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CONWY CATCHMENT MANAGEMENT PLAN
Water Quality Assessment
Technical Memorandum No. EAN/93/TM18

Circulation

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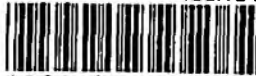
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SUMMARY

- 1) The sampling points and data considered in the water quality assessment for the Conwy Catchment Management Plan are outlined.
- 2) The data indicated failure of the Potable Abstraction Suite of determinands at Capel Curig WTW in respect of colour, total ammonia, phenols and total copper.
- 3) The data indicated failures of the objective for salmonid fisheries of Class 1 in respect of dissolved copper (significantly to class 5 at all three sites where there were results), total zinc (significantly, $P < 90\%$, to class three at four out the six sites considered and not significantly at the other two), dissolved lead (significantly to class 3 at the one site it there were results), and pH (not significantly at two out of the six sites considered) at two sites.
- 4) In the case of dissolved copper and lead the minimum quoted concentrations were higher than the required standard. However, the occurrence of results higher than this minimum value indicates that failure of the standard cannot be discounted.
- 5) The minimum quoted concentration for dissolved chromium was the same as the standard.

INTRODUCTION

Catchment Management Plans consider the uses to which the water resource in a catchment is put. From these uses objectives are derived. The water quality required to achieve these objectives and protect the uses are defined by water quality standards which are mostly quantifiable so that achievement of the objectives may be readily assessed.

The Catchment Management Plans summarise this information in a very succinct form so that conflicts of use and failure of objectives may be easily identified. This report is a supporting document to the plan and is a record of the water quality data used in that part of the assessment carried out by the Environmental Appraisal Unit. For the Conwy Catchment, the plan also incorporates as a pilot study, the application of proposed Statutory Water Quality Objectives (SWQOs). The SWQO scheme applies only to classified river stretches in respect of Fisheries Ecosystem Use and future Potable Abstraction Use.

The assessments described in this report was carried out in two parts which involved different sampling points and techniques of data analysis:

- 1) For the production of the Catchment Management Plan and
- 2) For the proposed SWQOs.

The assessment described in this report is confined to the river above the tidal limit.

USES

For the assessment of water quality it is not necessary to identify the uses of the catchment that may be affected by water quality and the objectives derived to protect them in any detail. Standards have been set to achieve the different objectives and so protect the uses. It is, therefore, only necessary to identify the uses and objectives that require the most stringent standards.

The uses in the catchment that are affected by water quality include:

1) Potable water abstraction. There are a number of abstractions both by the statutory water company, and by private properties.

2) Fisheries. The Conwy and its tributaries contain important salmonid fisheries with approximately 50% of the fish rearing area of the catchment accessible to migratory salmon and trout. This area will be increased with access above the Conwy Falls on completion of a fish-pass tunnel. The Conwy from its tidal limits to a point 2.4 km upstream of Ysbyty Ifan, along with most of the Machno and half the length of the Lledr are designated under the EC Fisheries Directive (78/659/EEC).

3) Conservation. The western side of the catchment is in the Snowdonia National Park and there are a number of SSSIs and National Nature Reserves within the catchment.

WATER QUALITY STANDARDS FOR CATCHMENT MANAGEMENT PLAN

The water quality standards which have been set to achieve the objectives and so protect the uses are grouped into sets of suites. For each recognised use of the catchment there is a single suite listing all the relevant Environmental Standards. The standards are listed within their suites in the Appendix I for the Catchment Management Plan. Standards for the SWQOs are considered separately below. Where the standards are dependent on the hardness of the water, the lowest hardness category (<50 mg/l as CaCO₃) is applicable.

The suites considered for the Conwy are shown below:

| USE | WATER QUALITY SUITE |
|-------------------------------------|--|
| Potable Water Abstraction | WQ Suite 7: Potable Abstraction |
| Fisheries | WQ Suite 2: List 1 Substances WQ Suite 4: Protection of sensitive aquatic life including salmonids |
| Conservation/ Special Ecosystems | Site Specific |

Note 1: Where more than one recognised use takes place in a particular part of the catchment, the various suites of Environmental Quality Standards which apply are considered together and the strictest set of standards derived from the combined suites will apply to that part of the catchment, thus protecting all relevant uses.

Note 2: The standards applicable in Suite 7: Potable Abstraction depend on the degree of treatment of the raw water. In this assessment bacterial and virus standards were not considered and for other determinands the strictest standards were taken to apply (standards applicable to A1 treatment - see Appendix I) although standards for A2 treatment apply after December 1991.

Note 3: Special Conservation areas are likely to have their own specific water quality requirements. Conservation areas in the Conwy have not had specific water quality requirements identified.

SAMPLING

The sample points considered in this assessment are:

607811 Capel Curig Treatment Works
25001 R. Conwy, Railway Bridge, Near Cwm Llanerch Farm, Betws-y-Coed
25006 R. Llugwy, B5106 Road Crossing, Betws-y-Coed
25009 R. Llugwy, Pont ar Lledr, Fairy Glen, Betws-y-Coed

The positions of these sampling points (and those considered for the SWQOs - see below) are shown in Fig. 1.

ASSESSMENT OF WATER QUALITY

In the present assessment, data from 1 October 1989 to 30 September 1992 collected as part of the RQO or directive monitoring programmes (Sample Type codes - ME) were considered. The statistical values calculated by TDIB were used in the assessment for the Catchment Management Plan although data were treated differently for the assessment for the SWQOs and are considered below.

Sample Point 607811 - Capel Curig Water Treatment Works, was assessed against the standards in Suite 7 but only including phenol from the organic determinands.

The following determinands in Suites 2 and 3 were not analysed for during the period assessed at any of the sites other than 607811 - Capel Curig WTW).

DDT Total Isomers

none of the cyclodiene insecticides

Hexachlorocyclohexane

1,2 Dichloroethane

trichloroethylene

perchloroethylene

No samples of sediment or biota were analysed

Analyses for total zinc are recorded under determinand numbers 245 (results as mg/l) and 7245 (results as ug/l). This may or may not reflect differences in the method of analysis and hence Limit of Detection. There are also difficulties with the assessment of dissolved copper, dissolved lead and dissolved chromium against the standards as the minimum quoted concentrations on the databank are the same as or higher than the quality standard.

The analytical results in relation to the standards are summarised in Table 1: Table 1a, for sampling point 607811 in relation to Suite 7: Potable Abstraction and 1b-d for the other sampling points in relation to Suite 2: List I Substances and Suite 4: Protection of sensitive aquatic life including salmonid fish.

Results from all samples taken during the three year period are summarised for comparison with the standards although many in Suites 2: and 7: should be considered as an annual average. Differences in interpretation using all the data instead of annual data can occur if the maximum observed concentration exceeds the standard but the mean does not.

SPT 607811 fails the strictest standards for Suite 7 in respect of Colour, total ammonia, phenols, total copper. However, the minimum quoted concentration of total copper is 0.05 mg/l which is higher than the standard as a 95%ile (although there is a concentration of 0.025 mg/l recorded in the data set). That the maximum recorded concentration is higher than the minimum quoted does indicate that failure of the standard cannot be discounted. Failure of the higher copper standard (A2 treatment) cannot be discounted either for the same reason, although the other determinands that failed the stricter standards do pass this second standard. Because this sampling point is at the Water Treatment Works and not at the river and protection of Potable Abstractions occurs through the EC Directive on Surface Water Abstraction, assessment at this SPT was not subsequently included in the Catchment Management Plan or Statutory Water Quality Objectives (see below). The assessment is included here because it was undertaken before the decision to exclude it.

At the other sampling sites, determinands in Suite 2 and most of the metals in Suite 4 were only analysed for at SPT 25001. At this site there were failures in respect of dissolved copper, dissolved lead and total zinc. In the case of dissolved copper and lead the minimum quoted concentrations are higher than the standards. However, in both cases concentrations above this minimum have been found so that true failure of the standard cannot be discounted. The minimum quoted concentration for dissolved chromium is greater than the standard and all results were less than this value so that it is not possible to assess the presence of this metal against the standard.

At the other two sites considered - SPT 25006 and 25009 - only the metals dissolved copper and total zinc in Suite 4 were analysed for. Both metals failed the standard at both sites, although the minimum quoted concentration for dissolved copper is higher than the standard. Again at both these sites there were analytical results higher than the minimum so that genuine failures for dissolved copper cannot be discounted.

The existence of high concentrations of zinc is recognised in the derogation from the standard for this metal in the designation under the EEC Fish

Directive. The upper Conwy Catchment is known to be acidified with low pH as as a problem although there was no failure of the standard in the data assessed.

STATUTORY WATER QUALITY OBJECTIVES

The Department of the Environment in 1992 proposed a scheme of Statutory Water Quality Objectives which sets standards of water quality appropriate for different specified uses, which, if accepted, would place a statutory obligation on the NRA to achieve. The Conwy Catchment is one of the catchments where the scheme is to be applied as a pilot study.

Within the Catchment Management Plan, the Statutory Water Quality Objectives scheme will only apply to the classified river stretches and to Fisheries Ecosystem Use and Potable Abstraction Use. There are no potable abstractions in classified stretches in the Conwy Catchment and the use only applies where an abstraction is planned for the future. The protection of existing Potable Abstractions occurs through the EC Directive on Surface Water Abstraction. Thus for the Conwy Catchment only the Fisheries Ecosystem Use is applicable. The stretches applicable to the Conwy Catchment are marked in Fig. 1.

A code of practice for data handling in the assessment of the current status of the catchment for the Statutory Water Quality Objectives is shown in Appendix II. The standards for water hardness $<50 \text{ mg/l as CaCO}_3$ are applicable to the Conwy Catchment, and the proposed standards for the catchment are those in Class 1.

Initial assessment was carried out using the data from the sample points considered for the Catchment Management Plan and described above. However, because of time constraints %ile figures were retrieved from TDIB i.e. 'less than' values are treated as face value results and not halved, and used in the assessment.

After production of the first draft of the Catchment Plan it was felt that the assessment did not reflect the water quality situation in the catchment in respect of the effects of the acidification for which there was much evidence from investigational work. Further, the assessment carried out for the Catchment Management Plan omitted consideration of some of the routine monitoring sites in the classified stretches. It was decided that further analysis of data should be carried out for the SWQO proposals. Also by this time the protocol for treatment of data had been incorporated into a number of PC Programs.

These programs allowed estimation of the robustness of the classification at the Sampling point indicated by the analysis of data. This was achieved using a second program that calculated an 'optimistic' class using the lower (or higher for dissolved oxygen) 95% confidence limit of the statistic calculated from the sample data.

The sampling points considered in this assessment were:

| SPT No. | DESCRIPTION | NOTES |
|---------|--------------------------|---------------------------|
| 25001 | R. Conwy, Betws-y-Coed | SPT considered in CMP |
| 25006 | A. Llugwy, B5106 Br | " |
| 25009 | A. Lledr, Pont ar Lledr | " |
| 25010 | A. Machno, Woollen Mill | SPT NOT considered in CMP |
| 25136 | R. Conwy, Ysbyty Ifan | " |
| 25013 | A. Merddwr, Pentrefoelas | " |

The positions of these sampling points are shown in Fig. 1.

Data for the same time period and purpose codes as for the CMP were considered i.e. 1 October 1989 to 30 September 1992 and purpose code 'ME'.

The data was evaluated using the SWQO suite of programs to establish the 'most likely class' and 'optimistic class'. Any uncertainties identified were resolved using AARDVARK program. No tests were made to test the normality of distribution or trends and step changes.

The assessment is summarised in Table 2a.

The results for dissolved oxygen at the lower Conwy Site (SPT 25001, Table 2a) which indicate a Most Likely Class (MLC) of 4 and optimistic Class of 3 results from three oxygen results of 0%. These values occurred because of a problem with MENSAR to TDIB transfers. In all three cases the values were >90% so that the true classes are 1. The problem with the transfers has been solved and the results on TDIB corrected.

The MLC/OPT. classification on respect of dissolved oxygen at the Conwy, Ysbyty Ifan (SPT 25136) of 3/1 results from a single result of 46% for which no reason can be found.

The minimum quoted concentrations of dissolved copper and lead (5 and 10 ug/l) are higher than the standard for class I (1 ug/l) so that the classes where there are results for these metals (SPT 25001 for Pb, SPT 25001, SPT 25006, SPT 25009 for Cu) may be artifacts. However, for both metals at all the sites there were positive results (> Limit of Detection) so that failure of the standards for Class 1 cannot be discounted.

There was failure of Class I standards in respect of pH at the upper site on the R. Conwy (SPT 25136) - MLC and optimistic estimates, A. Lledr and A. Machno - MLC estimates only.

There was failure of Class 1 standards in respect of total zinc at the lower site on the R. Conwy (SPT 25001), A. Lledr (SPT 25009), A. Machno (SPT 25010), and A. Merddwr (SPT 25013) - MLC and optimistic estimates, R. Conwy, Ysbyty Ifan (SPT 25136) and A. LLugwy (SPT 25006) - MLC estimates only.

Fig. 1 Conwy Catchment showing designated stretches (---) and associated sampling sites (X) considered in the water quality assessment for the Catchment Management Plan/proposed statutory water quality objectives.

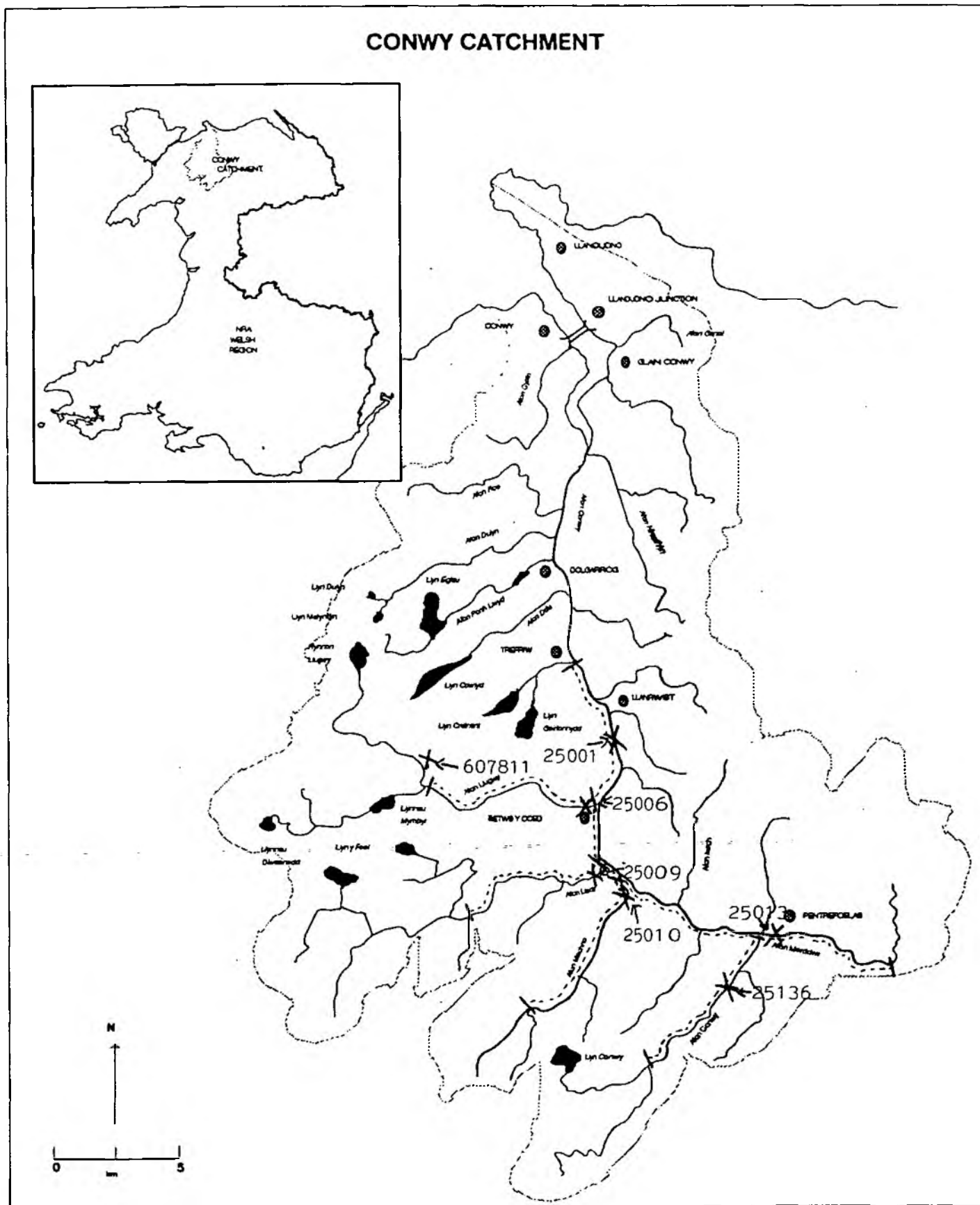


Table Ia. Summary of water quality at
 SPT: 607811 Capel Curig Water Treatment Works - Raw Water

| DET. | DET. NO. | NO SAMPLES | MEAN | MAX. | OTHER STATS | EQS | UNITS | PASS/FAIL P/F |
|---------------|----------|------------|-----------|----------|-------------|---------|-------|---------------|
| Suite 7 | | | | | | | | |
| Tot. Cd | 253 | 9 | all >0.5 | | | 5(6) | ug/l | P |
| Tot. Hg | 105 | 8 | .08 | .1 | 0.32(6) | 1(6) | ug/l | P |
| Tot. As | 356 | 9 | all <.002 | | | .05(6) | ug/l | P |
| Tot. B | 283 | 8 | .062 | .07 | .2(6) | 1(6) | ug/l | P |
| Tot. Cr | 375 | 9 | 2.9 | 5 | 6.3(6) | 50(6) | ug/l | P |
| Tot. Cu | 215 | 26 | .05 | .074 | .068(6) | .02(6) | ug/l | F |
| Diss. Fe | 419 | 26 | .075 | .194 | .185(6) | 0.3(6) | ug/l | P |
| Tot. Pb | 326 | 9 | .003 | .005 | .006(6) | .05(6) | ug/l | P |
| Tot. Se | 379 | 9 | all <.005 | | | .01(6) | ug/l | P |
| Tot. Zn | 245 | 26 | .05 | .1 | .09(6) | 3(6) | ug/l | P |
| Ammonia-N | 111 | 26 | .029 | .12 | .07(6) | .05(6) | ug/l | F |
| D.O. | 81 | 26 | 95.1 | 108 | min. 81 | >70 | % | P |
| BOD | 85 | 26 | .9 | 2.1 | 1.8(6) | 3(6) | ug/l | P |
| Tot. Ba | 257 | 8 | all <.04 | | | 0.1(6) | ug/l | P |
| Susp. Solids | 135 | 26 | 2 | 7 | 5(6) | 25(6) | ug/l | P |
| pH | 61 | 26 | 6.2 | 5.6(min) | 7.7(max) | 6.5-8.5 | | F |
| Total Cyanide | 175 | 8 | all <.002 | | | .05(6) | ug/l | P |
| Fluoride | 177 | 8 | .05 | .05 | .06(6) | 1.5(6) | ug/l | P |
| Phenols | 979 | 23 | .73 | 1.04 | 1.23(6) | 1(6) | ug/l | F |
| Colour | 69 | 26 | 13 | 28 | 29(6) | 20 | ug/l | F |
| Nitrate | 117 | 26 | .16 | 1.14 | .39(6) | 11.3 | ug/l | P |

- (1) Annual Average
- (2) Total HCH
- (3) 5 %ile
- (4) 75 %ile
- (5) No increase
- (6) 95 %ile
- (7) 95 %ile - Tidal average
- (8) Mean

Table 1b. Summary of water quality at

SPT: 25001 R.Conwy, Railway Bridge, Nr Llanerch Farn, Betws-y-Coed

| DET. | DET. NO. | NO SAMPLES | MEAN | MAX. or Min. | OTHER STATS | EQS | UNITS | PASS/FAIL P/F |
|-----------------|----------|------------|-----------|--------------|-------------|----------|-------|---------------|
| SUITE 2 | | | | | | | | |
| Tot. Hg | 269 | 3 | all <.1 | | | (5) | ug/l | |
| Tot. Cd | 253 | 9 | all <.001 | | | 5(1) | ng/l | P |
| Chloroform | 816 | 25 | .55 | 1 | | (5) | ug/l | |
| Tot. pp DDT | 555 | 33 | all <.003 | | | (5) | ug/l | |
| PCP | 1685 | 25 | 3.29 | 50 | | (5) | ug/l | |
| TCB | 9687 | 23 | .015 | .015 | | None yet | ug/l | |
| SUITE 4 | | | | | | | | |
| Tot. NH4-N | 111 | 50 | .025 | .09 | .06(6) | .78(6) | ng/l | P |
| Unionised NH3-N | 119 | 13 | 0? | .0001 | | .021(6) | ng/l | P |
| Tot. BOD | 35 | 37 | 1.4 | 3.4 | 2.6(6) | 3(6) | ng/l | P |
| B.O. | 32 | 42 | 11.4 | 8.9 | 9.6(3) | 9(3) | ng/l | P |
| Susp. Solids | 135 | 50 | 4 | 23 | | 25(1) | ng/l | P |
| pH | 61 | 43 | 6.7 | 5.9 | 6.1 | 6.0(30) | | P |
| Diss. As | 7354 | 26 | 1.93 | 2 | | 50(1) | ug/l | P |
| Tot. B | 7763 | 25 | all <70 | | | 2000(1) | ug/l | P |
| Diss. Fe | 7419 | 26 | 111.8 | 258.8 | 278.5(6) | 1000(6) | ug/l | P |
| Diss. Cr | 7373 | 26 | all <10 | | | 10(1) | | |
| Diss. Cu | 7213 | 33 | 5.7 | 11.6 | | 1(1) | ug/l | F |
| | | | | | 8.2(6) | 5(6) | ug/l | F |
| Diss. Pb | 52 | 26 | 11.2 | 25 | | 4(1) | ug/l | F |
| Diss. Ni | 7427 | 26 | 20.9 | 293 | | 50(1) | ug/l | P |
| Tot. Zn | 7245 | 48 | 36 | 90.8 | | 8(1) | ug/l | F |
| | | | | | 67.4(6) | 30(6) | ug/l | F |
| Tot. Zn | 245 | 9 | .048 | .087 | | .008(1) | ng/l | F |
| | | | | | .115(6) | .03(6) | ng/l | F |
| Tot. Va | 7768 | 25 | all <20 | | | 20(1) | ug/l | P |

(1) Annual Average

(2) Total HCH

(3) 5 %ile

(4) 75 %ile

(5) No increase

(6) 95 %ile

(7) 95 %ile - Tidal average

(8) Mean

Table 1c. Summary of water quality data at
 SPT: 25006 R. Llugwy, B5106 Road Crossing, Betws-y-Coed

| DET. | DET. NO. | NO SAMPLES | MEAN | MAX. or MIN. | OTHER STATS | EQS | UNITS | PASS/FAIL P/F |
|-----------------|----------|------------|------|--------------|-------------|---------|-------|---------------|
| SUITE 4 | | | | | | | | |
| Tot. NH4-N | 111 | 32 | .032 | .12 | .069(6) | .78(6) | mg/l | P |
| Unionised NH3-N | 119 | 31 | 0? | .003 | | .021(6) | mg/l | P |
| Tot. NOD | 35 | 32 | 1.1 | 2.9 | 2.3(6) | 3(6) | mg/l | P |
| D.O. | 82 | 32 | 11.2 | 14.4 | 9.3(3) | 9(3) | mg/l | P |
| Susp. Solids | 135 | 32 | 2.7 | 14.4 | | 25(1) | mg/l | P |
| pH | 61 | 32 | 6.7 | 6.1 (min) | 6.06(3) | 6.0(3) | | P |
| | | | | | | | | |
| Diss. Cu | 7213 | 13 | 5.1 | 6.3 | | 1(1) | ug/l | F |
| | | | | | 5.7(6) | 5(6) | ug/l | F |
| Tot. Zn | 7245 | 31 | 64.7 | 186 | | 8(1) | ug/l | F |
| | | | | | 159.8(6) | 30(6) | ug/l | F |
| Tot. Zn | 245 | 32 | .07 | .186 | | .008(1) | mg/l | F |
| | | | | | .140(6) | .03(6) | mg/l | F |

Table 1d. Summary of water quality data at
 SPT: 25009 R. Lledr, Pont ar Lledr, Fairy Glen, Betws-y-Coed

| DET. | DET. NO. | NO SAMPLES | MEAN | MAX. or MIN. | OTHER STATS | EQS | UNITS | PASS/FAIL P/F |
|-----------------|----------|------------|------|--------------|-------------|---------|-------|---------------|
| SUITE 4 | | | | | | | | |
| Tot. NH4-N | 111 | 32 | .035 | .17 | .1 | .78(6) | mg/l | P |
| Unionised NH3-N | 119 | 31 | 0? | .0003 | | .021(6) | mg/l | P |
| Tot. NOD | 85 | 32 | 1.2 | 2.7 | 2.4 | 3(6) | mg/l | P |
| D.O. | 82 | 32 | 11.1 | 9.2 | 9.2(3) | 9(3) | mg/l | P |
| Susp. Solids | 135 | 32 | 2 | 13 | | 25(1) | mg/l | P |
| pH | 61 | 32 | 6.7 | 6.1 | 6.1(3) | 6.0(3) | | P |
| | | | | | | | | |
| Diss. Cu | 7213 | 13 | 5.1 | 6.3 | | 1(1) | ug/l | F |
| | | | | | 5.6(6) | 5(6) | ug/l | F |
| Tot. Zn | 7245 | 31 | 18 | 98 | | 8(1) | ug/l | F |
| | | | | | 39.5 | 30(6) | ug/l | F |
| Tot. Zn | 245 | 32 | .018 | .098 | | .008(1) | mg/l | F |
| | | | | | .039 | .03(6) | mg/l | F |

- (1) Annual Average
- (2) Total HCN
- (3) 5 %ile
- (4) 75 %ile
- (5) No increase
- (6) 95 %ile
- (7) 95 %ile - Tidal average
- (8) Mean

Table 2a. SWQO assessment summary for

SPT: 25001 R.Conwy, Railway Bridge. Nr Lisnerch Fara, Betws-y-Coed

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|------------|-----------|---------------------|------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 81 | 41 | (2) | 58.8 | 65.1 | 4 | 3 |
| Tot. BOD | 85 | 37 | (5) | 2.2 | 1.9 | 1 | 1 |
| Tot. NH3-N | 111 | 50 | (5) | .05 | .04 | 1 | 1 |
| Union. NH3-N | 119 | 13 | (8) | .0001 | 0 | 1 | 1 |
| pH lower | 61 | 43 | (3) | 6.1 | 6.2 | 1 | 1 |
| pH upper | 61 | 43 | (4) | 7.3 | 7.1 | 1 | 1 |
| Diss. Pb | 52 | 26 | (1) | 5.6 | 5.7 | 3 | 3 |
| Diss. Cr | 7373 | 26 | (1) | 5 | 5 | 1 | 1 |
| Tot. Zn | 7245 | 45 | (1) | 36 | 31.2 | 3 | 3 |
| Diss. Cu | 7213 | 33 | (1) | 3.8 | 2.8 | 5 | 5 |
| Diss. Ni | 7427 | 26 | (1) | 15.1 | 0 | 1 | 1 |
| Diss. As | 7354 | 26 | (1) | .9 | .9 | 1 | 1 |
| Tot. E | 7763 | 25 | (1) | 35 | 35 | 1 | 1 |
| Diss. Fe | 7419 | 26 | (1) | 111.6 | 68 | 1 | 1 |
| Tot. Va | 7768 | 25 | (1) | 10 | 10 | 1 | 1 |

Table 2b. SWQO assessment summary for

SPT: 25135 R. Conwy, Top Stretch

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|------------|-----------|---------------------|------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 81 | 30 | (2) | 79.4 | 82.9 | 2 | 1 |
| Tot. BOD | 85 | 30 | (5) | 1.8 | 1.5 | 1 | 1 |
| Tot. NH3-N | 111 | 30 | (5) | .05 | .04 | 1 | 1 |
| Union. NH3-N | 119 | 29 | (5) | .0001 | 0 | 1 | 1 |
| pH lower | 61 | 30 | (3) | 5.4 | 5.6 | 5 | 5 |
| pH upper | 61 | 30 | (4) | 7.2 | 6.9 | 1 | 1 |
| Tot. Zn | 7245 | 29 | (1) | 22.6 | 4.3 | 3 | 1 |

MLC Most Likely Class

OPT. Optimistic Class

(1) Mean

(2) 10 %ile - Normal

(3) 5 %ile - Normal

(4) 95 %ile - Normal

(5) 90 %ile - Log normal by method of moments

(6) 95 %ile - Log normal by method of moments

Table 2c. SWQO assesment summary for
SPT: 25006 R.Llugwy, B5106 Br

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|---------------|-----------|---------------------|-------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 81 | 32 | (2) | 92.2 | 93.5 | 1 | 1 |
| Tot. BOD | 85 | 32 | (5) | 1.9 | 1.6 | 1 | 1 |
| Tot. NH3-N | 111 | 32 | (5) | .06 | .05 | 1 | 1 |
| Union. NH3-N | 119 | 31 | (6) | .0002 | .0001 | 1 | 1 |
| pH lower | 61 | 32 | (3) | 6.1 | 6.2 | 1 | 1 |
| pH upper | 61 | 32 | (4) | 7.4 | 7.2 | 1 | 1 |
| Tot. Zn | 7245 | 31 | (1) | 64.6 | 50.4 | 3 | 1 |
| Diss. Cu | 7213 | 13 | (1) | 2.8 | 2.2 | 5 | 5 |

Table 2d. SWQO assesment summary for
SPT: 25009 R.Lledr, Pont ar Lledr

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|---------------|-----------|---------------------|-------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 81 | 32 | (2) | 90.8 | 92.2 | 1 | 1 |
| Tot. BOD | 85 | 32 | (5) | 2 | 1.6 | 1 | 1 |
| Tot. NH3-N | 111 | 32 | (5) | .07 | .05 | 1 | 1 |
| Union. NH3-N | 119 | 31 | (6) | .0001 | .0001 | 1 | 1 |
| pH lower | 61 | 32 | (3) | 5.9 | 6.1 | 5 | 1 |
| pH upper | 61 | 32 | (4) | 7.3 | 7.4 | 1 | 1 |
| Tot. Zn | 7245 | 31 | (1) | 18 | 11.7 | 3 | 3 |
| Diss. Cu | 7213 | 13 | (1) | 3.1 | 2.2 | 5 | 5 |

Table 2e. SWQO assesment summary for
SPT: 25010 R.Machno, Woolen Mill

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|---------------|-----------|---------------------|-------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 81 | 30 | (2) | 85.4 | 87.3 | 1 | 1 |
| Tot. BOD | 85 | 30 | (5) | 2.2 | 1.8 | 1 | 1 |
| Tot. NH3-N | 111 | 30 | (5) | .14 | .1 | 1 | 1 |
| Union. NH3-N | 119 | 29 | (6) | .0001 | .0001 | 1 | 1 |
| pH lower | 61 | 30 | (3) | 5.9 | 6 | 5 | 1 |
| pH upper | 61 | 30 | (4) | 6.8 | 6.7 | 1 | 1 |
| Tot. Zn | 7245 | 29 | (1) | 17.2 | 14.4 | 3 | 3 |

MLC Most Likely Class
OPT. Optimistic Class
(1) Mean
(2) 10 %ile - Normal
(3) 5 %ile - Normal
(4) 95 %ile - Normal
(5) 90 %ile - Log normal by method of moments
(6) 95 %ile - Log normal by method of moments

Table 3f. SWGO assesment summary for
 SPT: SPT 25013 R.Merddwr, Pentrefoelas

| DET. | DET. NO. | NO SAMPLES | STATISTIC | SUM.STATS % or ug/l | | CLASS | |
|--------------|----------|---------------|-----------|---------------------|-------|-------|------|
| | | | | MLC | OPT. | MLC | OPT. |
| D.O. | 31 | 29 | (2) | 86.4 | 86.9 | 1 | 1 |
| Tot. BOD | 65 | 29 | (5) | 2.3 | 2 | 1 | 1 |
| Tot. NH3-N | 111 | 29 | (5) | .03 | .06 | 1 | 1 |
| Union. NH3-N | 119 | 28 | (6) | .0002 | .0001 | 1 | 1 |
| pH lower | 61 | 29 | (3) | 6.4 | 6.5 | 1 | 1 |
| pH upper | 61 | 29 | (4) | 7.4 | 7.2 | 1 | 1 |
| Pot. Zn | 7245 | 20 | (1) | 17.2 | 11.8 | 3 | 3 |

MLC Most Likely Class

OPT. Optimistic Class

(1) Mean

(2) 10 %ile - Normal

(3) 5 %ile - Normal

(4) 95 %ile - Normal

(5) 90 %ile - Log normal by method of moments

(6) 95 %ile - Log normal by method of moments

APPENDIX I

The following water quality suites apply to recognised catchment uses as shown in the table below.

| Use | Suites |
|--|---------------|
| Basic Amenity | 1 |
| General Ecosystem Conservation | 1 2 3 |
| Salmonid Fishery | 2 4 |
| Cyprinid Fishery | 2 3 |
| Commercial Shell Fishery | 8 |
| Fish farming | 9 |
| Angling | 1 |
| Bathing | 1 5 |
| Immersion Sports | 1 6 |
| Non-immersion Sports | 1 |
| Potable Water Abstraction | 7 |
| Industrial / Agricultural Abstraction: | Site-specific |
| Special Conservation Sites | Site-specific |

Water Quality Suite 1 : Aesthetic Criteria

| DETERMINAND | ASSESSMENT METHOD | STANDARD |
|-----------------------------|----------------------|---|
| Colour | Visual inspection | No perceptible abnormal discolouration |
| Mineral oils | Visual inspection | Only visible on detailed inspection (<2% cover) |
| Foaming | Visual inspection | Only visible on detailed inspection (<2% cover) |
| Transparency | Visual inspection | No perceptible turbidity * |
| Litter | Visual inspection | Only visible on detailed inspection (<2% cover) |
| Odour | Olfactory inspection | No perceptible odour |
| Excessive biological growth | Visual inspection | Only visible on detailed inspection (<2% cover) |
| Aerobic conditions | Visual inspection | Aerobic conditions should be maintained |

* Derogation permissible in extreme meteorological or geographical conditions.

Water Quality Suite 2 : List I Substances

Inland Waters

| DETERMINAND | UNIT | VALUE: | | STATISTIC |
|--------------------------|------------------------|-----------|------------|-----------|
| | | Discharge | Background | |
| Cadmium | µgCd/l | 5 | 5 | AA, T |
| Carbon tetrachloride | µgCCl ₄ /l | 12 | + | AA, T |
| Chloroform | µgCHCl ₃ /l | 12 | + | AA, T |
| DDT total isomers | µg/l | 0.025 | + | AA, T |
| PP' - DDT | µg/l | 0.01 | + | AA |
| Cyclodiene Insecticides: | | | | |
| - total 'drins' ** | µg/l | 0.03 | + | AA, T |
| - endrin ** | µg/l | 0.005 | + | M, T |
| aldrin *** | µg/l | 0.01 | + | AA, T |
| dieldrin *** | µg/l | 0.01 | + | AA, T |
| endrin ** | µg/l | 0.005 | + | AA, T |
| isodrin *** | µg/l | 0.005 | + | AA, T |
| Hexachlorocyclohexane | µgHCH/l | 0.1 | 50 | AA, T |
| Hexachlorobenzene | µgHCB/l | 0.03 | + | AA, T |
| Hexachlorobutadiene | µgHCD/l | 0.1 | + | AA, T |
| Mercury | µgHg/l | 1 | + | AA, T |
| Pentachlorophenol | µgPCP/l | 2 | + | AA |

Proposals have been published for the following candidate List I substances (II) but these have not so far been adopted: 1,2 - dichloroethane, trichloroethylene, perchloroethylene, trichlorobenzene.

The concentrations of the following List I substances in sediments must not increase significantly with time:

Cadmium, Hexachlorocyclohexane, Mercury.

The concentrations of the following List I substances in sediments and/or molluscs and/or fish must not increase significantly with time:

DDT, pentachlorophenol, cyclodiene insecticides, hexachlorobenzene, hexachlorobutadiene.

AA = Annual Average

T = Total

M = Maximum

+ = 'Standstill' provisions apply: no increase on the previously recorded value is permissible.

** Standards applicable to 1 January 1994.

*** Standards applicable after 1 January 1994.

Water Quality Suite 2 (Continued)

Estuaries and Coastal Waters

| DETERMINAND | UNIT | VALUE: | | STATISTIC |
|-----------------------|--------------------|-----------|--------------------|----------------|
| | | Discharge | Background | |
| Cadmium | $\mu\text{gCd}/1$ | 2.5 | 0.5 (C) 1.0 (E) | AA, D AA, D |
| Hexachlorocyclohexane | $\mu\text{gHCH}/1$ | 0.02 | + | AA, T |
| Mercury | $\mu\text{gHg}/1$ | 0.3 | + | AA, D |

For other List I substances the values listed in the inland waters table also apply to estuaries and coastal waters.

AA - Annual Average

T - Total

D - Dissolved

C - Coastal Waters

E - Estuaries

+ - 'Standstill' provisions apply: no increase on the previously recorded value is permissible.

Water Quality Suite 3 : Protection of aquatic life including cyprinid fish

Standards applying to Inland Waters and Estuaries / Coastal Waters:

| DETERMINAND | UNIT | VALUE: | | STATISTIC |
|----------------------|-----------|---------------|------------------------------|-----------|
| | | Inland Waters | Estuaries/ Coastal Waters | |
| Arsenic | µgAs/l | 50 | 25 | AA, D |
| Boron | µgB/l | 2000 | 7000 | AA, T |
| Inorganic tin | µgSn/l | 25 | 10 | AA, T |
| Organotins: | µg/l | TBT 0.02 | 0.002 | M, T |
| TBT / TPT | | TPT 0.02 | 0.008(E) | M, T |
| pH | pH values | 6.0-9.0 | | 95P |
| Iron | µgFe/l | 1000 | 1000 | AA, D |
| Mothproofing agents: | µg/l | | | 95P, T |
| PCSDs/PADs | | 0.05 | 0.05 | |
| Sulcofuron | | 25 | 25 | |
| Flucofuron | | 1 | 1 | |
| Permethrin | | 0.01 | 0.01 | |
| Cyfluthrin | | 0.001 | 0.001 | |

Standards applying to Estuaries and Coastal Waters:

| DETERMINAND | UNIT | VALUE | STATISTIC |
|-------------------|----------------------|-------|-----------------------|
| Ammonia: | mgN/l | | |
| Total | | 1.0 | M |
| Unionised | | 0.021 | AA |
| | | 0.042 | 95P |
| | | 0.12 | M |
| Dissolved Oxygen | mgO ₂ /l | <5 | 95P |
| | | <3 | M |
| Hydrogen Sulphide | µgH ₂ S/l | 10 | Average over 24 hours |
| Chromium | µgCr/l | 15 | AA, D |
| Copper | µgCu/l | 5 | AA, D |
| Lead | µgPb/l | 25 | AA, D |
| Nickel | µgNi/l | 30 | AA, D |
| Zinc | µgZn/l | 40 | AA, D |
| Vanadium | µgV/l | 100 | AA, T |

Water Quality Suite 3 (Continued)

Standards applying to Inland Waters:

| DETERMINAND | UNIT | VALUE (Inland Waters) | STATISTIC |
|---|-------------------------------------|--|-----------|
| Ammonia: | $\mu\text{gN}/\text{l}$ | | |
| Total | | 0.78 | 95P |
| Unionised | | 0.021 | 95P |
| BOD | mg/l | 6 | 95P, T |
| Dissolved oxygen | mgO_2/l | ≥ 7 | AA, T |
| Suspended Solids | mg/l | 25 ** | AA, T |
| Residual chlorine | mgCl_2/l | 0.0068 (at pH6) | 95P, T |
| Hydrogen sulphide (undissociated H_2S) | $\mu\text{gH}_2\text{S}/\text{l}$ | | |
| | <15 °C, <5 $\text{mg O}_2/\text{l}$ | 0.5 (24 hr max) | 5.0 |
| | <15 °C, >5 $\text{mg O}_2/\text{l}$ | 1.0 (") | 10.0 |
| | >15 °C, <5 $\text{mg O}_2/\text{l}$ | 0.25 (") | 2.5 |
| | >15 °C, >5 $\text{mg O}_2/\text{l}$ | 0.5 (") | 5.0 |
| Temperature | °C | Thermal discharges must not cause a rise greater than 3°C | 98P |
| | | ≤ 28 ** | 98P |
| | | ≤ 10 for breeding of cold- water species ** | 98P |
| Phosphorus (indicative of need to reduce eutrophication) | $\text{mg PO}_4/\text{l}$ | 0.13 | AA, T |

The following standards are hardness-related in inland waters:

| | | Mean Hardness (mg/l as CaCO_3) | | | | | | |
|----------|--------------------------|---|--------|---------|---------|---------|------|--------|
| | | <50 | 50-100 | 100-150 | 150-200 | 200-250 | >250 | |
| Chromium | $\mu\text{gCr}/\text{l}$ | 150 | 175 | 200 | 200 | 250 | 250 | AA, D |
| Copper | $\mu\text{gPb}/\text{l}$ | 1 | 6 | 10 | 10 | 10 | 28 | AA, D |
| | | 5 | 22 | 40 | 40 | 40 | 112 | 95P, D |
| Lead | $\mu\text{gPb}/\text{l}$ | 50 | 125 | 125 | 250 | 250 | 250 | AA, D |
| Nickel | $\mu\text{gNi}/\text{l}$ | 50 | 100 | 150 | 150 | 200 | 200 | AA, D |
| Zinc | $\mu\text{gZn}/\text{l}$ | 75 | 175 | 250 | 250 | 250 | 500 | AA, T |
| | | 300 | 700 | 1000 | 1000 | 1000 | 2000 | 95P, T |
| Vanadium | $\mu\text{gV}/\text{l}$ | 20 | 20 | 20 | 20 | 60 | 60 | AA, T |

AA = annual average; M = maximum; 95P = 95 percentile; 98P = 98 percentile; T = total; D = dissolved; E; Value applies to Estuaries only; ** = Derogation permitted in the event of exceptional meteorological or geographical conditions.

Water Quality Suite 4 : Protection of sensitive aquatic life
including salmonid fish

| DETERMINAND | UNIT | VALUE (Inland waters) | STATISTIC |
|----------------------|----------|--------------------------|-----------|
| Arsenic | µgAs/l | 50 | AA, D |
| Boron | µgB/l | 2000 | AA, T |
| Inorganic tin | µg/Snl | 25 | AA, T |
| Organotins: | µg/l | TBT | M, T |
| TBT / TPT | | TPT | M, T |
| pH | pH value | 6.0-9.0 | 95P |
| Iron | µgFe/l | 1000 | AA, D |
| Mothproofing agents: | µg/l | | 95P, T |
| PCSDs/PADs | | 0.05 | |
| Sulcofuron | | 25 | |
| Flucofuron | | 1 | |
| Permethrin | | 0.01 | |
| Cyfluthrin | | 0.001 | |

The following standards are hardness-related:

| | | Mean Hardness (mg/l as CaCO ₃) | | | | | | |
|----------|--------|--|--------|---------|---------|---------|------|--------|
| | | <50 | 50-100 | 100-150 | 150-200 | 200-250 | >250 | |
| Chromium | µgCr/l | 5 | 10 | 20 | 20 | 50 | 50 | AA, D |
| Copper | µgCu/l | 1 | 6 | 10 | 10 | 10 | 28 | AA, D |
| | | 5 | 22 | 40 | 40 | 40 | 112 | 95P, D |
| Lead | µgPb/l | 4 | 10 | 10 | 20 | 20 | 20 | AA, D |
| Nickel | µgNi/l | 50 | 100 | 150 | 150 | 200 | 200 | AA, D |
| Zinc | µgZn/l | 8 | 50 | 75 | 75 | 75 | 125 | AA, T |
| | | 30 | 200 | 300 | 300 | 300 | 500 | 95P, T |
| Vanadium | µgV/l | 20 | 20 | 20 | 20 | 60 | 60 | AA, T |

Water Quality Suite 4 (Continued)

| DETERMINAND | UNIT | VALUE (Inland waters) | STATISTIC |
|---|-----------------------|---|-----------|
| Ammonia: | mg N/l | | |
| Total | | 0.78 * | 95P |
| Unionised | | 0.021 * | 95P |
| BOD | mgO ₂ /l | 3 | 95P, T |
| Dissolved oxygen | mgO ₂ /l | ≥9 * | AA, T |
| Suspended solids | mg/l | 25 ** | AA, T |
| Residual chlorine | mgCl ₂ /l | 0.0068 (at pH 6) | 95P, T, |
| Hydrogen sulphide (undissociated H ₂ S) | μgH ₂ S/l | | AA |
| | | <15 °C, <5 mg O ₂ /l 0.5 (24 hr max 5.0) | |
| | | <15 °C, >5 mg O ₂ /l 1.0 (" 10.0) | |
| | | >15 °C, >5 mg O ₂ /l 0.25 (" 2.5) | |
| | | >15 °C, >5 mg O ₂ /l 0.5 (" 5.0) | |
| Temperature | °C | Thermal discharges must not cause a rise greater than 1.5 °C | 98P |
| | | ≤21.5 | 98P |
| | | ≤10 for breeding of cold- water species | 98P |
| Phosphorus (indicative of need to reduce eutrophication) | mg PO ₄ /l | 0.065 | T |

AA = annual average; 95P = 95 percentile; T = total; D = dissolved;
M = maximum; 98P = 98 percentile; ** Derogation permitted in the event of
exceptional meteorological or geographical conditions.

* Different values apply for migratory salmonids in estuaries and coastal
waters: -

| | | | |
|------------------|---------------------|-------|-----|
| Ammonia: | mg N/l | | |
| Total | | 1.0 | M |
| Unionised | | 0.021 | AA |
| | | 0.042 | 95P |
| | | 0.12 | M |
| Dissolved oxygen | mgO ₂ /l | <3 | 95P |
| | | <5 | M |

Water Quality Suite 5 : Bathing

Guidelines on public health standards for bathing are being awaited. In the absence of guidelines, the following standards will apply.

Aesthetic standards

- i) No visual evidence of pollution by gross sewage solids and debris except under occasional unfavourable weather conditions.
- ii) No regular or consistent substantiated complaints from water users.
- iii) No formation of sewage slicks, discolouration, or foaming visible from foreshore areas frequented by the public.
- iv) In order to meet these standards, foul flows into bathing waters shall be subject to the following requirements:
 - a) All persistent material is to be removed from the flow and disposed of off site
 - b) Faecal particle size discharged will be dependent upon the available minimum initial dilution (AMID) in the receiving waters as calculated during a mean spring or neap tidal range, whichever gives the lowest value at any time during the tidal cycle:

| Dilution | Particle size |
|-----------------|---------------|
| AMID < 10 | < 1 mm |
| 10 < AMID < 100 | < 3 mm |
| AMID > 100 | < 6 mm |

- c) A minimum initial dilution standard of 100 will apply to all discharges, however treated, for aesthetic acceptability and to reduce the density stability of the diluted effluent.

Microbial standards

Standards used to assess compliance with bathing water quality objectives will be those used by the Department of the Environment to assess compliance with the EC Bathing Waters Directive in designated bathing waters. These standards are as follows:

| | | |
|------------------------------|-------|-------------------------------------|
| <u>E. Coli</u> (per 100 ml) | 2000 | 95 percentile. Imperative value. |
| Total coliforms (per 100 ml) | 10000 | 95 percentile. Imperative value. |

The Catchment Management Plan should note whether Salmonella or enteroviruses are present above the following limits:

| | | |
|-----------------------------------|---|----------------|
| Salmonella (per litre) | 0 | 95 percentile |
| Enteroviruses (PFU per 10 litres) | 0 | 95 percentile. |

Water Quality Suite 5 (Continued)

The Catchment Management Plan should also note whether the following standards, which must be passed if a bathing beach is to qualify for a European Blue Flag award, are achieved:

| | | |
|------------------------------|-----|----------------|
| <u>E. Coli</u> (per 100 ml) | 100 | 95 percentile. |
| Total coliforms (per 100 ml) | 500 | 95 percentile. |

In cases where a beach has been awarded a Blue Flag, these standards will be used to assess water quality in preference to the Department of the Environment standards listed below.

Water Quality Suite 6 - Immersion Sports

Guidelines on public health standards for immersion sports are being awaited. In the absence of guidelines, the following standards will apply.

Aesthetic standards

- i) No visual evidence of pollution by gross sewage solids and debris except under occasional unfavourable weather conditions.
- ii) No regular or consistent substantiated complaints from water users.
- iii) No formation of sewage slicks, discolouration, or foaming visible from foreshore areas frequented by the public.
- iv) In order to meet these standards and safeguard participants in immersion sports, foul flows into recognised areas where such sports are traditionally practised within the catchment shall be subject to the following requirements:
 - a) All persistent material is to be removed from the flow and disposed of off site.
 - b) Faecal particle size discharges will be dependent upon the available minimum initial dilution (AMID) in the receiving waters as calculated during a mean spring or neap tidal range, whichever gives the lowest value at any time during the tidal cycle:

| Dilution | Particle size |
|-----------------|---------------|
| AMID < 10 | < 1 mm |
| 10 < AMID < 100 | < 3 mm |
| AMID > 100 | < 6 mm |

-
-
-
- c) A minimum initial dilution standard of 100 will apply to all discharges, however treated, for aesthetic acceptability.

Water Quality Suite 7 : Potable Abstraction

| DETERMINAND | UNIT | VALUE (95P, T, unless shown otherwise) | | |
|---|---------|--|--------------|--------------|
| | | A1 treatment | A2 treatment | A3 treatment |
| <u>Bacteria and viruses</u> | | | | |
| Total coliforms (37 °C) | /100 ml | 50 | 5000 | 50 000 |
| Faecal coliforms | /100 ml | 20 | 2000 | 20 000 |
| Faecal streptococci | /100 ml | 20 | 1000 | 10 000 |
| Salmonella | / 5 l | 0 | 0 | |
| <u>List I Substances</u> | | | | |
| Cadmium | µgCd/l | 5 | 5 | 5 |
| Mercury | µgHg/l | 1 | 1 | 1 |
| Total pesticides (includes dieldrin) | µg/l | 1 | 2.5 | 5 |
| <u>List II Substances</u> | | | | |
| Arsenic | µgAs/l | 50 | 50 | 100 |
| Boron | µgB/l | 1000 | 1000 | 1000 |
| Chromium | µgCr/l | 50 (T) | 50 (T) | 50 (T) |
| Copper | µgCu/l | 20 | 50 | 1000 |
| Iron | µgFe/l | 300(D) | 2000(D) | 1000(D) |
| Lead | µgPb/l | 50 | 50 | 50 |
| Selenium | µgSe/l | 10 | 10 | 10 |
| Zinc | µgZn/l | 3000 | 5000 | 5000 |
| Organotins: | µg/l | | | |
| Tributyl tin | | 0.02(M) | 0.02(M) | |
| Triphenyl tin | | 0.09(M) | 0.09(M) | |
| Mothproofing agents: | µg/l | | | |
| Cyfluthrin | | 0.001 | 0.001 | |
| Permethrin | | 0.01 | 0.01 | 0.01 |

Water Quality Suite 7 : Potable Abstraction (Continued)

| DETERMINAND | UNIT | VALUE (95P, T, unless shown otherwise) | | |
|---|---|--|--------------|--------------|
| | | A1 treatment | A2 treatment | A3 treatment |
| <u>Other Determinands</u> | | | | |
| Ammonia | $\mu\text{gNH}_4/\text{l}$ | 0.05 | 1.5 | 4 |
| Dissolved Oxygen | % sat | >70 | >50 | >30 |
| BOD | $\text{mg O}_2/\text{l}$ | <3 | <5 | <7 |
| Barium | $\mu\text{gBa}/\text{l}$ | 100 | 1000 | 1000 |
| Cyanide | $\mu\text{gCN}/\text{l}$ | 50 | 50 | 50 |
| Fluorides | $\mu\text{gF}/\text{l}$ | 1500 | 700-1700 | 700-1700 |
| Phenols | $\mu\text{gC}_6\text{H}_5\text{OH}/\text{l}$ | 1 | 5 | 100 |
| Polycyclic aromatic hydrocarbons | $\mu\text{gPAH}/\text{l}$ | 0.2 | 0.2 | 1 |
| Dissolved or emulsified hydrocarbons | $\mu\text{g}/\text{l}$ | 50 | 200 | 1000 |
| pH | pH value | 6.5-8.5 | 5.5-9.0 | |
| Colour | $\text{mg}/\text{l Pt scale}$ | 20 ** | 100 ** | 200 ** |
| Temperature | $^{\circ}\text{C}$ | 25 ** | 25 ** | 25 ** |
| Nitrates | mgNO_3/l | 50 ** | 50 ** | 50 ** |
| Sulphates | mgSO_4/l | 250 | 250 ** | 250 ** |
| Phosphates | $\mu\text{gP}_2\text{O}_5/\text{l}$ | 400 | 700 | 700 |
| Chloride | mgCl/l | 200 | 200 | 200 |
| Kjeldahl Nitrogen (except NO_3) | $\text{mg}/\text{l O}_2$ | 1 | 2 | 3 |
| COD | $\text{mg}/\text{l O}_2$ | | | 30 |
| Odour | Dilution factor, 25°C | 3 | 10 | 20 |
| Conductivity | $\mu\text{g}/\text{cm}^{-1}$, 20°C | 1000 | 1000 | 1000 |
| Suspended solids | mg/l | 25 | | |
| Surfactants (laurylsulphate) | $\mu\text{g}/\text{l}$ | 200 | 200 | 200 |
| Substances extractable with Chloroform | $\mu\text{g}/\text{l SEC}$ | 100 | 200 | 500 |

M - Maximum; D - Dissolved; 95P - 95 percentile; T - Total.

** - Exceptional climatic or geographic conditions.

SWOO Implementation

Code of practice for Data handling.

1.0 Assessment of current status of Catchment.

1.1 Uses: Fisheries Ecosystem Use.
Potable Abstraction Use.

1.2 Standards: See attached sheet.

1.3 Methods of assessment:

- 1.3.1 Use three years data whenever possible.
 1.3.2 Use routine monitoring points and routine monitoring data.
 1.3.3 Retrieve data from TDIB and convert to AARDVARK format.
 1.3.4 Run data through TEST DATA program modules to;
 a. Test for normality of distribution
 b. Examine data for trends or step changes and causes.
 1.3.5 Restrict assessment to post step-change data dependant on evaluation.
 1.3.6 FISHERIES ECOSYSTEM
 Run data through Percentile Calculation Module to obtain percentiles identified as follows.

| Determinand | Expected Distribution | P%ile |
|----------------|-----------------------|------------------------|
| DO | Normal | 10 |
| pH | Normal | 5 and 95 |
| BOD | Log normal | 90 (Method of moments) |
| NH3 | Log normal | 90 (" ") |
| Unionised NH3 | Log normal | 95 (" ") |
| List II metals | Log normal | Annual average |

Once these figures have been obtained they should be assessed against the Standards for this Use and the Spt assigned to an appropriate Fisheries Class.

1.3.7 POTABLE ABSTRACTION

Assessment for these standards is made in accordance with the EC Directive for Surface Water Abstractions. This requires that in order to achieve compliance, 95% of samples must comply with the standards. This is not a population percentile just a simple Pass/Fail assessment of the data. For 12-19 samples we are allowed one failure. For less than 12 samples we are not allowed any failures. The compliance will be assessed against the standards for the Abstraction's designated class. NB: The classification is not a true hierarchy so if an Abstraction fails its Class A1 standards it does not become class A2 it is registered as non-compliant.

1.4 Rules for assessment:

1.4.1 Less than values.

For all determinands we should halve the less than values. This will ensure that the data is handled in a manner consistent with the DOE returns for the List II and List I substances.

1.4.2 Greater than values.

For all "greater thans" use the value quoted.

1.4.2 Unionised NH3.

For calculation of Unionised NH3 all pH values greater than 8.0 should be reset to 8.0.

TABLE 1

STANDARDS FOR USE IN SWQO SCHEME

1.0 FISHERY ECOSYSTEM USE

| Class | DO % sat 10%ile | BOD(ATU) mg/l 90%ile | Total NH3 mg/l N 90%ile | Unionised NH3 mg/l N 95%ile | pH 5& 95%ile | List II see 2.0 <i>AA's Norms</i> |
|-------|-----------------------|----------------------------|-------------------------------|-----------------------------------|--------------------|---|
| 1 | 80 | 2.5 | 0.2 | 0.021 | 6-9 | 'A' stds |
| 2 | 70 | 4.0 | 0.6 | 0.021 | 6-9 | 'A' stds |
| 3 | 60 | 6.0 | 1.3 | 0.021 | 6-9 | 'B' stds |
| 4 | 50 | 8.0 | 2.5 | - | 6-9 | 'B' stds |
| 5 | 20 | 15.0 | 9.0 | - | - | - |
| 6 | <20 | - | - | - | - | - |

2.0 LIST II SUBSTANCES

'A' stds-for protection of sensitive aquatic life (~~annual average's~~)

| Mean Hardness(mg/l) | 0-50 | 50-100 | 100-150 | 150-200 | 200-250 | >250 |
|------------------------|------------------------------------|--------|---------|---------|---------|------|
| Diss Copper (ug/l) | 1 | 6 | 10 | 10 | 10 | 28 |
| Diss Chromium(ug/l) | 5 | 10 | 20 | 20 | 50 | 50 |
| Diss Arsenic (ug/l) | <----- 50 -----> | | | | | |
| Diss lead (ug/l) | 4 | 10 | 10 | 20 | 20 | 20 |
| Diss Nickel (ug/l) | 50 | 100 | 150 | 150 | 200 | 200 |
| Total Zinc (ug/l) | 8 | 50 | 75 | 75 | 75 | 125 |
| Total Boron (ug/l) | <----- 2000 -----> | | | | | |
| Diss Iron (ug/l) | <----- 1000 -----> | | | | | |
| Tot Vanadium (ug/l) | <----- 20 -----> X ----- 60 -----> | | | | | |
| Tot TributylTin (ug/l) | <-----0.02 max allow conc-----> | | | | | |
| Tot triphenyltin(ug/l) | <-----0.02 max allow conc-----> | | | | | |

'B' stds-for protection of other aquatic life (~~annual average's~~)

| Mean Hardness(mg/l) | 0-50 | 50-100 | 100-150 | 150-200 | 200-250 | >250 |
|------------------------|------------------------------------|--------|---------|---------|---------|------|
| Diss Copper (ug/l) | 1 | 6 | 10 | 10 | 10 | 28 |
| Diss Chromium(ug/l) | 150 | 175 | 200 | 200 | 250 | 250 |
| Diss Arsenic (ug/l) | <----- 50 -----> | | | | | |
| Diss lead (ug/l) | 50 | 125 | 125 | 250 | 250 | 250 |
| Diss Nickel (ug/l) | 50 | 100 | 150 | 150 | 200 | 200 |
| Total Zinc (ug/l) | 75 | 175 | 250 | 250 | 250 | 500 |
| Total Boron (ug/l) | <----- 2000 -----> | | | | | |
| Diss Iron (ug/l) | <----- 1000 -----> | | | | | |
| Tot Vanadium (ug/l) | <----- 20 -----> X ----- 60 -----> | | | | | |
| Tot TributylTin (ug/l) | <-----0.02 max allow conc-----> | | | | | |
| Tot triphenyltin(ug/l) | <-----0.02 max allow conc-----> | | | | | |

3.0 POTABLE ABSTRACTION STANDARDS.

| Det no. | Parameters & units | | A1 | A2 | A3 |
|---------|--------------------------------------|---------------------------------------|--------|--------|-------|
| 69 | Coloration (after simple filtration) | mg/pt scale | 20 | 100 | 200 |
| 76 | Temperature | deg C | 25 | 25 | 25 |
| 117 | Nitrates | mg/l NO ₃ | 50 | 50 | 50 |
| 177 | Fluorides | mg/l F | 1.5 | | |
| 419 | Dissolved iron | mg/l Fe | 0.3 | 2 | |
| 215 | Copper | mg/l Cu | 0.05 | | |
| 245 | Zinc | mg/l Zn | 3 | 5 | 5 |
| 356 | Arsenic | mg/l As | 0.05 | 0.05 | 0.1 |
| 253 | Cadmium | mg/l Cd | 0.005 | 0.005 | 0.005 |
| 375 | Total Chromium | mg/l Cr | 0.05 | 0.05 | 0.05 |
| 328 | Lead | mg/l Pb | 0.05 | 0.05 | 0.05 |
| 379 | Selenium | mg/l Se | 0.01 | 0.01 | 0.01 |
| 105 | Mercury | mg/l Hg | 0.001 | 0.001 | 0.001 |
| 257 | Barium | mg/l Ba | 0.1 | 1 | 1 |
| 175 | Cyanide | mg/l Cn | 0.05 | 0.05 | 0.05 |
| 183 | Sulphates | mg/l SO ₄ | 250 | 250 | 250 |
| 979 | Phenols | mg/l C ₆ H ₅ OH | 0.001 | 0.005 | 0.1 |
| 666 | Dissolved hydrocarbons | mg/l | 0.05 | 0.2 | 1.0 |
| * | Polycyclic aromatic hydrocarbons | mg/l | 0.0002 | 0.0002 | 0.001 |
| # | Total pesticides | mg/l | 0.001 | 0.0025 | 0.005 |
| 111 | Ammonia | mg/l NH ₄ | | 1.5 | 4 |

* Polycyclic aromatic hydrocarbons includes the following substances

Benzo[GHI]perylene
 Benzo[DEF]chrysene
 Benzo[B]fluoranthene
 Benzo[K]fluoranthene
 Fluoranthene
 Indeno[123-CD]pyrene

Total pesticides includes the following substances

Parathion
 Dieldrin
 HCH (includes alpha, beta and gamma)