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DEVON AREA
INTERNAL REPORT

NON-COMPLIANCE WITH WATER QUALITY OBJECTIVES ON THE CROYDE STREAM (UPPER CATCHMENT)

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NON-COMPLIANCE WITH WATER QUALITY OBJECTIVES ON THE CROYDE STREAM (UPPER CATCHMENT)

1. INTRODUCTION

This report is concerned with determining the cause of high Biochemical Oxygen Demand (BOD) levels in the Croyde Stream, identified from the routine water quality monitoring data at Forda (URN: R30A031, NGR SS457391) (Map 1). Water quality problems between Croyde and Georgeham were addressed in an earlier report (FWI/93/016).

The upper catchment covers an area of approximately 3km² and is mainly given over to grazing. The stream is reasonably fast flowing, descending 70m over the 2km between the source and Forda.

2. TERMS OF REFERENCE

2.1 DERIVATION

The Water Quality Objective for the Croyde Stream is River Ecosystem Class 2 (RE2) (Table 1). During the period 1993-5 (inclusive) the Croyde Stream between Crowborough and Forda marginally failed RE2 objectives because of elevated Biochemical Oxygen Demand (BOD) values (see Ref. 1 for explanation of significant/marginal failures). These failures were identified in ' Local Environment Agency Plan, North Devon Streams, October 1996', where it was stated that further work would be carried out. This document details the methods and results of such work.

2.2 PROJECT TEAM

T. Cronin (Project Leader)
R. Pearson (Project Manager/Author)

3. METHODS

1. Identify relationships between water quality data obtained from the routine monitoring programme and weather conditions.

2. Consult with the Water Quality Office, Biology Office and Devon Area Wardens to identify potential sources of poor water quality.

3. Carry out an initial survey of the area removing samples where appropriate.

4. Undertake a small sampling programme (see Map 1 for sample locations).

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4. RESULTS

4.1 HISTORIC

Four of the six BOD values exceeding 4.0 mg/l (the RE2 90%ile limit) at Forda between 1993-6 were coincident with rainfall (Table 2.) Of the 47 sample sets taken between 1993-6 BOD concentrations exceeding the RE2 90%ile limit occurred on 6 occasions (two of which had associated total ammonia concentrations exceeding the RE2 90%ile limit of 0.6mg/l (Table 3).

Routine water quality sampling was also carried out at Crowborough (Map 1, Site 8) up until the end of 1993. There was one BOD exceedance of the RE2 90%ile limit in that year, the BOD at Forda being similarly elevated on the same date. However, three elevated BOD levels at Crowborough in 1992 were not repeated at the site in Forda on the same dates.

Routine biological monitoring at Crowborough Farm (Map 1) indicates no chronic water quality problems upstream of this point.

The Water Quality Officer had visited the area in February 1997. Septic tank discharges were found at South Hole Farm and at 'Forda Meade' (Map 2). The latter discharges directly to the watercourse and may be compromising samples taken downstream.

Examination of the Pollution Incident Logging System (PILS) revealed a number of incidents relating to oil contamination or discolouration but no persistent single pollution. South Hole Farm (Map 1) had been visited as part of the Task Force Campaigns in August 1996 where run-off during wet weather was given as a possible source of pollution. Unspecified septic tank discharges were also cited in PILS (Appendix 1).

4.2 INVESTIGATION

4.2.1 INITIAL VISIT

An initial inspection of the area was made on 12/2/97.

In both Forda and Crowborough a number of properties adjacent to the watercourse were found to be served by septic tanks. A recently installed septic tank serving holiday barn conversions at Darracott was found, the soakaway lying within 15m of a spring in contravention of consent conditions (Appendix 2). There was no evidence of point source pollution, but there is the potential for such pollution to occur.

'Forda Meade' was visited and the owner said that he intended to upgrade the septic tank this year (1997). The outfall was not immediately visible.

Reports were received (anon.) of an occasional milky discolouration of the South Hole tributary.

Chemical samples were taken at sites 1, 4, 6 and 7. Examination of substrates at sites 1, 2 and 4 showed traces of sewage fungus, whereas sites 3 and 5 through 8 showed none.

4.2.2 CONTINUING VISITS

Five subsequent visits were made. Eight sites were sampled (Map 1), additional bacteriological sub-samples being taken to isolate possible septic tank inputs. Initial results showed poor water quality on the South Hole tributary. On 19/03/97 samples were also taken upstream of South Hole Farm. The data obtained from all site visits are given in Table 4 and summarised in Table 5.

5. DISCUSSION

The summary statistics presented in Table 5 indicate that water quality problems are likely to derive from one or more of the following sources in the Forda area (Map 2):

1. Septic Tank at 'Forda Meade'

No substantial discharge was noted during the investigation. The effect of the South Hole tributary would be to mask any impact from the septic tank. In assessing the impact of the discharge at Site 1, samples would have to be taken under comparable conditions in both the presence and absence of a discharge.

2. South Hole Tributary

Four of five samples showed an increased BOD concentration at Site 4 compared with Site 3, suggesting loading on the Croyde Steam below the confluence. The loading will be proportional to the product of the flow and the appropriate BOD concentration. In comparison with the Croyde Stream, the tributary flow is small (perhaps 5-10% of main flow) and the effective loading at Site 1 is diminished.

The BOD concentrations from the investigation sampling programme can be used to predict the theoretical BOD needed in the South Hole tributary to cause exceedance of the 4 mg/l concentration at the routine monitoring point at Forda. As comparative data from the initial visit is not available for all three sites they have not been used in the following calculations.

The assumptions used are (i) the Croyde Stream BOD is the mean value obtained from the investigation sampling programme, and (ii) BOD is conservative (ie. there is no diminution).

2.26 mg/l BOD in South Hole trib., and
1.10 mg/l BOD in Croyde Stream (above trib.)
causes a BOD of 1.24 mg/l at the routine sampling point.

Therefore the South Hole trib., with a BOD of 2.26 mg/l causes 0.14 mg/l rise in BOD in the Croyde Stream.

For the routine monitoring site to reach 4.0 mg/l BOD an increase of (4.0 - 1.1)/0.14 = 20.71 times the BOD concentration in the South Hole trib. would be needed.

Therefore 2.26 x 20.71 = 46.8 mg/l.

A BOD of 47mg/l is quite possible on an input of this nature. No account has been taken of the variability in the analytical determination of BOD and it should be stressed that such a calculation does not predict expected values but merely indicates the possibility that such values could be obtained.

The disparity between BOD values for Sites 4 and 5 is noticeable and is almost certainly a result of organic degradation within the garden pond at 'Forda Meade'.

Bacteria levels in the tributary are very high. Their effects on levels at the routine site are illustrated in Fig. 1.2. Again there are marked falls in levels at Site 4 compared with Site 5 resulting from the buffering function of the pond.

A general guide to the origin of bacterial contamination can be found by the ratio Faecal coliforms : Faecal streptococci (>4.4 = human; <0.7 = non-human) (Ref. 2). The ratio is not definitive and associated limitations should be borne in mind. In this case the data for Site 5 identifies the source as essentially non-human:

Site 5	Ratio
24/02/97	0.94
28/02/97	0.26
04/03/97	0.81
10/03/97	0.22
19/03/97	0.29

This possibly indicates farm run-off.

3. Piped Surface Water and Road Run-off

There were increases in the levels of some determinands at Site 1 over those at Site 2 (Fig. 1.0). This could only be accounted for where levels were being augmented from one or both of the above sources. In addition, the bacteria ratio at Site 1 had increased, as shown below, suggesting that some degree of human-based sewage was responsible:

Site 1	Ratio
24/02/97	2.40
28/02/97	1.17
04/03/97	1.21
10/03/97	0.14
19/03/97	5.83

This indicates the possible contribution of local septic tanks.

6. CONCLUSIONS

While the piped surface water discharge and road drains (Map 2) probably exert an influence on water quality during wet weather, the most likely cause of BOD failures at the routine site is contaminated surface water run-off/septic ingression at South Hole Farm.

7. RECOMMENDATIONS

1. The Water Quality Officer to discuss with the owner any remedial steps required in relation to surface water contamination or the ingression of septic effluent at South Hole Farm.

   ACTION: Water Quality Officer

2. The Water Quality Officer to encourage early upgrading of the septic tank at 'Forda Meade'.

   ACTION: Water Quality Officer

3. The Water Quality Officer to inspect Darracott septic tank in view of consent conditions and take any necessary action.

   ACTION: Water Quality Officer

4. Additional sanitary samples to be taken at Sites 3 and 4 during routine monitoring of

the Croyde stream at Forda. In the event of a BOD exceedance at the routine site such samples would greatly assist in a deduction of any contamination source.

ACTION: Monitoring Officer (Devon)

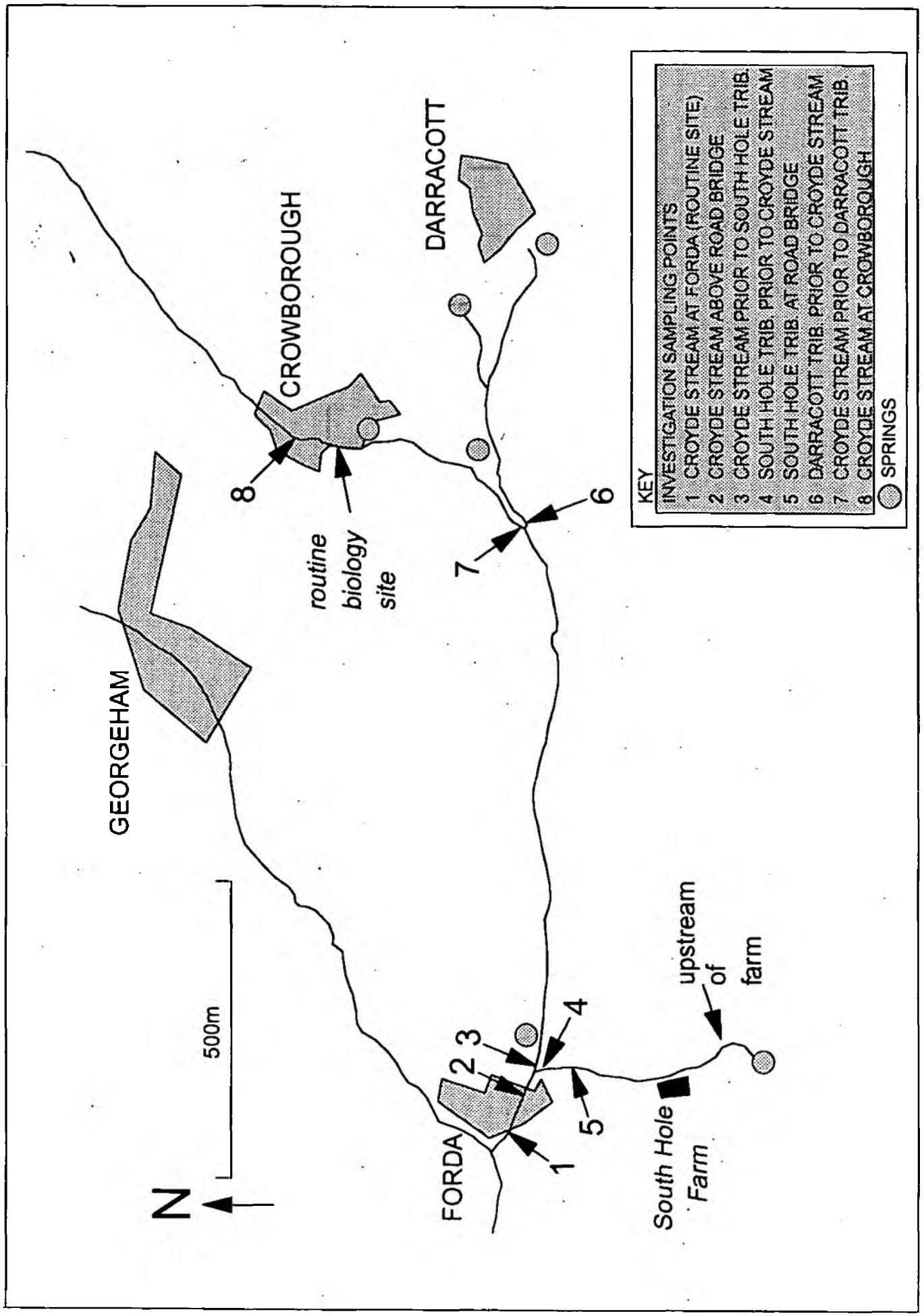
8. REFERENCES

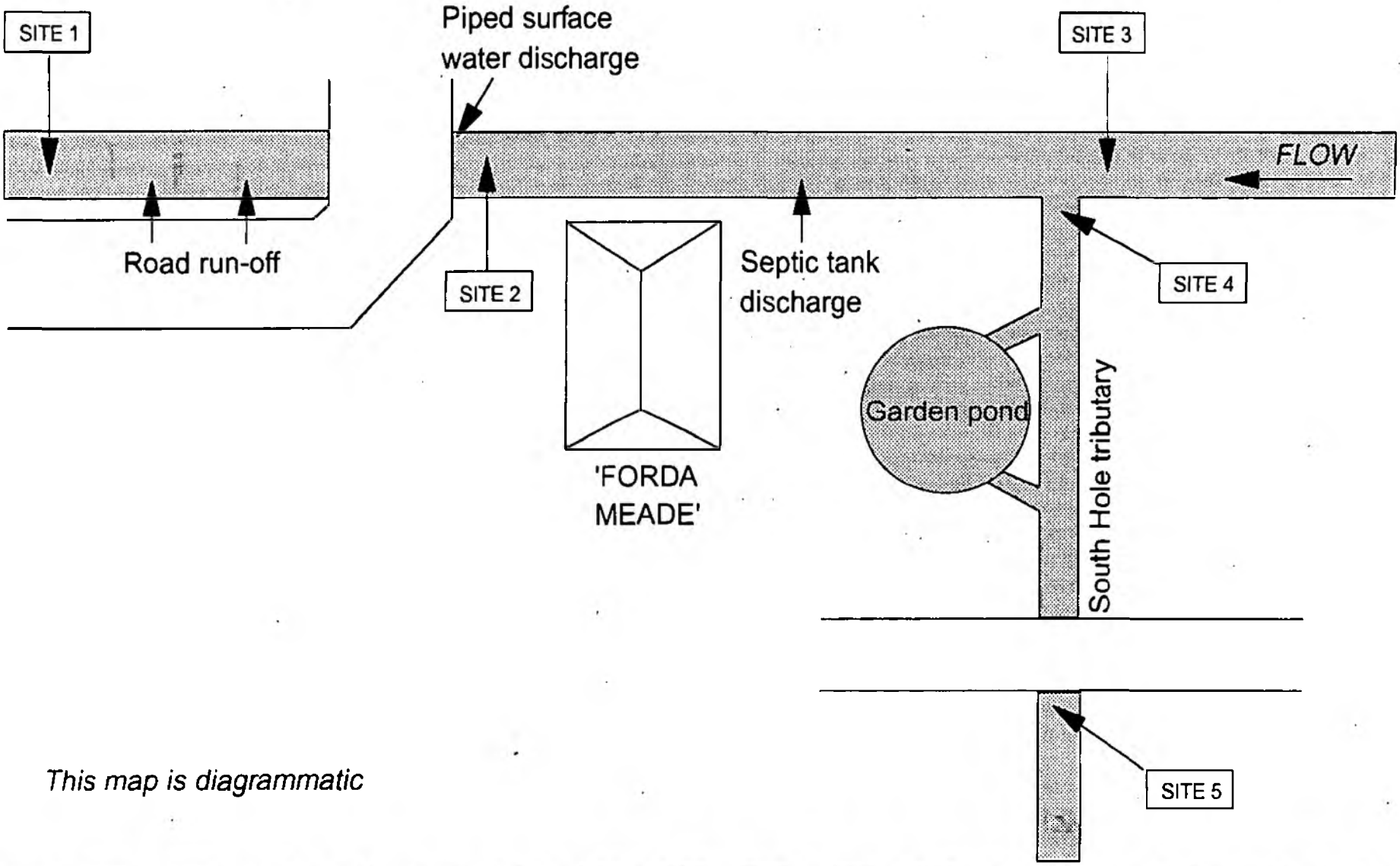
1. *North Devon Streams* Local Environment Agency Plan, October 1996, p.45.

2. *An Investigation to Identify and Assess General/Bacteriological Inputs to the Woolacombe Stream* (Environment Agency Internal Report, DEV/WQ/5/96), P. Rose, 1996.

MAP 1.

UPPER CATCHMENT OF CROYDE STREAM SHOWING SAMPLING POINTS





MAP 2. CROYDE STREAM IN VICINITY OF FORDA

This map is diagrammatic

TABLE 1. Standards for the Five River Ecosystem Use Classes

Use Class	DO % sat 10%ile	BOD (ATU) mg/l 90%ile	Total Ammonia mg N/l 90%ile	Un-ionised Ammonia mg N/l 95%ile	pH 5%ile & 95%ile	Hardness mg/l $CaCO_3$	Dissolved Copper µg/l 95%ile	Total Zinc µg/l 95%ile	Class Description
1	80	2. 5	0. 25	0. 021	6. 0 - 9. 0	10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500	Water of very good quality suitable for all fish species
2	70	4. 0	0. 6	0. 021	6. 0 - 9. 0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500	Water of good quality suitable for all fish species
3	60	6. 0	1. 3	0. 021	6. 0 - 9. 0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000	Water of fair quality suitable for high class coarse fish populations
4	50	8. 0	2. 5	-	6. 0 - 9. 0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000	Water of fair quality suitable for coarse fish populations
5	20	15. 0	9. 0	-	-	-	-	-	Water of poor quality which is likely to limit coarse fish populations

TABLE 2. ELEVATED BOD CONCENTRATIONS IN THE CROYDE STREAM AT FORDA IN RELATION TO RAINFALL AT BITTADON GAUGING STATION (NGR SS542422) 1993-6.

Date	BOD concentration mg/l	Rainfall	
		Sampling date	Previous day
30-Mar-93	>8.5	1.3	0.8
03-Jun-93	4.3	0	4.5
25-May-94	8	7.9	11.8
01-Jul-94	7.7	0	0
23-Aug-95	5.7	6.5	1.7
12-Apr-96	9.5	16.4	9.8

TABLE 3.0 ROUTINE ANALYSIS DATA FOR CROYDE STREAM AT FORDA 1993-6. (Bold entries indicate dates on which BOD values were elevated above 4.0 mg/l. Determinands with asterisk exceeded the RE Class 2 90%ile value)

Date	BOD mg/l	Ammonia Total mg/l	Ammonia non-ionised mg/l	Dissolved Oxygen % sat.
12-Jan-93	1.4	0.06	<0.0100	100
28-Jan-93	<1	0.04	<0.0100	103
18-Feb-93	<1	0.06	<0.0100	97
30-Mar-93	**>8.5***	**1.10***	**0.0102**	**94**
28-Apr-93	1.4	0.1	0.0013	91
03-Jun-93	**4.3***	**0.06**	**0.0014**	**96**
02-Aug-93	1.8	0.1	0.0013	96
06-Sep-93	3.1	0.06	0.0007	94
02-Oct-93	1.5	0.06	0.0007	93
20-Oct-93	1.7	0.03	0.0004	94
05-Nov-93	<1	0.03	0.0005	93
02-Dec-93	1.2	0.03	0.0005	93
14-Jan-94	<1	0.02	0.0001	97
08-Feb-94	1.4	0.04	0.0004	96
24-Feb-94	1.2	<0.02	0.0002	96
28-Mar-94	1.6	0.05	0.0006	97
20-Apr-94	<1	0.02	0.0004	102
25-May-94	**8.0***	**0.22**	**0.0052**	**98**
01-Jul-94	**7.7***	**1.30***	**0.0398***	**87**
17-Aug-94	2	0.06	0.0016	83
10-Oct-94	2.2	0.09	0.0016	89
26-Oct-94	1.9	0.03	0.0004	97
17-Nov-94	1.1	0.02	0.0003	98
16-Dec-94	1.1	0.03	0.0004	89
23-Feb-95	1.2	0.03	<0.0003	100
22-Mar-95	1.2	0.03	<0.0006	99
26-Apr-95	<1	0.07	0.0019	99
12-Jun-95	1.1	0.03	<0.0008	97
06-Jul-95	<1	0.03	<0.0011	98
26-Jul-95	2.9	0.15	0.004	100
23-Aug-95	**5.7***	**0.12**	**0.0026**	**110**
15-Sep-95	2	0.59	0.0139	91
04-Oct-95	1.2	0.09	0.0019	109
02-Nov-95	1.9	0.08	0.0012	91
16-Nov-95	2.5	0.1	0.0013	100
11-Jan-96	1.4	0.04	0.0004	97
26-Jan-96	1.5	0.03	0.0003	98
26-Feb-96	1.9	0.06	0.0008	98
21-Mar-96	2.6	0.26	0.0045	98
12-Apr-96	**9.5***	**0.51**	**0.0039**	**98**
14-May-96	2.8	0.04	0.0009	98
12-Jun-96	1.2	0.13	0.0031	92
31-Jul-96	<1	0.08	0.002	92
20-Aug-96	2.6	0.27	0.0058	95
11-Sep-96	1.7	0.09	0.0024	100
16-Oct-96	1.9	0.07	0.0012	98
08-Nov-96	2.6	0.13	0.0015	92

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	7.85			7.65		7.8	7.1		
Cond (mS/cm)									
Turb (NTU)									
Temp (C)	9.8			9.6		9.8	10		
D.O. (% sat.)	97			93		100	90		
B.O.D. (mg/l)	2.1			4.8		1.6	<1		
C.O.T. (mg/l)									
NH3 (mg/l N)	0.11			0.24		<0.03	<0.03		
N.O.T.(mg/l N)	4.5			4.8		5.2	5.4		
Nitrate(mg/l N)	4.47			4.73		5.19	5.39		
Nitrite (mg/l N)	0.035			0.073		0.009	0.007		
NH3 non-ion (mg/l N)	0.0014			0.0019		0.0003	<0.0001		
SS 105 C (mg/l)	66			187		41	9.1		
SS 500 C (mg/l)									
Alk 4.5 (mg/l)	68			101		65	68		
Sulphate (mg/l)									
Phosphate (mg/l)									
F strep (No.100ml)									
F coliform (No.100ml)									
Tot coliform (No.100ml)									
Weath temp	mild			mild		mild	mild		
Weath prec	Heavy rain		Heavy rain in past 24 hrs			Heavy rain	Heavy rain		
Flow	normal			normal		normal	normal		

TABLE 4.0 INVESTIGATION DATA FOR 12 FEBRUARY 1997

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	7.9	7.9	7.95	7.75	7.75	7.45	7.85	7.55	
Cond (mS/cm)	334	334	321	412	409	341	294	256	
Turb (NTU)	18	16	16	26	49.4	8	9	6	
Temp (C)	8.7	8.8	8.8	9.4	9.6	9.3	8.8	8.5	
D.O. (% sat.)	98	100	98	96	93	96	99	98	
B.O.D. (mg/l)	1.2	1.2	<1	1.7	2	1.1	1.1	1.4	
C.O.T. (mg/l)	1.1	1.1	0.86	1.3	1.4	<0.5	1.2	2.1	
NH3 (mg/l N)	0.05	0.04	0.03	0.15	0.17	<0.03	<0.03	<0.03	
N.O.T.(mg/l N)	5.7	5.6	5.5	6.5	6.6	6.3	5.4	4.4	
Nitrate(mg/l N)	5.69	5.59	5.5	6.47	6.57	6.3	5.4	4.4	
Nitrite (mg/l N)	0.009	0.009	0.004	0.027	0.034	0.005	<0.004	0.004	
NH3 non-ion (mg/l N)	0.0007	0.0005	0.0004	0.0015	0.0017	0.0001	0.0004	0.0002	
SS 105 C (mg/l)	37	44	32	46	78	15	17	8.4	
SS 500 C (mg/l)	28	30	25	39	66				
Aik 4.5 (mg/l)	83	80	74	109	105	82	63	44	
Sulphate (mg/l)	22	21	21	22	22	25	18	14	
Phosphate (mg/l)	0.06	0.06	0.05	0.16	0.15	0.04	0.06	0.12	
F strep (No.100ml)	2000	1818	144	8455	19000	430	72	153	
F coliform (No.100ml)	4800	5200	310	15000	18000	430	420	1636	
Tot coliform (No.100ml)	22000	14000	1818	37000	49000	600	780	26000	
Weath temp	mild	mild	mild	mild	mild	mild	mild	mild	
Weath prec	showery	showery	showery	showery	showery	showery	showery	showery	
Flow	high	high	high	high	high	normal	normal	normal	

TABLE 4.1 INVESTIGATION DATA FOR 24 FEBRUARY 1997

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	7.85	7.8	7.9	7.6	7.65	7.35	7.7	7.5	
Cond (mS/cm)	346	348	343	433	441	352	318	282	
Turb (NTU)	39	23	19	108	397	8	21	11	
Temp (C)	9.7	9.6	9.7	9.8	9.8	9.7	9.6	9.2	
D.O. (% sat.)	101	101	101	98	95	93	99	97	
B.O.D. (mg/l)	1.3	1.3	1.2	4	6.8	1.4	1.5	1.4	
C.O.T. (mg/l)	1.1	1	0.67	2.9	5.6	0.9	1.4	1.9	
NH3 (mg/l N)	0.06	0.06	0.04	0.72	0.45	<0.03	<0.03	0.03	
N.O.T.(mg/l N)	5.6	5.6	5.5	6	5.7	6.2	5.1	4.1	
Nitrate(mg/l N)	5.59	5.59	5.49	5.96	5.65	6.19	5.09	4.09	
Nitrite (mg/l N)	0.012	0.01	0.005	0.042	0.049	0.006	0.006	0.006	
NH3 non-ion (mg/l N)	0.0008	0.0007	0.0006	0.0052	0.0036	0.0001	0.0003	0.0002	
SS 105 C (mg/l)	59	53	41	174	429	15	32	16	
SS 500 C (mg/l)	48	41	32	165	403		24		
Alk 4.5 (mg/l)	72	72	70	98	95	74	55	37	
Sulphate (mg/l)	23	23	24	25	26	28	21	18	
Phosphate (mg/l)	0.1	0.08	0.06	0.24	0.86	0.05	0.07	0.05	
F strep (No.100ml)	3000	780	280	12909	41000	144	360	230	
F coliform (No.100ml)	3500	3600	670	7300	11000	500	520	530	
Tot coliform (No.100ml)	6100	10909	901	25000	37000	480	1182	3700	
Weath temp	mild	mild	mild	mild	mild	mild	mild	mild	
Weath prec	rain	rain	rain	rain	rain	rain	rain	rain	
Flow	normal	normal	normal	normal	normal	normal	normal	normal	

TABLE 4.2 INVESTIGATION DATA FOR 28 FEBRUARY 1997

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	7.9	7.9	7.95	7.6	7.65	7.4	7.85	7.55	
Cond (mS/cm)	331	332	322	407	431	331	297	253	
Turb (NTU)	13	11	8	27	83	5	8	4	
Temp (C)	10	10	10	10	10.3	9.7	10	9.8	
D.O. (% sat.)	96	95	97	93	89	96	99	98	
B.O.D. (mg/l)	1.1	1.3	1.2	2.3	>8.9	1	1.1	1.1	
C.O.T. (mg/l)	0.92	1.1	0.83	1.3	4	0.74	1.2	1.8	
NH3 (mg/l N)	0.05	<0.03	<0.03	0.2	0.89	<0.03	<0.03	<0.03	
N.O.T.(mg/l N)	5.5	5.4	5.4	5.9	6	6.1	5.2	3.8	
Nitrate(mg/l N)	5.49	5.39	5.4	5.87	5.96	6.09	5.2	3.8	
Nitrite (mg/l N)	0.008	0.007	0.004	0.026	0.036	0.005	<0.004	<0.004	
NH3 non-ion (mg/l N)	0.0007	0.0004	0.0005	0.0015	0.0075	0.0001	0.0004	0.0002	
SS 105 C (mg/l)	30	30	22	49	122	8.3	17	6.4	
SS 500 C (mg/l)	25	25	<20	42	104				
Alk 4.5 (mg/l)	76	78	74	107	113	77	62	44	
Sulphate (mg/l)	22	22	22	23	28	25	19	15	
Phosphate (mg/l)	0.05	0.06	0.04	0.19	0.96	0.04	0.06	0.12	
F strep (No.100ml)	5300	5200	99	37000	36000	72	81	54	
F coliform (No.100ml)	6400	5500	270	32000	29000	72	540	720	
Tot coliform (No.100ml)	48000	30000	440	>100000	>100000	108	2600	4800	
Weath temp	mild	mild	mild	mild	mild	mild	mild	mild	
Weath prec	showery	showery	showery	showery	showery	showery	showery	showery	
Flow	normal	normal	normal	normal	dry	normal	normal	normal	

TABLE 4.3 INVESTIGATION DATA FOR 04 MARCH 1997

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	7.9	7.95	8	7.65	7.8	7.4	7.9	7.65	
Cond (mS/cm)	333	335	326	404	399	335	304	248	
Turb (NTU)	19	19	17	25	25	4	8	5	
Temp (C)	12.7	12.7	12.9	11.7	12	11.9	13.1	13.1	
D.O. (% sat.)	103	101	100	97	93	96	101	96	
B.O.D. (mg/l)	1.5	1.3	1.1	2.3	2.1	<1	<1	1.1	
C.O.T. (mg/l)	0.75	0.8	0.68	1.1	1.1	<0.5	0.94	1.6	
NH3 (mg/l N)	0.06	0.06	<0.03	0.24	0.21	<0.03	<0.03	<0.03	
N.O.T.(mg/l N)	5.4	5.4	5.4	5.5	5.7	6.2	5.3	3.5	
Nitrate(mg/l N)	5.39	5.39	5.39	5.46	5.66	6.19	5.3	3.49	
Nitrite (mg/l N)	0.013	0.013	0.007	0.037	0.039	0.006	0.004	0.006	
NH3 non-ion (mg/l N)	0.0011	0.0012	0.0007	0.0023	0.0028	0.0002	0.0006	0.0003	
SS 105 C (mg/l)	34	37	34	50	53	11	17	9.9	
SS 500 C (mg/l)	27	29	28	45	47				
Alk 4.5 (mg/l)	76	76	72	105	101	72	62	38	
Sulphate (mg/l)	22	22	23	22	21	26	20	15	
Phosphate (mg/l)									
F strep (No.100ml)	45000	31000	180	165000	120000	<10	27	153	
F coliform (No.100ml)	6100	6700	220	40000	26000	54	135	630	
Tot coliform (No.100ml)	11000	12000	400	51000	46000	90	4500	5900	
Weath temp	warm	warm	warm	warm	warm	warm	warm	warm	
Weath prec	dry	dry	dry	dry	dry	dry	dry	dry	
Flow	normal	normal	normal	normal	normal	normal	normal	normal	

TABLE 4.4 INVESTIGATION DATA FOR 10 MARCH 1997

TABLE 4.5 INVESTIGATION DATA FOR 19 MARCH 1997

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	u/s farm
pH	8	8	8	7.85	7.95				8.3
Cond (mS/cm)	342	342	334	404	396				412
Turb (NTU)	27	24	9	9	15				10
Temp (C)	8.9	8.9	9	9.5	9.4				10.3
D.O. (% sat.)	100	99	101	101	97				105
B.O.D. (mg/l)	1.1	1.6	1	1	1.3				1
C.O.T. (mg/l)	0.79	0.59	0.72	0.66	0.63				0.73
NH3 (mg/l N)	<0.03	<0.03	<0.03	<0.03	0.04				<0.03
N.O.T.(mg/l N)	5.5	5.4	5.5	5.1	5.1				8.1
Nitrate(mg/l N)	5.49	5.39	5.49	5.08	5.07				8.09
Nitrite (mg/l N)	0.008	0.006	0.005	0.018	0.025				0.008
NH3 non-ion (mg/l N)									
SS 105 C (mg/l)	66	68	26	18	28				25
SS 500 C (mg/l)	52	57	20		25				22
Aik 4.5 (mg/l)	81	81	79	109	105				92
Sulphate (mg/l)	24	24	24	23	22				21
Phosphate (mg/l)									
F strep (No.100ml)	720	680	81	2300	4100				360
F coliform (No.100ml)	4200	3600	180	5600	6700				126
Tot coliform (No.100ml)	7200	17000	380	10000	23000				230
Weath temp	mild	mild	mild	mild	mild				mild
Weath prec	dry	dry	dry	dry	dry				dry
Flow	normal	normal	normal	normal	normal				normal

TABLE 5 SUMMARY STATISTICS FOR SELECTED INVESTIGATION DATA

Dissolved Oxygen (% sat.)

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97	97			93		100	90	
24/02/97	98	100	98	96	93	96	99	98
28/02/97	101	101	101	98	95	93	99	97
04/03/97	96	95	97	93	89	96	99	98
10/03/97	103	101	100	97	93	96	101	96
19/03/97	100	99	101	101	97			
No samples	6	5	5	6	5	5	5	4
mean	99.2	99.2	99.4	96.3	93.4	96.2	97.6	97.3
min	96	95	97	93	89	93	90	96
max	103	101	101	101	97	100	101	98
90%ile	102	101	101	99.8	96.2	96	100.4	98
SD	2.64	2.49	1.82	2.61	2.65	2.23	3.88	0.83

BOD (ATU)

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97	2.1			4.8		1.6	1	
24/02/97	1.2	1.2	1	1.7	2	1.1	1.1	1.4
28/02/97	1.3	1.3	1.2	4	6.8	1.4	1.5	1.4
04/03/97	1.1	1.3	1.2	2.3	8.9	1	1.1	1.1
10/03/97	1.5	1.3	1.1	2.3	2.1	1	1	1.1
19/03/97	1.1	1.6	1	1	1.3			
No samples	6	5	5	6	5	5	5	5
mean	1.38	1.34	1.1	2.68	4.22	1.22	1.14	1.25
min	1.1	1.2	1	1	1.3	1	1	1.1
max	2.1	1.6	1.2	4.8	8.9	1.6	1.5	1.4
90%ile	1.8	1.48	1.2	4.4	8.06	1.52	1.34	1.4
SD	0.348	0.136	0.089	1.311	3.05	0.24	0.185	0.15

Total Ammonia

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97	0.11			0.24		0.03	0.03	
24/02/97	0.05	0.04	0.03	0.15	0.17	0.03	0.03	0.03
28/02/97	0.06	0.06	0.04	0.72	0.45	0.03	0.03	0.03
04/03/97	0.05	0.03	0.03	0.2	0.89	0.03	0.03	0.03
10/03/97	0.06	0.06	0.03	0.24	0.21	0.03	0.03	0.03
19/03/97	0.03	0.03	0.03	0.03	0.04			
No samples	6	5	5	6	5	5	5	4
mean	0.06	0.044	0.032	0.263	0.352	0.03	0.03	0.03
min	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
max	0.11	0.06	0.04	0.72	0.89	0.03	0.03	0.03
90%ile	0.085	0.06	0.036	0.48	0.714	0.03	0.03	0.03
SD	0.024	0.014	0.004	0.216	0.300	0.000	0.000	0.000

TABLE 5.0 (cont.) SUMMARY STATISTICS FOR INVESTIGATION DATA

Ammonia non-Ionised

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97	0.0014			0.0019		0.0003	0.0001	
24/02/97	0.0007	0.0005	0.0004	0.0015	0.0017	0.0001	0.0004	0.0002
28/02/97	0.0008	0.0007	0.0006	0.0052	0.0036	0.0001	0.0003	0.0002
04/03/97	0.0007	0.0004	0.0005	0.0015	0.0075	0.0001	0.0004	0.0002
10/03/97	0.0011	0.0012	0.0007	0.0023	0.0028	0.0002	0.0006	0.0003
19/03/97								
No samples	5	4	4	5	4	5	5	4
mean	0.00094	0.0007	0.00055	0.00248	0.0039	0.00016	0.00036	0.000225
min	0.0007	0.0004	0.0004	0.0015	0.0017	0.0001	0.0001	0.0002
max	0.0014	0.0012	0.0007	0.0052	0.0075	0.0003	0.0006	0.0003
90%ile	0.00128	0.00105	0.00067	0.00404	0.00633	0.00026	0.00052	0.00027
SD	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000

Suspended Solids (105°C)

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97	66			187		41	9.1	
24/02/97	37	44	32	46	78	15	17	8.4
28/02/97	59	53	41	174	429	15	32	16
04/03/97	30	30	22	49	122	8.3	17	6.4
10/03/97	34	37	34	50	53	11	17	9.9
19/03/97			26	18	28			
No samples	5	4	5	6	5	6	5	4
mean	45.2	41	31	87.3	142	18.1	18.42	10.2
min	30	30	22	18	28	8.3	9.1	6.4
max	66	53	41	187	429	41	32	16
90%ile	63.2	50.3	38.2	180.5	306.2	30.6	26	14.17
SD	14.470	8.520	6.570	66.860	146.820	11.746	7.450	3.590

Faecal Coliforms

	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8
12/02/97								
24/02/97	4800	5200	310	15000	18000	430	420	1636
28/02/97	3500	3600	670	7300	11000	500	520	530
04/03/97	6400	5500	270	32000	29000	72	540	720
10/03/97	6100	6700	220	40000	26000	54	135	630
19/03/97	4200	3600	180	5600	6700			
No samples	5	5	5	5	5	4	4	4
mean	5000	4920	330	19980	18140	264	403.75	879
min	3500	3600	180	5600	6700	54	135	530
max	6400	6700	670	40000	29000	500	540	1636
90%ile	6280	6220	526	36800	27800	479	534	1361.2
SD	1104.600	1188.949	175.613	13694.145	8504.023	202.618	181.685	442.191

FIGURE 1. INVESTIGATION DATA SHOWN AS VALUES FOR SELECTED DETERMINANDS ACROSS 3 SITES (MEANS OF 5 SAMPLES EXCEPT WHERE INDICATED)

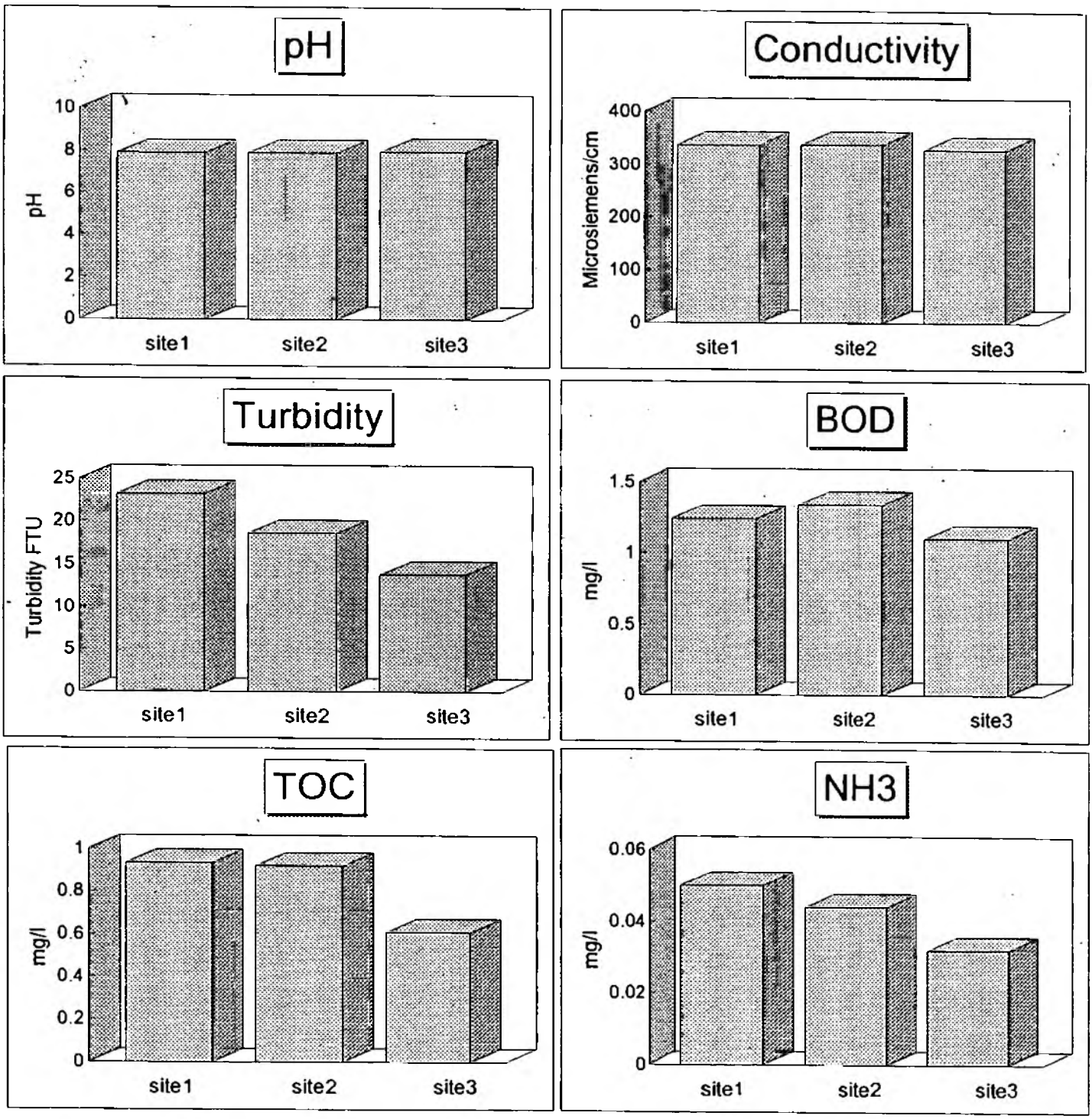


FIGURE 1.1 INVESTIGATION DATA SHOWN AS VALUES FOR SELECTED DETERMINANDS ACROSS 3 SITES (MEANS OF 5 SAMPLES EXCEPT WHERE INDICATED)

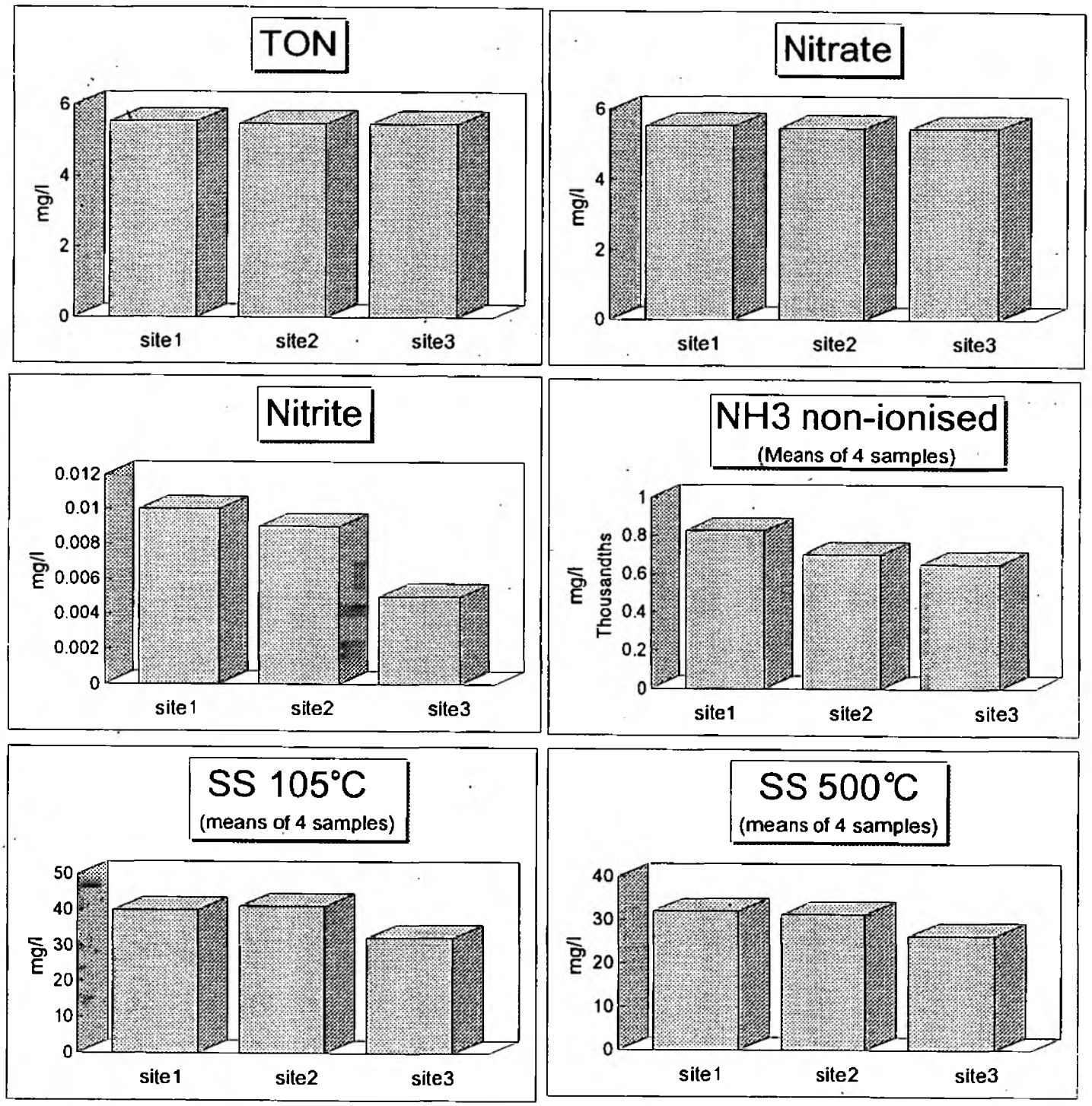
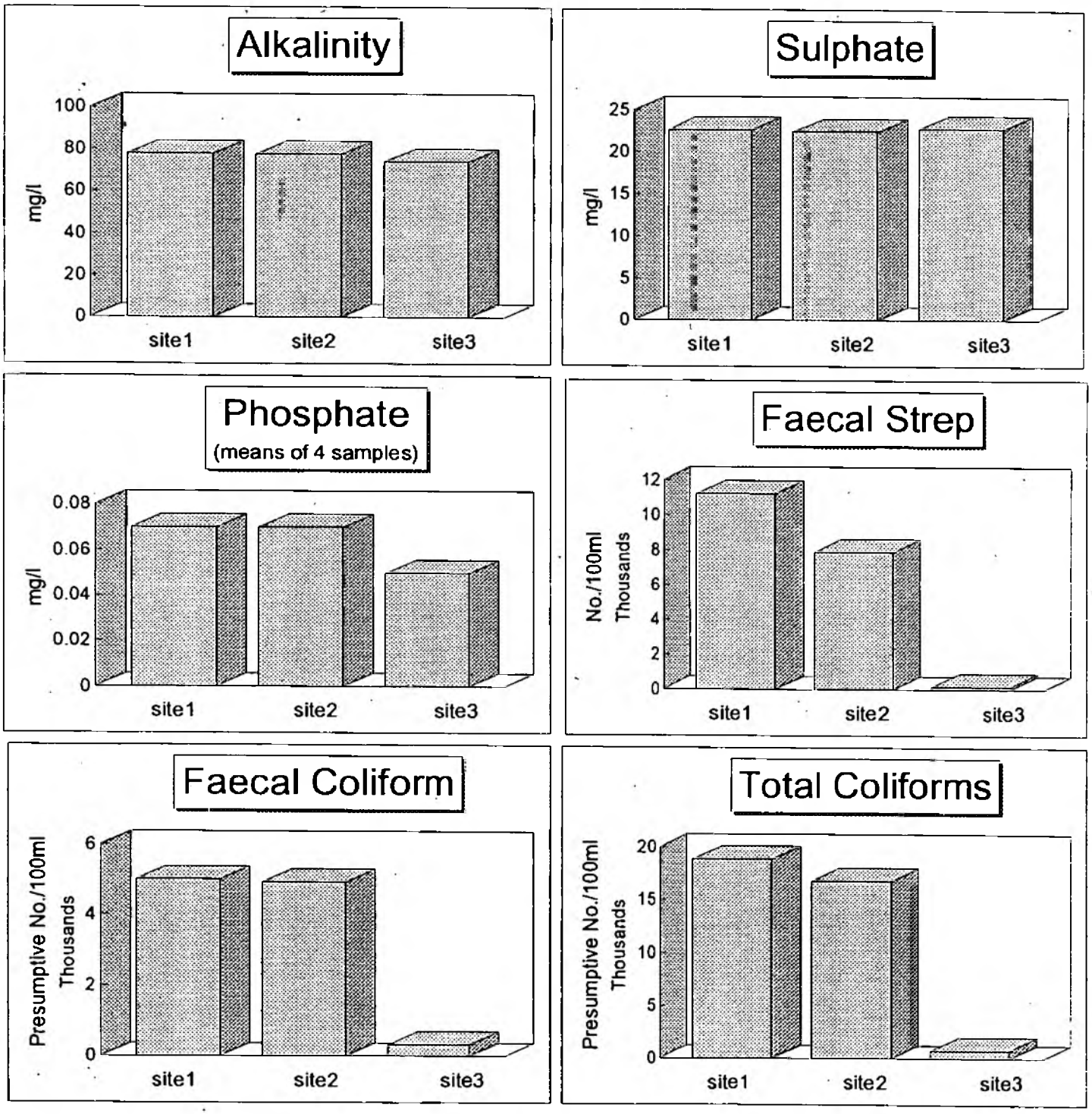


FIGURE 1.2 INVESTIGATION DATA SHOWN AS VALUES FOR SELECTED DETERMINANDS ACROSS 3 SITES (MEANS OF 5 SAMPLES EXCEPT WHERE INDICATED)



APPENDIX 1.0

CCG (F) 30A/P/ CROYDE STREAM

FIELD CONTROL REPORT File No.

FORWARD TO: FO, FWO, TWO (PO) WAO, OP.ENG, OTHER Colin Brown

LOCATION TASK FORCE WINTER 1994 - 95 CROYDE/WOOLACOMBE STR

DAY/DATE MAY 95 MAP REF. _____ TIME _____ HRS.

RIVER/TIDE/SEA/WEATHER CONDITIONS – Before, after and at the time of occurrence

_____

_____ HW _____ HRS.

_____ HW _____ HRS.

PERSONS INVOLVED

NAME	ADDRESS	DESCIPTION

VEHICLES/VESSELS

REG. NO.	MAKE/TYPE	COLOUR	BODY/HULL

N. R. A. STAFF/EQUIPMENT INVOLVED

P Sc.

RECOMMENDATIONS

I was unable to locate any problems on the Croyde / Woolacombe streams when walked for TASK FORCE. I would expect any problem would be septic tanks / possibly better Covered in the Summer months.

APPENDIX 1.1

File 30A/P/CRO

Coyle Stream General.

FIELD INSPECTION REPORT

Name of Works	CROTOR STREAM T File				
Catchment/ User Ref No.	30A SS457392				
Date 21/8/96		Time 1100 1500		Weather	SUN & CLOUD
Flow SUMMER LEVEL			Visual Appearance GOOD CLEAR CLEAR		
Plant Operation SEVEN SITES VISITED UPSTREAM OF THE FORDA SAMPLING POINT TO ESTABLISH CAUSE OF FAILURE. STREAM LOOKED CLEAN THROUGHOUT. SOME SIGNS OF SILT DEPOSIT AROUND FORDA. INVERTEBRATES PLENTIFUL					
General Comments THE ONLY POSSIBLE SOURCES OF POLLUTION FOUND WERE RAN A MINOR RUN OFF FROM SOUTH MOOR FARM YARD DURING WET WEATHER. FARMS SHARLAN 2K DAY CAMPING IN THE FIELD ADJACENT TO THIS STREAM AT FORDA MILL FARMER SHARLAND (ONLY ONE TENT DURING VISIT) FREE CATTLE ACCESS TO STREAM UPSTREAM OF FORDA TOWARDS DARRACOTT. THERE IS A POND AND NURSERY (SPRINGFIELDS) AT DARRACOTT THAT COULD BE CONNECTED BUT THERE WERE NO SIGNS OF POLLUTION AT TIME OF VISIT. I CANNOT UNDERSTAND THE REASON FOR FAILURE. JUST ABOVE THE SAMPLING POINT A ROAD DRAIN ENTERS THE STREAM BUT THIS WAS DRY AT TIME OF VISIT.					
OFFICER	R C BICKLE WARDEN.				

(USERS.AND.AEM.STD]FIELD_INSPECTION_FORM.WP5

APPENDIX 2.

NATIONAL RIVERS AUTHORITY — Folio No. NRA-SW-2290

WATER ACT 1989 – CONSENT TO DISCHARGE — File No. 050/30A/43

The National Rivers Authority, in pursuance of its powers under the above mentioned Act, HEREBY GIVES CONSENT to the discharge described hereunder subject to the terms and conditions set out below.

Name & Address of Applicant:	MR F TUCKER DARRACOTT FARM DARRACOTT NORTH DEVON
Date of Application:	20 August, 1990
Date of Consent:	1 November, 1990
Description of Discharge:	
Type:	Treated Domestic Sewage Effluent.
From (discharge location):	Darracott Farm, Darracott
To:	Soakaway.

Conditions

1. General

   (a) Except with the agreement of the person making the discharge under this consent, no notice shall be served revoking the consent or modifying the conditions before 1 November, 1992.

   (b) For the purpose of applying the conditions, a sample taken from the manhole at the commencement of the effluent drain shall be deemed to be the same as a sample taken at the outlet to the soakaway.

2. As to Outlet

   (a) The outlet shall be sited at NGR SS 4714 3917 and shall be used only for the discharge of treated domestic sewage effluent to soakaway.

   (b) The septic tank and soakaway shall be designed and constructed in accordance with B.S. 6297: 1983.

   (c) No part of the soakaway shall be within 150 metres of any well, borehole or spring, 75 metres of any existing soakaway, or 50 metres of any watercourse.

   (d) At least 2 metres of soil shall be present below the invert level of the soakaway.