Rankin Inlet and Igloolik, the median incubation period of the first egg was 36 days, and decreased 1 day for each additional egg. The incubation period of the 4th egg (33 days) was similar to what has been reported elsewhere (Burnham 1983).

The Arctic peregrine falcon is a generalist predator with a diverse diet that includes passerines, shorebirds , ducks , gulls, terns, jaegers, black guillemots, and, when available, collared lemmings, brown lemmings, and Arctic ground squirrels. Bradley and Oliphant (1991) indicated that, around Rankin Inlet, small birds (64% of prey items) represented the greatest portion of prey items, followed by microtine rodents (25%), large birds (8%), and Arctic ground squirrels (4%). The most important prey measured by percent biomass were large birds (43%), followed by small birds (25%), microtine rodents (18%), and Arctic ground squirrels (15%).

In Nunavut, the earliest documented arrival for Peregrine Falcons is 10 May at a known breeding site near Rankin Inlet. Although arrival timing varies with spring conditions, the majority of sites are

occupied during the 3rd week of May. Median laying date in Rankin Inlet (9 June) is typically earlier than Igloolik (15 June) and northern Baffin Island (16 June). Median date of hatching ranges from 14 July at Rankin Inlet to 18 July on northern Baffin Island and 20 July at Igloolik (Jaffre et al. 2015). Birds depart the breeding grounds from mid-September through early October, arriving on the wintering grounds throughout Central and South America in November.

Figure 1. Adult male peregrine falcon. Note the dark hood and face with distinct dark malar stripe, white throat, slate-grey back, and barred belly, legs, and tail. Wing are long and pointed. Note the yellow legs, cere and eye ring.

Gyrfalcon (*Falco rusticolus*)

The gyrfalcon (GYRF; Figure 2) is large with pointed wings, but more rounded and broader than the wings of other falcon species. The tail is relatively long. When perched, wings extend 2/3 down the tail. The body is thick and powerful, particularly in females. Adults have yellow ceres, eye-rings and legs. As in all falcons, the eyes appear black. Three main color morphs occur: black, grey and white. White adults have almost pure white breasts and bellies, with dark wingtips (dipped-in-ink appearance). Grey adults have slate-colored back, with white underparts mottled with gray arrowhead-shaped markings. Dark adults are dark-grey overall above and dark-streaked breasts and belly. There is extreme reverse sex dimorphism, with males being approximately 2/3 the size of females (Ferguson-Lees et al. 2001).

Gyrfalcons distribution extends throughout the circumpolar Arctic. Most of the breeding range occurs north of 60°N, but breeding pairs are known to exist as far south as 55°N, mainly along sea coasts in eastern Canada. Many adults remain within the breeding range throughout the year, but some disperse southwards in winter, small numbers reaching the northern United States (Cade 1982, Poole 1987). Immature birds are much more likely to winter south of breeding range, and females are thought to disperse more widely, with many males remaining relatively close to breeding territories throughout the year.

Ptarmigan are often cited as the most important prey species by biomass, but Arctic ground squirrel and Arctic hare are also important, as well as small mammals (mice and voles) and other birds (ducks, sparrows, buntings). In central Nunavut, Poole and Boag (1988) identified eleven species of birds and five species of mammals among the prey. Birds accounted for three quarters of the diet, and adult rock ptarmigan were the most common. Arctic ground squirrel and arctic hare, made up the bulk of mammalian prey.

Males occupy and defend nesting territories as early as the end of January, with females arriving in mid-March. In Nunavut, laying typically begin in the first week of May with most pairs laying by the end of the second week in May. Nestlings typically hatch in mid-June but hatching can occur throughout June. Nestlings fledge in late July or early August after 7 weeks in the nest. In Nunavut, gyrfalcon usually nest on cliff ledges, ideally beneath sheltering overhang; sometimes nests in trees or on man-made structures. Nests are generally on rock ledges or abandoned rough-legged hawk or common raven nests. Use of alternate nest sites is not uncommon. Pairs do not necessarily attempt breeding every year, depending on food supply. Typical clutch size is 3-4 eggs (Booms et al. 2008) that are incubated for 34-36 days mostly by the female (ca. 80%). The North American population including Nunavut is considered to be stable (Clum and Cade 1994, Kirk and Hyslop 1998). Although low spring temperatures are associated with later arrival at nesting territories in Nunavut (Poole and Bromley 1988), there was no effect on laying dates. However, (Poole and Bromley 1988) indicated that increased spring precipitation (snow) reduced reproductive success.

Figure 2. Adult female gyrfalcon. Wings are more rounded and broader than the peregrine falcon. The tail is relatively long. When perched, wings extend 2/3 down the tail. The body is thick and powerful, particularly in females. Adults have yellow ceres

Rough-legged Hawk (*Buteo lagopus)*

The rough-legged hawk (RLHA; Figure 3) is a medium-large bird of prey, with a fairly small beak, predominantly brown in colour and often mottled. Plumage is highly variable with recognized light and dark morphs. Extensive field experience is required to distinguish between males and females, and between adults and juveniles based on plumage alone. A broad chest band is evident in most plumage variations, and in flight, a dark carpal patch is characteristic in light morph individuals. One or more dark terminal bands appear on the tail. The wing tips are long enough to reach or extend past the tail when the animal is perched. Legs are feathered to feet (Ferguson-Lees et al. 2005).

Widespread throughout North America, breeding from the Aleutian Islands, the interior of Alaska, Yukon, northern Mackenzie, and across Nunavut to northern Labrador and Newfoundland and south to Manitoba and southeastern Quebec. In Nunavut, rough-legged hawks are present over most of the territory except for islands without lemmings (Bechard and Swem 2002).

Regularly hovers, or “kites” while facing into the wind scanning for prey. Soars with wings raised in a slight dihedral (V-shape). It is a diurnal raptor that still-hunts from prominent perching structure on both breeding and wintering grounds. Prey is captured on the ground. Courtship involves soaring and calling, with the male engaged in a flight display of repeated undulating stoops rising upward to mid-air stall. It is gregarious on migration, often travelling in large flocks, but small groups or individuals are not uncommon.

During the summer, breeding pairs prefer rugged terrain areas with steeper slopes in areas associated with primary production (i.e., vegetation), and were most likely to nest in large, productive valleys surrounded by high-elevation plateaus (Galipeau et al. 2016). It is widely distributed in winter, usually found in open habitat resembling the tundra such as prairies, plains, coastal marshes, agricultural fields, and airports (Johnsgard and Johnsgard 1990). More common in wintering areas typified by short growing seasons and low precipitation, with highest densities in the northern United States, Great Basin area, and the western shortgrass prairies (Bock and Lepthien 1976, Bock et al. 1977).

The rough-legged hawk is a small mammal specialist; thus, its breeding activity is generally associated with local abundance of ground squirrels, voles, or lemmings (Hanski 1991, Potapov 1997). It will prey on birds when small mammals are scarce, particularly juvenile passerines and shorebirds, and will resort to consuming carrion opportunistically (Watson 1986). Usually reproductively mature at 2 years of age. Stick-nests are built soon after arrival on territory, typically on cliffs, on bluffs, or on the ground. Clutch sizes are variable (1-7 eggs), depending on food availability, but 3-5 eggs are usual and laid in May. Incubation is 31-33 days, provided almost entirely by the female. Nestling period is 35-40 days, and fledglings remain dependent on adults for another 2 weeks. The male provisions the young and the female, which feeds the young. Pairs show nest site fidelity, and in locations where ground squirrels are entirely absent, they may forgo breeding or have small broods when lemmings are low, in contrast to Snowy Owls, which are truly nomadic (Bechard and Swem 2002). Bechard and Swem (2002) indicated that egg-laying date was associated with spring temperatures and snow-free ledges, but Potapov (1997) reported no effect of snow melting date or spring/summer temperatures on number of nesting pairs.

Figure 3. Adult male rough-legged hawk. Note predominantly brown in colour and mottled. A broad chest band is evident, and dark carpal patches (not evident here) are characteristic in light morph individuals. One or more dark terminal bands appear on the tail. Wing tips are long enough to reach or extend past the tail when perched. Note that legs are feathered to feet.

Methods

Terminology

The terminology used throughout this report follows (Franke et al. 2017). The following terms are highlighted in an effort to clarify terminology used in this report, and/or to distinguish terms used from similar terms that have distinct meaning:

nest — The structure made or the place used by birds for laying their eggs and sheltering their young (Steenhof and Newton 2007) regardless of whether eggs are laid in the nest in a given year or in any year (Millsap et al. 2015, Steenhof et al. 2017), see Scrape for Gyrfalcons.

nesting site — The substrate which supports the nest or the specific location of the nest on the landscape (Ritchie and Curatolo 1982, Millsap et al. 2015, Steenhof et al. 2017).

alternative nesting site — One of potentially several nests within a nesting territory that is not a used nest in the current year (Millsap et al. 2015).

nesting territory — An area that contains, or historically contained, one or more nests within the home range of a mated pair: a confined locality where nests are found, usually in successive years, and where no more than one pair is known to have bred at one time (Newton and Marquiss 1984, Steenhoff and Newton 2007). Note that a nesting territory may or may not be defended (Postupalsky 1974), and

probably does not include all of a pair's foraging habitat (Newton and Marquiss 1984, Steenhoff and Newton 2007).

occupancy — The quotient of the count of occupied nesting territories and the count of known nesting territories that were fully surveyed in a given breeding season (Franke et al. 2017).

brood size — The actual number of young hatched from a single nesting attempt by a pair of birds. For studies in which mortality that occurs between hatching and the first observation of the brood is unknown, it is appropriate to report brood size (i.e., number hatched) only for broods equal to, or less than 10 days of age. For broods older than 10 days of age, see Brood Size ≥10 days. Report mean and standard error, or standard deviation.

brood size ≥ 10 days — The number of young hatched from a single nesting attempt by a pair of birds. For studies in which mortality that occurs between hatching and the first observation of the brood is unknown, and nestlings are equal to, or greater than 10 days of age, but less than Minimum Acceptable Age for Assessing Success. Report mean and standard error, or standard deviation.

minimum acceptable age for assessing success — A standard nestling age at which a nest can be considered successful. An age when young are well grown but not old enough to fly and after which mortality is minimal until actual fledging. Typically 80% of the age that young of a species normally leave the nest of their own volition for many species, but lower (65–75%) for species in which age at fledging varies considerably or for species that are more likely to leave the nest prematurely when checked (Steenhof and Newton 2007).

nest survival — The probability that a nesting attempt survives over the complete nesting period. When Daily Survival Rate (DSR; Dinsmore et al. 2002) is assumed to be constant over time and E is the nesting period (usually expressed in days), nest survival is DSR^E; otherwise nest survival is the product of each estimated DSR. For raptors, nest survival is the equivalent of nesting success for egg-laying pairs (Steenhof et al. 2017).

productivity — The number of young that reach the minimum acceptable age for assessing success; usually reported as the number of young produced per territorial pair or per occupied territory in a particular year (Steenhoff and Newton 2007, Steenhof et al. 2017).

total production — The total number of young detected.

Field Surveys

Structured surveys were conducted from 2013 – 2019. The focus of these surveys was to search known nesting sites for the presence of cliff-nesting raptors (Figure 4). In addition to the structured surveys, favourable habitat was searched opportunistically when ferrying between known sites, camps or other mine infrastructure and when raptors or signs of site use (e.g., whitewash, orange-colored lichen, and unused nests) were observed. Sites were considered occupied if one or more adults displayed territorial or reproductive behavior (e.g., vocalization and/or flight behavior associated with defense of breeding territory or presence of nest building, nest, or eggs). Locations with partially built or unused nests without detection of breeding aged adults were noted as such (e.g., old stick nest; no birds detected). Raptor monitoring in 2019 involved weekly nest monitoring of accessible territories, one boat survey on Meliadine Lake (July 19), and one helicopter survey (August 7).

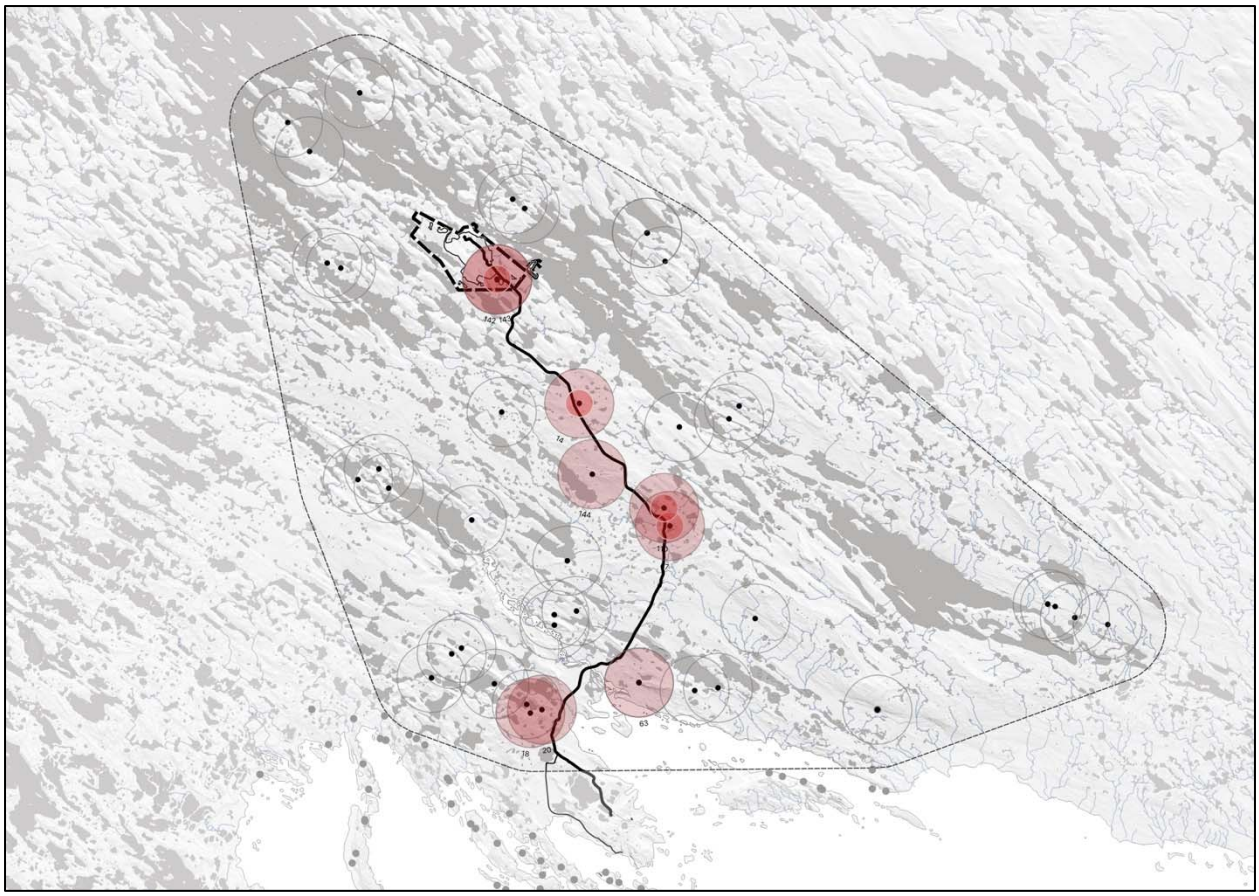


Figure 4. Location of raptor territories within an area surrounding the Meliadine Project. Buffers of 1.5 km and 600 m are drawn around each territory. Territories that are located within 1.5 km of Meliadine infrastructure are coloured with light red, and territories that are located within 600 m of Meliadine infrastructure are coloured with dark red.

Data Exploration

Nearest Neighbour Distances

Nearest neighbour distances (NND) were calculated in R (R Development Core Team 2017) using the sp, rgeos, and geosphere packages to transform nesting site locations into spatial objects, calculate pairwise distances, and identify the shortest distance between known neighbouring nesting site locations.

Distance to disturbance

Spatial objects (lines and polygons) describing the project footprint were acquired from Agnico Eagle. Euclidean distances from nesting sites to the nearest spatial object were calculated in R (R Development Core Team 2017) using the sp, rgeos, and geosphere packages. Summary data were generated using the hist, boxplot and summary functions in R. The Government of Nunavut currently refers to species-specific disturbance guidelines outlined in Government of British Columbia (2013), and this report follows those recommendations.

Assigning Nesting Sites to Nesting Territories

In the absence of marked individuals, it can be challenging to definitively identify alternative nesting sites. Failure to account for alternative nesting sites can lead to underestimating demographic parameters such as annual productivity. To address this problem, a rule-based approach was used to estimate the number of alternative nesting sites within the study area (Figure 5):

- If two species-specific nesting sites were separated by a distance of ≤ 1 km they were considered alternative nesting sites in a single nesting territory.
- If two nesting sites within 1 km of each other were occupied by the same species in a given year, they were considered separate territories.
- If multiple species-specific nesting sites were within 1 km of one another, discrete geographic landforms or discontinuities in cliff structure were used to separate or combine sites into territories.

Temporal patterns of multi-species occupancy were used to assess the plausibility of decisions based on the application of the three rules listed above. For example, if two nesting sites were located within 1 km of each other and were occupied by two different species in alternating years, these nesting sites were identified as distinct alternative nesting sites for each species.

Assigning Identification Numbers (ID) to Nesting Territories was conducted according to the following rule set:

- Nesting Territory IDs were assigned within species only (e.g., Nesting Territory IDs for PEFA and RLHA were never shared).
- Nesting Territory IDs were assigned using the Identification Number of one of the Nesting Sites in the cluster according to the following rule set, in order of priority:

    i. Length of tenure (i.e., nesting sites with the longest tenure)

    ii. First tenure (i.e., nesting sites with the first tenure in the event length of tenure was equal).

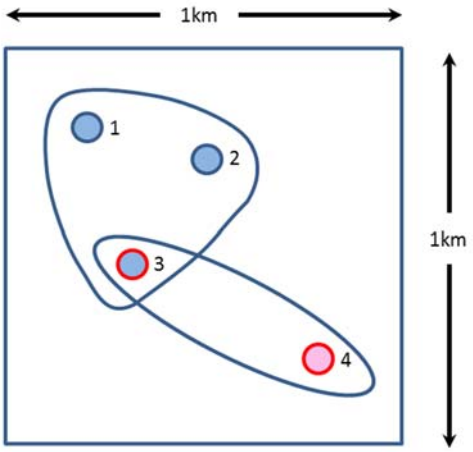
Occupancy

For each species separately, we first tallied the total count of known nesting sites across all surveys combined. We then adjusted the year-specific count of known nesting sites to account for nesting sites that were not known in that year (i.e., had not been found). Using the methods to assign nesting sites to nesting territories described in the previous section, we tallied the number year-specific nesting territories. We then calculated the year-specific proportion of known nesting territories that were occupied as a proportion of the known nesting territories that were surveyed. For visualization purposes only (i.e., no statistical assessment of trend was attempted), we then used Loess Regression to smoothen the available time series.

Results

Data Exploration

A total of 43 confirmed unique raptor nesting sites have resulted from surveys conducted near the Meliadine Project between 2013 and 2019 (see Table 1). Peregrine falcons have been documented at 29 nesting sites, rough-legged hawks at 25 nesting sites, and gyrfalcons have not yet been documented in the area. Among occupied nesting sites, the mean distance to the nearest territory was 1.44 km. The mean nearest neighbour distance (i.e., occupied sites only) was 1.15 km (range = 0.27– 6.6 km). Mean distance from known occupied nesting sites to the haul road was 4.70 km (range = 0.2 – 19.5 km). A



NS ID	PEFA NT ID	RLHA NT ID	2011	2012	2103	2014	2015	2016	2017
1	1	-	PEFA	PEFA	NBD	NBD	NBD	PEFA	PEFA
2	1	-	NBD	NBD	PEFA	NBD	PEFA	NBD	NBD
3	1	4	NBD	NBD	NBD	PEFA	RLHA	RLHA	NBD
4	-	4	RLHA	RLHA	NBD	RLHA	NBD	NBD	RLHA

Figure 5. Rule-based approach used to assign nesting sites to nesting territories. A cluster of four nesting sites within 1 km of one another that exhibit a site occupancy history among seven years for two species (PEFA and RLHA). Nesting Sites 1 and 2 (blue circles with blue borders) have been occupied solely by PEFA. Nesting Site 4 (red circle with red border) has been occupied solely by RLHA. Nesting Site 3 (blue circle with red border) has been occupied by both PEFA and RLHA. In this example, Nesting Sites 1, 2 and 3 are grouped into a single PEFA Nesting Territory and assigned Nesting Territory ID 1 based on PEFA–specific tenure length (Nesting Site 1 has the longest tenure) and first tenure. Nesting Sites 3 and 4 are grouped into a single RLHA Territory and assigned Nesting Territory ID 4 based on RLHA–specific tenure length (Nesting Site 4 has the longest tenure) and first tenure. Unique nesting locations are ultimately defined by a Nesting Territory ID and a Nesting Site ID (E.g., NT ID 1, NS ID 2). NBD = no birds detected.

total of three sites fall within 600m (see Government of British Columbia 2013) of the haul road, and four nesting sites within 1.5 km of the Haul Road (see management plans below. Mean distance from known occupied sites to the Meliadine Lease footprint was 12.48 km (range 0 – 29 km). Two nesting sites are located within the Meliadine footprint, and are considered candidates for development of a site-specific management plan (see Management Plans section of this document). However, neither are with the 600m limit identified.

After applying the rule-based approach to assign nesting sites to nesting territories, we assessed one cluster of sites that have been occupied by both rough-legged hawks and peregrine falcons. Sites 18, 20, and 37 are all within 1000m of each other, however they have been simultaneously occupied within years and we therefore regard them as distinct territories. In summary, surveys conducted from 2013 to 2019 have identified a total of 29 unique peregrine falcon and 25 unique rough-legged hawk territories in the study area.

Point estimates for occupancy indicate that peregrine falcons (mean = 0.61) have been stable (Table 2, Figure 6). For rough-legged hawks, mean occupancy was equal to 0.34, however, data indicate that a peak occurred in 2013 (0.57), and 2016 (0.52). Such high variation in occupancy is a well-known for small-mammal specialists which respond to microtine rodent cycles (Gilg et al. 2006).

Table 1. Geographic coordinates (decimal degrees), distance to nearest neighbour (D2NN), distance to road (D2RD), and distance to footprint (D2FP) for 43 occupied nesting sites surveyed between 2013 and 2019. Territories that are within 600 m of Meliadine infrastructure (road, or footprint) are highlighted in dark yellow, while territories that are within 1.5 km of infrastructure are highlighted in light yellow. All remaining territories are located outside of the buffer zone suggested by the TEMMP, and therefore require no management plan.

site	latitude	longitude	D2NN (km)	D2RD (km)	D2FP (km)	Mgt. Plan
1	62.86836	-92.25605	1.4	5.73	16.9	no
14	62.97506	-92.12968	3.1	0.23	5.8	yes
18	62.85464	-92.17156	0.4	1.17	18.6	yes
20	62.85597	-92.16164	0.5	0.78	18.5	yes
37	62.85801	-92.17464	0.4	1.46	18.2	yes
46	63.07264	-92.36035	1.6	7.66	6.1	no
61	62.91391	-92.13992	2.2	4.07	12.3	no
63	62.86641	-92.07864	2.4	1.37	18.1	yes
67	62.92745	-92.05219	0.8	0.26	12.2	yes
77	62.86449	-92.01107	1.0	4.31	19.5	no
79	62.87997	-92.23043	0.5	5.05	15.6	no
81	62.86605	-92.20228	1.7	3.12	17.2	no
84	63.02948	-92.28385	2.5	3.05	2	no
85	62.85595	-91.87472	6.6	10.86	23.9	no
88	62.88890	-92.15097	0.4	2.34	14.9	no
89	62.92978	-92.22168	3.9	6.40	10	no
95	62.96907	-92.00168	0.7	4.99	10.4	no
96	62.94216	-92.29262	0.9	8.18	9.3	no
98	62.94964	-92.30101	0.9	7.86	8.7	no
103	63.08382	-92.37894	1.6	9.10	7.5	no
107	62.86341	-92.03104	1.0	3.49	19.2	no
109	63.02752	-92.33361	2.5	5.52	4.2	no
110	62.93445	-92.05718	0.8	0.41	11.4	yes
112	62.87769	-92.23878	0.5	5.33	15.8	no
113	62.89293	-92.15108	0.4	2.73	14.5	no
114	62.97403	-91.99301	0.7	5.62	10.4	no
115	62.97170	-92.19602	3.4	2.61	5.5	no
116	62.94549	-92.31899	1.0	8.84	9.5	no
117	63.05057	-92.17638	0.7	2.57	2	no
121	62.89437	-92.13210	1.0	2.51	14.5	no
127	62.89143	-91.97929	3.4	4.39	17.6	no
129	63.04116	-92.07213	1.5	6.11	5	no
131	62.89614	-91.72274	0.3	17.10	26.7	no
134	63.09531	-92.31744	3.3	7.70	6.4	no
135	63.05417	-92.18661	0.7	2.51	2.1	no
136	63.03012	-92.05630	1.5	6.46	5.6	no
138	62.96590	-92.04414	2.2	2.92	9	no
139	62.89179	-91.70596	1.0	18.00	27.6	no
140	62.89705	-91.72914	0.3	16.77	26.3	no
141	62.88911	-91.67776	1.5	19.46	29	no
142	63.02298	-92.19985	0.0	0.23	0	yes
143	63.02323	-92.19994	0.0	0.23	0	yes
144	62.94755	-92.11851	3.1	1.04	8.9	yes

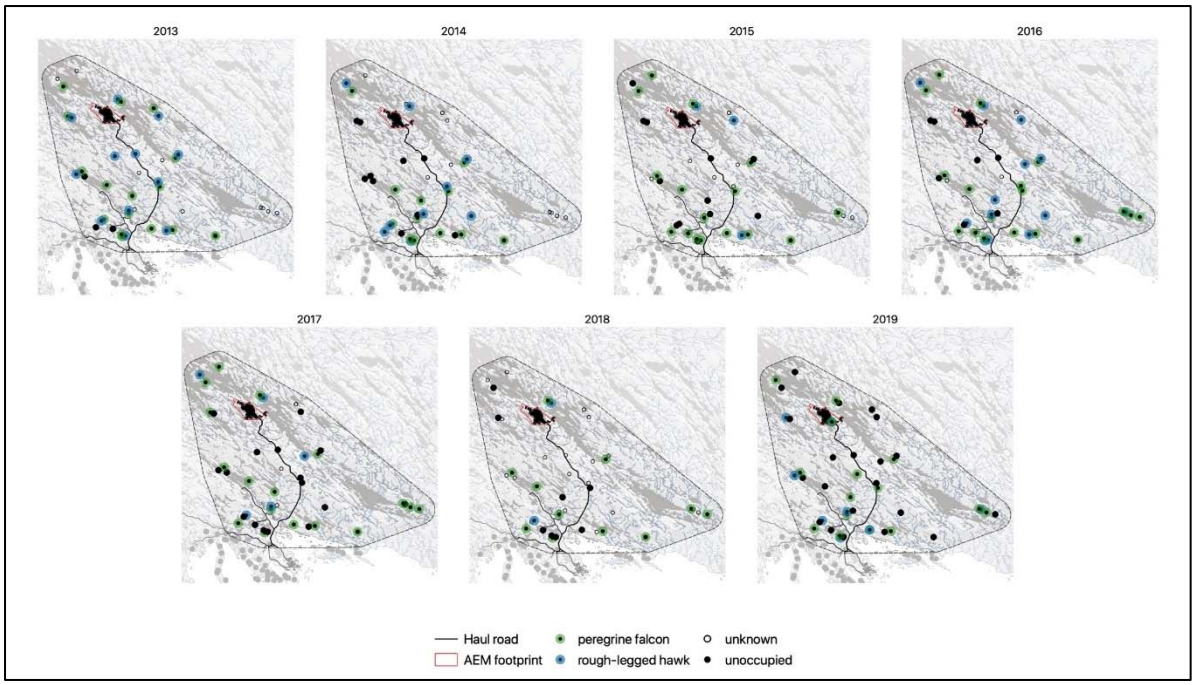


Figure 6. Distribution (2013 – 2019) of peregrine falcon and rough-legged hawk nesting sites. Black circles indicate nesting sites that were checked within the given year, and determined to be unoccupied. Open circles indicate nesting sites that were unknown or unchecked in the given year, and coloured circles represent respective species occupying a given territory (green = peregrine falcon, and blue = rough-legged hawk). The Haul Road (black line), Meliadine footprint (black polygon), and regional study area (black line) are shown relative to the distribution of nesting sites.

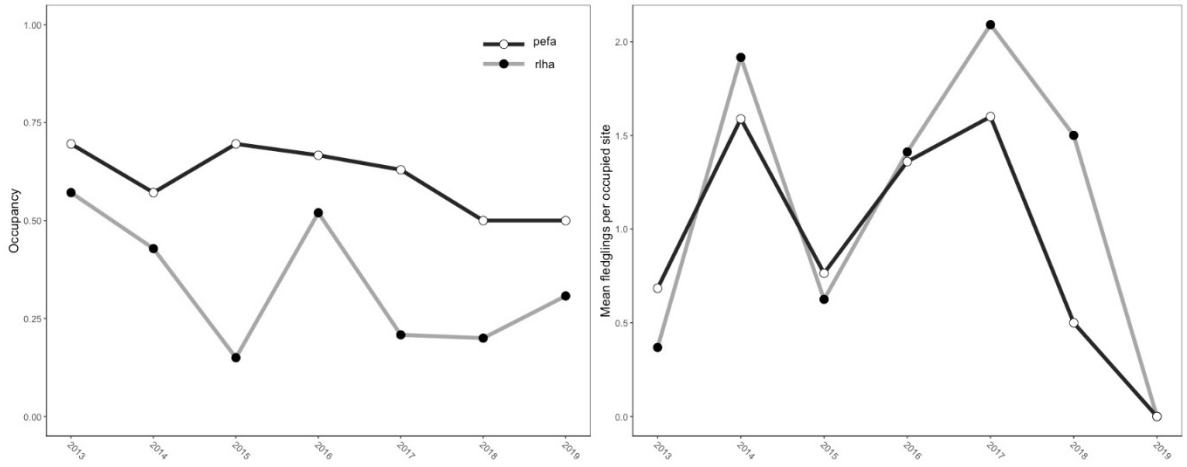


Figure 7. Trend (visualizations purposes only) in occupancy and productivity for peregrine falcons (black line), and rough-legged hawks (grey line), from 2013 – 2019. Annual occupancy point estimates for each survey year are also presented (see Table 1 for details).

Discussion

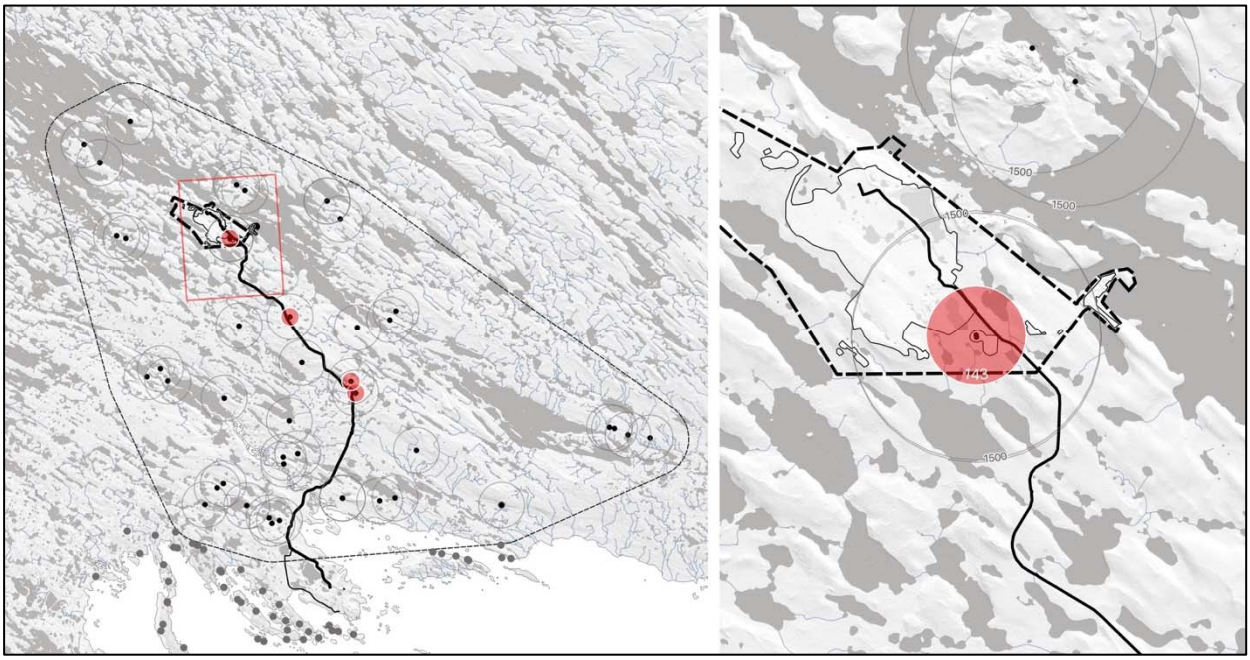
Monitoring for breeding raptors has occurred consistently in the area associated with Meliadine Project infrastructure since 2013, and surveys have focused on searching for, documenting, and mapping nesting sites for three raptor species (peregrine falcons, rough-legged hawks, and gyrfalcons). Study design has included at least two surveys – one to assess the location of occupied territories during the

pre-incubation and incubation periods, and one to assess site productivity during the late brood rearing period.

Mitigation and management outlined in the TEMMP requires the protection of species at risk during the breeding season (Term and Condition 59), and requires that disturbance to birds is minimized through consistent monitoring (Term and Condition 59), including nest-specific mitigation where necessary (Terms and Conditions 61, 62, and 75). It should be noted that peregrine falcons were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in November of 2017, and were ranked "Not at Risk". However, the responsible Minister has not yet rendered a decision on the recommendation made by COSEWIC, and peregrine falcons are currently listed on Schedule 1 of the Species at Risk Act (SARA 2002, as amended), and are considered to be "Special Concern". This report meets the Terms and Conditions outlined by NIRB by documenting and mapping raptor nesting sites, and presenting site-specific management plans for nests within 1.5km of the project infrastructure, including minimum "no disturbance" buffers, including requirements for SARA-listed species.

Management Plans (Terms and Conditions 61)

Nesting Sites 142 and 143 - <200 m to disturbance

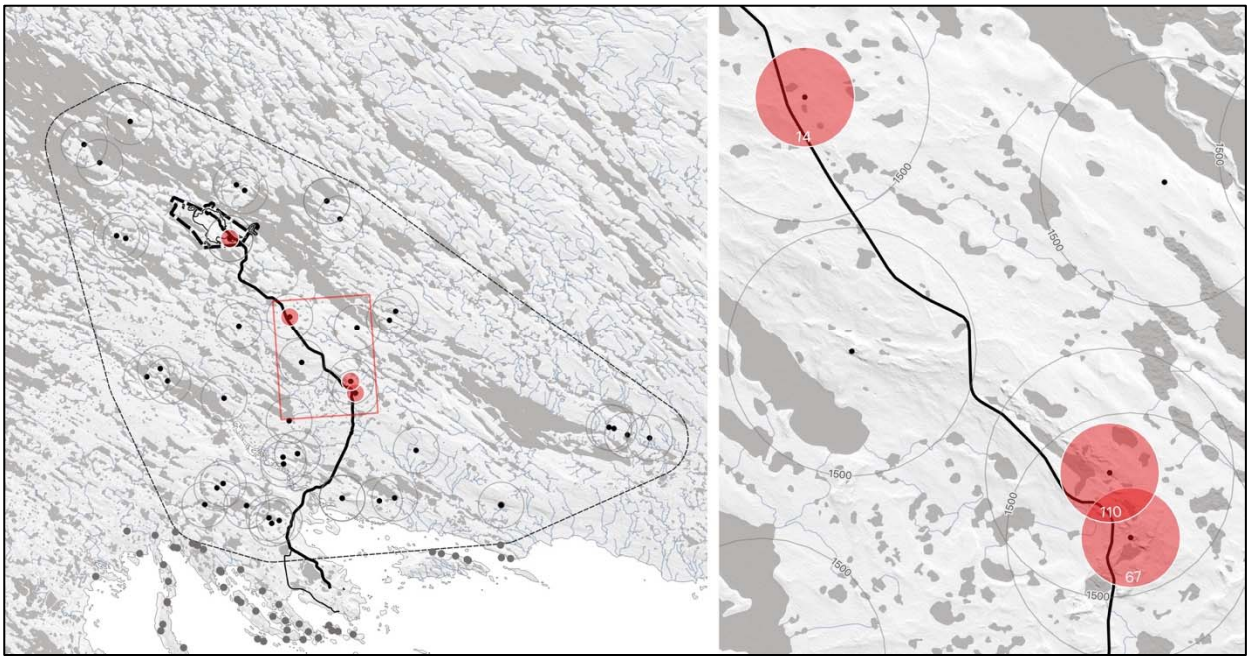


Site	*Dist.*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
142	(0m)	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	PEFA
143	(0m)	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	RLHA

On June 6, 2019, M. Theriault (Agnico Eagle) contacted A. Franke (Arctic Raptors Inc.) to discuss the presence of pair of rough-legged hawks and a pair of peregrine falcons that had each established a nest on the side wall of a saline pond located within the Meliadine lease area. Given the high likelihood that both pairs had already initiated egg-laying, A. Franke advised against the use of deterrents. A buffer of 100m was established for all foot-traffic, on-going work (installation of a pump within the pond and construction of a crusher pad) was postponed, and a drone was deployed to pinpoint the exact locations of the nests on the side wall. Once the nests were located, site engineers indicated that both nests were

not within line-of-site due the height of the safety berm surrounding the pond and the distance of both nests below grade. A. Franke advised Agnico Eagle Environmental staff to avoid pump installation until the 3rd week of June to ensure that birds had completed egg-laying, and to avoid the hatching period between July 5 – 15, and to conduct work only on good weather days. Work on the crusher pad was not performed. A water pipe was positioned at grade as far as possible away from the nests, but the pump was not installed. Agnico Eagle Environmental staff conducted routine water-level monitoring within the pond on July 7, and simultaneously surveyed the nest location for activity of adult birds. Adults birds were observed flying, and were also observed landing on the side-walls of the pond once the water-level monitoring had been completed. Subsequent monitoring by Agnico Eagle Environment staff indicated that both nests failed in the second week of July. Although not directly observed, the cause of failure was likely precipitation and cold weather as multiple failures associated with inclement weather are known to have occurred among the majority of raptor nests throughout the region at this time. The Government of Nunavut was notified of actions recommended by A. Franke. Although these nest failures were almost certainly associated with natural factors, it is recommended that deterrents are installed in the spring of 2020 prior to the arrival of raptors (prior to 01 May), to reduce the likelihood of occupancy. However, both sites will be monitored regularly in the spring to assess territory status. If deterrents are successful, no further mitigation will be necessary. In the event that deterrents are not successful, nest-specific mitigation measures will be taken on the basis of circumstances (e.g., species, location of nest, proposed activity) encountered at the time, as recommended by Arctic Raptors Inc.

Nesting Sites 14, 110, and 67 – 200 to 600 m to disturbance

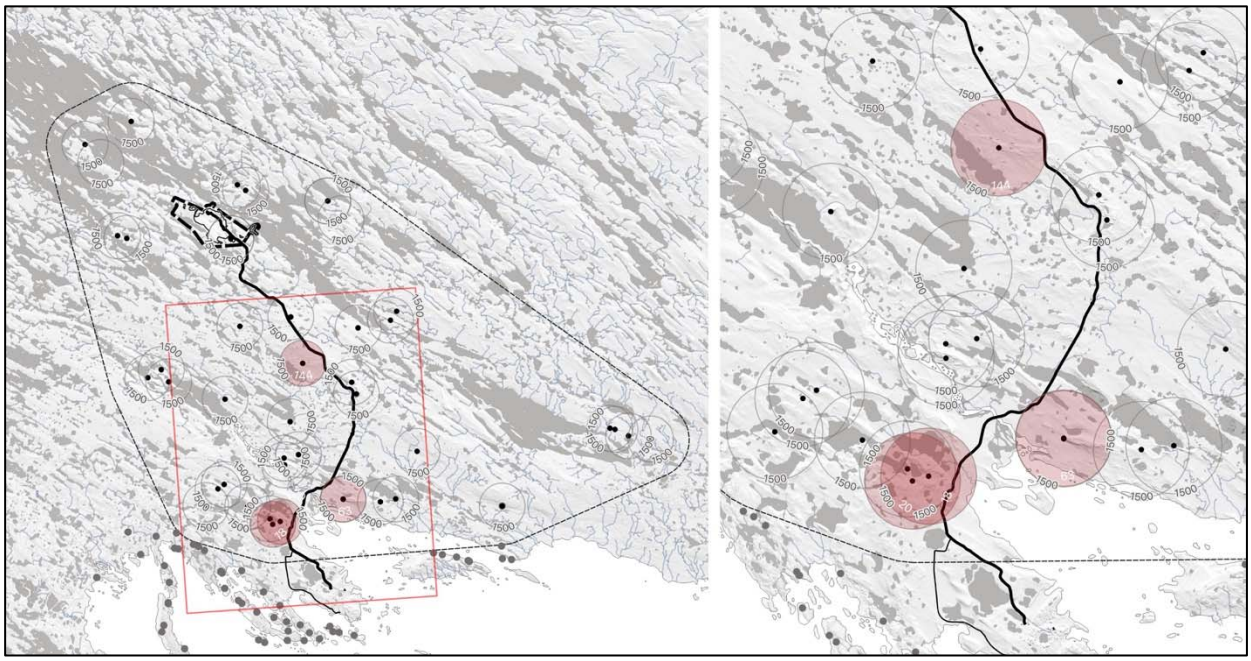


site	*Dist.*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
14	(230m)	RLHA	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied
110	(410m)	RLHA	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied	unoccupied
67	(260m)	PEFA	PEFA	PEFA	PEFA	unoccupied	unoccupied	PEFA

A total of three raptor territories are within 600 meters of the all-weather road between the Meliadine mine and the community of Rankin Inlet. Sites 14 and 110 were occupied by rough-legged hawks in

2013, and site 67 has been occupied five out of the seven years by peregrine falcons. Sites 14 and 110 will continue to be checked for occupancy each spring, but due to the lack of occupancy in the last 5 years, a management plan is not needed. During the years in which site 67 was occupied, a mean of 1.4 nestlings were fledged per year (2013 = 3, 2014 = 3, 2015 = 1, 2016 = 0, 2019 = 0) – an average that is 0.52 nestlings greater than all peregrines within the study area during the same time period. Given the consistent occupancy and relative success of site 67, a management plan beyond consistent monitoring is not necessary.

Nesting Sites 18, 20, 63, and 144 – within 1.5 km to disturbance



site	*Dist.*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
18	(1170m)	PEFA	RLHA	unoccupied	RLHA	PEFA	PEFA	RLHA
20	(780m)	RLHA	PEFA	PEFA	RLHA	unoccupied	unoccupied	unoccupied
63	(1370m)	PEFA	PEFA	PEFA	PEFA	unoccupied	unoccupied	PEFA/RLHA
144	(1040m)	unknown	unknown	unknown	unknown	unknown	unknown	PEFA

A total of four territories are located within 1.5 km of the all-weather road. Site 144 was discovered documented by Golder staff in 2019. One adult bird was observed, and although Golder staff documented the presence of a nest, no eggs were documented, and there is no known history of raptors occupying this location. This location will be monitored for the presence of breeding raptors in future years.

Sites 18, 20, and 63 have all been occupied by both peregrine falcons and rough-legged hawks, 6, 4, and 5 out of the 7 years respectively. All sites are located beyond the 600m recommended buffer (Government of British Columbia 2013). Furthermore, there is no line of sight between the road and any of the nest sites, and disturbance from traffic is therefore minimal. All sites will be monitored annually, but a management plan is not considered necessary.

Table 2. Occupancy for peregrine falcons, rough-legged hawks and gyrfalcon breeding near the Meliadine Project, Nunavut from 2013 – 2019.

Occupancy metrics

Year	2013			2014			2015			2016			2017			2018			2019		
	occupied	known	occupancy	occupied	known	occupancy	occupied	known	occupancy	occupied	known	occupancy	occupied	known	occupancy	occupied	known	occupancy	occupied	known	occupancy
PEFA	16	23	0.70	12	21	0.57	16	23	0.70	18	27	0.67	17	27	0.63	11	22	0.5	15	30	0.5
RLHA	12	21	0.57	9	21	0.43	3	20	0.15	13	25	0.52	5	24	0.21	2	10	0.2	8	26	0.31

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