

**ENVIRONMENTAL DEPARTMENT
CORNWALL AREA**



NRA

FINAL DRAFT REPORT

**AN ASSESSMENT OF MERCURY
CONTAMINATION IN THE RED
RIVER CATCHMENT**

**May 1995
INV/95/004**

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1. INTRODUCTION

1.1. Background

In 1990 a report to the Regional Advisory Board identified a risk of failure for total mercury with the EC dangerous substance directive in the Red River at R23A006 (see figure 1). The report recommended an immediate investigation to determine the source of mercury and eliminate contamination.

In 1992 a report of the investigation (FWI/92/007) identified the discharge from South Crofty Mine (P23A/P/7) to be the probable source of mercury. The storage or milling of imported ore within South Crofty mine was thought to have been the source. However, mercury was also thought to be present in the natural geology.

A follow up investigation (FWI/93/010) in 1993 of South Crofty mine concluded the ultimate source of mercury was from the natural geology. The report recommended further analysis to determine whether the mercury is of mineral or elemental origin.

1.2. Objective

To assess the historic and current extent of mercury contamination in the Red River catchment.

2. METHODS

1. Review of water quality data
2. Review of past practices at South Crofty mine
3. Make recommendations for further work

3. RESULTS AND DISCUSSION

3.1. Water quality data -1983 to 1993

3.1.1. Monitoring sites

The location of monitoring and investigation sites used in this review are shown in figure 1.

The discharges from South Crofty mine (P23A/P/7 and R23A004) are registered under the EC dangerous substance directive. However, neither are registered for mercury. Sites used to monitor the impact of the discharges for EC dangerous substance directive purposes are shown in figure 1. The environmental quality standard (EQS) for total mercury in inland waters is 1.0 µg/l expressed as an annual average.

R23A006 is also used for red list, annex 1A and Paris commission monitoring purposes. For annex 1A the UK has agreed to reduce mercury loadings by 70% via all pathways from 1985 to 1995.



3.1.2. Routine water quality data

A summary of total mercury annual average concentrations from 1983 to 1993 is shown in table 1. In 1990 and 1991 samples for red list, annex 1A and Paris commission monitoring purposes were taken separately and analysed by laboratories in Welsh and Severn/Trent NRA regions. All other samples prior to November 1991 were analysed by SWWSL laboratories at Truro or Countess Weir. Since November 1991 all samples have been analysed by NRA South Western laboratory at Exeter.

Under the EC dangerous substance directive the EQS for total mercury was not exceeded at any site in the period 1983 to 1993.

Under annex 1A mercury loadings for R23A006 from 1990 to 1993 are shown below:

1990	-	8.96 kg/year
1991	-	1.18 kg/year
1992	-	No data
1993	-	0.69 kg/year

The 1993 value represents a 92% reduction compared with the 1990 value. Data prior to 1990 was not reported on. In 1992 mercury was not monitored for annex 1A purposes. The Red River was considered not to be a significant annex 1A site on the basis of data collected from 1990 to 1993. As such since 1993 R23A006 has been dropped from the annex 1A monitoring programme.

3.1.3. Investigation water quality data

A summary of an investigation into the impact of South Crofty discharge (P23A/P/7) is shown in figure 2. The discharge operates at night to cut down on pumping costs. The investigation was carried out on the 22 and 23 February 1993.

Mercury was not detected in any of the river samples throughout the pumping operation. Mercury was detected in one of the discharge samples but was well below the EC dangerous substance directive EQS for inland waters.

3.1.4. Sediment quality data

A summary of sediment samples taken for routine monitoring and investigative purposes is shown in table 2.

No standards for mercury in sediments are currently in use in the UK. Standards are in use in Germany and these were used for comparison purposes in FWI/92/007 and FWI/93/010.

The results indicate a heavily polluted reach of sediment (>9.7 mg/kg dry weight) at R23A104 downstream of South Crofty mine discharge (P23A/P/7) in 1991, 1992 and 1993. All of the remaining river sites were considered at most moderately polluted (<2.4 mg/kg dry weight). The results from samples taken at R23A002 upstream of South Crofty mine discharge (P23A/P/7) were considered unpolluted (<0.6 mg/kg dry weight).

The results from an investigation within South Crofty mine complex were variable (see table 2 - 22 February 1993). This may have been partly due to the difficulty of obtaining the samples although this was not acknowledged in the report (FWI/93/010). Several of the samples were taken from dry channels.

3.2. Operational practices at South Crofty mine

Nigerian ore containing mercury was milled at South Crofty during 1990 (R. Waite pers. comm.). No milling of ore has taken place at South Crofty since 1990. It was thought the milling of this ore contributed to the elevated concentrations of mercury during 1990.

4. CONCLUSIONS

1. The Red River at R23A006 has not failed the EC dangerous substance directive standard for total mercury from 1983 to 1993.
2. Sediment results indicates the Red River reach immediately downstream of South Crofty mine discharge (P23A/P/7) to be significantly contaminated with mercury.
3. Milling of ore at South Crofty during 1990 was the most likely source of mercury.

5. ACTIONS

1. Sediment samples for mercury to be taken annually at R23A006, R23A005, R23A003, R23A104, P23A/P/7 and R23A002 to assess degree of contamination and recovery.

Action - Survey Officer

2. Monitoring to be reviewed annually.

Action - Investigations Officer

6. REFERENCES

Mercury concentrations in the Red River catchment. Report of the Environmental Protection Manager. 1990.

Investigation of mercury contamination in the Red River catchment, West Cornwall. A M Burrows and J Proctor. 1992. FWI/92/007.

An investigation to identify the source of mercury contamination in the Red River catchment. R Smith. 1993. FWI/93/010.

An assessment of metalliferous pollution in the Red River catchment - summary report. P Rose. 1993.

Figure 1. Major discharges and selected monitoring sites in the Red River catchment

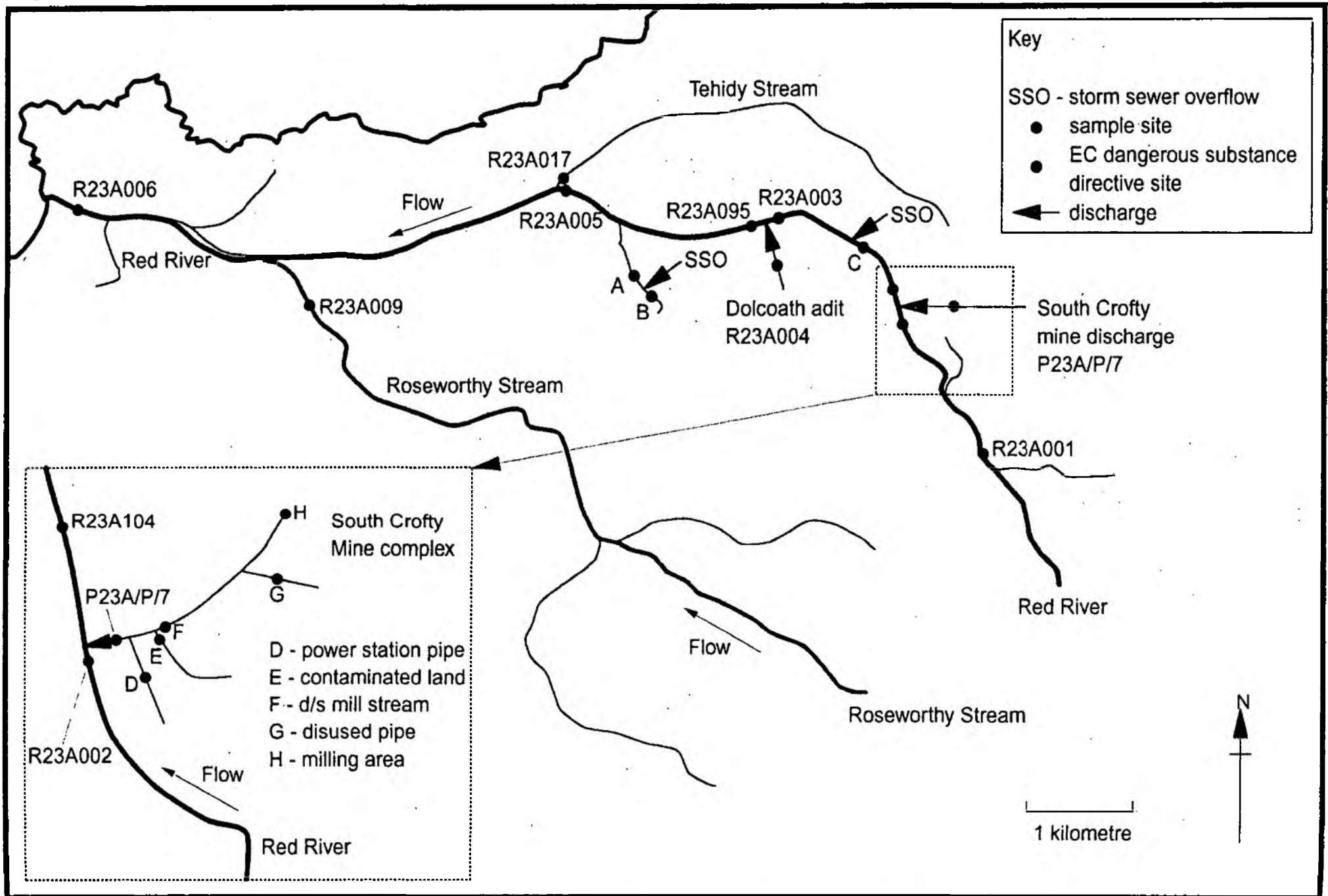


Table 1. Annual average mercury concentrations ($\mu\text{g/l}$) in the Red River catchment (Standard = $1.0 \mu\text{g/l}$)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
R23A006	0.2	0.18	0.41	0.15	0.11	0.31	0.21	0.26	0.23	0.04	0.02
R23A006 *								0.60	0.06		
R23A009									0.12	0.02	0.02
R23A017										0.02	0.02
R23A005									0.30	0.03	0.35
R23A095											0.03
R23A004									0.15	0.02	0.02
R23A003									0.36	0.03	0.13
R23A104											0.05
P23A/P/7											0.05
R23A002									0.08	0.02	0.02
R23A001									0.13	0.02	0.02

* - red list, annex 1A and Paris commission

Table 2. Total mercury in sediments collected from the Red River catchment (mg/kg dry weight)

	29-OCT-90	27-FEB-91	09-DEC-91	07-OCT-92	17-DEC-92	22-FEB-93	13-OCT-93
R23A006	0.02		0.02	2.22		0.6	
R23A009							
R23A017							
R23A005		1.9				1.1	1.3
A		0.8					
B		0.3					
R23A095		0.6					
R23A004							2.5
R23A003		1.6			0.1	1.7	
C		10.0				3.0	
R23A104		28.0			10.3	89.0	
P23A/P/7					5.6	25.2	
D						1.3	
E						0.9	
F						5.0	
G						2.3	
H						31.0	
R23A002		0.1			0.1	0.1	0.5
R23A001							

Figure 2. Impact of South Crofty Mine effluent on the downstream river water quality of the Red River during 22-23 February 1993 (taken from summary report 1993)

