

9 MINERALIZATION

9.1 MINERALIZATION DESCRIPTION

Two types of mineralization have been found on the Mount Nansen property and the Tawa property: precious metal quartz sulphide vein zones and disseminated copper-molybdenum mineralization (Eaton and Archer, 1989; Unknown author, 2008).

The precious metal quartz sulphide vein zones occur as fault-shear-vein alteration zones and cut across all rock types (Eaton and Archer, 1989; Melling, 1995). This suggests that the mineralized structures are younger than the enclosing host rocks (Denholm et al, 2000; Lecuyer, 1997; Melling, 1995). Some quartz sulphide veins are brecciated and the precious metal vein zones can be divided into two subsystems: vein systems and breccia zones.

The vein systems are more common and are mostly found within planar structures (Denholm et al, 2000). These vein systems consist of quartz, carbonate, and some sulphide (Denholm et al, 2000). The vein systems range from simple quartz veins as exemplified by the Huestis and Webber zones to a complex anastomosing series of veins and veinlets as exemplified by the Brown-McDade zone (Melling, 1995). The vein systems strike northwest and dip steeply toward east or west (Melling, 1995). Individual vein system has a length of up to 600 m and a width of 2-8 m and is open to depth (Denholm et al, 2000). These vein systems form steeply plunging shoots and the high grade zones are usually found where the veins split, bend, or are cut by northeast trending cross fault (Melling, 1995) which created more open space for mineralizing fluids (Eaton and Archer, 1989).

The breccia zones are mostly siliceous and pipe-like, and are steeply plunging. These zones are up to 150 m wide and are composed of a series of sub-parallel faults separated by fractured and altered wallrocks (Eaton and Archer, 1989). The mineralization is best developed at places of faults cutting igneous rocks (Eaton and Archer, 1989). At least eight pipe-like breccias bodies have been found on the property (e.g. within the quartz feldspar porphyry complex and north end of the Brown-McDade open pit and PPBX showing, Figure 7). The breccias zones are believed to be associated with the late stage volatile-enriched silica flooding of fractured zone (Sawyer and Dickson, 1975).

Sulphides in the precious metals vein zones consist of pyrite and arsenopyrite with lesser amounts of galena, sphalerite, chalcopyrite, and stibnite (Denholm et al, 2000). The gold mineralization occurs as fine-grained (5-40 micron) inclusion in sulphides or in the interstices (Denholm et al, 2000; Lecuyer, 1997). The silver mineralization occurs mostly as inclusion in galena and sphalerite (Denholm et al, 2000). The silver to gold ratio varies greatly amongst the various zones. It was reported by Denholm et al in 2000 that the silver to gold ratio is about 7:1 in the planar vein mineralization and about 3:1 in the breccia pipe mineralization yet drilling by BYG in 1998 showed average silver gold ratios of 50:1. It was considered that this difference was caused solely by the difference in base metal values between the two types (Denholm et al, 2000). Other elements associated with the gold and silver in the property include arsenic, cadmium, zinc, copper, antimony, and lead (Melling, 1995).

The disseminated copper-molybdenum mineralization is associated with a quartz feldspar porphyry complex. It represents a deeper and hotter part of the hydrothermal system compared to

the quartz sulphide veins (Eaton and Archer, 1989). Wallrock alteration in the quartz feldspar porphyry complex includes localized silicic and potassic cores surrounded by advanced argillic and phyllic halos giving way to weak argillic and propylitic margins (Sawyer and Dickson, 1975).

Both hypogene and supergene copper mineralization exist in the property and copper grades appear to be at least doubled by supergene enrichment (Sawyer and Dickson, 1975). Copper mineralization is weak (average grade of less than 0.1% Cu) but extensive, covering a 4.5 km² area (Eaton and Archer, 1989). Highest copper grade (0.5-0.6%) is discovered in fracture zones where supergene chalcocite is relatively well developed (Sawyer and Dickson, 1975). Molybdenum mineralization is usually associated with late stage silica flooding and veining (Sawyer and Dickson, 1975) which formed localized porphyry breccia zones. The highest molybdenum value (~0.06%) is found at the siliceous breccia zone, but this molybdenum mineralization may not be regarded as the true “porphyry” mineralization (Sawyer and Dickson, 1975). Average molybdenum value in the property is probably <0.01% (Sawyer and Dickson, 1975). Beside molybdenum, the late stage fluids also carry elements iron, copper, lead, zinc, silver and gold (Sawyer and Dickson, 1975). In the writers opinion the porphyry may have acted as a heat engine that drove fluids which formed the veins and were the same source of the volatiles that created the breccia zones.

9.2 MINERALIZED ZONES IN THE MOUNT NANSEN PROPERTY

The Mount Nansen property hosts four distinct gold and silver mineralized zones (the Brown-McDade zone, the Webber zone, the Huestis zone, and the Flex zone). Significant exploration and development work has been conducted in these zones.

9.2.1 BROWN-MCDADE ZONE

The Brown-McDade deposit contains an upper, open pittable oxide zone and a lower sulphide zone which can be assessed by underground methods. In the Brown-McDade underground, there are two types of mineralization: the more prevalent anastomosing veins and veinlets of quartz with minor carbonate and varying amounts of sulphides and the less prevalent sulphide-rich siliceous breccias (Figure 8). The anastomosing veins occur in structurally controlled fractures which cut the coarse-grained granodiorite and the veins are spatially associated with a series of quartz porphyry dykes injected along a strong fault known as Footwall fault (Denholm et al, 2000; Melling, 1995). The Footwall fault strikes 160° and dips 50°-60° to the southwest (Melling, 1995). The second type of mineralization, sulphide-rich breccias, exists in the north end of the zone and is strongly cut by faulting (Denholm et al, 2000).

9.2.2 WEBBER ZONE

In the Webber zone, a west-northwest striking quartz-vein network dipping 70°-80° to the west is the host of the mineralization (Figures 9 and 10; Melling, 1995). The veins occur as fracture-filling veins in the metamorphic rocks which were intruded by an extensive porphyritic body striking northeast (Campbell, 1994). The veins vary from 0.3 m to 2.0 m in width, and have been significantly explored over 500 m strike length through a combination of surface stripping, trenching and underground development (Campbell, 1994; Denholm et al, 2000).

Two main vein structures have been recognized in the Webber deposit, the No 1 (Footwall) and the No 2 (Hanging wall). The No 1 and No 2 veins have been developed over distances of at

least 200 m and 250 m respectively (Campbell, 1994). Individual mineralized shoots within each vein are typically 50 m in strike length and 100 m along the steep lunge direction with the main shoots open to depth (Denholm et al, 2000).

Seventeen ore shoots on the two veins defined by underground sampling averaged 25 metres in length, 1.0 metres in width with average grades of 14.06 g/t gold and 917 g/t silver (Stroshein, 2007b). The listing and description of the underground ore shoots are shown in Table 3.

Drilling between 1985 and 1987 was carried out to test the continuity of the deposit above and below the adit. Drill holes south of the deposit in 1996 intersected veins at 110 metres and 170 metres along the trend. Drill hole 96-177 intersected veining across 6 metres that averaged 6.7 g/t gold and 213 g/t silver. The Webber Creek fault appears to cut off the deposit to the North; however, the deposit remains open to the south and to depth. (Stroshein, 2007b)

The highest gold and silver grades occur within quartz veins containing fine-grained sulphides, including pyrite, galena, sphalerite, arsenopyrite and so on (Campbell, 1994). Shoot boundaries between gold-rich and barren vein are sharp and correlate well between the surface exposures and underground development (Denholm et al, 2000).

9.2.3 HUESTIS ZONE

The Huestis deposit consists of a north-northwest striking quartz-vein network which dips 65-75° to the east (Figure 11; Melling, 1995). The veins, which individually vary from 0.3 m to 2.0 m and average 1.0 m in width, occupy shear-controlled fractures in metamorphic rocks and have been defined over 500 m along strike by both underground development and surface trenching (Denholm et al, 2000). Three main vein structures have been recognized, the No 11 (Hanging wall), the No 12 (Intermediate) and the No 13 (Footwall), and they have been developed and extensively chip sampled on two levels, the 4100 and 4300. Individual mineralized shoots within each vein are typically 100 m in strike length and 170 m along the steep plunge direction with the main shoots open to depth. A deep hole, 94-151, confirmed the continuation of the mineralized structure to a vertical depth of about 400 m below surface. The continuation of the mineralized structure to a vertical depth of ~400 m below has been confirmed by a deep hole (Denholm et al, 2000).

There are sixteen ore shoots identified by underground sampling. The shoots average 27 m in length, 1.0 metres wide with average grades of 19.88 g/t gold and 442 g/t silver (Stroshein, 2007b). The listing and description of the underground ore shoots are exhibited in Table 3.

The character and mineralogy of the Huestis veins are identical to the Webber veins with better grade gold mineralization again associated with arsenopyrite concentrations with the exception that stibnite appears more widespread in Huestis. Little oxidation has been reported in the Huestis deposit and the ores have been considered refractory by BYG Natural Resources Ltd geologists.

9.2.4 FLEX ZONE

The Flex zone lies between the Webber zone and the Huestis zone (Figures 4 and 9). It has been defined by stripping, surface trenching and diamond drilling (Figures 9 and 12). There is a complex series of anastomosing narrow quartz veins filling fractures in the Paleozoic metamorphic rocks along the strike in the Flex zone (Denholm et al, 2000). The veins, including

the main vein, the footwall vein, the east vein and the hangingwall vein, are sub-parallel and dip steeply to the west (Anderson and Stroshein, 1998). The veins were offset by northeast-trending faults (Figure 11). The Flex zone has been traced for over 550 m and is open to depth (Denholm et al, 2000; Melling, 1995). In the top 15-40 m, sulphide minerals within the veins are mostly converted to limonite or other oxides (Denholm et al, 2000; Melling, 1995). Structural control on the individual vein is significant (Denholm et al, 2000).

The veins range from 5 to 110 centimetres thick. Silicification of the wall rock extends ore grade widths up to seven metres (Stroshein, 2007b). Table 4 contains a listing of diamond drill intersections from the 1998 diamond drill holes on the Flex Zone.

9.2.5 OTHER ZONES

In addition to the above mineralization zones, there exist a few more exploration targets on the property. Potential exploration targets identified during the 1985 multi-element soil geochemical survey are shown in Figure 13. The Orloff King Zone (Figure 13) is on strike and to the northwest of the Dickson structure. It has been tested with shallow drill holes and trenches and has the potential to host low-grade near-surface open pitable oxide material (Denholm et al, 2000). The PPBX showing (Figure 13) is a sulphide-poor quartz-tourmaline breccias zone (Denholm et al, 2000). Over the Mount Nansen porphyry, large copper, molybdenum and bismuth soil geochemical anomalies occur (Figure 13) and placer gold is being mined in creeks draining the porphyry (Denholm et al, 2000). Many gold soil anomalies have not been tested and they mostly trend northwest-southeast, which is the main structure direction in the area. Follow-up work including detailed mapping, trenching, and drilling are recommended on these anomalies. Upper Back, Volcanic Basal Conglomerate and Upper Webber soil anomalies appear to be the most promising ones (Figure 13; Denholm et al, 2000). The fine grained pyrite associated with the veins as observed by the writer at the Webber and Flex trenches gives an opportunity to use induced polarization (IP) to trace the extension of these veins and any others that are similar. In addition the IP survey may locate areas where these zones may converge.

Table 3: Vein Ore Shoots Huestis and Webber Deposits (Stoshein, 2007b)

DEPOSIT	VEIN No.	ORE SHOOT	LENGTH (m)	WIDTH (m)	GOLD (gpt)	SILVER (gpt)	OUNCES Au	OUNCES Ag	TONNES/Vert.m.	
Huestis/1311	11	628	22.9	0.8	16.80	82.3	28.3	138.3	52	
		12	609	10.7	0.9	23.32	332.6	21.9	312.9	29
			609	18.3	1.2	16.46	226.3	35.4	486.6	67
			610	17.8	0.9	14.74	308.6	21.8	456.2	46
			612	24.4	0.9	21.26	480.0	54.7	1032.3	67
			615	33.5	1.5	22.63	802.3	111.5	3953.9	153
			617	30.5	0.9	21.6	377.1	58.1	1013.8	84
			650	30.5	0.9	16.11	401.1	43.3	1078.3	84
			653	42.7	1.0	17.14	205.7	68.8	825.8	125
			657	30.5	0.9	13.71	274.3	36.9	737.3	84
			660	32.0	0.9	20.57	154.3	58.1	435.5	88
			662	47.2	1.0	19.89	596.6	91.1	2734.3	143
		13	645	27.4	1.5	14.74	545.1	59.5	2198.2	125
			H-15	18.3	0.9	9.94	366.9	16.0	591.7	50
		15	H-12	18.3	0.9	24	174.9	38.7	282.0	50
		17	H-12s	18.3	0.9	10.29	264.0	16.6	425.8	50
	Totals			423.1	16.1			760.7	16702.0	1207
Averages			26.4	1.0	19.88	441.7				
Webber/1311	1	101	13.7	0.9	8.57	253.7	10.4	306.9	38	
		105	30.5	1.2	13.03	332.6	46.7	1192.0	111	
		107	30.5	1.8	10.97	462.9	59.0	2488.5	167	
		119	32.0	0.9	8.91	476.6	25.2	1345.2	88	
		120	21.3	0.6	5.83	384.0	7.3	481.7	39	
		120/121		15.2	1.5	8.91	1080.0	20.0	2419.4	70
			122	24.4	0.6	10.63	325.7	15.2	467.0	45
		2	129	33.5	0.9	10.63	925.7	31.4	2737.3	92
			130	30.5	0.9	6.86	1920.0	18.4	5161.3	84
			131	13.7	0.6	12.3	761.14	10.0	613.8	25
			134	15.2	0.6	8.23	452.6	7.4	405.5	28
			136	36.6	1.5	22.97	1491.4	123.5	8018.4	167
			139	6.1	0.9	11.66	984.0	6.3	529.0	17
			146	12.8	1.0	15.09	270.9	19.3	346.6	40
			153	27.4	1.1	8.57	822.9	24.2	2322.6	88
			154	22.9	0.9	15.09	1258.3	30.4	2536.9	63
			157	47.2	0.9	17.83	754.3	74.3	3142.9	130
Totals			413.6	17.0			528.9	34514.9	1292	
Averages			24.3	1.0	14.06	917.5				

Table 4: Summary Diamond Drill Hole Assays, Flex Zone, 1998 (Stoshein, 2007b)

DDH No.	From (m)	To (m)	Width (m)	Au (gpt)	Ag (gpt)
98-183	12.5	16.5	4.0	3.0	44.0
	14.7	15.2	0.5	8.7	98.8
98-184	37.0	38.0	1.0	4.7	295.8
98-185	20.1	21.0	0.9	12.3	134.6
98-186	6.4	7.9	1.5	4.4	52.7
	73.8	76.8	3.0	3.0	2.9
98-188	54.6	65.3	10.7	2.1	97.5
incl.	54.6	55.6	1.0	5.4	282.7
and	61.0	62.0	1.0	8.0	92.5
	91.2	94.2	3.0	19.0	802.8
98-189	36.7	37.6	0.9	1.5	7.1
	45.8	46.8	1.0	1.4	24.9
98-190	15.5	36.9	21.4	1.9	61.7
98-190	19.5	20.2	0.7	11.8	298.8
	36.5	36.9	0.4	13.7	1035.5
	47.2	48.0	0.8	5.9	243.5
98-191	31.3	51.8	20.5	2.0	143.4
incl.	32.2	32.9	0.7	31.5	4206.5
and	44.6	45.6	1.0	8.5	58.2
98-192	46.3	47.4	1.1	3.0	155.6
98-193	56.1	67.7	11.6	6.2	260.9
incl.	60.2	61.1	0.9	14.5	78.4
and	65.0	67.7	2.7	13.4	45.1
	86.2	86.9	0.7	17.5	362.0
98-194	64.0	69.6	5.6	5.0	80.8
	80.0	84.3	4.3	7.1	95.3
98-195	74.9	75.8	0.9	7.3	382.1
98-196	93.8	94.3	0.5	2.7	112.5
98-223	58.0	58.7	0.7	1.3	37.7
98-226	24.7	25.7	1.0	1.1	7.3
98-227	10.0	11.1	1.1	20.8	83.9
98-228	23.6	24.3	0.7	3.6	33.9
98-229	72.8	73.3	0.5	4.3	46.4
	90.0	90.5	0.5	9.1	89.0
98-230	33.5	38.2	4.7	1.2	45.7
98-231	9.8	20.3	10.5	5.0	76.1
incl.	14.7	15.0	0.4	31.9	443.4
and	17.7	18.4	0.7	25.0	302.7
and	18.9	19.3	0.4	21.8	436.2
	51.5	52.5	1.0	12.8	874.4
98-234	49.7	57.9	8.2	3.0	12.9
98-234	49.7	50.2	0.5	9.9	43.5
and	54.2	55.1	0.9	6.7	38.3
98-235	31.8	39.9	8.1	2.6	33.7
incl.	33.0	34.0	1.0	9.3	4.7
98-236	30.0	31.0	1.0	1.8	4.6
98-237	8.8	10.4	1.5	0.7	9.0
98-238	26.0	27.0	1.0	2.1	169.8
	51.3	52.5	1.2	2.4	120.8
98-239	19.8	20.6	0.8	8.0	401.9
incl.	19.8	20.1	0.3	17.3	1019.1
	39.6	40.6	1.0	8.6	40.2
	47.0	48.0	1.0	9.4	541.1

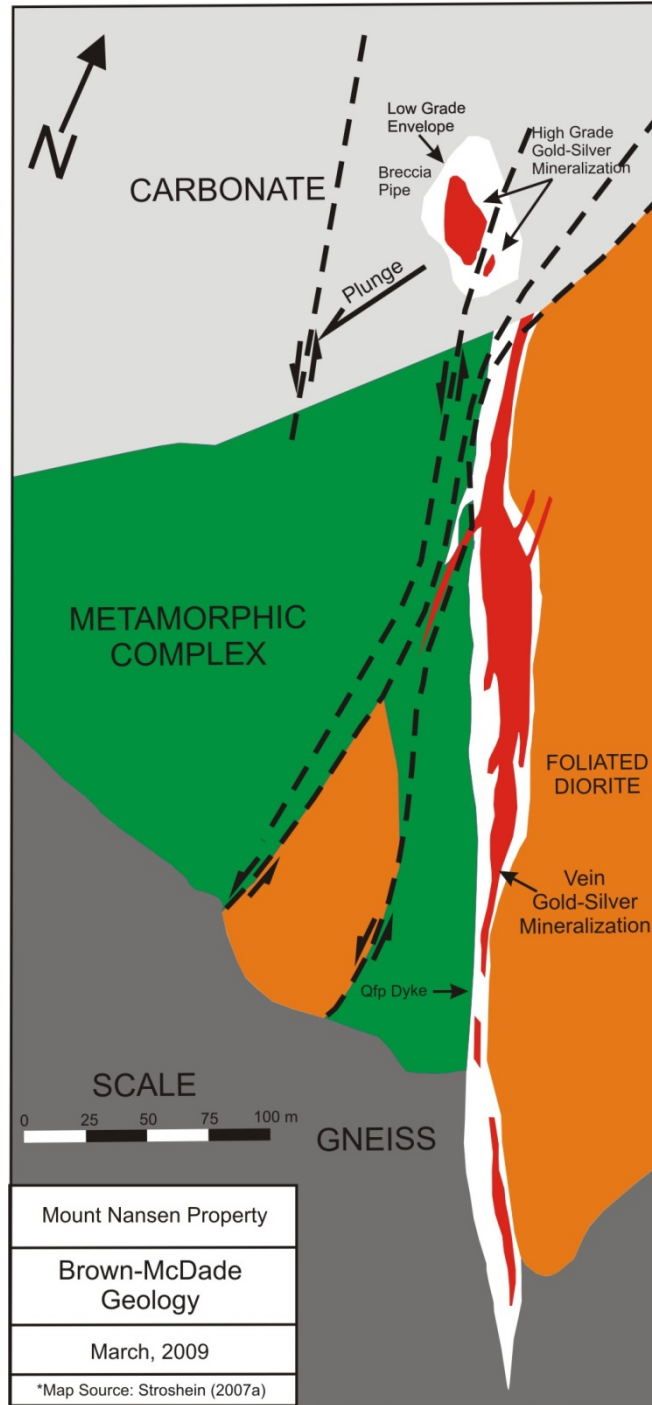


Figure 8: Simplified geology map of the Brown-McDade mine (modified from Stroshein, 2007 a). Note the two types of mineralized bodies (vein and breccias).

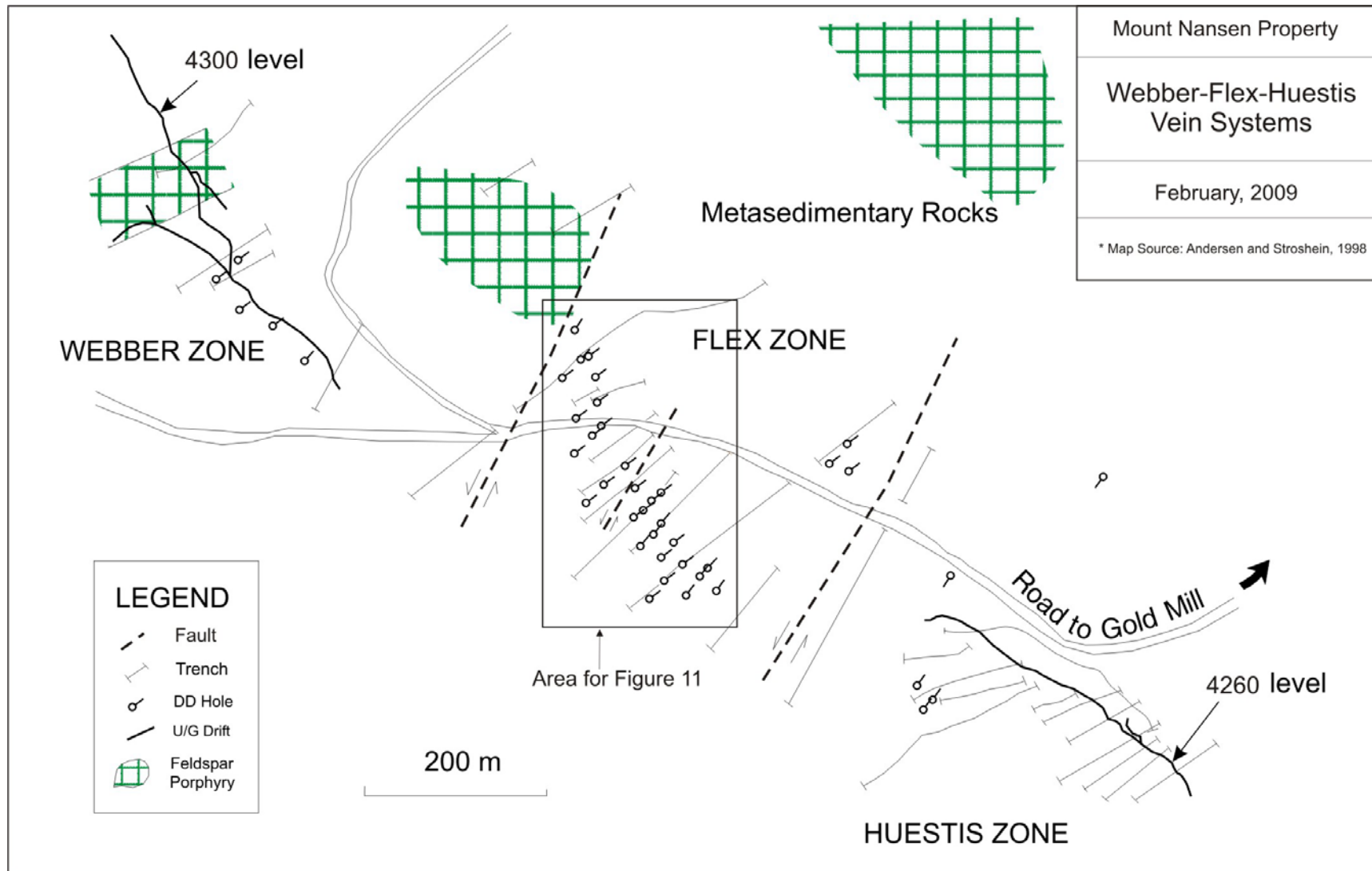


Figure 9: Plan view of the exploration work conducted around 1997 in Webber-Flex-Huestis vein systems (Anderson and Stroshein, 1998).

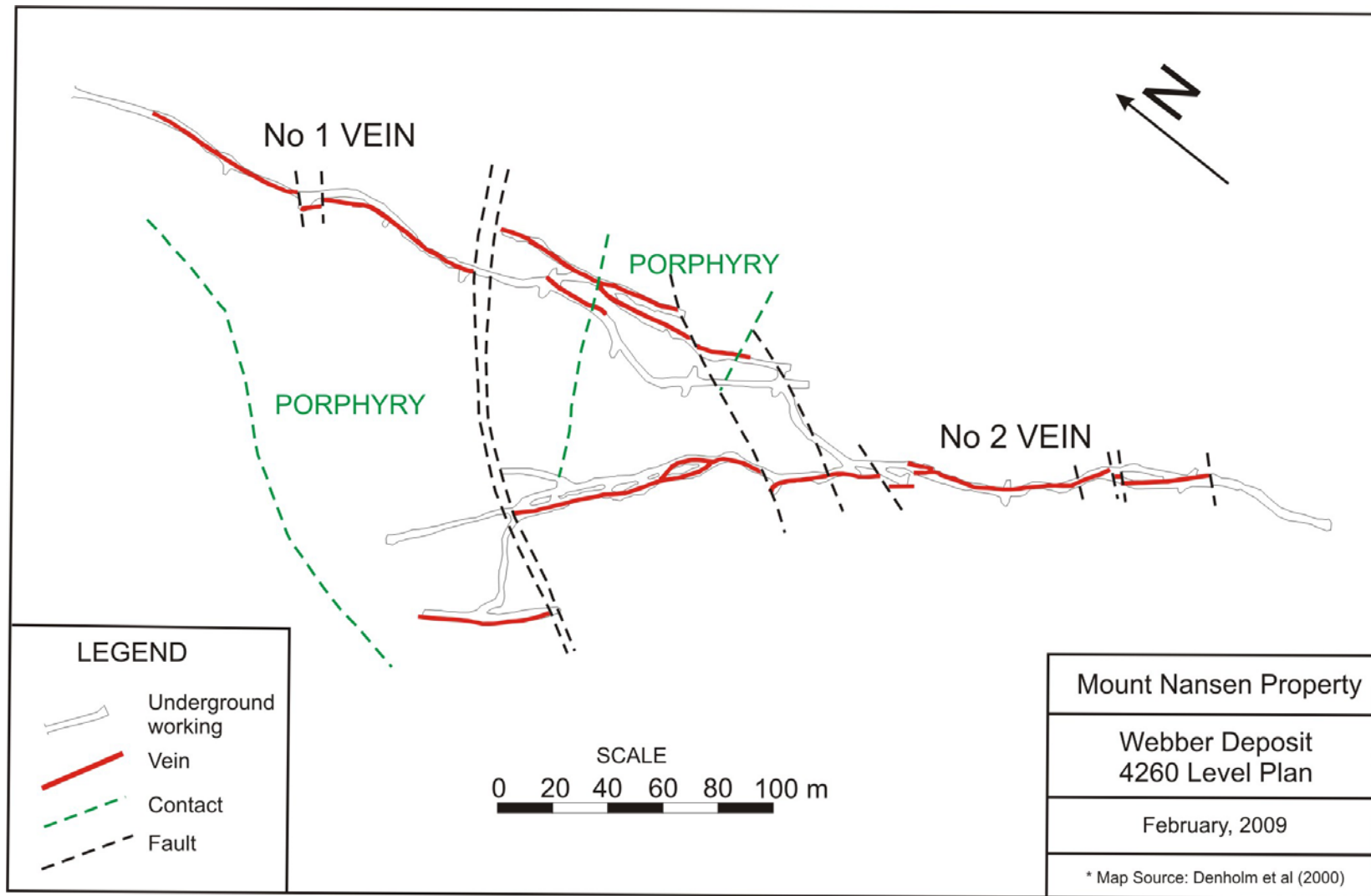


Figure 10: Webber deposit 4260 level plan map (Denholm et al, 2000).

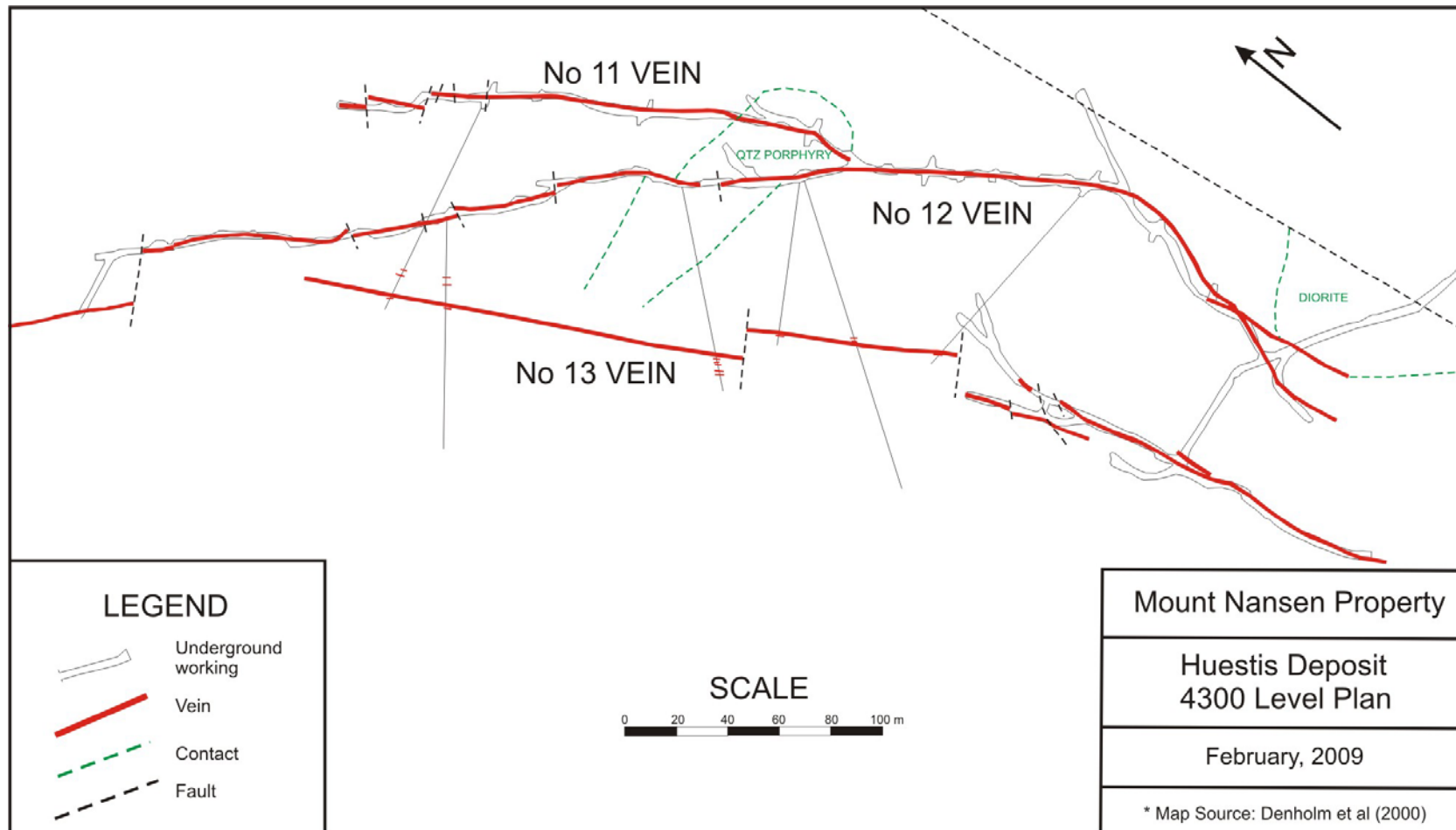


Figure 11: Huestis deposit 4300 level plan (Denholm et al, 2000).

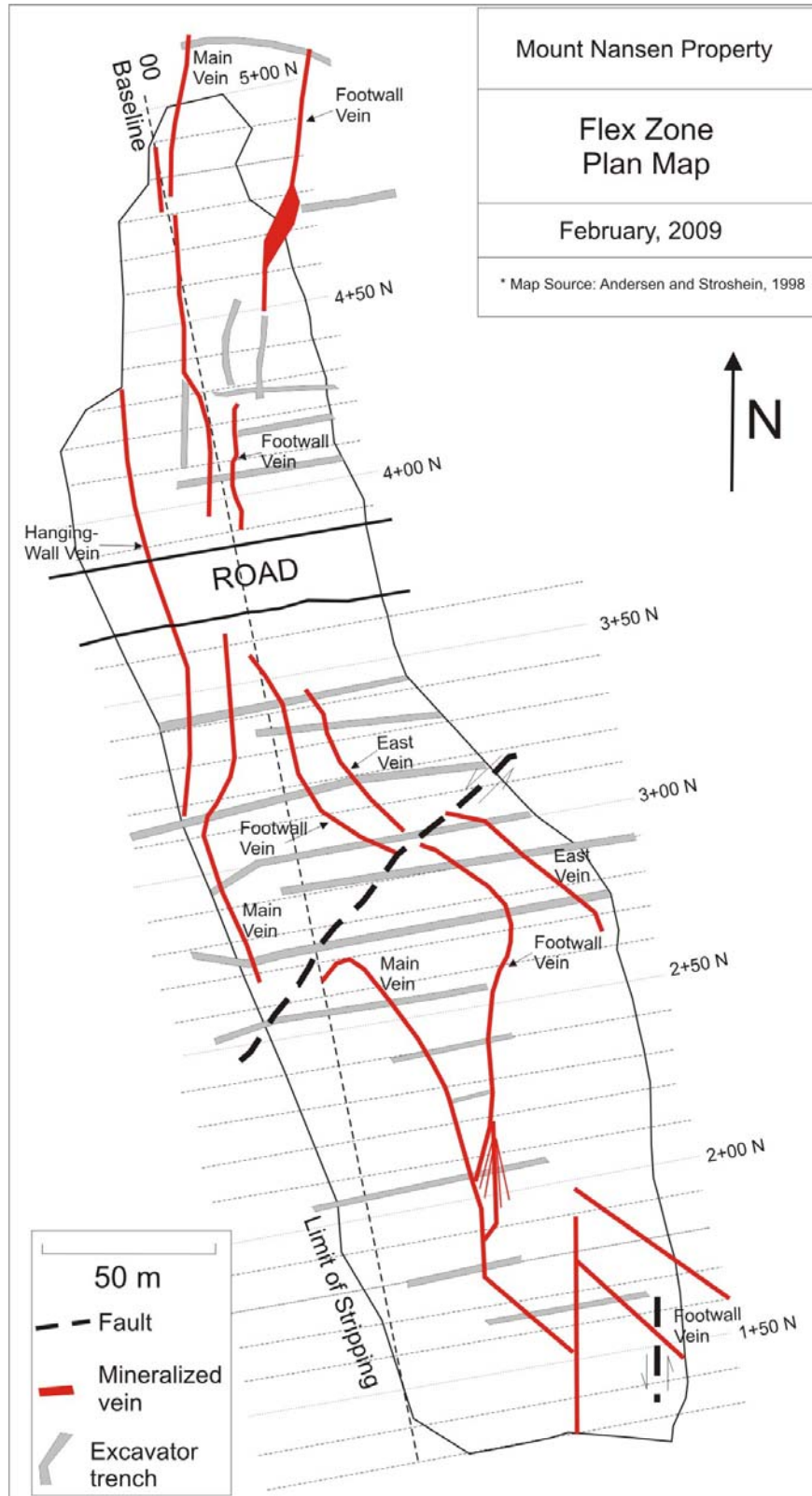


Figure 12: Plan view of the Flex vein system as exposed at surface. The four veins dip steeply west (Anderson and Stroshein, 1998).

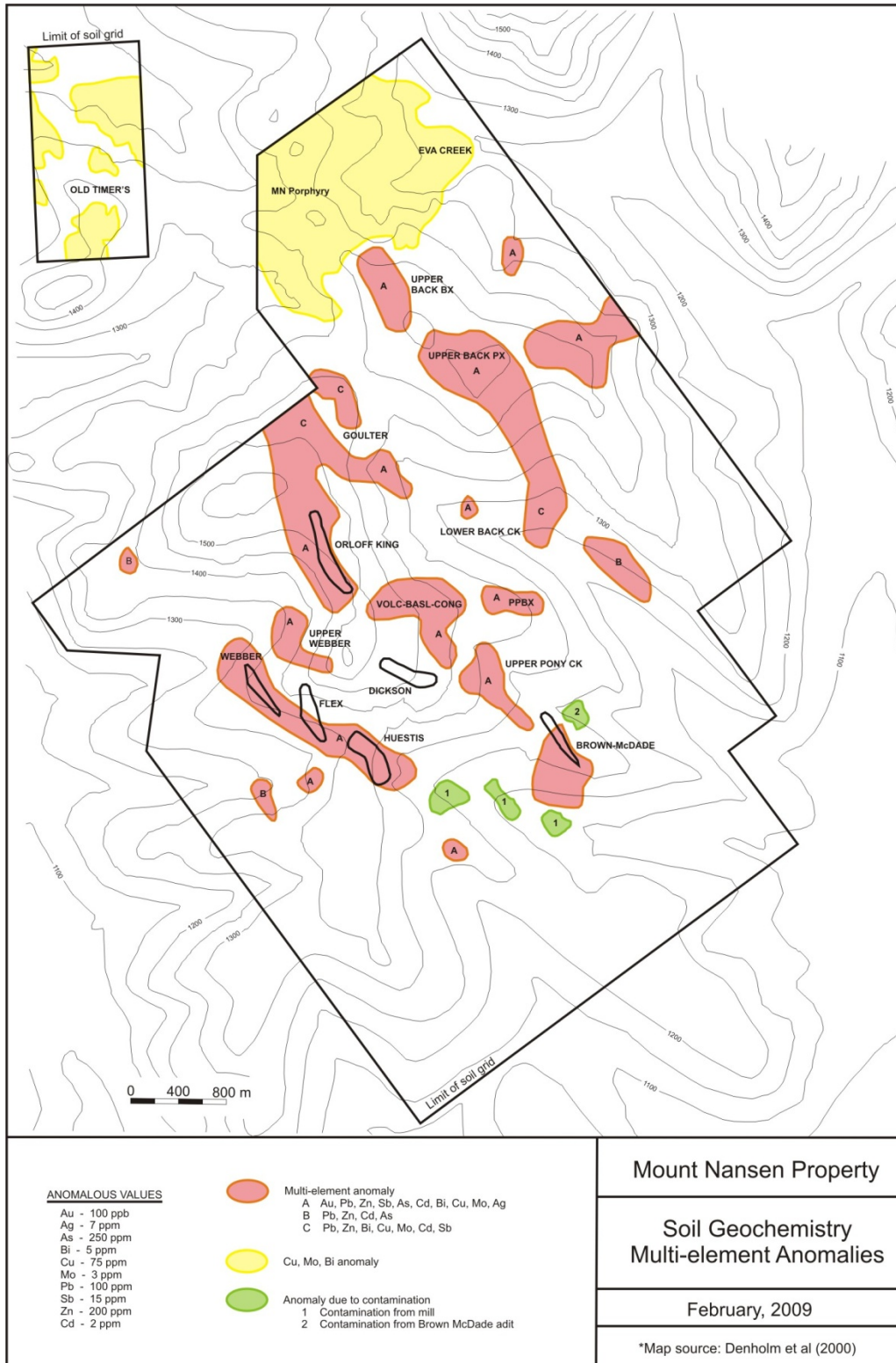


Figure 13: Multi-element anomalies in the Mount Nansen property outlined during the soil geochemical survey conducted by BYG Natural Resources Ltd in 1985-1986 (modified from Denholm et al, 2000).