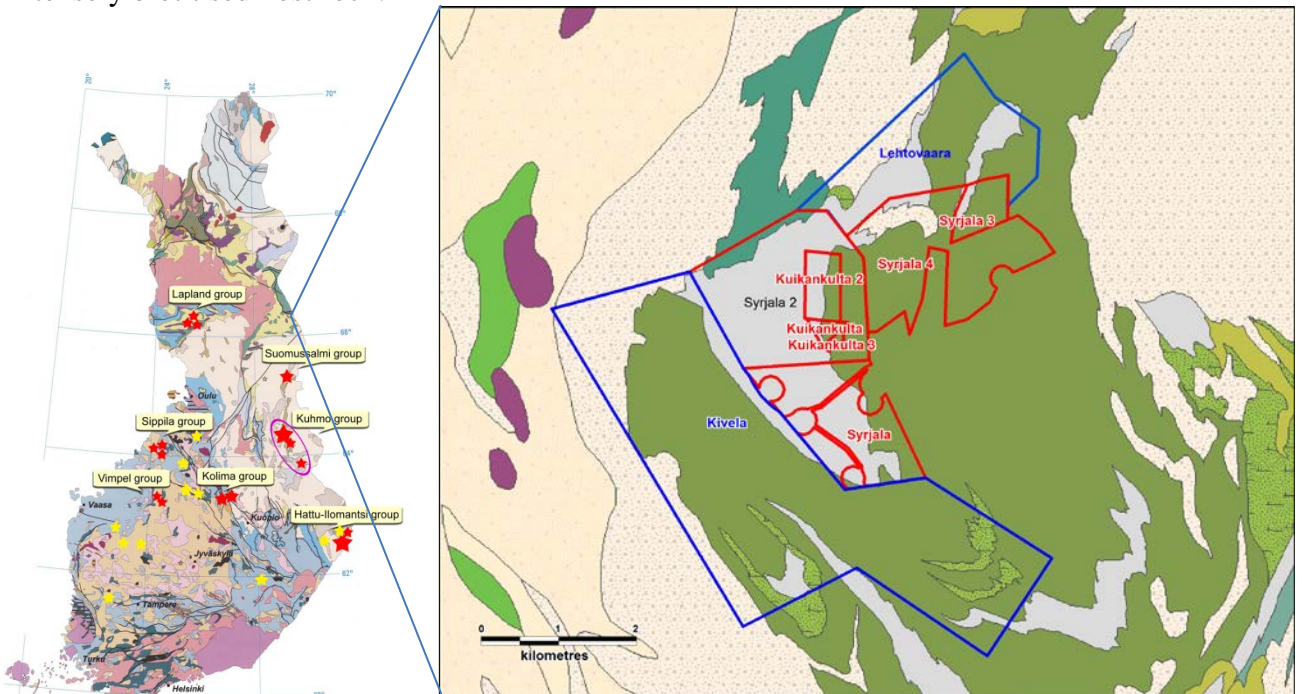


Kuikka, Finland

Property location

The Kiannanniemi gold prospects are located in the southern part of Suomussalmi greenstone belt, eastern Finland, on the northwestern side of Lake Kiantajarvi. The nearest railway station and communal centre, Suomussalmi, is about 40 km south of the Kiannanniemi Au prospect area.

The Kiannanniemi gold prospects are associated with altered shear zones in Archaean intermediate and mafic metavolcanics in the southern part of the Suomussalmi greenstone belt. The most prominent occurrence, Kuikka, is a 1 km long and 15-30 m. It is an Archaean orogenic gold deposit in tholeiitic metabasalt in a second-order, NNW-trending, lithology-parallel, ductile shear zone. Alteration mineral assemblages (biotite-calcite) indicate mineralisation under amphibolite-facies conditions. Coarse, free native gold in quartz veins and their immediate, intensely biotitised host rock.



Exploration history

The Geological Survey of Finland launched a research and exploration project 'Archaean Terranes in eastern Finland' in 1992 building on geological work carried out in the Late Archaean Kuhmo-Suomussalmi greenstone belt over several years prior to 1992. The main task of the project, in addition to geological mapping, was to explore for nickel and gold by using geological, geophysical and geochemical methods. Gold exploration in Kiannanniemi started in 1995, when boulders and weathered bedrock with high Au contents were found and high concentrations of Au, As and Te were analysed in the till/bedrock interface in the area. Prospecting and diamond drillings were directed to four Au targets, of which three targets were drilled at several stages during the years 1996-1999.

Geological outline

The Late Archaean Suomussalmi greenstone belt, eastern Finland, is surrounded by Middle to Late Archaean tonalite-trondhjemite gneisses and migmatites (Luukkonen 1991). The belt is roughly N-S trending, up to 10 km wide, and about 60 km long (Fig . 9) . The main rock types in the Kiannanniemi area are basic and intermediate volcanics with minor ultramafic units. In the Kuikkapuro prospect area the main rock type is tholeiitic lava, and the gold mineralization is in a 10 to 30 m wide folded alteration zone with quartz and biotite as the main minerals. In the area agglomerates area and volcanic breccias accompany basalts and the mineralisation occurs in narrow mylonitic alteration zones with biotite and quartz. The rocks have been folded and foliated with a strong lineation plunging east and northeast. Northwest and southwest trending shear zones and joints cut the axial plane foliation and the mineralized zones. These may be associated with emplacement of Proterozoic dolerite dikes.

The Kuikka Gold Mineralization

The main rock types of the Kuikka gold mineralization consist of fine to medium grained mafic volcanic rocks, in the eastern part of the study area and previously discussed alteration zones towards the west. The mafic volcanic rocks occasionally show primary structures such as pillow lavas. These rocks are metamorphosed, but very little altered. They represent the country rocks of the alteration zones which host the gold mineralization.

The mafic volcanic rocks have a fairly sharp contact with a 10 - 20 m thick biotite and quartz rich alteration zone containing only remnants of amphibole. The highest gold contents are confined to this zone which has been traced over 1 km in NNW-SSE direction by diamond drilling. The dip is about 60° towards ENE. The alteration zone is foliated and folded by Archaean deformation, but cut by an unaltered dolerite dike, which resembles dykes of a Proterozoic dyke swarm cutting the greenstones of the Suomussalmi Belt. The axial plane foliation trends NW-SE and the dip is commonly steeper than the dip of the alteration zone. The gold content within this zone is very unevenly distributed and associated with folded quartz veinlets and lodes.

The biotite alteration grades into a garnet-biotite alteration zone towards the west. The predominant mineralogy in this zone is quartz, biotite, plagioclase, garnet and chlorite. In the garnet-bearing zone the gold content drops almost to background levels even though some sulphides and arsenides may be present. With increasing grade the garnets increase in diameter up to a centimetre and the quartz veinlets, which carry most of the gold in the biotite alteration zone, disappear. Yet, the same deformation phases, shown by overprinted foliation structures of amphibole in the mafic volcanic rocks and biotite in the gold bearing zone, seem to be present.

In the northern part of the Kuikka prospect intermediate pyroclastic rocks, fragments being lapilli or agglomerate, and narrow bands of felsic volcanics are more common than in the central part. The younging direction based on graded bedding and cross cutting structures is towards the mafic volcanics eg. to the east. The metamorphosed garnet-bearing rocks consist of garnet and actinolite (partly altered to chlorite and quartz). The gold bearing zone is a biotite and quartz-rich

zone in contact with the mafic volcanic rocks in the east. The alteration seems to be less pervasive than in the central part of the Kuikka mineralization.

Almost all the gold found is in an altered zone of a mafic volcanic rock. The highest contents, over 100 g/t, are in the quartz veins. In this zone the amphibole has been replaced by biotite and lesser chlorite, quartz veinlets are abundant and epidote, as an alteration product of plagioclase, is fairly common. According to overprinting structures, at least a portion of the epidote crystallized later than the folded quartz veins which host the richest gold concentration. Gold occurs as native grains up to a millimetre in size. Two Micro probe-analysed 0.5 mm gold grains (6 points) contain Au 84.28 - 89.44 wt% and Ag 14.60 - 10.07 wt%. Arsenopyrite and pyrite are present in the gold-bearing quartz veins, but as shown by the micro probe analyses, they do not form intergrowths with the gold. Tellurium seems to be closely associated with gold, but tellurium bearing minerals were not yet found.

The gold mineral resource assessment of 225 m along the strike in the central part of the Kuikka mineralization has been reported in Heino (2000). The calculation yields 54 000 t mineralized rock with a grade of 14.6 g Au/t if the high peak values are accepted. If an upper limit of 25 g/t is assumed, the grade is 7.5 g Au/t.

