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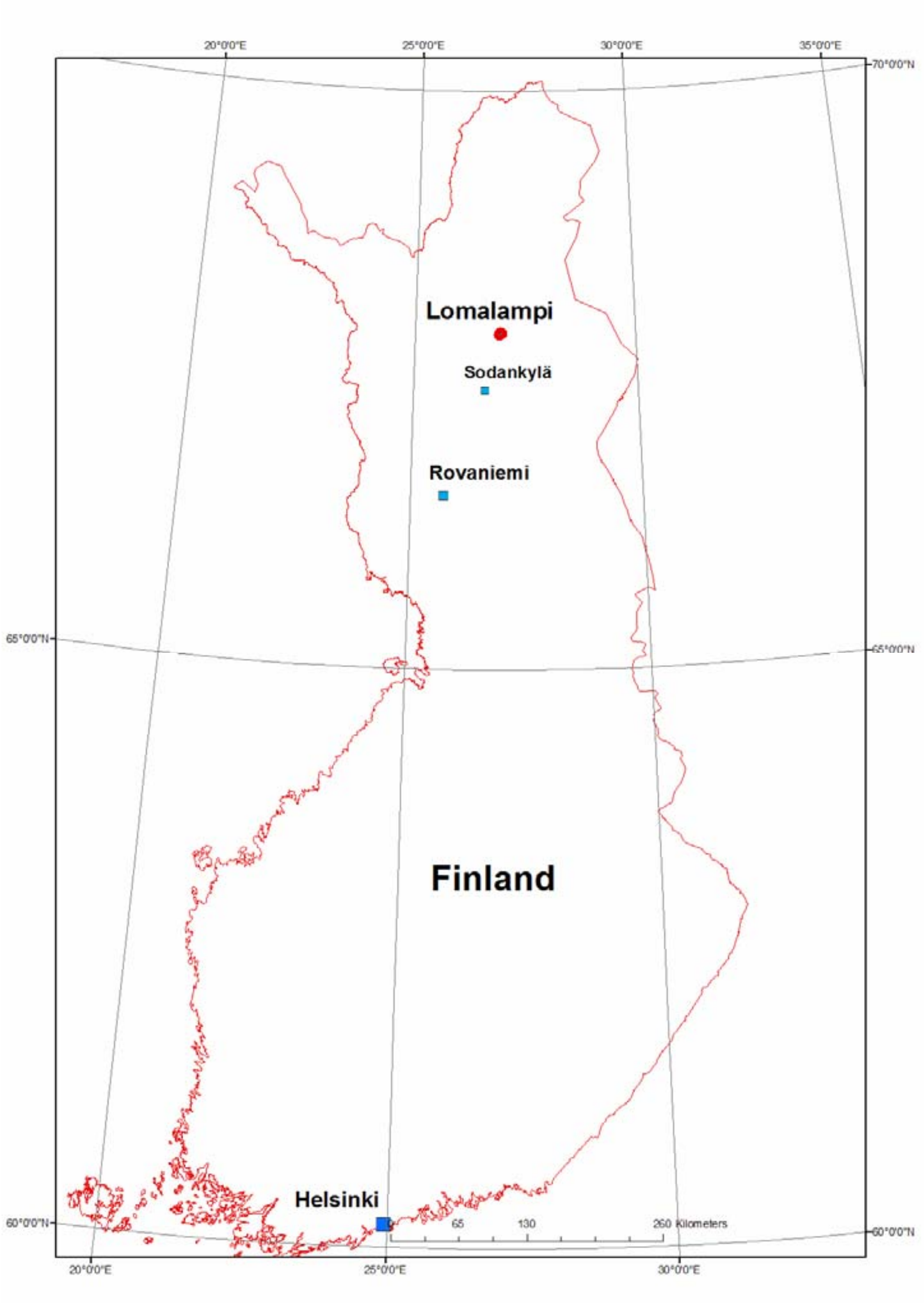
The komatiite-hosted Lomalampi PGE-Ni-Cu-Au deposit, Northern Finland

Tuomo Törmänen, Pertti Heikura, Heikki Salmirinne



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The komatiite-hosted Lomalampi PGE-Ni-Cu-Au deposit, Northern Finland

Abstract
Geological Survey of Finland (GTK) has investigated the Lomalampi PGE-Ni-Cu-Au deposit during 2004-2009. The deposit is located in the municipality of Sodankylä, about 70 km north east from the town of Sodankylä. The deposit is associated with a komatiitic olivine cumulate, which belongs to the Peurasuvanto formation of the Savukoski group. GTK has drilled a total of 48 holes (6157 m) in the prospect area. In addition to drilling, the area is covered by systematic ground geophysical surveys using magnetic and electromagnetic VLF-R measurements. There are also 6 IP and 3 Sampo lines. No till geochemical survey were done, but there are two MMI sampling lines, one across to known mineralisation and one further towards NE. The PGE-Ni-Cu-Au mineralisation is hosted by 30-60 meters wide, steeply SE dipping olivine orthocumulate body. The mineralisation is generally 10-20 meters thick and has been trace along strike for 390 meters. It consists of disseminated base metal sulphides, mainly pyrrhotite, pentlandite and chalcopyrite (1-6 vol. %). The main platinum phase is sperrylite which occurs mostly with silicates (80%), and the main Pd carrier is an unusual Pd-Ni-Te-Sb-Bi phase(s). About 40 % of Pd-phases occur with sulphides and sulpharsenides.
At 0.1 ppm Pt cut off, the mineralisation has a total tonnage of 3.06 Mt with 0.269 ppm Pt, 0.122 ppm Pd, 0.074 ppm Au, 1682 ppm Ni and 571 ppm Cu.

Keywords
Lomalampi, exploration, claims, magnetic, VLF-R, IP and SAMPO-EM measurements, drilling, MMI, report, platinum, palladium, nickel, copper, gold

Geographical area
Finland, Lapland, Sodankylä, Lomalampi

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Raportin nimi
The komatiite-hosted Lomalampi PGE-Ni-Cu-Au deposit, Northern Finland

Tiivistelmä

Geologian tutkimuskeskus (GTK) on tutkinut Lomalammen PGE-Ni-Cu-Au esiintymää vuosien 2004-2009 aikana. Esiintymä sijaitsee Sodankylän kunnassa, noin 70 kilometriä Sodankylän kirkonkylältä koilliseen. Esiintymä liittyy komatiittiseen oliviinikumulaattiin, joka kuuluu Savukoski ryhmän Peurasuvantomuodostumaan. GTK on kairannut tutkimusalueelle kaikkiaan 48 reikää (6157 m). Kairausten lisäksi alueelle on tehty systemaattinen maanpinta magneettinen ja VLF-R mittaus. Alueelle on tehty myös 6 IP- ja 3 SAMPO-mittauslinjaa. Moreenigeokemiaa ei ole tehty, mutta alueella on kaksi MMI-näytteenottolinjaa, toinen mineralisaation yli ja toinen alueen koillisosassa. PGE-Ni-Cu-Au mineralisaation isäntäkivi on 30-60 m paksu, jyrkästi kaakkoon kaatuva oliviiniortokumulaatti. Mineralisaation paksuus on tyypillisesti 10-20 m ja sen tunnettu pituus on 390 m. Mineralisaatio koostuu pirotteisista perusmetallisufideista, lähinnä magneettikiisusta, pentlandiitista ja kuparikiisusta (1-6 til. %). Tärkein platinamineraali on sperryliitti, joka esiintyy pääasiassa silikaattien kanssa (80 %) ja tärkein palladiummineraali on epätavallinen Pd-Ni-Te-Sb-Bi faasi. Noin 40 prosenttia Pd-faaseista esiintyy sulfidien ja sulfarsenidien kanssa.
0.1 ppm Pt- raja-arvolla mineralisaation tonnimäärä on 3.06 Mt, jossa on keskimäärin 0.269 ppm platinaa, 0.122 ppm palladiumia, 0.074 ppm kultaa, 1682 ppm nikkeliä ja 571 ppm kuparia.

Asiasanat (kohde, menetelmät jne.)
Lomalampi, malminetsintä, valtaus, magneettinen, VLF-R, IP ja SAMPO-EM-mittaus, syväkairaus, MMI, raportti, platina, palladium, nikkeli, kupari, kulta

Maantieteellinen alue (maa, lääni, kunta, kylä, esiintymä)
Suomi, Lappi, Sodankylä, Lomalampi

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Contents

1 INTRODUCTION

The Geological Survey of Finland (GTK) is a government organization under the Ministry of Employment and the Economy. GTK`s duties are prescribed in law, and its primary task is to carry out mapping using geological, geophysical and geochemical methods. GTK provides basic geological information for the sustainable use of natural resources especially for exploration and mining industry, construction, land use planning, nature conservation and environmental studies. GTK has offices in Espoo (near Helsinki), Kuopio, Kokkola and Rovaniemi, with a permanent staff of 650, including about 300 geologists, geochemists and geophysicists.

GTK has been involved in mineral exploration in Finland since its foundation. Projects have ranged from regional to prospect scale and have led to the discovery of a number of significant deposits. Today, GTK´s role is to acquire data from new areas and prospects to encourage further evaluation by the private sector. All discoveries and prospects which are considered to host significant mineralization are globally tendered to the private sector through the Ministry of Employment and the Economy at the earliest exploration stage possible although GTK itself has no direct role in the mining business. Finland can be considered to be an attractive exploration target in several respects. Geoscientific data coverage is excellent, but large areas can be considered under-explored. It is a modern, western country with a highly educated population; infrastructure is highly developed with good port facilities, an extensive high-voltage power grid, and a comprehensive road and airport network. In addition, the country is close to major markets.

GTK´s role is to provide confidential and customized expert services to exploration and mining companies in the Fennoscandian Shield and worldwide. These include all aspects and scales of mineral exploration and prospect evaluation, from planning and implementing regional exploration programs, to detailed mineralogical studies and deposit modelling.

Studies and exploration of mafic and ultramafic igneous rocks is one of the principal interests of GTK. In the course of these studies, GTK has concentrated on eastern and central Finland Proterozoic Svecofennian intrusions, eastern Finland Archaean komatiite belts, intracratonic 2.5 Ga layered mafic intrusions, and central Lapland proterozoic komatiite belts. These studies have led to the discovery of several nickel, Fe-Ti-V oxide, chrome, and platinum-group element (PGE) deposits, the Lomalampi representing a PGE enrichment hosted by the Sattasvaara komatiite formation in central Lapland.

Delineation of the Sattasvaara komatiite formation and its areal distribution were outlined in the Lapin vulkaniittiprojekti (Lapland Volcanite Project, 1984-1989), which reported (Lehtonen *et. al.* 1998) Sattasvaara to be 40 km long and 5 km wide belt running E-W on the north side of the municipal centre Sodankylä. The formation was noted to be composed of ultramafic (komatiitic) and mafic volcanite and related cumulates and volcanogenic debris deposits. Geological research was activated on the Sattasvaara formation in 2002 when a two years long collaboration project between GTK and Australian CSIRO (SANI project, Räsänen 2004) started to look at the petrological features of various ultramafic rocks, in order to evaluate the nickel potential of the Sattasvaara formation. This project drilled some geological traverses over the formation and adjacent supracrustal sequences, one traverse was made at Lomalampi in 2004 with two holes intersecting the PGE mineralisation. The discovery drill holes were 3723/04/R406 and R407..

Due to above mentioned PGE findings GTK returned to the area and started an extensive research program, which included ground geophysical measurements, geochemical studies and several drilling phases. These studies further enhanced the mineral potential of Lomalampi prospect, and resulted in Lomalampi being offered through an international tendering process.

2 GEOGRAPHY AND GENERAL PROPERTY DESCRIPTION

2.1 Titles

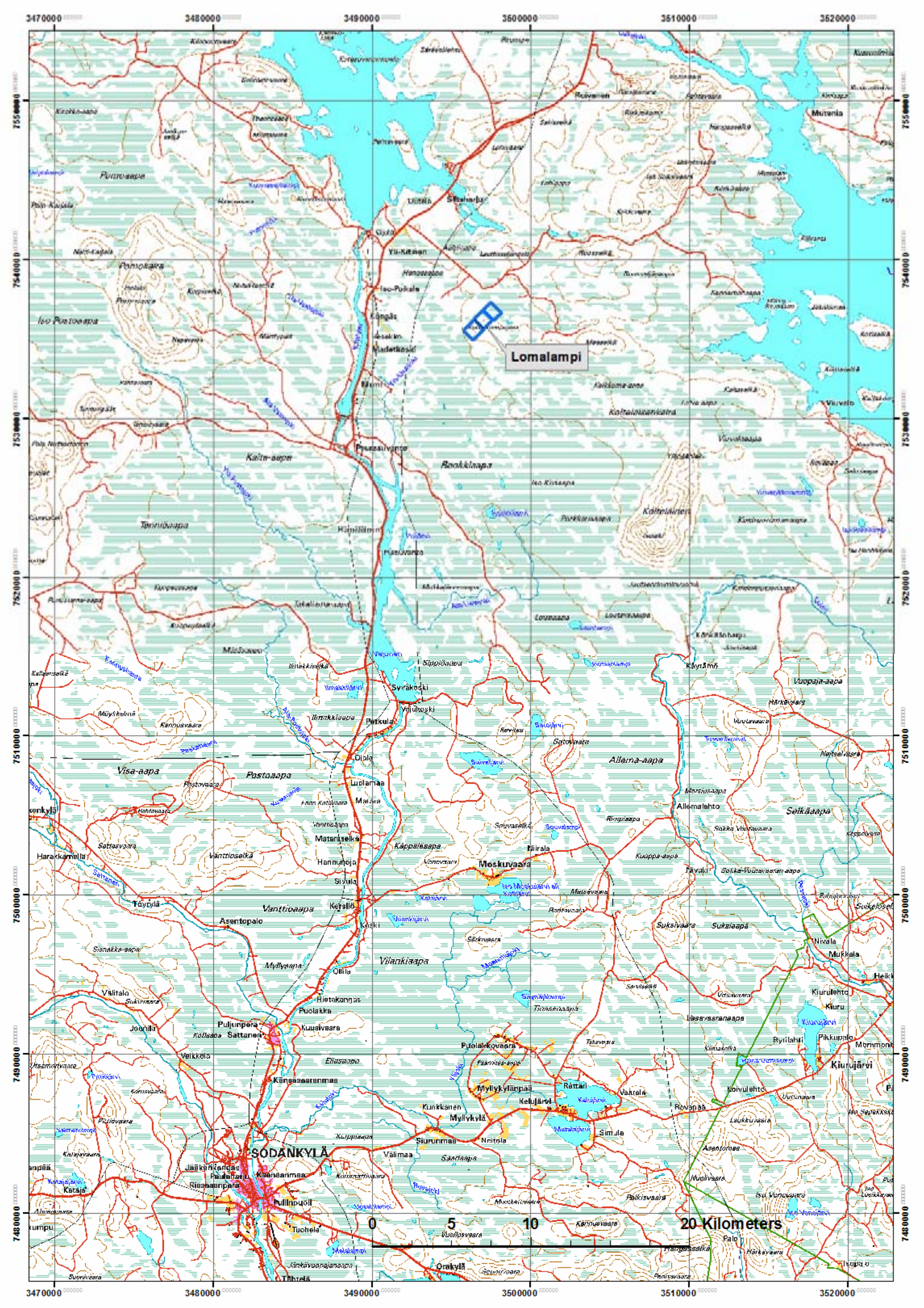

Figure. 1. Road map showing the location of Lomalampi (7903/1), Lomalampi 1 (8748/1) and Lomalampi 2 (8748/2) claims. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10).

The original claim (Lomalampi, reg. id 7903/1) is currently valid until 11th of February, 2013. In addition, the Geological Survey of Finland (GTK) has applied for two new claims (Lomalampi 1 and 2, reg. id 8748/1 and 8748/2) (Table 1 and Figs.1 and 2). The current and applied claims cover an area of about 215 ha. The claim areas are partially surrounded by private enterprise claim applications.

The land within these exploration lease areas is all state owned. There is no inhabitation in the claim areas the nearest permanently inhabited house is 6 km from Lomalampi.

An exploration license entitles the holder (individual or company) to carry out exploration activities in the claim area with or without the consent of the landowner. The claimant must, however, compensate the landowner in full for any permanent or temporary damage or inconvenience caused by the exploration activities inside or outside the claim area. The claimant shall also act in compliance with environmental legislation and other laws and regulations.

Table 1. List of claims included in the tender process.

Register id	Name of the claim	Area in hectares
7903/1	Lomalampi	83,78
8748/1	Lomalampi 1	62,67
8748/2	Lomalampi 2	68,96

2.2 Location, access and infrastructure

The Lomalampi claim areas are located in the municipality of Sodankylä, Finnish KKJ zone 3 coordinates 7535500 mN 3496500 mE (Figs. 1 and 2). There is an access track, used as a winter road, from a forest road, which originates from a main road E75 (Fig. 2). The forest road is open for public, but not maintained by authorities. Forest and winter roads are kept open only occasionally in winter times. The nearest municipal centre Sodankylä, is ca 75 km away by road and the nearest town is Rovaniemi 135 km further to the south from Sodankylä. Rovaniemi has a railroad connection and several daily flights to Helsinki. High voltage power line (110 kV) is located ca 4 km from Lomalampi. Nearest hydro power stations Porttipahta and Kurittukoski are located ca 9 km and ca 10 km from Lomalampi (Fig. 1).

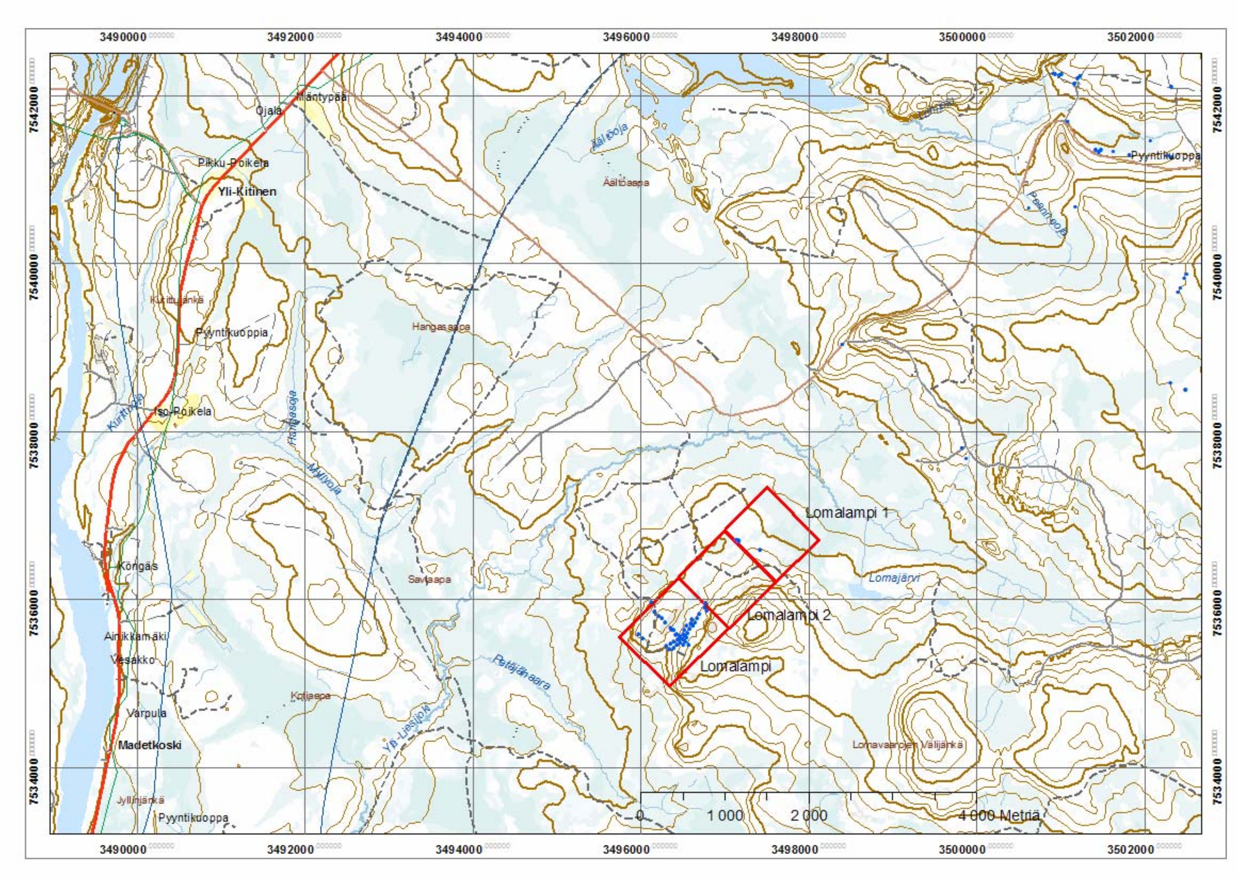

Figure 2. Basemap of the Lomalampi prospect, showing the location of Lomalampi (7903/1), Lomalampi 1 (8748/1) and Lomalampi 2 (8748/2) claims. The blue dots indicate the diamond drill holes. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10).

2.3 Physiography, climate and vegetation

The Lomalampi deposit is located on the NW sloping side of a hill above a bog, 250-280 m asl. Vegetation is typical of the pine-tree dominated Fennoscandian coniferous forest belt. Spruce and birch are also present in smaller amounts.

In the region, weathering-resistant rock types, such as quartzite and some volcanic rocks are well exposed whereas the PALJASTUMAs of soft rocks like metasediments (blackschists) are uncommon. The forest ground is covered by thin moss while the bogs are covered by a layer of peat. The thickness of overburden varies from half to 25 meters.

Weather conditions are characteristic of the northern Fennoscandian climate with temperate summers and cold winters. During the summer months (June-August) temperatures range from 10 °C to 25 °C, and during the winter months (November-April) between –5 °C to –30 °C. The terrain is snow covered in winters and bogs, lakes and rivers freeze every year for 5 to 6 months. The maximum thickness of snow varies from 0.6 to 1.2 m in March. The annual rainfall is 550 mm and distributed evenly throughout the year.

2.4 Property history

The area of Lomalampi deposit may have been claimed in past, but no exploration activity other that surface mapping and sparse and targeting geochemical sampling has taken place before the drilling made in 2004. The discovery was made in a joint petrological research project of GTK and Australian CSIRO. The discovery drill hole was 3723/04/R407. This hole was one of nine shallow (50-80 m) drill holes, which were distributed over the 0.5 km long traverse over the Peurasuvanto formation, as the Sattasvaara formation is called in this area, and adjacent lithologies (Fig 3).

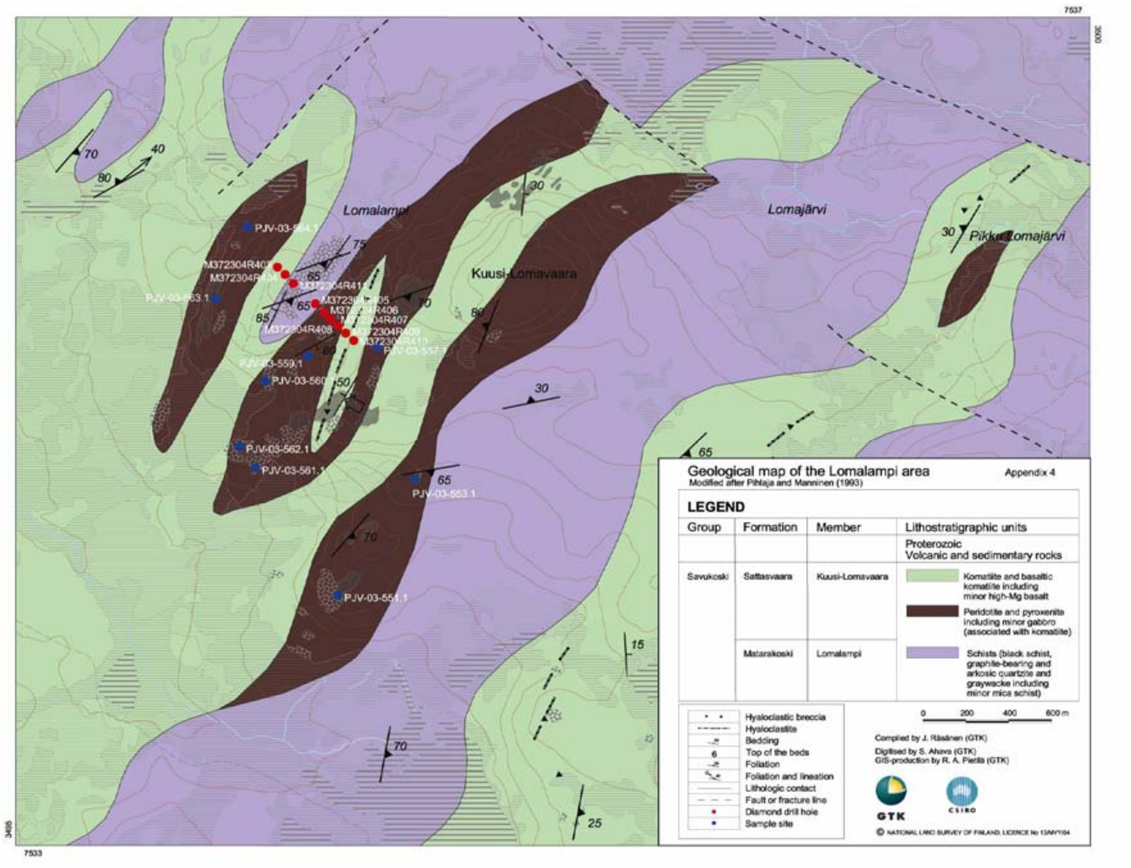

Figure 3. A geological map of the Lomalampi area. (Räsänen 2004).

3 REGIONAL GEOLOGY

3.1 Geological setting

The following description of the regional geology is based on the publications by Lehtonen et al. 1998 and Räsänen 2004. Sattasvaara (Peurasuvanto fm in the claims area) formation belongs to Early Proterozoic Savukoski group and it has been interpreted to be c. 2050 Ma in age. Sattasvaara is part of the succession starting by Salla group and followed by Onkamo, Sodankylä, Savukoski, Kittilä, Lainio and Kumpu groups. Deposition occurred over a time span of c. 2500-1900 Ma with number of nondepositional periods. Counted groups are however dislocated over the central Lapland at present so that there is no single location, where all the groups would form single traceable stratigraphic succession. Generally rocks become younger from east to west.

Sattasvaara formation is interpreted to overlie various types of subaqueous sedimentary rocks, and Fe-tholeiitic and picritic volcanites. Sattasvaara is overlain by Fe-tholeiite and subaqueous sedimentary rocks of the Kittilä group (Table 2).

Table 2. Stratigraphic position of the Sattasvaara formation after Lehtonen et al. 1998.

Group	**Age, U-Pb-Zr [Ma]**	**Formation**	**Lithology**
Kittilä		Porkonen	BIF, Fe-sulphide/Fe-carbonate schist
	>2012	Kautoselkä	Fe-tholeiitic volcanite
Savukoski	>2050	Sattasvaara	Komatiitic volcanite
		Sotkaselkä	Picritic volcanite
		Linkupalo	Fe-tholeiitic volcanite
	>2130	Matarakoski	Phyllite, black schist, dolomite, tuff, tuffite, BIF

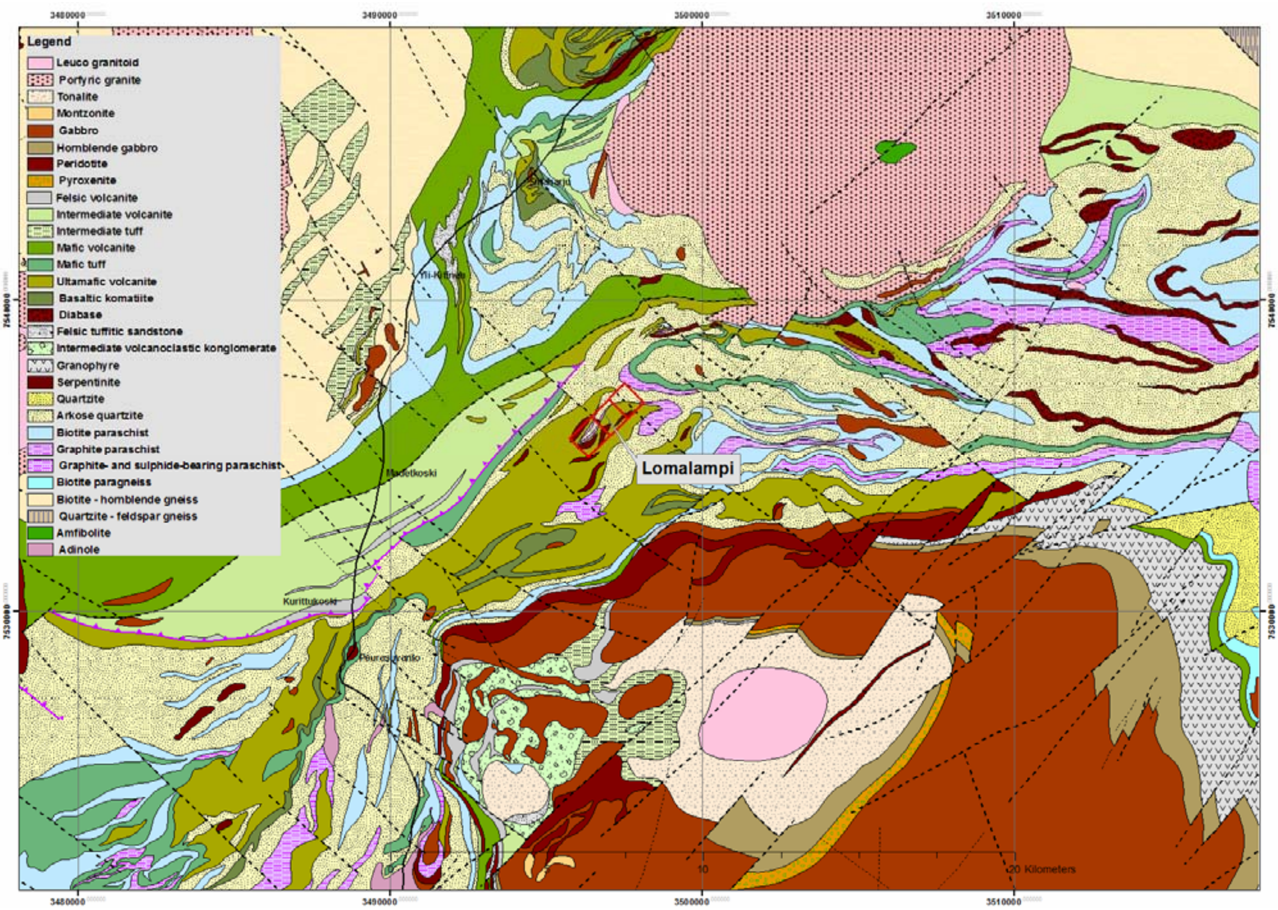

Figure 4. General geological map of the Lomalampi area. The Lomalampi claims are also indicated. (Bedrock Map Database DigiKP Finland, GTK. Version 1.0, 17 November 2009).

3.2 Economic geology

Few tens of kilometres radius around the Lomalampi deposit has been subjected into exploration of gold and commodities related to mafic and ultramafic igneous rocks i.e. nickel, copper, PGE, chrome, and Fe-Ti-V oxides. Exploration activities have led to resource inventories depicted in the Table 3.

Table 3. Metal resources of reported in 25 km radius around the Lomalampi target (FODD).

Name	Status	Metals	Size category	Mt
Pahtavaara Au	Active mine	Au	Small	4.31
Koitelainen LC	Not exploited	Cr, PGE	Potentially large	2
Koitelainen V	Not exploited	V, Fe	Medium	15
Koitelainen UC	Not exploited	Cr, V	Large	70
Kevitsa	Not exploited	Ni, Cu, Co, PGE	Large	208
Ala-Postojoki	Not exploited	V, Fe	Small	5
Puilettilampi	Not exploited	Fe	Small	2

In addition to deposits listed in Table 3 there are two Au showings, namely the Palokiimaselkä and Ruosselkä (FINGOLD Database).

3.3 Quaternary geology

Glacial drift composed mainly till covers most of the area and only a small proportion of the bedrock is exposed. The till cover is generally 2-7 m thick, although the thickness of the thickest overburden encountered in drilling is approx. 25 m. In areas of thicker overburden, two separate till units have been identified

The bedrock underneath the till is commonly unweathered but pre-glacial weathered bedrock is also encountered, especially in the NE end of the claim area.

The glacial transport is from WNW and the transportation distances are short (50-100 m) where the drift cover is thin, whereas with thicker drift cover (>10 m) the glacial transport can be up to two kilometres.

4 EXPLORATION

4.1 Exploration techniques

The following description only relates to the techniques used since 2004, unless otherwise indicated. In addition to target scale activities the area is covered by low-altitude airborne geophysical measurements and areal till geochemical sampling (1 point / 4 km^2) none of the sampling site actually plotting in the claim areas.

The techniques used include geophysical and geochemical methods in addition to drilling. Bedrock mapping was also performed. Table 4 lists exploration methods and how they were able to detect the mineralisation.

Table 4. Exploration methods.

Exploration method	**Systematic/test lines**	**Notes**
Geophysical method		
Ground magnetic	Systematic	Indicates the hosting olivine cumulate well
VLF-R	Systematic	Indicates the graphite and sulphide bearing black schists
IP, multilayer	Six lines	Indicates the graphite and sulphide bearing black schists and disseminated sulphides in olivine cumulate
Sampo-EM	Three lines	Indicates the graphite and sulphide bearing black schists
Geochemical methods		
Targeting till geochemistry	One line	Doesn’t cross the mineralisation
Mobil-Metal-Ion	Two lines	Indicates Pt enriched zone
Drilling		

4.1.1 Drilling, sampling, sample preparation and assaying

In total, GTK has drilled 48 drill holes (6157 m) in the Lomalampi prospect area during the years 2004 (R403-411), 2006 (R412-417), 2007 (R0418-0432), 2008 (R0433-0446) and 2009 (R447-450) (Fig. 5, Appendix 7 and 13). The diamond drill core size used was ca. 42 mm (T56 bit). The drill core was split with a diamond saw and half core was sampled for the assay with a maximum sample length two meters. The sample was crushed in a jaw crusher and pulverized in a ring or a disc mill.

Drill cores were assayed in the GTK Geolaboratory and Labtium Oy (2007-). Au with method 522U, GFAAS, aqua regia leach, Hg–coprecipitation, 20 g of sample material. Gold, palladium and platinum were analyzed with Pb-fire assay with ICP-OES finish (methods 703P, 704P and 705P, 25 or 50 g sample weight) with aqua regia digestion. All 6 platinum group elements (+Au) were analyzed by NiS-fire assay with Te-coprecipitation and ICP-MS finish (714M, 15 g sample weight), aqua regia digestion. Silver, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, S, Sb, and Zn were analyzed using ICP-OES technique with aqua regia digestion (method 510P). Method 511p was also used, which is the same method as 510P with 18 additional elements determined. Multielement determinations by the XRF –technique (whole rock analyses) with the method 175X (pressed pellets). Cerium, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Tm, Yb, Sc, Y, U, and Th were analyzed with HF-$HclO_4$-digestion, lithium metaborate-sodium perborate fusion and ICP-MS finish (method 308M). In some cases additional elements Co, Hf, Nb, Rb, Ta, V and Zr were also analyzed with this method. Total carbon was analyzed with combustion technique and S/C analyzer (Method 811L).

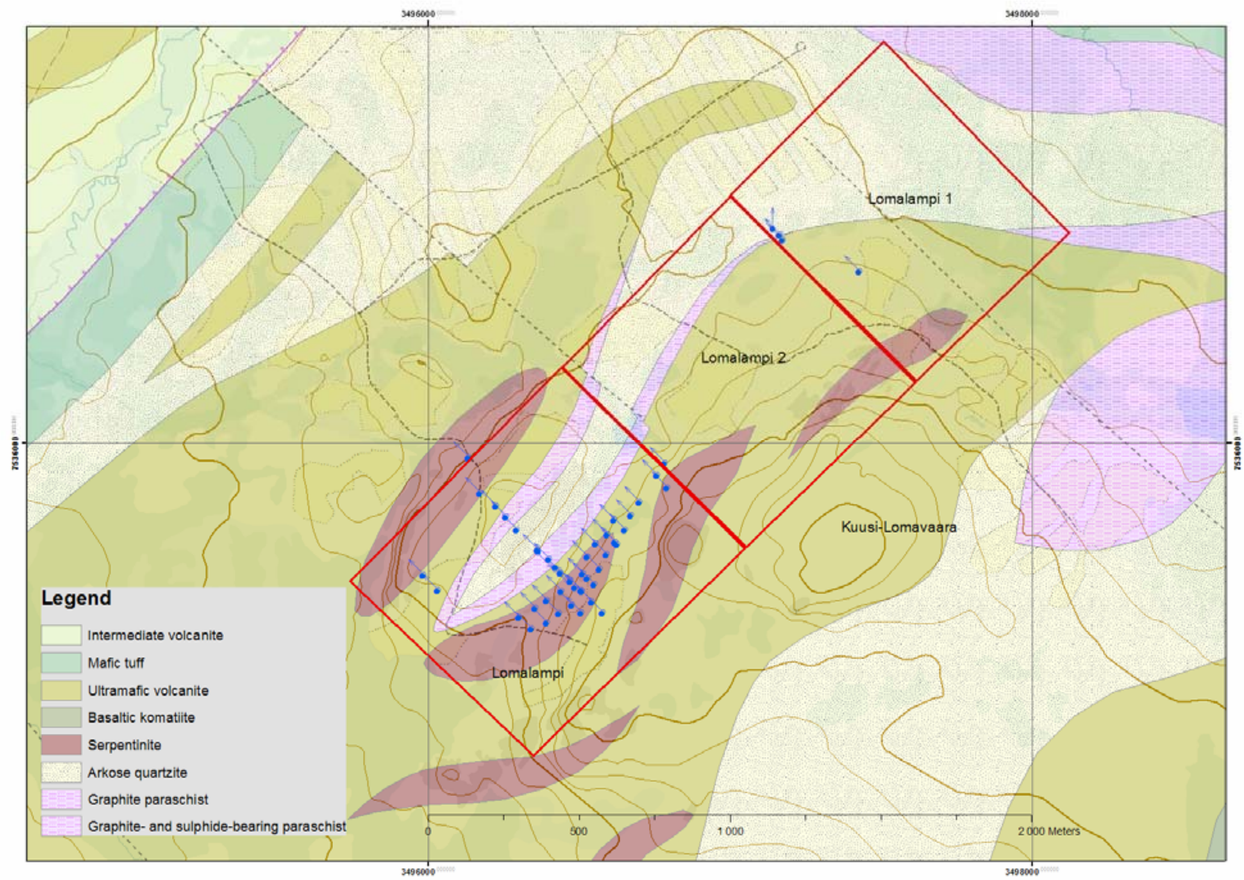

Figure 5. Drill holes in the Lomalampi prospect area. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10. Bedrock Map Database DigiKP Finland, GTK. Version 1.0, 17 November 2009).

4.2 Geochemical surveys

In 2007 the Geological Survey of Finland decided to undertake an extensive sampling program in order to test the Mobile Metal Ion (MMI) method in the predominantly glacial deposit overburden conditions of Finland. The Lomalampi PGE prospect was selected as one of the targets to test the method, especially for palladium. The main sampling line is about 920m long, runs parallel to the initial drillings done in 2004, and extends about 170m past hole R410 at the south east and about 170 m past hole R0442 at the north east (Fig. 6). Sampling interval is quite variable due to differing overburden conditions, but is generally between 10 to 50 meters. 41 samples (plus two duplicate samples) were taken from the main sampling line. Additional 9 samples were taken from two short adjacent lines. Samples were analyzed by the SGS-laboratories, using a patented weak leach method with an ICP-MS finish (ME-MS18 method) for 42 elements (see Sarala et. al 2008). In 2008 35 additional MMI samples were taken along a ca. 950 m sampling line at the NE-part of the claims area. The samples were analyzed by ALS-Chemex, using their selective leach method with ICP-MS finish (method ME-MS23) for 58 elements.

No till geochemistry was done in the claims area during this study. There are no regional till geochemistry sampling points within the area, however one targeting till geochemistry (or so called line till geochemistry) NW-SE sampling line crosses over the central parts of the claims area.

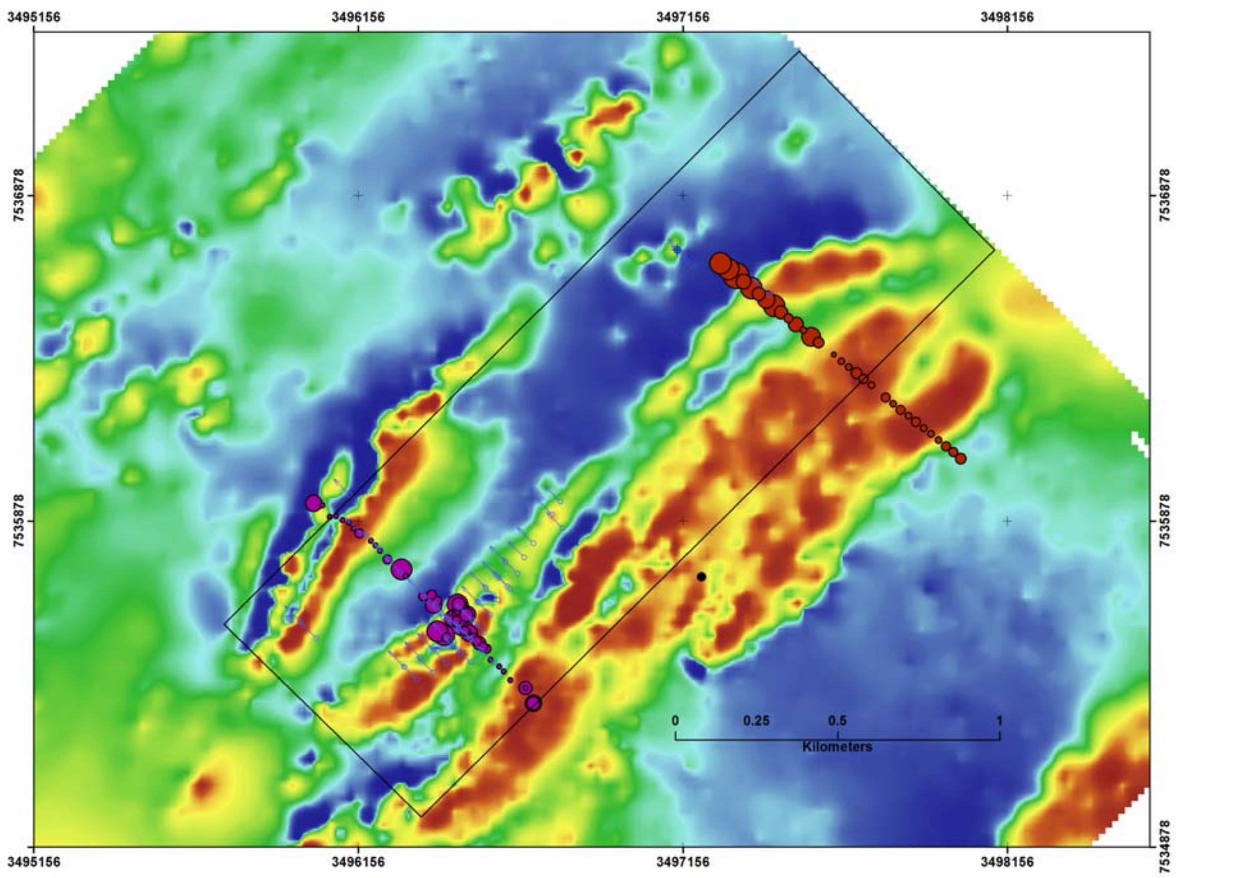

Figure 6. MMI sampling on ground magnetic map. Year 2007 sampling is located on the SW end of the claim area and year 2008 sampling on NE end. In 2007 sampling the maximum Pd was 3.2 ppb and in 2008 3.1 ppb respectively. Drill holes also indicated.

4.2 Geological mapping

GTK has mapped the area at 1:100 000 scale in mid 80's and the geological map was published in 1993. Additional bedrock observations were done during the GTK-SCIRO project, and also during the most resent exploration phase conducted by GTK. In the claims area and surroundings, PALJASTUMAs occur mostly on top of, and along the NW flanks of the Kuusi-Lomavaara hill (Fig. 7, Appendix 4).

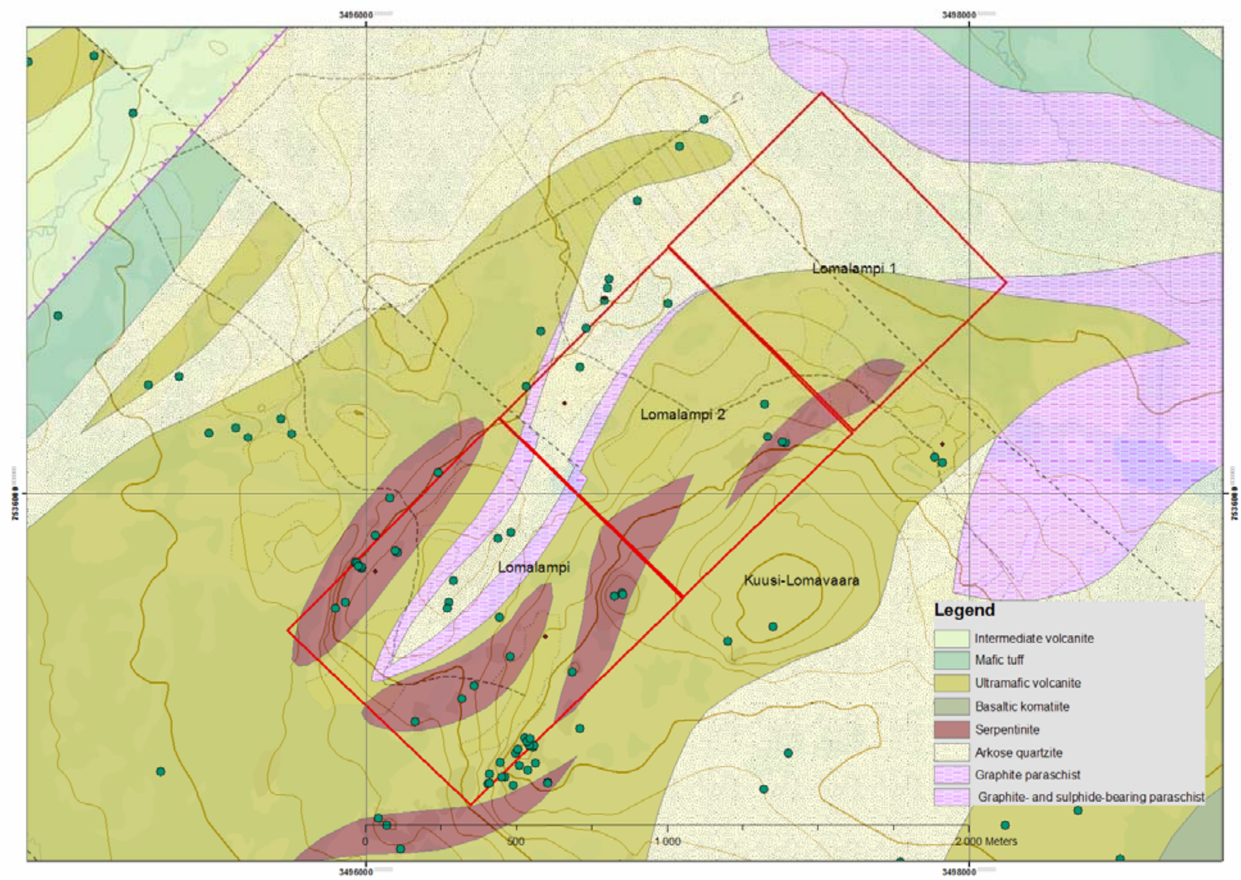

Figure 7. Bedrock obseravations (green dots) in the Lomalampi area. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10, Bedrock Map Database DigiKP Finland, GTK. Version 1.0, 17 November 2009).

4.3 Geophysical surveys

High-resolution, low-altitude airborne magnetic, electromagnetic and radiometric surveys measured in 1994 for national aerogeophysical mapping project cover the study area. The line spacing is 200 meters and survey altitude 30–40 meters. Magnetic, electromagnetic VLF-R, Sampo (Gefinex 400S) and electrical IP methods have been used for more detail ground geophysical surveys in the area (Table 4). Systematic ground magnetic and VLF-R measurements were started in 2003 in SANI project (Turunen 2004). In 2007 magnetic and VLF-R surveys were expanded to cover 15.5 km2 as a whole. In 2007 IP and Sampo profile measurements were done also. List of data files and index map of ground geophysical data included to report is presented in Appendix 11.

Magnetic map in Lomalampi area is presented in Figure 8. The biggest magnetic anomalies are caused by peridotites and serpentinites in ultramafic cumulates, whose magnetic susceptibility values according to petrophysical measurements are rather high, 0.5 – 0.7 *10-6 SI. Quartzites and graywackes are generally not magnetic. Sedimentary rocks include also lot of graphite- and graphite-sulphide schists, which can be distinguished in VLF-R results as conductors.

Magnetic anomaly caused by ore cumulate is about 450 m long and interpreted average width of source is about 50 m on the surface (Fig. 9). Dip is quite steep (ca. 90 - 80 degrees) to the SE. In both contacts, especially on the NW-side, there is graphite- and graphite-sulphide schists, which results wider conductivity anomalies detected in VLF-R and DCIP surveys (Fig. 10).

SAMPO is a wide-band deep electromagnetic system, which interpretations are mainly based on the horizontal layer models. Method has been shortly describes by Soininen and Jokinen (1991). In Lomalampi area SAMPO (Gefinex 400 S) has been used for explore deep conductive targets in ultramafic cumulate bodies known in surface. Tree profiles have been measured using coil separation 400 m, which is approximately same than attained depth extent. In Figure 11 electromagnetic VLF-R phase angle map overlapped by vertical pseudosections of apparent resistivity from SAMPO EM soundings are presented. The strongest conductivity anomalies in both methods are observed in the Lomalampi prospect area associated with graphite- and graphite-sulphide schist existing in contacts of ore cumulate. Other notable conductivity anomalies detected by SAMPO system, have not been interpreted to relate to cumulates.

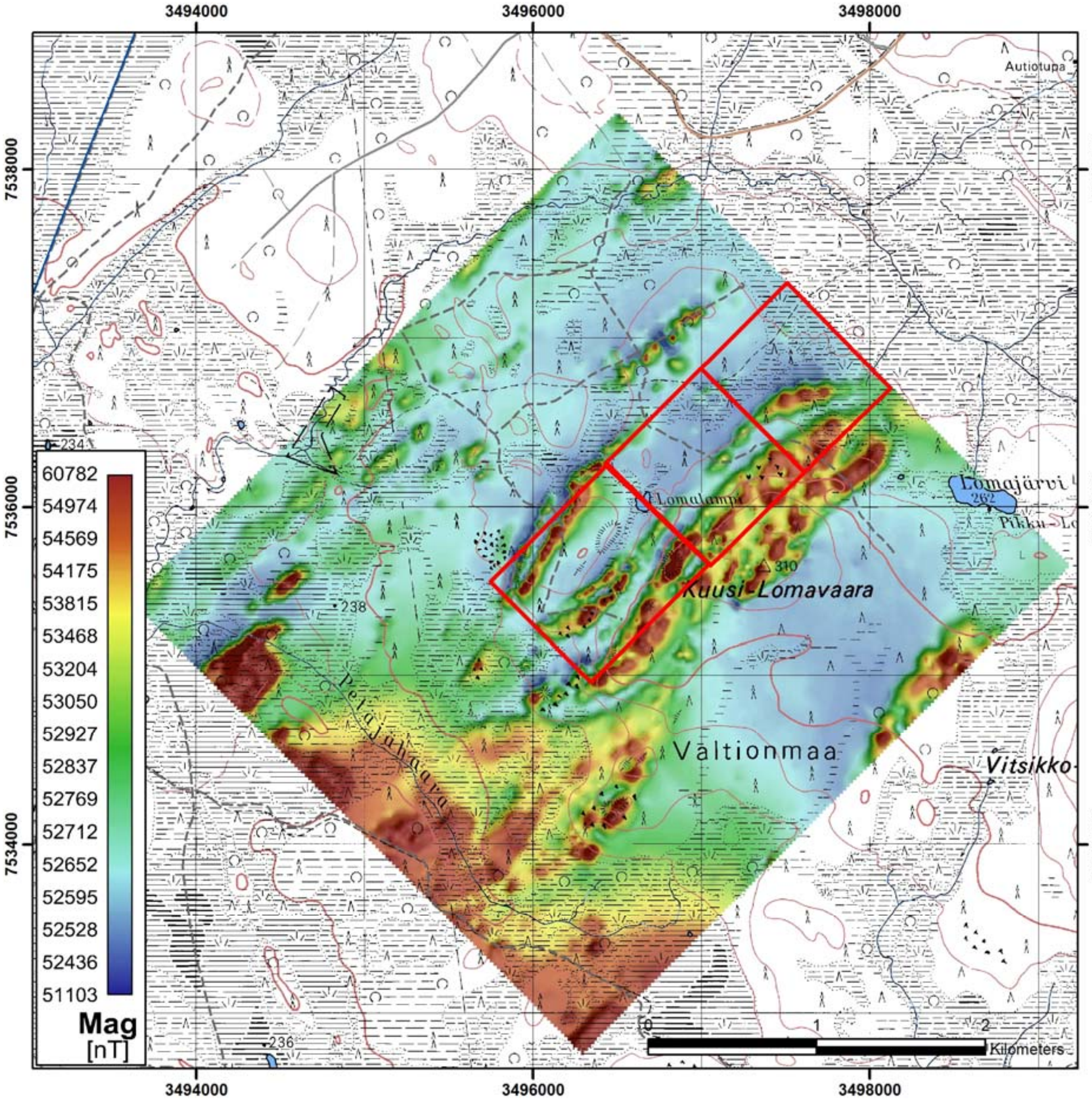

Figure 8. Shaded relief map of total magnetic field in Lomalampi study area. GTK's claims are plotted as red polygons. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10)

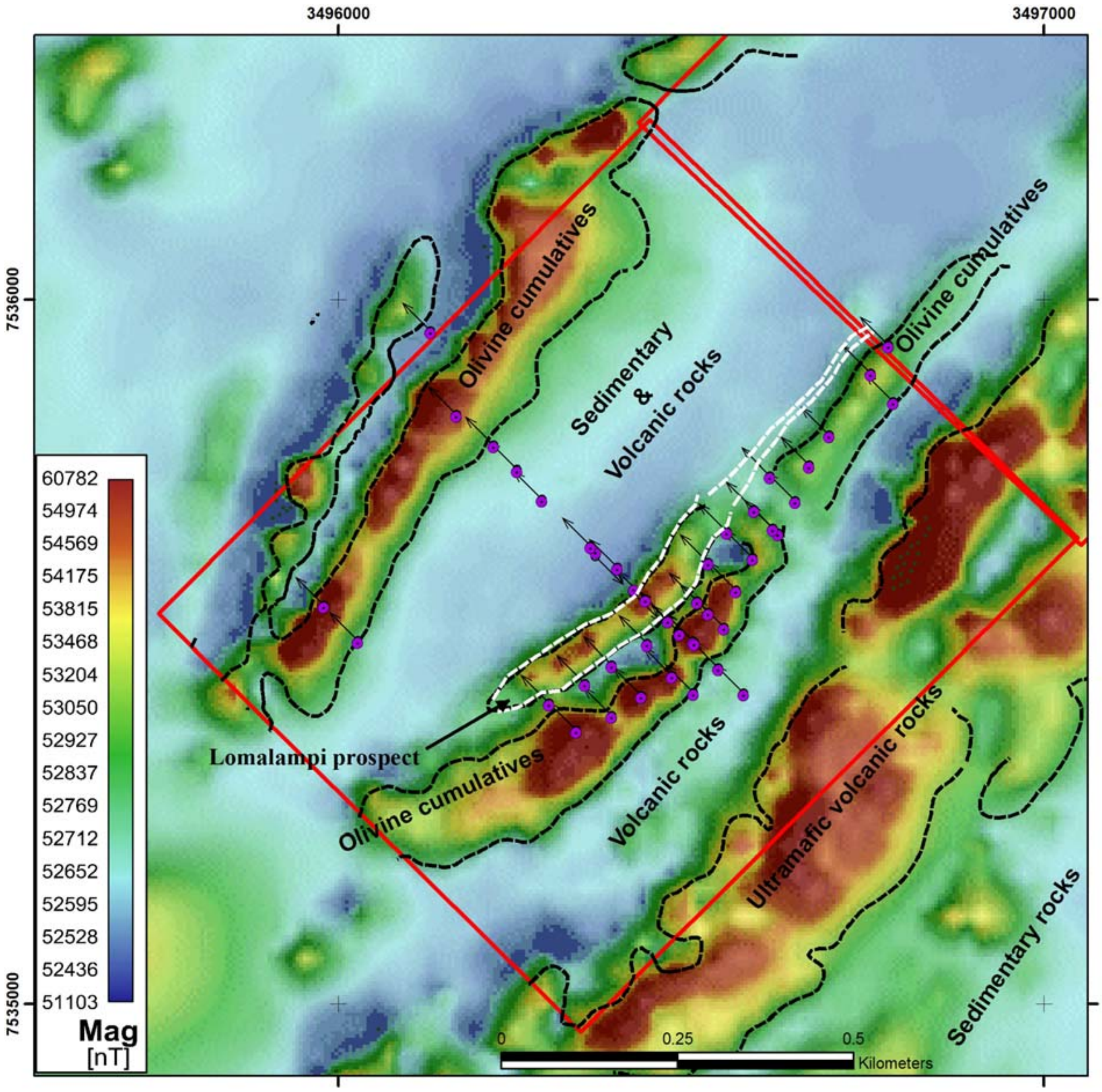

Figure 9. Shaded relief map of total magnetic field focused on prospect area. Ore cumulate is plotted as a white dash line. Interpreted borders of other cumulate bodies and ultramafics are plotted as black dash lines. Drill holes are plotted as violet dots with direction arrows. GTK's claims are plotted as red polygons.

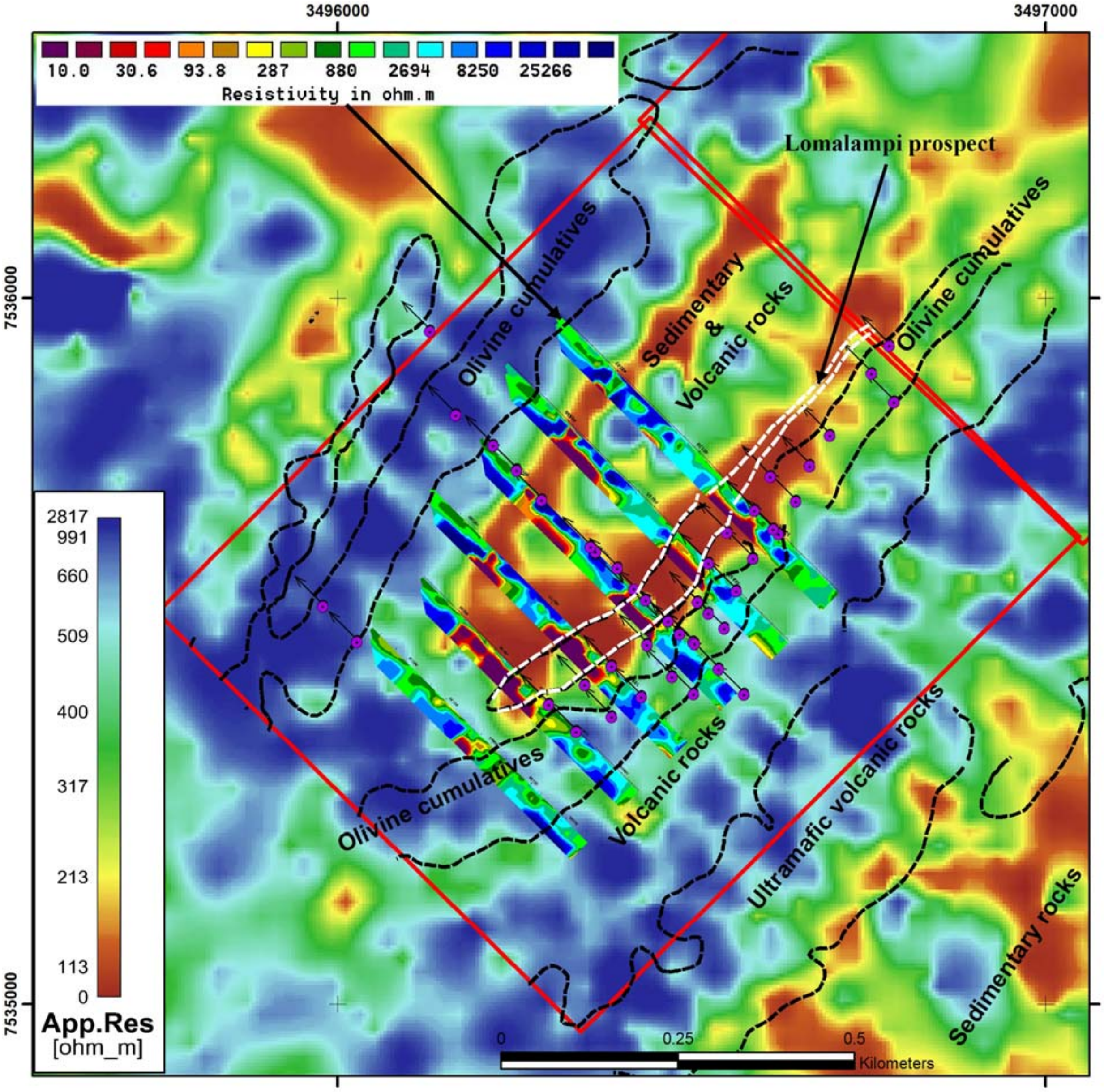

Figure 10. VLF-R apparent resistivity map focused on prospect area overlapped by vertical sections of resistivity models interpreted from pole-dipole DCIP soundings. Depth extent of sections is ~40 meter. Plotted lines, polygons and symbols as in Figure 9.

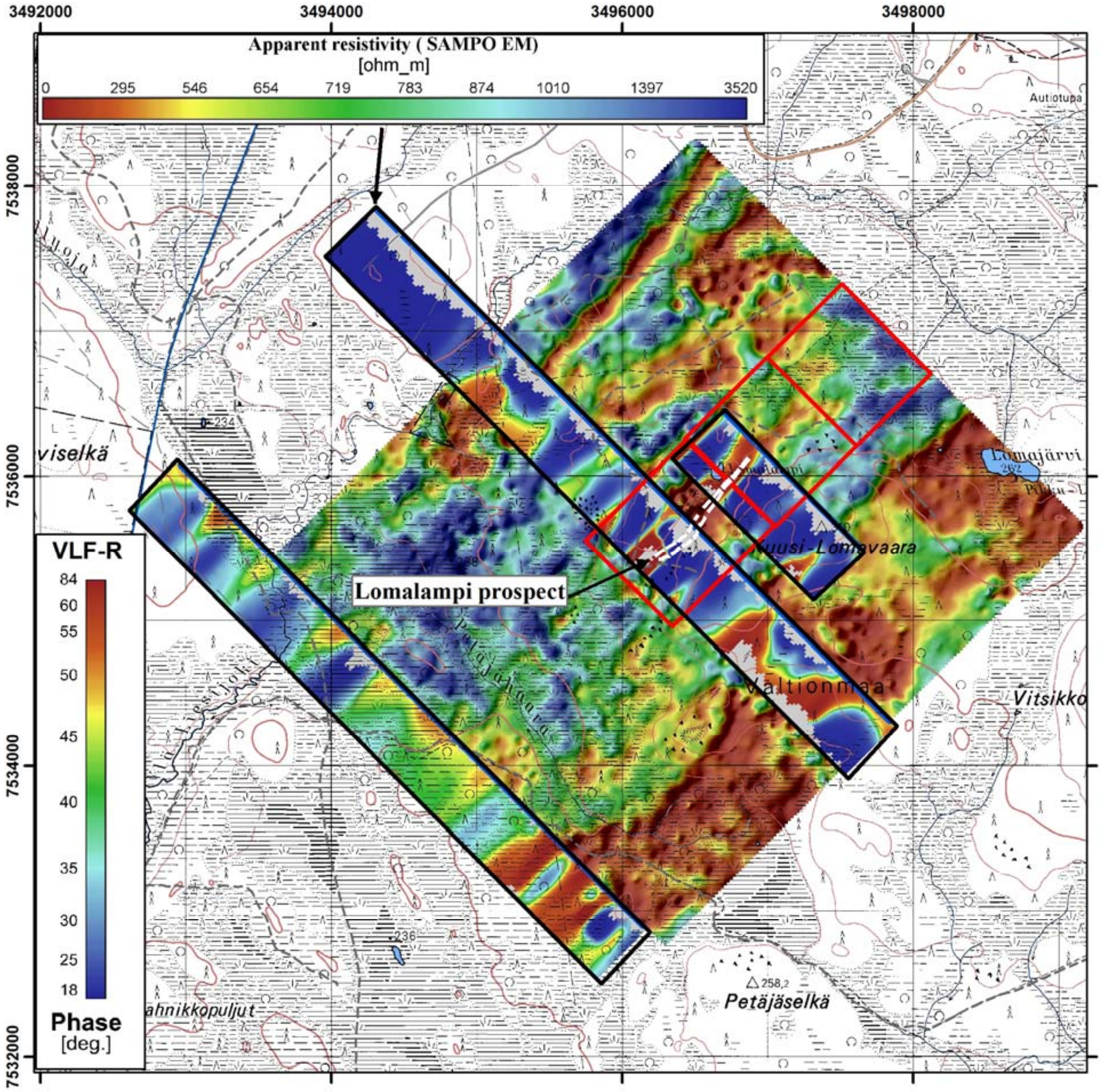

Figure 11. VLF-R phase angle map in Lomalampi area overlapped by vertical pseudosections of apparent resistivity from SAMPO EM soundings (3 profiles). Depth extent of sections is ~500 meter. GTK's claims are plotted as red polygons. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10)

The conventional geophysical methods used for Ni-exploration are magnetic and electromagnetic surveys due to predictable petrophysical properties of typical Ni-mineralised rocks; high magnetic susceptibility and high conductivity (low resistivity). Based on this hypothesis Fuzzy Logic prospectivity analysis was made using systematic ground magnetic and VLF-R data. The analysis was performed ArcGIS 9.3.1 program and ArcSDM (Spatial Data Modeller) tool set, which is publicly available (Sawatzky et al., 2009). Basics of the conceptual, knowledge driven Fuzzy Logic method has been described by Bonham-Carter (1994).

Data sets and fuzzy operators used for analysis have been presented in the flow chart in Figure 12. Apparent resistivity and phase angle of VLF-R measurements were used to describe high conductivity areas. Total magnetic field was used to describe high magnetic areas together with magnetic Tilt Derivative (TDR) to demarcate magnetic sources more specific. Resultant Ni-prospectivity map has been presented in Figure 13. Discovered ore cumulate comes up as very high prospectivity area, as well as some other small areas in the SW-part of the survey area. During the exploration work drilling was focused to the discovered Ni-deposit and other potential prospectivity anomalies coming up were not sampled.

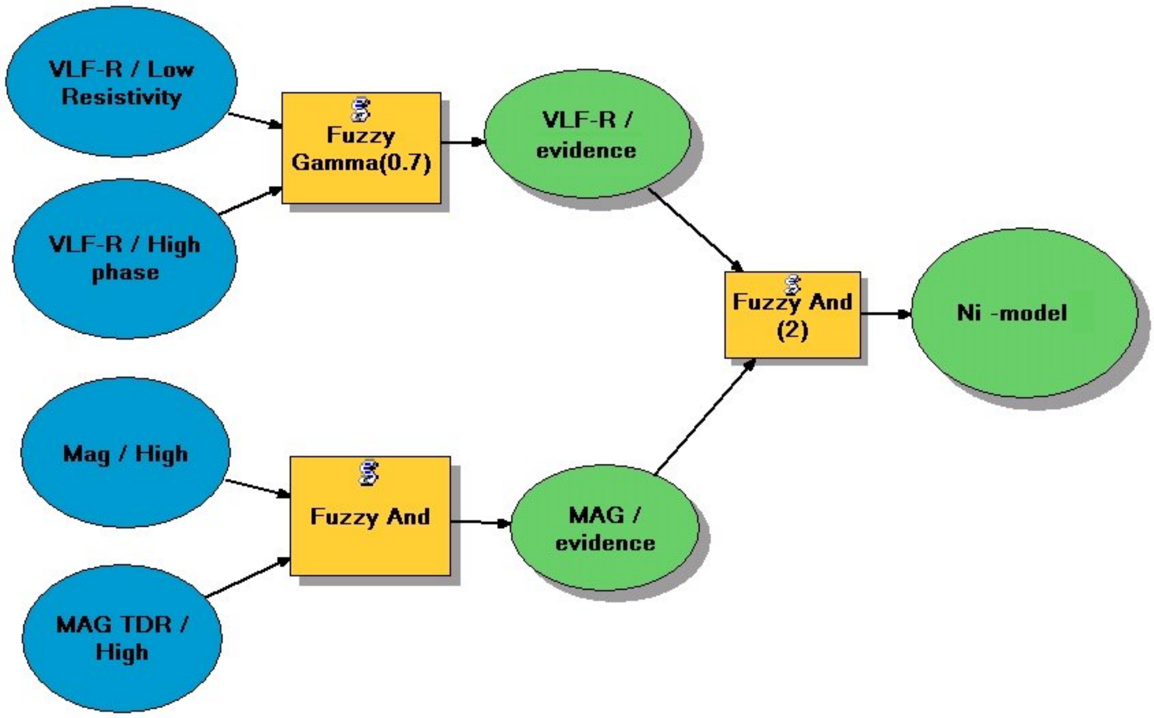

Figure 12. Flow chart of the Fuzzy Logic Ni –prospectivity based on ground geophysical magnetic and electromagnetic VLF-R surveys.

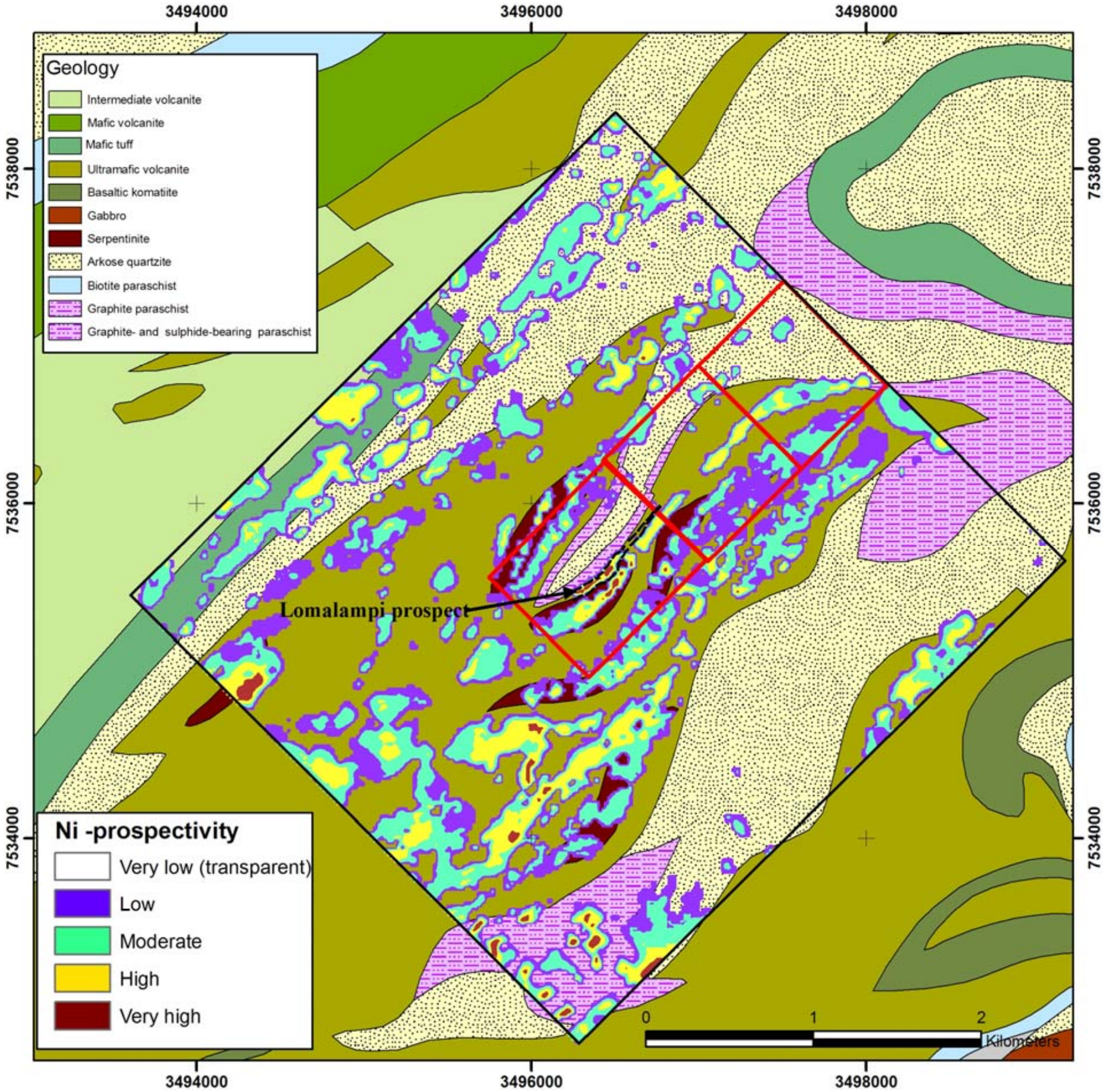

Figure 13. Fuzzy Logic Ni-prospectivity map based on ground geophysical magnetic and electromagnetic VLF-R surveys. Geological map on the background (Bedrock Map Database DigiKP Finland, GTK. Version 1.0, 17 November 2009).

4.4 Petrophysical measurements

Petrophysical laboratory measurements have been done from 45 drill holes, 5471 samples together. Density D [kg/m3], magnetic susceptibility K[10-6 SI] and remanence J [mA/m] has been measured using 1 m interval.

Petrophysical in situ loggings have been done in 8 drill holes during SANI project 2002-2004 by Astrock Oy. Density, susceptibility, chargeability, apparent resistivity, total gamma radiation and gamma ray spectrometry loggings were done using ~0.1 m interval. The same 8 drill holes were also recorded by videoscanner developed by Astrock Oy. Sampling interval of videoscanner was 1 cm on average. Due to small hole diameter and opacities of water in holes the quality of video recordings is varying. In-situ loggings and drill hole video recordings are described in detail by Turunen (2004). Petrophysical data and drill hole videos included to this report are listed in Appendix 12.

Median values of petrophysical parameters for main rock typed reported from drill holes are presented on Tables 5 and 6. Density-susceptibility diagram of petrophysical laboratory measurements is presented in Figure 14. Histograms of petrophysical in situ loggins are presented in Figure 15. According to the results ultramafic peridotites have highest magnetic susceptibility (~0.5 – 0.7 SI) compared with other rocks types drilled. Also the resistivity values of peridotites are high. The smallest resistivity and chargeability values are in graphite-sulphide schists. Mineralized peridotites has little bit increased chargeability compared with other olivine cumulates probably due to disseminated sulphides. Densities of mafic and ultramafic rocks are 200-300 kg/m3 higher than quartzites and graywackes, but density of mineralized peridotites does not differ from densities of other ultramafic rocks. Total gamma radiation values of ore rocks are low and generally do not differ from other rocks excluding graphite-sulphide schists, which have increased radiation values compared with all others.

According to the petrophysical data best methods for PGE-Ni -exploration in Lomalampi are magnetic and IP surveys. Regardless of high resistivity values of mineralized rocks electromagnetic methods are also very useful due to associated graphite and graphite-sulphide schist on the contacts of the discovered ore cumulate.

Table 5. Median values of density and magnetic susceptibility from petrophysical laboratory measurements for main rock types reported from drill holes in Lomalampi area (45 drill hole).

Rock type	Count	Median Density [kg/m^3]	Median Susceptibility [µSI]
Graywacke	260	2640	220
Quartzite	294	2646	300
Black schist	275	2733	2720
Sulphide schist	226	2940	1765
Graphite-sulphide schist	63	2714	2950
Peridotite	1403	2838	51160
Pyroxenite	412	2971	1175
Serpentinite	953	2852	77620
Hyalotuffite	113	2933	1070

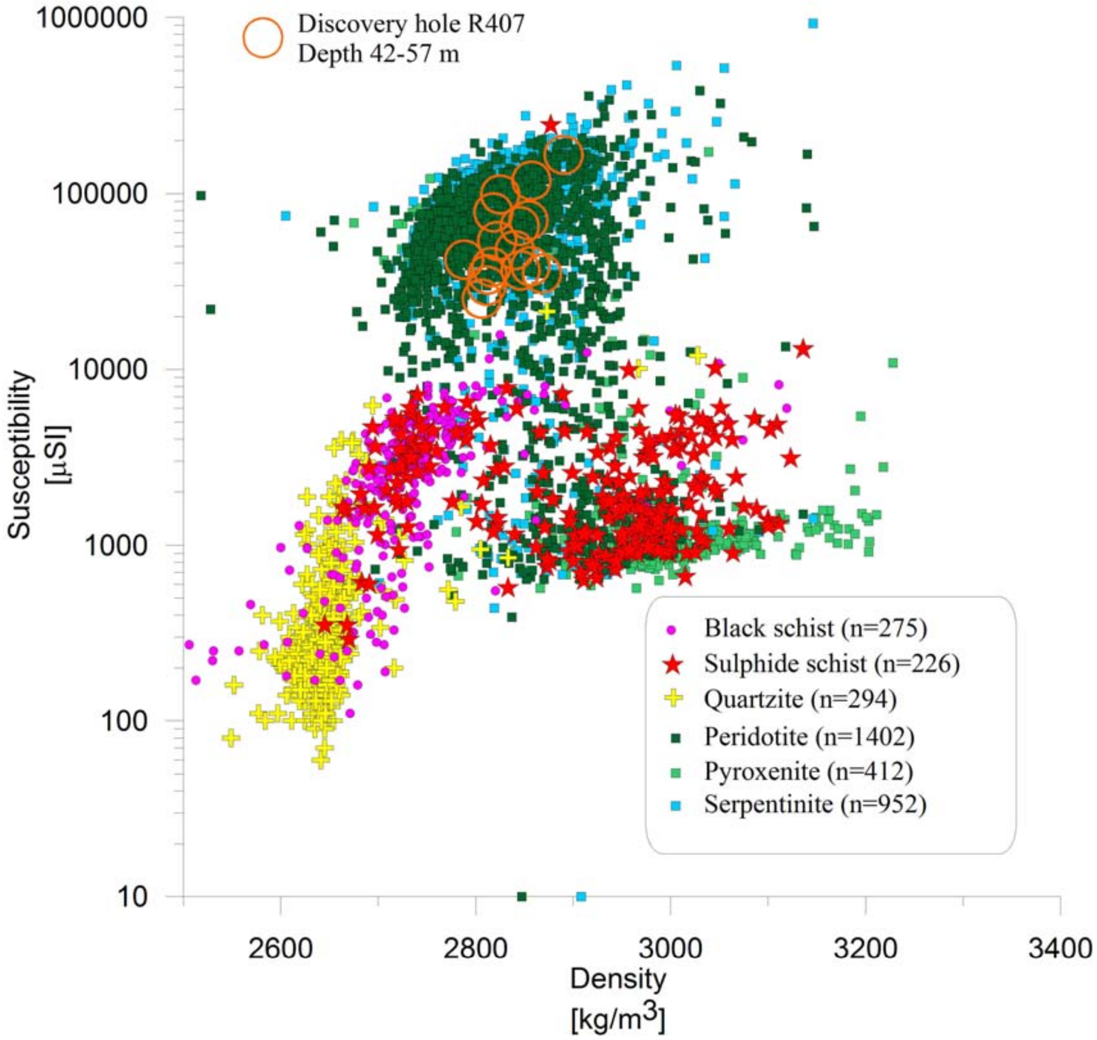

Figure 14. Density-susceptibility diagram of petrophysical laboratory measurements in Lomalampi (45 drill holes, 5338 samples). PGE-Ni-Cu-Au mineralized peridotites in the hole R407 has been plotted as orange circles.

Table 6. Median values of petrophysical in situ loggings for main rock types reported from drill holes in Lomalampi area (8 drill holes, 2004).

Rocktype	Count	Density [kg/m3]	Susceptibility [µSI]	Chargeability [%]	App. Resistivity [Ωm]	Tot. Radiation [µR/h]
Graywacke	631	2588	293	2.85	4686	3.23
Felsic tuffite	165	2742	732	5.69	69	7.39
Graphite schist	92	2796	855	1.24	371	0.50
Graphite-sulphide schist	605	2707	2790	7.65	21	18.54
Gabbro	102	3082	1801	1.79	2019	6.21
Peridotite	1320	2810	60861	3.19	6153	0.57
Pyroxenite	589	2993	5346	1.47	5022	0.87
Ultramafic hyalotuffite	914	2920	934	0.88	835	1.06
Ultramafic lava	387	3027	1170	1.32	2784	3.72

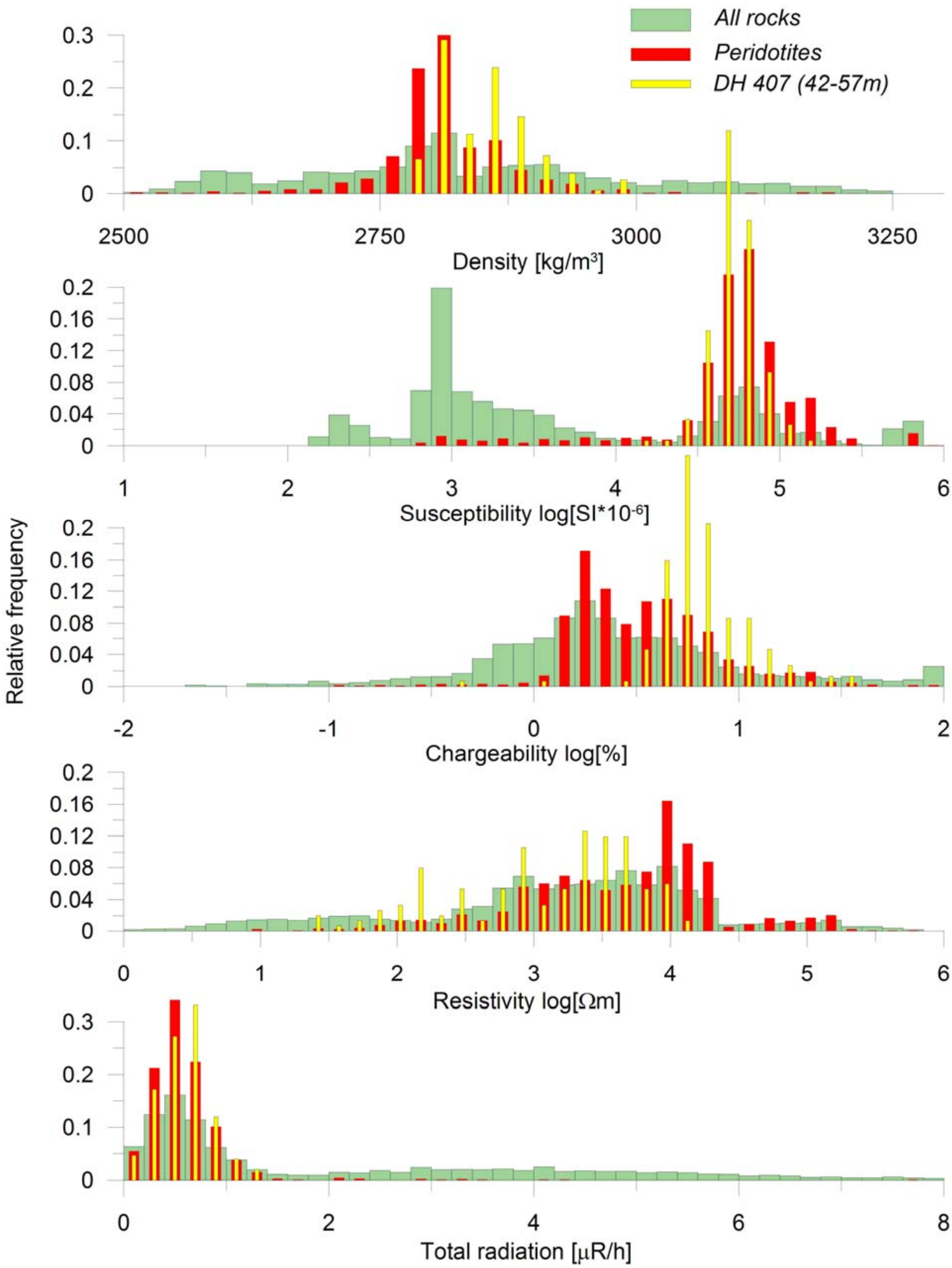

Figure 15. Histograms of petrophysical in situ loggins in Lomalampi area (8 drill holes). All rocks has been plotted as light green (4805 samples), peridotites (1320 samples) as red and PGE-Ni-Cu-Au mineralized peridotites (150 samples) as yellow bars.

5 PROPERTY GEOLOGY

5.1 Lithology and stratigraphy

In the Lomalampi area, the bedrock consists dominantly of various ultramafic volcanic rocks and sedimentary rocks belonging to the Savukoski and Sodankylä groups. Rocks belonging to the older Salla, Onkamo and Kuusamo groups as well as the younger Kittilä and Kumpu groups are not known to occur in the claims area. The general trend of different rock units is NE-SW, changing to more E-W trending on the NE side of the claims area (Fig. 7).

Sedimentary rocks are mainly fine-grained graphite and sulphide containing black schists, phyllites, quartzites, and graywackes, containing more feldspar-, graphite- and sericite-rich interlayers. Most if not all of these sediments belong to the Matarakoski formation of the Savukoski group.

Mafic and ultramafic rocks in the area belong to the Peurasuvanto formation of the Savukoski group, which corresponds with the Sattasvaara formation in Sodankylä area. They are mostly komatiitic to komatiitic basalt volcanic rocks and associated cumulate rocks ranging from peridotite to gabbro. Ultramafic volcanic rocks are fine-grained lavas, breccias, and various types of hyaloclastic rocks. Associated cumulate rocks are mostly small- to medium-grained olivine-orthocumulates with subordinate amounts of pyroxenitic cumulates, olivine-phyric ultramafics, and gabbros. The rocks have been metamorphosed at greenschist to lower-amphibolite facies conditions. Volcanic rocks have been altered to talc-chlorite-amphibole rocks with variable amounts of carbonate. Olivine cumulates are altered to serpentine-chlorite-amphibole rocks and locally to talc-carbonate rocks. Despite the alteration primary textures are locally well preserved but primary magmatic silicate minerals have not survived. Olivine cumulate bodies are generally undeformed, expect for their more pyroxenitic contacts, which are often strongly tectonised. Ultramafic volcanic rocks, as well as phyllites - black schists have been more susceptible to deformation, which has resulted in development of foliation, folding and shearing.

There are four significant SW-NE trending olivine cumulate bodies within the claims area; two at the north-west and two at the south-east. They are separated by a sequence of various ultramafic volcanic rocks and metasediments, with volcanic rocks being the dominant rock type closer to the NW-cumulate bodies and also at depth in the SE part, whereas sedimentary rocks are more common at the SE. Ultramafic rocks extend beyond the claims area towards north-west, south-east, and east (c.f. Figs. 4 and 7). Based on bedrock observations and ground geophysics these ultramafics include also cumulate rocks.

The local stratigraphic sequence is poorly known, but according to Räsänen (2004) the SE cumulates lie on top of the black schists-phyllites and these are covered, in turn, by ultramafic volcanic rocks towards east. This is comparable to the general stratigraphy of the Savukoski group, i.e. metasedimentary rocks of the Matarakoski formation lie under the komatiitic rocks of Peurasuvanto (Sattasvaara) formation (Table 2). However, in the current version of the 1:200 000 bedrock map, the quartzites and graywackes of the Lomalampi area are denoted to the older Sodankylä group.

In the NW part of the drilled area, layering dips towards SE at ca. 45 degrees (R403, R404, R411 and R0439). There are some indications that the stratigraphic top is downwards, in which case the whole rock package is overturned. In holes R0420 and R405, it seems that the in the uppermost metasedimentary rocks, the dip of the layering is similar but below the black schist in hole R0420 layering/foliation of the ultramafic volcanics becomes nearly vertical, which is also the plunge of the two SE cumulate bodies. Ultramafic volcanic rocks as well as graphitic sediments up to the contact with the first of the SE cumulates show strong foliation and also shearing, and the hanging wall contact is clearly tectonic. It is possible that the rock package extending from the NW cumulate to SE cumulates represents an anticline structure with overturned NW limb and near vertical SE limb, and with fold axis plunging towards NE.

Of the four main cumulate bodies, more abundant data is available of the two SE cumulates as the narrower western cumulate hosts the PGE-Ni-Cu-Au mineralisation. The mineralised cumulate (ore cumulate) is a sheet like body dipping at steep angle (ca. 80 degrees) to the SE. It has been traced along strike for about 450 meters, and it is possible that it continues further to the NE. It has a true thickness ranging from 30 to 65 meters and drilling indicates that the thickness increases slightly at depth. The deepest drill intersect is at 270 m (R0420). Towards the NE, past drill hole profile R0429-R0433 the ore cumulate becomes thinner (ca. 20 m, holes R0430 and R0431) at near surface depths, while at deeper level intersects it is still fairly thick (ca. 40 m, holes R0432,R0434 and R0445). Further towards the NE the cumulate body seems to disappear altogether, although drillings have intersected 3-10 m thick amphibole-chlorite schist, which is weakly mineralised.

The ore cumulate is mainly composed of altered olivine orthocumulate, grading locally in to olivine mesocumulate. The footwall contact is of ten tectonised and made of an amphibole-chlorite±bitotite schist 0.5-2 m thick. Where better preserved, the contact zone is gradational from peridotitic to more pyroxenitic rock in composition. Immediate footwall rocks range from komatiitic and komatiitic basaltic volcanites, phyllites-black schists, and quartzites to graywackes. The footwall is also considered to be the stratigraphic lower contact of the cumulate. The hanging wall or upper contact is also tectonised, including the upper part of the cumulate. The upper contact zone is usually 1-3 m thick, variably tectonised, and featureless pyroxenitic interval. However, in the central and NE parts of the cumulate, this is often followed by “white-specked” rock that can be several meters thick, which grades in to normal olivine cumulate. In thin section, the rock consists of millimetre-sized porphyroblast-like amphibole grains in a fine grained foliated talc-chlorite “matrix”. Closer to the peridotite, small olivine pseudomorphs appear inside these amphibole grains. The amphibole grains probably represent pyroxene phenocrysts and the rock was originally pyroxene(-olivine) phyric rock.

The rock package separating the ore cumulate from the other south-east cumulate (SE cumulate), is relatively narrow, generally 5-10 meters. It consists of phyllites-black schists, ultramafic dykes and minor ultramafic volcanics. At the NE, where the ore cumulate begins to thin, the gap between ore and SE cumulate widens and quartzite-graywacke becomes the dominant rock type.

The SE cumulate closely resembles the ore cumulate as it is mostly composed of altered olivine ortho- to mesocumulates. The major difference is the nearly ubiquitous presence of a gabbro-pyroxenite zone on both flanks of the cumulate. The SE cumulate has been completely intersected by only one hole, R415, which indicates a true thickness of ca. 105 meters for the olivine cumulate part, and a total thickness of ca. 120 meters, including the flanking gabbro-pyroxenitic zones. The SE cumulate has traced along strike for about 650 meters by drilling. Based on ground magnetic measurements the total length is probably ca. 2.4 km.

5.2 Petrology of ultramafic rocks

The designation of different rock types is based on drill core observations, major- and trace-element chemistry, and thin section studies. For clarity, some closely related rock types are grouped under a single type, thus reducing the number of rock types to 10. For instance, different komatiitic volcanic rocks (lava’s, hyaloclastites, etc) have been combined under komatiitic volcanite term, and various mafic-ultramafic schists (chlorite schist, some of the sulphide schists, and different combinations of amphibole-chlorite-biotite bearing schists) have been grouped under chlorite-biotite-amphibole schists.

Most of the mafic-ultramafic rocks in the Lomalampi area can be classified as komatiitic rocks as they have high MgO (>18 %), Cr (>0.1 %), and Ni (>0.1 %) contents. Komatiitic basalts are distinguished by their lower MgO (<19 %) and especially lower Ni (<0.1 %) contents. Komatiitic and komatiitic basaltic rocks form a continuous series both on the Jensen cation diagram and the CMA diagram (Fig. 16). The Al_2O_3 contents are comparable with the Al-undepleted type of komatiites, with a small number of samples showing lower Al_2O_3 values. TiO_2 values show a slightly bimodal distribution as some of the komatiitic and komatiitic basaltic volcanic rocks have higher TiO_2 values. This variation in TiO_2 contents can also be seen on Al_2O_3 vs. TiO_2 diagram (see Fig. 17). Most of the cumulate rocks can be classified as Al-undepleted type komatiite (AUDK) based on the Al_2O_3-TiO_2 ratio (15-22), while volcanic rocks with higher TiO_2 contents have lower Al_2O_3-TiO_2 ratios (10-15) and they would be classified as Al-depleted type komatiite (ADK) (Fig. 18). On the so called Hanski-diagram (Hanski 1992) most of the cumulate rocks are classified as AUDK type with a smaller ADK population, while the volcanic rocks are mostly Ti-enriched AUDK type (Fig. 18).

Komatiitic volcanites have hump-shaped chondrite-normalised REE diagrams with depleted LREE's (average La_{CN}/Sm_{CN} 0.68) and HREE's (average Gd_{CN}/Yb_{CN} 1.61), whereas komatiitic basalts have relatively flat LREE's (average La_{CN}/Sm_{CN} 0.96) but are similarly HREE depleted (average Gd_{CN}/Yb_{CN} 1.68) (Figs. 19 and 20). Chlorite-biotite-amphibole schists show variable REE behaviour from LREE depleted to LREE enriched, reflecting variable protolith types for these rocks (Fig. 21).

The major- and trace-element chemistry of the ore cumulate and the SE cumulate are fairly similar, but there are some distinct differences. The SE cumulate has slightly higher MgO, Cr, SiO_2 and Ni, and slightly lower TiO_2 and Al_2O_3 and much lower S compared to the ore cumulate (Table 7). The main difference, in addition to sulphur content, is the REE-content; SE olivine cumulates have a higher proportion of LREE enriched samples (Fig. 22) and an average La_{CN}/Sm_{CN} ratio of 1.2, whereas the ore cumulate samples are mostly LREE depleted (Fig. 23) with an average La_{CN}/Sm_{CN} ratio of 0.62 (Table 7). Both are also HREE depleted, although not as strongly as the volcanic komatiites. Pyroxenitic cumulates associated with the two cumulate bodies also follow this trend.

Background values for Pt and Pd was estimated from unmineralised intersections of the ore cumulate (holes R415, R0421, R0423, R0424 and R0426, 198 samples) and from four intersection of the SE cumulate (R0421, R0423, R0424 and R0427, 201 samples). The average Pd and Pt values for the ore cumulate are 13.1 ppb and 33.3 ppb, respectively (median values 12.2 ppb and 30.9 ppb, respectively) and for the SE cumulate 11.2 ppb Pd and 21.5 ppb Pt (median values 0 ppb and 17.7 ppb, respectively). The ore cumulate has about twice as much combined platinum and palladium than the SE cumulate, especially when comparing the median values. While the Cu and Ni contents are identical, the sulphur content of the ore cumulate is also much higher, ca. 2500 ppm, than in the SE cumulate, ca. 700 ppm.

Gabbroic rocks occurring with the ore and SE cumulates form a fairly homogeneous group that have generally high Cr contents (0.1-0.2 %), moderate TiO_2 (0.5-0.6 %), and are LREE enriched (La_{CN}/Sm_{CN} 1.9) and have distinct positive Eu anomaly (Fig. 24). Some gabbros were also encountered on the SE side of SE cumulate (R410) that have higher TiO_2 (0.6-0.7 %) and are only moderately LREE enriched (La_{CN}/Sm_{CN} 1.2) and show no Eu anomaly. Third gabbro group is associated with the NW cumulates (holes R0440-R0443). These have variable composition ranging from leucocratic, low-MgO (ca. 3.5 %), low Cr (bdl.) and high TiO_2 (1.7-1.9 %) to more mafic gabbros with moderate Cr (0.03-0.09 %) and TiO_2 (0.4-0.7 %) contents. Both the leucocratic and mafic gabbros are LREE depleted (La_{CN}/Sm_{CN} 0.54).

Table 7. Comparison between ore and SE cumulate (VF %).

	MgO	**TiO_2**	**Al_2O_3**	**SiO_2**	**Cr**	**S**	**Ni**	**La_{CN}/Sm_{CN}**	**Gd_{CN}/Yb_{CN}**
SE cumulate n=55	33.12	0.3274	5.43	45.53	0.4493	0.059	0.1783	1.245	1.381
Ore cumulate n=59 (*36)	30.09	0.3494	5.51	44.75	0.4127	0.205*	0.1478*	0.615	1.261

*Excluding samples with >0.5% S

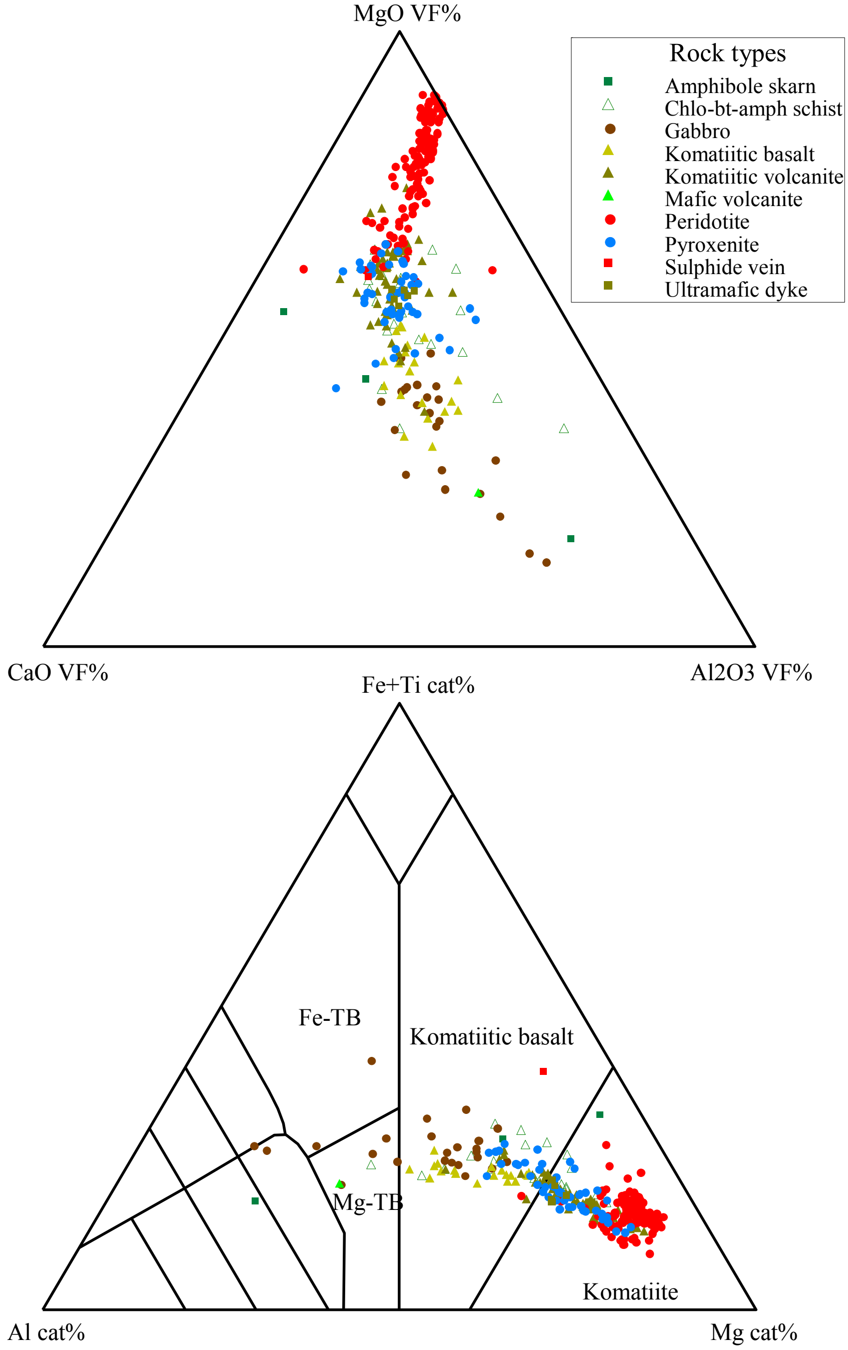

Figure 16. CMA and Jensen cation diagram with mafic-ultramafic samples from Lomalampi.

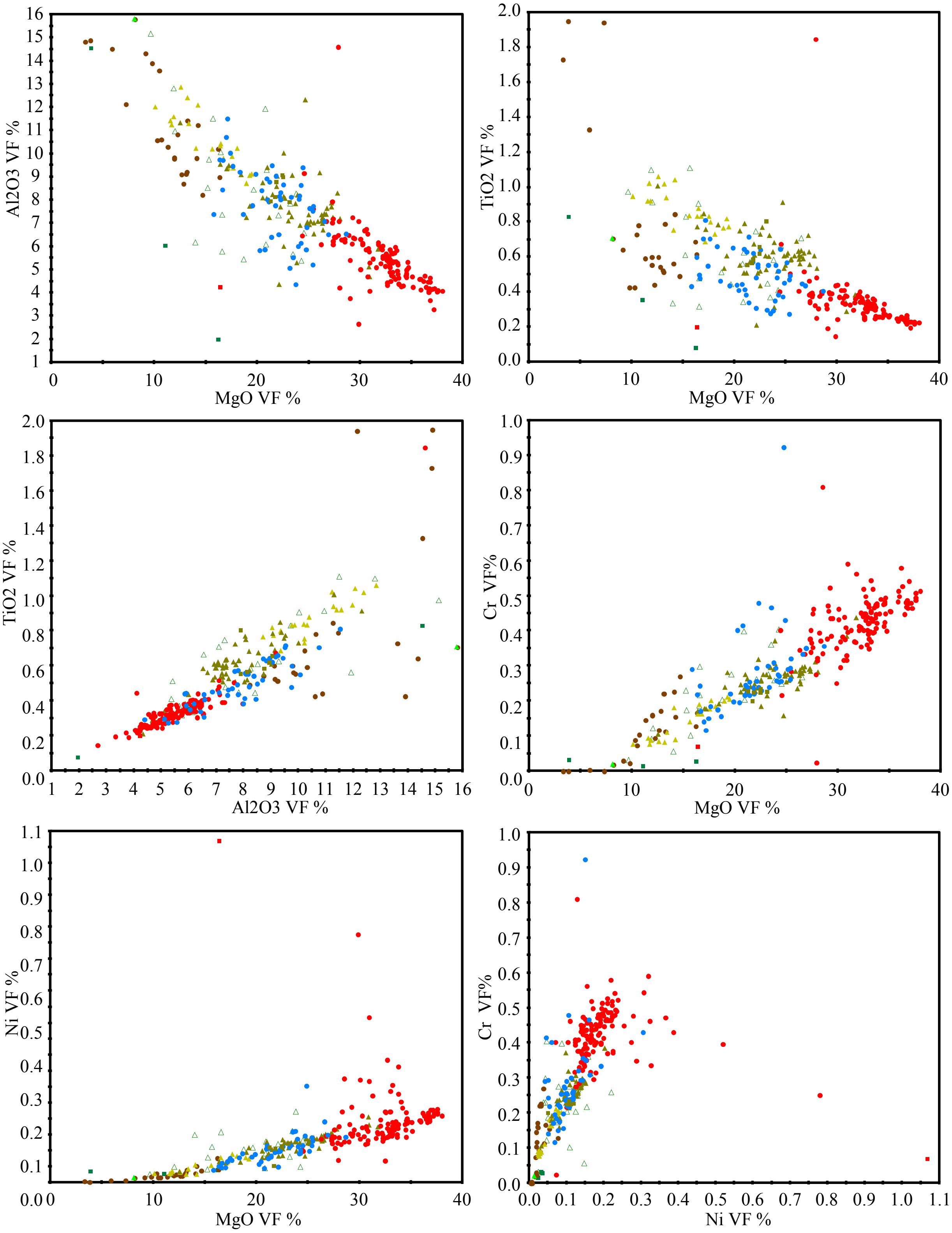

Figure 17. Chemical composition of mafic-ultramafic rocks of Lomalampi on X-Y digrams. Symbols as in Fig. 16.

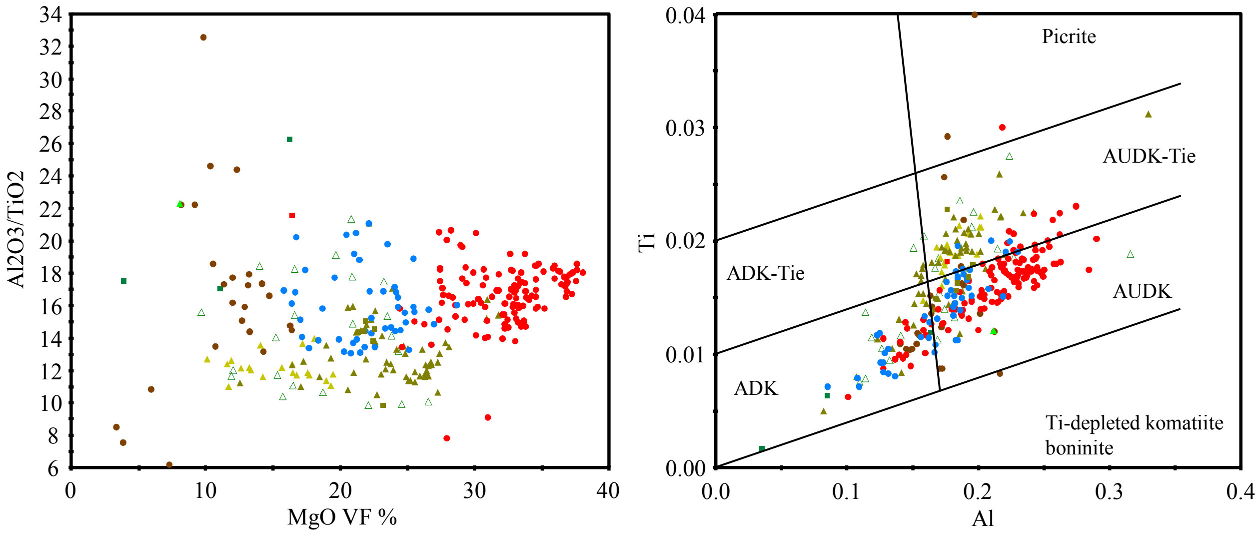

Figure 18. Al2O3/TiO2 ratios for Lomalampi mafic-ultramafic rocks and classification based on the "Hanski"-digram (on the left). ADK=aluminium depleted komatiite, AUDK=aluminium undepleted komatiite, Tie=Ti-enriched. Symbols as in Fig. 16.

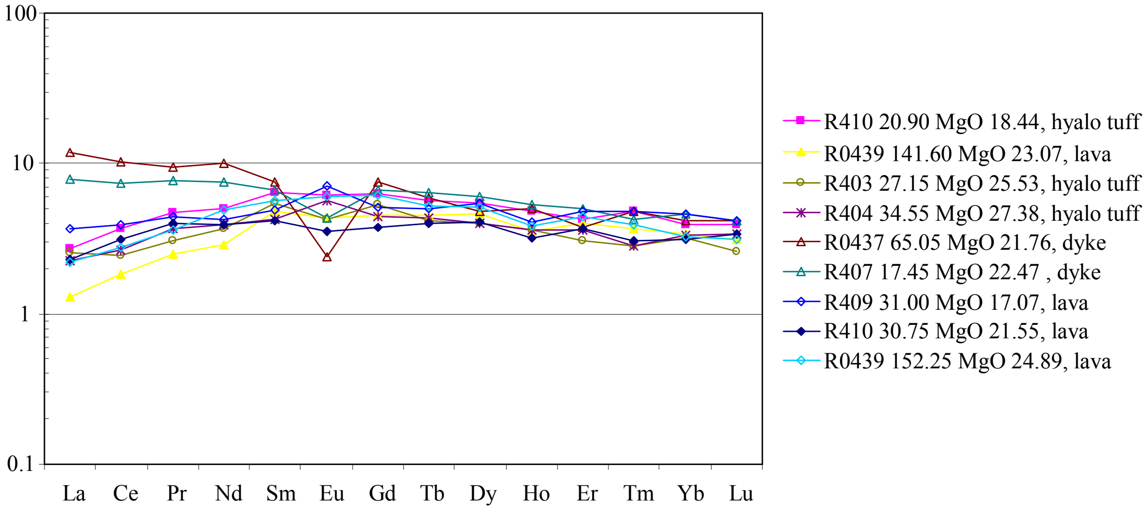

Figure 19. Some representative REE diagrams of komatiitic volcanic rocks and dykes with MgO contents (VF percents). Number after hole id. Indicates starting depth of REE-sample. Chondrite normalisation values from Taylor & MacLennan 1985.

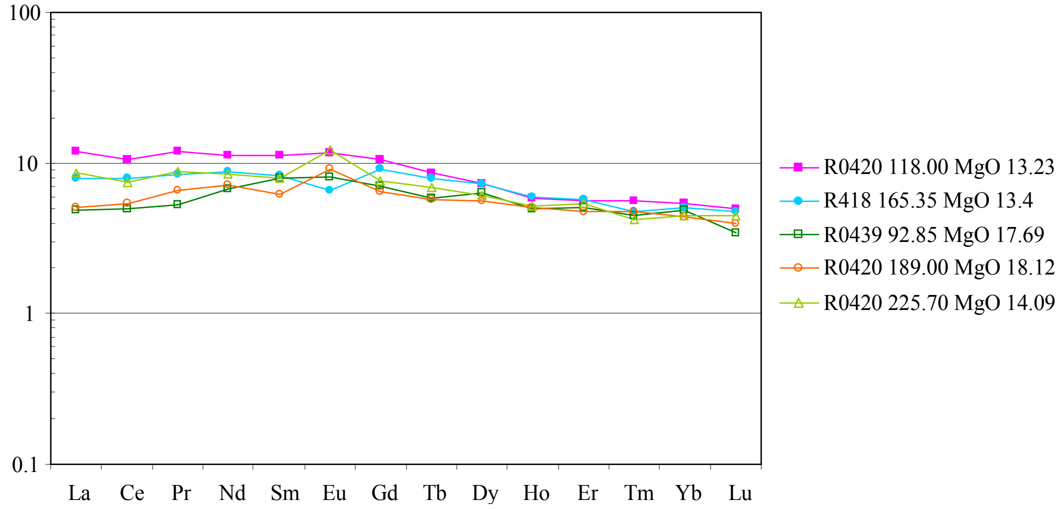

Figure 20. Some representative REE diagrams of komatiitic basalts.

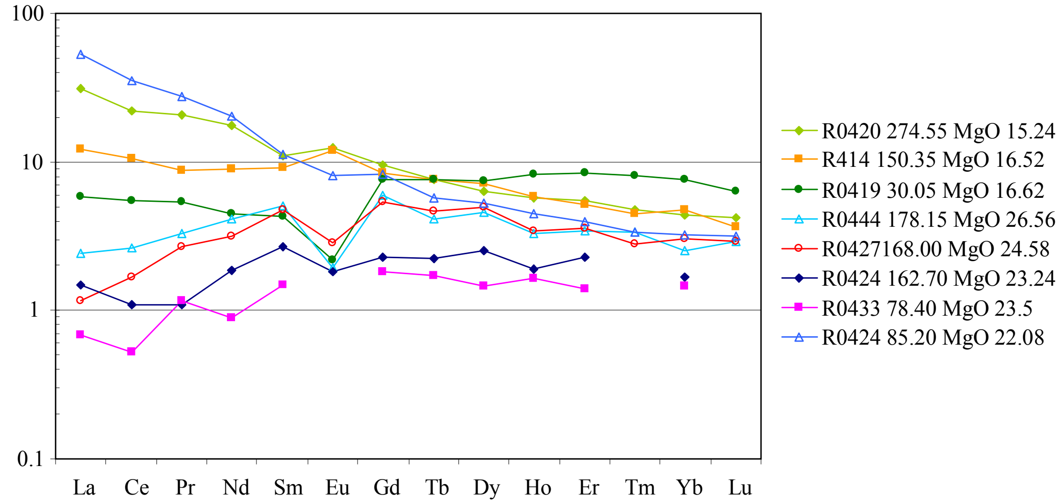

Figure 21. Some representative REE diagrams of chlorite-biotite-amphibole schists.

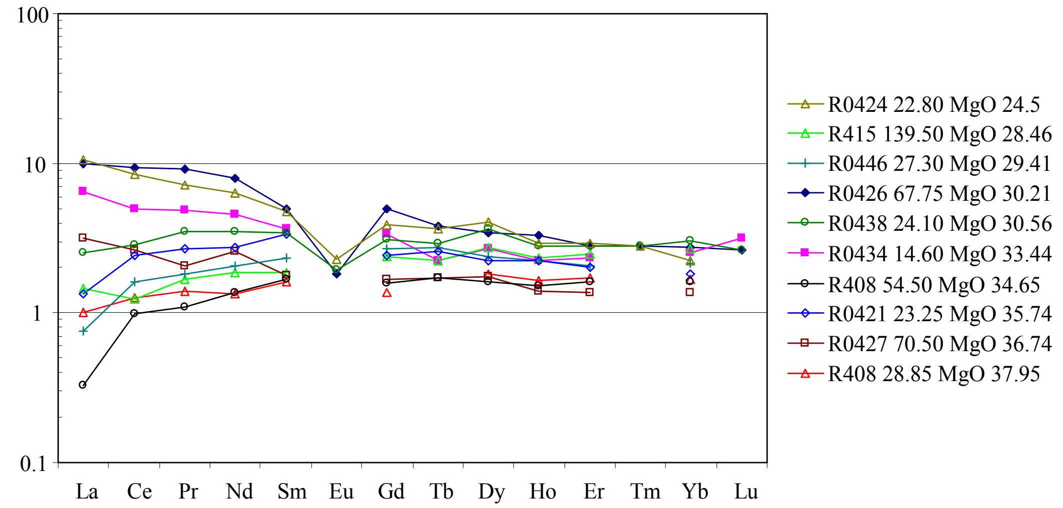

Figure 22. Some representative REE diagrams of SE olivine cumulates.

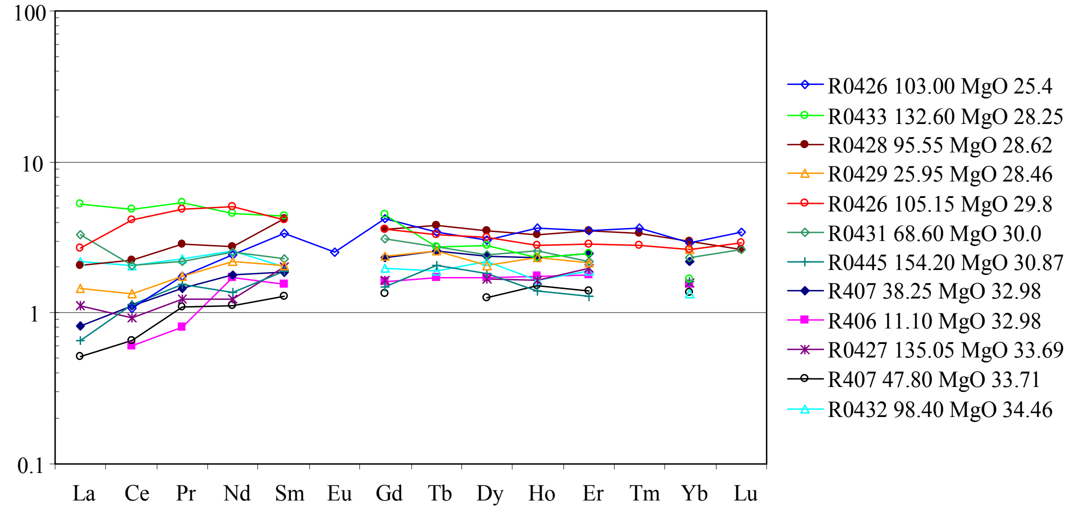

Figure 23. Some representative REE diagrams of mineralisation hosting olivine cumulates, including some mineralised samples (≥1ppm 2PGE; R407 47.80, R431 68.60, and R429 25.95).

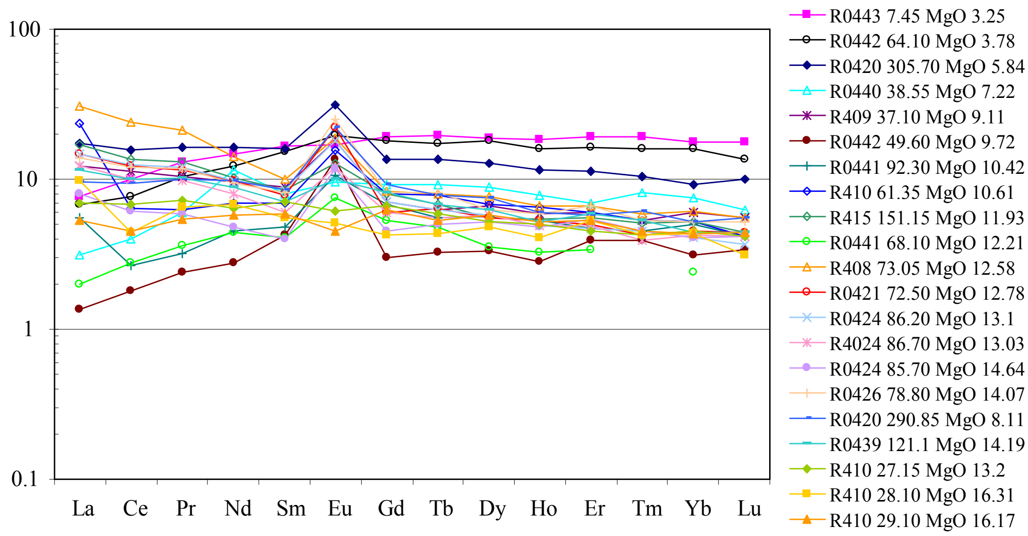

Figure 24. REE diagrams of all gabbroic samples from the Lomalampi area.

5.3 PGE-Ni-Cu-Au mineralisation

The Lomalampi PGE-Ni-Cu-Au mineralisation is associated with the smaller of the two SE olivine cumulate bodies. The mineralisation has been intersected on 8 drill hole profiles, between holes R416-R0436. In addition, the most north-eastern hole R0437 has one 1.5 m intersect of ore-grade material. Based on the current drilling the depth extent of the mineralisation is highly variable; on some profiles the mineralised zone occurs only in the near surface level (e.g. R416-R0421-R415), whereas on some profiles it has been intersected at three different levels (e.g. R0431-R0434-R0444). The thickness of the mineralisation (>300 ppb 2PGE+Au) generally varies between 10-20 meters (true thickness). The mineralisation can occur as a single zone (Fig. 26, R0427) or as multiple (up to three) zones, separated by 1-8 m thick weakly mineralised (<300 ppb 2PGE+Au) zones. The mineralised zone can be located at the presumed stratigraphic basal part of the cumulate, in the middle of the cumulate or in the upper part of the cumulate.

The mineralisation is composed of disseminated sulphides, some sulphides occur also in thin talc-carbonate and quartz-carbonate veins. One, ca. 0.6 m semimassive sulphide zone was intersected in hole R0437, with high base and precious metal content (1.5 m with 1.597 % Ni+Cu and 1.42 ppm 2PGE+Au). Typically the sulphur content of the mineralisation is between 0.5-3 percent. The average base- and precious-metal contents for mineralised samples (2PGE≥300 ppb) are shown in Table 8 (this includes some PGE mineralised intervals in the footwall mafic-ultramafic schists, close to the cumulate contact). Sulphidic Ni content has not been evaluated using bromine-methanol or ammonium citrate leach. Bromine-methanol leach was used for comparing the Ni content of feed for the metallurgical testing together with total leach methods (See report by Maksimainen & Kalapudas) and the difference was around 500 ppm less Ni with the bromine-methanol leach. In the unmineralised SE cumulate, ICP-OES analyses (with aqua regia leach) low sulphur samples with < 100 ppm S have quite variable Ni contents between 400-1350 ppm, which could be estimated as minimum and maximum silicate Ni contents.

Table 8. Metal contents for mineralised samples with 2PGE >300 ppb. Note that Ni includes a proportion of silicate-bound nickel.

n=238	Cu ppm	Ni ppm	S %	Au ppb	Pd ppb	Pt ppb	2PGE ppb	Ni+Cu ppm	Pt/Pd	Pt/Au
Average	749	2015	1.24	92	204	434	638	2764	2.2	15.5
Median	581	1885	1.03	49	180	388	565	2535	2.2	7.1
Max	8650	7320	7.99	1220	646	1320	1966	15970	3.5	109.8
Min	37	344	0.034	0	78	69	300	767	0.2	0.4

Table 9. Some of the better intersections of the mineralisation.

Hole	From	Length	Pt ppb	Pd ppb	Au ppb	2PGE+Au ppb	Ni ppm	Cu ppm	Ni+Cu ppm
R407	40.40	16.9 m	638	302	57	997	2956	1035	3991
R413	48.60	22.0 m	558	265	102	925	2611	1041	3652
R416	43.90	15.95 m	627	299	62	987	2514	862	3377
R0429	13.50	21.0 m	485	213	84	782	1831	773	2604
R0431	56.60	18.0 m	461	191	134	786	2854	1565	4419

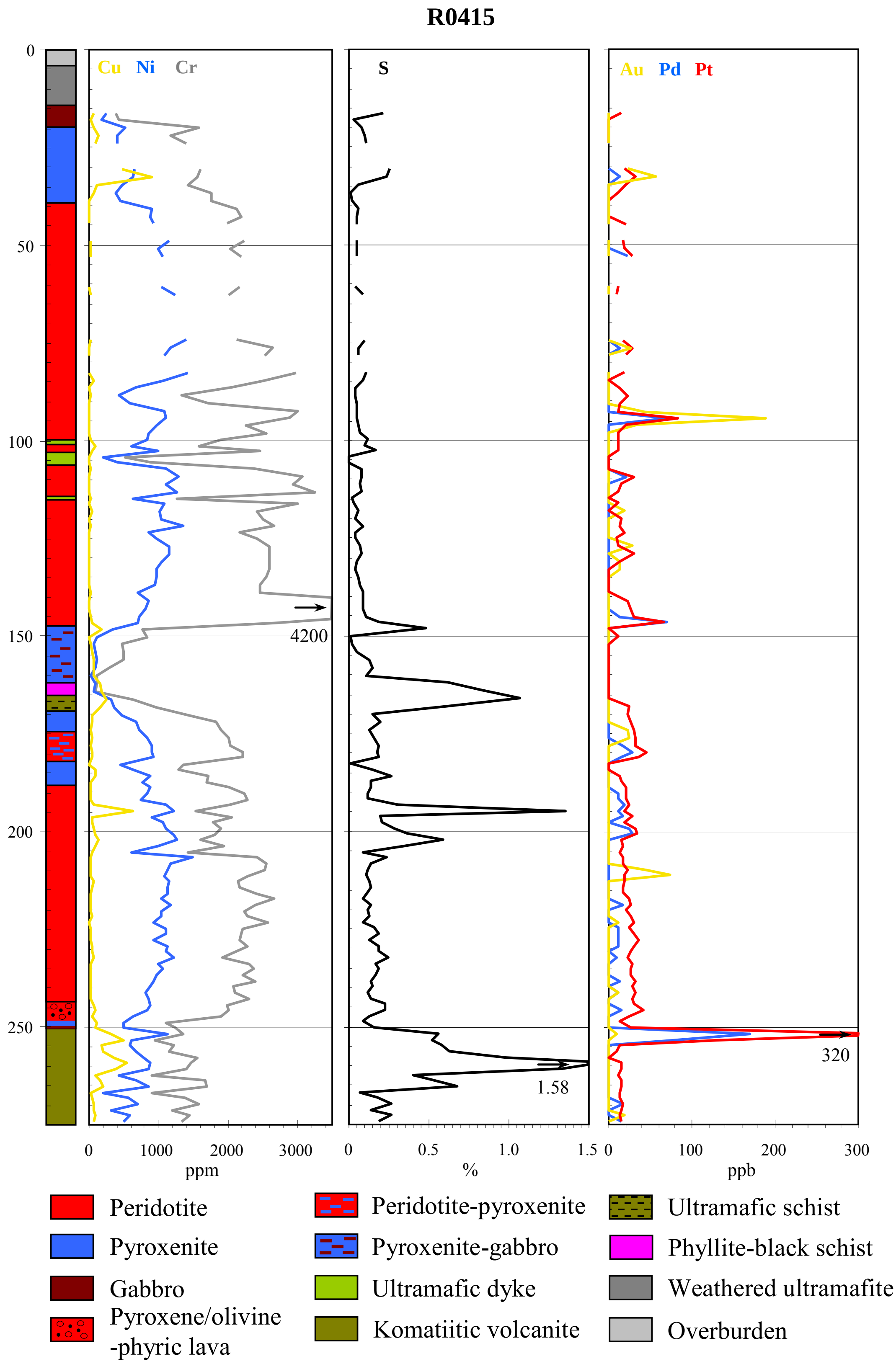

Figure 25. Representative drill hole that intersects both cumulate bodies, with Cr, Ni, Cu (ICP-OES), Au, Pd, and Pt (Pb-fire assay) contents.

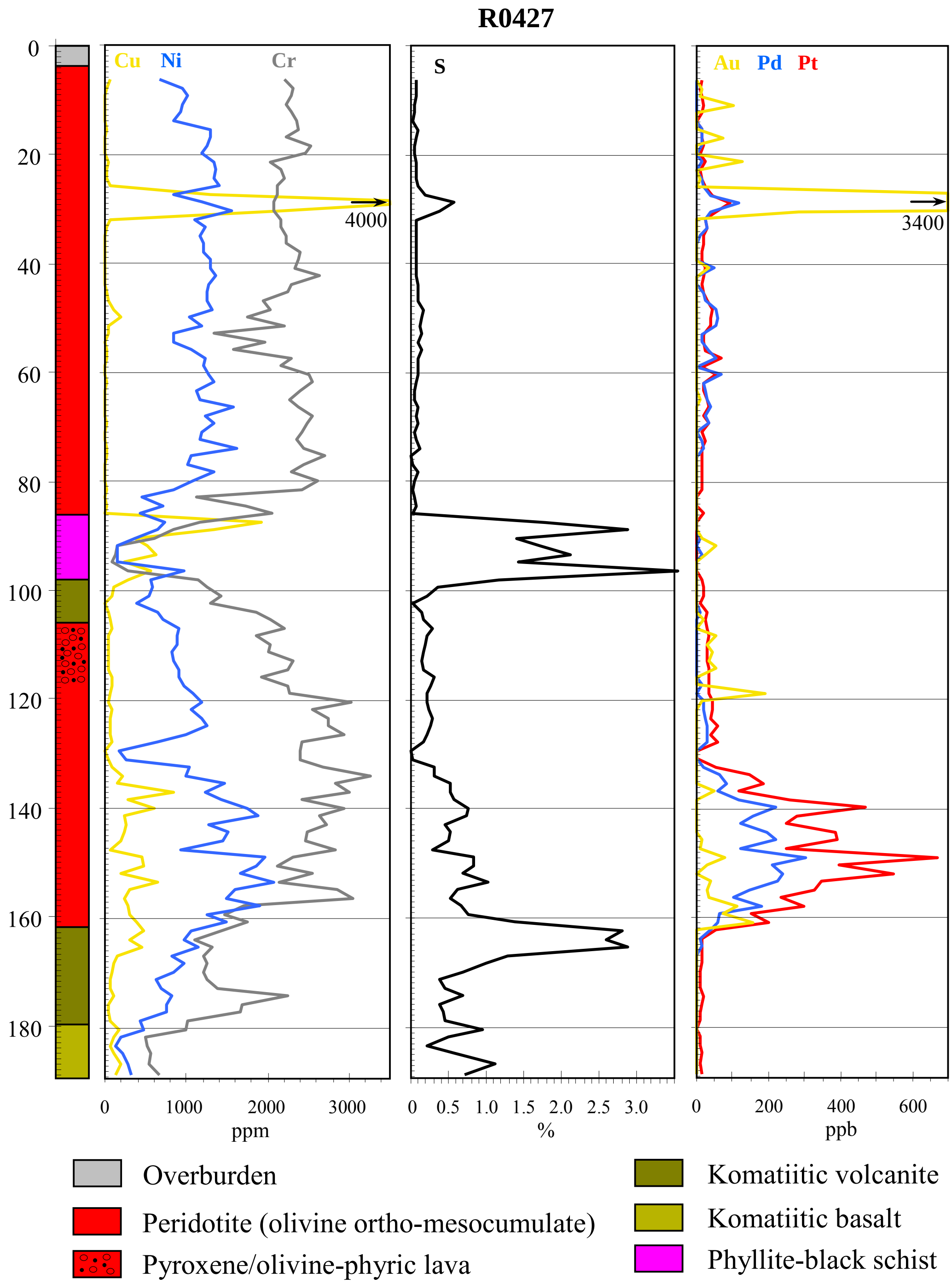

Figure 26. Example of drill core intersecting Ni-Cu-PGE mineralisation associated with the lower part of ore cumulate.

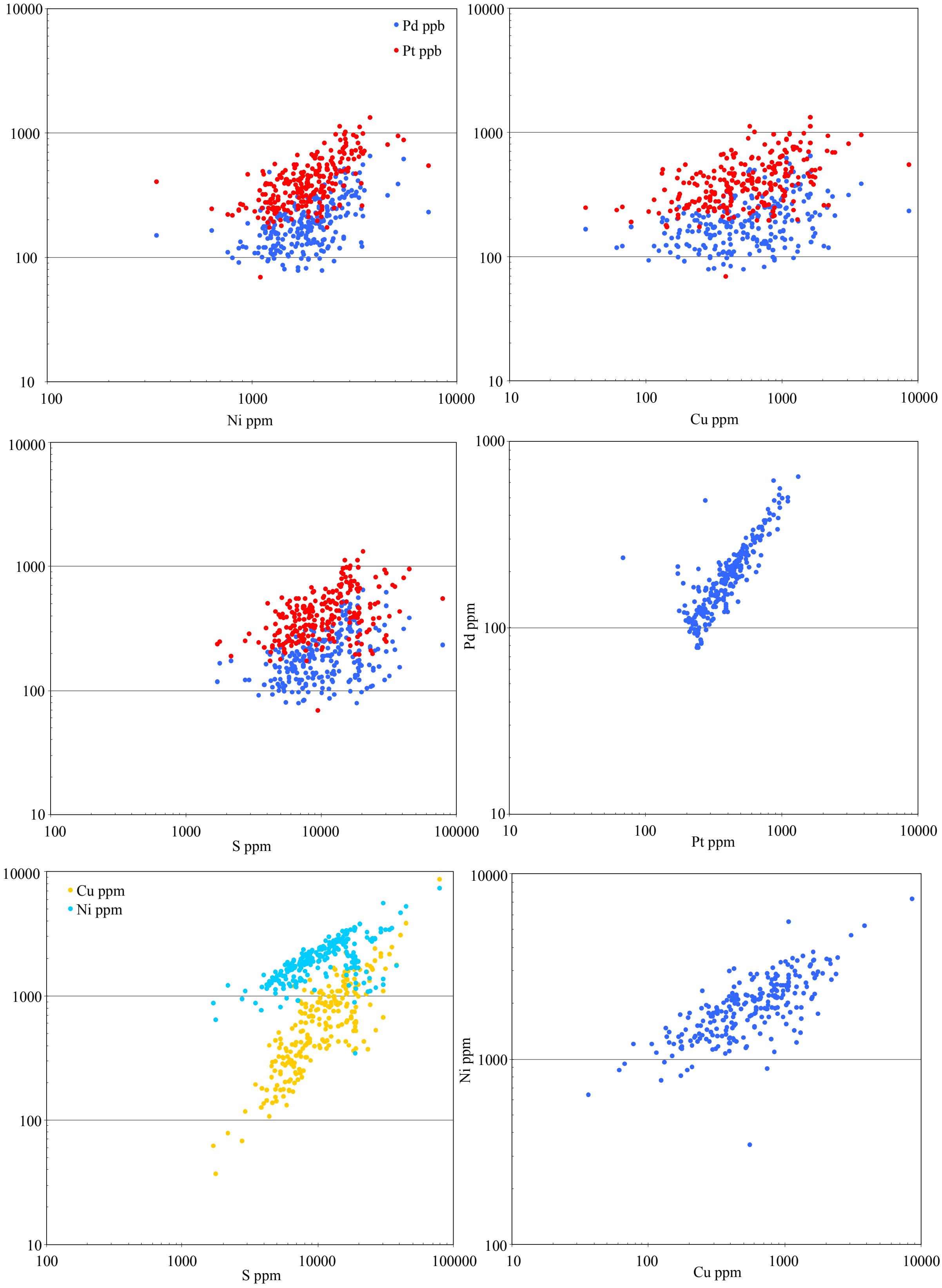

Figure 27. Various metal vs.metal and metal vs. sulphur diagrams for samples with >300 ppb 2PGE.

Figure 27 depicts various correlations between ore-forming elements. Platinum and palladium show good correlation with each other, moderate correlation with Ni, and somewhat weaker correlations with Cu and S. Copper shows fairly good correlation with S, whereas nickel shows more scattered distribution with one distinct population showing fairly good correlation with S. The mutual correlation between Ni and Cu is fairly good.

The high Pt-Pd ratio is unusual for known Finnish PGE-bearing deposits; although some of the Kuhmo-area komatiitic Ni deposits are PGE-bearing, but they are Pd-dominant. The only two deposits with Pt/Pd higher than one are the Paasivaara PGE-reef in the Penikat layered intrusion and the Kevitsa Ni-Cu-PGE deposit. The chondrite-normalised 6PGE-Au diagram for the Lomalampi deposit (Fig. 28) and the two above mentioned deposits are fairly similar with flat or slightly downward sloping curve in the Pt-Pd part (see Mutanen 1997 for Kevitsa and Alapieti & Lahtinen for Paasivaara and other Finnish reef-type PGE deposits).

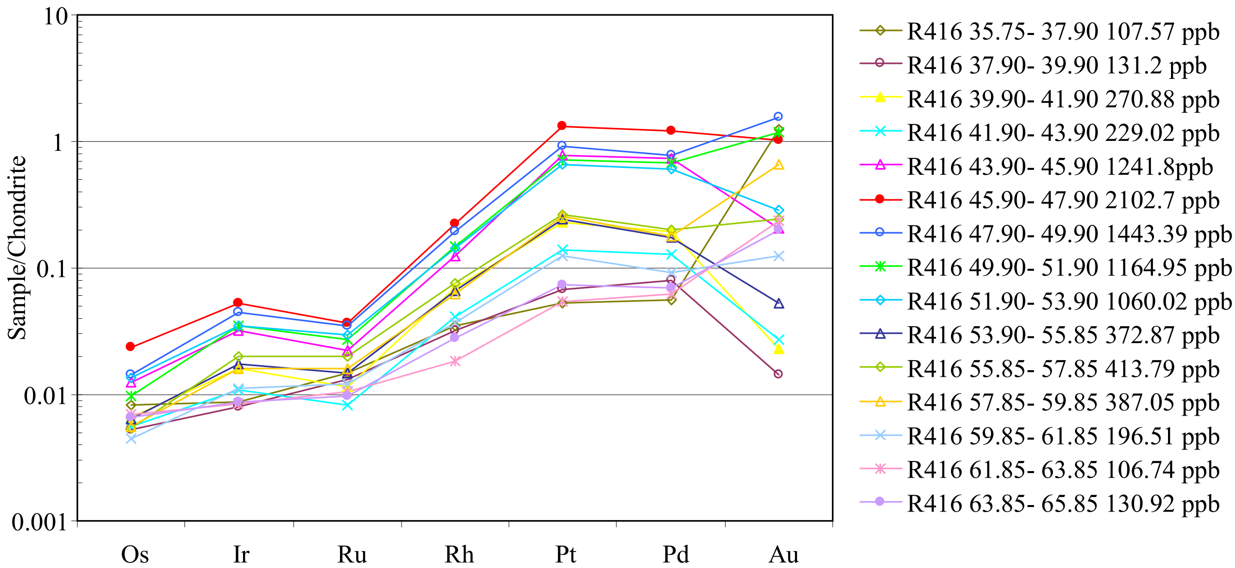

Figure 28. Chondrite normalised 6PGE+Au data for 15 samples from R416. Ppb value indicates combined 6PGE concentrations.

5.4 Ore minerals

The ore mineralogy of the Lomalampi prospect is fairly simple with pyrrhotite, pentlandite and chalcopyrite as the main minerals. They occur as small grains usually between 0.01 to 0.2 mm in size, sometimes forming larger sulphide blebs up to 1-2mm in size. They occur at interstitial spaces between altered olivine grains, together with talc, chlorite, amphibole, serpentine, carbonates and magnetite. Sulphides are also found with thin veins and veinlets composed of talc, carbonate and magnetite. In mineralized samples sulphides comprise 1-5 vol. % of the rock. In addition to the above mentioned main sulphide minerals, minor to trace sulphide phases found from the Lomalampi samples include pyrite, sphalerite, millerite and galena. Arsenides and sulpharsenides include nickeline (NiAs), löllingite (FeAs) and cobaltite-gersdorffite (Ni-Co-AsS).

The PGE mineralogy is also fairly simple with sperrylite ($PtAs_2$) as the only platinum mineral found in GTK studies. Palladium occurs as an unusual Pd-Ni-Te+Sb+Bi phase(s). In addition to these Pt and Pd minerals, a few Co-Ni sulfarsenide grains contains minute patches enriched in Rh and Ru-Os, possible representing small exsolved phases belonging in the Ru-Os-Rh-AsS system. Sperrylite occurs mostly with silicates whereas of the Pd-phases about 40 % occur with sulphides and sulpharsenides (Fig. 30). More data on the sulphide and precious metal mineralogy can be found in the attached reports by O. Knauf (Knauf 2009a, Knauf 2009b, Knauf 2009c).

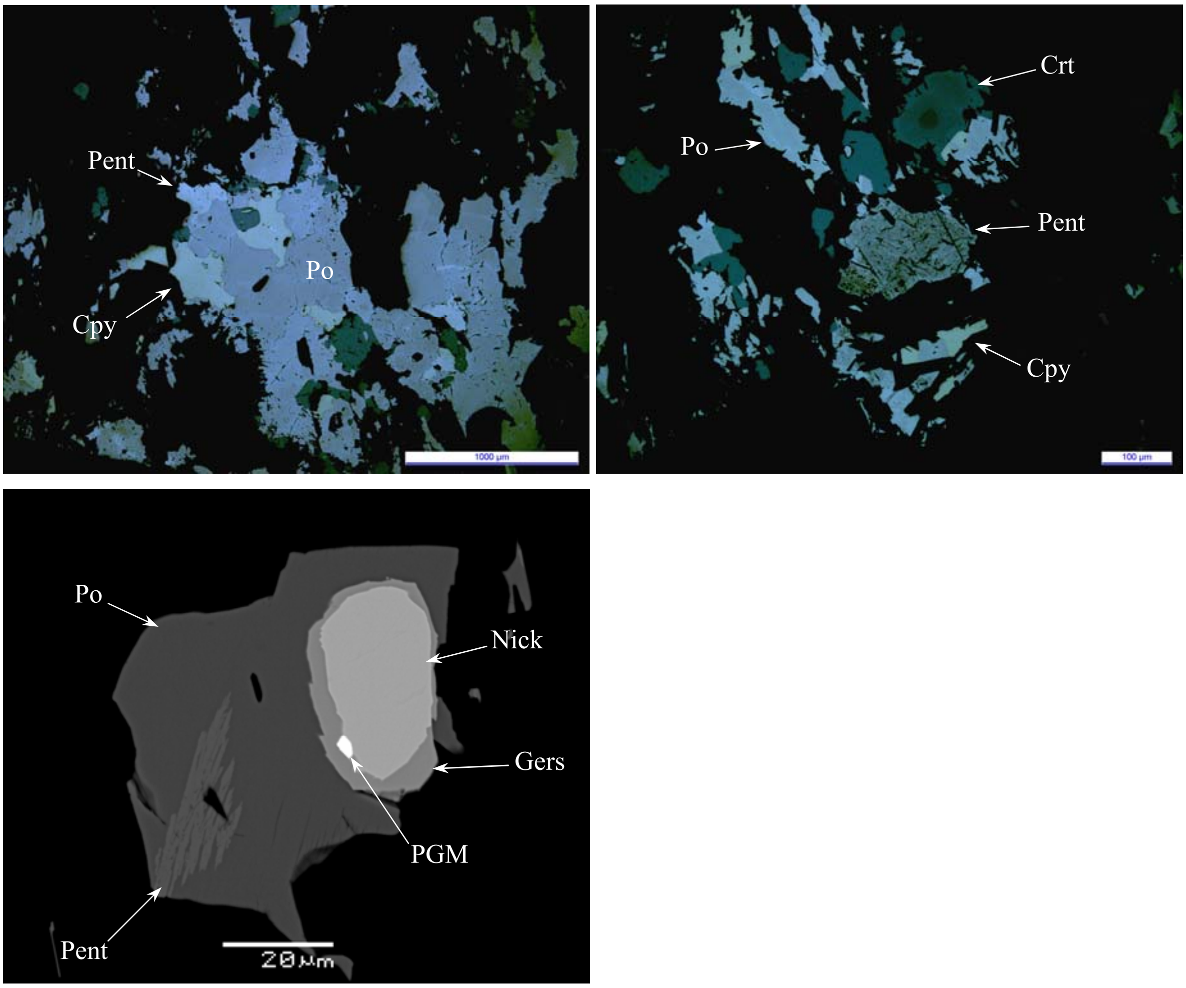

Figure 29. Upper left, coarse grained pyrrhotite (po) with chalcopyrite(cpy) and pentlandite(pent) R0431 68.95. Upper right, altered pentlandite with pyrrhotite and chalcopyrite. Also visible is partially altered chromite (crt) grain R0429 26.35. Lower left, backscattered SEM image of small Pd-Ni-Te-Sb-Bi mineral associated with nickeline (nick), gersdorffite (gers) and pyrrhotite (po) with pentlandite lamellae R0418 101.70.

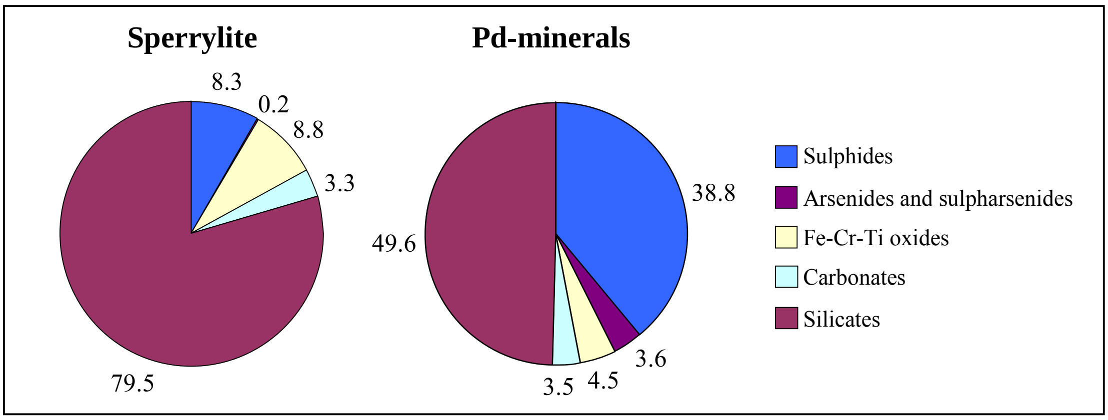

Figure 30. Host phases for sperrylite and Pd-bearing phases (in percentages).

5.5 Other targets near the Lomalampi prospect

The Sakiatieva prospect is located in the Ruosselkä area, about 10 kilometres northeast from the Lomalampi target (Fig. 1). GTK has explored the Ruosselkä area during 1999-2006, which includes the Sakiatieva gold mineralisation.

6 ENVIRONMENTAL STATEMENT

6.1 Environmental aspects

There are two nature conservation areas in the immediate vicinity of the Lomalampi prospect. The nearest conservation area Natura 2006 protection area (dark violet) and another, the nature park of Koitelaiskaira (lighter violet) (Fig. 31). The Natura 2006 conservation area is the nature and birdlife directive (EU).

The Lomalampi prospect is a part of the reindeer herding area, which covers the whole Lapland province.

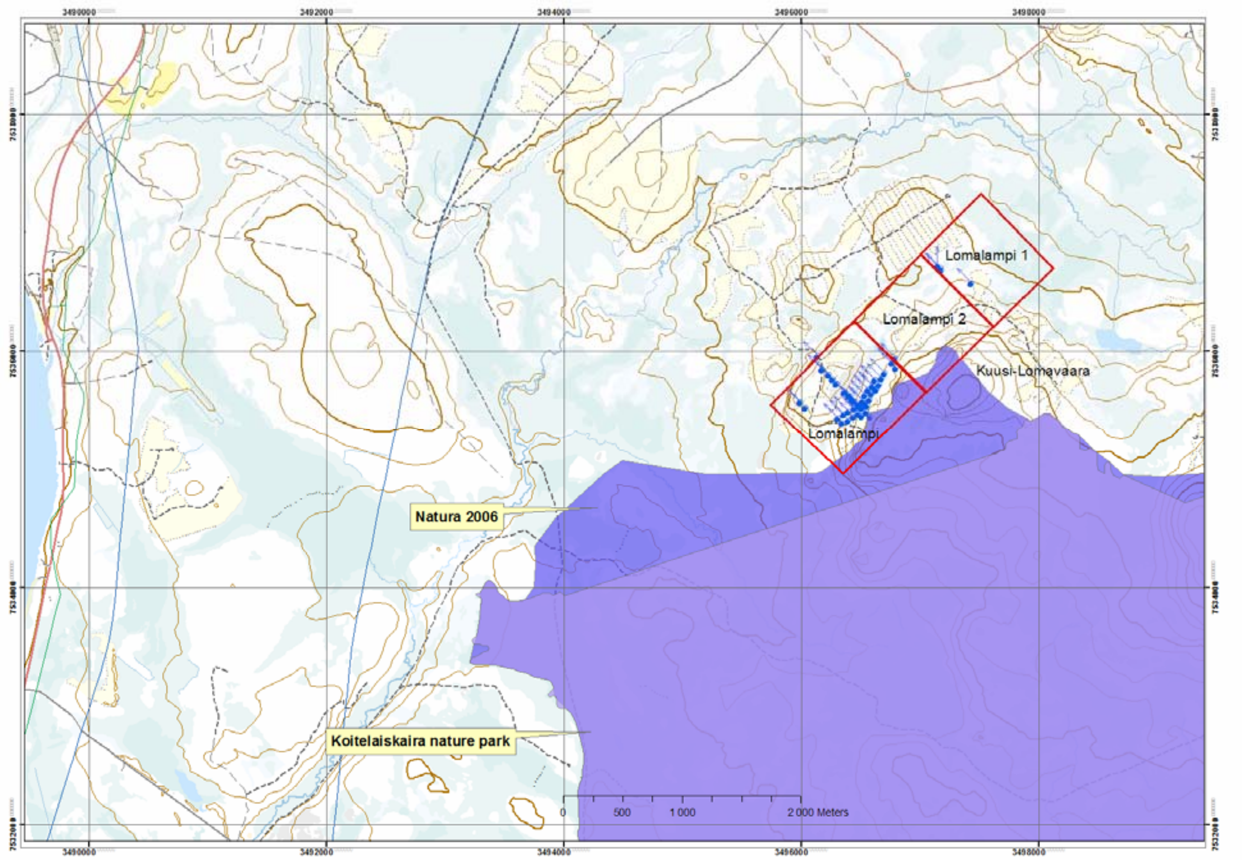

Figure 31. The nature conservation areas in the immediate vicinity of the Lomalampi prospect. (Basemaps © National Land Survey of Finland, license no. MML/VIR/TIPA/217/10).

7 METALLURGICAL TESTS

Mineralised intervals from six drill cores were selected for metallurgical tests, which were conducted with a bench scale laboratory flotation machine at the GTK's Outokumpu mineral processing laboratory. The samples were crushed to below 1.5 mm particle size, combine to one composite sample and homogenised. About 45 kg in 1.5 and 5 kg batches were used grinding and flotation tests. Table 10 gives the average grade of the flotation feeds. A total of 17 tests were carried out. Table 11 gives the best results achieved. For full results of the metallurgical tests see attached report by Maksimainen & Kalapudas (2010).

Table 10. Average grade of flotation test feeds.

Ni (%)	Cu (%)	Ag (g/t)	Au (g/t)	Pd (g/t)	Pt (g/t)	S (%)
0.250	0.079	10.11	0.217	0.216	0.469	1.30

Table 11. Grade and recovery percentage of best achieved concentrate.

Mass (wt%)	Ni (%)	Cu (%)	Ag (g/t)	Au (g/t)	Pd (g/t)	Pt (g/t)	S (%)
Grade	10.1	6.2	8.347	12.5	12.0	14.1	29.0
Rec %	47.9	88.5	-	-	65.3	34.2	-

8 RESOURCE ESTIMATIONS

Mineral resource assessment was done by solid and by block modelling. Recommendations of the Finnish Association of Mining and Metallurgical Engineers (VMY 1991) were applied to the methods and classifications used.

A cut off grade of 0.08 ppm Pt was used for the solid modelling. The volume of the solid model is 1.534 Mm^3. The average density of the body is 2.86 g/cm^3, which give's a total mineral resource of 4.387 Mt with an average grade of 0.27 ppm Pt, 0.12 ppm Pd, 0.08 ppm, Au, 1631 ppm Ni and 569 ppm Cu. A 2x2x2 m block size for the deposits and its surroundings was used in the block modelling. Tonnage-grade estimations based on the modelling is presented in Table 12 at different Pt cut off values. Modelling was done to a depth of about 160-170 m below surface. The deposit is open at depth and may have extensions towards SW and NE. For more comprehensive review of the modelling and resource estimations see the attached report by Koistinen et al. (2010).

Table 12. Summary of the mineral resource assessment by block modelling:

Cut off Pt ppm	Pt ppm	Pd ppm	Au ppm	Ni ppm	Cu ppm	Co ppm	Density g/cm^3	Tonnage t
0	0.207	0.095	0.062	1459	517	103	2.846	4307888
0.1	0.269	0.122	0.074	1682	571	117	2.848	3064767
0.2	0.343	0.154	0.085	1862	638	127	2.847	1906397
0.3	0.421	0.191	0.102	2068	784	141	2.857	1055879
0.4	0.503	0.229	0.126	2334	972	156	2.872	505886
0.5	0.573	0.264	0.148	2481	1038	164	2.872	233046
0.6	0.664	0.315	0.175	2411	863	160	2.851	57636

9 DISCUSSION AND CONCLUSIONS

The Lomalampi Ni-Cu-PGE-Au deposits is an unusual PGE-enriched - low base metal mineralisation hosted by komatiitic olivine cumulates. The hosting olivine cumulate has relatively high back-ground values of platinum, palladium and sulphur indicating that the magma was close to sulphide saturation during emplacement. Formation of the mineralisation was probably due to local contamination of the magma by S-enriched footwall schists.

The mineralisation has been traced for ca 390 m along strike and to a maximum depth of about 140 m below surface. The mineralised body, which is composed disseminated base metal sulphides, is usually between 10-20 m thick.

The discovery of the Lomalampi deposit is the first significant find, which is associated with the Sattasvaara-Peurasuvanto-Mertavaara formation(s) and indicates further potential for komatiitic units in northern Finland.

10 RECOMMENDATIONS FOR FUTURE WORK

The deposit is open at depth and, at least, towards NE. Current drillings are concentrated in a fairly limited area, while komatiitic rocks are known to extend towards south and south-west, and to a lesser degree towards north and north-east. Some of the komatiitic belts also contain cumulates, although geological information is fairly sparse (mainly outcrop observations). Other cumulate bodies, especially if associated with sulphur bearing schists should be investigated.

- Possible extensions of the mineralised cumulated towards NE at depth should be checked with drilling.

- Other komatiitic cumulates associated with S-bearing schists (c.f. Fig. 13).

- Beneficiation tests to increase Ni and PGE recoveries.

- Does the mineralisation show up in till geochemistry (Cu, Pd)?

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APPENDICES

1. List of drill holes.
2. Number of analysis, analysis methods, and analysis order numbers.
3. List of polished thin sections.
4. List of bedrock mapping observations in the Lomalampi area.
5. Ni and S-contents in drill core samples exceeding 2500 ppm Ni.
6. Cu-contents in drill core samples exceeding 1000 ppm.
7. Pt-contents in drill core samples exceeding 0.5000 ppm.
8. Pd-contents in drill core samples exceeding 0.2500 ppm.
9. Au-contents in drill core samples exceeding 0.2500 ppm.
10. PGE+Au-contents in drill core samples exceeding 1.0000 ppm.
11. Geophysical ground surveys.
12. Petrophysical laboratory measurements and loggings from drill holes.
13. Location of drill holes.
14. Geological map of the Lomalampi area.

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List of drill holes at the Lomalampi prospect

Hole-ID	*Northing*	*Easting*	*Elev. (Z)*	*Azimuth*	*Dip*	*Length (m)*	*Overburden (m)*
M372304R403	7535789	3496219	270.88	315.00	45.00	77.30	21.70
M372304R404	7535754	3496252	271.47	315.00	45.00	57.10	10.20
M372304R405	7535615	3496394	262.65	315.00	45.00	63.05	7.80
M372304R406	7535570	3496434	264.75	315.00	45.00	82.65	6.50
M372304R407	7535540	3496466	267.81	315.00	45.00	74.90	11.00
M372304R408	7535510	3496501	271.64	315.00	45.00	75.30	4.60
M372304R409	7535473	3496537	273.14	315.00	45.00	54.40	7.60
M372304R410	7535437	3496573	275.49	315.00	45.00	76.80	3.60
M372304R411	7535712	3496287	272.68	315.00	45.00	74.10	2.20
M372306R412	7535850	3496785	273.87	315.00	45.00	92.00	17.65
M372306R413	7535567	3496507	269.96	315.00	45.00	114.80	5.45
M372306R414	7535508	3496503	271.59	315.00	45.00	182.10	2.70
M372306R415	7535438	3496502	272.00	315.00	45.00	275.00	3.90
M372306R416	7535507	3496436	265.97	315.00	45.00	138.15	13.00
M372306R417	7535451	3496348	260.28	315.00	45.00	98.10	5.05
M372307R0418	7535522	3496482	271.00	315.00	45.00	197.30	1.70
M372307R0419	7535586	3496417	262.00	135.00	80.00	154.70	6.80
M372307R0420	7535639	3496363	265.00	135.00	70.00	363.15	4.70
M372307R0421	7535462	3496471	272.00	315.00	45.00	176.40	1.20
M372307R0422	7535477	3496386	261.00	315.00	45.00	113.70	7.90
M372307R0423	7535434	3496428	270.00	315.00	50.00	200.60	1.70
M372307R0424	7535405	3496386	266.00	315.00	45.00	180.50	2.70
M372307R0425	7535423	3496297	259.00	315.00	45.00	91.30	5.50
M372307R0426	7535384	3496336	261.00	315.00	45.00	185.70	4.50
M372307R0427	7535530	3496545	273.00	315.00	45.00	189.40	3.50
M372307R0428	7535551	3496523	273.00	315.00	60.00	165.40	1.70
M372307R0429	7535622	3496523	267.00	315.00	45.00	100.55	9.00
M372307R0430	7535666	3496549	266.00	315.00	45.00	101.40	8.80
M372307R0431	7535697	3496588	268.00	315.00	45.00	86.10	10.50
M372307R0432	7535629	3496586	273.00	315.00	55.00	201.25	3.80
M372308R0433	7535583	3496562	272.35	315.00	45.00	160.15	2.45
M372308R0434	7535664	3496622	272.00	315.00	45.00	142.55	5.90
M372308R0435	7535745	3496610	267.92	315.00	45.00	123.85	8.45
M372308R0436	7535803	3496694	271.00	315.00	45.00	124.20	9.90
M372308R0437	7535931	3496778	270.05	315.00	45.00	120.30	17.50
M372308R0438	7535891	3496753	271.30	315.00	55.00	89.70	12.45
M372308R0439	7535646	3496356	266.05	315.00	45.00	202.95	5.50
M372308R0440	7535561	3495978	265.77	315.00	45.00	157.90	2.90
M372308R0441	7535511	3496026	263.59	315.00	45.00	110.10	7.55
M372308R0442	7535832	3496166	269.02	315.00	45.00	110.20	3.50
M372308R0443	7535951	3496129	260.11	315.00	45.00	114.45	7.45
M372308R0444	7535671	3496614	271.73	315.00	65.00	191.40	5.00
M372308R0445	7535710	3496646	271.03	315.00	65.00	173.20	6.20
M372308R0446	7535760	3496666	270.47	315.00	65.00	113.20	6.55
M372309R447	7536567	3497424	268.00	315.00	45.00	85.50	6.60
M372309R448	7536690	3497160	266.00	315.00	45.00	28.00	23.60
M372309R449	7536670	3497170	266.00	315.00	45.00	33.00	24.40
M372309R450	7536710	3497140	266.00	0.00	90.00	33.10	6.40

Amounts and analysis methods of the Lomalampi drill cores

Hole ID		Ore analyses							Petrological analyses			
	703P	**704P**	**705P**	**714M**	**510P**	**511P**	**522U**	***Laboratory no.***	**175X**	**308M**	**811L**	***Laboratory no.***
	(n)	**(n)**	**(n)**	**(n)**	**(n)**	**(n)**	**(n)**		**(n)**	**(n)**	**(n)**	
37232004R403		26			26			79054	1	1		79054,217782
37232004R404		17			17			79054	3	1		79054,217782
37232004R405	*1*	19				20		90301				
37232004R406		14			14		9	79054,90306				
37232004R407	*1*	32			39		7	91364,90307	13	8	1	90307
37232004R408		32			32		3	79055,90309	2	1		79055
37232004R409		18			18			79055	2	1		79055,217782
37232004R410		13			13			79055		1		217782
37232004R411		4			4		2	79055				
37232006R0412	*2*	6			8			89584	3			89590
37232006R0413	*5*	46			51			89585,203676	4			89590
37232006R0414	*1*	85			86			89586	20	17	8	89590,217782
												217783
37232006R0415		76			76			89587,203675	10	2		89590
37232006R0416		60		15	60			89588,85626	4			89590
37232006R0417	*4*	38			42			89589	3			89590
37232007R0418		62			62			204770	13	13	13	204771,217782
												217783
37232007R0419	*6*	81			87			204772	11	11	11	204773,217782
												217783
37232007R0420	*1*	125			126			204774,216252	32	36	26	204775,216253
												217782,217783
37232007R0421		117			117			204988	11	11	11	204989
37232007R0422	*1*	63			64			204981	2	2	2	204982
37232007R0423		130			130			204983	6	6	6	204984
37232007R0424		117			117			204985	15	15	15	204986
37232007R0425		41			41			204979	2	2	2	204980
37232007R0426		92			92			204977	10	10	10	204978
37232007R0427		122			122			204973	5	5	5	204974
37232007R0428		92			92			204975	4	4	4	204976
37232007R0429		60			60			204781	3	3	3	204782
37232007R0430	*1*	16			17			204778	0	0	0	
37232007R0431		17			17			204776	2	2	2	204777
37232007R0432		62			62			204779	4	4	4	204780
37232008R0433	*1*	104			105			216256	6	6		216257
37232008R0434	*4*	64	1		68			216258	4	4		216259
37232008R0435		28			28			216480	0	0		
37232008R0436		63			63			216481	3	3		216482
37232008R0437		51			51			216483	2	2		216484
37232008R0438		25			25			216486	1	1		216485
37232008R0439		81			81			216254	25	25	15	216255,217783
37232008R0440		99			99			216492	5	5		216251
37232008R0441		54			54			216491	6	6		216251
37232008R0442		23			23			216249	6	6		216251
37232008R0443		14			14			216250	4	4		216251
37232008R0444		126			126			216260	5	5		216261
37232008R0445	*3*	108			111			216489	9	9		216490
37232008R0446		72			72			216487	3	3		216488
37232009R0447		39			39			217946				
37232009R0450		10			10			217947				
Total	**31**	**2644**	**1**	**15**	**2661**	**20**	**21**		**264**	**235**	**138**	

Polished thin sections from drill cores

Drill hole	*Depth*	*Section number*	*Drill hole*	*Depth*	*Section number*
M372304R403	28.20	RO 401130	M372307R0418	29.55	0807950
M372304R403	41.10	RO 401131	M372307R0418	43.45	0807951
M372304R403	52.70	RO 401132	M372307R0418	62.35	0807952
M372304R403	60.20	RO 401133	M372307R0418	94.40	0807953
M372304R403	74.15	RO 401134	M372307R0419	78.30	0807954
M372304R404	14.80	RO 401135	M372307R0419	131.70	0807955
M372304R404	21.75	RO 401136	M372307R0420	97.00	0807956
M372304R404	27.85	RO 401137	M372307R0420	118.00	0807957
M372304R404	34.55	RO 401138	M372307R0420	129.80	0807958
M372304R405	16.95	RO 401139	M372307R0420	149.20	0807959
M372304R405	32.44	RO 401140	M372307R0420	170.90	0807960
M372304R405	35.85	RO 401141	M372307R0420	201.80	0807961
M372304R405	42.15	RO 401142	M372307R0420	305.65	0809522
M372304R405	44.60	RO 401143	M372307R0421	23.25	0807962
M372304R405	46.42	RO 401144	M372307R0421	71.50	0807963
M372304R405	51.65	RO 401145	M372307R0421	72.95	0807964
M372304R405	59.80	RO 401146	M372307R0423	26.60	0807965
M372304R406	6.90	RO 401094	M372307R0423	55.50	0807966
M372304R406	9.75	RO 401095	M372307R0423	56.00	0807967
M372304R406	11.25	RO 401096	M372307R0423	59.70	0807968
M372304R406	13.45	RO 401097	M372307R0423	178.55	0807969
M372304R406	15.95	RO 401098	M372307R0423	189.00	0807970
M372304R406	16.95	RO 401099	M372307R0424	20.85	0807971
M372304R406	20.45	RO 401100	M372307R0424	23.15	0807972
M372304R406	27.85	RO 401101	M372307R0424	41.70	0807973
M372304R406	52.05	RO 401102	M372307R0426	11.80	0807974
M372304R407	17.60	RO 401103	M372307R0426	30.10	0807975
M372304R407	19.55	RO 401104	M372307R0426	67.75	0807976
M372304R407	29.35	RO 401105	M372307R0426	72.25	0807977
M372304R407	38.40	RO 401106	M372307R0426	79.25	0807978
M372304R407	40.30	RO 401107	M372307R0426	124.40	0807979
M372304R407	41.40	RO 401108	M372307R0426	170.50	0807980
M372304R407	47.95	RO 401109	M372307R0427	6.95	0807981
M372304R407	52.65	RO 401110	M372307R0427	26.00	0807982
M372304R407	67.40	RO 401111	M372307R0427	70.95	0807983
M372304R408	13.40	RO 401112	M372307R0427	168.50	0807986
M372304R408	21.90	RO 401113	M372307R0427	114.35	0807984
M372304R408	29.00	RO 401114	M372307R0427	135.50	0807985
M372304R408	54.65	RO 401115	M372307R0428	84.00	0807987
M372304R408	62.05	RO 401116	M372307R0428	95.55	0807988
M372304R408	73.20	RO 401117	M372307R0429	26.35	0807989
M372304R409	24.35	RO 401118	M372307R0429	42.00	0807990
M372304R409	31.15	RO 401119	M372307R0431	60.55	0807991
M372304R409	37.25	RO 401120	M372307R0431	68.95	0807992
M372304R409	41.30	RO 401121	M372307R0432	23.25	0807993
M372304R409	50.80	RO 401122	M372307R0432	68.30	0807994
M372304R410	25.60	RO 401123	M372307R0432	85.35	0807995
M372304R410	27.30	RO 401124	M372307R0432	98.75	0807996

M372304R410	30.90	RO 401125	M372308R0433	78.35	0809523
M372304R410	44.30	RO 401126	M372308R0434	58.95	0809524
M372304R410	56.55	RO 401127	M372308R0440	7.80	0809525
M372304R410	61.50	RO 401128	M372308R0440	38.95	0809526
M372304R410	68.70	RO 401129	M372308R0441	39.45	0809527
M372304R411	7.00	RO 401147	M372308R0441	50.60	0809528
M372304R411	21.95	RO 401148	M372308R0441	68.05	0809529
M372304R411	26.95	RO 401149	M372308R0441	92.25	0809530
M372304R411	33.85	RO 401150	M372308R0442	16.90	0809531
M372304R411	44.20	RO 401151	M372308R0442	20.05	0809532
M372304R411	64.85	RO 401152	M372308R0442	90.25	0809533
M372304R411	72.45	RO 401153	M372308R0442	104.15	0809534
M372306R415	140.20	0706095	M372308R0444	71.60	0809535
M372306R415	154.90	0706096	M372308R0445	51.45	909861
M372306R416	65.90	0706097	M372308R0445	74.8	909863
M372306R416	80.07	0706098	M372308R0445	97.8	909864
			M372308R0445	154.75	909862

Mapping observations in the Lomalampi claims and surrounding area

OBS_ID	*TYPE*	*NORTHING*	*EASTING*
562-PJV-03	PALJASTUMA	7534925	3496041
40-TEM-86	LOHKAREIKKO	7535020	3497320
31-JER-04	RAKKA + PALJASTUMA	7535032	3496489
32-JER-04	PALJASTUMARYHMÄ	7535037	3496405
38-JER-04	RAKKA+ PALJASTUMA	7535040	3496601
554-PJV-03	PALJASTUMA	7535043	3496602
240-MOP-80	PALJASTUMA	7535060	3496450
33-JER-04	PALJASTUMA	7535060	3496460
34-JER-04	PALJASTUMA	7535071	3496410
37-JER-04	PALJASTUMA	7535082	3496536
35-JER-04	PALJASTUMARYHMÄ	7535097	3496507
36-JER-04	RAKKA+ PALJASTUMA	7535105	3496561
39-JER-04	PALJASTUMA	7535108	3496444
318-PJP-82	PALJASTUMA	7535140	3497400
30-JER-04	PALJASTUMA	7535140	3496496
555-PJV-03	PALJASTUMA	7535160	3496555
28-JER-04	RAKKA + PALJASTUMA	7535164	3496557
29-JER-04	PALJASTUMARYHMÄ	7535176	3496538
242-MOP-80	PALJASTUMA	7535220	3496710
560-PJV-03	PALJASTUMA	7535243	3496162
238-MOP-80	LOHKAREIKKO	7535320	3496320
559-PJV-03	PALJASTUMA	7535364	3496360
557-PJV-03	PALJASTUMA	7535407	3496684
237-MOP-80	PALJASTUMA	7535460	3496480
39-TEM-86	PALJASTUMA	7535510	3497200
44-JER-04	LOHKARE	7535525	3496595
38-TEM-86	LOHKAREIKKO	7535560	3497350
218-MOP-80	PALJASTUMA	7535620	3496270
220-MOP-80	PALJASTUMA	7535620	3495900
558-PJV-03	PALJASTUMA	7535640	3496276
563-PJV-03	PALJASTUMA	7535640	3495932
556-PJV-03	PALJASTUMA	7535661	3496822
235-MOP-80	PALJASTUMA	7535670	3496850
43-JER-04	LOHKARE	7535740	3496032
41-JER-04	PALJASTUMARYHMÄ	7535751	3495986
42-JER-04	RAKKA + PALJASTUMA	7535770	3495965
40-JER-04	PALJASTUMA	7535805	3496105
219-MOP-80	PALJASTUMA	7535810	3496100
217-MOP-80	PALJASTUMA	7535850	3496440
23-TEM-85	LOHKAREIKKO	7535860	3496030
22-TEM-85	PALJASTUMA	7535870	3496480
564-PJV-03	PALJASTUMA	7535986	3496080
24-TEM-85	PALJASTUMA	7536070	3496240
2-PJV$-07	LOHKAREIKKO	7536100	3497910
1-PJV$-07	PALJASTUMA	7536120	3497885
3-PJV$-07	LOHKARE	7536161	3497910
25-JER-04	PALJASTUMARYHMÄ	7536166	3497388
18-TEM-85	PALJASTUMARYHMÄ	7536170	3497380
24-JER-04	PALJASTUMARYHMÄ	7536187	3497330
46-JER-04	LOHKAREIKKO	7536198	3495755
70-TEM-83	LOHKAREIKKO	7536250	3495720
23-JER-04	PALJASTUMARYHMÄ	7536297	3497321
216-MOP-80	LOHKARE	7536300	3496660
21-SLK-07	PALJASTUMA	7536355	3496530

26-TEM-85	LOHKAREIKKO	7536420	3496710
349-PJP-82	LOHKAREIKKO	7536540	3496580
214-MOP-80	PALJASTUMA	7536550	3496730
17-TEM-85	LOHKAREIKKO	7536630	3497000
21-TEM-85	LOHKAREIKKO	7536640	3496790
27-JER-04	LOHKARE	7536646	3496790
25-TEM-85	LOHKAREIKKO	7536680	3496800
26-JER-04	LOHKAREIKKO	7536710	3496806
37-TEM-86	LOHKAREIKKO	7536970	3496900
3-JKL-85	LOHKAREIKKO	7537150	3497040
2-JKL-85	LOHKAREIKKO	7537240	3497120

Appendix 5

Ni and S-contents in drill core samples exceeding 2500 ppm Ni

Hole_ID	*SAMPLE*	*From-Depth*	*To_Depth*	*Length*	*NI (ppm)*	*S (ppm)*
M372308R0437	324950	93.05	94.55	1.50	7320.00	79900.00
M372306R413	295844	52.60	54.60	2.00	5500.00	30400.00
M372307R0430	307804	49.50	51.00	1.50	5200.00	45000.00
M372304R407	248616	62.80	63.50	0.70	4840.00	41000.00
M372307R0430	307803	48.00	49.50	1.50	4620.00	40900.00
M372307R0431	307786	61.10	62.60	1.50	3910.00	39500.00
M372308R0437	324942	81.05	82.55	1.50	3900.00	33400.00
M372306R416	295890	45.90	47.90	2.00	3770.00	20500.00
M372307R0431	307787	62.60	64.10	1.50	3630.00	33600.00
M372304R407	247321	48.50	49.50	1.00	3570.00	18700.00
M372307R0430	307800	43.50	45.00	1.50	3500.00	35100.00
M372304R407	247317	45.00	45.90	0.90	3490.00	18900.00
M372307R0431	307788	64.10	65.60	1.50	3460.00	29400.00
M372307R0430	307801	45.00	46.50	1.50	3420.00	31900.00
M372307R0431	307794	73.10	74.60	1.50	3420.00	33800.00
M372304R407	247322	49.50	50.50	1.00	3390.00	17600.00
M372304R407	247318	45.90	46.90	1.00	3370.00	18600.00
M372304R407	247323	50.50	51.50	1.00	3350.00	16400.00
M372304R407	247315	43.40	44.40	1.00	3310.00	15200.00
M372307R0429	309555	51.00	52.50	1.50	3250.00	18500.00
M372307R0431	307791	68.60	70.10	1.50	3240.00	29400.00
M372307R0430	307807	54.00	55.50	1.50	3230.00	23100.00
M372304R407	247320	47.95	48.50	0.55	3160.00	15800.00
M372304R407	247316	44.40	45.00	0.60	3130.00	16200.00
M372308R0437	324947	88.55	90.05	1.50	3110.00	35300.00
M372304R407	247319	46.90	47.80	0.90	3090.00	16400.00
M372304R407	247324	51.50	52.50	1.00	3080.00	15800.00
M372304R407	247327	54.65	55.25	0.60	3070.00	14300.00
M372308R0437	324951	94.55	96.50	1.95	3050.00	34800.00
M372306R416	295893	51.90	53.90	2.00	2980.00	15500.00
M372307R0428	319448	147.25	148.80	1.55	2970.00	12200.00
M372307R0430	307805	51.00	52.50	1.50	2930.00	23200.00
M372306R416	295889	43.90	45.90	2.00	2900.00	14200.00
M372307R0431	307793	71.60	73.10	1.50	2890.00	25400.00
M372307R0430	307802	46.50	48.00	1.50	2880.00	26500.00
M372309R0447	329945	39.90	40.60	0.70	2870.00	20.00
M372307R0418	318562	97.70	99.20	1.50	2860.00	14300.00
M372307R0418	318565	102.20	103.70	1.50	2860.00	16600.00
M372307R0418	318563	99.20	100.70	1.50	2850.00	14700.00
M372307R0431	307792	70.10	71.60	1.50	2850.00	26700.00
M372307R0429	309539	27.00	28.50	1.50	2830.00	16800.00
M372304R407	247314	42.40	43.40	1.00	2820.00	14100.00
M372307R0431	307789	65.60	67.10	1.50	2820.00	24500.00
M372304R407	247328	55.25	56.25	1.00	2810.00	13700.00
M372308R0437	324949	91.55	93.05	1.50	2810.00	32200.00
M372306R416	295892	49.90	51.90	2.00	2780.00	15500.00
M372304R407	247325	52.65	53.65	1.00	2760.00	13200.00
M372307R0418	318549	78.20	79.70	1.50	2760.00	11500.00
M372307R0429	309550	43.50	45.00	1.50	2740.00	14400.00

M372306R416	295891	47.90	49.90	2.00	2720.00	14700.00
M372307R0429	309542	31.50	33.00	1.50	2720.00	14000.00
M372307R0431	307790	67.10	68.60	1.50	2720.00	25200.00
M372306R413	295846	56.60	58.60	2.00	2690.00	13700.00
M372307R0418	318564	100.70	102.20	1.50	2680.00	15100.00
M372307R0419	308671	70.80	72.30	1.50	2680.00	16100.00
M372308R0444	325135	149.65	151.15	1.50	2680.00	12300.00
M372307R0429	309554	49.50	51.00	1.50	2670.00	14000.00
M372307R0426	319644	121.00	122.50	1.50	2660.00	8580.00
M372307R0430	307806	52.50	54.00	1.50	2600.00	18800.00
M372308R0435	325174	56.95	58.85	1.90	2580.00	23800.00
M372304R407	247326	53.65	54.65	1.00	2560.00	12600.00
M372307R0429	309538	25.50	27.00	1.50	2560.00	15500.00
M372308R0434	325347	106.60	108.10	1.50	2560.00	12800.00
M372306R413	295845	54.60	56.60	2.00	2550.00	12300.00
M372307R0429	309553	48.00	49.50	1.50	2550.00	13300.00
M372304R406	278146	13.45	15.45	2.00	2520.00	12600.00
M372308R0445	327021	146.70	148.20	1.50	2500.00	11100.00

Appendix 6

Cu-contents in drill core samples exceeding 1000 ppm

Hole_ID	*SAMPLE*	*From-Depth*	*To_Depth*	*Length*	*CU (ppm)*
M372308R0437	324950	93.05	94.55	1.50	8650.00
M372308R0440	327170	124.90	126.40	1.50	5450.00
M372308R0435	325176	61.05	62.65	1.60	4240.00
M372307R0427	318617	28.10	29.60	1.50	4000.00
M372307R0430	307804	49.50	51.00	1.50	3850.00
M372307R0419	308665	61.80	63.30	1.50	3710.00
M372307R0430	307803	48.00	49.50	1.50	3080.00
M372308R0444	325076	61.65	63.15	1.50	3040.00
M372308R0435	325163	40.25	42.20	1.95	3030.00
M372304R406	248613	59.20	60.20	1.00	3010.00
M372307R0430	307800	43.50	45.00	1.50	2460.00
M372307R0424	321208	163.20	164.70	1.50	2430.00
M372307R0431	307792	70.10	71.60	1.50	2380.00
M372308R0441	327076	85.50	87.00	1.50	2230.00
M372307R0419	308671	70.80	72.30	1.50	2210.00
M372307R0424	321164	97.20	98.70	1.50	2210.00
M372304R407	248616	62.80	63.50	0.70	2180.00
M372307R0431	307791	68.60	70.10	1.50	2180.00
M372307R0427	318618	29.60	31.10	1.50	2170.00
M372307R0431	307794	73.10	74.60	1.50	2160.00
M372307R0431	307788	64.10	65.60	1.50	2050.00
M372308R0446	327445	70.10	71.60	1.50	2020.00
M372307R0431	307787	62.60	64.10	1.50	1980.00
M372307R0424	321125	38.70	40.20	1.50	1970.00
M372307R0429	309569	73.00	74.50	1.50	1950.00
M372307R0427	318656	86.60	88.10	1.50	1930.00
M372307R0430	307802	46.50	48.00	1.50	1900.00
M372308R0437	324942	81.05	82.55	1.50	1870.00
M372308R0445	327035	167.70	169.20	1.50	1870.00
M372308R0437	324928	56.05	57.55	1.50	1840.00
M372307R0424	321161	92.70	94.20	1.50	1800.00
M372308R0441	327077	87.00	88.50	1.50	1800.00
M372306R416	295912	89.85	91.80	1.95	1770.00
M372307R0419	308640	9.65	10.75	1.10	1770.00
M372307R0430	307805	51.00	52.50	1.50	1770.00
M372307R0431	307786	61.10	62.60	1.50	1760.00
M372308R0433	324710	74.50	76.00	1.50	1750.00
M372308R0444	325141	158.65	160.15	1.50	1740.00
M372307R0431	307789	65.60	67.10	1.50	1720.00
M372304R407	247330	57.20	57.75	0.55	1680.00
M372307R0431	307790	67.10	68.60	1.50	1660.00
M372306R413	295851	66.60	68.60	2.00	1640.00
M372307R0430	307801	45.00	46.50	1.50	1640.00
M372304R407	247318	45.90	46.90	1.00	1630.00
M372306R416	295890	45.90	47.90	2.00	1620.00
M372307R0431	307793	71.60	73.10	1.50	1620.00
M372307R0429	309536	22.50	24.00	1.50	1580.00
M372307R0430	307807	54.00	55.50	1.50	1560.00
M372304R407	247320	47.95	48.50	0.55	1540.00

M372308R0445	326990	100.20	101.70	1.50	1530.00
M372307R0429	309555	51.00	52.50	1.50	1490.00
M372306R413	295848	60.60	62.60	2.00	1460.00
M372307R0429	309538	25.50	27.00	1.50	1450.00
M372308R0437	324931	60.55	62.05	1.50	1430.00
M372308R0437	324946	87.05	88.55	1.50	1400.00
M372307R0422	318745	17.65	19.15	1.50	1380.00
M372307R0429	309537	24.00	25.50	1.50	1380.00
M372304R407	247321	48.50	49.50	1.00	1360.00
M372307R0427	318657	88.10	89.60	1.50	1350.00
M372308R0437	324939	77.10	78.60	1.50	1340.00
M372307R0429	309551	45.00	46.50	1.50	1330.00
M372307R0429	309572	77.50	79.00	1.50	1320.00
M372307R0419	308686	93.30	94.80	1.50	1310.00
M372306R416	295892	49.90	51.90	2.00	1290.00
M372307R0427	318616	26.60	28.10	1.50	1290.00
M372307R0432	309847	104.40	105.90	1.50	1270.00
M372304R407	247322	49.50	50.50	1.00	1240.00
M372307R0421	315108	88.50	90.00	1.50	1240.00
M372307R0432	309879	151.80	153.30	1.50	1240.00
M372307R0432	309868	135.90	137.40	1.50	1230.00
M372308R0437	324941	79.60	81.05	1.45	1230.00
M372306R416	295913	91.80	93.80	2.00	1220.00
M372307R0429	309540	28.50	30.00	1.50	1220.00
M372308R0433	324755	142.00	143.50	1.50	1220.00
M372307R0429	309539	27.00	28.50	1.50	1210.00
M372307R0432	309877	148.80	150.30	1.50	1210.00
M372308R0435	325174	56.95	58.85	1.90	1210.00
M372306R413	295847	58.60	60.60	2.00	1190.00
M372306R416	295893	51.90	53.90	2.00	1190.00
M372307R0432	309848	105.90	107.40	1.50	1180.00
M372307R0429	309554	49.50	51.00	1.50	1160.00
M372304R407	247311	39.40	40.40	1.00	1150.00
M372304R407	247317	45.00	45.90	0.90	1150.00
M372304R407	247316	44.40	45.00	0.60	1140.00
M372307R0429	309571	76.00	77.50	1.50	1140.00
M372307R0426	319669	159.10	161.15	2.05	1130.00
M372307R0424	321163	95.70	97.20	1.50	1110.00
M372308R0444	325120	127.15	128.65	1.50	1110.00
M372308R0445	327034	166.20	167.70	1.50	1100.00
M372307R0424	321174	112.20	113.70	1.50	1090.00
M372304R407	247314	42.40	43.40	1.00	1080.00
M372306R413	295844	52.60	54.60	2.00	1080.00
M372306R416	295891	47.90	49.90	2.00	1080.00
M372307R0418	318546	73.70	75.20	1.50	1080.00
M372307R0424	321162	94.20	95.70	1.50	1080.00
M372307R0430	307806	52.50	54.00	1.50	1070.00
M372308R0434	325347	106.60	108.10	1.50	1070.00
M372307R0420	325420	331.60	333.10	1.50	1060.00
M372307R0432	309855	116.40	117.90	1.50	1060.00
M372308R0434	325349	109.60	111.10	1.50	1060.00
M372308R0437	324949	91.55	93.05	1.50	1060.00
M372307R0432	309854	114.90	116.40	1.50	1050.00

M372307R0423	320600	89.30	90.80	1.50	1040.00
M372308R0437	324951	94.55	96.50	1.95	1040.00
M372308R0439	324798	76.80	78.30	1.50	1040.00
M372307R0418	318558	91.70	93.20	1.50	1030.00
M372307R0431	307799	80.60	82.10	1.50	1030.00
M372308R0440	327105	27.35	28.85	1.50	1030.00
M372304R407	247323	50.50	51.50	1.00	1020.00
M372304R407	247324	51.50	52.50	1.00	1020.00
M372307R0428	319455	158.35	158.80	0.45	1020.00
M372308R0445	327021	146.70	148.20	1.50	1020.00
M372307R0432	309867	134.40	135.90	1.50	1010.00
M372307R0432	309873	142.80	144.30	1.50	1010.00

Appendix 7

Pt-contents in drill core samples exceeding 0.5000 ppm

Hole_ID	*SAMPLE*	*From_Depth*	*To_Depth*	*Length*	*PT (ppm)*
M372306R416	295890	45.90	47.90	2.00	1.3400
M372307R0418	318564	100.70	102.20	1.50	1.1200
M372304R407	247318	45.90	46.90	1.00	1.1100
M372307R0418	318565	102.20	103.70	1.50	1.0100
M372304R407	247317	45.00	45.90	0.90	0.9800
M372307R0429	309538	25.50	27.00	1.50	0.9730
M372307R0418	318563	99.20	100.70	1.50	0.9670
M372304R407	247316	44.40	45.00	0.60	0.9620
M372307R0430	307804	49.50	51.00	1.50	0.9470
M372306R416	295891	47.90	49.90	2.00	0.9390
M372307R0431	307791	68.60	70.10	1.50	0.9340
M372307R0418	318562	97.70	99.20	1.50	0.8890
M372306R413	295844	52.60	54.60	2.00	0.8780
M372306R416	295891	47.90	49.90	2.00	0.8720
M372304R407	264922	41.25	41.40	0.15	0.8680
M372307R0429	309537	24.00	25.50	1.50	0.8230
M372307R0431	307793	71.60	73.10	1.50	0.8220
M372304R407	247315	43.40	44.40	1.00	0.8190
M372307R0430	307803	48.00	49.50	1.50	0.8020
M372306R416	295889	43.90	45.90	2.00	0.7940
M372306R416	295889	43.90	45.90	2.00	0.7790
M372307R0429	309539	27.00	28.50	1.50	0.7620
M372304R407	247322	49.50	50.50	1.00	0.7560
M372306R416	295892	49.90	51.90	2.00	0.7420
M372306R416	295892	49.90	51.90	2.00	0.7320
M372307R0429	309540	28.50	30.00	1.50	0.7240
M372304R407	247321	48.50	49.50	1.00	0.7130
M372304R407	247327	54.65	55.25	0.60	0.7100
M372307R0431	307794	73.10	74.60	1.50	0.7020
M372306R413	295846	56.60	58.60	2.00	0.7010
M372307R0429	309536	22.50	24.00	1.50	0.6950
M372304R407	247324	51.50	52.50	1.00	0.6910
M372304R407	247314	42.40	43.40	1.00	0.6850
M372304R407	247319	46.90	47.80	0.90	0.6810
M372307R0430	307800	43.50	45.00	1.50	0.6810
M372307R0431	307792	70.10	71.60	1.50	0.6800
M372307R0427	318697	148.10	149.60	1.50	0.6700
M372306R416	295893	51.90	53.90	2.00	0.6680
M372307R0418	318566	103.70	105.20	1.50	0.6570
M372307R0431	307784	58.10	59.60	1.50	0.6540
M372304R407	247323	50.50	51.50	1.00	0.6450
M372304R407	247313	41.40	42.40	1.00	0.6350
M372306R413	295849	62.60	64.60	2.00	0.6250
M372307R0418	318544	70.70	72.20	1.50	0.6210
M372307R0418	318549	78.20	79.70	1.50	0.6190
M372308R0444	325122	130.15	131.65	1.50	0.6180
M372307R0428	319448	147.25	148.80	1.55	0.6140
M372304R407	247320	47.95	48.50	0.55	0.6110
M372304R407	264924	52.50	52.65	0.15	0.6080

M372306R413	295848	60.60	62.60	2.00	0.5950
M372307R0429	309542	31.50	33.00	1.50	0.5740
M372307R0418	318546	73.70	75.20	1.50	0.5720
M372308R0434	325346	105.10	106.60	1.50	0.5680
M372307R0432	309846	102.90	104.40	1.50	0.5570
M372306R413	296480	50.60	52.60	2.00	0.5560
M372306R413	295850	64.60	66.60	2.00	0.5520
M372307R0427	318699	151.10	152.60	1.50	0.5490
M372308R0444	325119	125.65	127.15	1.50	0.5480
M372308R0437	324950	93.05	94.55	1.50	0.5460
M372308R0444	325118	124.15	125.65	1.50	0.5460
M372307R0428	319443	139.65	141.15	1.50	0.5280
M372306R413	295845	54.60	56.60	2.00	0.5230
M372308R0433	324725	97.00	98.50	1.50	0.5230
M372308R0444	325124	133.15	134.65	1.50	0.5210
M372306R416	295893	51.90	53.90	2.00	0.5180
M372307R0418	318571	111.20	112.70	1.50	0.5090
M372307R0429	309541	30.00	31.50	1.50	0.5080
M372307R0418	318547	75.20	76.70	1.50	0.5070
M372307R0430	307802	46.50	48.00	1.50	0.5060
M372308R0434	325347	106.60	108.10	1.50	0.5020

Appendix 8

Pd-contents in drill core samples exceeding 0.2500 ppm

Hole_ID	*SAMPLE*	*From_Depth*	*To_Depth*	*Length*	*PD (ppm)*
M372306R416	295890	45.90	47.90	2.00	0.6710
M372306R413	295844	52.60	54.60	2.00	0.6120
M372304R407	247317	45.00	45.90	0.90	0.5560
M372307R0418	318563	99.20	100.70	1.50	0.5150
M372307R0418	318564	100.70	102.20	1.50	0.4980
M372307R0418	318565	102.20	103.70	1.50	0.4940
M372308R0433	324755	142.00	143.50	1.50	0.4800
M372307R0418	318562	97.70	99.20	1.50	0.4780
M372304R407	247318	45.90	46.90	1.00	0.4760
M372304R407	247316	44.40	45.00	0.60	0.4660
M372307R0429	309538	25.50	27.00	1.50	0.4400
M372306R416	295889	43.90	45.90	2.00	0.4290
M372306R416	295891	47.90	49.90	2.00	0.4270
M372306R416	295889	43.90	45.90	2.00	0.4100
M372304R407	247315	43.40	44.40	1.00	0.4080
M372306R416	295891	47.90	49.90	2.00	0.4000
M372307R0430	307804	49.50	51.00	1.50	0.3850
M372307R0429	309537	24.00	25.50	1.50	0.3800
M372306R416	295892	49.90	51.90	2.00	0.3750
M372307R0429	309539	27.00	28.50	1.50	0.3740
M372306R416	295892	49.90	51.90	2.00	0.3740
M372304R407	247322	49.50	50.50	1.00	0.3650
M372304R407	247314	42.40	43.40	1.00	0.3460
M372304R407	247321	48.50	49.50	1.00	0.3450
M372304R407	247319	46.90	47.80	0.90	0.3440
M372307R0431	307791	68.60	70.10	1.50	0.3350
M372307R0429	309540	28.50	30.00	1.50	0.3320
M372304R407	247324	51.50	52.50	1.00	0.3320
M372307R0428	319448	147.25	148.80	1.55	0.3320
M372306R416	295893	51.90	53.90	2.00	0.3300
M372307R0431	307793	71.60	73.10	1.50	0.3180
M372307R0430	307803	48.00	49.50	1.50	0.3130
M372304R407	247320	47.95	48.50	0.55	0.3130
M372304R407	247327	54.65	55.25	0.60	0.3070
M372307R0418	318566	103.70	105.20	1.50	0.3070
M372307R0427	318697	148.10	149.60	1.50	0.3050
M372307R0418	318549	78.20	79.70	1.50	0.3050
M372307R0431	307792	70.10	71.60	1.50	0.3020
M372308R0444	325118	124.15	125.65	1.50	0.3010
M372304R407	247323	50.50	51.50	1.00	0.2980
M372307R0429	309536	22.50	24.00	1.50	0.2960
M372306R413	295846	56.60	58.60	2.00	0.2940
M372307R0418	318544	70.70	72.20	1.50	0.2930
M372304R407	247313	41.40	42.40	1.00	0.2850
M372304R407	264922	41.25	41.40	0.15	0.2790
M372306R413	295848	60.60	62.60	2.00	0.2750
M372307R0428	319443	139.65	141.15	1.50	0.2750
M372308R0444	325119	125.65	127.15	1.50	0.2700
M372308R0434	325346	105.10	106.60	1.50	0.2670

M372306R416	295893	51.90	53.90	2.00	0.2650
M372308R0444	325122	130.15	131.65	1.50	0.2550
M372307R0418	318547	75.20	76.70	1.50	0.2550
M372306R413	296480	50.60	52.60	2.00	0.2540
M372308R0433	324725	97.00	98.50	1.50	0.2540
M372306R413	295849	62.60	64.60	2.00	0.2530
M372308R0441	327068	73.50	75.00	1.50	0.2500

Appendix 9

Au-contents in drill core samples exceeding 0.2500 ppm

Hole_ID	*SAMPLE*	*From_Depth*	*To_Depth*	*Length*	*AU (ppm)*
M372307R0427	318617	28.10	29.60	1.50	3.4000
M372307R0418	318573	114.20	115.70	1.50	2.1400
M372308R0433	324718	86.50	88.00	1.50	1.2300
M372307R0418	318560	94.70	96.20	1.50	1.2200
M372307R0432	309846	102.90	104.40	1.50	0.9020
M372307R0427	318616	26.60	28.10	1.50	0.8850
M372307R0418	318563	99.20	100.70	1.50	0.8740
M372307R0429	309547	39.00	40.50	1.50	0.7220
M372308R0437	324950	93.05	94.55	1.50	0.6440
M372307R0425	315172	35.30	36.80	1.50	0.6310
M372308R0445	326976	79.20	80.70	1.50	0.5500
M372308R0444	325106	106.15	107.65	1.50	0.5400
M372304R406	278142	6.90	8.00	1.10	0.5150
M372307R0428	319448	147.25	148.80	1.55	0.5100
M372307R0419	308669	67.80	69.30	1.50	0.5080
M372307R0430	307800	43.50	45.00	1.50	0.4740
M372307R0418	318546	73.70	75.20	1.50	0.4600
M372307R0432	309840	93.90	95.40	1.50	0.4520
M372308R0435	325175	58.85	61.05	2.20	0.3790
M372308R0434	325317	49.65	51.15	1.50	0.3530
M372308R0445	326962	58.20	59.70	1.50	0.3470
M372308R0436	325010	93.20	94.70	1.50	0.3440
M372307R0419	308660	54.30	55.80	1.50	0.3310
M372306R416	295884	33.85	35.75	1.90	0.3300
M372307R0423	320643	153.60	155.10	1.50	0.3240
M372307R0419	308683	88.80	90.30	1.50	0.3180
M372307R0422	318745	17.65	19.15	1.50	0.3070
M372308R0444	325076	61.65	63.15	1.50	0.3070
M372307R0418	318547	75.20	76.70	1.50	0.2970
M372307R0431	307784	58.10	59.60	1.50	0.2960
M372307R0428	319447	145.75	147.25	1.50	0.2900
M372307R0427	318618	29.60	31.10	1.50	0.2850
M372307R0429	309569	73.00	74.50	1.50	0.2820
M372307R0431	307794	73.10	74.60	1.50	0.2790
M372307R0419	308668	66.30	67.80	1.50	0.2720
M372306R413	295844	52.60	54.60	2.00	0.2710
M372307R0430	307804	49.50	51.00	1.50	0.2670
M372307R0430	307803	48.00	49.50	1.50	0.2660
M372308R0445	327019	143.70	145.20	1.50	0.2640
M372307R0429	309537	24.00	25.50	1.50	0.2610
M372307R0419	308680	84.30	85.80	1.50	0.2510

PGE+Au-contents in drill core samples exceeding 1.0000 ppm

Hole_ID	*SAMPLE*	*From_Depth*	*To_Depth*	*Length*	*PGE+Au (ppm)*
M372307R0427	318617	28.10	29.60	1.50	3.6100
M372307R0418	318563	99.20	100.70	1.50	2.3560
M372307R0418	318573	114.20	115.70	1.50	2.2890
M372306R416	295890	45.90	47.90	2.00	2.1580
M372307R0418	318560	94.70	96.20	1.50	1.8730
M372307R0418	318564	100.70	102.20	1.50	1.8150
M372306R413	295844	52.60	54.60	2.00	1.7610
M372307R0418	318565	102.20	103.70	1.50	1.6710
M372304R407	247318	45.90	46.90	1.00	1.6390
M372307R0432	309846	102.90	104.40	1.50	1.6390
M372304R407	247317	45.00	45.90	0.90	1.6050
M372307R0418	318562	97.70	99.20	1.50	1.6050
M372307R0430	307804	49.50	51.00	1.50	1.5990
M372306R416	295891	47.90	49.90	2.00	1.5840
M372307R0429	309538	25.50	27.00	1.50	1.5670
M372304R407	247316	44.40	45.00	0.60	1.5350
M372307R0429	309537	24.00	25.50	1.50	1.4640
M372307R0428	319448	147.25	148.80	1.55	1.4560
M372307R0431	307791	68.60	70.10	1.50	1.4280
M372308R0437	324950	93.05	94.55	1.50	1.4210
M372307R0430	307803	48.00	49.50	1.50	1.3810
M372307R0430	307800	43.50	45.00	1.50	1.3680
M372306R416	295891	47.90	49.90	2.00	1.3600
M372304R407	247322	49.50	50.50	1.00	1.3100
M372308R0433	324718	86.50	88.00	1.50	1.3040
M372307R0418	318546	73.70	75.20	1.50	1.2760
M372306R416	295892	49.90	51.90	2.00	1.2720
M372306R416	295889	43.90	45.90	2.00	1.2600
M372307R0431	307793	71.60	73.10	1.50	1.2490
M372304R407	247315	43.40	44.40	1.00	1.2460
M372307R0431	307794	73.10	74.60	1.50	1.2250
M372306R413	295846	56.60	58.60	2.00	1.2240
M372306R416	295889	43.90	45.90	2.00	1.2179
M372304R407	264922	41.25	41.40	0.15	1.1850
M372306R416	295892	49.90	51.90	2.00	1.1830
M372307R0429	309539	27.00	28.50	1.50	1.1510
M372307R0431	307784	58.10	59.60	1.50	1.1470
M372304R407	247327	54.65	55.25	0.60	1.1170
M372304R407	247321	48.50	49.50	1.00	1.1110
M372304R407	247324	51.50	52.50	1.00	1.1070
M372307R0429	309540	28.50	30.00	1.50	1.0980
M372307R0418	318566	103.70	105.20	1.50	1.0840
M372307R0429	309536	22.50	24.00	1.50	1.0790
M372307R0431	307792	70.10	71.60	1.50	1.0670
M372307R0418	318547	75.20	76.70	1.50	1.0590
M372307R0427	318697	148.10	149.60	1.50	1.0530
M372304R407	247314	42.40	43.40	1.00	1.0520
M372308R0444	325122	130.15	131.65	1.50	1.0480
M372307R0418	318549	78.20	79.70	1.50	1.0460

M372306R413	295849	62.60	64.60	2.00	1.0450
M372304R407	247319	46.90	47.80	0.90	1.0400
M372306R416	295893	51.90	53.90	2.00	1.0382
M372304R407	264924	52.50	52.65	0.15	1.0250
M372304R407	247323	50.50	51.50	1.00	1.0130

Appendix 11

Geophysical ground surveys / Data included to the report

MAGNETIC

Data files:	03mg372311_1.xyz, 03mg372311_2.xyz 07mg372311_1.xyz
Equipment:	Proton magnetometer
Area:	~15.5 km^2
Line direction:	NW-SE
Line spacing	100m/50m
Point separation:	10m

VLF-R

Data files:	03vr372311_1.xyz, 03vr372311_2.xyz 07vr372311_1.xyz
Equipment:	Geonics EM16R
VLF-R station:	DHO38 23.4 kHz
Area:	~15.5 km^2
Line direction:	NW-SE
Line spacing	100m/50m
Point separation:	20m/10m

IP

Data files:	07ip372311.xyz
Equipment:	Scintrex IPR-12
Array:	Pole-dipole (a=10m, n=1-8)
Area:	6 profiles
Line direction:	NW-SE
Point separation:	10 m

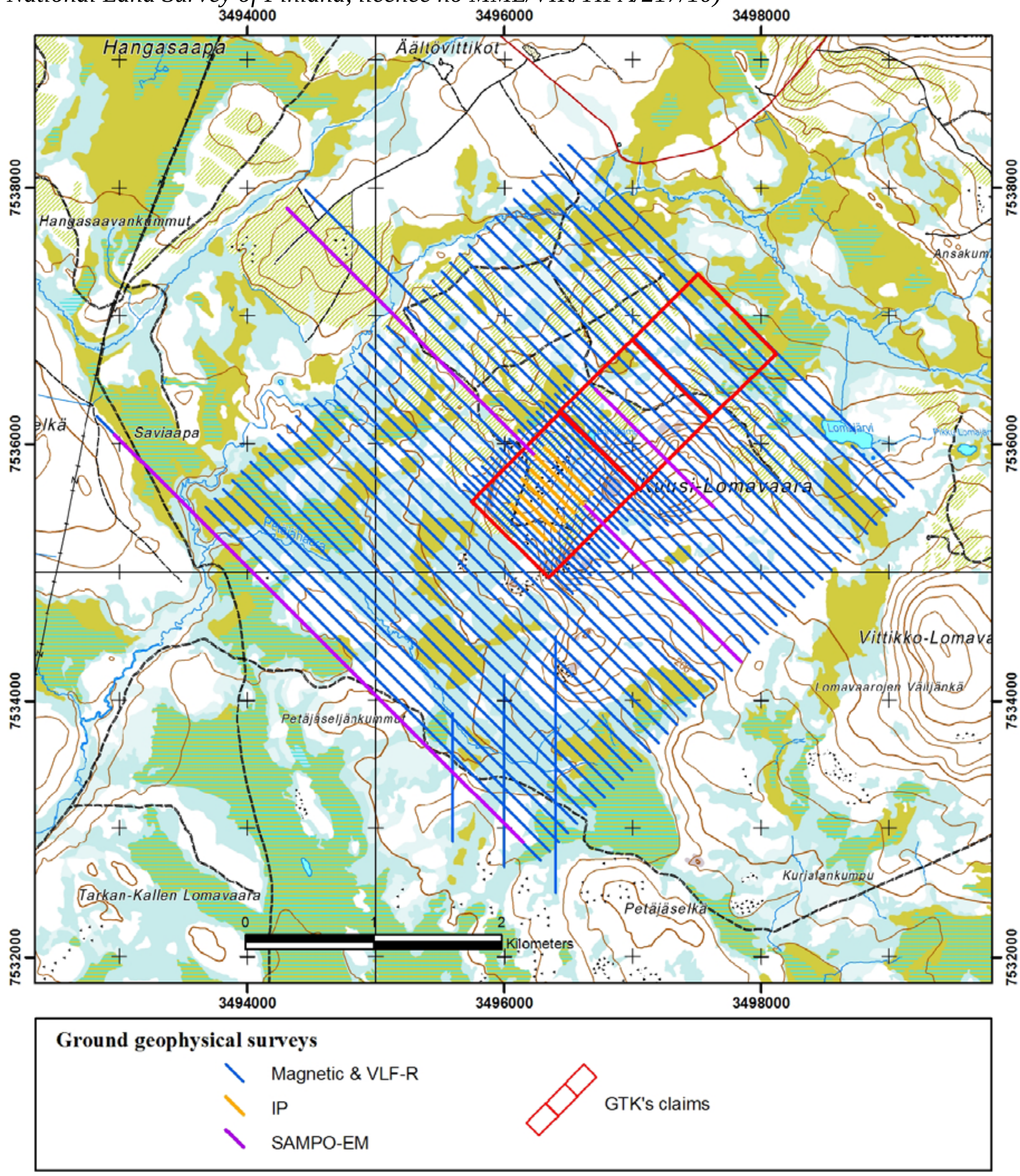
SAMPO-EM (Gefinex 400 S)

Data files:	Line_1.sam, Line_1.gdb Line_2.sam, Line_2.gdb Line_3.sam, Line_3.gdb
Equipment:	Gefinex 400 S
Area:	3 profiles
Line direction:	NW-SE
Transmitter:	50x50 m coil
Coil separation:	400 m
Point separation:	100 m

Summary table of geophysical ground measurements included to report

	points	***line_km***	***Extent***
Magnetic	18982	187.4	~15.5 km^2
EM; VLF-R	11829	180.3	~15.5 km^2
IP	280	2.74	6 profiles
SAMPO-EM	111	10.80	3 profiles

Index map of ground geophysical data included to report in Lomalampi study area. (Basemaps: © National Land Survey of Finland, licence no MML/VIR/TIPA/217/10)



Petrophysical laboratory measurements and loggings from drill holes
Data included to report

Number of petrophysical laboratory measurements and loggings from drill holes in Lomalampi.

Drill hole	*From depth [m]*	*To depth [m]*	*DSR Count*
M372304R403	22	77	56
M372304R404	11	57	47
M372304R405	8	63	56
M372304R406	7	82	76
M372304R407	16	74	59
M372304R408	5	75	70
M372304R409	14	54	40
M372304R410	4	76	70
M372304R411	3	74	71
M372306R412	19	92	74
M372306R413	8	114	105
M372306R414	4	182	179
M372306R415	10	275	263
M372306R416	19	138	120
M372306R417	7	98	77
M372307R0419	10	154	144
M372307R0420	5	363	358
M372307R0421	2	176	175
M372307R0422	8	113	102
M372307R0423	2	200	198
M372307R0424	4	180	177
M372307R0425	6	91	81
M372307R0426	5	185	179
M372307R0427	6	189	184
M372307R0428	2	165	164
M372307R0429	10	100	90
M372307R0430	9	101	90
M372307R0431	11	86	76
M372307R0432	4	201	197
M372308R0433	3	160	158
M372308R0434	6	142	136
M372308R0435	9	123	115
M372308R0436	9	124	114
M372308R0437	20	120	93
M372308R0438	13	89	71
M372308R0439	6	202	197
M372308R0440	3	157	154
M372308R0441	8	110	103
M372308R0442	4	110	107
M372308R0443	8	114	105
M372308R0444	5	191	187
M372308R0445	7	173	166
M372308R0446	7	113	107
M372309R0447	7	85	62
M372309R0450	7	33	18
		TOTAL	***5471***

DSR = Laboratory measurements, sampling interval ~1m ; density D [kg/m^3], susceptibility K [10^{-6} SI] and remanence J [mA/m].

Number of petrophysical loggings from drill holes in Lomalampi.

Drill hole	***From depth [m]***	***To depth [m]***	***LOG Count***
M372304R404	3.70	55.40	491
M372304R405	3.70	60.30	567
M372304R406	3.70	81.10	770
M372304R407	3.70	73.10	693
M372304R408	3.70	73.30	694
M372304R409	3.70	52.00	484
M372304R410	3.70	74.80	712
M372304R411	3.70	71.30	671
		TOTAL	***5082***

LOG = Loggings, logging interval ~0.01m;

D = Density [kg/m^3]
K = Susceptibility [10^{-6} SI]
M = Chargeability [%]
R = Apparent resistivity [Ωm]
TOT = Total gamma radiation [μR/h]
Depth [m]

Number of gamma spectrometry loggings from drill holes in Lomalampi.

Drill hole	***From depth [m]***	***To depth [m]***	***KUT Count***
M372304R404	1.00	56.89	286
M372304R405	8.06	61.52	325
M372304R406	1.00	82.74	424
M372304R407	0.63	74.73	739
M372304R408	0.72	75.05	391
M372304R409	0.21	54.56	286
M372304R410	1.00	76.86	396
M372304R411	1.00	73.32	398
		TOTAL	***3245***

KUT = Gamma spectrometry loggings (K = Potassium, U = Uranium, T = Thorium), logging interval ~0.20 m;

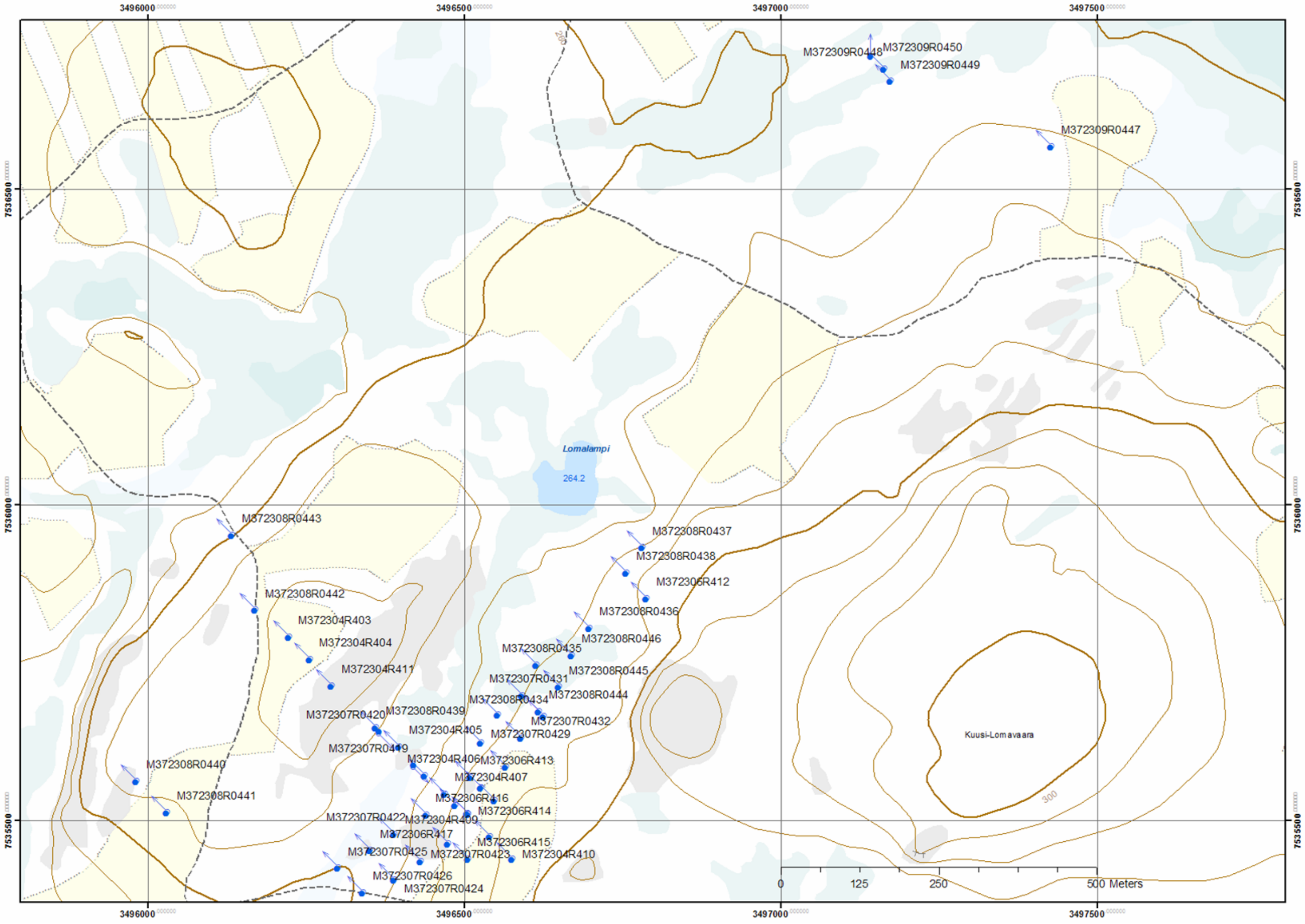
K = Potassium [%]
U = Uranium [ppm]
Th = Thorium [ppm]
Depth [m]

Drill hole videos in Lomalampi.

Drill hole	***To depth [m]***
M372304R404	55.16
M372304R405	61.82
M372304R406	82.73
M372304R407	55.26
M372304R408	75.75
M372304R409	54.13
M372304R410	76.33
M372304R411	73.00

Appendix 13

Location of the drill holes. (Basemaps: © National Land Survey of Finland, licence no MML/VIR/TIPA/217/10)



Appendix 14

Schematic geological map of the Lomalampi area, (P. Heikura). (Basemaps: © National Land Survey of Finland, licence no MML/VIR/TIPA/217/10)