ENVIRONMENTAL PROTECTION

NRA

National Rivers Authority
South West Region

# River Sid Catchment
# River Water Quality
# Classification 1990

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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 SID CATCHMENT

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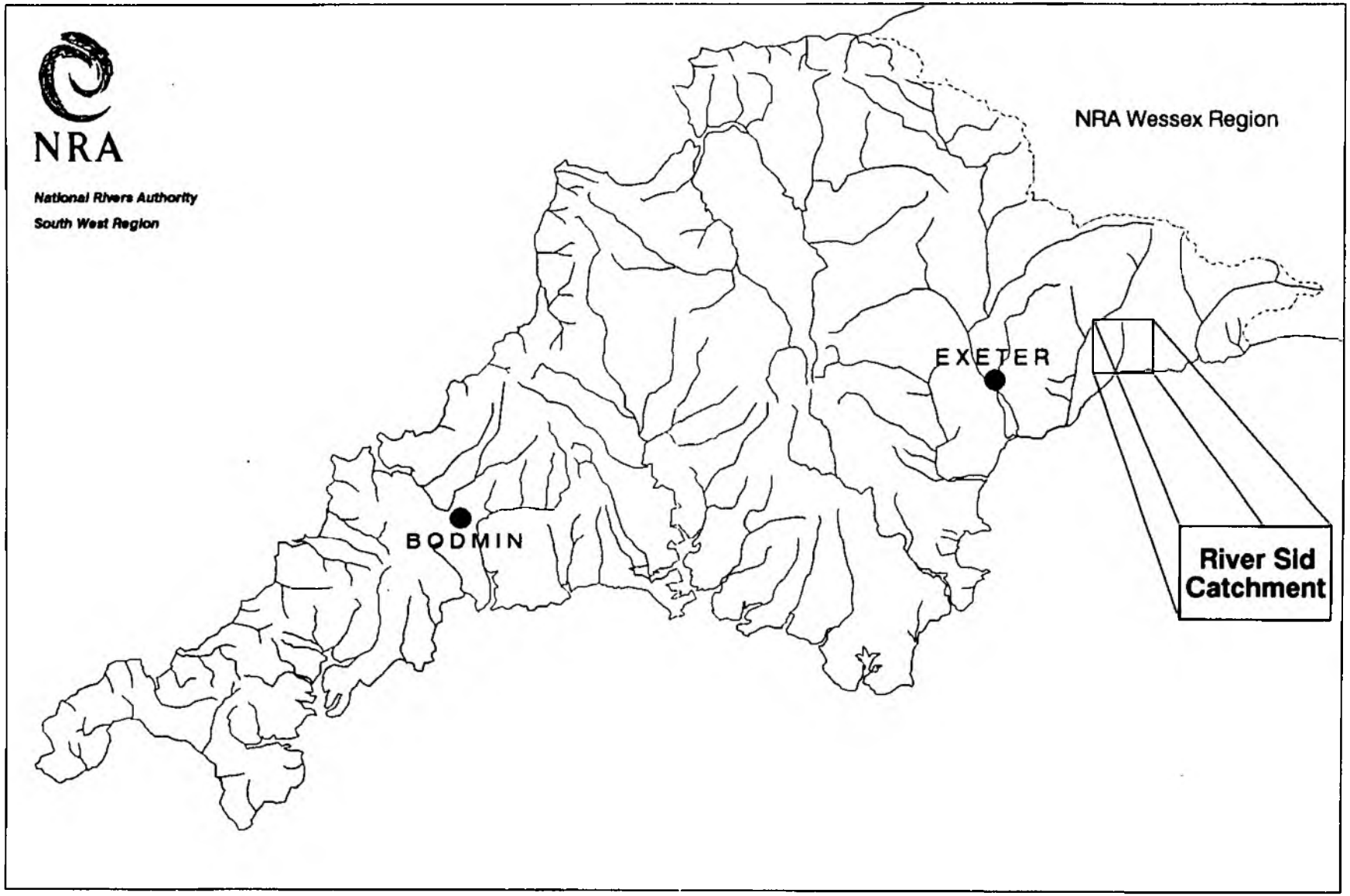
# National Rivers Authority
# South West Region




River Sid Catchment

## 1. INTRODUCTION

Monitoring to assess the quality of river waters is undertaken in thirty-two 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.

River lengths have been re-measured and variations exist over those recorded previously.

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), (9.1).

This report presents the river water quality classification for 1990 for monitored river reaches in the River Sid catchment.

## 2. RIVER SID CATCHMENT

The River Sid flows over a distance of 10.2 km from its source to the tidal limit, (Appendix 10.1). Water quality was monitored at one site at approximately monthly intervals. The sites at Stoney Bridge, Sidbury and the A3052 Bridge at Sidford were sampled on fifteen occasions during 1990 because of no recent water quality data.

Throughout the Sid catchment one secondary tributary of the River Sid was monitored.

### 2.1 SECONDARY TRIBUTARY

The Roncombe Stream flows over a distance of 4.5 km from its source to the confluence with the River Sid, (Appendix 10.1) and was monitored on twenty occasions during 1990 because of no recent water quality data.

Each sample was analysed for a minimum number of determinands (Appendix 10.2) 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 Act Register, (9.2).

## 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 Sid catchment are identified in Appendix 10.1.

### 3.2 River Quality Classification

River water quality is classified using the National Water Council's (NWC) River Classification System (see Appendix 10.3), 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

| Class | Description |
|---|---|
| 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 10.4.1 and 10.4.2.

The quality classification system incorporates some of the European Inland Fisheries Advisory Commission (EIFAC) criteria (Appendix 10.3) recommended for use by the NWC system.

## 4. 1990 RIVER WATER QUALITY SURVEY

The 1990 regional classification of river water quality also includes the requirements of the Department of the Environment quinquennial national river quality survey. The objectives for the Department of the Environment 1990 River Quality Survey are given below:

1) To carry out a National Classification Survey based on procedures used in the 1985 National Classification Survey, including all regional differences.

2) To classify all rivers and canals included in the 1985 National Classification Survey.

3) To compare the 1990 Classification with those obtained in 1985.

In addition, those watercourses, which were not part of the 1985 Survey and have been monitored since that date, are included in the 1990 regional classification of river water quality.

## 5. 1990 RIVER WATER QUALITY CLASSIFICATION

Analytical data collected from monitoring during 1988, 1989 and 1990 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 10.5.

The quality class for 1990 can be compared against the appropriate River Quality Objective and previous annual quality classes (1985-1989) also based on three years combined data, for each river reach in Appendix 10.5.

The river water classification system used to classify each river length is identical to the system used in 1985 for the Department of the Environment's 1985 River Quality Survey. The determinand classification criteria used to determine the annual quality classes in 1985, subsequent years and for 1990 are indicated in Appendices 10.4 and 10.4.1.

Improvements to this classification system could have been made, particularly in the use of a different suspended solids standard for Class 2 waters. As the National Rivers Authority will be proposing new classification systems to the Secretary of State in the near future, it was decided to classify river lengths in 1990 with the classification used for the 1985-1989 classification period.

The adoption of the revised criteria for suspended solids in Class 2 waters would not have affected the classification of river reaches.

The river quality classes for 1990 of monitored river reaches in the catchment are shown in map form in Appendix 10.6.

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 10.7.

## 6. 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 10.8.

Appendix 10.9 indicates the number of samples analysed for each determinand over the period 1988 to 1990 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 relevant quality standard (represented as a percentage), is indicated in Appendix 10.10.

## 7. CAUSES OF NON-COMPLIANCE

For those river reaches, which did not comply with their assigned RQOs, the cause of non-compliance (where possible to identify) is indicated in Appendix 10.11.

## 8. 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. |

## 9. REFERENCES

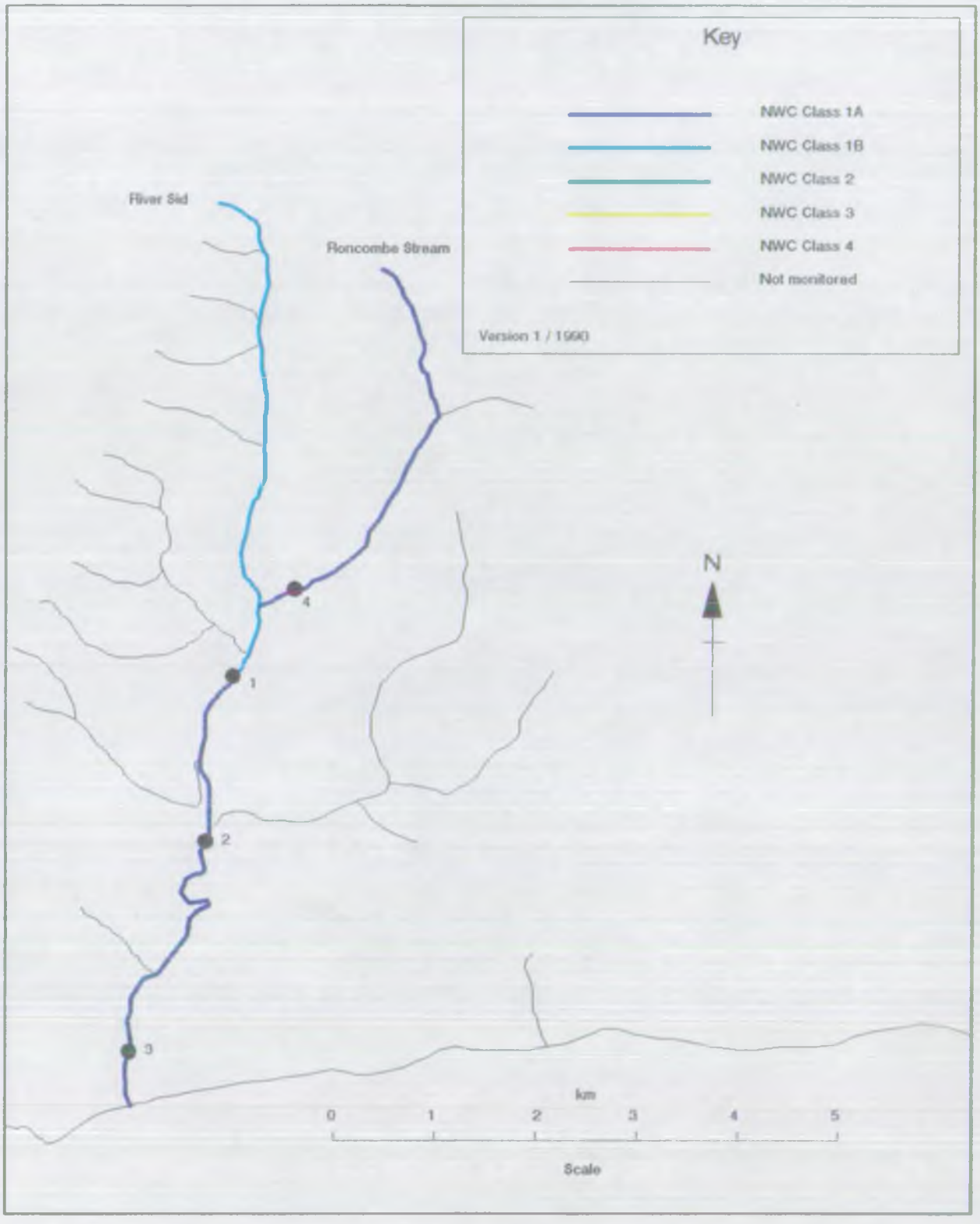
Reference


9.1 National Water Council (1977). River Water Quality: The Next Stage. Review of Discharge Consent Conditions. London.

9.2 Water Act 1989 Section 117

9.3 Alabaster J. S. and Lloyd R. Water Quality Criteria for Freshwater Fish, 2nd edition, 1982. Butterworths.

# Sid Catchment
# River Quality Objectives



## BASIC DETERMINAND ANALYTICAL SUITE FOR ALL CLASSIFIED RIVER SITES

pH as pH Units

Conductivity at 20 C as uS/cm

Water temperature (Cel)

Oxygen dissolved % saturation

Oxygen dissolved as mg/l O

Biochemical oxygen demand (5 day total ATU) as mg/l O

Total organic carbon as mg/l C

Nitrogen ammoniacal as mg/l N

Ammonia un-ionised as mg/l N

Nitrate as mg/l N

Nitrite as mg/l N

Suspended solids at 105 C as mg/l

Total hardness as mg/l CaCO3

Chloride as mg/l Cl

Orthophosphate (total) as mg/l P

Silicate reactive dissolved as mg/l SiO2

Sulphate (dissolved) as mg/l SO4

Sodium (total) as mg/l Na

Potassium (total) as mg/l K

Magnesium (total) as mg/l Mg

Calcium (total) as mg/l Ca

Alkalinity as pH 4.5 as mg/l CaCO3

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

| | | | | |
|---|---|---|---|---|
| 3 Poor Quality | (i) DO greater than 10% saturation<br>(ii) Not likely to be anaerobic<br>(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 |
| 4 Bad Quality | Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times | | Similar to Class 4 of RPS | Waters which are grossly polluted and are likely to cause nuisance |
| X | DO greater than 10% saturation | | | Insignificant watercourses and ditches not usable, where the objective is simply to prevent nuisance developing |

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 $NH_4$. **

(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 $NH_4$/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%<br>BOD (ATU) not greater than 3 mg/l O<br>Total ammonia not greater than 0.31 mg/l N<br>Non-ionised ammonia not greater than 0.021 mg/l N<br>Temperature not greater than 21.5 C<br>pH greater than 5.0 and less than 9.0<br>Suspended solids not greater than 25 mg/l |
| 1B | Dissolved oxygen % saturation greater than 60%<br>BOD (ATU) not greater than 5 mg/l O<br>Total ammonia not greater than 0.70 mg/l N<br>Non-ionised ammonia not greater than 0.021 mg/l N<br>Temperature not greater than 21.5 C<br>pH greater than 5.0 and less than 9.0<br>Suspended solids not greater than 25 mg/l |
| 2 | Dissolved oxygen & saturation greater than 40%<br>BOD (ATU) not greater than 9 mg/l O<br>Total ammonia not greater than 1.56 mg/l N<br>Non-ionised ammonia not greater than 0.021 mg/l N<br>Temperature not greater than 28 C<br>pH greater than 5.0 and less than 9.0<br>Suspended solids not greater than 25 mg/l |
| 3 | Dissolved oxygen % saturation greater than 10%<br>BOD (ATU) not greater than 17 mg/l O |
| 4 | Dissolved oxygen % saturation not greater than 10%<br>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 |
| | 95 percentile |
| Suspended solids | 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 CaCO3 | 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 CaCO3 | 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 |

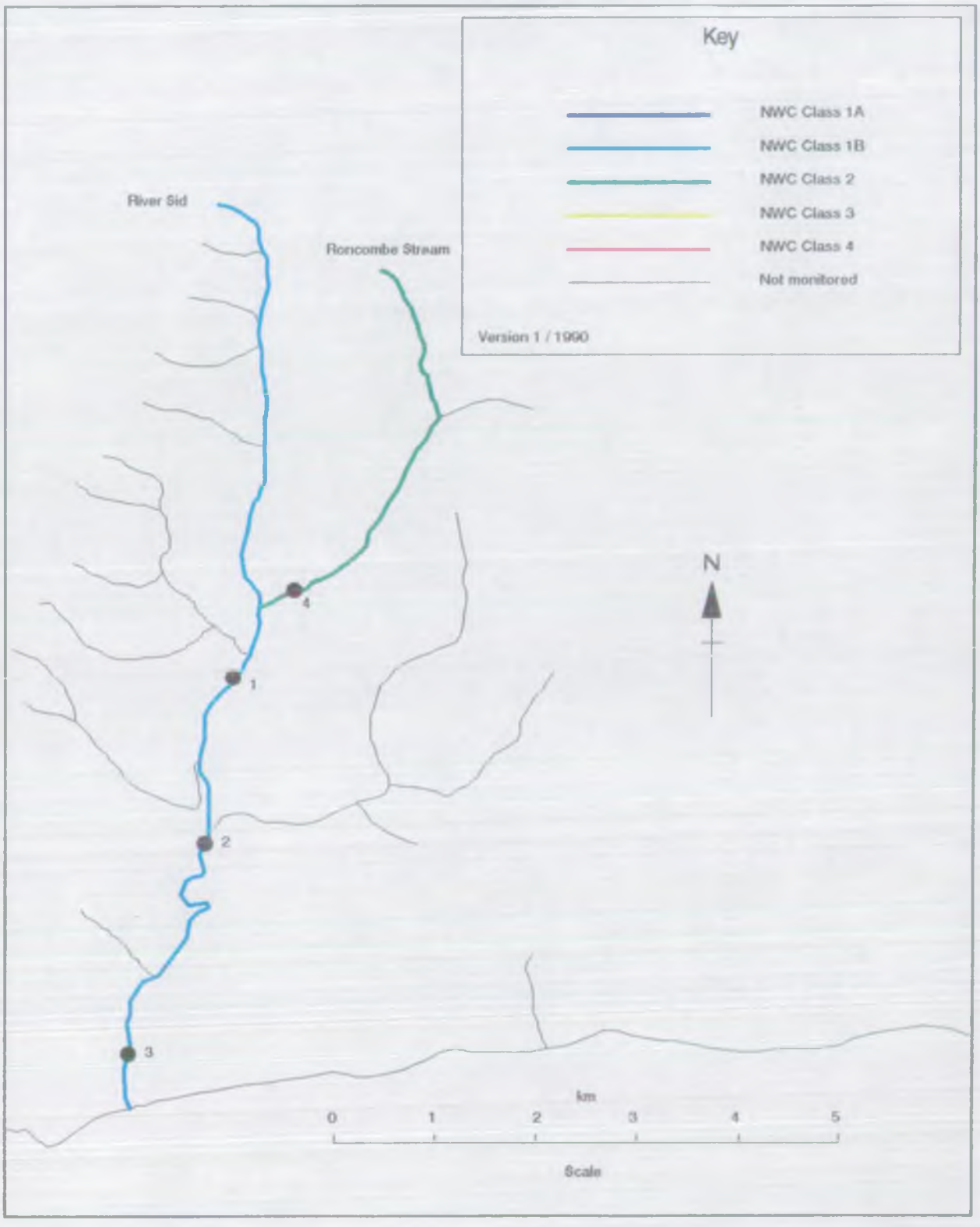
NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
CATCHMENT : SID (03)

| 1990 Map Position Number | River | Reach upstream of | User Reference Number | National Grid Reference |
|---|---|---|---|---|
| 1 | SID | STONEY BRIDGE SIDBURY | R03A001 | SY 1400 9165 |
| 2 | SID | A3052 BRIDGE SIDFORD | R03A002 | SY 1375 8995 |
| 3 | SID | SIDMOUTH | R03A003 | SY 1280 8780 |
| | SID | NORMAL TIDAL LIMIT (INFERRED STRETCH) | | |
| 4 | RONCOMBE STREAM | COTFORD | R03A013 | SY 1423 9222 |
| | RONCOMBE STREAM | NORMAL TIDAL LIMIT (INFERRED STRETCH) | | |

| 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 |
|---|---|---|---|---|---|---|---|---|
| 5.0 | 5.0 | 1B | 2 | 3 | 2 | 1B | 1A | 1B |
| 1.8 | 6.8 | 1A | 1A | 3 | 2 | 2 | 1A | 1B |
| 2.9 | 9.7 | 1A | 1A | 3 | 2 | 2 | 1A | 1B |
| 0.5 | 10.2 | 1A | 1A | 3 | 2 | 2 | 1A | 1B |
| 4.4 | 4.4 | 1A | | | | | | 2 |
| 0.1 | 4.5 | 1A | | | | | | 2 |

Appendix 10.5

# Sid Catchment
# Water Quality - 1990

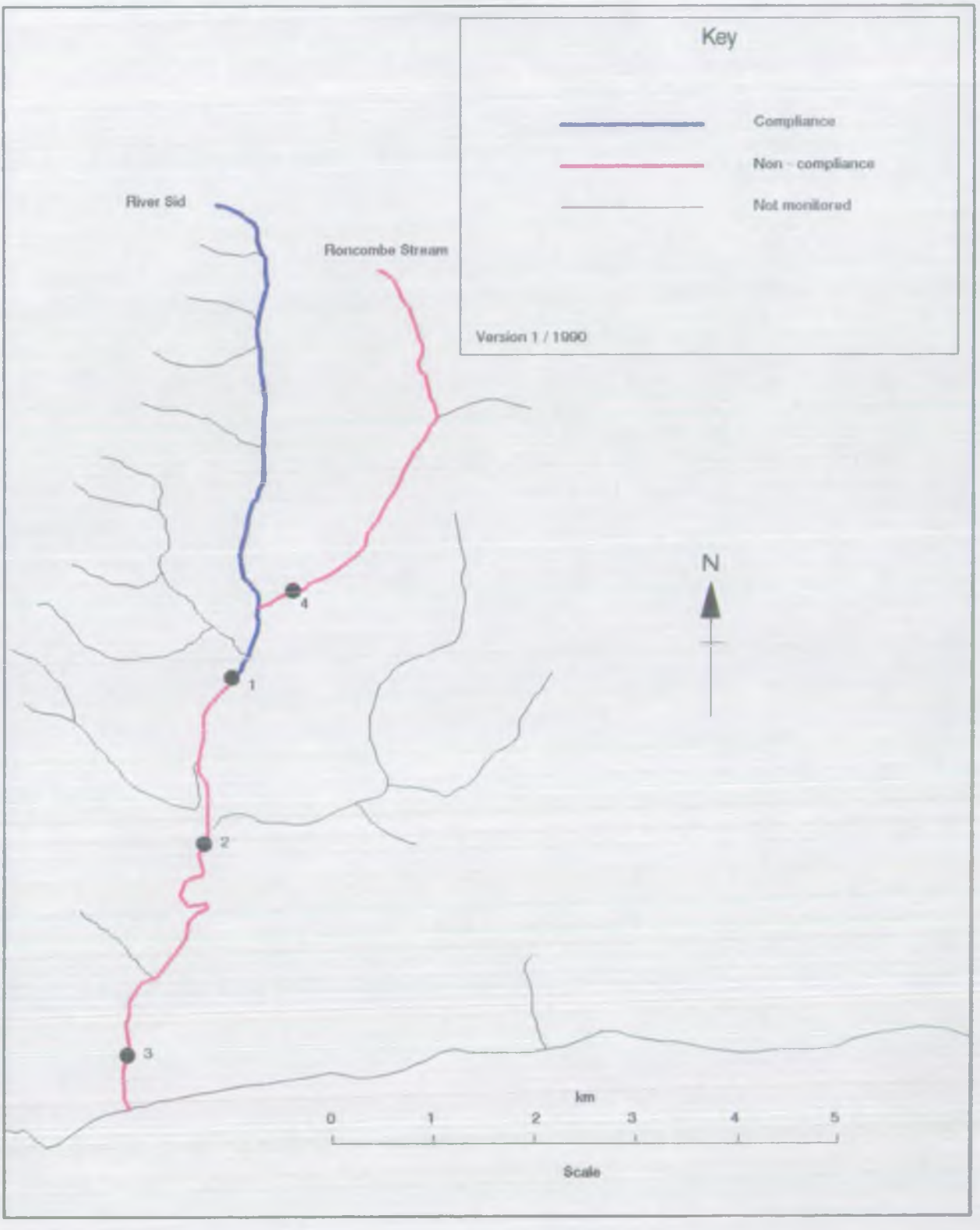


NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
CALCULATED DETERMINAND STATISTICS USED FOR QUALITY ASSESSMENT
CATCHMENT : SID (03)

| River | Reach upstream of | User Ref. Number | 90 NWC Class | Calculated Determinand Statistics used for Quality Assessment | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | pH Lower | | pH Upper | | Temperature | | DO (%) | | BOD (ATU) | | Total Ammonia | | Union. Ammonia | | S.Solids | | Total Copper | | Total Zinc | |
| | | | | Class | 5%ile | Class | 95%ile | Class | 95%ile | Class | 5%ile | Class | 95%ile | Class | 95%ile | Class | 95%ile | Class | Mean | Class | 95%ile | Class | 95%ile |
| SID | SIDNEY BRIDGE SIDBURY | R03A001 | 1B | 1A | 7.6 | 1A | 8.6 | 1A | 16.9 | 1B | 74.4 | 1B | 3.6 | 1A | 0.156 | 1A | 0.010 | 1A | 8.3 | - | - | - | - |
| SID | A3052 BRIDGE SIDFORD | R03A002 | 1B | 1A | 7.5 | 1A | 8.8 | 1A | 17.0 | 1A | 85.4 | 1B | 3.8 | 1A | 0.164 | 1A | 0.010 | 1A | 8.9 | - | - | - | - |
| SID | SIDMOUTH | R03A003 | 1B | 1A | 7.8 | 1A | 8.9 | 1A | 17.4 | 1A | 88.0 | 1B | 3.1 | 1A | 0.142 | 1A | 0.010 | 1A | 10.6 | 1A | 24.8 | 1A | 26.6 |
| HONIDMIE STREAM | COMFORD | R03A013 | 2 | 1A | 7.6 | 1A | 8.6 | 1A | 17.9 | 1A | 85.3 | 1B | 3.6 | 1A | 0.120 | 1A | 0.010 | 1A | 11.6 | 1A | 9.9 | 2 | 608.5 |

Appendix 10.7

# Sid Catchment
# Compliance - 1990



NATIONAL RIVERS AUTHORITY – SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
NUMBER OF SAMPLES (N) AND NUMBER OF SAMPLES EXCEEDING QUALITY STANDARD (F)
CATCHMENT : SID (03)

| 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 |
| SID | SIDNEY BRIDGE SIDBURY | R03A001 | 23 | – | 23 | – | 22 | – | 22 | – | 23 | – | 23 | – | 21 | – | 23 | – | 1 | – | 1 | – |
| SID | A3052 BRIDGE SIDFORD | R03A002 | 23 | – | 23 | – | 21 | – | 21 | – | 23 | 2 | 23 | – | 18 | – | 23 | 1 | 2 | – | 2 | – |
| SID | SIDMOUTH | R03A003 | 31 | – | 31 | – | 31 | – | 31 | – | 31 | 1 | 31 | – | 28 | – | 31 | 2 | 31 | – | 31 | – |
| HORCOMBE SIDMOUTH | COMFORD | R03A013 | 20 | – | 20 | – | 20 | – | 20 | – | 20 | 1 | 20 | – | 19 | – | 20 | 2 | 20 | – | 20 | 1 |

Appendix 10.9

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
1990 RIVER WATER QUALITY CLASSIFICATION
PERCENTAGE EXCEEDENCE OF DETERMINAND STATISTICS FROM QUALITY STANDARDS
CATCHMENT : SID (03)

| 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 |
| SID | STONEY BRIDGE SIDBURY | R03A001 | - | - | - | - | - | - | - | - | - | - |
| SID | A3052 BRIDGE SIDFORD | R03A002 | - | - | - | - | 28 | - | - | - | - | - |
| SID | SIDMOUTH | R03A003 | - | - | - | - | 3 | - | - | - | - | - |
| RONCOMBE STREAM | COTFORD | R03A013 | - | - | - | - | 19 | - | - | - | - | 22 |

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION
IDENTIFICATION OF POSSIBLE CAUSES OF NON-COMPLIANCE WITH RQO
CATCHMENT : SID (03)

| 1990 Map Position Number | River | Reach upstream of | User Reference Number | Reach Length (km) | Possible causes of non-compliance |
|---|---|---|---|---|---|
| 2 | SID | A3052 BRIDGE SIDFORD | R03A002 | 1.8 | DROUGHT, UP-STREAM ABSTRACTIONS |
| 3 | SID | SIDMOUTH | R03A003 | 2.9 | |
| 4 | RONCOMBE STREAM | COTFORD | R03A013 | 4.4 | FARMING ACTIVITIES |

Appendix 10.11