BRITISH GEOLOGICAL SURVEY

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MINERAL RECONNAISSANCE PROGRAMME OPEN FILE REPORT NO. 15

AN APPRAISAL OF THE GOLD POTENTIAL OF MINE DUMPS IN THE NORTH MOLTON AREA, NORTH DEVON.

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This data package relates to work carried out by the British Geological Survey on behalf of the Department of Trade and Industry

SUMMARY

Investigations into the presence of gold in the tips at seven abandoned iron and iron with copper mines in the North Molton area of Devon have shown that there is a possibility of economic amounts of gold in the waste tips of Bampfylde Mine.

INTRODUCTION

Gold occurrences have been recorded at two mines, Bampfylde and Britannia, in the North Molton mining area, south of Exmoor, along with other metal ores, principally iron and copper (Dines, 1956; Collins, 1975). Samples were collected from the dumps at Bampfylde and Britannia mines and five other mines in the area which exploited mineralisation within the same sequence of Devonian sedimentary rocks. The objective was to determine the presence of gold in the mine dump material, its morphology and the possible case for more detailed assessment of economic viability at a later date (Figure 1).

Location

The North Molton mining district lies in the foothills of Exmoor, around the village of Heasley Mill (Figure 1). The remains of 6 mines visited fall within the ownership of North Molton Estates. These are Bampfylde, Walscott, Stowford, Barton, Crowbarn and New Florence (Table 2). Bampfylde (sometimes known as Poltimore) was the largest and most productive mine in the North Molton area. The area is covered by 1:50 000 Ordnance Survey map sheet 180 (Barnstaple) and 1:25 000 sheet SS 63/73. Geological coverage is provided by 1:50 000 Geological Survey sheet 293 (Barnstaple) and 1:10 560 sheets SS 73 SW and SS 73 SE.

The survey area lies on the low rolling hills south of Exmoor, given over to grassland, with some arable fields and coniferous plantations. The western boundary of the survey area was the east side of the River Bray and to the east, the River Mole forms the boundary. Most of the mines lie in tributary valleys of the River Mole (Figure 1).

Previous Research

The area was mapped on the one-inch scale by Sir Henry de la Beche between 1832 and 1835 and resurveyed at this scale by W A E Ussher between 1878 and 1900. The area was resurveyed at six-inch scale by B J Williams between 1968 and 1977 (Figure 2).

The mines of the area were described by Groves (1952) and Dines (1956) in his comprehensive study of South West England. In 1974 some geophysical and geochemical prospecting was carried out by British Kynoch Metals as part of a project aimed at finding extensions of the base metal mineralisation in the North Molton area under the auspices of the Mineral Exploration and Investment Grants Act (MEIGA). The presence of gold at Bampfylde and Britannia was first noted in analyses of the gossans in the 1850's. Numerous authors have commented on this occurrence, first Pattinson (1853), and subsequently Calvert (1854), Gregg and Lettsom (1858), Forbes (1869), Collins (1871 and 1904), Maclaren, (1902 and 1908), Emmons, (1937), Dines (1956), Rottenbury (1974) and Collins (1975).

A study of mineralisation in the North Devon area was carried out by Rottenbury (1974), who concluded that vein-style mineralisation was more widespread than had been recognised previously but was not economically workable.

Geology

The North Molton iron and copper mines exploited mineralisation within the Upper Devonian succession of sandstones, slates and limestones in the Exmoor Basin. The Pickwell Down Sandstones comprise red, purple and green cross-bedded and ripple marked sandstones interbedded with greenish-grey siltstones and

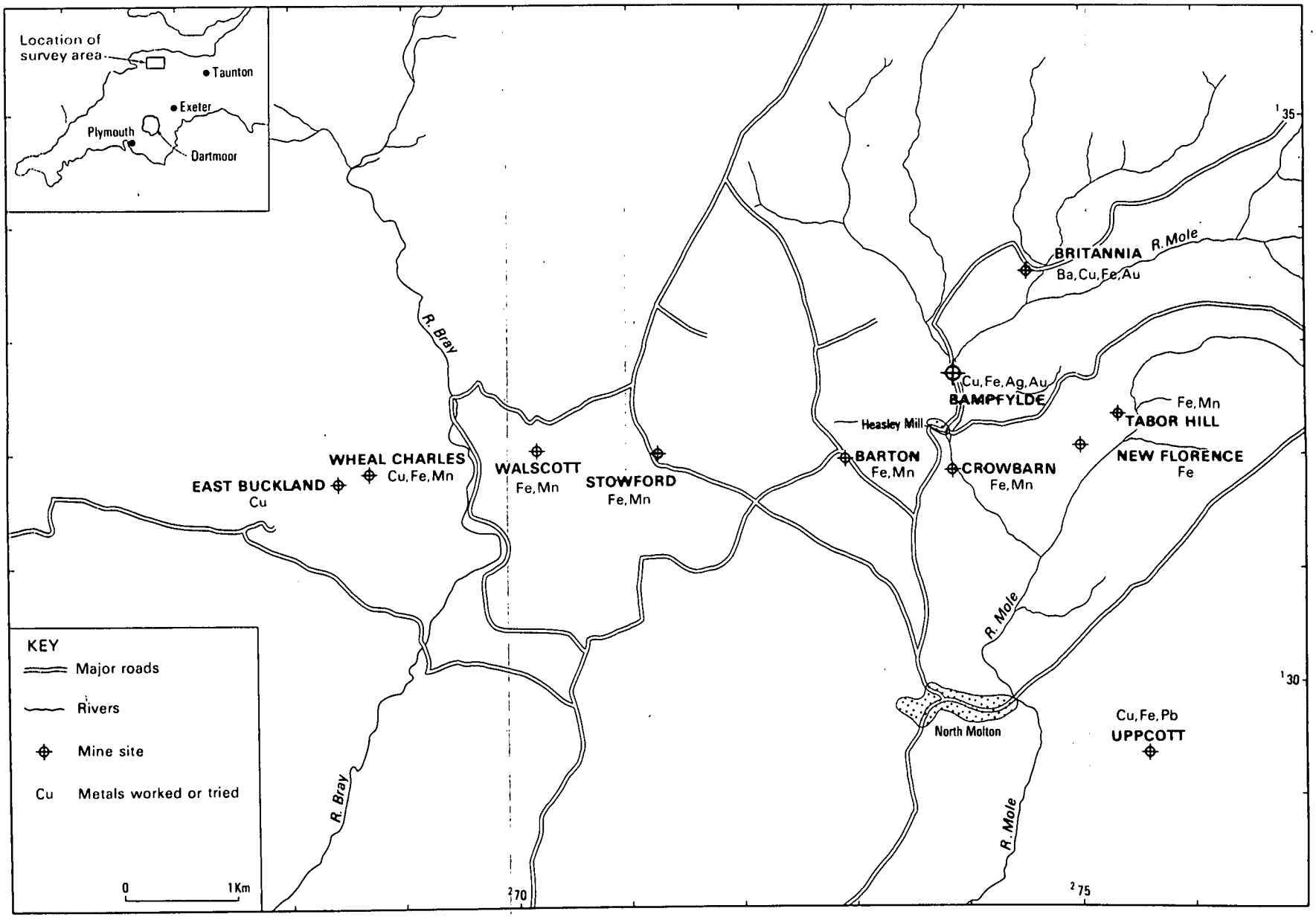

Figure 1 Location map of the survey area

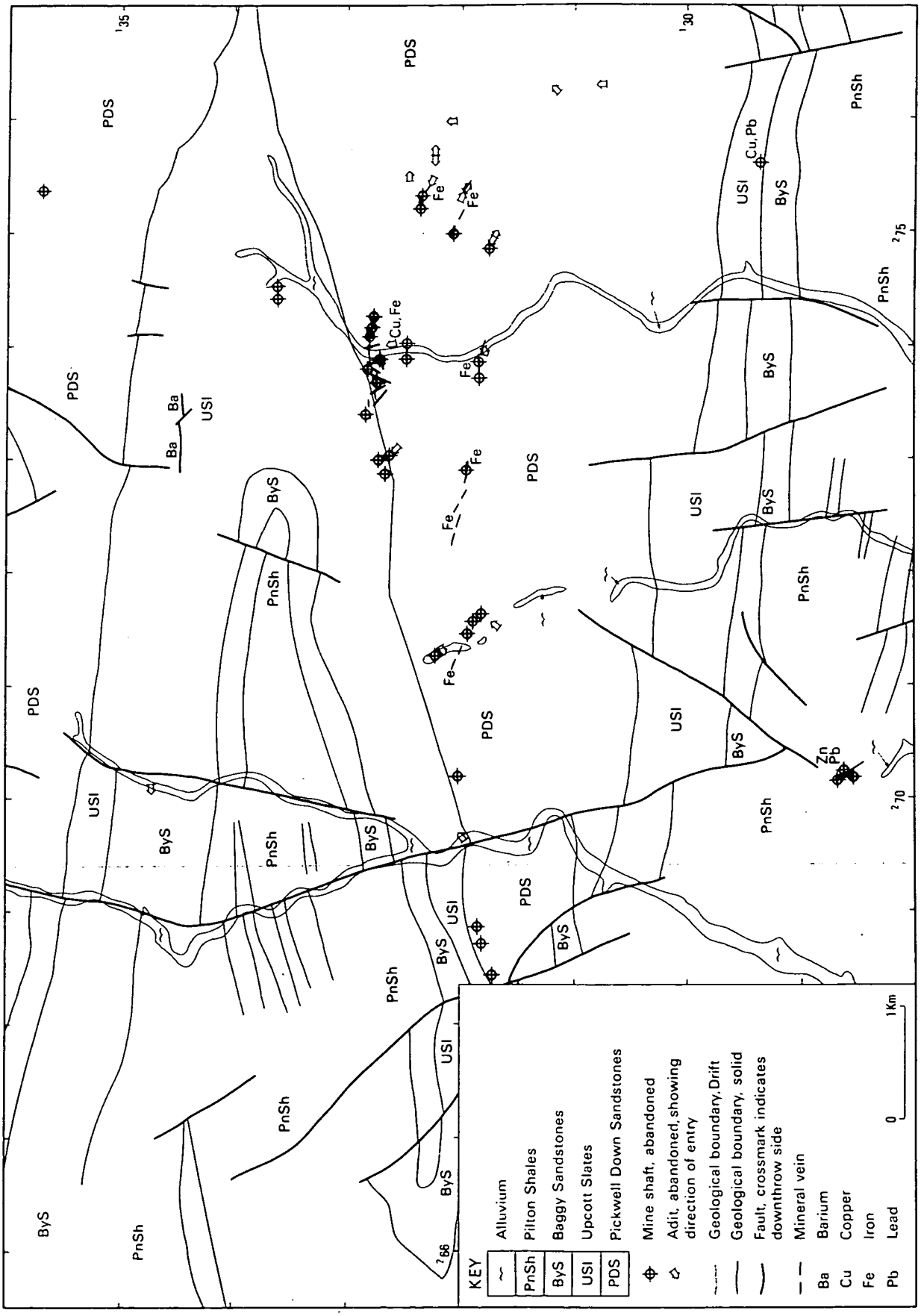

Figure 2 Geological map of the survey area, based on 1:50,000 GS Sheet 293, Barnstaple

slates. They are thought to have been deposited in shallow non-marine environments. The succession grades upwards into the Upcott Slates, composed of greenish grey slates and graded siltstones with occasional fine cross-bedded sandstones and thin limestones, thought to have been deposited in back-swamps or shallow freshwater lakes. The overlying Baggy Sandstones, massive cross-bedded sandstones and siltstones with conglomerates and thin limestones, are again a shallow water deposit, but with some marine facies. In this area there is a gradual upward passage into the Pilton Shales, which represent a major shoreline transgression, and fine sandstones, siltstones and thin cherts appear in the succession (Selwood and Durrance, 1982).

After deposition and burial, the sedimentary rocks of the district were folded during the Variscan orogeny. In the area around North Molton, the Pickwell Down Sandstone, Upcott Slate and Baggy Sandstone outcrop in a Z-shaped structure caused by a northern syncline and a southern anticline (Figure 2). These structures trend at approximately 85° east of north. The Pickwell Down Sandstones are more competent than the Upcott Slates, which are highly cleaved. Post-deformational tension cracks are found in both rock types (Rottenbury, 1974).

MINERALISATION AND MINING

In the North Molton district, veins appear to have been emplaced as fracture fill during crustal extension, which suggests a later rather than earlier (syn-Variscan) origin (R C Scrivener, pers. comm.). Rottenbury (1974) proposed an age of 360 Ma and subsequently, Rottenbury and Youell (1974) suggested that the Exmoor and North Devon mineralisation was a Permo-Triassic fissure infill in the Devonian rocks. Ineson and others (1977) obtained potassium-argon dates on clay minerals varying from 348±4 Ma to 294±4 Ma for some Bampfylde material and 296 to 301±3 Ma for Bampfylde North Lode and some of the other mines, but the radiometric age of the clay is not necessarily that of the principal mineralising event.

Table 1: Mines and metals worked in the North Molton area

Mine	Other names	Metals present	Lithology	Type
Britannia *	Prince Regent	Ba-Cu-Fe-Au	Uppcott Slates	T
Bampfylde *	North Molton Gold Poltimore Gold Bampfylde Copper New Bampfylde	Cu-Fe-Ag-Au	Pickwell Down Sandstones	P
Barton *	Barton Pits	Fe-Mn	Pickwell Down Sandstones	P
Walscott *	Poltimore	Fe-Mn	Pickwell Down Sandstones	T
Stowford *		Fe-Mn	Pickwell Down Sandstones	P
Crowbarn *	South Poltimore Gold	Fe-Mn	Pickwell Down Sandstones	P
New Florence *	Florence	Fe	Pickwell Down Sandstones	P
Tabor Hill	?N Lode, Florence	Fe-Cu	Pickwell Down Sandstones	T
East Buckland		Cu	Uppcott Slates /Baggy Sandstones	P
Wheal Charles		Cu-Fe-Mn	Pickwell Down Sandstones /Uppcott Slates	T
Uppcott		Cu-Fe-Pb	Uppcott Slates	P

* sampled by the present survey Type - T Trial; P Producing mine

Dines (1956) suggested that the ore deposits of North Devon represented the outer zone of hydrothermal activity of the Cornubian batholith. Ineson and others (1977) also assumed that fluids from this source had migrated along fractures during the Variscan orogeny. Consideration of physical constraints led Scrivener and Bennett (1980) and Beer and Scrivener (1982) to suggest that source fluids came from within the Devonian sedimentary sequence and were, partly at least, mobilised by the regional metamorphism which took place before the emplacement of the Cornubian batholith. The metal concentrations were believed to

be derived from syngenetic accumulations in the sedimentary rocks and Scrivener and Bennett (1980) suggested a partial stratigraphic control, with siderite, goethite and limonite common in the Pickwell Down Sandstones and the iron-copper mineralisation in this lithology lying close to the boundary with the Upcott Slates. In the Uppcott Slates, barium, copper and lead have been recorded, baryte, chalcopyrite and tetrahedrite noted at Britannia, and chalcopyrite and galena at Uppcott. Rottenbury (1974) suggested that this was a lateral zoning of the mineralisation, with an iron zone to the south, copper mineralisation running east–west across the central part of the area and a baryte zone to the north.

In the North Molton district, iron and copper were the principal metals extracted, with manganese, lead, barium, silver and gold also present (Table 1). Veins trend east–west and dip steeply both to north and south. The fissure fillings consist typically of quartz, iron oxides and carbonates and brecciated host rock, with copper sulphides at Bampfylde, and baryte at Britannia (Rottenbury, 1974). On the dumps at Bampfylde, goethite, probably gossaneous, malachite and azurite are common. Rottenbury (1974) suggests that the copper and barytes represent a later event from that which caused the iron deposition. Vertical zoning of the mineralisation can be seen at Bampfylde, with a gossaneous capping over an oxidised zone, a secondary enriched zone and the primary zone (Rottenbury, 1974).

Working may have started with iron, silver and manganese being extracted in medieval and Elizabethan times with mines closing and reopening at intervals. Most of the mines were worked from adits, with shafts sunk later as workings went deeper into the hillsides. The main production of iron and copper took place in the late 19th Century with most mines finally closing by 1900. Some small amounts of iron ore were taken during World War 1, and attempts were made to reopen New Florence by Canadian Army Engineers in 1942 but no production ensued (Groves, 1952). Bampfylde was the scene of an attempted swindle in 1854 when it appears that salting of the supposed gold ore took place both to promote the mine and the sales of a type of processing equipment (Rottenbury, 1974).

At Bampfylde, on the North Lode, assays of 8 Dwt per ton (12.24 g/tonne gold) were made by Johnson Matthey and Co in 1864, some ten years after the swindle attempt. More recently, Rottenbury sampled ore from the upper levels of this lode and recorded up to 86 ppm gold in 10 channel samples by neutron activation at the National Reactor Centre, Risley. On crushing 3 g of the highest grade sample and treating with nitric and hydrofluoric acid, 14 gold grains ranging from 5 to 200 μm in size were recovered. Further mineralogical work revealed some gold embedded in malachite from this lode (Rottenbury, 1974).

At Britannia, Rottenbury (1974) noted the presence of gold in a gossan from a copper lode, and a specimen is in the Camborne School of Mines Collection.

Dumps remain at most mine sites, but Britannia has been cleared away and the dumps removed. At Bampfylde, in contrast, a substantial amount of material remains in several tips along the strike of the veins and in the valley of the Mole. Some of the mine sites have been landscaped, e.g., Britannia and Barton Pits, while others, in more isolated spots, are more or less in the state that they were left when closed, e.g. Florence and Stowford, where machinery and bogies are still extant.

SAMPLING AND ANALYSIS

As it was known from previous work in the area (Rottenbury, 1974) that discrete (free) gold grains were present, or held in a soft matrix of secondary minerals such as a gossan or malachite, it was decided to extract any gold by physical means rather than make an assessment solely by chemical analysis. This meant that the amount of gold which could be easily extracted could be estimated and also any grains would be available for further study. In addition, some chemical analyses were made on dump material.

Method

18 mine dumps or workings were visited at 7 former mines and 22 grab samples of approximately 4 kg collected (Figure 3 and Table 2). The material collected may not be representative of the mine as a whole,

although as far as possible, material was representative of the dump sampled. At a panning site on the River Mole, at Bampfylde, the samples were wet sieved at 2 mm and the washed oversize collected. The <2 mm sample, approximately 1 kg in weight, was then panned to provide a heavy mineral concentrate of c. 50 g. The oversize and concentrates were examined in the field and the clast compositions recorded (Table 3). After return to Keyworth, the samples were dried and 16 sieved at 30 mesh (500 mm) and magnetically fractionated using a Frantz Isodynamic Magnetic Separator. Each magnetic fraction was subsequently superpanned to concentrate the heavy minerals and any precious metal grains were then hand picked and weighed. The results are presented below (Table 4) and an account of the mineralogical examination is given in the Appendix.

Eight of the oversize (> 2 mm) samples were crushed, ground and subsampled to 25 g for gold analysis by acid digestion and AAS finish at Caleb Brett Analabs, St Helens. The results are presented in Table 4.

Samples examined mineralogically and chemically analysed were selected on the basis of field observation. This resulted in a strong bias in favour of the Bampfylde samples as this was the only site where gold grains were recorded in the pan.

Table 2: Sample locations

Location	Sample No.	Easting	Northing	Description of sample locations
New Florence	123	275185	131978	Opposite mine buildings, small tip, south side stream
New Florence	124	275110	132010	Filled in entrance N of track
New Florence	125	275025	132045	Adit entrance between track and field boundary
Crowbarn	126	273915	131760	Lowest tip, near footbridge over R. Mole
Stowford	127	271210	132125	Run-in adit at NW end of workings, N of fence
Stowford	128	271200	131975	Small run-in adit, near farm buildings
Barton	129	272490	132045	Barton Pits farmyard, base of hedge, north of open barn
Barton	130	272790	131970	Rews Cross, pit side, south-east of track entrance
Bampfylde, W side	131	273385	132780	Western shaft, west of field boundary
Bampfylde, W side	132	273535	132725	Tip, south-west of shaft, opposite field boundary
Bampfylde, W side	133	273605	132735	Depression in tips, 30m east of shafts
Bampfylde, E side	134	274120	132780	Dump in S. Radworthy field, some rubbish
Bampfylde, E side	135	274065	132780	Dump in S. Radworthy field, by fence at wood
Walscott	136	269965	132140	On edge of tramming dump, north of adit
Britannia	137	274560	133580	South-west edge of quarry face, south of vein?
Bampfylde, W side	138	273780	132750	Nose of roadside tip
Bampfylde, W side	139	273710	132740	Roadside tip, above track crossing from north to south
Bampfylde, E side	140	273850	132742	Area around shaft
Bampfylde, E side	141	273840	132670	Tip near dam, opposite end of track
Bampfylde, E side	142	273890	132750	Large tip at base of hill
Bampfylde, E side	143	274040	132750	In forest, west of fence
Bampfylde, W side	144	273780	132750	Nose of roadside tip

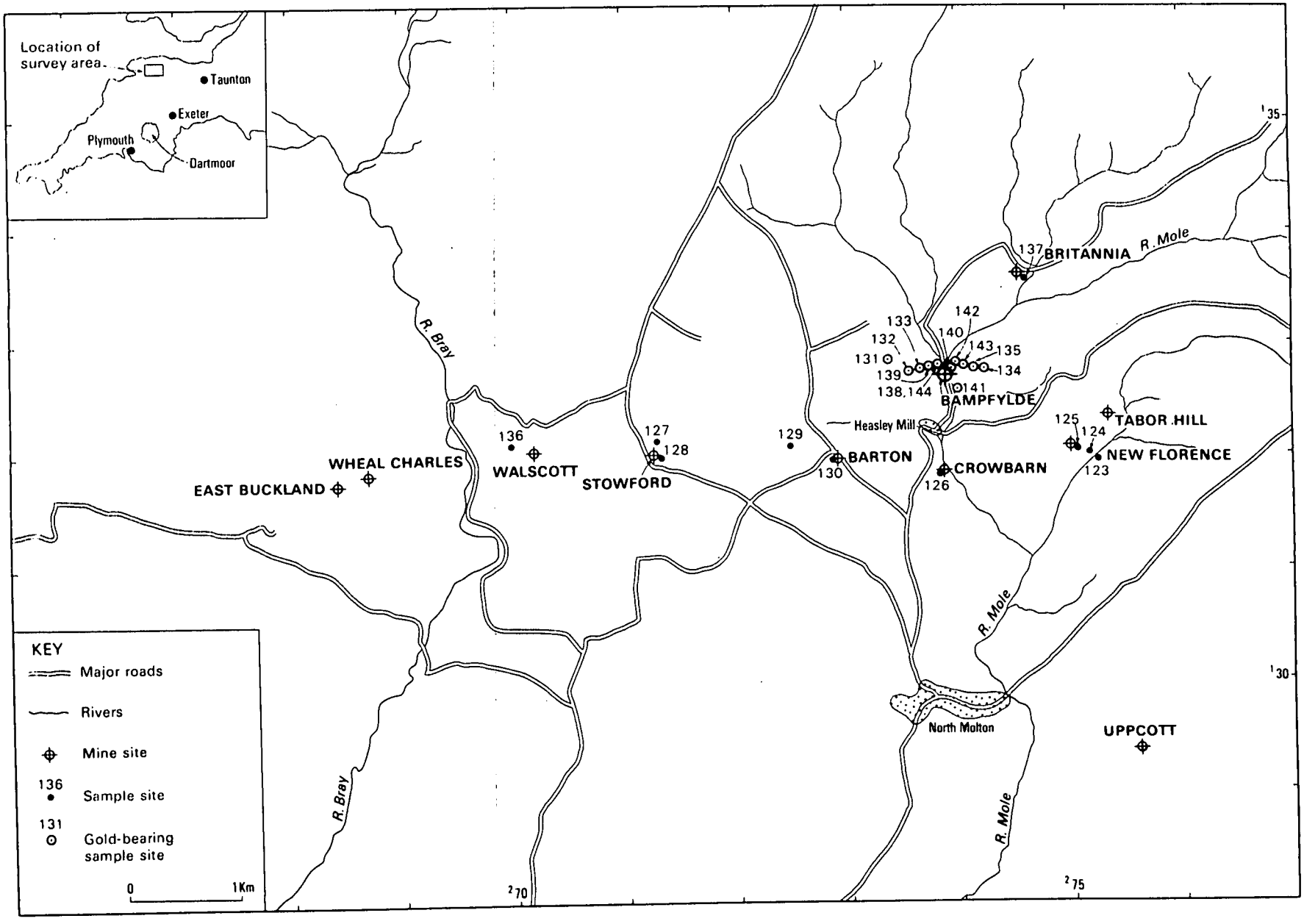

Figure 3 Location of sampling sites and results

Table 3: Field examination of material

Location	Sample No.	Fragments present	Mineral noted in field examination of panned concentrate
New Florence	123	purple, weathered sandstone, shale	hematite, specular hematite, few malachite
New Florence	124	purple cream sandstone, some hematite ore	hematite, specular hematite, few malachite
New Florence	125	purple, cream shale	hematite, specular hematite, few malachite
Crowbarn	126	Purple sandstone, quartz/carbonate veins, hematite	hematite, specular hematite, few bornite
Stowford	127	Quartz/hematite, hematised sandstone,	hematite, specular hematite, few malachite
Stowford	128	purple sandstone, hematite	hematite, specular hematite, few malachite, ?pyrite
Barton	129	Quartz sandstone hematite, malachite	hematite, specular hematite, few malachite
Bampfylde, W side	130	Quartz. hematite, specular hematite, sandstone, carbonate	hematite, specular hematite, few malachite
Bampfylde, W side	131	sandstone shale, malachite, hematite	hematite, specular hematite, abundant tarnished pyrite, few malachite, few gold
Bampfylde, W side	132	grey-green shale, some bleached, quartz, hematite, siderite, malachite, minor chalcopyrite	hematite, specular hematite, few malachite, many (c.100) small to medium gold grains
Bampfylde, W side	133	grey slatey sandstone, little mineralisation seen in fragments	very abundant hematite, specular hematite, tarnished pyrite, malachite
Bampfylde, E side	134	heavily stained grey green slate, Fe ore, minor quartz	hematite, specular hematite, moderate amount copper sulphides, malachite, some (<10) very fine gold grains
Bampfylde, E side	135	hematised purple slate, quartz veins with hematite, malachite	hematite, specular hematite, minor copper sulphide, malachite, trace gold grains (<10)
Walscott	136	siderite, manganese oxide, grey shales with hematite partings	hematite, tarnished pyrite
Britannia	137	grey slate, hematite ore and gossan	hematite, moderate sulphides
Bampfylde, W side	138	purple, red, green sandstones, quartz veins, hematite, manganese oxides	hematite, malachite, 10's of very small gold grains
Bampfylde, W side	139	purple red, green sandstones, quartz veins, hematite, manganese oxides	hematite, malachite, 10's of very small gold grains
Bampfylde, E side	140	purple, green sandstones, quartz, malachite	hematite, malachite, <10 small gold grains
Bampfylde, E side	141	purple, green sandstones, quartz, malachite	hematite, malachite, pyrite, chalcopyrite, few (<10) gold grains
Bampfylde, E side	142	purple, green sandstones, quartz, malachite	hematite, malachite, pyrite, chalcopyrite, few (<10) gold grains
Bampfylde, E side	143	quartz vein, brecciated sandstone, hematite, malachite	hematite, chalcopyrite, >10 gold grains
Bampfylde, W side	144	purple-red, green sandstones, quartz veins, hematite, manganese minerals	hematite, malachite, 10's of very small gold grains

Grain analysis

Gold grains were counted in the superheavy fraction, followed by extraction and weighing using a five place balance with a lower limit of 0.00001 g (Appendix). In some cases although grains could be counted, the weights were below this limit and an estimate based on a weight of 0.0000142 g per grain used. This was obtained by adding total grains and weight for samples 132 (80 grains and 0.00098 g) and 138 (71 grains and 0.00107 g). In other cases, not all the gold grains were counted or extracted due to their extremely small size (Table 4 and Appendix).

Unexpectedly, gold was found in the magnetic fraction of the samples not attached to magnetic gangue material. It is possible that iron coatings from immersion of the samples in water could have caused this effect. To compensate for attachment of gangue minerals (specular hematite in particular) it is suggested that weights are reduced by 25%. However, this may be counter-balanced by an underestimation due to the uncounted very fine grains.

Table 4: Results of mineralogical examination and chemical analyses

Location	Sample No	Non-magnetic fraction grains			Magnetic fraction grains			Sum of fractions	Assume <2 mm sample weight 1 kg	Gold in >2 mm material
		No	Wt, g	*Estimated Wt, g	No	Wt, g	*Estimated Wt, g	Wt, g	g/tonne	g/tonne
Crowbarn	126	0	-	-	0	-	-	-	-	-
Stowford	127	0	-	-	0	-	-	-	-	-
Bampfylde, West	131	2		0.0000285	1	-	0.0000142	0.0000427	0.0427152	0.217
Bampfylde, West	132	40	0.0005300		40	0.0004500		0.0009800	0.9800000	0.537
Bampfylde, West	133	0	-	-	1	-	0.0000142	0.0000142	0.0142384	0
Bampfylde, East	134	11		0.0001566	6	-	0.0000854	0.0002421	0.2420530	0.232
Bampfylde, East	135	4		0.0000570	8	-	0.0001139	0.0001709	0.1708609	0.107
Walscott	136	0	-	-	0	-	-	-	-	
Britannia	137	0	-	-	0	-	-	-	-	
Bampfylde, West	138	31	0.0005300		40	0.0006400	-	0.0011700	1.1700000	0
Bampfylde, West	139	12	0.0000700		12	0.0001400	-	0.0002100	0.2100000	-
Bampfylde, East	140	1	0.0000200		8	0.0000400	-	0.0000600	0.0600000	-
Bampfylde, East	141	0	-	-	11	-	0.0001566	0.0001566	0.1566225	-
Bampfylde, East	142	0	-	-	3	-	0.0000427	0.0000427	0.0427152	-
Bampfylde, East	143	4		0.0000570	12	0.0000600	-	0.0001170	0.1169536	-
Bampfylde, West	144	3	0.0000300		8	0.0000700	-	0.0001000	0.1000000	-

* Estimate based on a weight of 0.0000142 g per grain

ASSESSMENT

Gold was only recorded in material from Bampfylde. No trace of gold was found in the sample from Britannia Mine and none of the samples from the other sites were auriferous.

At Bampfylde, significant quantities of free gold are present on the dumps. This could be extracted using bulk concentrating techniques, e.g. using a Knelson Concentrator, without much pre-processing of the dump material except for screening to a suitable size. There may be more 'bound gold' in the >2 mm size fraction of the dump material which could be liberated by additional crushing.

At the time of the 1974 survey, an estimate of 85,000 cubic yards was obtained for the remaining dump material. It is not known how much material has been removed since that date but local information suggests that most of the material remains on site.

An attempt to assess the amount of gold in this material is presented below (Table 5). The following assumptions are made in order to make this assessment:

a. The samples are representative of the dump and the dump represents run-of-mine material.
b. No gold was lost during panning.
c. The 25% reduction in the weight of gold is balanced by the underestimation of grain numbers.
d. The analytical result for the chemical gold content of the >2 mm size material and weight of grains. from the <2 mm size fraction can be amalgamated.
e. The silver content of the gold is low.
f. A figure of 70% recovery by physical means is used.
g. The amount of material in the dumps is still 85,000 cubic yards.
h. The average density of this material is assumed to be 3 g/cc.

Table 5: Estimate of quantity of gold in Bampfylde dumps

West side Sample No.	***Average** g/t	**Amount of gold in dumps at this concentration** Troy oz at 70% recovery	**East side** Sample No.	***Average** g/t	**Amount of gold in dumps at this concentration** Troy oz at 70% recovery
131	0.173429	760	134	0.234513	1027
132	0.64775	2838	135	0.122965	539
133	0.00356	16	140	0.015	66
138	0.2925	1281	141	0.039156	172
139	0.0525	230	142	0.010679	47
144	0.025	110	143	0.029238	128
Average W Bank	0.199123	872	**Average E Bank**	0.075259	330
** calculated from combination of concentration from <2 mm and >2 mm fractions in the proportion 0.25:0.75*			**Average all sites**	0.0160056	701

CONCLUSIONS AND RECOMMENDATIONS

1. Gold is present in appreciable amounts in the tips at Bampfylde Mine, but not in the other tips sampled.

2. Assuming 70% recovery and 85,000 cubic yards of material, c. 700 Troy oz of gold might be extracted from the tips at Bampfylde Mine. However, as the variation between these small samples is large, the amount of gold that could be extracted might vary between less than 100 and over 2000 Troy oz.

3. Further work at Bampfylde would be necessary to prove this resource, including assessing a methodology for commercial extraction.

4. Further reconnaissance sampling needs to be carried out on the East Buckland, Wheal Charles and Uppcott mine sites. Britannia Mine site should also be sampled in more detail.

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APPENDIX: GOLD IN BAMPFYLDE CONCENTRATES

(Mineralogy and Petrology Short Report MPSR/92/22)

Examination requested

The weight of free gold present in the non-magnetic fractions of sixteen panned concentrates from the various dumps in the vicinity of Bampfylde, N Molton, Devon.

The <30 mesh magnetic fractions were also examined after discussion of the results on the <30 mesh non-magnetic fractions.

LABORATORY EXAMINATION

1/ Non-magnetic fractions

Heavy grains from the samples were separated using the Superpanner followed by hand picking under a binocular microscope to extract the gold grains.

The gold grains extracted were placed in a pre-weighed gelatine capsule and weighed. In the cases of UBR 131 and UBR 132 a number of extremely small gold grains were left in the concentrate as it was judged that their aggregate weight would not be measurable.

The results are given in Table I. In the table an entry in the weight column indicates that gold grains were found, and placed in a capsule, even if the weight was too small to register on the balance.

Table I

Sample Number	Weight of Gold	Comments on associated minerals
UBR 126	-	
127	-	
131	< 0.00001g	Pyrite
132	0.00053g	2 Qtz/Au composites
133		Pyrite
134	< 0.00001g	
135	< 0.00001g	Cuprite or Cinnabar
136	-	
137	-	
138	0.00053g	
139	0.00007g	
140	0.00002g	Malachite and Chalcopyrite
141	-	
142	-	
143	<0.00001g	
144	0.00003g	

2/ Magnetic fractions

The <30 mesh magnetic fractions were separated into a potentially gold containing fraction, which comprised the heavy "tip" from the superpanner, and the remainder including any lighter heavy minerals. The "tip" was examined under a binocular microscope and any gold found placed in a gelatine capsule and weighed if sufficient to register on the balance.

The results are given in Table II. Where only a few grains, too small to be weighed, were found only the numbers of grains are given.

TABLE II

Sample Number	Weight of Gold	Comments
UBR 126	-	none
127	-	none
131	-	1 grain
132	0.00045g	
133	-	1 grain
134	-	6 grains
135	-	8 grains
136	-	none
137	-	none
138	0.00064g	
139	0.00014g	
140	0.00004g	8 grains
141	-	11 grains
142	-	2/3 grains
143	0.00006g	
144	0.00007g	8 grains

Comment

The gold found in the magnetic fractions was not all attached to magnetic particles. It was noticed that in several cases the water on the superpanner became heavily stained with iron oxide. This cleansing of the particles could have removed loosely bound magnetic material to leave the clean gold grains that were found.

To allow for other material (mainly specular hematite but also quartz, which being much less dense has less effect) attached to some of the gold grains it is suggested that the weights particularly in Table II are reduced by a quarter to compensate for the included gangue.

D. J. Bland

14-01-93

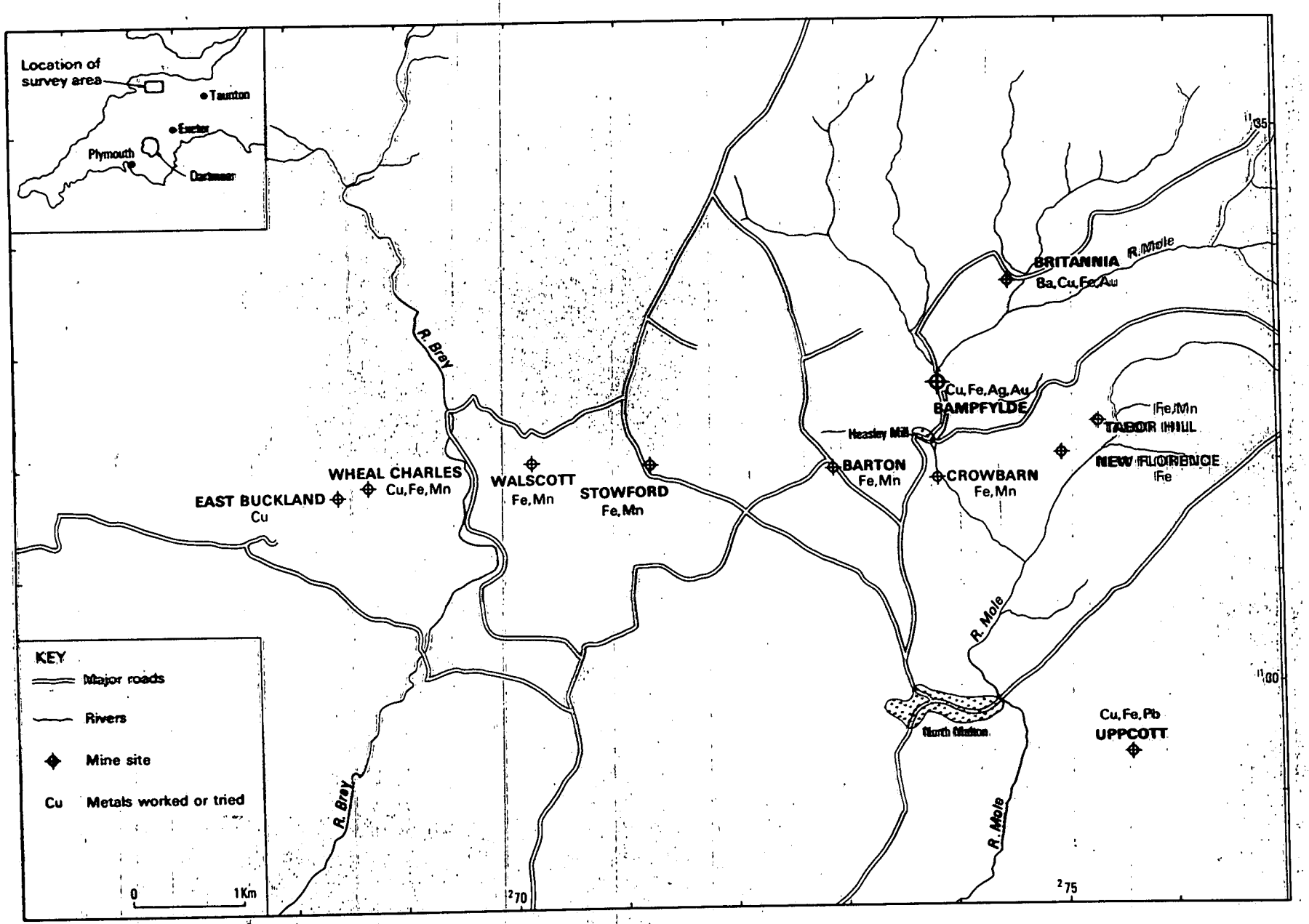

Figure 1 Location map of the survey area

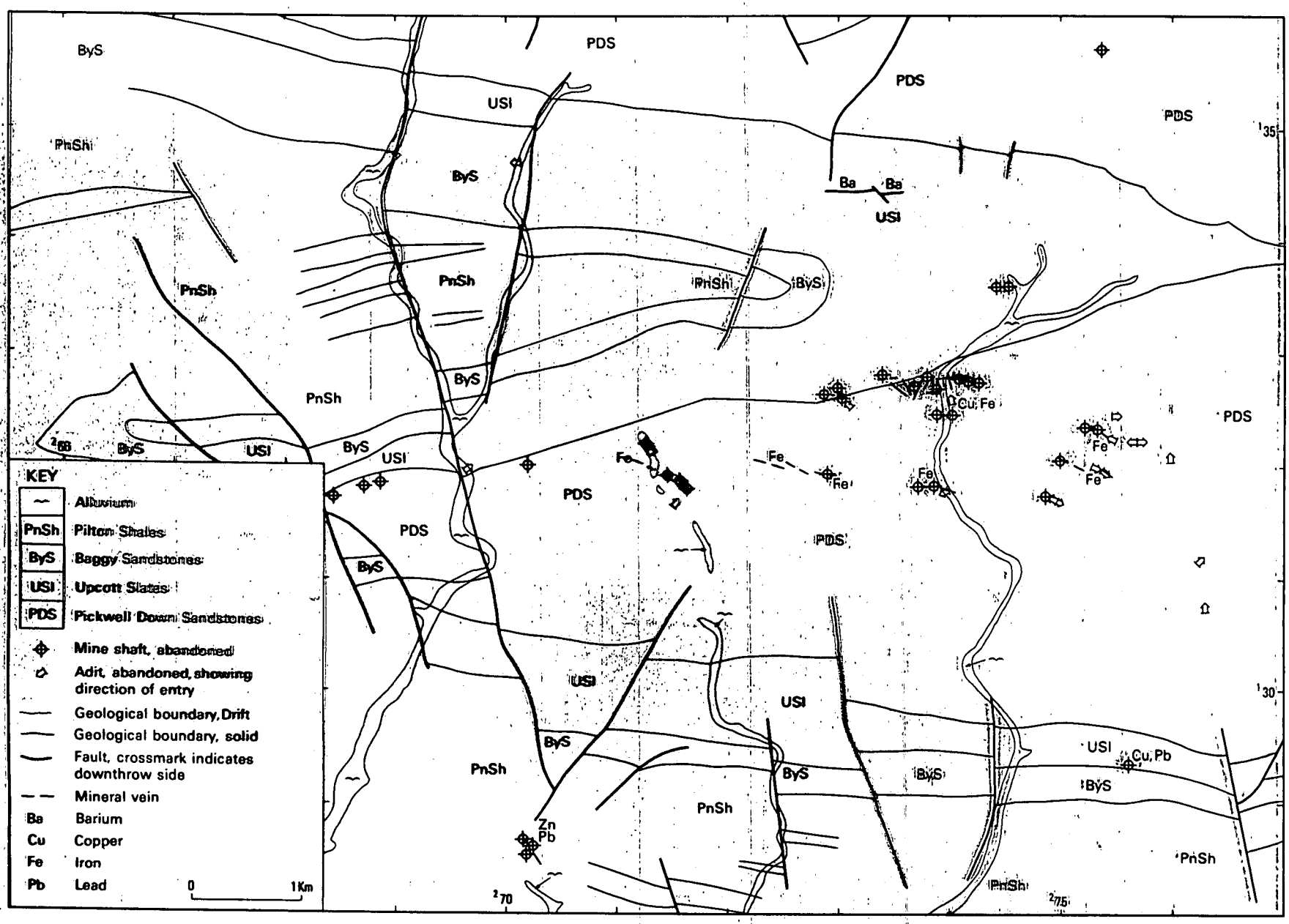

Figure 2 Geological map of the survey area, based on 1:50,000 GS Sheet 293, **Barnstaple**

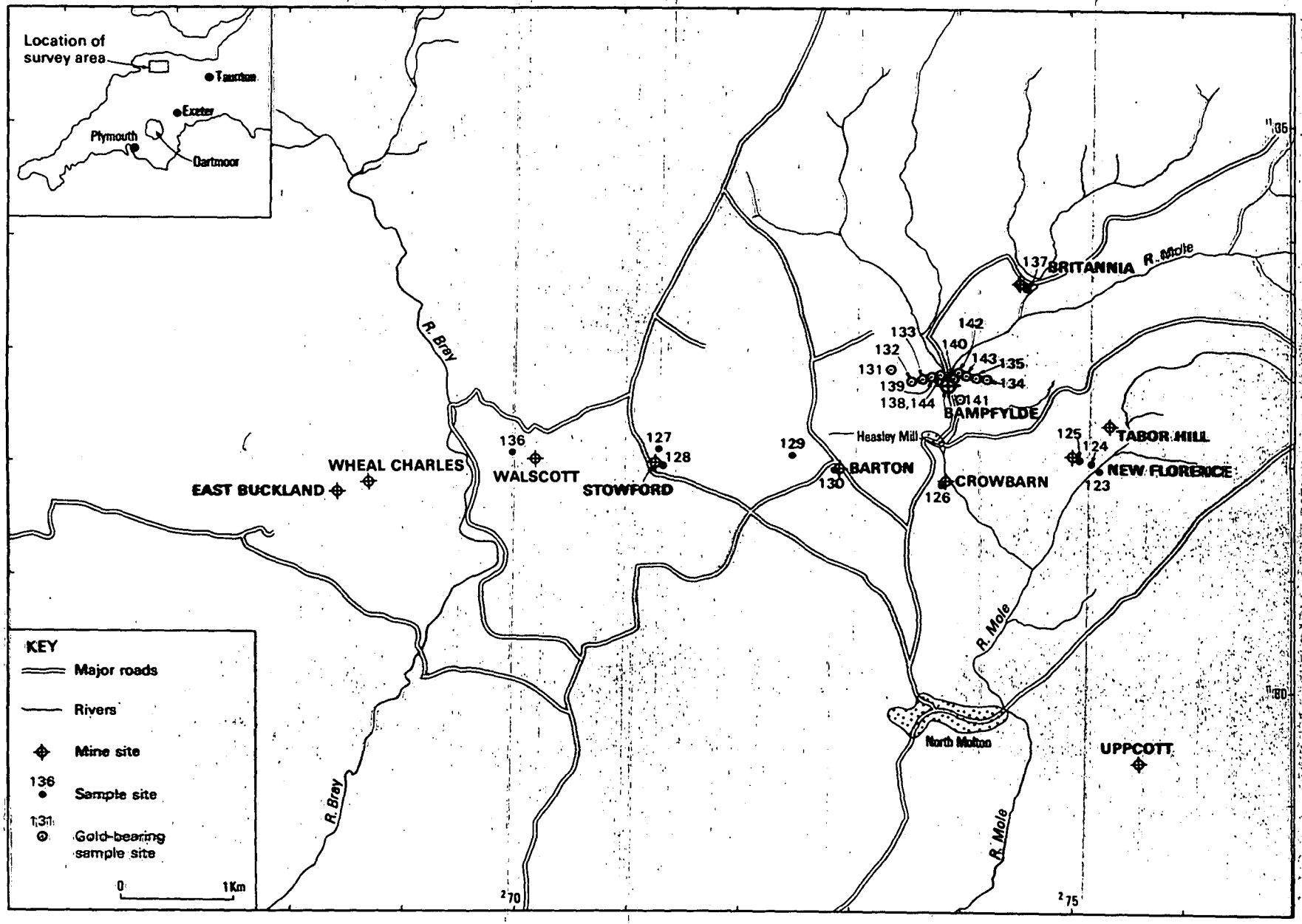

Figure 3 Location of sampling sites and results