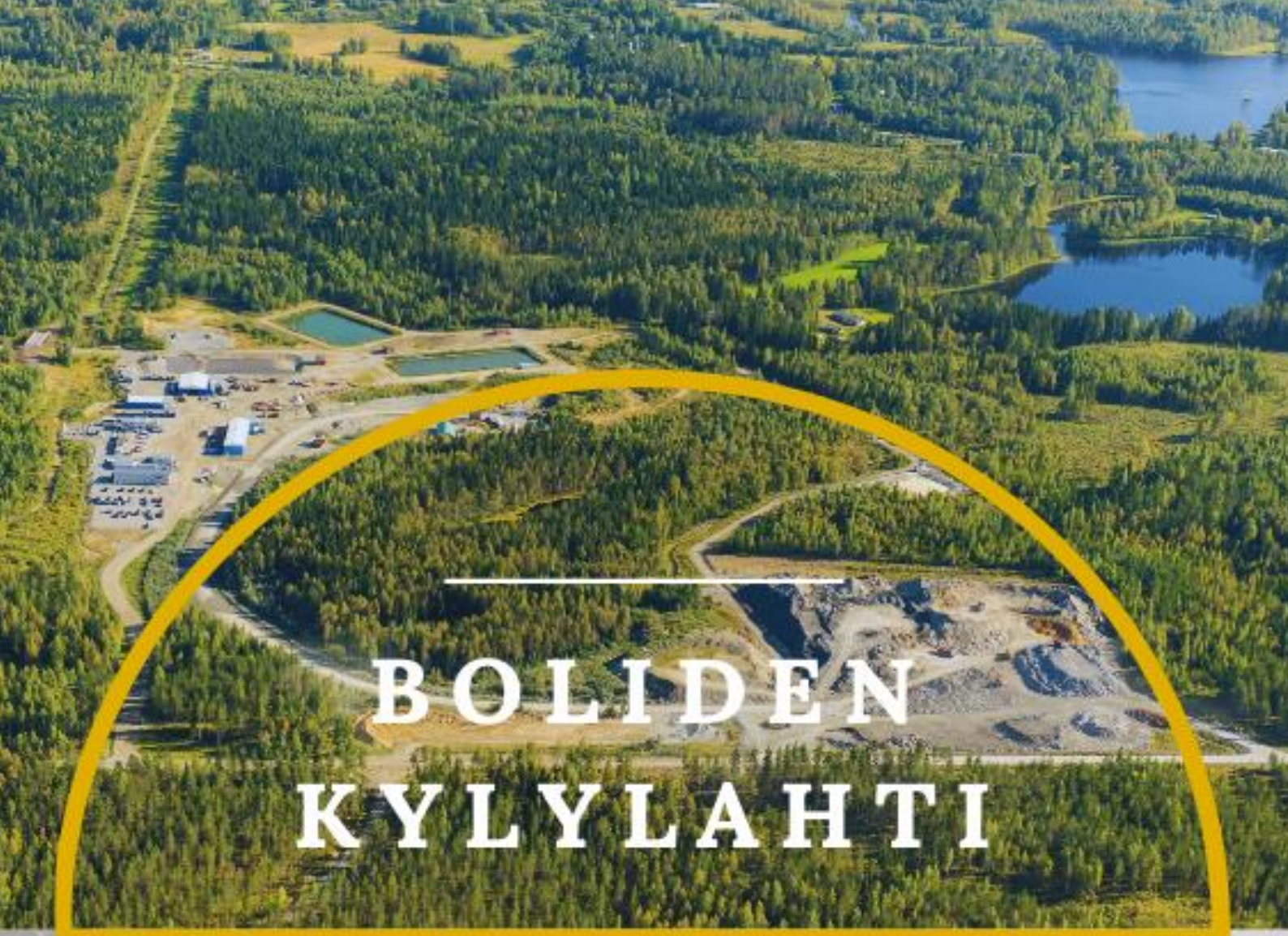

BOLIDEN KYLYLAHTI

BIODIVERSITY GRI REPORT 2021

BOLIDEN

CONTENT

1. GENERAL INFORMATION

1.1. Kylylahti Site

Kylylahti is a closed polymetallic Cu-Au-Zn-Ni-Co(-Ag) underground mine, where ore was mined between 150 and 810 meters below surface. The ore is situated in the Luikonlahti mill, 43 km from the mine by road (see figure 1).

Note that while Kylylahti mine is owned and operated by Boliden Kylylahti (Boliden), Mondo Minerals B.V. (Mondo) owns a mining license (Vasara) north of the Kylylahti licenses. Essentially, Boliden and Mondo have a co-operative contract which allows Boliden to mine base metals from Mondo's Vasara mining license. Likewise, Mondo can exploit talc formation on Kylylahti mining license.

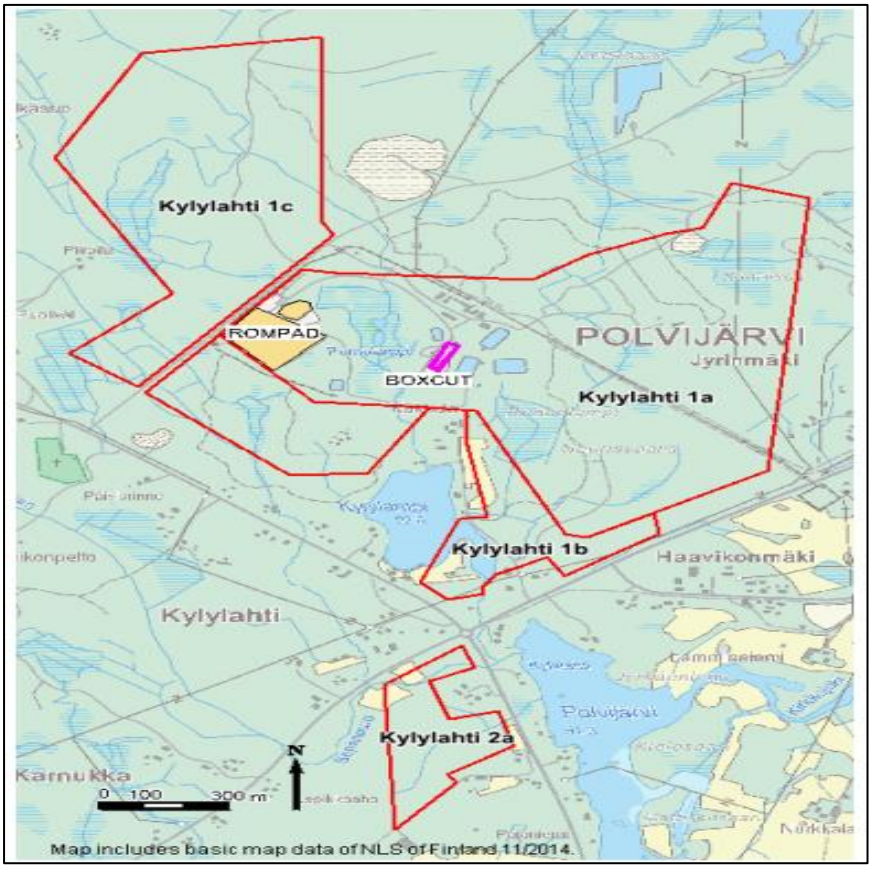

Figure 1. *Map illustrating Kylylahti mining site and licenses*

When it comes to land, footprint area affected by mining and related operations is estimated to be around 890 ha in Kylylahti and 1500 ha in Luikonlahti. However, Boliden owns mining licenses to only 670 ha surface right, mainly because of the close location of the Polvijärvi center to the Kylylahti mine. Remaining land is primarily used for forestry and agriculture. In Luikonlahti on the other hand, the majority of the footprint area is used for forestry.

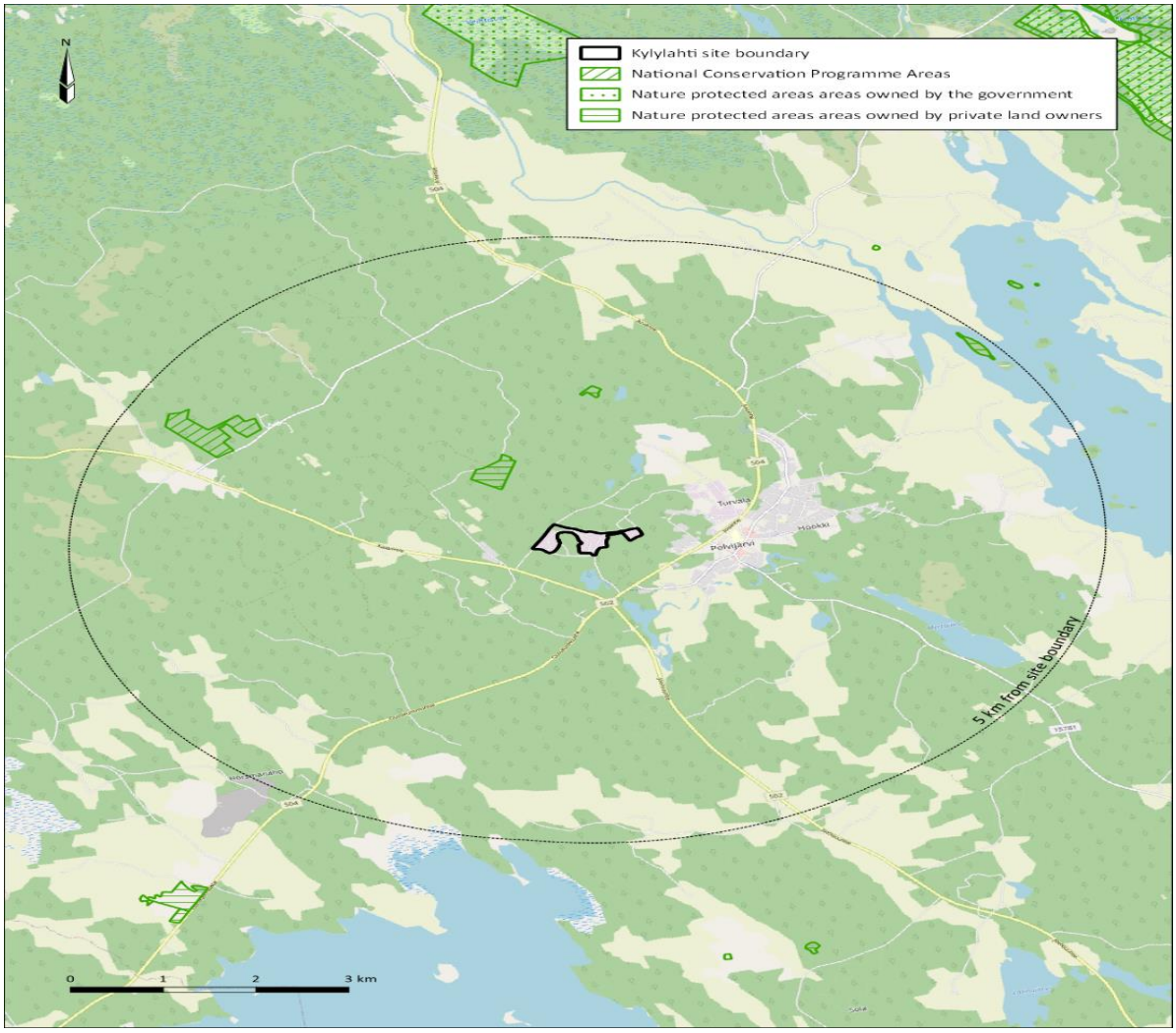

Figure 2. *Illustration of Kylylahti site boundary and the surrounding area of conservational land, nature protections (private and government owned within 5 Km radius)*

1.2. Luikonlahti Site

The Luikonlahti enrichment plant was constructed in the 1960s to exploit copper ores found in the area. Kylylahti Copper Oy acquired Luikonlahti's plant in 2010 and started operating in 2012. In 2014, Boliden took over Kylylahti Copper Oy. The enrichment area is located in the village of Luikonlahti in Kaavi, stretching southeast of Jynkkänniemi and Kunttisuo in Petkellahti, including Heinälamme and its surroundings, all the way to Kylmäpuronniemi.

The mining districts in force in the area are: Luikonlahti 1–2, 4 and 6–11, Petkel I and II and Petkellahti. During 2015, the auxiliary area of the Luikonlahti mining district was reduced to an area of 17.8 hectares. The discontinued part was located west of the railway line west of Heinälamme and the closure was applied for at the request of the owner of the property in the area. Since then, the areas of operation of the Luikonlahti mining district, other auxiliary areas and mining permit areas under the new Mining Act have remained unchanged.

Concentrates formed in the Luikonlahti enrichment process include copper-gold concentrate, zinc concentrate, nickel-cobalt concentrate, Sulphur/cobalt nickel concentrate and tailings. In 2020, nickel cobalt enriched has been sold to the Australian Glencore smelter and at the end of the year, small lots were also sold to a Canadian company.

Monitoring of the operation, emissions and environmental impacts of the enrichment plant was carried out in accordance with the environmental permit in force during 2020 and the water and fisheries monitoring program for the Luikonlahti mine and enrichment plant was approved by the Ely Centre of Pohjois-Savo in 2015.

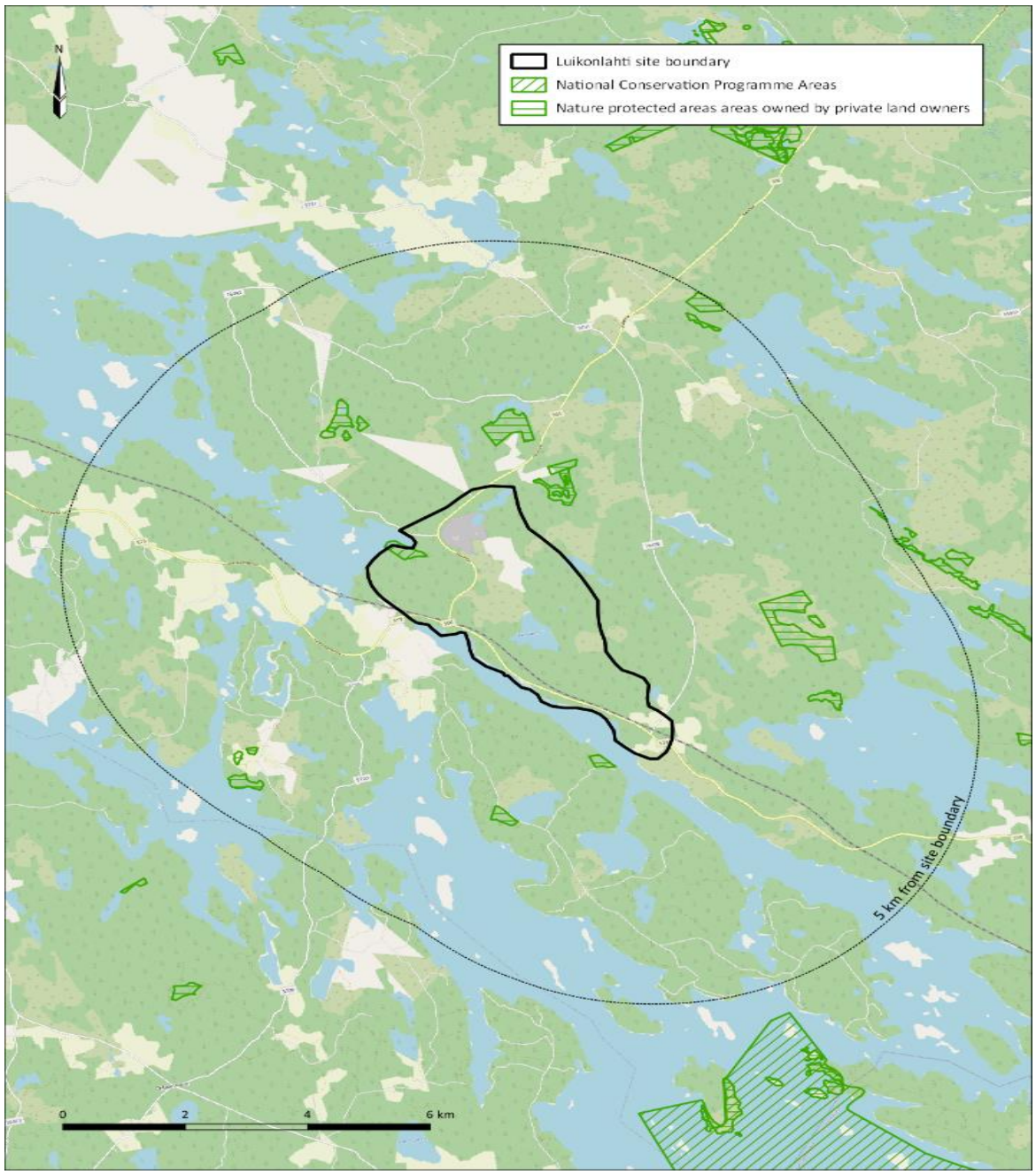

Figure 2. *Illustration of Luikonlahti site boundary and the surrounding area of conservational land, nature protections (private and government owned within 5 Km radius)*

Figure 3. Illustration of Luikonlahti mining licenses.

2. IMPACTS OF OPERATING ACTIVITIES ON BIODIVERSITY ASPECTS

We have direct and indirect criteria for which negative impacts on biodiversity should be evaluated: Air Quality, Soil Quality, Surface/Ground Water and Noise & Vibration.

2.1. Kylylahti site

The environmental monitoring of the Kylylahti mine in 2020 was carried out in accordance with the current monitoring plan. Based on the observation results, the mine's operations in 2000 have been in accordance with the environmental permit conditions. For the most part, there have been no emissions or adverse effects on the environment.

2.1.1. Air Quality

According to the monitoring plan, the concentrations of deposition and deposition of dust from mining should have been monitored twice during the first full year of operation (once in summer and once in winter). During 2017, the air quality measurements were carried out according to the approved plan during the winter and summer periods. In 2020, no quality measurements have been made.

2.1.2. Surface/Ground Water Quality

A. Surface Water

As far as surface water is concerned, monitoring was carried out in accordance with the plan. Additionally, the stooling of kirkkojoki and the demolition waterworks below has-been carried out in accordance with the joint monitoring programmed of Pohjois-Viinijärvi. Additionally, the elevation of surface water was monitored four times from Kylylamme, Polvijärvi and Purnulamme. Observations from levels monitoring are summarized in both the table and illustration chart below:

Table 1: Observations of surface water levels from stations' bottom piles

PvmTarkkailupiste	23.3.2020	21.7.2020	11.9.2020	14.12.2020
Polvijärvi	0,78	0,68	0,78	0,78
Kylylampi	0,29	0,25	0,29	0,29
Purnulampi	0,82	0,72	0,87	0,83

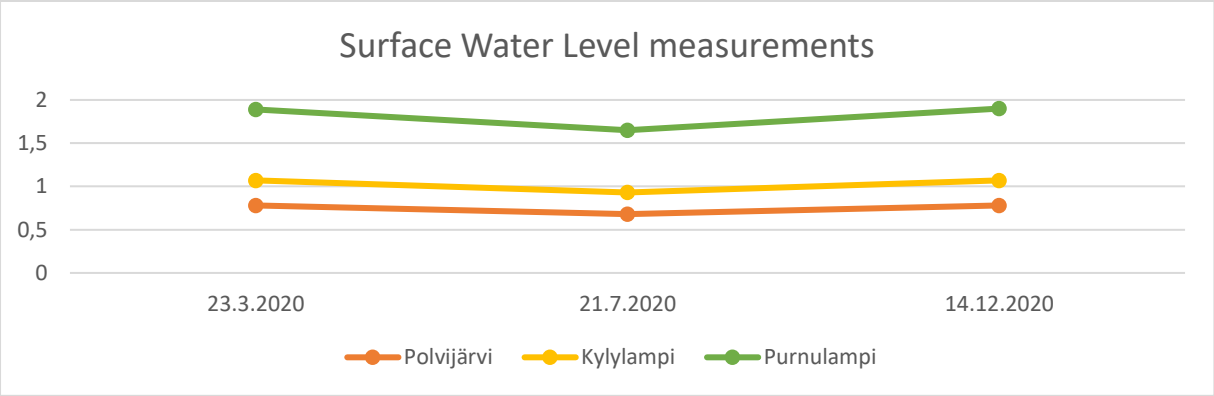

Figure 4. *Water levels variations in Polvijärvi, Kylylamme and Purnulamme*

Sediment studies will be carried out in accordance with the monitoring plan every fourth year. Based on the samples from Kylylahti and Paajanniemi in Polvijärvi in 2020, mining effects on waters can be observed below the discharge point at the Pajaniemi sample point under the elevated electrical conductivity and as an increase in the concentrations of sulphate, nickel, cobalt, and cadmium. Still, given that the sediment sample was taken at relatively short intervals from the bottom of the specimen lake, it remains uncertain whether the sample is sediment, or whether the bottom layer change concentrations and their leaching into flowing water is still possible.

Overall, the impact of the mine on the quality of the sediment will be monitored following the end of mining and demolition's water impact, in accordance with the monitoring program.

B. Ground Waters

All wells under the monitoring program, with the exception of deep wells (No 1 and 30) were sampled in July 2020. The municipality's water network has considerably expanded. During the operation of the mine, 35 properties have joined the water network in the Jyrinmäki and Haavikonmäki areas. In this area, one existing well of domestic water, which is under groundwater monitoring, remains within the scope of the mine (well No 10).

North of the mine, there have been no changes along the Feed Bridges. The two wells closest to the mine in domestic water use are under groundwater monitoring (Wells No 7 and 21).

The results and test reports of the household water wells involved in the monitoring have been sent to the owners of the wells and the ELY Centre once they have been completed. They have been reported in full to the Central Government's Environmental Reporting System YLVA.

In 2020, the water in the wells was still judged as good domestic water. As of the previous years, most of the well and the pH of the sample water were below the target threshold of 6,5. In the courtyard of the House of Kylylamme, the well has not been used for domestic water since 2012. It was emptied in summer 2019, after which it was dry for a long time.

The mine was sampled in the autumn and its water met the requirements for household water. On a health basis, no exceedances of the amount of nitrate were observed during 2020. In general, it can be concluded that most of the well samples examined met the quality requirements and recommendations for household water in terms of the characteristics studied.

2.1.3. Soil Quality

As planned, the determination of soil heavy metal concentrations was carried out on a one-off basis during the final phase of mining in summer 2020 and will be carried out in other areas after their dismantlement.

Comparing 2020's soil results with 2007's survey (carried out by Envineer Oy prior to mining operations), findings suggest that the effects of mining are most significant in areas close to dust-causing activities. These include a processing field or traffic routes, where conditions for the spread of rock dust in the air are highly likely to occur. Results also show that metal concentrations increase closer to the functions that cause dusting.

Results of the shovel pit test show dusting caused by mining (treatment of stone in the ROM pad field, driving of rocks on roads), in the concentrations of cobalt, chromium, copper and nickel and Sulphur. The presence of stone dust in the vicinity of operations is also supported by terrain observations on the surfaces of undergrowth and trees. Still, the extent to which stone dust is present is fairly limited and visible dust is greatly reduced closer to the forest.

Aggregate sample from the soil survey "Edge of the loading area" KK27 is located opposite to the loading area on the mine road embankment and from which organic renewable material had been pruned out. The sample suggests that heavy metals do not bind with the soil but are present as dust on the surface of organic matter. Overall, total concentrations of all metals analyzed were lower in this aggregate sample compared with the sample point KK27. In addition, based on the solubility studies carried out on the aggregate sample, heavy metals in the sample are scarce. The solubility of several metals was below the laboratory's limit of quantification under the prevailing pH conditions.

2.1.4. Noise and Vibration

During 2020, mining did not go deeper with a depth of -710 mpy and a bottom that has been conjured towards the village agglomeration of Polvijärvi and the Haavikonmäki area. During 2020, vibration measurements have been carried out continuously throughout the year at Kylylammentie 6A, Jyrintie11, Yhdystie2 and Haavikontie42 and 29. Based on the results, mining has not caused any vibrations that could have damaged the properties.

As for noise in the area of operation, measurements have been constantly carried out in 2013 and 2016. However, no further measurements have been carried out during 2020.

2.2. Luikonlahti Site

The same also applies on Luikonlathi's site. In this case, we have different criteria for which negative impacts on biodiversity should be evaluated: Air Quality, Wetlands, Surface/Ground Water and Noise & Vibration.

2.2.1. Air Quality

Pöly's fallout and hover measurements were carried out in accordance with the prescription of the ympäristö permit during 2015 and re-measured once in the winter/summer 2018. In 2020, there was no dust measurements.

2.2.2. Wetlands / Landuse

The marsh waters of the tailings area are partially discharged into a wetland treatment plant built in The Great Swamp, from where the exhausted waters are pumped into the enrichment process or into the clearing area at the southern end of the tailings area. In Luikonlahti and twice a year, wetland stations are sampled quarterly in accordance with the permit regulations and from the wetlands in Petkelpuro.

Touching upon metal concentrations in the waters of wetland stations (K1, K2, K3), Petkelpuro (Pv2) and marsh water ditch (J1), a large amount of sulphate (through electrical conductivity) was most strong in the water of the Great Swamp Wetland K1. Wetlands were also found to contain increased concentrations of several metals (nickel). In the large swamp wetland, iron concentrations were generally lower than other observation sites, as iron is likely to oxidize in the wetland treatment of the Great Swamp and prey on the bottom of the wetland.

As for mercury and antimony concentrations in wetlands, they were below the limit of quantitation, including those of molybdenum, lead, chromium, and arsenic. PH of the water in the marsh water ditch J1 in May was most clearly indicated by acidity, otherwise acidity was less pronounced in wetlands.

During the years of operation of the enrichment plant, both Palopuro and Myllypuro wetlands (K2 and K3) have also seen an increase in the pH values of water and a decrease in metal concentrations. Overall, the concentrations in wetland and marsh waters only exceed the target values for iron. PH values have also been mainly in accordance with the permit condition.

2.2.3. Surface Waters

The water quality of surface waters, wetlands and drains were clearly burdened, except for the bypass, for several metals and sulphate. The impact of the operation of the G/10 plant on the watercourse of the area is monitored by two observation stations in Retusen and seven observation stations in Rikkavesi.

Retusen Petkellahti (station 1A) is clearly burdened by the mining area. The effect of wastewater is manifested in Petkellahde, for example, as oxygen problems and in concentrations of salt, metal and sulphate that are higher than the natural level. The biosafe concentrations of nickel exceeded the environmental quality standard level at station 1A in accordance with regulation (1308/2015) on both observations except for paving. Nickel concentrations were also higher than the maximum concentration in the vessel and intermediate water according to regulation (1308/2015) on both observations.

The concentrations of sulphate were also slightly elevated in the vessel and intermediate water at all Rikkavesi observation stations. The biosocial concentrations of nickel and lead, as well as cadmium concentrations, were clearly lower than the environmental quality standard at all stations in Rikkavesi.

2.2.4. Ground Waters

A. Wells

Water samples were taken from wells under the monitoring program in 2020. Wells No. 14 and 13 are no longer in domestic water use. When it comes to water levels, there have been no changes. As in the previous year, water quality was weakened by increased nickel concentrations, the maximum concentration (140 µg/l) was also higher than it was the year before. Nickel concentrations in well 14 also exceed, by a number of times, the domestic water quality requirement of 20 µg/l for small units (StM Regulation No 1049/2001). Nickel content in well 11 (Räsänen), similarly, exceeded the quality requirements for drinking water in September.

PH values of the water in wells and springs were below the recommended level of drinking water except well 10 (Laasola) for at least one observation.

B. Groundwater pipes, mine shaft and natural sources

In addition to wells, groundwater impacts are monitored in four groundwater pipes, an old mine shaft and two natural sources. There had been no change in the surface heights of the sources. The pH values of the water were below the recommended level for household water at both sources, the other characteristics of the water in the sources were excellent. Nickel and sulphate concentrations in the water at the resort's source were still well above the Source of Kaunisharju.

Overall, there have been no significant changes in the water quality of groundwater pipes. The surface of groundwater pipeline PP3 rose continuously until 2016 but has since settled at its current interest rate.

Groundwater pipe PP3 was rich in solids, other pipes had solid concentrations below the limit of quantitation or close to the limit of quantitation. The water in pipe PP3 was completely oxygen-free on both observations and, as in the previous years, was of poor quality, e.g., several metals and sulphate concentrations were very high.

In the water of tube PP4, the concentrations of several metals were also clearly elevated, nickel concentrations have been down in the long-term review. The water in tubes PP3 and PP4 was also very acidic (pH values 4.0-4.5). The water quality of pipe PP8 was mainly weakened by elevated sulphate concentrations, elevated concentrations in recent years, as well as soluble nickel and calcium concentrations, among others. The water quality of pipe PP101 was reduced by increased concentrations of sulphate and nickel, and for sulphate the maximum for 2020 clearly decreased from the previous year.

Overall, there have been no significant changes in the water quality of the mine shaft during the operation of the enrichment plant, but the quality of the water has always been the same. The quality of the water entering the mine shaft has been monitored under self-monitoring on a monthly basis.

2.2.5. Noise & Vibration

2020 carried no noise measurements. Factually, no continuous or repeated monitoring order has been issued for noise. Still, the next time noise measurements are carried out due to operational changes, they may affect the level of ambient noise in advance.

The operation of the enrichment plant is not expected to cause any disturbing vibrations to the environment or nearby residents. No permit regulation has been issued for vibration measurements and no vibration measurements have been carried out.

3. HABITATS PROTECTED OR RESTORED

3.1. PROTECTION AREAS

The following maps (see figure 5 and 6) present a visualization on the protection areas close to Luikonlahti and Kylylahti, respectively.

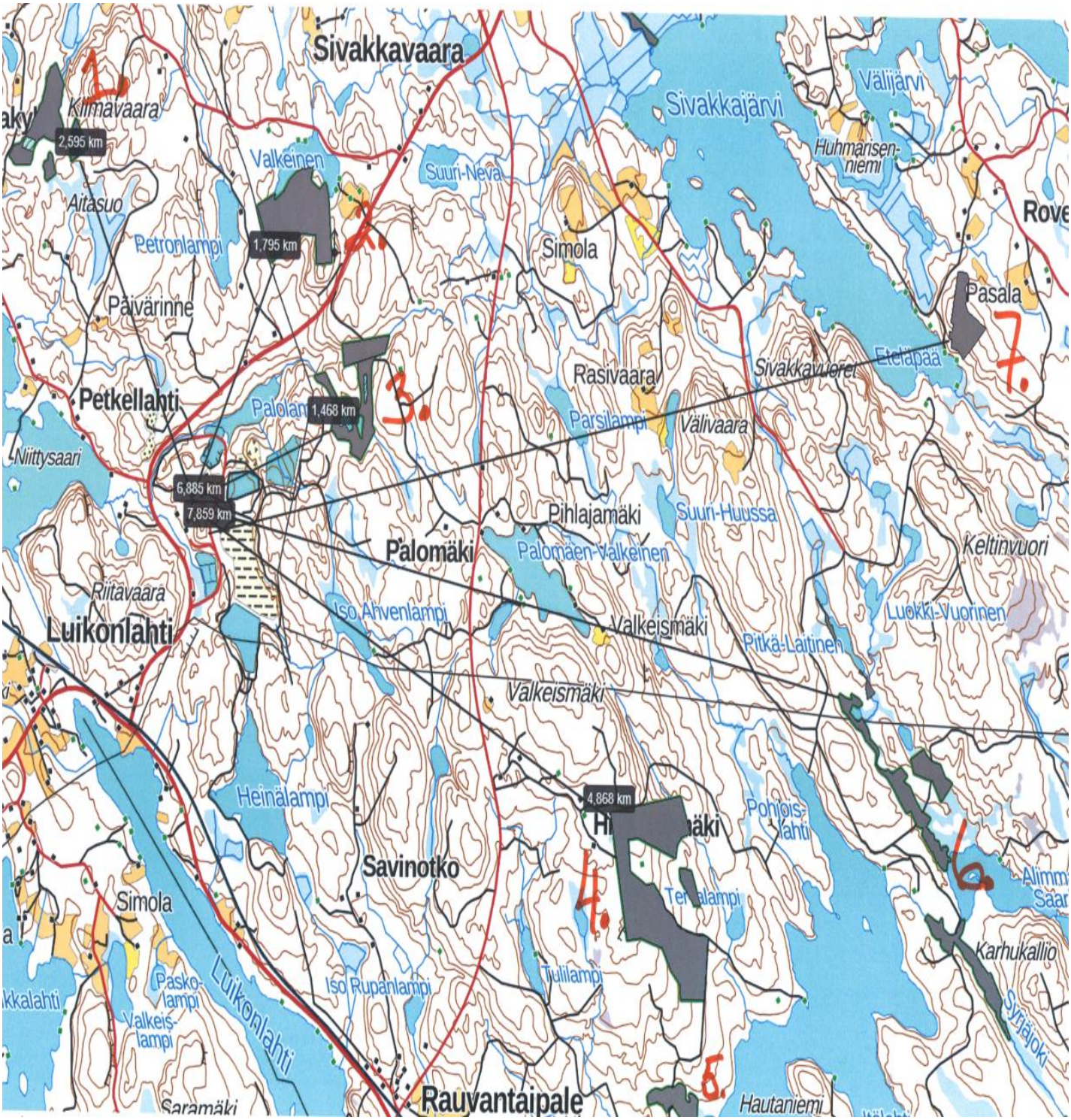

***Figure 5**. Protection areas in Kaavi Municipality, Luikonlahti Mill area*

1. **Kiimalampi natural protection area**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 29.1.2021
    d. CDDA[1]-mark -9999
2. **Hiltuskalmisto natural protection area**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 29.9.2017
    d. CDDA-mark 555633689
    e. IUCN[2] category IV (Habitat/species management area)
3. **Kukkelonnotkon metsä**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 13.2.2013
    d. CDDA-mark 555633689
    e. IUCN category IV (Habitat/species management area)
4. **Turulanvaara**
    a. SACFI0600080
    b. 27.3.2018
    c. 69 ha

4. **Turulanvaaran luonnonsuojelualue**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 31.12.2000
    d. CDDA-mark 176214
    e. IUCNcategory IV (Habitat/species management area)
5. **Turulanvaara 2**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 17.6.2020
6. **Syrjäjoen helmi**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 18.11.2020
    d. CDDA-mark 555701498
7. **Purola**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 30.8.2021
    d. CDDA-mark -9999

[1] Common Database on Designation Areas
[2] IUCN Protected Area Categories System (https://www.iucn.org/theme/protected-areas/about/protected-area-categories)

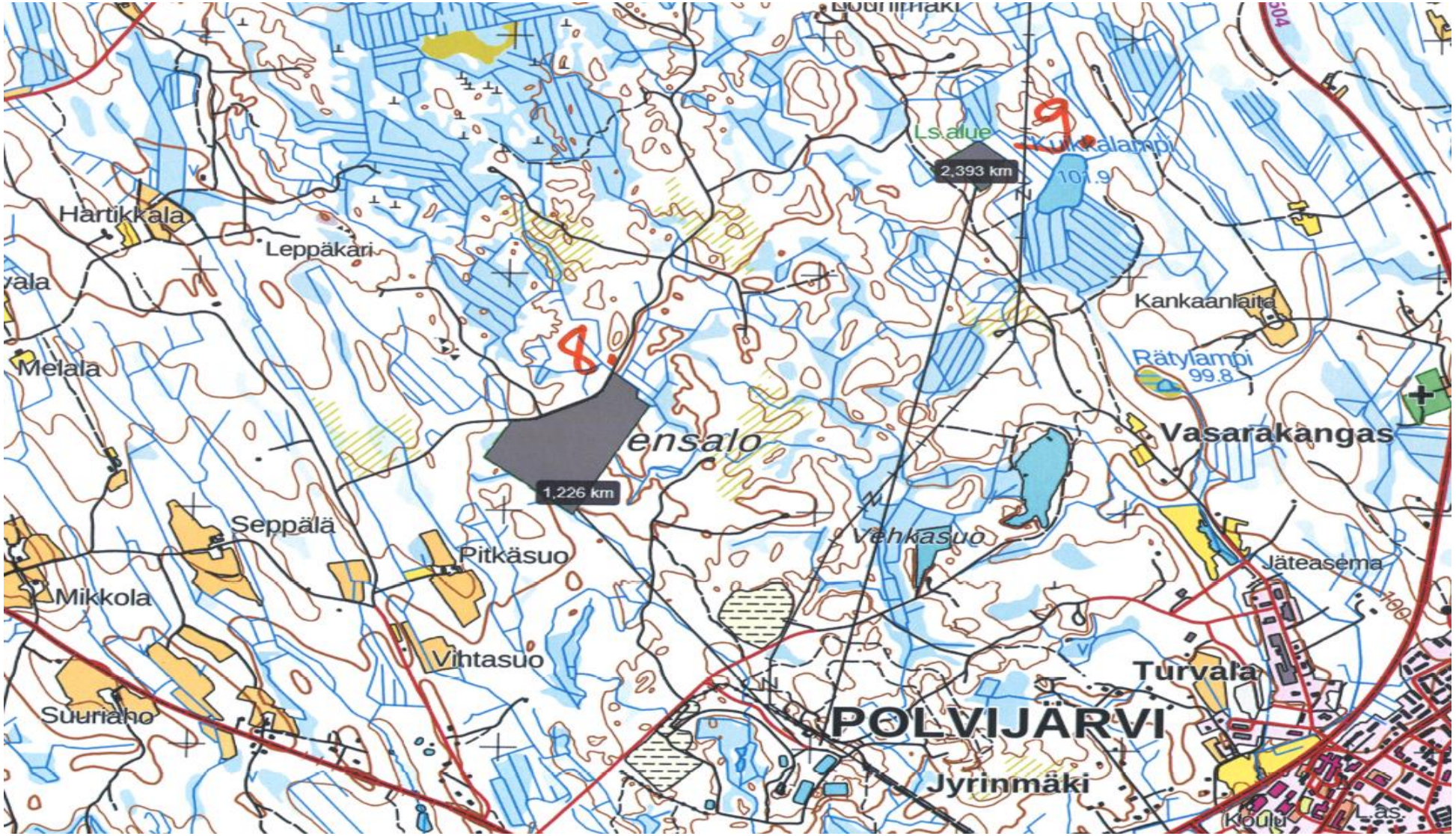

Figure 6. *Protection areas in Polvijärvi municipality. Kylylahti mine area*

8. **Louhen lluonnonsuojelualue**
    a. Privately owned protection area
    b. Based on natural protection act 24§
    c. Protection decision made 20.7.2020
    d. CDDA-mark 555701138

9. **Autiomäen rauhoitusalue**
    a. Privately owned temporary protection area
    b. Based on natural protection act 25§
    c. Protection decision made 29.2.2012
    d. ceases 29.2.2032
    e. CDDA 555550554

4. RED LIST SPECIES AND NATIONAL CONSERVATION LIST SPECIES WITH HABITATS IN AREAS AFFECTED

Few of the EU Habitats directive annex IV species were observed within Kylylahti's surrounding area. Among these, we mention Moor frog (*Rana arvalis*) and Northern bat (*Eptesicus nilssonii*). Note that their occurrence was based on aerial images and previous information. Also, nature survey conducted by Envineer Oy contributed to the collection of the following data.

4.1. Moor frog

Survey was conducted on 13th of May 2021 near Purnulampi and based on moor frog vocalization, an estimation of 13 frogs were observed in the northern parts of Purnulampi (see figure 7 for clearer illustration).

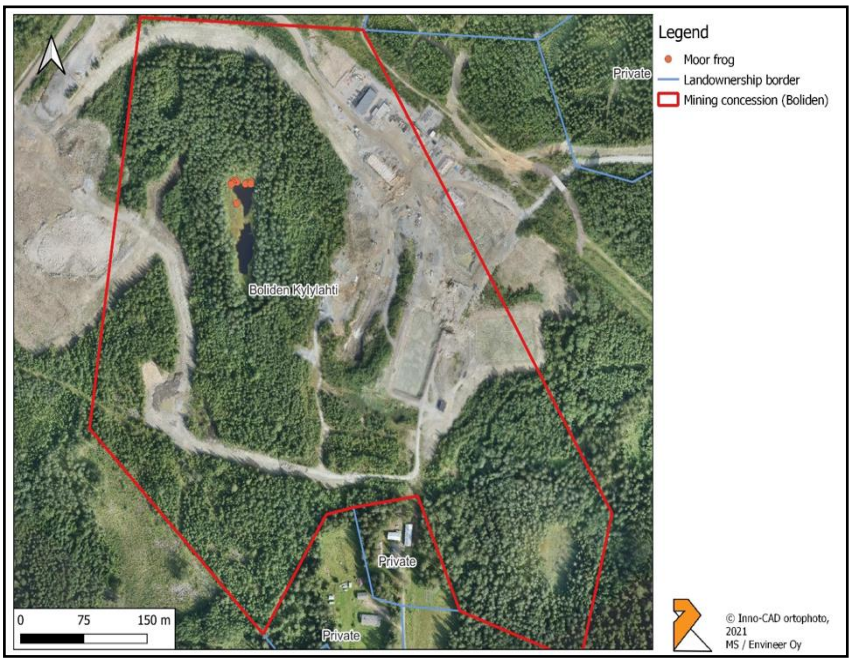

Figure 7. Map showing the location of Moor frog near Purnulampi area

4.2. Northern bat

All bat species in Finland are firmly protected by national and European Union legislations. It is prohibited to kill, capture, harm or disturb the species, especially during breeding seasons or at the spots of value to their life cycles. Both areal inspection and background information helped determine location focus for the conducted survey (4th – 5th) of August 2021 using an ultrasound module.

A total of 4 sightings of bats in the area (Figure 6). Three of them were observed during August and one was observed in Purnulampi during moor frogs' survey. Overall, it is likely that northern bats in the area open locations in the mine site hunting. Still, it is too early to establish if some of these areas are important feeding or transition grounds based on one survey.

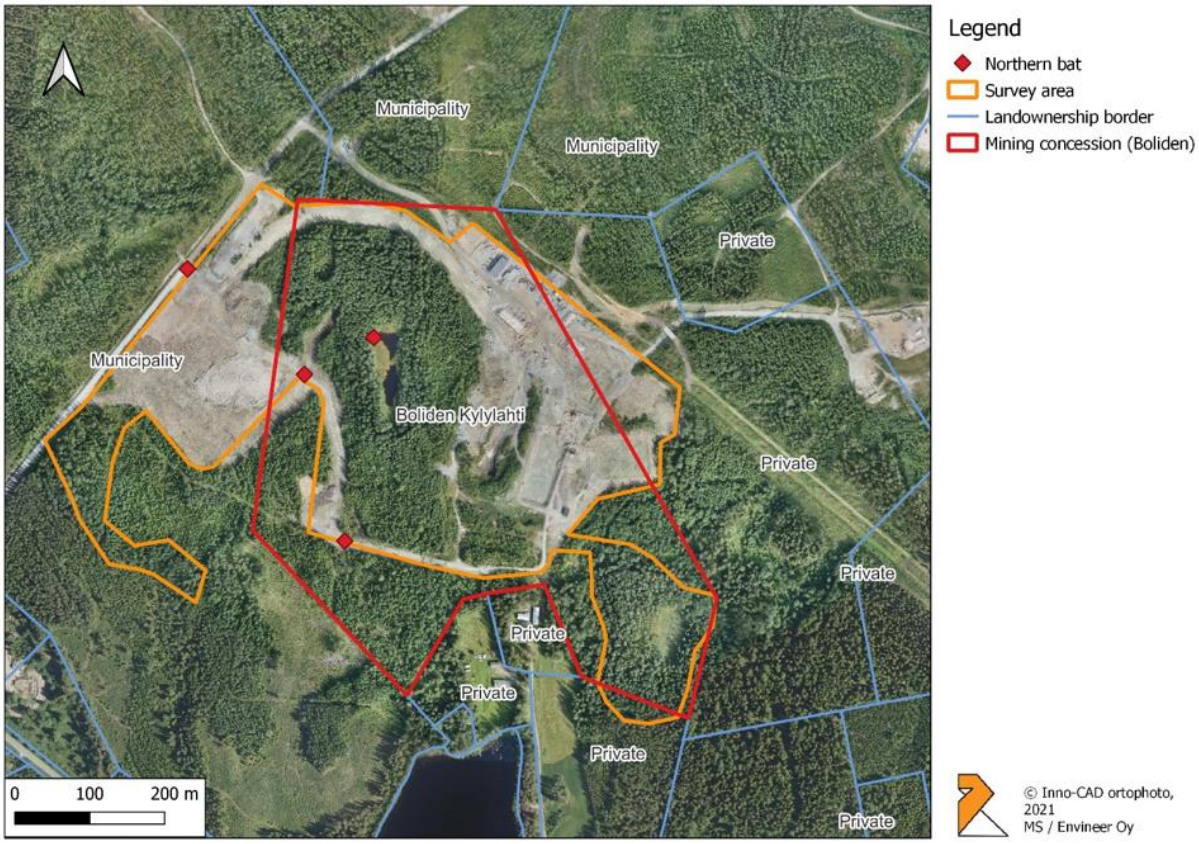

Figure 6. *Map showing the location of Northern bats around the mining concession*

4.3. Birds

Counting of breeding birds was done in July 2021 at the mine site. Results of the bird censuse and estimation of breeding pairs are presented in the following table (table 2).

Table 2. Results of bird counting and guesstimate of breeding pairs in the area.

Species	Latin	Number of pairs	Status (Red list 2019)
Mallard	*Anas platyrhynchos*	1	
Eurasian Wigeon	*Anas penelope*	1	VU
Green Sandpiper	*Tringa ochropus*	1	
Wood Sandpiper	*Tringa glareola*	1	NT
Common Snipe	*Gallinago gallinago*	2	NT
Common Gull	*Larus canus*	13	
Black-headed Gull	*Larus ridibundus*	0-2	VU
Common Tern	*Sterna hirundo*	2	
Wood Pigeon	*Columba palumbus*	1	
Common Swift	*Apus apus*	0-2	EN
Barn Swallow	*Hirundo rustica*	15	VU
Sand Martin	*Riparia riparia*	2-3	EN
Tree Pipit	*Anthus trivialis*	3	
White Wagtail	*Motacilla alba*	3	NT
Wren	*Troglodytes troglodytes*	1	
Dunnock	*Prunella modularis*	1	
European Robin	*Erithacus rubecula*	3	
Northern Wheatear	*Oenanthe oenanthe*	1	
Blackbird	*Turdus merula*	2	

Fieldfare	*Turdus pilaris*	2	
Redwing	*Turdus iliacus*	3	
Song Thrush	*Turdus philomelos*	2	
Garden Warbler	*Sylvia borin*	2	
Lesser Whitethroat	*Sylvia curruca*	3	
Willow Warbler	*Phylloscopus trochilus*	7	
Common Chiffchaff	*Phylloscopus collybita*	1	
Goldcrest	*Regulus regulus*	1	
Spotted Flycatcher	*Muscicapa striata*	1-2	
Pied Flycatcher	*Ficedula hypoleuca*	1	
Blue Tit	*Parus caeruleus*	1	
Great Tit	*Parus major*	2	
Eurasian Treecreeper	*Certhia familiaris*	1	
Raven	*Corvus corax*	0-1	
Chaffinch	*Fringilla coelebs*	4	
Bullfinch	*Pyrrhula pyrrhula*	1	
Siskin	*Carduelis spinus*	2	
Yellowhammer	*Emberiza citrinella*	2	

Categories of Red list: EN Endangered, VU Vulnerable and NT Near Threatened

All of the documented bird species are common in the near the site. Few species are judged to be endangered (living at the site: Sand Martin breeds in sandy banks and Common Swift breeds usually in a scanty pine forest). Other species like Dunnock, Eurasian Treecreeper etc. Gulls and terns are also typical species on tailing and pond sites.

4.4. Other species

In the area, some dragonflies were observed in the area; precisely, two entities of Subarctic Darner (Aeshna subarctica, males) and one Brown Hawker (Aeshna grandis, female). On the other hand, no EU Habitats directive dragonflies such as Lilypad Whiteface (Leucorrhinia caudalis) or Yellow-spotted Whiteface (Leucorrhinia pectoralis) were observed.

5. SUMMARY

Purnulampi holds a conservation status in the survey area. It is protected by Water Conservation Act 2:11 § (Pristine and not more than 1 ha large ponds and lakes). There were no other biotopes in the area that would belong to classes 4 or 5 (few or no signs of human activities respectively).

Table 3. *Key results from the site nature surveys.*

Species	Conservational status / Threatened (Red List 2019)
Moor frog	LC (EU habitats' directive species)
Northern bat	LC (EU habitats' directive species)
Subarctic darner	LC
Brown hawker	LC
Eurasian Wigeon	VU Vulnerable
Black-headed Gull	VU Vulnerable
Common Swift	EN Endangered
Barn Swallow	VU Vulnerable
Sand Martin	EN Endangered

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