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GUIDELINES ON STATUTORY RETURNS:

BATHING WATERS DIRECTIVE

ENVIRONMENT AGENCY  
WELSH REGION CATALOGUE  
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## BATHING WATERS DIRECTIVE

### INTRODUCTION

The EC Bathing Waters Directive (76/160/EEC) is intended to safeguard public health and the environment by reducing pollution of bathing waters and protecting such waters against further deterioration.

The Directive identifies a number of water quality standards which should be achieved in waters subject to the Directive and indicates the required monitoring frequency. These standards fall into two categories, mandatory (I) and guideline (G) standards. Details of the requirements for compliance of these standards are given later. The UK Government uses the E.coli and total coliform standards as the basis for determining compliance with the Directive. Additional "I" standards concern the occurrence of Salmonella, enteroviruses and a range of physico-chemical standards. The occurrence of faecal streptococci and "tarry residues and persistent floating solids" are also examined although these are non mandatory "G" standards.

### Sampling Programme

The bathing season has been identified by DOE as 14 May to 30 September but the requirement that monitoring must commence 2 weeks earlier, means that the sampling period runs from 1 May to 30 September.

50 bathing waters have been identified in the Welsh Region as falling within the scope of the Directive. Although these bathing waters have not been formally designated, colloquially they are referred to as such, and for brevity the word "designated" will be used in this document. The raw data for these sites (listed in Appendix 1) is reported to DOE and Welsh Office.

The Government requires that the bathing waters are monitored in accordance with the requirements of the Bathing Waters Directive. However, as yet, DOE has not issued formal detailed implementation advice for this Directive so the monitoring programme has been developed using informal guidance from DOE and HMIP.

The Directive considers the following determinands:

Total coliforms, E.coli, Faecal streptococci, Salmonella, Enteroviruses, pH, Colour change, Mineral oils, Surface active substances, Phenols, Transparency, Dissolved oxygen, Tarry residues and floating matter, Ammonia, Nitrogen, Pesticides, Heavy metals, Cyanides, Nitrates and Phosphates. Some of these parameters are only required when known problems exist and so DOE require the following determinands to be reported as a minimum:

Total coliforms, E.coli, Faecal streptococci, Salmonella, Enteroviruses, pH, Colour change, Mineral oils, Surface active substances, Phenols, Transparency, and Tarry residues and persistent floating solids.

The Directive specifies transparency to be measured by use of the Secchi disc. It has been decided that due to the nature of the Welsh Region beaches this is in many cases too dangerous, and that turbidity should be measured instead. The equivalent transparency is then calculated where:

$$\text{Transparency (cm)} = \frac{746.3}{\text{Turbidity (ftu)} - 0.798}$$

In most cases failure of the transparency criterion in Wales is due to natural physical processes rather than pollution, so it is hoped that derogations will be granted by Welsh Office for all Welsh bathing waters regarding transparency. However, until this is decided sampling for turbidity during the bathing season will continue.

In addition to the monitoring of "designated" bathing waters the NRA monitors bathing water quality at other sites in order to establish the impact of unsatisfactory discharges and to ensure bathing water quality does not deteriorate. All data collected at these "non designated" bathing water sites are reported to Welsh Office. These sites are sampled on a three year rolling programme basis dependent on the degree of bathing water use and available staff resources. These are sampled for E.coli, total coliforms and faecal streptococci only.

The results and compliance statistics of sampling for both EC and non EC waters are collated in the annual Welsh Region NRA internal Bathing Waters Report.

### **Bathing Waters Directive Standards**

Article 3 of the EC Directive on the quality of bathing waters (76/160/EEC) requires member states to set bathing water quality standards no less stringent than those specified as "I" values in the Annex to the Directive. Article 3 also requires member states to endeavour to observe "G" values as guidelines, whether or not there is a corresponding "I" value. These standards are shown in Appendix 2.

## BATHING WATERS MONITORING REQUIREMENTS

### Monitoring of EC "Designated" Bathing Waters

Submission of monitoring data: Annually by 15th November for preceding bathing season. Data is submitted to DOE on floppy disc and to Welsh Office as a print-out.

Sampling period: 1 May to 30 September.

Frequency of sampling: Weekly between 1 May and 30 September so that at least 20 samples are collected for all determinands except Salmonella and enter-viruses. Sampling for entero-viruses should be carried out at least twice in the season, during July and August and 5 times for Salmonella, at monthly intervals.

Sampled at: All sites identified in Appendix 1 and shown in Figure 1.

ARGs used: EM02 - for sampling when Salmonella and entero-viruses are not required  
EM03 - for sampling when Salmonella is required but entero-viruses are not required  
EM04 - for sampling when all determinands are required, including Salmonella and entero-viruses

### Determinands used:

| "I" Value Determinand                       | Unit                             | Determinand Code |
|---|----------------------------------|------------------|
| <u>E.coli</u>                               | No. / ml                         | 9040             |
| Total coliforms                             | No. / ml                         | 9030             |
| Salmonella                                  | Presence / absence               | 1193             |
| Enteroviruses                               | Plaque Forming Units / 10 litres | 9435             |
| pH  | pH units                         | 0061             |
| Mineral oils (visual film or odour)         | Presence / absence *             | 9242             |
| Surface active substances (lasting foam)    | Presence / absence *             | 9243             |
| Phenols (odour)                             | Presence / absence *             | 9244             |
| Colour change from normal**                 | Change / no change               | 9467             |
| Transparency (calculated from turbidity)*** | Transparency - Pass/Fail         | 0068 (turbid.)   |

### "G" Value Determinands

|   |                    |      |
|---|--------------------|------|
| Faecal Streptococci                           | No. / 100 ml       | 2549 |
| Tarry residues and persistent floating solids | Presence / absence | 9245 |

\* where "presence" is noted a water sample must be taken

\*\* colour is also measured in the lab (det.code 0069) but not reported to DOE

\*\*\* subject of a derogation application

In addition to the determinands listed in the previous table salinity (det. code 9170), time of high tide (det. code 0004) and relative time of tide (det. code 9247) should also be measured as specified on the ARGs. Relative time of tide should be expressed as the number of hours before(-) or after(+) the closest high tide.

The determinands to be reported to DOE and Welsh Office are those shown in the table on the previous page. Salinity, time of high tide and relative time of tide are not reported. Colour is recorded as both "colour change from normal" (reported to DOE) and "colour" measured in the laboratory in Hazens - det.code 0069 (not reported to DOE). This laboratory measurement is taken in order to build up a base against which changes can more accurately be identified.

If the presence of mineral oils, surface active substances, or phenols is recorded then a confirmatory sample must be taken using the appropriate determinand codes as listed below:

|                              |   |  |           |      |
|------------------------------|---|--|-----------|------|
| Mineral oils                 | - | Oil & Grease (mg/l)                        | det. code | 0666 |
| Phenols                      | - | Phenols - monohydric<br>(distilled) (mg/l) | det. code | 0749 |
| Surface Active<br>Substances | - | Synthetic Anionic (mg/l)<br>Detergents     | det. code | 0461 |

To aid data retrieval of the basic information a macro JDPECBBRETURN has been set up.

## Monitoring of Non EC "Designated" Bathing Waters

Submission of monitoring data: As early as possible after the end of the bathing season. A print-out of the data is submitted to Welsh Office. DOE do not require this data.

Sampling period: 1 May to 30 September.

Frequency of sampling: Weekly between 1 May and 30 September so that at least 20 samples are collected.

Sampled at: Sites identified in Appendix 3 for the appropriate year of the 3 year rolling programme. Pollution Control Managers should inform the Senior Environmental Regulations Scientist of the sites to be sampled once staff resources have been determined.

ARGs used: WM01

Determinands used:

| Determinand         | Unit         | Determinand Code |
|---------------------|--------------|------------------|
| <u>E.coli</u>       | No. / ml     | 9040             |
| Total coliforms     | No. / ml     | 9030             |
| Faecal Streptococci | No. / 100 ml | 2549             |

Salinity (det. code 9170) should also be measured as specified in the ARG but is not reported to Welsh Office.

WELSH REGION NRA INTERNAL BATHING WATERS REPORT

Report production: Annually by the release date of DOE report in Parliament. The exact date is not known until shortly before release.

Circulated to:

- Regional General Manager
- Management Group
- Regional Board Member
- Chairmen Regional Advisory Committees
- Divisional Scientists
- Laboratory Manager
- Pollution Control Managers
- Area Pollution Control Officers
- Environmental Appraisal Manager
- Senior Environmental Regulations Scientist
- Regional Environmental Appraisal Scientist
- Senior Environmental Appraisal Officers
- Public Relations Officer

The report will be circulated to the above immediately prior to the publication of the DOE report in Parliament.

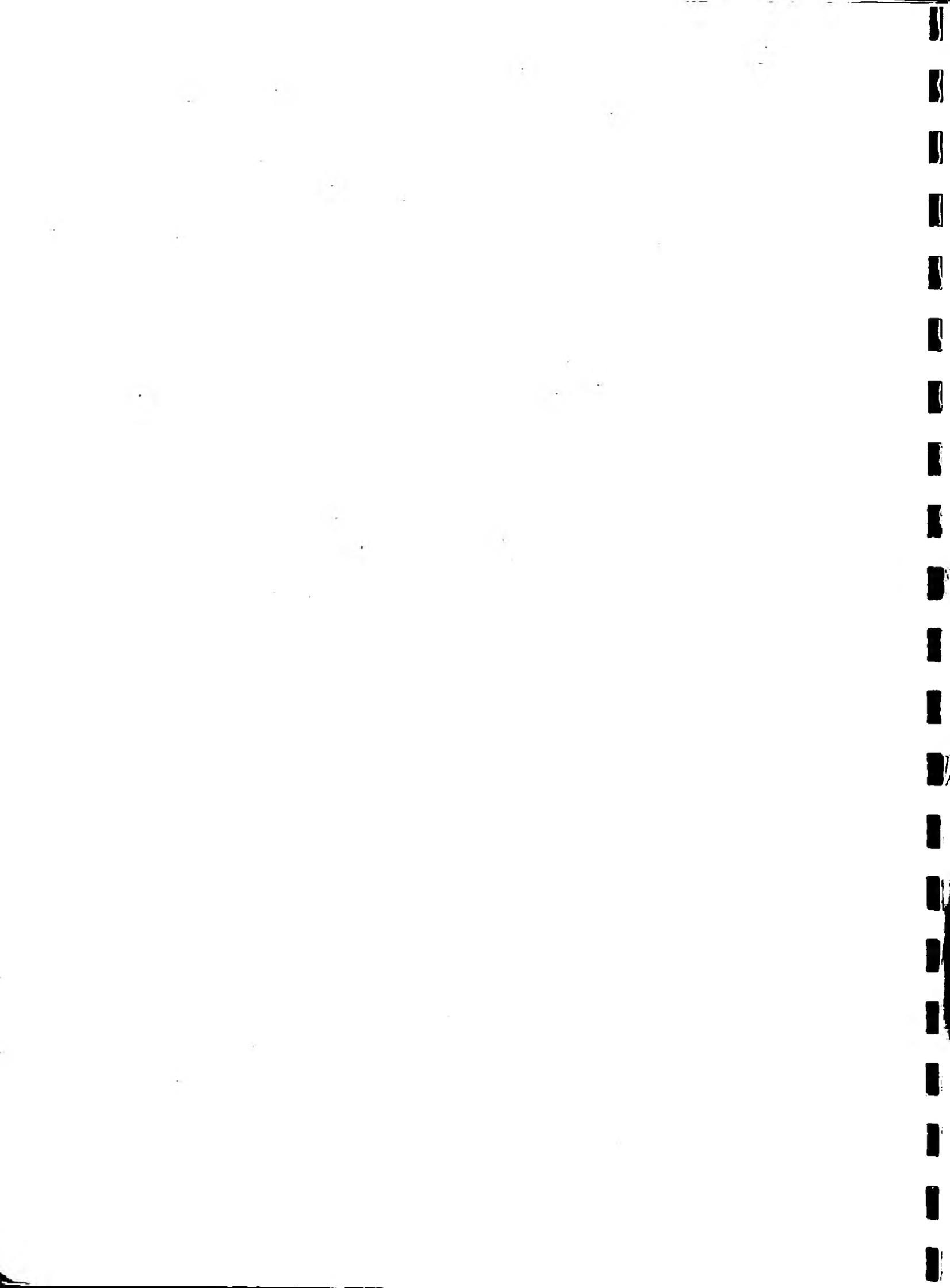
The report will also be circulated to the following, soon after publication of the DOE report in Parliament:

- All local Environmental Health Officers
- All Medical Officers of Environmental Health
- Tourist Boards, both National and Local
- National Parks Committees
- Dwr Cymru
- Constituency MPs
- European MPs
- Local District Councils
- County Councils
- Environmental Bodies
  - Marine Conservation Society
  - Heritage Coast
  - Council for the Preservation of Rural Wales
  - Countryside Commission

1989 Bathing Water Report is filed in Strategic Planning filing system in:-

Drawer: Statutory Returns  
File: SR05 Bathing Water

**IMPORTANT:** The internal report must not be issued outside Welsh Region NRA before the DOE report is presented in Parliament.



SAMPLING POINTS OF EC "DESIGNATED" BATHING WATERSSouth East

|       |                           |         |      |
|-------|---------------------------|---------|------|
| 19055 | Jacksons Bay Beach, Barry | ST 1220 | 6657 |
| 19034 | Whitmore Bay, Barry       | ST 1145 | 6625 |
| 19037 | Cold Knap Beach, Barry    | ST 0965 | 6640 |

South West

|       |                         |         |      |
|-------|-------------------------|---------|------|
| 19100 | Southerndown Beach      | SS 8840 | 7290 |
| 19114 | Trecco Bay, Porthcawl   | SS 8310 | 7630 |
| 19117 | Sandy Bay, Porthcawl    | SS 8240 | 7650 |
| 19122 | Rest Bay, Porthcawl     | SS 8000 | 7790 |
| 19051 | Aberafan Slip           | SS 7390 | 8960 |
| 74006 | Swansea Bay at Slip     | SS 6440 | 9210 |
| 39105 | Bracelet Bay            | SS 6300 | 8710 |
| 39106 | Limeslade Bay           | SS 6250 | 8700 |
| 39109 | Langland Bay            | SS 6060 | 8710 |
| 39111 | Caswell Bay             | SS 5910 | 8740 |
| 39123 | Oxwich Bay              | SS 5070 | 8620 |
| 39127 | Port Eynon Bay          | SS 4720 | 8480 |
| 74010 | Rhossili Beach          | SS 4140 | 9000 |
| 39005 | Pembrey Beach           | SS 4000 | 9980 |
| 39010 | Pendine Beach           | SN 2380 | 0740 |
| 39013 | Amroth Beach            | SN 1670 | 0680 |
| 39017 | Saundersfoot Beach      | SN 1410 | 0470 |
| 39020 | Tenby North Beach       | SN 1345 | 0080 |
| 39024 | Tenby South Beach       | SS 1325 | 9985 |
| 84231 | Broadhaven Centre       | SM 8610 | 1380 |
| 39048 | Newgale Beach           | SM 8460 | 2170 |
| 84232 | Whitesands Centre       | SM 7300 | 2700 |
| 39065 | Newport Sands North     | SN 0530 | 4070 |
| 39080 | Traeth Gwyn, New Quay   | SN 3980 | 5970 |
| 39091 | Aberystwyth South Beach | SN 5790 | 8140 |
| 39093 | Aberystwyth North Beach | SN 5830 | 8220 |

North

|       |                               |         |      |
|-------|-------------------------------|---------|------|
| 20171 | Aberdyfi                      | SN 6072 | 9580 |
| 20023 | Borth (Sampled by south west) | SN 6060 | 9010 |
| 20019 | Tywyn                         | SH 5767 | 0032 |
| 20402 | Fairebourne Beach             | SH 6091 | 1307 |
| 20014 | Barmouth                      | SH 6084 | 1590 |
| 20028 | Llandanwg Beach               | SH 5669 | 2818 |
| 22596 | Harlech                       | SH 5676 | 3148 |
| 22539 | Morfa Bychan                  | SH 5421 | 3595 |
| 23142 | Criccieth Beach East          | SH 5033 | 3808 |
| 22589 | Pwllheli Beach                | SH 3710 | 3407 |
| 22552 | Abersoch                      | SH 3168 | 2772 |
| 22564 | Morfa Dinnle                  | SH 4349 | 5669 |
| 27551 | Benllech                      | SH 5268 | 8256 |
| 27532 | Trearddur Bay                 | SH 2556 | 7891 |
| 27536 | Rhosneigr                     | SH 3237 | 7212 |
| 25032 | Llandudno West Shore          | SH 7655 | 8165 |
| 25046 | Llandudno North Shore         | SH 7918 | 8227 |
| 25049 | Colwyn Bay                    | SH 8584 | 7917 |
| 3604  | Sandy Cove                    | SH 9780 | 8060 |
| 3608  | Rhyl                          | SJ 0020 | 8260 |
| 3612  | Prestatyn                     | SJ 0540 | 8390 |

Appendix 2

BATHING WATERS DIRECTIVE STANDARDS

The detailed requirements for compliance as set out in Article 5 of the Directive are as shown below:

For "I" value determinands:-

- a) 95% of the samples must comply with the "I" value.
- b) The 5% not complying with the "I" value must not
  - (i) exceed 1.5 x "I" value except for microbiological determinands and pH, and
  - (ii) consecutive samples taken at statistically valid intervals must not exceed the "I" value, ie. "I" value failures must be of short duration.

For "G" value determinands:-

- a) 90% of the samples must conform with the "G" value (80% in the case of total coliform and faecal coliform parameters).
- b) The 10 (or 20) % not complying with the "G" value must not:-
  - (i) exceed 1.5 x "G" value except for microbiological determinands, pH and Dissolved Oxygen, and
  - (ii) consecutive samples taken at statistically valid intervals must not exceed the "G" value, ie "G" value failures should be of short duration.

The "I" and "G" standards are shown on the following page:

| Parameters                                    | "I" Standard   | "G" Standard   |
|---|--|--|
| <u>Microbiological</u>                        |  |  |
| <u>E.coli</u>                                 | 2000 / 100 ml  | 100 / 100 ml   |
| Total coliforms                               | 10000 / 100 ml   | 500 / 100 ml   |
| Faecal streptococci                           | -  | 100 / 100 ml   |
| Salmonella                                    | 0 / litre  | -  |
| Enteroviruses                                 | 0 PFU / 10 litres  | -  |
| <u>Physico-chemical</u>                       |  |  |
| pH  | 6 - 9  | -  |
| Colour  | No abnormal change in colour   | -  |
| Mineral Oils                                  | No film visible on water surface and no odour                                | 0.3 mg / litre   |
| Surface Active Substances                     | No lasting foam  | 0.3 mg / litre   |
| Phenols                                       | No specific odour (0.05 mg / litre)  | 0.005 mg / litre   |
| Transparency                                  | Extinction depth of 1m for Secchi disc - equivalent to 6.665 ftu (turbidity) | Extinction depth of 2m - equivalent turbidity value not yet calculated |
| Tarry Residues and Persistent Floating Solids | -  | Must be absent   |

## Appendix 3

SAMPLING POINTS OF NON EC "DESIGNATED" BATHING WATERS

| Beach              | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|--------------------|--------------|--------------|--------------|--------------|--------------|
| Penarth            | 19027        |              |              |              |              |
| Penarth Yacht Club | 19029        | x            | x            |              | x            |
| Ranny Bay          | 19068        |              |              |              |              |
| Lavernock Beach    | 19030        |              |              |              |              |
| St Mary's Well Bay | 19031        |              |              |              |              |
|                    | 19032        | x            | x            |              | x            |
| Watch House Bay    | 68603        | x            | x            |              | x            |
| Sully Island       | 19075        |              |              |              |              |
| Bendricks Beach    | 19076        |              |              |              |              |
| Whitmore Bay       | 19033        |              |              |              |              |
|                    | 19035        |              |              |              |              |
| Little Island      | 19056        |              |              |              |              |
| Fontygary Bay      | 19038        | x            | x            |              | x            |
| Limpert Bay        | 19147        |              |              |              |              |
| Llantwit           | 19091        |              |              |              |              |
|                    | 19040        |              |              |              |              |
|                    | 74050        | x            | x            |              | x            |
| Southerndown       | 19103        |              |              |              |              |
| Ogmore             | 19042        | x            | x            |              |              |
|                    | 19043        | x            | x            | x            | x            |
|                    | 19044        | x            | x            |              |              |
| Newton Bay         | 19108        |              |              |              |              |
|                    | 19109        |              |              |              |              |
|                    | 19110        | x            |              |              |              |
|                    | 19111        |              |              |              |              |
|                    | 19112        |              |              |              |              |
|                    | 19046        |              |              |              |              |
|                    | 74011        |              |              |              |              |
| Trecco Bay         | 19113        |              |              |              |              |
|                    | 19115        |              |              |              |              |
| Sandy Bay          | 19116        |              |              |              |              |
|                    | 19118        |              |              |              |              |
| Rest Bay           | 19121        |              |              |              |              |
|                    | 19123        |              |              |              |              |
|                    | 19124        |              |              |              |              |
|                    | 19126        |              |              |              |              |
| Kenfig Sands       | 19127        |              |              |              |              |
|                    | 19149        |              |              |              |              |
|                    | 19128        |              |              |              |              |
| Margam Sands       | 19131        | x            | x            |              |              |
|                    | 19135        | x            | x            | x            | x            |
|                    | 74004        | x            | x            |              |              |
| Aberafan           | 19150        | x            |              |              |              |
|                    | 19050        |              |              | x            | x            |
|                    | 19052        |              |              | x            | x            |
| Jersey Marine      | 74026        | x            | x            |              |              |
|                    | 39153        | x            | x            | x            | x            |
|                    | 39097        | x            | x            |              |              |

## Appendix 3 (contd)

| Beach           | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|-----------------|--------------|--------------|--------------|--------------|--------------|
| Swansea Bay     | 39098        |              |              |              |              |
|                 | 39154        |              |              |              |              |
|                 | 39100        |              |              |              |              |
|                 | 39101        |              |              |              |              |
|                 | 39102        |              |              |              |              |
|                 | 39103        |              |              |              |              |
|                 | 39155        |              |              |              |              |
|                 | 74002        |              |              |              |              |
|                 | 39104        |              |              |              |              |
|                 | Langland Bay | 39107        |              |              |              |
| 39108           |              |              |              |              |              |
| Caswell Bay     | 39112        |              |              |              |              |
| Pwlldu Bay      | 39114        |              |              |              |              |
| Oxwich Bay      | 39122        |              |              |              |              |
|                 | 39159        |              |              |              |              |
| Port Eynon Bay  | 39124        |              |              |              |              |
|                 | 39126        |              |              |              |              |
| Mewslade Bay    | 39128        |              |              |              |              |
| Fall Bay        | 39131        |              |              |              |              |
| Rhossili Bay    | 39161        |              |              |              |              |
| Broughton Beach | 74025        |              | x            |              | x            |
| Llanelli        | 39002        | x            | x            |              |              |
|                 | 39001        | x            | x            | x            | x            |
| Burry Port      | 39003        | x            | x            | x            | x            |
| Pembrey         | 39145        |              |              |              |              |
| Pendine         | 39011        |              |              | x            | x            |
| Marros Sands    | 39135        |              |              |              |              |
|                 | 39012        |              |              | x            | x            |
| Amroth          | 39014        |              |              | x            | x            |
|                 | 39015        |              |              |              |              |
| Wisemans Bridge | 39016        |              |              | x            | x            |
|                 | 39018        |              |              | x            | x            |
| Saundersfoot    | 39019        |              |              | x            | x            |
|                 | 39021        |              |              | x            | x            |
| Tenby (North)   | 39022        |              |              | x            | x            |
| Tenby (South)   | 39023        |              |              | x            | x            |
|                 | 39025        |              |              | x            | x            |
| Lydstep Beach   | 39026        |              |              |              |              |
|                 | 88503        | x            |              |              |              |
| St Ishmael      | 88502        | x            |              |              |              |
|                 | 39008        | x            |              |              |              |
| Llanstephan     | 39027        | x            |              |              | x            |
|                 | 39028        | x            |              |              | x            |
| Freshwater East | 86210        | x            |              |              |              |
|                 | 39029        | x            |              |              | x            |
| Barafundle Bay  | 39030        | x            |              |              | x            |
|                 | 39136        |              |              |              |              |
| Freshwater West | 39031        |              |              |              |              |
| West Angle Bay  | 39032        |              |              | x            |              |
| Llanreath Bay   | 86106        |              |              | x            |              |
| Neyland         | 39034        |              |              |              |              |
|                 | 85110        |              |              | x            |              |

## Appendix 3 (contd)

| Beach            | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|------------------|--------------|--------------|--------------|--------------|--------------|
| Llanstadwell     | 39035        |              |              |              |              |
|                  | 39036        |              |              |              |              |
| Dale             | 39040        |              | x            |              |              |
|                  | 39043        |              |              | x            |              |
| Marloes Sands    | 39139        |              |              |              |              |
| Martins Haven    | 39041        |              |              |              |              |
| Musselwick Sands | 39140        |              |              |              |              |
| Broad Haven      | 39044        |              |              |              |              |
|                  | 39045        |              |              |              |              |
| Little Haven     | 39043        |              | x            |              |              |
| Druidston Haven  | 39141        |              |              |              |              |
| Gelliswick       | 39037        | x            |              | x            |              |
| Nolton Haven     | 39046        | x            |              |              |              |
| Newgale          | 39047        |              |              | x            | x            |
|                  | 39049        |              |              | x            | x            |
| Solva            | 84230        |              |              |              |              |
|                  | 39050        | x            |              |              |              |
| Caerfai Bay      | 39142        |              | x            |              |              |
| Whitesands Bay   | 39051        |              |              |              |              |
| Abreiddy         | 39053        |              | x            |              |              |
| Traethllyn       | 39143        |              |              |              |              |
| Porthgain        | 39054        |              |              |              |              |
| Trevine          | 39055        | x            |              |              |              |
| Abermawr Bay     | 39144        |              |              |              |              |
| Goodwick         | 39058        | x            | x            |              | x            |
|                  | 39059        | x            | x            |              | x            |
|                  | 84004        | x            | x            |              |              |
| Pwll Gwaelod     | 39061        |              |              |              |              |
| Newport Sands S. | 39064        |              |              | x            | x            |
| Ceibwr           | 39066        |              |              |              |              |
| Fishgaurd        | 39060        | x            | x            |              | x            |
| Poppit Sands     | 39067        | x            | x            |              | x            |
|                  | 39068        | x            | x            |              | x            |
| Gwbert           | 83515        |              | x            | x            |              |
| North Gwbert     | 39070        |              | x            |              |              |
| Traeth Y Mwnt    | 39071        |              |              |              |              |
| Aberporth Beach  | 39072        | x            | x            | x            |              |
|                  | 83502        | x            | x            | x            |              |
| Tresaith Beach   | 83503        |              |              |              |              |
|                  | 39073        | x            | x            |              | x            |
|                  | 83504        |              |              |              |              |
| Llangranog       | 39075        | x            | x            | x            | x            |
| Penbryn          | 39074        |              |              |              |              |
|                  | 39147        |              |              |              | x            |
| Cwntudu          | 39076        |              |              |              |              |
| Newquay          | 39077        |              |              |              |              |
|                  | 39078        |              |              |              |              |
|                  | 39079        |              |              | x            |              |
| Llanina          | 39146        |              |              |              | x            |
| Little Quay      | 39081        | x            |              | x            | x            |

| Beach             | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|-------------------|--------------|--------------|--------------|--------------|--------------|
| Aberaeron         | 39082        | x            |              |              |              |
|                   | 39083        |              |              |              |              |
|                   | 39084        | x            |              |              |              |
| Llanon            | 39085        | x            |              |              |              |
|                   | 39086        |              |              |              |              |
| Llanrhystud       | 39087        |              |              |              |              |
|                   | 39088        |              |              |              |              |
|                   | 39089        |              |              |              |              |
| Aberystwyth N & S | 39090        |              |              | x            | x            |
|                   | 39092        |              |              |              |              |
|                   | 39094        |              |              |              |              |
| Aberystwyth Slip  | 82103        |              |              | x            | x            |
|                   | Clarach Bay  |              |              |              |              |
| Ynyslas           | 39095        | x            | x            | x            | x            |
|                   | 39096        | x            |              |              |              |
|                   | 20022        |              |              |              |              |
| Aberdyfi          | 20369        |              |              |              |              |
|                   | 20169        |              |              |              |              |
|                   | 20170        | x            | x            | x            | x            |
| Tywyn             | 20172        | x            | x            | x            | x            |
|                   | 20271        |              |              |              |              |
|                   | 20270        |              |              |              |              |
|                   | 20269        |              |              |              |              |
|                   | 20268        |              |              |              |              |
|                   | 20024        |              |              |              |              |
|                   | 20267        |              |              |              |              |
|                   | 20266        |              |              |              |              |
|                   | 20272        |              |              |              |              |
|                   | 20320        |              |              |              |              |
|                   | 20265        |              |              |              |              |
|                   | 20264        |              |              |              |              |
|                   | 20263        |              |              |              |              |
| Llwyngwril        | 20186        |              |              |              |              |
|                   | 20187        |              |              |              |              |
|                   | 20018        |              |              |              |              |
|                   | 20188        |              |              |              |              |
|                   | 20189        |              |              |              | x            |
|                   | 20190        |              |              |              |              |
|                   | 20191        |              |              |              |              |
| 20017             |              |              |              |              |              |
| Fairbourne        | 20193        |              |              |              |              |
|                   | 20192        |              |              |              |              |
|                   | 20016        |              |              |              |              |
| Barmouth          | 20015        |              |              |              |              |
|                   | 20185        |              |              |              |              |
|                   | 20184        |              |              |              |              |
|                   | 20183        |              |              |              |              |
|                   | 20013        |              |              |              |              |
|                   | 20182        |              |              |              |              |
|                   | 20029        |              |              |              |              |
|                   | 20181        |              |              |              | x            |
|                   | 20180        |              |              |              |              |
| 20012             |              |              |              |              |              |

Appendix 3 (contd)

| Beach          | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|----------------|--------------|--------------|--------------|--------------|--------------|
| Llanaber       | 20025        | x            |              | x            |              |
| Talybont       | 20026        | x            |              |              |              |
| Llanendwyn     | 20027        |              | x            |              |              |
|                | 22566        |              |              |              |              |
|                | 23203        |              |              |              |              |
|                | 23204        |              |              |              |              |
|                | 23205        |              |              |              |              |
|                | 23206        |              |              |              |              |
|                | 23207        |              |              |              |              |
|                | 23208        |              |              |              |              |
| Morfa Bychan   | 22593        |              |              |              |              |
|                | 22540        |              |              | x            |              |
|                | 88501        | x            | x            |              |              |
| Criccieth      | 23159        |              |              |              |              |
|                | 23158        |              |              |              |              |
|                | 23157        |              |              |              |              |
|                | 23143        |              |              |              |              |
|                | 22542        |              |              |              |              |
|                | 23141        |              |              |              |              |
|                | 23140        |              |              |              |              |
|                | 23139        |              |              |              |              |
|                | 22541        |              |              | x            | x            |
|                | 23138        |              |              |              |              |
| Menai Straits  | 23290        |              |              |              | x            |
| Afonwen        | 22543        | x            | x            | x            |              |
| Pen-Y-Chain    | 22544        | x            | x            | x            |              |
| Morfa Aberech  | 22545        |              | x            | x            |              |
| Pwllheli       | 22546        |              |              | x            |              |
| Traeth Crugan  | 22548        |              | x            | x            |              |
| Llanbedrog     | 22549        | x            | x            | x            | x            |
| Abersoch       | 22550        |              |              | x            | x            |
|                | 22551        |              |              |              |              |
| Aberdaron      | 22553        | x            | x            | x            | x            |
| Porth Meuddwy  | 22554        |              |              |              |              |
| Porth Oer      | 22555        | x            |              |              |              |
| Porth Iago     | 22556        | x            |              |              |              |
| Porth Colman   | 22557        | x            |              |              |              |
| Porth Tywyn    | 22558        |              |              | x            |              |
| Porth Dinllaen | 22559        | x            | x            | x            | x            |
| Porth Nefyn    | 22560        | x            | x            | x            | x            |
| Trefor         | 22561        | x            | x            | x            |              |
| Aberdesach     | 22562        | x            | x            |              |              |
| Pontllyfni     | 22563        |              |              | x            |              |
| Morfa Dinlle   | 22565        |              |              |              |              |
| Dinas Dinlle   | 23244        | x            | x            | x            |              |
| Port Dinorwic  | 23252        | x            | x            |              |              |
| Llanfairfechan | 23245        | x            | x            | x            | x            |
| Carreg Wen     | 23253        | x            | x            | x            |              |

## Appendix 3 (contd)

| Beach                          | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|--------------------------------|--------------|--------------|--------------|--------------|--------------|
| Morfa Conwy                    | 23246        | x            | x            | x            |              |
|                                | 25036        | x            |              |              |              |
| Caernarfon                     | 22567        |              |              |              |              |
|                                | 22568        |              |              |              |              |
| Penmaenmawr                    | 22996        |              |              |              |              |
|                                | 22995        | x            |              |              |              |
|                                | 22994        |              |              |              |              |
|                                | 23006        | x            |              |              | x            |
|                                | 22993        |              |              |              |              |
|                                | 23008        |              |              |              |              |
|                                | 23005        | x            |              |              | x            |
| Llandudno (W.Shore)            | 22992        |              |              |              |              |
|                                | 22991        |              |              |              |              |
|                                | 25115        |              |              |              |              |
|                                | 25117        |              |              |              |              |
|                                | 25118        |              |              |              |              |
|                                | 25173        |              |              |              |              |
|                                | 25172        |              |              |              |              |
|                                | 25170        |              |              |              |              |
|                                | 25171        |              |              |              |              |
|                                | 25168        |              |              |              |              |
|                                | 25169        |              |              |              |              |
|                                | 25031        |              |              |              |              |
|                                | 25030        |              |              |              |              |
|                                | 25165        |              |              |              |              |
|                                | 25166        |              |              |              |              |
| 25116                          |              |              |              |              |              |
| 25167                          |              |              |              |              |              |
| 25114                          |              |              |              |              |              |
| 25113                          |              |              |              |              |              |
| Penrhyn Bay                    | 25045        |              | x            | x            |              |
|                                | 25023        |              |              |              |              |
| Colwyn Bay                     | 25043        |              |              |              |              |
|                                | 25042        |              |              | x            |              |
|                                | 25022        |              |              |              |              |
|                                | 25041        |              |              | x            |              |
|                                | 25020        |              |              |              |              |
| Llanddulas<br>Abergele/Pensarn | 25018        |              |              |              |              |
|                                | 3597         |              |              | x            | x            |
|                                | 3600         |              |              |              |              |
|                                | 3599         |              |              |              |              |
|                                | 3601         | x            | x            | x            | x            |
|                                | 3625         |              |              |              |              |
|                                | 3626         |              |              |              |              |
|                                | 3627         |              |              |              |              |
|                                | 3628         |              |              |              |              |
|                                | 3703         |              |              |              |              |
|                                | 3603         |              |              |              |              |
|                                | 3577         |              |              |              |              |
|                                | 3704         |              |              |              |              |
|                                | 3578         |              |              |              |              |
|                                | 3629         |              |              |              |              |
| 3630                           |              |              |              |              |              |

| Beach             | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|-------------------|--------------|--------------|--------------|--------------|--------------|
| Kinmel Bay        | 3605         |              |              | x            | x            |
| Sunnyvale         | 3606         |              |              |              |              |
| Rhyl              | 3607         |              |              |              |              |
|                   | 3705         |              |              |              |              |
|                   | 3609         |              |              |              |              |
|                   | 3706         |              |              |              |              |
|                   | 3610         |              |              | x            | x            |
| Ffrith            | 3611         | x            | x            | x            | x            |
| Prestatyn         | 3613         |              |              |              |              |
|                   | 3614         |              |              | x            |              |
|                   | 3615         |              |              |              |              |
| Point of Ayr      | 3616         | o            |              |              |              |
|                   | 3617         |              | x            |              | x            |
| Porth Eilean      | 27549        |              |              |              |              |
| Traeth Llugwy     | 27528        | x            |              | x            | x            |
| Porth Moelfre     | 27561        |              |              |              |              |
| Traeth Bychan     | 27527        | x            |              |              | x            |
| Benllech          | 27550        |              |              |              |              |
|                   | 27826        |              |              |              |              |
|                   | 27827        |              |              | x            | x            |
| Beaumaris         | 27828        | x            |              |              | x            |
|                   | 27829        |              |              |              | x            |
| Red Wharf Bay     | 27552        |              |              |              | x            |
| Llanddona         | 27562        | x            |              |              | x            |
| Pier Penmon Beach | 27563        |              |              |              |              |
| Lleiniog Beach    | 27564        |              |              |              |              |
| Niwbwrch          | 27537        | x            |              | x            |              |
| Malltraeth        | 27556        |              |              |              |              |
| Aberffraw         | 27538        | x            |              | x            | x            |
| Porth Trecastell  | 27539        | x            |              |              |              |
| Porth Nobla       | 27540        | x            |              |              |              |
| Rhosneigr         | 27535        |              |              |              |              |
|                   | 27534        | x            | x            | x            | x            |
| Traeth Crigyl     | 27557        |              |              |              |              |
| Traeth Cymra      | 27558        |              |              |              |              |
| Silver Bay        | 27541        |              |              |              |              |
| Borth Wen         | 27542        |              |              |              |              |
| Porth-Y-Garan     | 27543        |              |              |              |              |
|                   | 27787        | x            |              |              |              |
| Porth Gwr Mawr    | 27544        |              |              |              |              |
| Trearddur Bay     | 27786        |              |              |              |              |
|                   | 27533        |              |              |              |              |
|                   | 27545        |              |              |              |              |
| Porth Dafarch     | 27546        | x            |              |              |              |
| Holyhead          | 27559        |              |              |              |              |
|                   | 27810        |              |              |              |              |
|                   | 27811        |              |              |              |              |
|                   | 27812        |              |              |              |              |
|                   | 27813        |              |              |              |              |
|                   | 27814        |              |              |              |              |

Appendix 3 (contd)

| Beach                       | Sample Point | Sampled 1986 | Sampled 1987 | Sampled 1988 | Sampled 1989 |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|
| Penrhos                     | 27815        |              |              |              |              |
|                             | 27816        |              |              |              |              |
|                             | 27817        | x            |              |              |              |
|                             | 27818        |              |              |              |              |
|                             | 27560        |              |              |              |              |
| Porth Tywyn Mawr Church Bay | 27547        |              |              |              |              |
|                             | 27548        | x            |              | x            |              |
|                             | 27531        |              |              |              |              |
|                             | 27530        |              |              |              |              |
| Cemaes Bay                  | 27529        | x            | x            |              | x            |

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