

Environmental Protection Report

River Cober Catchment River Water Quality Classification 1991

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NRA

National Rivers Authority

South West Region

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Suggestions for improvements that could be incorporated in the production of the next Classification report would be welcomed.

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RIVER WATER QUALITY IN THE RIVER COBER CATCHMENT

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South West Region**



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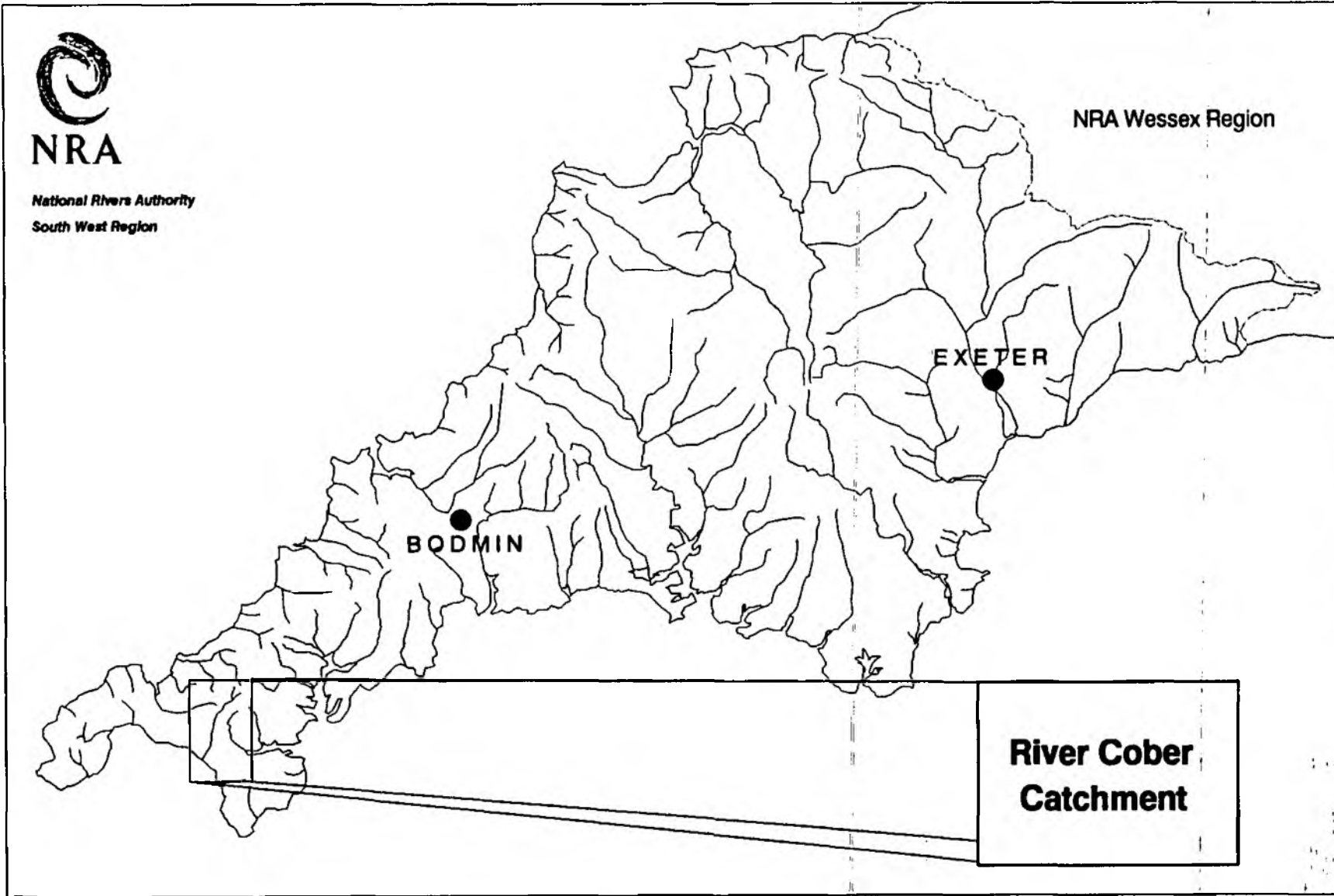
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BODMIN

River Cober Catchment

**River Cober
Catchment**



1. INTRODUCTION

Monitoring to assess the quality of river waters is undertaken in thirty-four catchments within the region. As part of this monitoring programme samples are collected routinely from selected monitoring points at a pre-determined frequency per year, usually twelve spaced at monthly intervals. Each monitoring point provides data for the water quality of a river reach (in kilometres) upstream of the monitoring point.

Each water sample collected from each monitoring point is analysed for a range of chemical and physical constituents or properties known as determinands. The analytical results for each sample are entered into a computer database called the Water Quality Archive.

Selected data are accessed from the Archive so that the quality of each river reach can be determined based on a River Classification System developed by the National Water Council (NWC), (7.1).

This report presents the river water quality classification for 1991 for monitored river reaches in the River Cober catchment.

2. RIVER COBER CATCHMENT

The River Cober flows over a distance of 17.4 km from its source via Loe Pool to the tidal limit, (Appendix 8.1). Water quality was monitored at six locations on the main river. Samples were taken at approximately monthly intervals.

Throughout the Cober catchment two secondary tributaries of the River Cober were monitored.

2.1 SECONDARY TRIBUTARIES

The Bodilly Stream and Medlyn Stream flow over a distance of 5.4 km and 5.5 km respectively from their source to the confluence with the River Cober (Appendix 8.1) and were both monitored at one location at approximately monthly intervals. Monitoring points are located in the lower reaches.

Each sample was analysed for a minimum number of determinands (Appendix 8.2) plus additional determinands based on local knowledge of the catchment. In addition, at selected sites, certain metal analyses were carried out.

The analytical results from all of these samples have been entered into the Water Quality Archive and can be accessed through the Water Resources Act Register, (7.2).

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3. NATIONAL WATER COUNCIL'S RIVER CLASSIFICATION SYSTEM

3.1 River Quality Objectives

In 1978 River Quality Objectives (RQOs) were assigned to all river lengths that were part of the routine monitoring network and to those additional watercourses, which were not part of the routine network, but which received discharges of effluents.

For the majority of watercourses long term objectives were identified based on existing and assumed adequate quality for the long term protection of the watercourse. In a few instances short term objectives were identified but no timetable for the achievement of the associated long term objective was set.

The RQOs currently in use in the River Cober catchment are identified in Appendix 8.1.

3.2 River Quality Classification

River water quality is classified using the National Water Council's (NWC) River Classification System (see Appendix 8.3), which identifies river water quality as being one of five quality classes as shown in Table 1 below:

Table 1 - National Water Council - River Classification System

<u>Class</u>	<u>Description</u>
1A	Good quality
1B	Lesser good quality
2	Fair quality
3	Poor quality
4	Bad quality

Using the NWC system, the classification of river water quality is based on the values of certain determinands as arithmetic means or as 95 percentiles (5 percentiles are used for pH and dissolved oxygen) as indicated in Appendices 8.4 and 8.4.1.

The quality classification system incorporates some of the European Inland Fisheries Advisory Commission (EIFAC) criteria (Appendix 8.3) recommended for use by the NWC system.

4. 1991 RIVER WATER QUALITY CLASSIFICATION

Analytical data collected from monitoring during 1989, 1990 and 1991 were processed through a computerised river water quality classification programme. This resulted in a quality class being assigned to each monitored river reach as indicated in Appendix 8.5.

The quality class for 1991 can be compared against the appropriate River Quality Objective and previous annual quality classes (1985-1990) also based on three years combined data, for each river reach in Appendix 8.5.

The river water classification system used to classify each river length is identical to the system used both in 1985 and 1990 for the Department of the Environment's Quinquennial River Quality Surveys. The determinand classification criteria used to determine the annual quality classes in 1985, subsequent years and for 1991 are indicated in Appendices 8.4 and 8.4.1.

The river quality classes for 1991 of monitored river reaches in the catchment are shown in map form in Appendix 8.6.

The calculated determinand statistics for pH, temperature, dissolved oxygen, biochemical oxygen demand (BOD), total ammonia, un-ionised ammonia, suspended solids, copper and zinc from which the quality class was determined for each river reach, are indicated in Appendix 8.7.

5. NON-COMPLIANCE WITH QUALITY OBJECTIVES

Those monitored river reaches within the catchment, which do not comply with their assigned (RQO), are shown in map form in Appendix 8.8.

Appendix 8.9 indicates the number of samples analysed for each determinand over the period 1989 to 1991 and the number of sample results per determinand, which exceed the determinand quality standard.

For those non-compliant river reaches in the catchment, the extent of exceedance of the calculated determinand statistic with the relevant quality standard (represented as a percentage), is indicated in Appendix 8.10.

6. GLOSSARY OF TERMS

RIVER REACH	A segment of water, upstream from sampling point to the next sampling point.
RIVER LENGTH	River distance in kilometres.
RIVER QUALITY OBJECTIVE	That NWC class, which protects the most sensitive use of the water.
95 percentiles	Maximum limits, which must be met for at least 95% of the time.
5 percentiles	Minimum limits, which must be met for at least 95% of the time.
BIOLOGICAL OXYGEN DEMAND (5 day carbonaceous ATU)	A standard test measuring the microbial uptake of oxygen - an estimate of organic pollution.
pH	A scale of acid to alkali.
UN-IONISED AMMONIA	Fraction of ammonia poisonous to fish, NH^3 .
SUSPENDED SOLIDS	Solids removed by filtration or centrifuge under specific conditions.
USER REFERENCE NUMBER	Reference number allocated to a sampling point.
INFERRED STRETCH	Segment of water, which is not monitored and whose water quality classification is assigned from the monitored reach upstream.

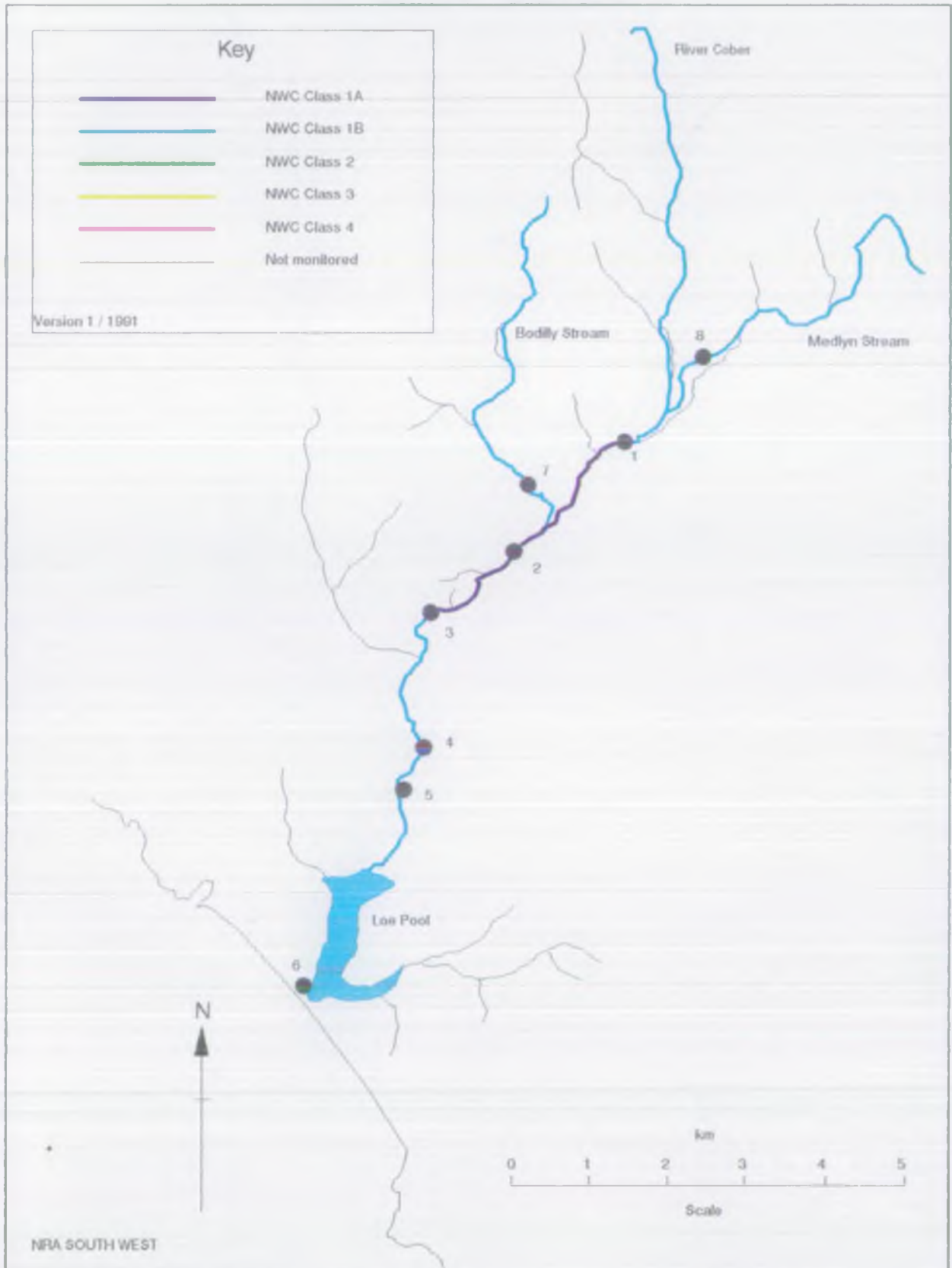
7. REFERENCES

Reference

- 7.1 National Water Council (1977). River Water Quality: The Next Stage. Review of Discharge Consent Conditions. London.
- 7.2 Water Resources Act 1991 Section 190.
- 7.3 Alabaster J. S. and Lloyd R. Water Quality Criteria for Freshwater Fish, 2nd edition, 1982. Butterworths.

Cober Catchment River Quality Objectives

Appendix 8.1





BASIC DETERMINAND ANALYTICAL SUITE FOR ALL CLASSIFIED RIVER SITES

pH as pH Units

Conductivity at 20 C as $\mu\text{S}/\text{cm}$

Water temperature (Cel)

Oxygen dissolved & saturation

Oxygen dissolved as $\text{mg}/\text{l O}$

Biochemical oxygen demand (5 day total ATU) as $\text{mg}/\text{l O}$

Total organic carbon as $\text{mg}/\text{l C}$

Nitrogen ammoniacal as $\text{mg}/\text{l N}$

Ammonia un-ionised as $\text{mg}/\text{l N}$

Nitrate as $\text{mg}/\text{l N}$

Nitrite as $\text{mg}/\text{l N}$

Suspended solids at 105 C as mg/l

Total hardness as $\text{mg}/\text{l CaCO}_3$

Chloride as $\text{mg}/\text{l Cl}$

Orthophosphate (total) as $\text{mg}/\text{l P}$

Silicate reactive dissolved as $\text{mg}/\text{l SiO}_2$

Sulphate (dissolved) as $\text{mg}/\text{l SO}_4$

Sodium (total) as $\text{mg}/\text{l Na}$

Potassium (total) as $\text{mg}/\text{l K}$

Magnesium (total) as $\text{mg}/\text{l Mg}$

Calcium (total) as $\text{mg}/\text{l Ca}$

Alkalinity as pH 4.5 as $\text{mg}/\text{l CaCO}_3$

MWC RIVER QUALITY CLASSIFICATION SYSTEM

River Class	Quality criteria	Remarks	Current potential uses
Class limiting criteria (95 percentile)			
1A Good Quality	(i) Dissolved oxygen saturation greater than 80%	(i) Average BOD probably not greater than 1.5 mg/l	(i) Water of high quality suitable for potable supply abstractions and for all abstractions
	(ii) Biochemical oxygen demand not greater than 3 mg/l	(ii) Visible evidence of pollution should be absent	(ii) Game or other high class fisheries
	(iii) Ammonia not greater than 0.4 mg/l		(iii) High amenity value
	(iv) Where the water is abstracted for drinking water, it complies with requirements for A2* water		
	(v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)		
1B Good Quality	(i) DO greater than 60% saturation	(i) Average BOD probably not greater than 2 mg/l	Water of less high quality than Class 1A but usable for substantially the same purposes
	(ii) BOD not greater than 5 mg/l	(ii) Average ammonia probably not greater than 0.5 mg/l	
	(iii) Ammonia not greater than 0.9 mg/l	(iii) Visible evidence of pollution should be absent	
	(iv) Where water is abstracted for drinking water, it complies with the requirements for A2* water	(iv) Waters of high quality which cannot be placed in Class 1A because of the high proportion of high quality effluent present or because of the effect of physical factors such as canalisation, low gradient or eutrophication	
	(v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS)	
2 Fair Quality	(i) DO greater than 40% saturation	(i) Average BOD probably not greater than 5 mg/l	(i) Waters suitable for potable supply after advanced treatment
	(ii) BOD not greater than 9 mg/l	(ii) Similar to Class 2 of RPS	(ii) Supporting reasonably good coarse fisheries
	(iii) Where water is abstracted for drinking water it complies with the requirements for A3* water	(iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs	(iii) Moderate amenity value
	(iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)		

3 Poor Quality	(i) DO greater than 10% saturation (ii) Not likely to be anaerobic (iii) BOD not greater than 17 mg/l. This may not apply if there is a high degree of re-aeration	Similar to Class 3 of RPS	Waters which are polluted to an extent that fish are absent only sporadically present. May be used for low grade industrial abstraction purposes. Considerable potential for further use if cleaned up
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4 Bad Quality	Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times DO greater than 10% saturation	Similar to Class 4 of RPS	Waters which are grossly polluted and are likely to cause nuisance Insignificant watercourses and ditches not usable, where the objective is simply to prevent nuisance developing
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- Notes
- (a) Under extreme weather conditions (eg flood, drought, freeze-up), or when dominated by plant growth, or by aquatic plant decay, rivers usually in Class 1, 2, and 3 may have BODs and dissolved oxygen levels, or ammonia content outside the stated levels for those Classes. When this occurs the cause should be stated along with analytical results.
 - (b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH₄. **
 - (c) In most instances the chemical classification given above will be suitable. However, the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases, the quality classification of the water should be down-graded on the basis of biota actually present, and the reasons stated.
 - (d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95 percentile limits.

EEC category A2 and A3 requirements are those specified in the EEC Council directive of 16 June 1975 concerning the Quality of Surface Water intended for Abstraction of Drinking Water in the Member State.

Ammonia Conversion Factors

(mg NH₄/l to mg N/l)

Class 1A	0.4 mg NH ₄ /l = 0.31 mg N/l
Class 1B	0.9 mg NH ₄ /l = 0.70 mg N/l
	0.5 mg NH ₄ /l = 0.39 mg N/l

NWC RIVER CLASSIFICATION SYSTEM

CRITERIA USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION FOR NON-METALLIC DETERMINANDS

River Class	Quality Criteria
1A	Dissolved oxygen % saturation greater than 80% BOD (ATU) not greater than 3 mg/l O Total ammonia not greater than 0.31 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 21.5 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
1B	Dissolved oxygen % saturation greater than 60% BOD (ATU) not greater than 5 mg/l O Total ammonia not greater than 0.70 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 21.5 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
2	Dissolved oxygen & saturation greater than 40% BOD (ATU) not greater than 9 mg/l O Total ammonia not greater than 1.56 mg/l N Non-ionised ammonia not greater than 0.021 mg/l N Temperature not greater than 28 C pH greater than 5.0 and less than 9.0 Suspended solids not greater than 25 mg/l
3	Dissolved oxygen % saturation greater than 10% BOD (ATU) not greater than 17 mg/l O
4	Dissolved oxygen % saturation not greater than 10% BOD (ATU) greater than 17 mg/l O

STATISTICS USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION

Determinand	Statistic
Dissolved oxygen	5 percentile
BOD (ATU)	95 percentile
Total ammonia	95 percentile
Non-ionised ammonia	95 percentile
Temperature	95 percentile
pH	5 percentile
Suspended solids	95 percentile arithmetic mean

NWC RIVER CLASSIFICATION SYSTEM

CRITERIA USED BY NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION FOR METALLIC DETERMINANDS

SOLUBLE COPPER

Total Hardness (mean) mg/l CaCO ₃	Statistic	Soluble Copper* ug/l Cu	
		Class 1	Class 2
0 - 10	95 percentile	< = 5	> 5
10 - 50	95 percentile	< = 22	> 22
50 - 100	95 percentile	< = 40	> 40
100 - 300	95 percentile	< = 112	> 112

* Total copper is used for classification until sufficient data on soluble copper can be obtained.

TOTAL ZINC

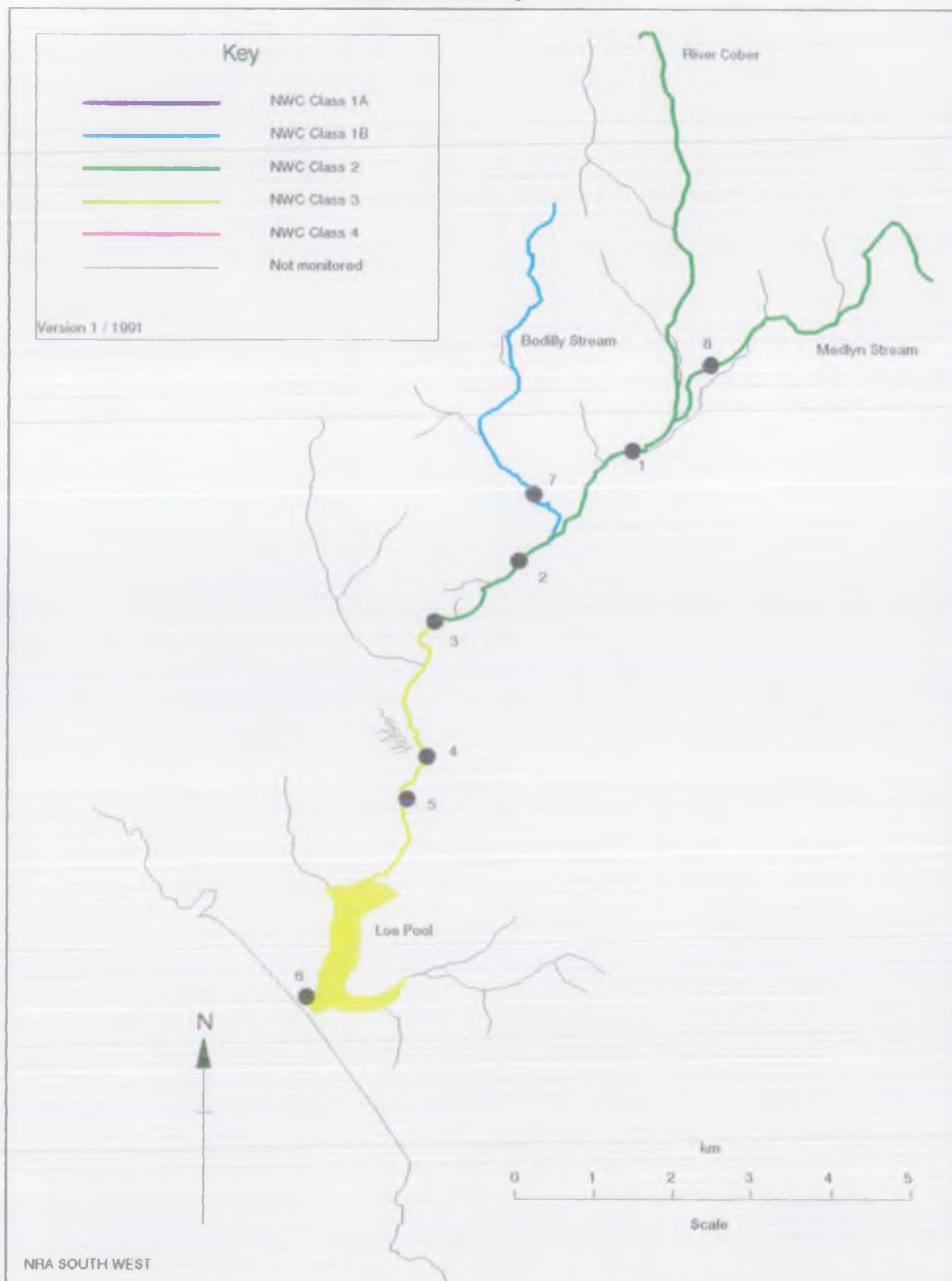
Total Hardness (mean) mg/l CaCO ₃	Statistic	Total Zinc ug/l Zn		
		Class 1	Class 2	Class 3
0 - 10	95 percentile	< = 30	< = 300	> 300
10 - 50	95 percentile	< = 200	< = 700	> 700
50 - 100	95 percentile	< = 300	< = 1000	> 1000
100 - 300	95 percentile	< = 500	< = 2000	> 2000

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
 1991 RIVER WATER QUALITY CLASSIFICATION
 CATCHMENT: COBER

1991 Map Position Number	River	Reach upstream of	User Reference Number	National Grid Reference	Reach Length (km)	Distance from source (km)	River Quality Objective	85 NWC Class	86 NWC Class	87 NWC Class	88 NWC Class	89 NWC Class	90 NWC Class	91 NWC Class
1	COBER	TRENEAR BRIDGE	R20A001	SW 6810 3138	6.6	6.6	1B	1B	2	2	2	2	2	2
2	COBER	COVERACK BRIDGE	R20A008	SW 6686 3013	2.0	8.6	1A	1B	2	2	1B	2	2	2
3	COBER	LOWERTOWN BRIDGE	R20A003	SW 6580 2913	1.7	10.3	1A	1B	2	2	1B	2	2	2
4	COBER	HELSTON PARK GAUGING STATION	R20A009	SW 6548 2723	2.3	12.6	1B	2	3	3	2	3	3	3
5	COBER	BELOW HELSTON STW	R20A004	SW 6526 2681	0.5	13.1	1B	2	3	3	2	3	3	3
6	COBER	INFLOW, LOE POOL (INFERRED STRETCH)	R20A005	SW 6425 2428	1.3	14.4	1B	2	3	3	2	3	3	3
	COBER	AT BAR OUTFALL			1.7	16.1	1B	2	3	3	3	3	4	3
	COBER	MEAN HIGH WATER (INFERRED STRETCH)			1.3	17.4	1B	2	3	3	3	3	4	3
7	BODILLY STREAM	BODILLY MILL	R20A002	SW 6700 3185	4.4	4.4	1B	1B	2	2	2	2	1B	1B
	BODILLY STREAM	COBER CONFLUENCE (INFERRED STRETCH)			1.0	5.4	1B	1B	2	2	2	2	1B	1B
8	MEDLYN STREAM	CHY BRIDGE	R20A006	SW 6935 3263	4.2	4.2	1B						3	2
	MEDLYN STREAM	COBER CONFLUENCE (INFERRED STRETCH)			1.3	5.5	1B							3

Cober Catchment Water Quality - 1991

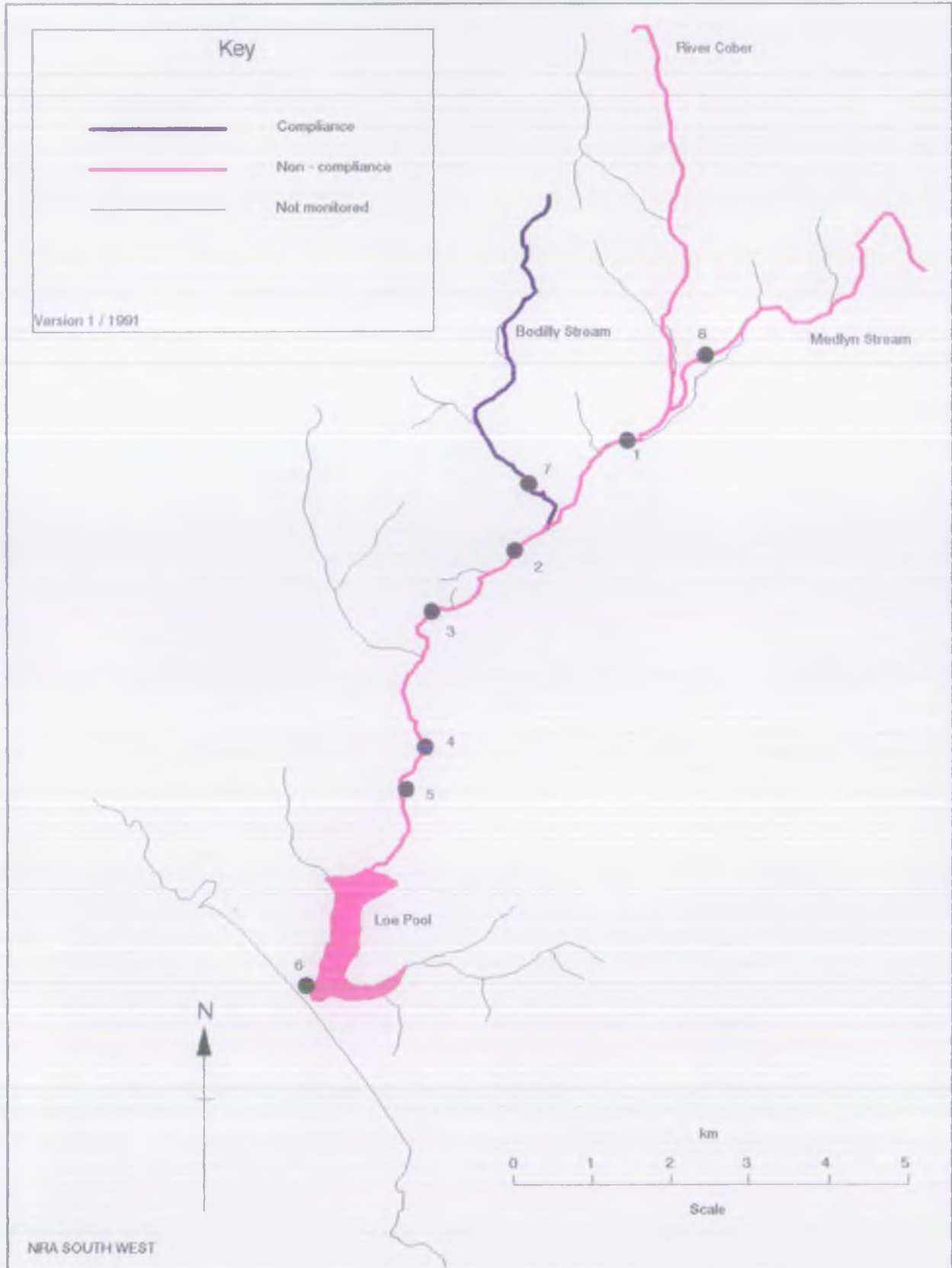
Appendix 8.6



NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
 1991 RIVER WATER QUALITY CLASSIFICATION
 CALCULATED DETERMINAND STATISTICS USED FOR QUALITY ASSESSMENT
 CATCHMENT: COBER

River	Reach upstream of	User Ref. Number	RQD	Calculated Determinand Statistics used for Quality Assessment																			
				pH Lower Class 5tile		pH Upper Class 95tile		Temperature Class 95tile		DO (%) Class 5tile		BOD (AOU) Class 95tile		Total Ammonia Class 95tile		Union. Ammonia Class 95tile		S.Solids Class Mean		Total Copper Class 95tile		Total Zinc Class 95tile	
COBER	TRENEAR BRIDGE	R20A001	1B	1A	6.0	1A	7.5	1A	15.1	1A	83.7	1A	2.7	1A	0.128	1A	0.010	1A	6.6	2	40.6	2	361.6
COBER	COVERACK BRIDGE	R20A008	1A	1A	6.2	1A	7.4	1A	15.3	1A	80.9	1A	2.9	1A	0.203	1A	0.010	1A	7.3	2	51.9	1A	45.7
COBER	LOWMEADAN BRIDGE	R20A003	1A	1A	6.0	1A	7.6	1A	15.5	1A	84.6	1A	2.4	1A	0.165	1A	0.010	1A	7.5	2	32.0	1A	52.3
COBER	HELSTON PARK GAUGING STATION	R20A009	1B	1A	6.6	1A	7.5	1A	15.7	1B	78.6	1B	3.7	1A	0.228	1A	0.010	3	35.3	2	129.8	1A	107.7
COBER	BELOW HELSTON SW	R20A004	1B	1A	6.4	1A	7.4	1A	16.6	1B	65.0	2	7.3	3	2.268	1A	0.010	1A	15.9	2	43.0	1A	59.6
COBER	AT BAR OUTFALL	R20A005	1B	1A	6.5	3	10.6	2	21.7	1B	67.1	2	8.1	2	1.089	3	0.038	1A	19.1	1A	23.9	1A	55.9
BODILLY STREAM	BODILLY MILL	R20A002	1B	1A	6.0	1A	7.4	1A	14.8	1A	80.5	1B	3.3	1B	0.418	1A	0.010	1A	18.8	1A	16.7	1A	49.0
MELLYN STREAM	CHY BRIDGE	R20A006	1B	1A	5.7	1A	7.4	1A	16.7	2	41.8	1A	2.3	1A	0.212	1A	0.010	1A	7.1	2	22.4	1A	150.1

Cober Catchment Compliance - 1991



NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION

1991 RIVER WATER QUALITY CLASSIFICATION

NUMBER OF SAMPLES (N) AND NUMBER OF SAMPLES EXCEEDING QUALITY STANDARD (F)

CRUICKSHANK: COBER

River	Reach upstream of	User Ref. Number	pH Lower		pH Upper		Temperature		DO (%)		BOD (ATU)		Total Ammonia		Union. Ammonia		S.Solids		Total Copper		Total Zinc	
			N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F
COBER	TRENEAR BRIDGE	R20A001	41	-	41	-	32	-	32	-	41	-	41	-	30	-	41	-	31	3	31	1
COBER	COVERACK BRIDGE	R20A008	33	-	33	-	33	-	33	1	33	1	33	-	33	-	33	1	21	2	21	-
COBER	LOMERIDOWN BRIDGE	R20A003	44	-	44	-	36	-	36	-	44	1	44	-	34	-	44	1	34	3	34	-
COBER	HELSTON PARK GAUGING STATION	R20A009	32	-	32	-	32	-	32	-	32	-	32	-	32	-	32	5	32	5	32	-
COBER	BELOW HELSTON STW	R20A004	33	-	33	-	33	-	33	1	33	1	33	2	33	-	33	6	31	2	31	-
COBER	AT BAR OUTFALL	R20A005	42	-	42	8	33	1	32	1	42	3	42	9	30	1	42	3	32	-	32	-
BODILLY STREAM	BODILLY MILL	R20A002	42	-	42	-	33	-	33	-	42	1	42	-	33	-	42	2	20	-	20	-
MELLYN STREAM	CHY BRIDGE	R20A006	33	-	33	-	33	-	33	2	33	-	33	-	32	-	33	1	32	1	32	1

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
 1991 RIVER WATER QUALITY CLASSIFICATION
 PERCENTAGE EXCEEDENCE OF DETERMINAND STATISTICS FROM QUALITY STANDARDS
 CATCHMENT: COBER

River	Reach upstream of	User Ref. Number	PERCENTAGE EXCEEDENCE OF STATISTIC FROM QUALITY STANDARD										
			pH Lower	pH Upper	Temperature	DO (%)	BOD (ATU)	Total Ammonia	Un-ionised Ammonia	Suspended Solids	Total Copper	Total Zinc	
COBER	TRENEAR BRIDGE	R20A001	-	-	-	-	-	-	-	-	-	85	81
COBER	COVERACK BRIDGE	R20A008	-	-	-	-	-	-	-	-	-	136	-
COBER	LOWERTOWN BRIDGE	R20A003	-	-	-	-	-	-	-	-	-	45	-
COBER	HELSTON PARK GAUGING STATION	R20A009	-	-	-	-	-	-	-	-	41	224	-
COBER	BELOW HELSTON STW	R20A004	-	-	-	-	-	47	224	-	-	7	-
COBER	AT BAR OUTFALL	R20A005	-	18	1	-	-	63	56	81	-	-	-
BODILLY STREAM	BODILLY MILL	R20A002	-	-	-	-	-	-	-	-	-	-	-
MEDLYN STREAM	CHY BRIDGE	R20A006	-	-	-	30	-	-	-	-	-	2	-