

NATIONAL RIVERS AUTHORITY
SOUTH WEST REGION

AN INVESTIGATION INTO THE BATHING WATER QUALITY
AT PORTHALLOW.

SEPTEMBER 1989

R. GRANTHAM
TIDAL WATERS UNIT
N.R.A.
SOUTH WEST REGION
MANLEY HOUSE
KESTREL WAY
EXETER, EX2 7LQ

TWU/89/006

ENVIRONMENT AGENCY



125160

**AN INVESTIGATION INTO THE BATHING WATER
QUALITY AT PORTHALLOW.**

SUMMARY

The sea off the beach at Porthallow has failed the bacterial criteria for compliance with the E.C. Directive concerning the quality of Bathing Waters on several occasions during the period 1986-1989.

The Tidal Waters Unit of the National Rivers Authority, South West Region investigated the area on 25 August 1989. An inspection of the beach and the streams converging in Porthallow was undertaken and bacteriological samples taken in an attempt to identify the cause of the failures.

The investigation revealed the discharge of crude effluent from the village to the Porthallow stream resulting in high bacterial counts within the stream. The historical data and the observations from the investigation suggest that the non-compliance with the directive was most probably due to the discharge of contaminated freshwater to the sea.

AN INVESTIGATION INTO THE BATHING WATER
QUALITY AT PORCHALLOW.

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AN INVESTIGATION INTO THE BATHING WATER QUALITY AT PORTHALLOW.

1. INTRODUCTION

Porthallow is a coastal village situated to the south of the Helford River, Cornwall(see Figure 1). The inshore waters off the beach at Porthallow have been identified under the E.C. Bathing Water Directive(1) and have failed the bacterial criteria on several occasions between 1986 and 1989, see The Appendix.

The Tidal Waters Unit of the National Rivers Authority, South West Region investigated the area on 25/8/1989 in an attempt to identify the cause of the failures.

2. OBSERVATIONS

Two streams converge at a point in the village and flow through a culverted area under the beach, and discharges via a short outfall to the adjacent bathing waters. An inspection of the beach did not identify any discharges other than that from the stream.

The E.C. Bathing Water Directive routine sampling line is shown on the map as being some 20m to the north of the stream outfall.

There was extensive evidence of crude discharges to the main stream below the confluence and to the north tributary(2). Due to the area being overgrown no inspection was undertaken on the southern tributary.

3. SAMPLING PROCEDURE

Three samples were collected off the beach at an increasing distance northwards from the outfall and a number of samples taken at positions throughout the main stream and tributaries. The sample details are given in Table 1 and the sites illustrated in Figure 1.

4. RESULTS

The bacterial counts for Total Coliforms, E. coli and faecal streptococci for all samples and the salinities of the seawater samples are given in Table 1 and illustrated in Figure 1.

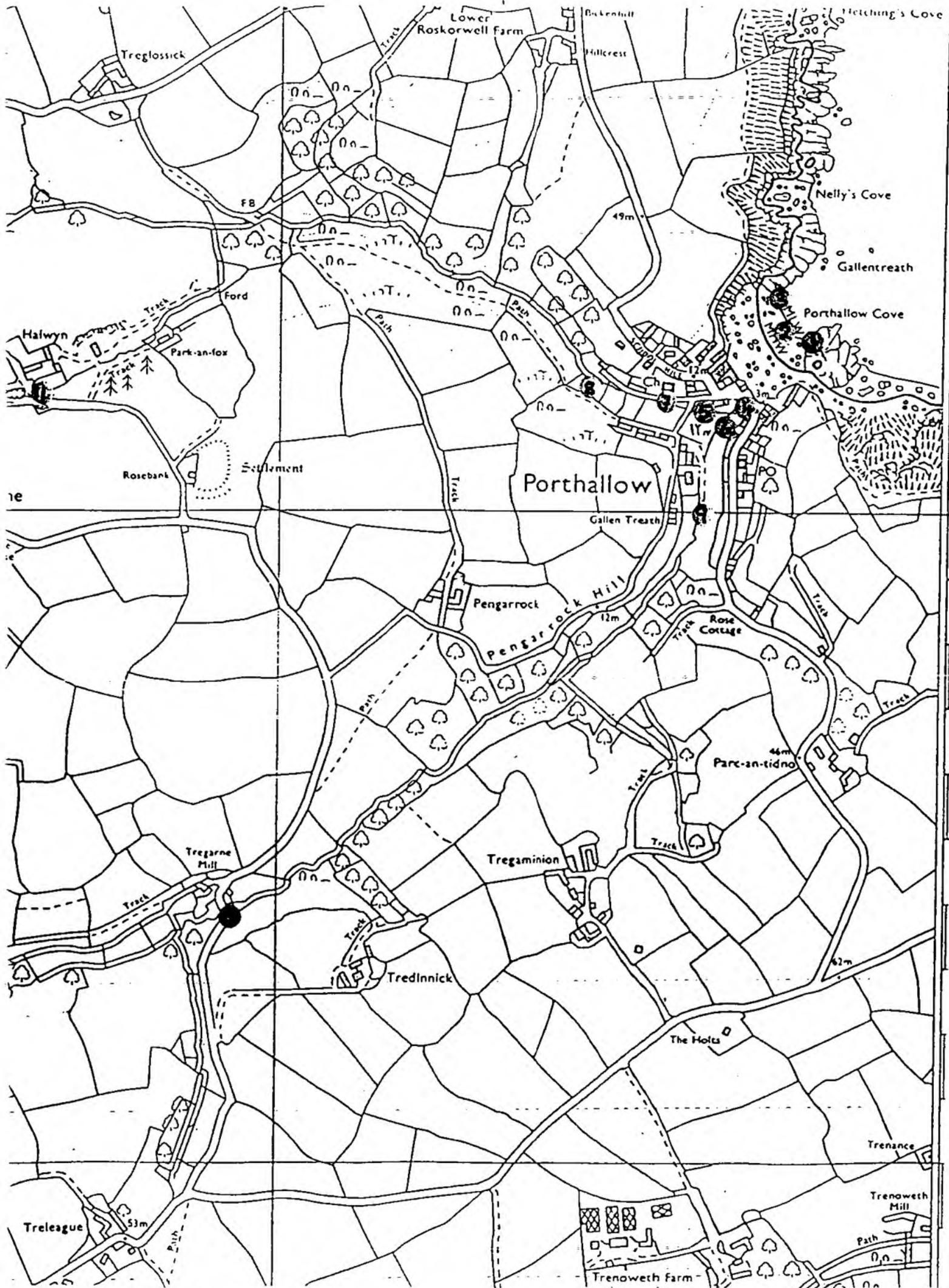
TABLE 1 - DETAILS OF SAMPLES COLLECTED 25/8/89

| Site | Sampling Site Description | NGR | Sal ‰ | Bacterial Counts | | |
|------|--|------------|-------|------------------|--------|----------|
| | | | | T.Coli | E.Coli | F.Strept |
| 1 | 1m from freshwater boil in sea water | SW79772325 | 28.5 | 13900 | 4100 | 72 |
| 2 | In seawater at E.C.B. sampling pt. (20m north of Site 1) | SW79752324 | 33.8 | 690 | 330 | 18 |
| 3 | Seawater app. 60m north of Site 1 | SW79732331 | 34.3 | 104 | 66 | 10 |
| 4 | Porthallow strm prior to culvert under beach (ECBR) | SW79722318 | | 139,000 | 39,000 | 1620 |
| 5 | Nth trib at confluence with Porthallow Strm. | SW79662315 | | 232,000 | 77,000 | 2040 |
| 6 | Porthallow Strm at confluence with Site 5. | SW79662315 | | 2,300 | 600 | 390 |
| 7 | Nth trib 20m u/s road bridge | SW79602317 | | 24,000 | 2000 | 1550 |
| 8 | Nth trib u/s habitation | SW79412325 | | 610 | 410 | 434 |
| 9 | Porthallow Strm u/s of habitation | SW79622301 | | 490 | 400 | 266 |
| 10 | Porthallow Strm at Tregarne Mill | SW78908239 | | 2300 | 200 | 620 |
| 11 | Nth trib at Halwyn | SW78652317 | | 2900 | 160 | 108 |

ECBR: The freshwater input site sampled on the same day at the bathing waters when checking the compliance with the E.C. Directive.

All samples are archived under reference RPL 19A

TABLE 1 Sampling sites at Porthallow on 25.8.89



5. ANALYSIS OF HISTORICAL DATA

Since 1986, regular water samples have been collected both at the E.C. sampling line on the beach (Site 2) and from the stream (Site 4). Investigation of the historical data shows a reasonable correlation between the E. coli counts of the stream and bathing waters when the salinities are used to calculate the proportion of freshwater within the seawater sample. This indicates that the bathing waters' failure to comply with the directive is due to the freshwater discharge from the stream.

6. ANALYSIS OF DATA COLLECTED 25/8/89

The samples taken from the streams above Porthallow had low bacterial levels consistent with the sparsely populated agricultural catchment. The streams situated in the village showed high bacterial counts that would be expected with the observed crude discharges. The three samples taken from the beach indicated decreasing bacterial levels and increasing salinity with distance from the freshwater discharge demonstrating that the only major source of contamination in the bathing waters is the stream discharge.

7. CONCLUSIONS

- (a) The historical data show a fair correlation between the levels of E. coli in the sea samples and in the stream, indicating that the stream, in the absence of other inputs, is the source of the pollution.
- (b) The investigation revealed that the stream is contaminated by crude discharges within the village of Porthallow, with little input from sources above the village.

8. REFERENCES

- (1) Article 5: Council Directive of 8 December 1975 concerning the quality of Bathing Water. (76/160/EEC).
Official Journal of the European Communities.
Appendix 4, No. L31/3.
- (2) Video Tape: Porthallow TWU Investigation.

M.HARRIS
20 SEPTEMBER 1989

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1986 PORTHALLOW BEACH | SW79702330 | | KERRIER D.C. | | | | | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| TOTAL COLIFORM/100ML | 8200 | 4200 | 7700 | 1310 | 9900 | 360 | 4500 | >20000 | 84 | 18400 | 1560 | 4500 |
| FAECAL COLIFORM/100ML | 4900 | 900 | 2000 | 270 | 720 | 200 | 700 | >20000 | 56 | 13200 | 560 | 80 |
| FAECAL STREPTOCOCCI | | | | | | | | | | | | |
| TRANSPARENCY M | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 |
| WATER TEMPERATURE C | 9.0 | 10.0 | 13.0 | 15.0 | 15.0 | 13.0 | 14.0 | 14.0 | 12.0 | 13.0 | 12.0 | 13.0 |
| VISIBLE POLLUTION | None Visible | None Visible | Sewage Based | Not Sewage | None Visible | Not Sewage | None Visible |
| CLOUD COVER | 7/8 | 3/4 | 3/8 | 1/2 | 3/4 | 7/8 | 3/4 | 8/8 | 8/8 | 7/8 | 1/8 | 7/8 |
| HOURS OF SUNSHINE | 2.2 | 11.4 | 13.3 | 7.8 | 6.2 | | 3.9 | 4.3 | | 0.9 | 8.9 | 0.6 |
| WEATHER YESTERDAY | Warm | Warm | Hot | Mild | Warm | Cold | Mild | Mild | Cold | Warm | Warm | Mild |
| WEATHER TODAY | Warm | Warm | Hot | Warm | Warm | Very Cold | Mild | Mild | Cold | Mild | Warm | Mild |
| SEA STATE | Smooth 10-50cm | Calm 0-10cm | Smooth 10-50cm | Light 0.5-1.25M | Smooth 10-50cm | Smooth 10-50cm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Calm 0-10cm | Smooth 10-50cm | Calm 0-10cm |
| SEA COLOUR | Normal |
| MINERAL OIL | No Oil Film or Smell |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam |
| PHENOL | No Phenol Odour |
| PH | | | | | | | | | | | | |
| WINDSPEED | Gentle Breeze | Light Breeze | Moderate Breeze | Moderate Breeze | Gentle Breeze | Fresh Breeze | Light Breeze | Calm | Strong Breeze | Calm | Light Breeze | Calm |
| WIND DIRECTION | SW | NE | NE | SE | SW | SW | S | SW | SW | | NE | |
| RAINFALL | 0.0 | 0.0 | 0.0 | 4.6 | 0.0 | 13.7 | 5.1 | 0.9 | 16.5 | 0.0 | 0.0 | 0.7 |
| SALINITY | 28.5 | 29.3 | 29.3 | 30.9 | 30.9 | 32.5 | 32.5 | 30.9 | 33.3 | 7.3 | 32.5 | 30.9 |
| NO. BATHERS IN WATER | None |
| TIME OF HIGH TIDE | 1355 | 1443 | 1157 | 1234 | 1027 | 1048 | 1130 | 924 | 953 | 835 | 821 | 741 |
| TIME OF SAMPLING | 1045 | 1040 | 1105 | 1355 | 1355 | 1120 | 1000 | 1030 | 1006 | 1035 | 1055 | 1040 |
| DATE OF SAMPLING | 19/05/86 | 02/06/86 | 16/06/86 | 30/06/86 | 14/07/86 | 28/07/86 | 29/07/86 | 11/08/86 | 26/08/86 | 08/09/86 | 22/09/86 | 06/10/86 |

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1987 PORTHALLOW BEACH | SW79702330 | ECB0630 | KERRIER D.C. | | | | | | | | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----|---|-----|
| TOTAL COLIFORM/100ML | 7300 | 12200 | 212 | 5100 | 570 | 38000 | 9100 | 22000 | 46 | 1860 | 14500 | 64 | | | |
| FAECAL COLIFORM/100ML | 300 | 2800 | 32 | 1560 | 200 | 9000 | 1000 | 7800 | 4 | 340 | 3100 | 8 | | | |
| FAECAL STREPTOCOCCI | 62 | 280 | 4 | 74 | 108 | 620 | 74 | 186 | 0 | 40 | 890 | 1 | | | |
| SALMONELLA | | | | | | | | | | | | | | | |
| TRANSPARENCY M | | 2.5 > | 3.9 | 3.8 > | 3.9 | > | 3.9 | > | 3.9 | > | 3.9 | < | 1.0 | > | 3.9 |
| WATER TEMPERATURE C | 12.0 | 12.0 | 14.0 | 12.0 | 14.0 | 13.0 | 17.0 | 16.0 | 15.0 | 18.0 | 20.0 | 17.0 | | | |
| VISIBLE POLLUTION | None Visible | | | |
| CLOUD COVER | 1/8 | 1/8 | 7/8 | 3/4 | 7/8 | 1/2 | 3/4 | 7/8 | 1/4 | 3/8 | 7/8 | 8/8 | | | |
| HOURS OF SUNSHINE | | | | | | | | | | | | | | | |
| WEATHER YESTERDAY | Cold | Mild | Warm | Warm | Mild | Hot | Warm | Mild | Hot | Warm | | Mild | | | |
| WEATHER TODAY | Warm | Warm | Mild | Warm | Warm | Warm | Warm | Mild | Warm | Warm | | Mild | | | |
| SEA STATE | Smooth 10-50cm | Smooth 10-50cm | Calm 0-10cm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Light 0.5-1.25M | Smooth 10-50cm | Calm | Smooth 10-50cm | Smooth 10-50cm | Smooth 10-50cm | | | |
| SEA COLOUR | Normal | | | |
| MINERAL OIL | No Oil Film or Smell | | | |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | | | |
| PHENOL | No Phenol Odour | | | |
| PH | 8.00 | 8.40 | 8.10 | 8.50* | 8.30 | | | | | | | | | | |
| WINDSPEED | Light Air | Gentle Breeze | Light Breeze | Light Breeze | Gentle Breeze | Gentle Breeze | Fresh Breeze | Moderate Breeze | Light Air | Gentle Breeze | Moderate Breeze | Gentle Breeze | | | |
| WIND DIRECTION | E | NE | SW | NW | SW | NW | NW | W | SW | NE | NE | SW | | | |
| RAINFALL | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 2.3 | 1.0 | 0.0 | 0.0 | 10.2 | 0.5 | | | |
| SALINITY | | 29.3 | 33.3 | 31.7 | 31.7 | 18.7 | 30.0 | 30.1 | 32.5 | 32.5 | 24.5 | 32.5 | | | |
| NO. BATHERS IN WATER | None | 1 to 10 | None | None | None | | | |
| TIME OF HIGH TIDE | | | | | | | | | | | | | | | |
| TIME OF SAMPLING | 1005 | 1000 | 1025 | 1130 | 1010 | 1025 | 1025 | 1030 | 1353 | 1025 | 1215 | 1045 | | | |
| DATE OF SAMPLING | 06/05/87 | 19/05/87 | 01/06/87 | 11/06/87* | 24/06/87 | 07/07/87 | 20/07/87 | 30/07/87 | 17/08/87 | 25/08/87 | 07/09/87 | 17/09/87 | | | |

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1988 PORTHALLOW BEACH | SW79702330 | | | ECB0630 | | | KERRIER D.C. | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| TOTAL COLIFORM/100ML | 24 | 750 | 17 | 4100 | 2800 | 17 | 10 | 1790 | 2 | 20200 | 10 | |
| FAECAL COLIFORM/100ML | 4 | 60 | 5 | 1600 | 1800 | 1 | 0 | 660 | 4 | 7100 | 6 | |
| FAECAL STREPTOCOCCI | 4 | 38 | 1 | 612 | 42 | 7 | 0 | 42 | 0 | 1000 | 0 | |
| SALMONELLA | Absent | | | | | | | | | | | |
| TRANSPARENCY M | 3.2 | > 3.9 | > 3.9 | 3.1 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 |
| WATER TEMPERATURE C | 10.0 | 14.0 | 12.0 | 14.0 | 19.0 | 16.0 | 13.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| VISIBLE POLLUTION | Not Sewage | None Visible | Not Sewage | Not Sewage | None Visible | Not Sewage | None Visible | None Visible | None Visible | None Visible | Not Sewage | None Visible |
| CLOUD COVER | 3/4 | 1/8 | 8/8 | 8/8 | 1/8 | 8/8 | 8/8 | 7/8 | 3/4 | 7/8 | 5/8 | |
| HOURS OF SUNSHINE | 1.1 | 13.1 | 3.9 | 1.4 | 13.9 | 7.4 | 0.0 | 3.8 | 7.6 | 1.2 | 11.2 | |
| WEATHER YESTERDAY | Mild | Warm | Warm | Hot | Hot | Warm | Warm | Mild | Warm | Warm | Warm | Warm |
| WEATHER TODAY | Warm | Warm | Warm | Warm | Hot | Warm | Mild | Warm | Warm | Warm | Warm | Warm |
| SEA STATE | Calm 0-10cm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Calm | Calm 0-10cm | Calm 0-10cm | Calm | Calm 0-10cm | Calm 0-10cm | Calm | Calm |
| SEA COLOUR | Normal |
| MINERAL OIL | No Oil Film or Smell |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam |
| PHENOL | No Phenol Odour |
| PH | 8.40 | | | | | | | | | | | |
| WINDSPEED | Moderate Breeze | Light Breeze | Gentle Breeze | Light Breeze | Calm | Light Breeze | Gentle Breeze | Gentle Breeze | Gentle Breeze | Light Breeze | Moderate Breeze | |
| WIND DIRECTION | SW | N | SW | NE | SW | S | SW | W | SW | NE | SW | |
| RAINFALL | 3.4 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 2.5 | 2.7 |
| SALINITY | 32.1 | 28.5 | 32.5 | 29.7 | 29.7 | 32.5 | 27.3 | 25.7 | 32.3 | 29.3 | 29.3 | |
| NO. BATHERS IN WATER | None |
| TIME OF HIGH TIDE | 726 | 657 | 718 | 751 | 1157 | 618 | 247 | 837 | 408 | 840 | 608 | |
| TIME OF SAMPLING | 1321 | 1307 | 1124 | 1200 | 1340 | 1023 | 1310 | 1028 | 1324 | 1008 | 1310 | 8 |
| DATE OF SAMPLING | 04/05/88 | 17/05/88 | 02/06/88 | 17/06/88 | 23/06/88 | 30/06/88 | 10/07/88 | 18/07/88 | 27/07/88 | 01/08/88 | 12/08/88 | 15/08/88 |

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1988 PORTHALLOW BEACH | SW79702330 | | | ECB0630 | | | KERRIER D.C. | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|
| TOTAL COLIFORM/100ML | 18 | 14 | 368 | 3600 | 386 | 16 | 3100 | 1510 | 154 | |
| FAECAL COLIFORM/100ML | 0 | 2 | 94 | 590 | 42 | 6 | 2800 | 750 | 20 | |
| FAECAL STREPTOCOCCI | 2 | 0 | 16 | 16 | 9 | 2 | 40 | 260 | 1 | |
| SALMONELLA | | | | | | | | | | |
| TRANSPARENCY M | > 3.9 | 2.1 | > 3.9 | < 1.0 | > 3.9 | 2.2 | 2.5 | < 1.0 | > 3.9 | |
| WATER TEMPERATURE C | 15.0 | 15.0 | 14.0 | 15.0 | 16.0 | 15.0 | 14.0 | 14.0 | 14.0 | |
| VISIBLE POLLUTION | None Visible | None Visible | None Visible | Sewage Based | None Visible | None Visible | None Visible | None Visible | Both Present | |
| CLOUD COVER | 8/8 | 3/4 | 3/4 | 1/4 | 8/8 | 8/8 | 7/8 | 8/8 | 1/8 | |
| HOURS OF SUNSHINE | 5.7 | 3.6 | 7.7 | 9.1 | 0.7 | 0.0 | 0.4 | 0.0 | 7.3 | |
| WEATHER YESTERDAY | Warm | Warm | Warm | Warm | Warm | Mild | Warm | Mild | Mild | |
| WEATHER TODAY | Warm | Warm | Warm | Warm | Warm | Mild | Warm | Mild | Warm | |
| SEA STATE | Calm 0-10cm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Moderate 1.25-2.0M | Calm 0-10cm | |
| SEA COLOUR | Normal | Not Normal | Normal | Not Normal | Normal | Normal | Not Normal | Abnormal | Normal | |
| MINERAL OIL | No Oil Film or Smell | |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | Abnormal Conditions | No Lasting Foam | |
| PHENOL | No Phenol Odour | |
| PH | | | | | | | | | | |
| WINDSPEED | Moderate Breeze | Moderate Breeze | Gentle Breeze | Light Breeze | Light Breeze | Moderate Breeze | Light Air | Light Air | Light Breeze | |
| WIND DIRECTION | SW | S | W | NW | NE | SW | SE | SE | SE | |
| RAINFALL | 1.0 | 0.3 | 8.4 | 1.5 | 0.0 | 0.0 | 0.6 | | | |
| SALINITY | 38.2 | 31.7 | 30.9 | 27.7 | 30.5 | 29.7 | 30.1 | 26.5 | 29.3 | |
| NO. BATHERS IN WATER | None | |
| TIME OF HIGH TIDE | 235 | 814 | 1038 | 800 | 728 | 614 | 1053 | 608 | 26 | |
| TIME OF SAMPLING | 1035 | 1310 | 1030 | 3 | 1342 | 1205 | 1045 | 1325 | 1430 | 1305 |
| DATE OF SAMPLING | 24/08/88 | 30/08/88 | 03/09/88 | 14/09/88 | 15/09/88 | 21/09/88 | 26/09/88 | 03/10/88 | 11/10/88 | 20/10/88 |

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1989 PORTHALLOW BEACH | SW79702330 | | ECB0630 | | KERRIER D.C. | | | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| TOTAL COLIFORM/100ML | 354 | 2 | 128 | 840 | 3110 | 6480 | 173 | 7000 | 9100 | 1700 | 2230 | 1090 |
| FAECAL COLIFORM/100ML | 70 | 2 | 366 | 200 | 820 | 1530 | 67 | 1500 | 3100 | 470 | 520 | 590 |
| FAECAL STREPTOCOCCI | 6 | 0 | 6 | 16 | 88 | 34 | 6 | 237 | 134 | 35 | 116 | 65 |
| SALMONELLA | Absent | | | | | | | | | | | |
| TRANSPARENCY M | > 3.9 | > 3.9 | > 3.9 | > 3.9 | 3.8 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 | > 3.9 |
| WATER TEMPERATURE C | 11.6 | 12.1 | 13.9 | 15.6 | 14.6 | 14.2 | 14.0 | 17.6 | 14.0 | 17.0 | 18.5 | 18.0 |
| VISIBLE POLLUTION | Both Present | Not Sewage | Both Present | Both Present | Both Present | Not Sewage | None Visible |
| CLOUD COVER | 8/8 | 1/2 | 3/8 | 3/8 | 8/8 | 3/4 | 8/8 | 1/8 | 8/8 | 8/8 | 1/2 | 3/4 |
| HOURS OF SUNSHINE | 0.0 | 3.1 | 12.0 | 12.6 | 1.5 | 12.3 | 0.0 | 14.6 | 0.0 | 0.0 | 9.7 | 8.7 |
| WEATHER YESTERDAY | Warm | Mild | Warm | Warm | Mild | Mild | Mild | Hot | Mild | Hot | Warm | Warm |
| WEATHER TODAY | Mild | Mild | Warm | Warm | Mild | Mild | Mild | Hot | Mild | Mild | Hot | Mild |
| SEA STATE | Calm | Calm 0-10cm | Light 0.5-1.25M | Smooth 10-50cm | Calm | Smooth 10-50cm | Calm 0-10cm | Calm | Calm 0-10cm | Calm 0-10cm | Smooth 10-50cm | Calm |
| SEA COLOUR | Normal | Normal | Not Normal | Not Normal | Normal | Not Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| MINERAL OIL | No Oil Film or Smell |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam | No Lasting Foam |
| PHENOL | No Phenol Odour |
| PH | | | | | | | | | | | | |
| WINDSPEED | Light Air | Gentle Breeze | Light Breeze | Gentle Breeze | Light Air | Moderate Breeze | Gentle Breeze | Light Air | Light Breeze | Light Breeze | Gentle Breeze | Calm |
| WIND DIRECTION | SE | SW | SE | N | N | NW | S | SE | SW | SW | SW | NW |
| RAINFALL | 0.0 | 0.0 | 0.1 | 0.0 | 4.1 | 0.1 | 0.0 | 0.0 | 2.5 | 17.4 | 0.0 | |
| SALINITY | 32.3 | 33.4 | 30.9 | 30.0 | 29.0 | 29.2 | 34.5 | 26.7 | 29.0 | 33.3 | 33.2 | 33.6 |
| NO. BATHERS IN WATER | None | 1 to 10 | None |
| TIME OF HIGH TIDE | 354 | 1005 | 656 | 323 | 524 | 837 | 1112 | 1900 | 301 | 851 | 1235 | 756 |
| TIME OF SAMPLING | 1120 | 1305 | 1115 | 1310 | 1055 | 1235 | 1030 | 1300 | 1120 | 1105 | 1240 | 1040 |
| DATE OF SAMPLING | 02/05/89 | 11/05/89 | 22/05/89 | 31/05/89 | 03/06/89 | 07/06/89 | 11/06/89 | 20/06/89 | 29/06/89 | 07/07/89 | 27/07/89 | 04/08/89 |

Appendix I - Historical Data from the E.C. Directive Sampling Point at Porthallow Beach

| 1989 PORTHALLOW BEACH | | SW79702330 | ECB0630 | KERRIER D.C. |
|-----------------------|----------------------|----------------------|----------------------|--------------|
| TOTAL COLIFORM/100ML | 60000 | 460 | 520 | 15800 |
| FAECAL COLIFORM/100ML | 31100 | 70 | 90 | 5000 |
| FAECAL STREPTOCOCCI | > 500 | 4 | 91 | |
| SALMONELLA | Absent | | | |
| TRANSPARENCY M | 3.7 | 3.1 | > 3.9 | |
| WATER TEMPERATURE C | 18.5 | 17.5 | 18.2 | |
| VISIBLE POLLUTION | Not Sewage | None Visible | Not Sewage | |
| CLOUD COVER | 7/8 | 1/2 | 1/4 | |
| HOURS OF SUNSHINE | 2.8 | 11.4 | 10.4 | |
| WEATHER YESTERDAY | Hot | Mild | Warm | |
| WEATHER TODAY | Mild | Warm | Warm | |
| SEA STATE | Calm 0-10cm | Smooth 10-50cm | Calm 0-10cm | |
| SEA COLOUR | Normal | Normal | Normal | |
| MINERAL OIL | No Oil Film or Smell | No Oil Film or Smell | No Oil Film or Smell | |
| FOAM | No Lasting Foam | No Lasting Foam | No Lasting Foam | |
| PHENOL | No Phenol Odour | No Phenol Odour | No Phenol Odour | |
| PH | | | | |
| WINDSPEED | Light Breeze | Light Breeze | Light Air | |
| WIND DIRECTION | SW | SW | SW | |
| RAINFALL | | | | |
| SALINITY | < 5.5 | 33.9 | 30.4 | |
| NO. BATHERS IN WATER | None | None | 1 to 10 | |
| TIME OF HIGH TIDE | 910 | 608 | 655 | |
| TIME OF SAMPLING | 1240 | 1040 | 1220 | |
| DATE OF SAMPLING | 07/08/89 | 16/08/89 | 18/08/89 | 5/9/89 |

Appendix II - Historical Data from Porthallow Stream

| 1986 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | 13700 | | EC 24400 | EC 23900 | |
| FAECAL COLIFORM/100ML | 186000 | | 17900 | 5400 | |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | | 13.0 | | | 11.9 |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | 7.80 | | | 8.30 |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 1040 | 1420 | 1035 | 1100 | 1200 |
| DATE OF SAMPLING | 19/05/86 | 21/05/86 | 02/06/86 | 16/06/86 | 19/06/86 |

| | | | | |
|---------|---------|---------|---------|---------|
| > 50000 | > 20000 | > 50000 | > 20000 | > 50000 |
| 4700 | 8100 | 21400 | > 20000 | > 20000 |

14.0

13.0

8.10

8.20

| | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|
| 1350 | 1350 | 1400 | 1110 | 1015 | 3 | 1220 |
| 30/06/86 | 01/07/86 | 14/07/86 | 28/07/86 | 30/07/86 | 11/08/86 | 19/08/86 |

Appendix II - Historical Data from Porthallow Stream

| 1986 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | 19400 | > 50000 | > 20000 | 45000 | |
| FAECAL COLIFORM/100ML | 16700 | 16600 | 13800 | 15200 | |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | | 12.9 | | | |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | 8.00 | | | |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 7 | 1255 | 1030 | 1050 | 1035 |
| DATE OF SAMPLING | 26/08/86 | 03/09/86 | 08/09/86 | 22/09/86 | 06/10/86 |

14.0

8.00

1110

09/10/86

Appendix II - Historical Data from Porthallow Stream

| 1987 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | EC 54000 | | 49300 | 100000 | 22500 |
| FAECAL COLIFORM/100ML | EC 16900 | | 21900 | 17400 | 1240 |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | | 11.3 | | | |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER, YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | 8.00 | | | |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 1000 | 1310 | 1005 | 1020 | 1135 |
| DATE OF SAMPLING | 06/05/87 | 12/05/87 | 19/05/87 | 01/06/87 | 11/06/87 |

23500

22000

107000

116000

95000

7000

1900

26000

31400

27000

13.0

13.0

7.90

8.20

1305

1005

1210

1025

1015

1035

1356

22/06/87

24/06/87

02/07/87

07/07/87

20/07/87

30/07/87

17/08/87

Appendix II - Historical Data from Porthallow Stream

| 1987 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | | 125000 | 242000 | 252000 | |
| FAECAL COLIFORM/100ML | | 15000 | 46000 | 87000 | |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | 15.1 | | | | 9.8 |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | 8.00 | | | 8.10 |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 1230 | 1020 | 1210 | 1035 | 1110 |
| DATE OF SAMPLING | 24/08/87 | 25/08/87 | 07/09/87 | 17/09/87 | 29/09/87 |

9.0

7.90

1240

14/10/87

Appendix II - Historical Data from Porthallow Stream

| 1988 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | 3400 | 16600 | 53000 | 25400 | 150000 |
| FAECAL COLIFORM/100ML | 1900 | 3500 | 11000 | 13800 | 78000 |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | | | | | |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | | | | |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 1326 | 1312 | 1127 | 1205 | 1325 |
| DATE OF SAMPLING | 04/05/88 | 17/05/88 | 02/06/88 | 17/06/88 | 23/06/88 |

| | | | | | | |
|-------|-------|-------|-------|--------|-------|--------|
| 25000 | 87000 | 53000 | 22200 | 490000 | 18000 | 222000 |
| 8000 | 38000 | 24000 | 10700 | 18500 | 11500 | 77000 |

| | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|
| 2 | 1315 | 2 | 1327 | 1011 | 1307 | 1040 |
| 30/06/88 | 10/07/88 | 18/07/88 | 27/07/88 | 01/08/88 | 12/08/88 | 24/08/88 |

Appendix II - Historical Data from Porthallow Stream

| 1988 PORTHALLOW | PORTHALLOW STREAM | SW79702320 | R19A032 | | |
|-----------------------|-------------------|------------|----------|----------|----------|
| TOTAL COLIFORM/100ML | 57000 | 59000 | 75000 | 26000 | 158000 |
| FAECAL COLIFORM/100ML | 6000 | 6400 | 6500 | 30000 | 23000 |
| FAECAL STREPTOCOCCI | | | | | |
| SALMONELLA | | | | | |
| TRANSPARENCY M | | | | | |
| WATER TEMPERATURE C | | | | | |
| VISIBLE POLLUTION | | | | | |
| CLOUD COVER | | | | | |
| HOURS OF SUNSHINE | | | | | |
| WEATHER YESTERDAY | | | | | |
| WEATHER TODAY | | | | | |
| SEA STATE | | | | | |
| SEA COLOUR | | | | | |
| MINERAL OIL | | | | | |
| FOAM | | | | | |
| PHENOL | | | | | |
| PH | | | | | |
| WINDSPEED | | | | | |
| WIND DIRECTION | | | | | |
| RAINFALL | | | | | |
| SALINITY | | | | | |
| NO. BATHERS IN WATER | | | | | |
| TIME OF HIGH TIDE | | | | | |
| TIME OF SAMPLING | 1305 | 1035 | 1347 | 1308 | 1050 |
| DATE OF SAMPLING | 30/08/88 | 03/09/88 | 15/09/88 | 21/09/88 | 26/09/88 |

115000 33000 17700

47000 22000 4200

1340 1440 1255

03/10/88 11/10/88 20/10/88

TABLE 1 Sampling sites at Porthallow on 25.8.89

