Naakenavaara

Occurence type: prospect

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	NA	NA	NA	NA
copper	2	NA	NA	NA	NA
cobalt	3	NA	NA	NA	NA
nickel	4	NA	NA	NA	NA
Indium	5	NA	NA	NA	NA
silver	5	NA	NA	NA	NA

Easting EUREF: 421007,401
Northing EUREF: 7510252,735

Easting YKJ: 3421148
Northing YKJ: 7513391

Discovery year: 1995
Discovered by: Geological Survey of Finland
Province: Kittilä (Au, Cu)
District: Sirkka (Cu, Au, Ni, Co)
Comments: Sulphide-enriched zones were discovered in diamond drilling in 1970s, these core were reanalysed for Au in 1994 and the Au-Cu mineralisation was discovered by additional drilling.
References: 2, 8

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
References: 2

Dimension

Expression: exposed
Form: NA
Shape: NA
Length (m): 2000
Width (m): NA
Thickness (m): NA
Depth (m): NA

Area (ha): NA
Dip azim: NA
Dip: NA
Plunge azim: NA
Plunge dip: NA
Orientation method: NA

Dimension comments: Extent unknown, possibly comprises several ore bodies within an area 2 km long, Potential copper ore is more continuos that that of potential gold or cobalt ores. Ore-grade material apparent thickness varies from <1 m to 50 m.

Holder history

Current holder: Aurion Resources Oy
Years: 2018

Holding type: Application for exploration permit

Previous holders:

Company	Years	Holding type	Comments
Tailtiu Oy	2009-2015	Claim (old law)	NA
BHP Billiton World Exploration	2004-2005	NA	NA
Geological Survey of Finland	1995-1998	Claim (old law)	NA

EXPLORATION ACTIVITY

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
2018-2021	detailed geology	Mikael Vasilopoulos	key geological features	8
	Lithological, geochemical and mineralogical study			

Taranis Resources Inc

Years	Activity type	Geologist	Exploration result	Ref
2010-2011	core drilling	John Gardiner	NA	5, 6, 7
	at least 26 drill holes			
	Intersections			
	HoleID	N-12		
	From-To	NA		
	Length	10,6m		
	copper	0,52%		
	nickel	0,03%		
	cobalt	0,02%		
	gold	0,05ppm		
	HoleID	N-12		
	From-To	NA		
	Length	7m		
	copper	0,61%		
	nickel	0,11%		
	cobalt	0,06%		
	gold	0,08ppm		
	HoleID	N-13		
	From-To	131,5-134,3		
	Length	2,7m		
	gold	3,86ppm		
	copper	1,01%		
	nickel	0,1%		
	cobalt	0,02%		
	Comments	*quartz-sericite breccia with pyrrhotite, chalcopyrite and albite and quartz veins*		
	HoleID	N-22		
	From-To	56,6-58,8		
	Length	2,2m		
	gold	0,89ppm		
	copper	0,91%		
	nickel	0,02%		
	cobalt	0,01%		
	HoleID	N-9		
	From-To	127,6-130,1		
	Length	2,5m		
	gold	0,76ppm		
	copper	1,7%		
	nickel	0,06%		
	cobalt	0,02%		
	Comments	*pyrrhotite-chalcopyrite quartz-rich zone*		

2010-2011	detailed geophysics	John Gardiner	NA	
	ground geophysics and SkyTEM			

2010-2010	excavation	John Gardiner	NA	
	7 trenches			

2009-2009	detailed geology	John Cardiner	NA	7
	re-sampling and re-logging the old drill cores of GTK			

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1996-1996	regional geophysics	NA	key geological features	
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

1995-1995	core drilling	Veikko Keinänen	mineral occurrences	2, 4
	19 diamond-drill holes, total 3122 m.			
	Intersections			
	HoleID	R604		
	From-To	173-174		
	Length	1m		
	gold	1,42ppm		
	HoleID	R605		
	From-To	171,6-172,6		
	Length	1m		
	gold	2,6ppm		
	HoleID	R607		
	From-To	143,7-146		
	Length	2,3m		
	copper	1,77%		
	HoleID	R611		
	From-To	63-64		
	Length	1m		
	gold	2,15ppm		
	HoleID	R613		
	From-To	125-140		
	Length	15m		
	copper	0,3%		
	HoleID	R618		
	From-To	113-114		
	Length	1m		
	gold	10,3ppm		
	HoleID	R619		
	From-To	14-19		
	Length	5m		
	copper	0,57%		

1994-1996	detailed geophysics	Veikko Keinänen	NA	2

1994-1994	detailed geochemistry	Veikko Keinänen	NA	2
	old drill cores were reanalysed for Au			

1994-1994	excavation	Veikko Keinänen	NA	2
	2 trenches; The best result was 22.0 m with 0.82 % Cu, the best Au content was 8.5 ppm / 0.5 m			

1979-1991	regional geochemistry	NA	NA	
	Regional geochemical till survey			

1973-1974	core drilling	Eero Nenonen	NA	2
	19 diamond-drill holes, total 2071 m; Sulphide-enriched zones were discovered in diamond drilling			
	Intersections			
	HoleID	R501		
	From-To	2-8		
	Length	6m		
	copper	0,76%		
	HoleID	R505		
	From-To	9,3-18,7		
	Length	9,4m		
	copper	0,34%		
	HoleID	R513		
	From-To	15,3-23,9		
	Length	8,6m		
	copper	0,39%		

1972-1974	detailed geophysics	Eero Nenonen	NA	2, 4

1972-1974	excavation	Eero Nenonen	NA	2, 4

1972-1974	detailed geology	Eero Nenonen	NA	2, 4

1972-1974	detailed geochemistry	Eero Nenonen	NA	2, 4

GEOLOGY

Host rock: Phyllite
Wall rock: Komatiite, Basaltic rock, Sericite quartzite

Phyllite (Host rock)

Rock type: Host rock
Proportion: major
Grain size: Fine grained 0.2 - 1 mm
Color: Black
References: 1, 2, 3, 4, 8
Comments: The occurrence is hosted by pre-mineralisation albitised graphitic phyllite, is close to a komatiite unit, and is located a few km from the Sirkka Shear Zone. The lithological units have a subhorizontal to horizontal setting in a very low-angle antiform that is bordered by a significant N-trending shear zone on the west, i.e. by the SSZ. Albite-quartz-carbonate veins with minor sulphides brecciate the host rocks.

Ore minerals:

Mineral	Proportion	Mineral texture
Chalcopyrite	minor	
	Chalcopyrite dominates the Cu-rich parts of the ore and is the only recognizable Cu mineral; it occurs as dissemination or elongated patches within the quartz-carbonate veins.	
Cobaltite	present	
	Cobaltite is the only Co mineral recognized and occurs in Co-rich parts as euhedral inclusions of variable size (up to 100 µm) in pyrrhotite	
Gersdorffite	minor	
Gold	rare	
	Native Au is only scarcely observed as very fine (< 10 µm) inclusions in pyrite and chalcopyrite and embedded in silicate minerals in late carbonate veins	
Pentlandite	present	
	Pentlandite flame exsolutions are visible in pyrrhotite in the Ni-rich parts of the ore zones.	
Pyrite	minor	
	Present throughout all the mineralised parts. May contain several % Co, and Au in solid solution. Typically to only sulphide in Co-only parts.	
Pyrrhotite	minor	
	Contains up to 0.97 wt% Co and 0.48 wt% Ni, with median concentrations at 617 and 3220 ppm, respectively.	

Other minerals:

Mineral	Proportion	Mineral texture
Albite	major	
Albite	major	
Biotite	major	
Calcite	minor	
Chlorite	major	
Quartz	present	

Structures
Breccia
Comments: Sulfide-bearing quartz-carbonate-albite veins in intensely fractured zones

Alteration:	Distribution:	Degree:	Relation to mineralization:
albitic alteration	Pervasive	Moderate	Pre
Comments:			
sericitic alteration	Pervasive	Moderate	Syn
sulphidation	Pervasive	Weak	Syn
Comments: Early Co-Cu mineralisation overprinted by late gold mineralisation			
biotite alteration	Pervasive	Weak	Syn
Comments: Also forms selvages on auriferous quartz-carbonaet veins			

Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	greenschist metamorphic facies	low metamorphic grade	NA		
Comments: Metamorphic peak during D2, thrusting during D3 was at least partly post-peak, late metamorphic.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	1770-1900		Y
Comments: Gold mineralisation probably during 1820 to 1770 Ma			

Komatiite (Wall rock)

Rock type: Wall rock
Proportion: minor
References: 8

Other minerals:

Mineral	Proportion	Mineral texture
Albite	minor	
	VAriable degree of albitisatino-related albite	
Biotite	minor	
Chlorite	major	
Dolomite	minor	
	Uncertain if ther also is abumdant magnesite	
Talc	major	

Alteration:	Distribution:	Degree:	Relation to mineralization:
albitic alteration	Pervasive	Weak	Pre
chloritic alteration	Pervasive	Moderate	Pre

Basaltic rock (Wall rock)

Rock type: Wall rock

Proportion: minor
References: 8

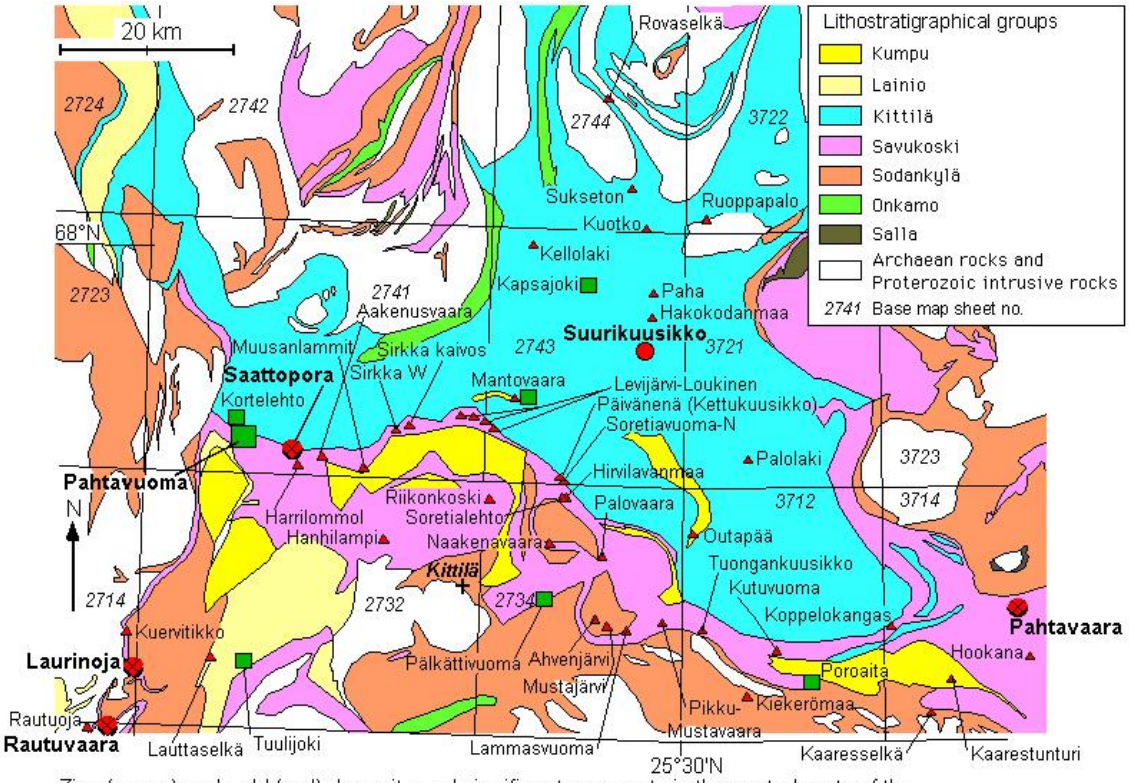
Sericite quartzite (Wall rock)

Rock type: Wall rock
Proportion: minor
References: 8

Alteration:	Distribution:	Degree:	Relation to mineralization:
albitic alteration	Pervasive	Moderate	
Comments: Probably part of the regional, pre-mineralisation albitisation			

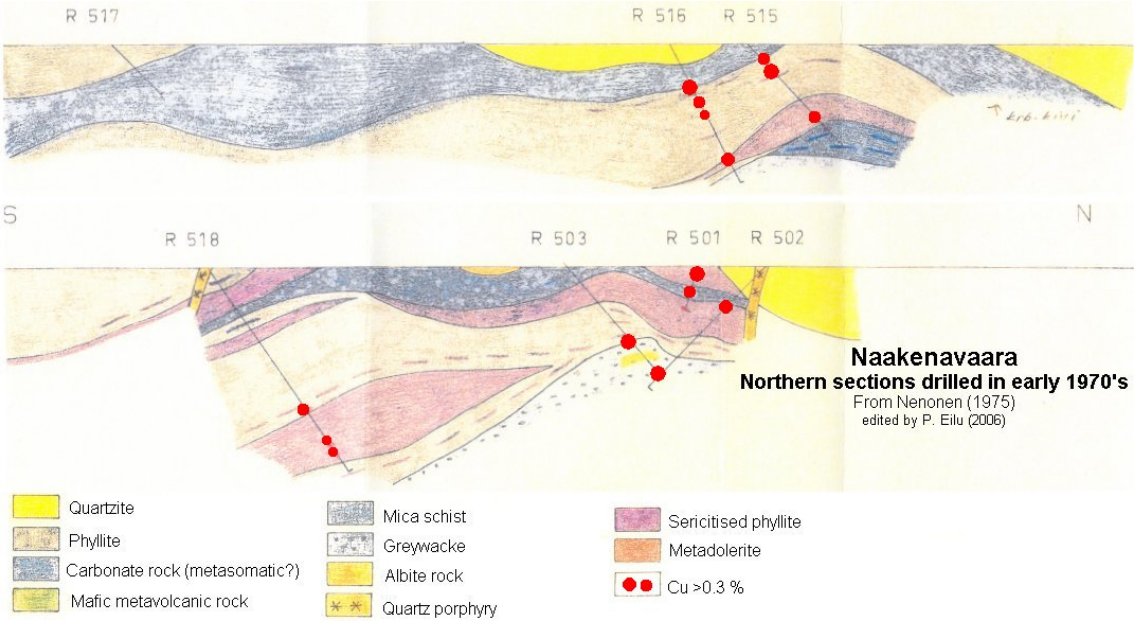
Figures

Regional geology:

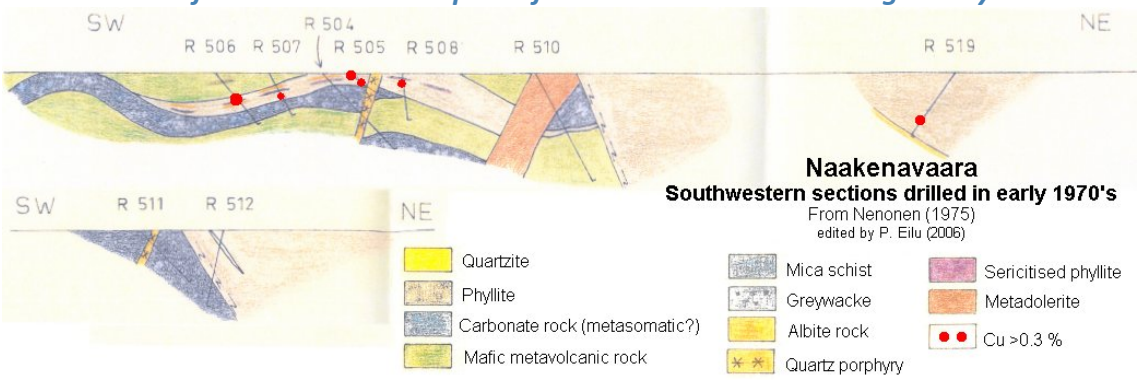


Zinc (green) and gold (red) deposits and significant prospects in the central parts of the Central Lapland greenstone belt. Lithostratigraphy from Lehtonen et al. (1998). Edited by P. Eilu (2007)

Cross sections from northern part of the Naakenavaara drilling survey in 1970':



Cross sections from southwestern part of the Naakenavaara drilling survey in 1970':



REFERENCES

1. Hölttä, P., Väisänen, M., Väänänen, J. & Manninen, T. 2007. Paleoproterozoic metamorphism and deformation in Central Lapland, Finland. Geological Survey of Finland, Special Paper 44, 7-56. *http://tupa.gtk.fi/julkaisu/specialpaper/sp_044_pages_007_056.pdf*

2. Keinänen, V. 2002.Tutkimustyöselostus Kittilän kunnassa valtausalueilla Naakenavaara 1, kaiv.rek.n:o 5522/1, Naakenavaara 2, kaiv.rek.n:o 5522/2, Naakenavaara 3, kaiv.rek.n:o 6089/3, Naakenavaara 4 ja 5, kaiv.rek.n:rot 6159/1 ja 2, Naakenavuoma 1 ja 2, Kaiv.rek.n:rot 6089/1 ja 2 sekä Putaanperä 1, kaiv.rek.n:o 5686/1 suoritetuista malmitutkimuksista. English summary: Report on mineral exploration carried out in Kittilä parish on exploration claims Naakenavaara 1, Mine Register no. 5522/1, Naakenavaara 2, Mine Register no. 5522/2, Naakenavaara 3, Mine Register no. 6089/3, Naakenavaara 4 and 5, Mine Register nos. 6159/1 and 2, Naakenavuoma 1 and 2, Mine Register nos. 6089/1 and 2 and Putaanperä 1, Mine Register no. 5686/1. Geological Survey of Finland, Report Mo6/2734 /2002/1/10. 6 p. (in Finnish)*http://tupa.gtk.fi/raportti/valtaus/m06_2734_2002_1_10.pdf*

3. Lehtonen, M., Airo, M.-L., Eilu, P., Hanski, E., Kortelainen, V., Lanne, E., Manninen, T., Rastas, P., Räsänen, J. & Virransalo, P. 1998. Kittilän vihreäkivialueen geologia: Lapin vulkaniittiprojektin raportti. Summary: The stratigraphy, petrology and geochemistry of the Kittilä greenstone area, northern Finland: a report of the Lapland Volcanite Project. Geological Survey of Finland, Report of Investigation 140. 144 p.*http://tupa.gtk.fi/julkaisu/tutkimusraportti/tr_140.pdf*

4. Nenonen, E. 1975. Selostus Kittilän Riikonkosken ympäristön malminetsintätöistä vuosilta 1971-1974. Geological Survey of Finland, Report M19/2734/75/1. 31 p. (in Finnish) *http://tupa.gtk.fi/raportti/arkisto/m19_2734_75_1.pdf*

5. Taranis Resources Inc. 2010. Press release 24/11/2010. *http://tupa.gtk.fi/karttasovellus/mdae/references/437_Naakenavaara/437_Taranis_PressRelease_2010_11_24.pdf*

6. Taranis Resources Inc. 2011. Press release 12/9/2011. *http://tupa.gtk.fi/karttasovellus/mdae/references/437_Naakenavaara/437_Taranis_PressRelease_2011_09_12.pdf*

7. Taranis Resources Inc. 2013. Management Discussion & Analysis for the year ended december 31, 2013 *http://tupa.gtk.fi/karttasovellus/mdae/references/437_Naakenavaara/437_Taranis_2013_Annual_MD&A.pdf*

8. Vasilopoulos, M., Molnár, F., Ranta, J-P. & O'Brien, H. 2022. Mineralogical, lithogeochemical and sulfide trace element characteristics of the Hirvilavanmaa Au-only and the base metal-rich Naakenavaara orogenic gold deposits in the Central Lapland belt, northern Finland. J. Geol. Explor. 244, 107132. https://doi.org/10.1016/j.gexplo.2022.107132