Kivimaa

Occurence type: deposit

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	0,05 t	0,03 t	0,02 t	Occurrence
copper	2	316,54 t	223,04 t	93,5 t	Occurrence

Easting EUREF: 401812,816
Northing EUREF: 7345690,369
Easting YKJ: 3401946
Northing YKJ: 7348763

Discovery year: 1965
Discovered by: Outokumpu Oy
Province: Peräpohja (Cu, Co, Fe)
Comments: A small(?) deposit which was mined in 1969.
References: 4, 5, 13, 14, 18

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Sub type 1: Au-Cu
Comments: All data in the references suggest epigenetic 'mesothermal' origin. Late-magmatic suggested in.
References: 7, 15, 18, 25, 26

Dimension

Expression: exposed
Form: discordant
Shape: irregular
Length (m): 350
Width (m): 3
Thickness (m): NA
Depth (m): 60
Area (ha): NA
Dip azim: NA
Dip: 50
Plunge azim: NA
Plunge dip: NA
Orientation method: Calculated average orientation
Dimension comments: One pre body; 1-6 m wide, about 350 m long, has a dip of 15–40°; open at 60 m depth. The main vein is in a W-trending dip-slip fault. The deposit is within 1-3 km from a major fault extending across the Peräpohja supracrustal sequence and in the hanging wall of, <1 km at surface, from a WSW-trending major detachment fault.

Holder history

Current holder: Arctic Minerals Exploration AB
Years: 2021
Holding type: Application for exploration permit

Comments: JV with Rio Tinto Exploration Oy

Previous holders:

Company	Years	Holding type	Comments
Norrbotten Exploration AB	2017-2019	Reservation	NA
Endomines Oy	2013	Exploration permit	NA
Endomines Oy	2006-2011	Claim (old law)	NA
Outokumpu Oy	2000-2002	NA	NA
private enterprise	1988-1992	NA	NA
Outokumpu Oy	1961-1970	NA	NA

EXPLORATION ACTIVITY

Endomines Oy

Years	Activity type	Geologist	Exploration result	Ref
2007-2007	core drilling	Jaakko Liikanen	key geological features	5
	5 drill holes, total 369 m, to the east of the mined part of the deposit. Only reported in a media release			
	Intersections			
	HoleID	TE/KI-1		
	From-To	40,1-46,7		
	Length	6,6m		
	gold	0,75ppm		
	copper	1,75%		

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
2002-2002	regional geophysics	Seppo Rossi, Vesa Perttunen	key geological features	7, 16, 17, 21, 22, 25, 26
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

1983-1991	detailed geology	Matti Äyräs, Seppo Rossi	NA	7, 16, 17, 21, 22, 25, 26

1983-1986	detailed geophysics	Matti Äyräs, Seppo Rossi	NA	18
	No obvious magnetic response, but a distinct IP anomaly.			

1983-1991	detailed geochemistry	Matti Äyräs, Seppo Rossi	NA	7, 16, 17, 21, 22, 25, 26
	A restricted Au anomaly, with high Au values (up to 0.44 ppm) in till <300 m to the E from the deposit, is probably related to the deposit. Au-till anomalies 200-400 m to the S and SE of the Kivimaa deposit are interpreted not to be related to the mined deposit. A Cu anomaly in till enveloping the deposit.			

Outokumpu Oy

Years	Activity type	Geologist	Exploration result	Ref
1961-1971	detailed geophysics	Pentti Rouhunkoski	NA	18
	No obvious magnetic response, but a distinct IP anomaly.			

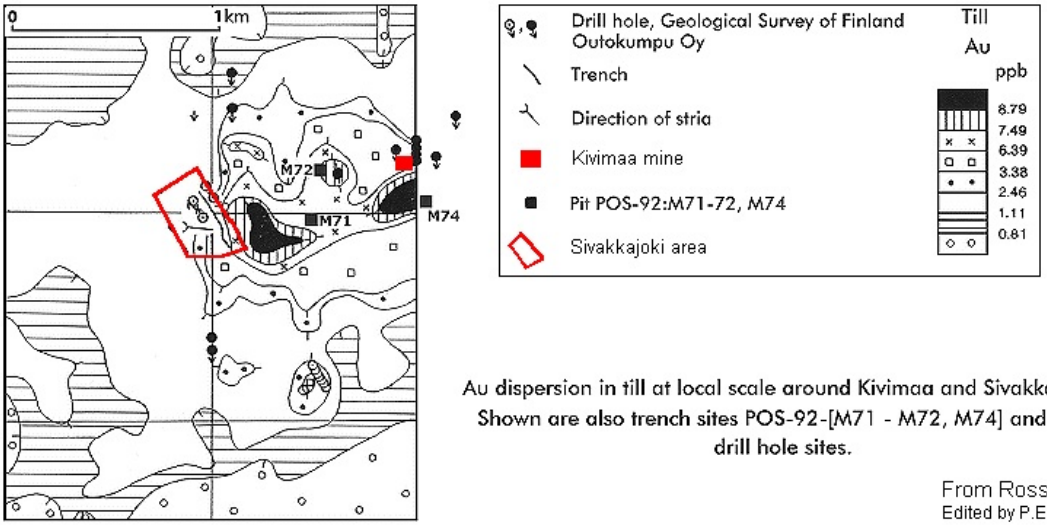
1961-1967	core drilling	Pentti Rouhunkoski	NA	1, 6, 18, 19, 24
	25 drill holes, total 2434 m, mineralisation was detected by drilling into a significant IP anomaly.			

1961-1971	detailed geology	Pentti Rouhunkoski	NA	1, 6, 18, 19, 24
	Gold- and copper-rich (100 ppm Au, 3% Cu) boulder samples found by an amateur prospector from the region.			

1961-1971	detailed geochemistry	Pentti Rouhunkoski	NA	7, 16, 17, 21, 22, 25, 26

Figures

Secondary anomaly:



Au dispersion in till at local scale around Kivimaa and Sivakkajoki. Shown are also trench sites POS-92-[M71 - M72, M74] and the drill hole sites.

From Rossi (1993)
Edited by P.Eilu (1999)

RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Outokumpu Oy	1967	NA	Non-compliant resource estimate	1
	Comments: Current resource excluding mined part.				
	Category:	**Measured, indicated and inferred mineral resource**			
	Tonnage:	**5000 t**			
	gold	5,3 ppm			
	copper	1,87 %			
	Cutoff:	**NA**			

Previous calculations

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Outokumpu Oy	1967	NA	Non-compliant resource estimate	1
	Comments: Original resource				
	Category:	**NA**			
	Tonnage:	**0,022 Mt**			
	copper	1,87 %			
	gold	5,3 ppm			
	Cutoff:	**NA**			

MINING

Kivimaa

Easting EUREF: 401812,816
Northing EUREF: 7345690,369
Status: Closed
Operating years: 1969-1970
Years in production: 2
Total ore mined: 18587 t
References: 8, 18, 20, 23

Total production:

Product	Product measure
copper	223,04 t
gold	37,17 kg

Other materials:

Material type	Material measure
Waste rock	8000 t

Mining activity:

Year	Ore mined	Ore processed	Activity type	Production	Other material
1970	0 t	18587 t	open-pit mining		
				copper 223,04 t gold 37,17 kg	Waste rock 0 t
1969	18587 t	0 t	open-pit mining		
					Waste rock 8000 t

Figures

Aerial photo of the water-filled Kivimaa open pit. Exploration trench sites (M71, M72, M74) are shown with arrows. View to the NW. Photo Risto Aario (Rossi 1993).

GEOLOGY

Host rock: Dolerite, Quartz vein, Mafic volcanic rock

Dolerite (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 1, 3, 7, 8, 15, 16, 18, 19, 25, 26

Ore minerals:

Mineral	Proportion	Mineral texture
Chalcopyrite	NA	
Ilmenite	minor	
Magnetite	variable	
Pyrite	variable	
Tetrahedrite	minor	

Other minerals:

Mineral	Proportion	Mineral texture
Albite	NA	Alteration product
Biotite	NA	Alteration product
Calcite	NA	
Chlorite	major	
Hornblende	major	
Quartz	NA	

Textures
Non-oriented
Banded

Alteration:	Distribution:	Degree:	Relation to mineralization:
carbonate alteration	NA	NA	NA
Comments: Alteration zone, <1-5 m wide, envelops the veins. A set of parallel, partially overlapping alteration zones.			
biotite alteration	NA	NA	NA
Comments: Alteration zone, <1-5 m wide, envelops the veins. A set of parallel, partially overlapping alteration zones.			
chloritic alteration	NA	NA	NA
Comments: Alteration zone, <1-5 m wide, envelops the veins. A set of parallel, partially overlapping alteration zones.			

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: Albite-actinolite-chlorite-epidote-quartz-calcite.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	1600-2500	2200	N
Comments: Mineralisation is post 2.2 Ga.			

Quartz vein (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 16, 18
Comments: A large quartz-calcite-sulphide vein with distinct banding, and a set of similar, smaller veins

Ore minerals:

Mineral	Proportion	Mineral texture
Arsenopyrite	minor	
Bismuth	minor	
Bismuthinite	minor	
Chalcopyrite	major	
Galena	minor	
Gold	minor	
	apparently, only in the quartz veins	
Ilmenite	minor	
Magnetite	major	
Pyrite	major	
Pyrrhotite	minor	
Rutile	minor	

Other minerals:

Mineral	Proportion	Mineral texture
Calcite	major	
Quartz	major	

Mafic volcanic rock (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 7, 8, 15, 16, 18, 25, 26

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		

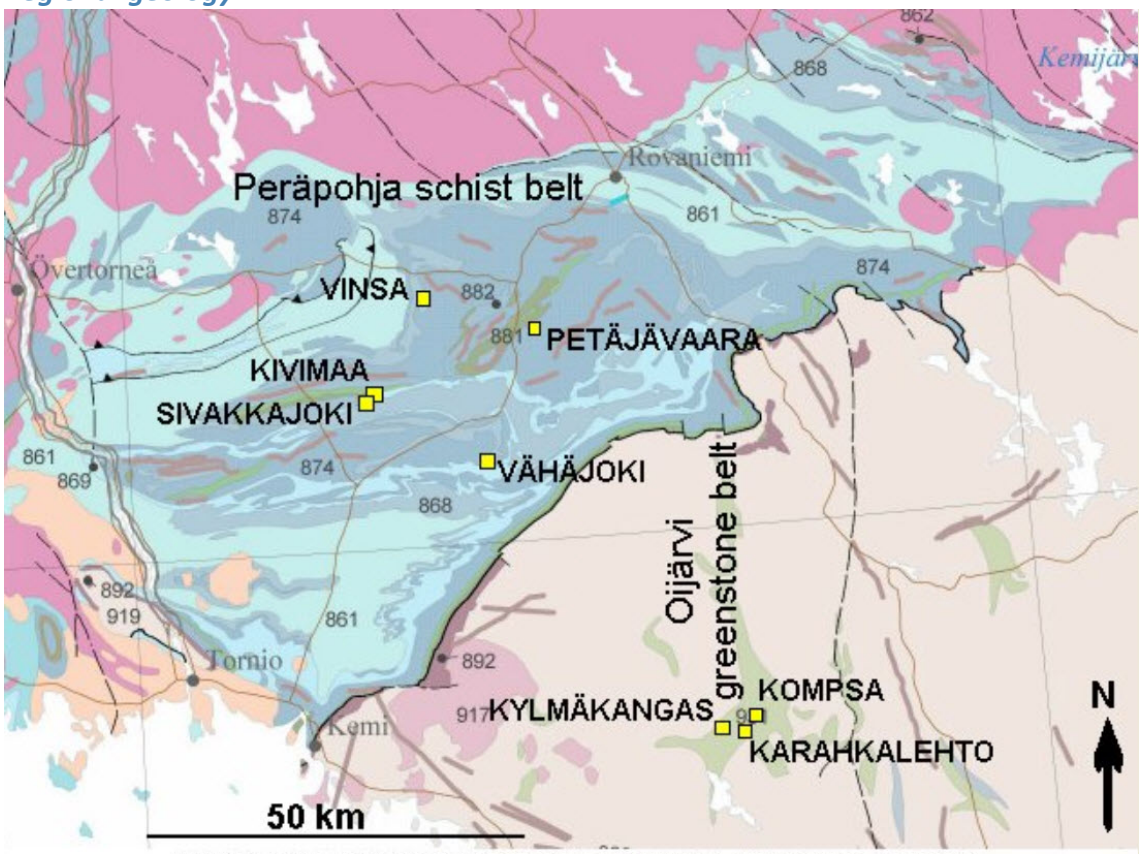
Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:

Paleoproterozoic (2500-1600 Ma)	1600-2500	N

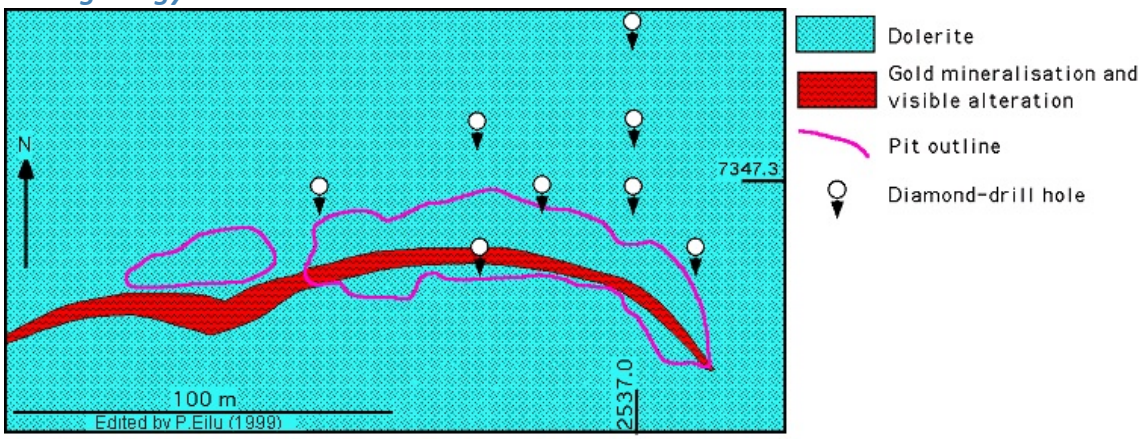
Figures

Regional geology:



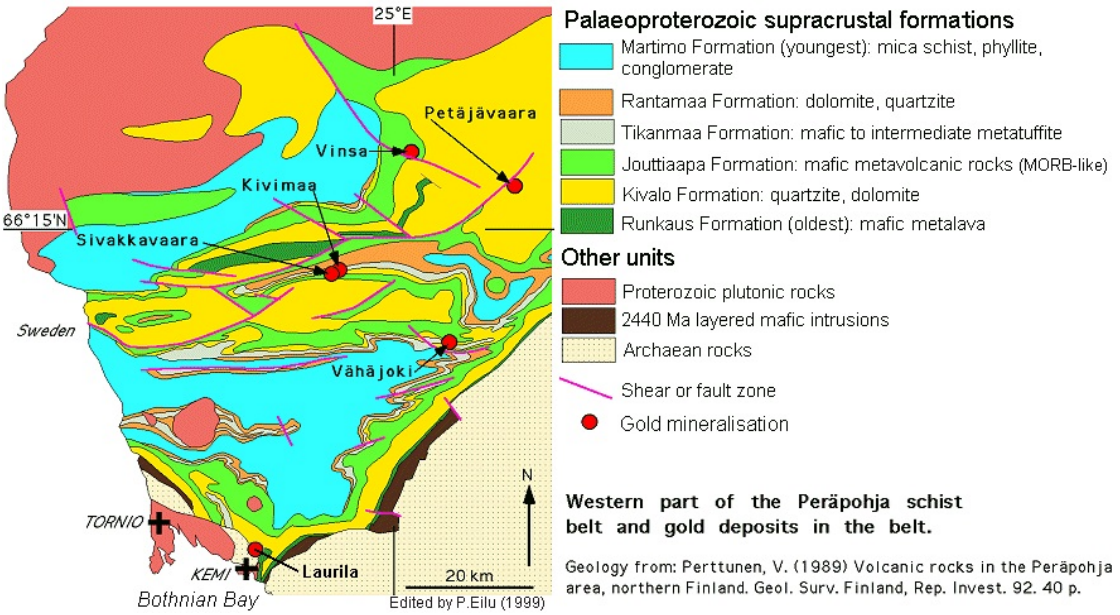
Drilling-indicated gold occurrences in Oijärvi greenstone belt and Peräpohja schist belt. Geology from Korsman et al. (1997).

Local geology:

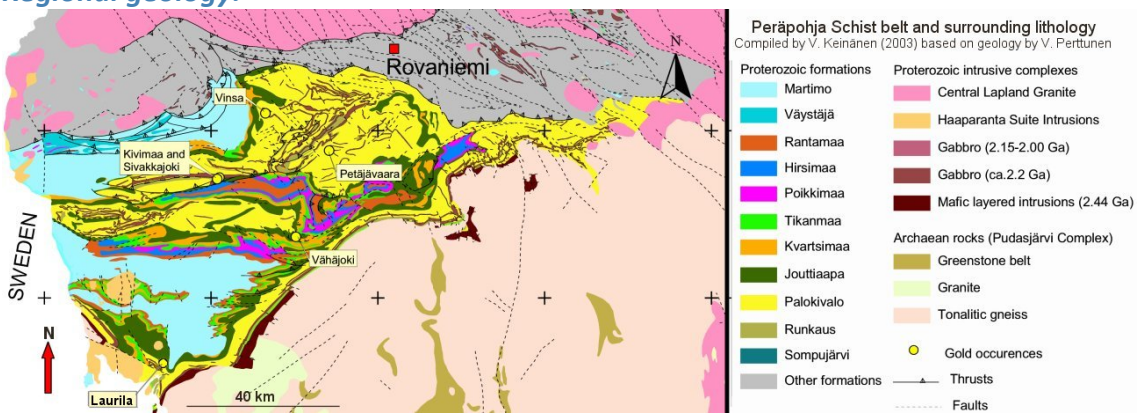


Surface geology at Kivimaa, Peräpohja schist belt. After Lehtinen and Eilu (1985).

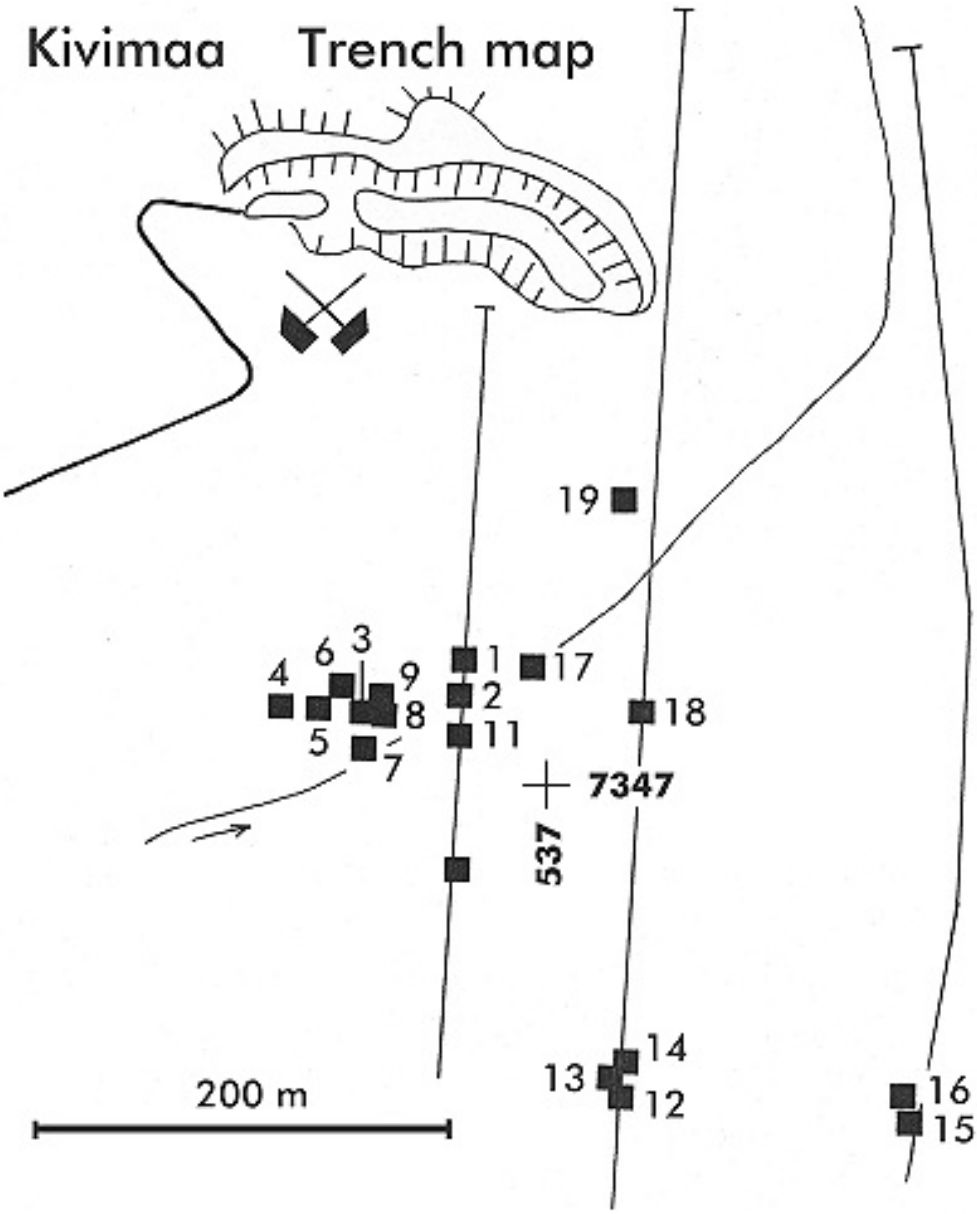
Regional geology:



Regional geology:



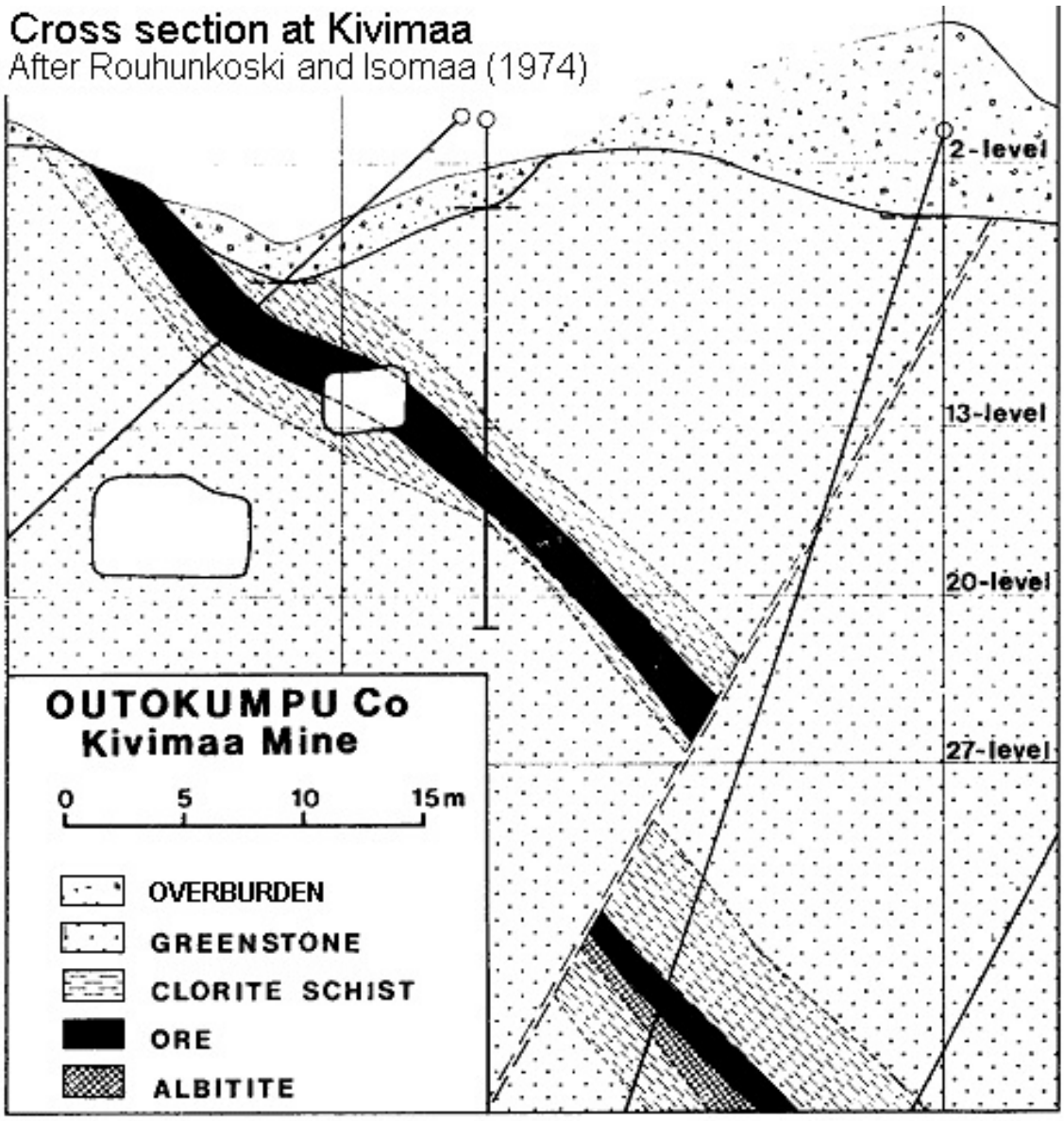
Trench:



Location of the trench pits. Solid lines mark some of the percussion drill lines.

(from Koivisto 1984)

Cross section:



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