

Location/Identification

MINFILE Number:	093K 008	National Mineral Inventory Number:	093K3 Mo3
Name(s):	<u>DENAK (ENDAKO)</u> DENAK, ELK, NU, ELKA, NUSAM, PATTAN, MING, ENDAKO, DENAK EAST, DENAK WEST, NU 1-6, ELK 4-8, TAN 4		
Status:	Past Producer	Mining Division:	Omineca
Mining Method	Open Pit	Electoral District:	Nechako Lakes
Regions:	British Columbia	Resource District:	Vanderhoof Natural Resource District
BCGS Map:	093K005		
NTS Map:	093K03E	UTM Zone:	10 (NAD 83)
Latitude:	54 02 40 N	Northing:	5990574
Longitude:	125 08 04 W	Easting:	360247
Elevation:	907 metres		
Location Accuracy:	Within 500M		
Comments:	Drilling and trenching on Elk 5, the Denak pit is now part of the Endako mine open pit (093K 006), which includes production and reserves data.		

Mineral Occurrence

Commodities:	Molybdenum		
Minerals	Significant:	Molybdenite, Magnetite, Pyrite	
	Associated:	Quartz, Calcite	
	Alteration:	Sericite, K-Feldspar, Kaolinite, Pyrite	
	Alteration Type:	Argillic, Potassic, Sericitic	
	Mineralization Age:	Unknown	
Deposit	Character:	Stockwork, Vein	
	Classification:	Porphyry, Hydrothermal, Epigenetic	
	Type:	L05: Porphyry Mo (Low F- type)	
	Shape:	Irregular	Modifier: Faulted
	Dimension:	46x0x0 metres	
	Comments:	Orebody is up to 46 metres in width, locally.	

Host Rock

Dominant Host Rock:	Plutonic		
Stratigraphic Age	Group	Formation	Igneous/Metamorphic/Other
Upper Jurassic	-----	-----	Francois Lake Batholith
Isotopic Age	Dating Method	Material Dated	
141 Ma	Potassium/Argon	Biotite	
Lithology:	Quartz Monzonite		
Comments:	Isotopic age reference: Canadian Institute of Mining, Special Volume 15, pages 494-454.		

Geological Setting

Tectonic Belt:	Intermontane	Physiographic Area:	Nechako Lowland
Terrane:	Stikine, Cache Creek		

Inventory

Capsule Geology

The Denak deposit is a western extension of the Endako orebody. The Endako deposit (093K 006) is located on a hillcrest approximately 160 kilometres west of Prince George in central British Columbia. The mine area encompasses several showings (093K 007, 10, 13, 14) and includes the 1.7-kilometre long Endako pit, the mined out Denak East pit and the partially developed Denak West pit. Production began in 1965 and by 1993 a total of 231 million tonnes had been mined yielding more than 157.5 million tonnes of molybdenum.

The Endako orebody is centrally situated within the Late Jurassic Francois Lake batholith. At least ten phases based on distinct textural and compositional changes have been recognized in the composite batholith. The orebody consists of an elongate stockwork of quartz-molybdenite veins developed within the Endako quartz monzonite phase and three types of felsic pre-ore dikes. The Endako quartz monzonite is bounded on the south by Francois granite and on the north by Casey alaskite and Glenannan granite. Post-ore basalt and andesite dikes crosscut the quartz monzonite, pre-ore dikes and mineralized stockwork.

In general terms, the orebody is a series of major east-striking veins oriented en echelon to form a zone elongated in a northwest direction. Length and width dimensions of the zone are approximately 3360 by 370 metres, of which the western 1830 metres is offset to the north by the West Basalt fault with a 1150 metre relative right-hand movement. Divided by this fault into two distinct domains, the east half dips moderately south and plunges west, while the west half dips east. Molybdenite, pyrite and magnetite are the most abundant primary metallic minerals. Minor chalcopyrite and traces of sphalerite, bornite, specularite and scheelite are also present. Single occurrences of beryl and bismuthinite have been reported. Molybdenite occurs in two types of veins. Large veins (up to 1.2 metres wide) contain laminae and fine disseminations of molybdenite. Fine fracture-fillings and veinlets of quartz-molybdenite occur as stockworks adjacent to the major veins. Alteration types include pervasive kaolinization, envelopes with potassium feldspar and envelopes with sericite.

A pyrite zone bounds the orebody to the south across a major fault. In this zone, mineralization consists of quartz, pyrite, minor magnetite and rare molybdenite. The mineralization occurs as fracture-filling in a poorly developed stockwork. The orebody is localized at or near the intersection of regional northwest and east structures.

Three distinct hydrothermal alteration phases are seen in the Endako ore zone. Introduced potassium-feldspar is noted as envelopes adjacent to veins and fractures. A second type of envelope seen is a fine-grained band of quartz-sericite and finely disseminated pyrite. Both of these envelopes can vary in width from 0.3 to 5 centimetres. Also pervasive kaolinization of the Endako quartz monzonite is present.

The orebody has been mined in three different open pits: the Endako, Denak East and Denak West. The Denak East open pit is mined out and is currently being backfilled with waste (ca. 1994). The ore contains progressively less stockwork and dips shallower as one traverses from the Endako pit in the southeast to the Denak West pit in the northwest.

The claims were originally staked in 1927 when two local men staked four mineral claims to cover an area of quartz-molybdenite float. Two short shafts were sunk in 1934, one on the 0.6 metre "Stellar" vein. During the period of 1934 to 1961, the property was examined by many geologists and several mining companies, but physical work was confined primarily to trenching and some sampling.

In May of 1962, trenching and a diamond drilling programs were commenced by Endako Mines Limited. Canex Aerial Exploration Ltd. entered the exploration of the property in October of the same year and completed 190 diamond-drill holes for a total of 24,000 metres and 810 metres of underground work for bulk sampling. The decision to develop the property for production was announced in March of 1964. Construction of the 9,000 tonne-per-day mine plant and development of the open pit began in June 1964, and the mine was officially opened on June 8, 1965.

In 1965, pit development by Endako Mines Ltd. consisted of the removal of 1.01 million cubic metres of overburden to permit the extension of mining from the west pit into the east pit. At the beginning of the year, a 9,000 tonne-per-day concentrator commenced operation; later improvements to the concentrator increased this rate to 13,500 tonnes per day. A total of 3,569,000 tonnes of ore at an average grade of 0.174 per cent Mo were milled for the year of 1965. Mill recovery was reported at 81.3 per cent with a total of 4.67 million kilograms of molybdenum being produced. Mineable reserves as of April 30, 1966 were 79,079,000 tonnes at 0.132 per cent Mo or 142,839,000 tonnes at 0.102 per cent Mo (Property File Cyprus Anvil Endako Mines Ltd., 1966).

In 1974, Canex Placer Ltd. completed 14 diamond drill holes, totalling 2304.0 metres, and 8 percussion drill holes, totalling 634.0 metres, on the NU 3 through NU 6 claims, the Elk 5 and 13 Fr. claims and the Tan 4 claim. Diamond drilling on the NU 3 to 4 claims yielded intercepts from core samples of up to 0.36 per cent molybdenite over 12 metres in hole S341, 0.24 per cent molybdenite over 33 metres in hole S345, 0.20 per cent molybdenite over 21 metres in hole S349, 0.25 per cent molybdenite over 27 metres in hole S354, 0.20 per cent molybdenite over 18 metres in hole S356 and 0.13 per cent molybdenite over 111 metres in hole S359, whereas drillhole S358 from the Tan 4 claim to the southeast of the other holes yielded 0.11 per cent molybdenite over 114 metres (Assessment Report 5021). Sludge samples from the drilling generally yielded higher values. Percussion drilling yielded up to 0.16 per cent molybdenite over 60 metres in hole R-78 located on the NU 3 claim (Assessment Report 5227).

In 1975, Canex Placer Ltd. completed seven percussion drill holes, totalling 640.0 metres, on the NU 3, 5 and Dat 1 Fr. claims. Drilling yielded intercepts of up to 0.14 per cent molybdenite over 87 metres in hole R-89 and 0.19 per cent molybdenite over 27 metres in hole R-96 (Assessment Report 5623).

In 1976, Canex completed a further eight diamond drill holes, totalling 857.0 metres, on the NU 1-6 claims. Drilling yielded intercepts of up to 0.16 per cent molybdenite over 24 metres in hole S415 and 0.16 per cent molybdenite over 30 metres in hole S418 (Assessment Report 5893).

In 1988, Placer Dome completed 18 diamond-drill holes in the mine area. In 1989, Placer Dome completed 14 diamond-drill holes in the mine area in an attempt to extend known ore reserves and to gather geotechnical information. In 1991, 31 diamond-drill holes were completed on the western part of Endako mine property.

During 1989 through 1995, Placer Dome Inc. completed 148 diamond drill holes, totalling 22 375.1 metres, on the Boot 3, 4, 9 and 15; Mining Lease No. 2, No. 7, No. 287, No. 292, No. 294 and Tan 4 in the mine area in an attempt to extend known ore reserves and to gather geotechnical information.

Drilling in 1995 in the Watkin's Creek area northwest of the Denak West pit was intended to test molybdenum mineralization along strike from the Denak West orebody. Drilling intersected molybdenite mineralization in sheared quartz veins and gouge with pyrite, chalcopyrite, magnetite and hypogene hematite as common accessories but without the significant potassic alteration that characterizes the highest grade molybdenite mineralization in the main zone of the Endako pit. Significant mineralization appears to occur in a northwest trending zone 60 to 91 metres wide (Assessment Report 24627).

Proven and probable ore reserves estimated by the company were 117,600,000 tonnes grading 0.077 per cent molybdenum on January 1, 1995; in addition, measured and indicated mineral resources were estimated at 147,850,000 tonnes grading 0.061 per cent molybdenum (Information Circular 1996-1, page 8).

Reserves as of January 1, 1996 were 104.8 million tonnes grading 0.077 per cent molybdenum (Schroeter, T. and Lane, R., personal communication, 1996).

Production and reserves are included with the Endako mine figures.

In 2003, a 3.7 line-kilometre induced polarization survey and seven diamond drill holes, totalling 786.4 metres, were completed on an induced polarization anomaly located approximately 900 metres east of the Endako pit and under the north wall of the Denak East pit. Near-economic grades are reported to have been encountered in all three holes under the north wall of the Denak East pit. Drillhole S-04-03 yielded 0.049 per cent molybdenite over 75 metres (Assessment Report 27406).

In 2006, Thomson Creek Mining Ltd. completed 32 diamond drill holes, totalling 5143.3 metres. Drilling on the Denak West zone, located immediately west of the west pit wall, yielded intercepts including 0.125 over 30 metres in hole 06-11 and 0.080 per cent molybdenite over 132 metres, including 0.100 per cent molybdenite over 87 metres, in hole 06-14, whereas drilling north of the pit yielded up to 0.053 per cent molybdenite over 37.5 metres in hole 06-20 (Assessment Report 28684).

According to Thomson Creek Metals Company Inc.'s 2007 Annual Report the focus of mining activities in 2008 will primarily be the Denak West pit. The company also plans to mine the walls between Endako, Denak West, and Denak East in order to create one large single pit.

In 2007, Thomson Creek Mining Ltd. completed 66 drillholes, totalling 10 926 metres, on the Endako property: 33 holes were completed on the Casey Lake area, 17 on the Denak (MINFILE 093K 008) occurrence area, 6 on the Endako occurrence area and 10 for condemnation drilling. No results of this work are known.

In 2008, Thomson Creek Mining Ltd. completed an initial phase of 18 drillholes located on multiple areas of the property and a further 34 drillholes, primarily in the Denak Extension (MINFILE 093K 098) area.

In 2010, Thomson Creek Mining Ltd. completed 91 diamond drill holes, totalling 13 777.5 metres, on the Endako property. This work centred on the Denak Extension, located northwest of the Denak West pit, and was designed to infill and increase a previously defined probable category reserve to a proven category. Other holes were completed on the Denak East pit south wall. Drilling on the Denak East pit south wall yielded up to 0.266 per cent molybdenite over 13.2 metres in hole 10-084 (Assessment Report 31870).

In 2011, Thomson Creek Mining Ltd., in conjunction with Georgia West Resources Inc., completed 19 diamond drill holes, totalling 3357 metres, on the Endako property. Seventeen holes were completed on the Georgia West area, located to the northwest of the occurrence, whereas two of the diamond drill holes, totalling 501.0 metres, were completed on the Denak Extension area. Also at this time, 45 diamond drill holes, totalling 8675.0 metres, were completed on the Endako mine.

In 2013, Thompson Creek Mining Ltd. completed a program of legal surveys, a LiDAR topographic survey and orthophoto base mapping on the Endako property.

In 2016, Thompson Creek Metals Co. Inc. completed a minor program of rock, silt, and soil sampling on the northern portion of the Endako property.

In 2017, Thompson Creek Metals Co. Inc. completed a minor program of prospecting, and geochemical (rock and soil) sampling on the northern portion of the Endako property.

In 2018, Thompson Creek Metals Co. Inc. completed a 17.5 line-kilometre induced polarization survey on several areas of the Endako property.

Bibliography

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Date Coded:	1985/07/24	Coded By:	BC Geological Survey (BCGS)	Field Check:	N
Date Revised:	2021/04/20	Revised By:	Karl A. Flower (KAF)	Field Check:	N