EP/05/00

DEVON AREA
INTERNAL REPORT

ENVIRONMENT AGENCY

INVESTIGATION OF THE WATER QUALITY IN THE BUCKLAND STREAM UP AND DOWNSTREAM OF EAST / WEST BUCKLAND

April 2000
DEV/EP/05/00
(CATCHMENT 08A)

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INVESTIGATION OF THE WATER QUALITY IN THE BUCKLAND STREAM UP AND DOWNSTREAM OF WEST / EAST BUCKLAND.

1. CATCHMENT DESCRIPTION

The Buckland Stream rises south-south west of Churchstow at NGR SX 6982 4486 and flows in a general south-west direction for approximately 4.5 km through a mixture of agricultural / settlement land, finally to discharge on the Bantham Beach at NGR SX 6628 4362 (see Figures 1-4). Bantham Beach is used extensively especially during the summer and is designated under the European Community Bathing Waters Directive (ECBWD, number 76/160/EEC). Running to the north of the stream is the River Avon and to the west is Burgh Island.

The Buckland stream is not monitored as part of the Routine Monitoring Programme for the River Ecosystem (RE) classification. However, a water sample is taken from the stream (70815410) either on the beach or near the beach depending on the tide (site 1, Figure 1) when the ECBWD sample (70816005) is collected during the bathing season (May 1 – 30 September)

2. TERMS OF REFERNCE

2.1 HISTORY

The village of Buckland (comprising of West Buckland and East Buckland) at present has no sewage treatment works. Domestic sewage is currently treated by many private septic tanks connected to the properties within the village.

Concerns have been raised regarding the pollution of the Bantham Stream due to inputs from the septic tanks albeit direct discharges or soak-a-ways in close proximity to the watercourse (locations of known sources given in APPENDIX I). Because the stream runs out over an ECBWD beach there has also been concern that stream water quality may effect bathing water quality.

2.2 OBJECTIVES

A request was received from the Environment Protection Officer (EPO) for the area to carry out a series of surveys to show impact, if any, that discharges from the Buckland Village area may have on the Buckland Stream. This investigation will concentrate on the impact of the village on the watercourse only; an ongoing study is investigating the effect, if any, of the stream on the ECBWD site.

2.3 PROJECT TEAM

T. Cronin (Project Leader)
P.Rose (Project Manager, author)

3. METHOD

3.1 BIODIVERSITY

A map of the investigation area along with a brief description of the nature of the investigation was supplied to the Conservation Team to determine if any biodiversity issues or conservation designations were applicable to the site (see APPENDIX II).

3.2 RISK ASSESSMENT

The site was inspected and a risk appraisal form completed for subsequent work (see APPENDIX III).

3.3 BIOLOGICAL ASSESSMENT

A biological survey was carried out with collections being taken from three sites on suitable riffles (see Figure 2). The sites were downstream of the village, (site 4, approximately 200m D/S of the last known septic tank discharge to the stream) at NGR SX 6742 4348, mid village, (site 5) NGR SX 6794 4378 and upstream of the village (site 6) at NGR SX 6815 4380.

The collections were made using the standard Environment Agency method of a 3-minute kick sample and 1 minute search. The macroinvertebrates were then identified down to family level on site and released back to the watercourse. The data collected were used to determine BMWP (Biological Monitoring Working Party) scores and ASPT (Average Score Per Taxon) figures.

3.4 CHEMICAL AND BACTERIOLOGICAL SURVEYS

A survey covering a 13-hour period during the day was carried out on the 3rd November 1998 with samples being taken at the same three sites as the biological study (sites 4 – 6, see Figure 2). Samples were analysed for a series of physiochemical parameters and three groups of bacteria: total coliforms, faecal coliforms and faecal streptococci. A second 13-hour survey (7th October 1999) which concentrated on the bacteriology (sample sites 1 – 5, 7 and 12, see Figures 1-4) was carried out with a follow up run (1st December1999) concentrating on sites 7-12 (data in APPENDIX IV).

4. RESULTS

4.1 BIODIVERSITY

No concerns were raised by the Conservation Team but it was noted that 'Burnt House Fields' next to the watercourse is a semi-improved neutral and marshy grassland and as such care would need to be taken when sampling in this area.(see APPENDIX II).

4.2 RISK ASSESSMENT

The risk assessment raised no specific issues other than those normally associated with fieldwork of this nature (see APPENDIX III).

4.3 BIOLOGICAL ASSESSMENT

BMWP and ASPT values were calculated from the collections.

Table 1. Biological assessment.

Site	BMWP	ASPT	Sewage Fungus cover %
4 D/S Village	141	5.88	20
5 Mid Village	148	6.17	2
6 U/S Village	155	6.46	0

(For full taxa list and abundance, see APPENDIX V.)

The data show a decrease in both BMWP and ASPT when comparing the aquatic macroinvertebrates communities present upstream of the village to that downstream. Whilst sewage fungus was not present on stones upstream, there was a 20 % cover on stones downstream.

4.4 CHEMICAL AND BACTERIOLOGICAL SURVEYS

The results from the chemical and bacteriological surveys are presented in tables' 2 - 4.
The data from the follow up survey 1st December 1999 are presented in APPENDIX IV.

None of the samples analysed for BOD / Dissolved Oxygen levels or total ammonia contained concentrations or levels that would have exceeded the Environmental Quality Standards (EQS's) for an RE class 1 River (see Table 3, Figure 5 and APPENDIX IV & VI).

There are no EQS's that are applicable to inland rivers with regard to bacteriological counts other than sites designated under the Surface Waters Abstraction Directive used for public water supply. However, the geometric means (a simple statistical calculation used to give a broad overview of bacterial numbers) calculated for each site for the two surveys showed higher levels of total / faecal coliforms and faecal streptococci downstream of the village compared to upstream (see Table 5 for geometric means). Results are presented in Tables 2 and 4 and Figures 6 – 9 graphically show the spatial and temporal trends in the counts throughout the survey periods.

Table 5. Geometric means from the bacteriological results.

	faecal coliforms No/100ml		**total coliforms No/100ml**		**faecal streptococci No/100ml**	
Site	**3/11/98**	**8/10/99**	**3/11/98**	**8/10/99**	**3/11/98**	**8/10/99**
4 (D/S village)	578	1372	6065	6123	227	563
5 (Mid village)	449	945	659	5593	214	692
6 (U/S village)	424	-	629	-	222	-
7 (U/S village)	-	530	-	632	-	302

5. DISCUSSION

This investigation has concentrated on the impact of East and West Buckland on the Buckland Stream. Because of the direct connection with the EC bathing beach at Bantham, further sites were sampled (sites 1-3 Figure 1). These included the beach (on the ECB sample line), mouth of the River Avon and just prior to where the stream discharges to the beach. These data have been circulated to the Regional Tidal Water Quality Team as a contribution to an ongoing investigation of historical EC bathing water failures at Bantham beach. The data are included in APPENDIX IV but have not been commented on other to say that none of the beach samples taken during the investigation contained bacteria counts that would have exceeded the ECBWD EQS's. Bantham Beach passed the EC bathing water directive standards for 1999.

The investigation initially covered sites 4 to 6 inclusive with site 4 being approximately 200 m downstream of the last identified domestic septic tank discharge pipe to the watercourse. Site 6 was replaced with 7 (see Figure 2) in order to cover potential discharges from cottages at the far east end of the village.

Further sites were used upstream of site 7 to gain a more thorough understanding of the catchment. At the headwaters (site 12, Figure 4) high bacteria counts were recorded during the 7th October 1999 survey but these were not reflected downstream at site 7 (data contained in APPENDIX IV). Between these two sites, the majority of the stream flows through 3 ponds in the Clanacombe Estate area. It is likely that these ponds, two of which are highly vegetated, acted as a form of polishing treatment resulting in the lower counts recorded downstream. Further investigations upstream could not attribute the cause of the high counts to anything other than cattle which were seen on the day of the survey very close and at times in the water course. Therefore, for the purpose of this report, site 7 is to be regarded as the highest point upstream of the village for this investigation.

The surveys were split into three types; biological assessment, chemical and bacteriological surveys.

5.1 Biological Impact Assessment

The advantage of a biological impact assessment over chemical / bacteriological surveys is that a historical impact of discharges on the macroinvertebrate community can be shown even if inputs are not causing a reduction of water quality at the time of making the collections.

The macroinvertebrate collections taken downstream of the village (site 4) contained less pollution sensitive taxa and more pollution tolerant taxa than those taken from upstream (site 6) did. This is reflected in the reduced BMWP scores and ASPT figures calculated from the collections made (see Table 1 and APPENDIX III). Since the sites were on the same watercourse and of similar site types, these results can be compared with each other. The difference in the communities recorded demonstrates a reduction in water quality at the downstream site compared to upstream (organic pollution enrichment in nature), the result of discharges from the village area to the watercourse. Incidentally, the collections from the site mid village (site 5) contained more taxa indicative of slightly better water quality than downstream and less than that observed upstream (site 6).

The reduction in water quality is further confirmed by the presence of sewage fungus downstream of the village. Sewage fungus is an aggregation of varying composition, of bacteria, algae, fungi and protozoa, frequently dominated by the slime-forming bacterium *Sphaerotilus natans*. Its presence indicates water heavily polluted with organic matter (Ref. 1). Twenty percent cover was recorded on the stones downstream of the village (site 4) whilst none was recorded upstream at site 6.

5.2 Chemical Surveys

Although the Buckland Stream is not monitored as part of the Routine Monitoring Programme and is therefore not classified as such, the chemical survey did not result in any values that would have exceeded the EQS's for an RE class 1 river. However, the chart presented in Figure 5 shows a general increase in BOD levels downstream of the village compared to upstream especially between 8:00 and 11:00 hrs. This would coincide with septic tank discharges to the stream following the use of toilets / bathrooms in the morning prior to going to work and possibly the use of washing machines / general house work in the morning.

It must be stressed, however, that the survey has been carried out at a time of year when there was probably least impact in the stream from the discharges. One would expect maximum impact at a time of low flows, minimal dilution and maximum occupancy of the properties within the village, i.e. during a long hot summer. Since the biological assessment has shown a detrimental impact on the watercourse, should the surveys be repeated during a low flow / maximum occupancy period, the village discharges have the potential to result in exceeded EQS's for RE class 1 and possible RE class 2 downstream of the village.

5.3 Bacteriological Surveys

Bacteriology, specifically the study of coliforms and faecal streptococci, is used to indicate faecally contaminated waters. These groups are natural intestinal inhabitants of warm-blooded animals including humans. Whilst normally harmless, they coexist in the gut with pathogens / disease causing organisms such as certain bacteria, protozoans and viruses. As such, the presence of coliforms in general indicates faecal contamination and possible presence of harmful pathogens (Ref. 2). Within this investigation, three bacteria groups were analysed for.

Total Coliforms:
This group includes the faecal coliforms and a wide variety of other species. They are usually associated with faecal material but some species thrive on certain types of vegetation and in soils. Included are species of *Escherichia*, *Klebsiella* and *Citrobacter* (Ref. 2).

Faecal Coliforms: These are a subgroup of the total coliforms and are thermo tolerant. This means that they are capable of living at elevated or warm-blooded temperatures. Generally the most abundant species in this group are *Klebsiella spp* and *Escherichia coli*. The latter is a natural inhabitant only in the intestine of warm-blooded animals. Presence of *E. coli* demonstrates faecal contamination and thus possible presence of intestinal or enteric pathogens (Ref. 2).

Faecal Streptococci: These include the enterococcus group and several species. Enterococci are enteric bacteria of humans (primarily *Streptococcus faecalis and S. faecium*) and as such their presence indicates wastewater contamination of human origin. The species *S. bovis*, *S. equinus* and *S. avium* are associated with non-human warm-blooded animal wastes (Ref. 2).

The charts in Figure 7 show that during the survey on the 3rd November 1998, the total and faecal coliform counts downstream of the village are greater than those recorded in upstream samples. In similar pattern to the BOD levels, the increase in counts is recorded in the morning samples indicating inputs from septic tank discharges.

Results from the 7th October 1999 survey are more conclusive. The charts in Figure 9 compare the bacteria counts recorded upstream with those downstream of the village. Again, the counts are elevated in the morning downstream of the village (maximum total coliforms. 26000 no/100ml, faecal coliforms 6000 no/100ml during period approximately 07:00 to 11:30 hrs) compared to low counts upstream during the same period (maximum total coliforms 600 no/100ml, faecal coliforms 650 no/100ml). This represents an approximate increase by 2 orders of magnitude for total coliforms and an order of magnitude for the faecal coliforms being attributable to the village discharges.

Besides results from the individual samples, the geometric means calculated for each of the sites using the data sets (see table 5) also illustrates the impact of the village discharges on the water quality of the stream.

Further confirmation as to the likely source of the bacterial contamination can be seen in the faecal colrform to faecal streptococcus ratio. Ratios greater than 4.4 indicate faecal pollution from human sources (i.e. discharges from septic tanks); ratios less than 0.7 indicate non-human sources and that in-between indicates a mixture. It should be noted that these ratios are only valid within 24 hours following the discharge due to the rapid die off of faecal streptococci outside the host (Ref. 2.).

The ratios given in Tables 2 and 4 for the downstream site indicate 7 and 5 samples respectively to be solely contaminated with human faecal matter. Again, the patterns of these samples are generally in the morning part of the survey, corresponding to the routine habits as discussed previously. This contrasts with the upstream data where the ratios indicated that none of the samples were exclusively contaminated by human waste. However it must be noted this is an indication only.

5.4 In Summary

The discharges from the village are having an impact on the water quality in the Buckland Stream some 200-metres downstream of the last identified septic tank discharge pipe. The resulting decrease in water quality downstream of the village has primarily been indicated by the decrease in pollution sensitive taxa and increase in pollution tolerant taxa downstream compared to that upstream. Sewage fungus was not present upstream but covers the stones downstream at approximately 20%.

The chemical and bacteriological data gathered from the stream show patterns during the day which reflect expected patterns should septic discharges be getting into the watercourse. However, no chemical EQS's were exceeded at the time of the survey. The bacteriological surveys have again confirmed there is an impact from discharges from the village.

In some cases, the faecal coliform counts have been increased by an order of magnitude downstream. Evidence as to the source of the bacterial loading has come from the faecal coliform to faecal streptococci ratios, which indicate the bacterial contamination is very likely to be faecal matter of human origin.

What is clear is that the surveys have shown the impact of the village on the Buckland stream during periods when any effect would likely be low. The surveys were not able to be carried out during the summer months. Rather than postpone the investigation further until this summer, it was decided to carry out the work to gain what evidence we could.

To record the maximum impact, the surveys would need to be repeated at a time of maximum discharge to the watercourse combined with minimum dilution effect from the stream. This would occur during a long dry period when many of the holiday let / 2nd homes in the village were occupied i.e. summer, preferably the bathing season. Any further data if gathered should also be collected with regard for use in the Bantham Beach study.

6. CONCLUSIONS

1. The discharges from West / East Buckland are having a detrimental effect on the macroinvertebrate community in the Buckland Stream. Sewage fungus is present in the watercourse downstream of the village, but not upstream, indicating organic pollution entering the stream from the village discharges.

2. No RE class EQS's for river water quality were exceeded in samples taken during the chemical survey.

3. Counts of total / faecal coliforms and faecal streptococci were greater downstream of the village than those upstream. Maximum counts downstream during the morning period were up to 43 times (total coliforms) and 9 times (faecal coliforms) greater than maximum counts during the same period upstream. Many of the faecal coliform to faecal streptococci ratios indicate the source to be solely human downstream and not solely human upstream i.e. the contamination to be from septic tanks.

4. Although the impact from the discharges into the stream and reduction in water quality was demonstrable, the surveys were carried out during a period of relatively low impact to the watercourse. To illustrate the maximum impact, worst case scenario, the surveys would need to be carried out again during low river flows and maximum house occupancy i.e. a dry hot summer.

7. RECOMMENDATIONS

1. The surveys should ideally be carried out again during high property occupancy and low stream flows. It has been agreed at the Bathing Waters Investigations meeting (13 April 2000), that the Buckland Stream surveys will be repeated July / August 2000 Bank Holiday when ST's should be full and overflowing with potentially maximum impact on the river water quality.

   Action: Area Investigation Team.

8. REFERENCES

1 P.D. Abel 1989. Water Pollution Biology. Ellis Horwood Ltd.

2 Task Force on Wastewater Biology 1990. Wastewater Biology: The Microlife. Water Pollution Control Federation (WPCF).

Figure 1. Map showing the Buckland Stream and sample sites

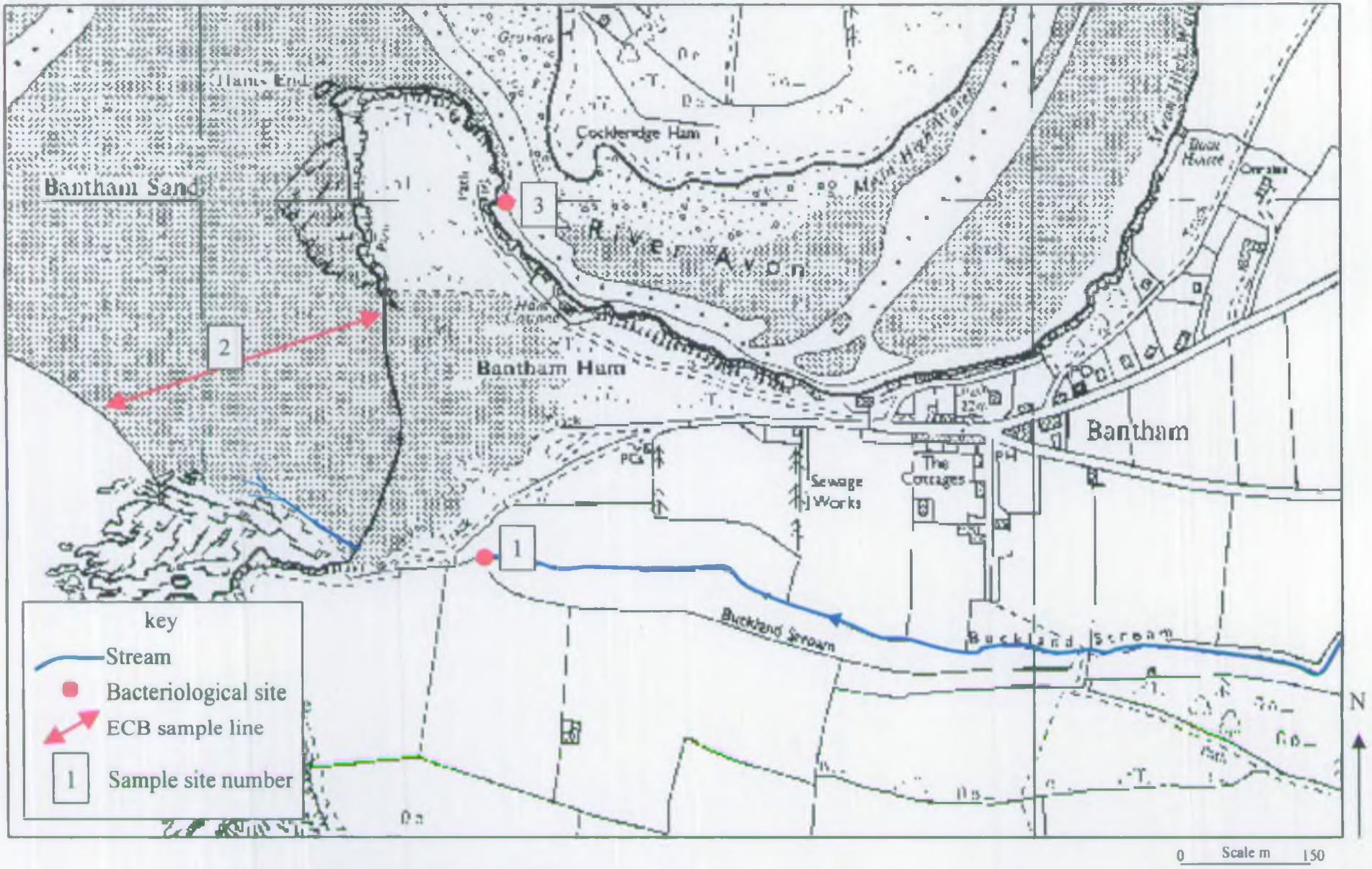


Figure 2. Map showing the Buckland Stream and sample sites

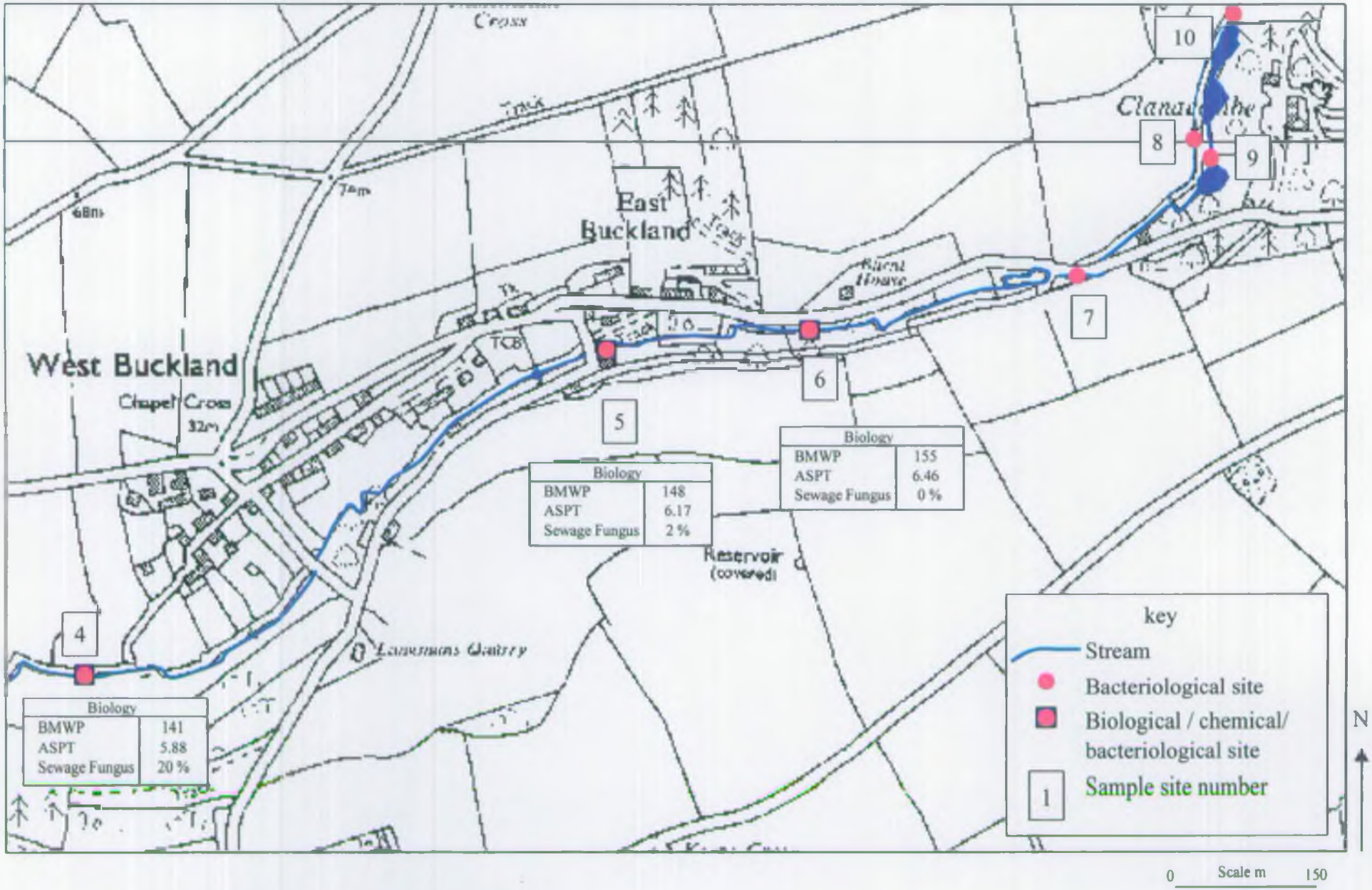


Figure 3. Map showing the Buckland Stream and sample sites

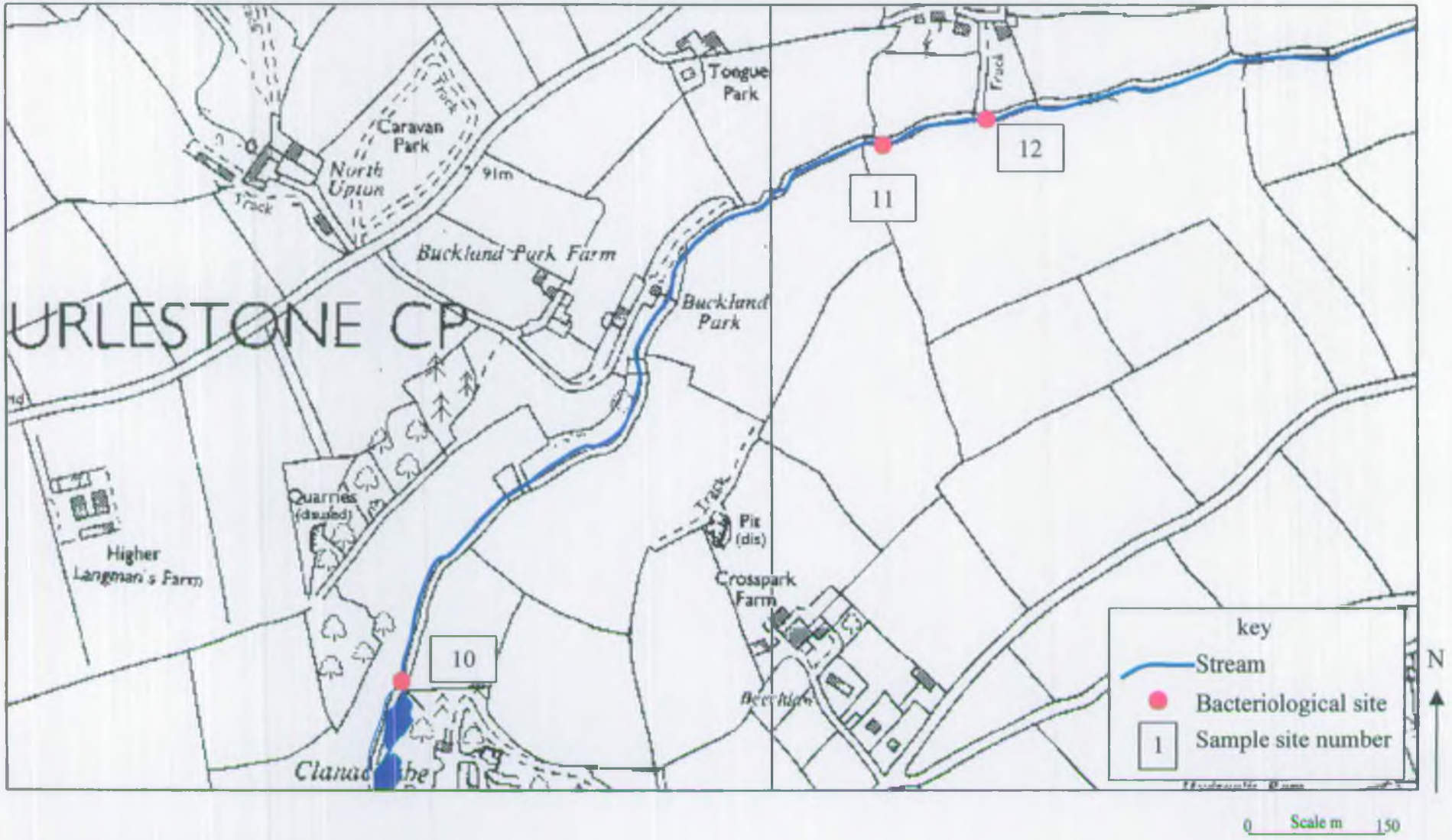


Figure 4. Map showing the Buckland Stream and sample sites

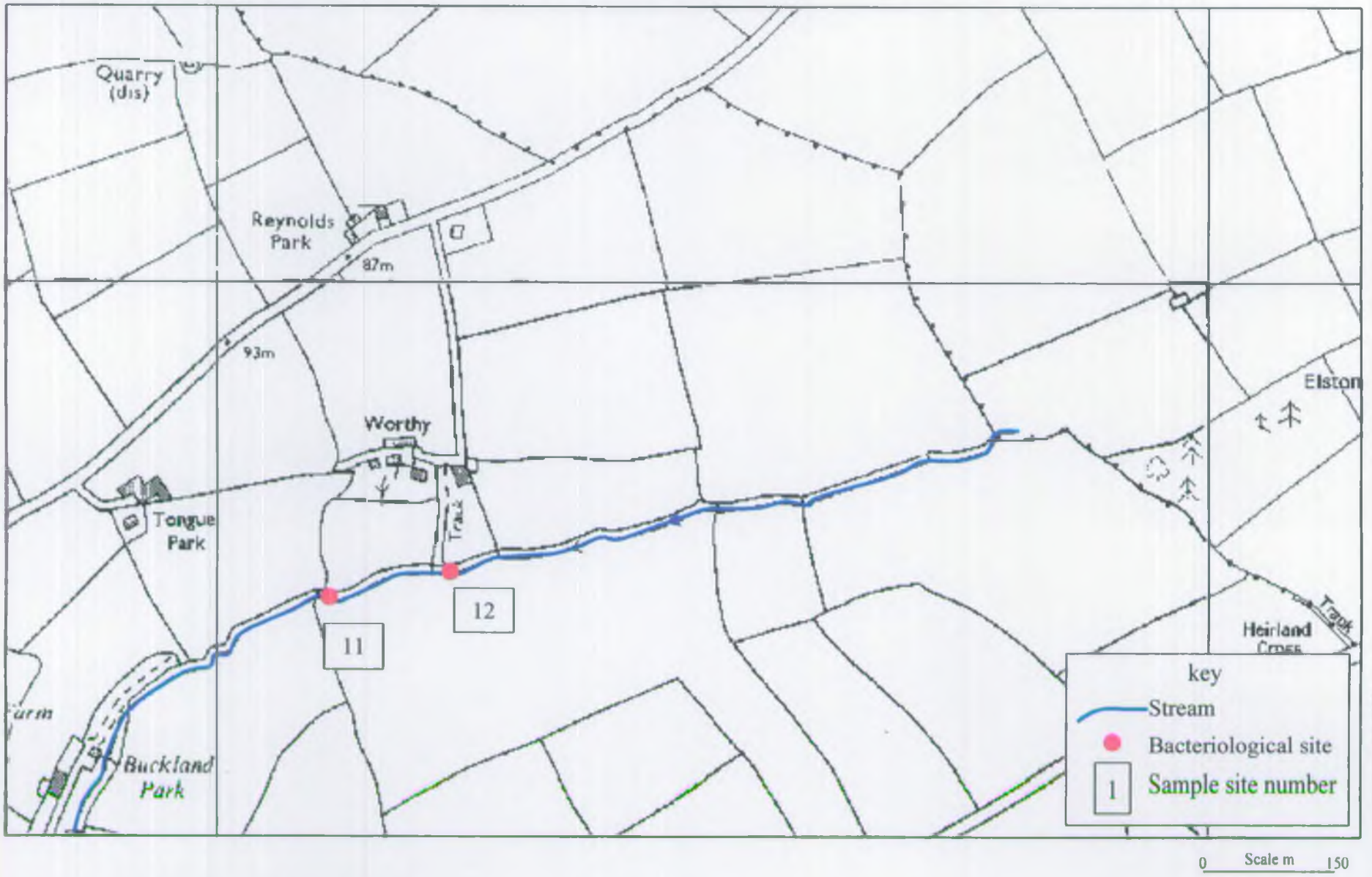


Table 2. The bacteriological results from the Buckland Stream survey 3 November 1998.

Upstream (site 6)					Village (site 5)					Downstream (site 4)				
Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c : f.s ratio	Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c : f.s ratio	Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c : f.s ratio
06:30	330	360	117	2.82	06:24	270	490	135	2.00	06:00	380	4300	180	2.11
07:07	310	480	135	2.30	07:01	440	400	330	1.33	06:50	2300	5300	198	**11.62**
07:45	380	580	320	1.19	07:42	310	630	108	2.87	07:30	610	16000	126	**4.84**
08:17	310	510	108	2.87	08:11	280	1091	230	1.22	08:00	2000	46000	200	**10.00**
09:23	530	1009	180	2.94	09:18	530	1700	54	**9.81**	09:05	630	21000	99	**6.36**
10:25	310	410	117	2.65	10:15	380	1091	117	3.25	10:04	2800	41000	230	**12.17**
11:20	280	430	72	3.89	11:15	230	727	90	2.56	11:03	610	4100	135	**4.52**
12:17	210	450	108	1.94	12:10	210	550	72	2.92	12:00	530	6300	117	**4.53**
13:17	410	545	230	1.78	13:09	410	340	90	**4.56**	13:00	117	380	153	0.76
14:19	153	210	45	3.40	14:09	400	135	153	2.61	14:00	330	2100	90	3.67
15:11	1636	1909	440	3.72	15:09	1727	1727	610	2.83	15:00	230	1545	480	0.48
16:15	380	420	171	2.22	16:05	420	510	390	1.08	16:00	510	4100	510	1.00
17:25	780	1727	250	3.12	17:19	430	350	162	2.65	17:09	340	1909	198	1.72
17:49	410	909	600	0.68	17:44	1545	1000	410	3.77	17:35	480	2800	240	2.00
18:18	710	650	550	1.29	18:12	400	610	410	0.98	18:05	630	2800	370	1.70
18:50	800	1364	2000	0.40	18:45	630	818	865	0.73	18:31	440	15000	600	0.73
19:12	550	727	670	0.82	19:08	620	1182	1198	0.52	19:01	710	48000	1000	0.71
Geo Means	**424**	**629**	**222**			**449**	**659**	**214**			**578**	**6065**	**227**	

9.81 Ratio above 4.4 indication human origin

F.C.: faecal coliforms

T.C.: total coliforms

F.S.: faecal streptococci

Table 3. The sanitary results from the Buckland Stream survey 3 November 1998

Date	Time	Site	D.O. % sat	BOD mg/l	Ammonia as N mg/l	Nitrate mg/l	S.S 105 °C mg/l
03-Nov-98	6:00	4	93.0	1.3	0.031	8.9580	16.7
03-Nov-98	6:50	4	93.6	1.3	< 0.030	8.9368	14.0
03-Nov-98	7:30	4	91.9	1.1	< 0.030	8.8874	21.7
03-Nov-98	8:00	4	92.5	1.3	0.045	8.8477	21.9
03-Nov-98	8:32	4	91.0	1.6	0.075	8.7832	31.9
03-Nov-98	9:05	4	92.7	1.2	0.040	8.7561	24.0
03-Nov-98	10:04	4	91.7	1.3	0.050	8.7949	22.1
03-Nov-98	11:03	4	92.1	1.1	0.044	8.8757	16.9
03-Nov-98	12:00	4	92.4	1.1	0.034	8.8969	16.5
03-Nov-98	13:00	4	93.4	1.0	0.032	8.7958	15.2
03-Nov-98	14:00	4	92.4	< 1.0	0.033	8.9573	15.3
03-Nov-98	15:00	4	91.0	< 1.0	0.043	9.0458	13.8
03-Nov-98	16:00	4	94.7	1.0	0.031	9.0163	12.8
03-Nov-98	17:09	4	94.9	1.1	0.032	8.9668	24.7
03-Nov-98	17:35	4	94.5	1.2	0.041	8.8922	19.4
03-Nov-98	18:05	4	94.7	1.6	0.035	9.0249	59.7
03-Nov-98	18:31	4	94.0	1.4	0.056	9.0424	37.8
03-Nov-98	19:01	4	93.0	1.5	0.066	9.1012	29.9
03-Nov-98	6:24	5	92.5	1.4	0.036	9.0571	9.9
03-Nov-98	7:01	5	92.5	1.1	< 0.030	8.6698	8.6
03-Nov-98	7:42	5	93.1	1.2	< 0.030	8.9587	10.6
03-Nov-98	8:11	5	92.4	1.2	0.048	9.0853	13.1
03-Nov-98	8:46	5	93.9	1.0	< 0.030	8.9873	10.4
03-Nov-98	9:18	5	93.6	1.1	0.033	9.0177	10.6
03-Nov-98	10:15	5	92.4	1.0	0.034	8.9665	11.4
03-Nov-98	11:16	5	92.9	1.0	< 0.030	8.9872	11.8
03-Nov-98	12:10	5	92.7	< 1.0	< 0.030	9.0682	8.4
03-Nov-98	13:09	5	92.3	< 1.0	< 0.030	8.9981	7.8
03-Nov-98	14:09	5	93.2	1.0	< 0.030	8.9764	12.9
03-Nov-98	15:09	5	96.2	< 1.0	0.036	9.1268	8.6
03-Nov-98	16:05	5	95.8	1.2	< 0.030	9.2076	9.6
03-Nov-98	17:19	5	94.5	< 1.0	0.040	9.1762	15.6
03-Nov-98	17:44	5	96.0	1.4	0.045	9.1653	77.9
03-Nov-98	18:12	5	95.1	1.3	0.045	9.1442	34.5
03-Nov-98	18:45	5	94.2	1.2	0.044	9.1922	31.6
03-Nov-98	19:08	5	95.0	1.2	0.053	9.1107	28.9
03-Nov-98	6:30	6	93.3	1.2	< 0.030	9.2011	12.7
03-Nov-98	7:07	6	92.5	1.3	< 0.030	9.1306	21.3
03-Nov-98	7:45	6	92.1	1.4	0.042	9.1377	25.3
03-Nov-98	8:17	6	93.9	1.2	< 0.030	9.1102	17.2
03-Nov-98	8:52	6	92.1	1.2	< 0.030	9.0191	22.3
03-Nov-98	9:23	6	91.6	1.1	0.034	9.0467	28.6
03-Nov-98	10:25	6	91.4	1.2	< 0.030	9.0713	17.0
03-Nov-98	11:20	6	93.2	< 1.0	< 0.030	9.0405	16.9
03-Nov-98	12:17	6	94.0	< 1.0	< 0.030	9.1713	14.6
03-Nov-98	13:17	6	93.5	1.2	0.045	9.0200	21.9
03-Nov-98	14:19	6	93.4	< 1.0	< 0.030	9.0516	15.2
03-Nov-98	15:11	6	96.9	1.0	< 0.030	9.2197	17.9
03-Nov-98	16:15	6	96.3	< 1.0	< 0.030	9.2806	13.9
03-Nov-98	17:25	6	95.6	2.0	< 0.030	9.2075	138.0
03-Nov-98	17:49	6	94.3	1.6	0.040	9.3066	78.4
03-Nov-98	18:18	6	94.0	1.4	0.039	9.0848	49.2
03-Nov-98	18:50	6	94.2	1.2	0.049	9.2319	44.8
03-Nov-98	19:12	6	92.4	1.2	0.040	9.3835	35.0

D.O. % sat: Dissolved Oxygen % saturation

BOD : Biochemical Oxygen Demand

S.S 105 °C Suspended solids dried at 105 °C

Table 4. Bacteriological results from the Buckland Stream survey 7 October 1999

Upstream (site 7)					Village (site 5)					Downstream (site 4)				
Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c. : f.s. ratio	Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c. : f.s. ratio	Time	F. C. no/100ml	T. C. no/100ml	F. S. no/100ml	f.c. : f.s. ratio
07:22	650	510	230	2.83	07:20	630	1818	490	1.29	07:05	1818	2500	490	3.71
08:23	500	480	210	2.38	08:21	560	3600	560	1.00	08:10	3000	4100	1455	2.06
09:12	400	480	260	1.54	09:05	650	4000	410	1.59	09:00	6000	26000	460	**13.04**
09:50	490	410	260	1.88	09:46	700	33000	430	1.63	09:39	5400	26000	570	**9.47**
10:33	300	470	250	1.20	10:30	550	5500	450	1.22	10:20	4600	4000	440	**10.45**
11:36	560	600	210	2.67	11:22	2100	16000	560	3.75	11:17	2500	4000	500	**5.00**
12:30	410	420	225	1.82	12:26	800	3500	550	1.45	12:20	540	4600	410	1.32
13:20	390	370	220	1.77	14:55	650	6000	470	1.38	13:05	2200	4500	420	**5.24**
15:00	300	360	180	1.67	15:50	700	4600	340	2.06	14:50	740	5500	470	1.57
15:55	250	350	200	1.25	16:35	3700	5000	750	**4.93**	15:45	450	8000	490	0.92
16:45	450	450	230	1.96	17:20	400	14000	5900	0.07	16:30	540	3900	460	1.17
17:25	5200	6600	1545	3.37	18:50	2500	4800	2300	1.09	17:15	955	19000	540	1.77
18:20	750	2000	640	1.17	19:05	1545	3600	750	2.06	18:05	390	3800	500	0.78
19:10	520	910	450	1.16	19:50	1171	3300	710	1.65	19:00	919	5900	450	2.04
19:55	620	710	510	1.22						19:45	770	3800	2000	0.39
Geo. Means	**530**	**632**	**302**			**945**	**5593**	**692**			**1372**	**6123**	**563**	

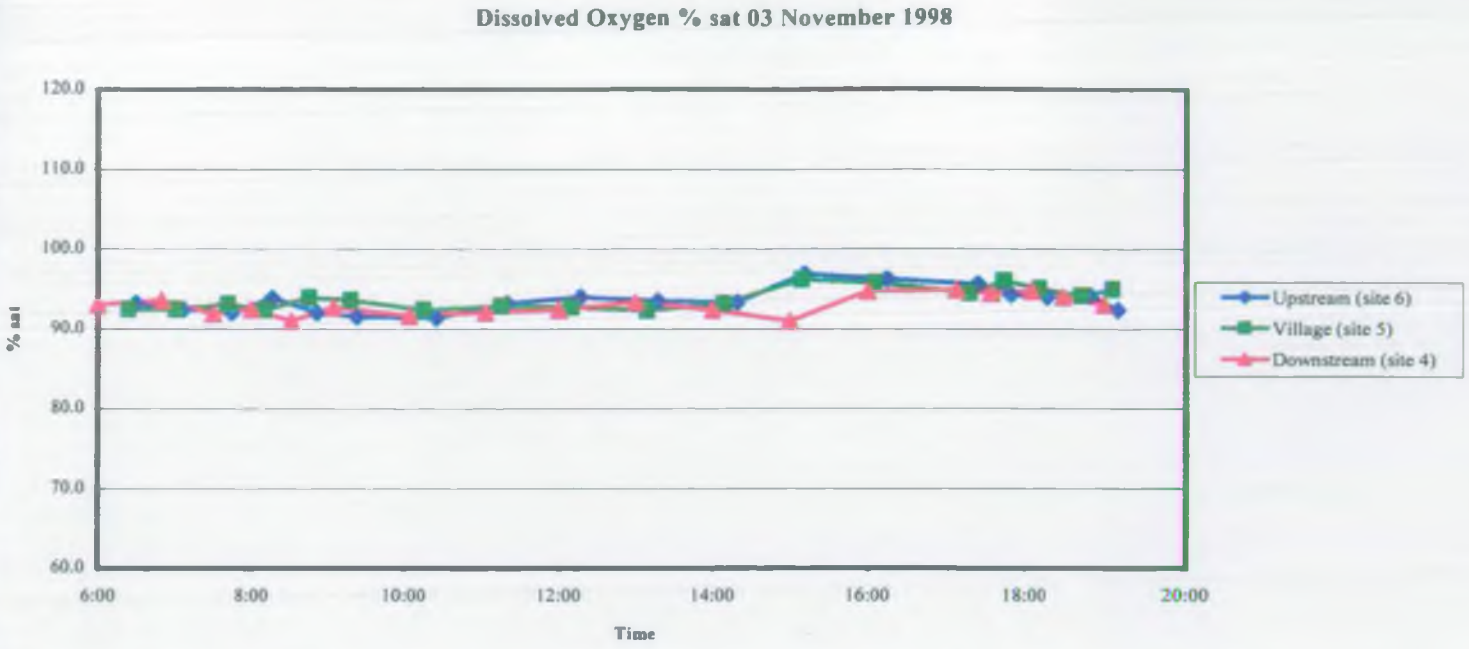
4.93 Ratio above 4.4 indicating human origin

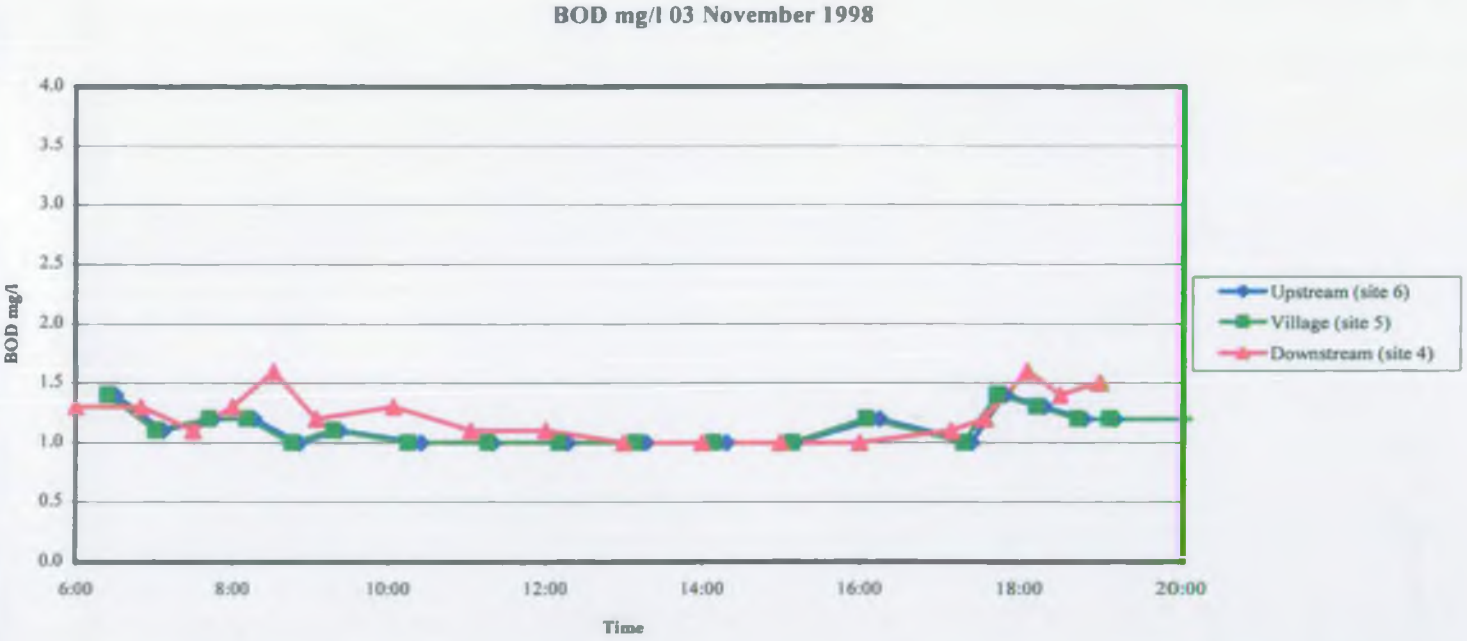
F.C.: Faecal coliforms

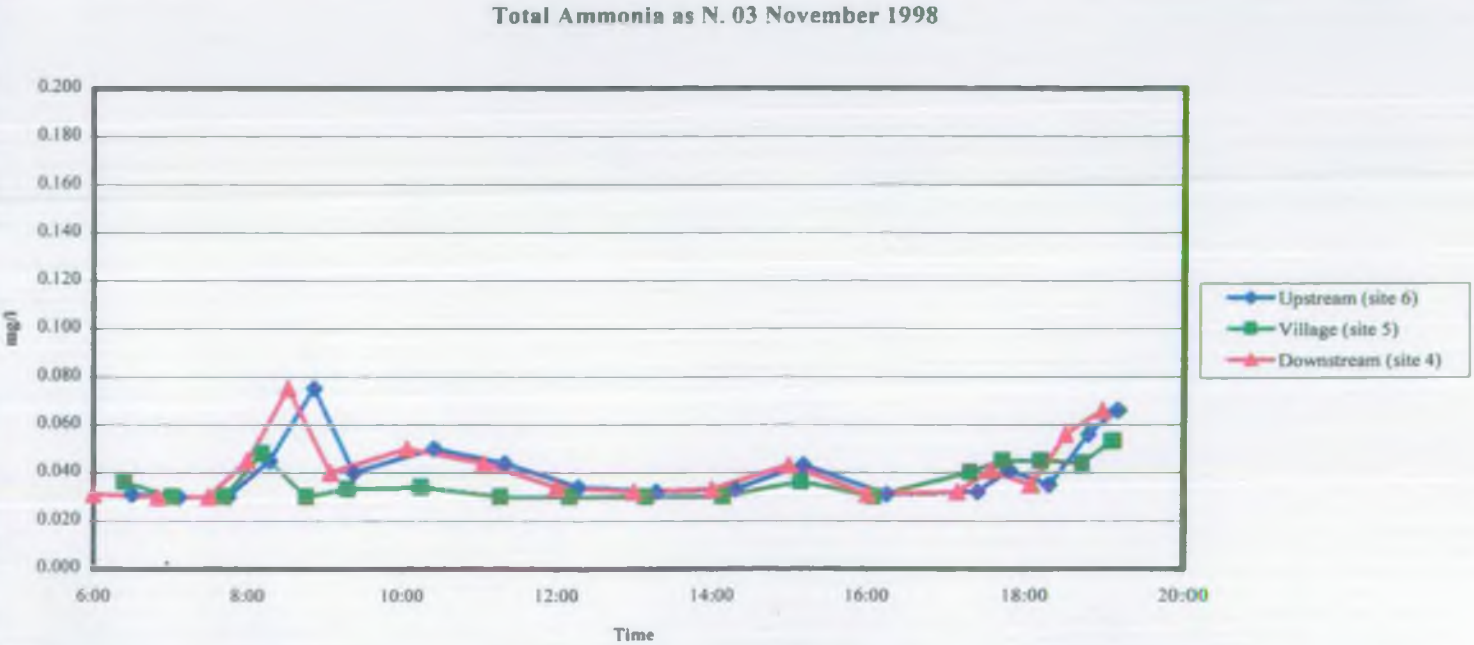
T.C.: Total coliforms

F.S.: Faecal streptococci

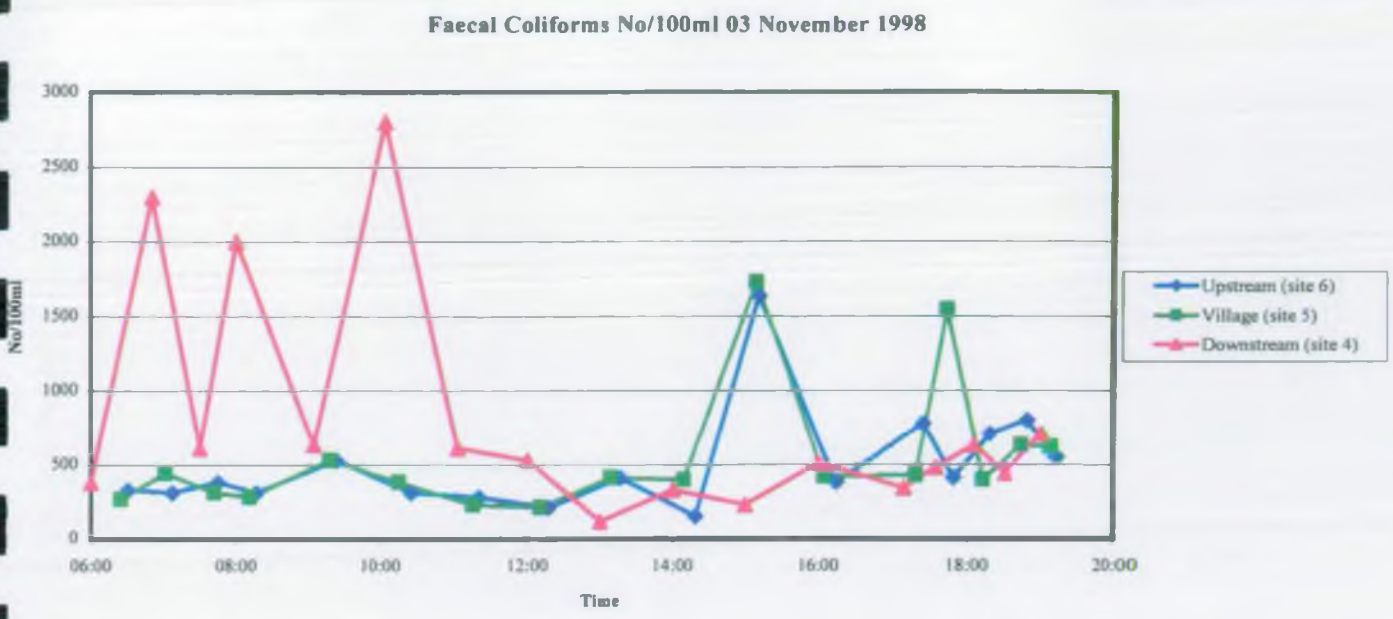
Figure 5. Charts comparing the same determinands with each sample site.

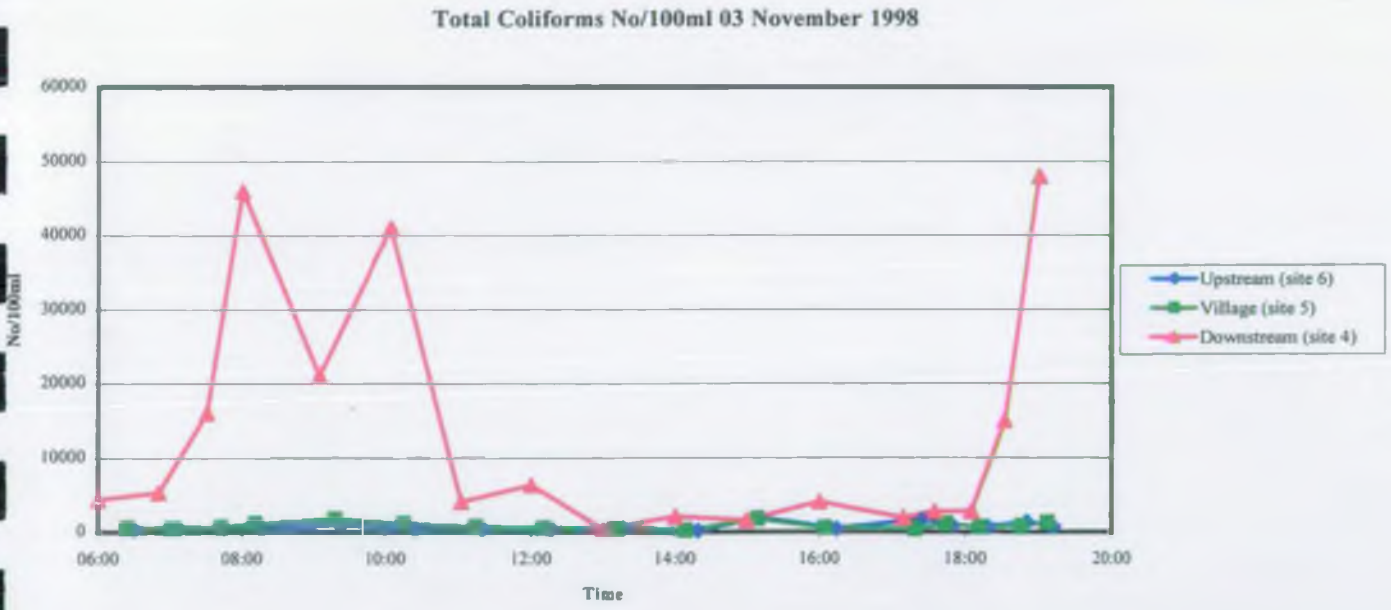






gure 6. Charts comparing the same bacteria groups for each sample site: 03 November 1998





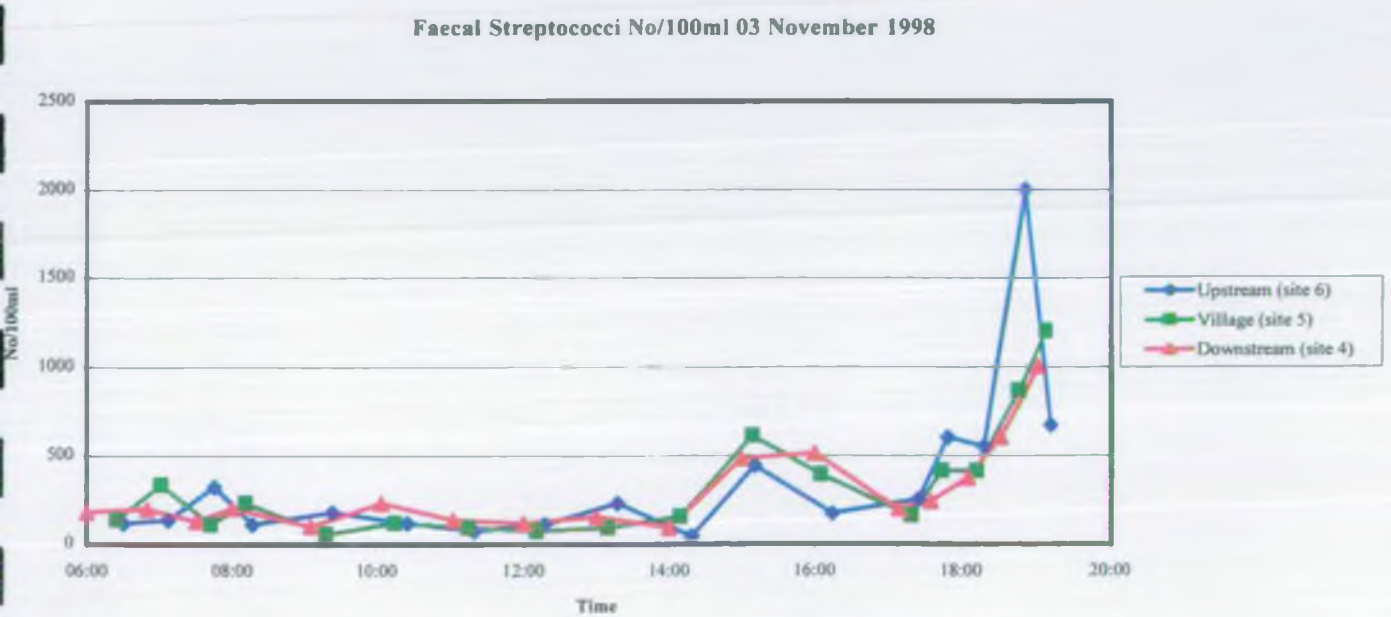
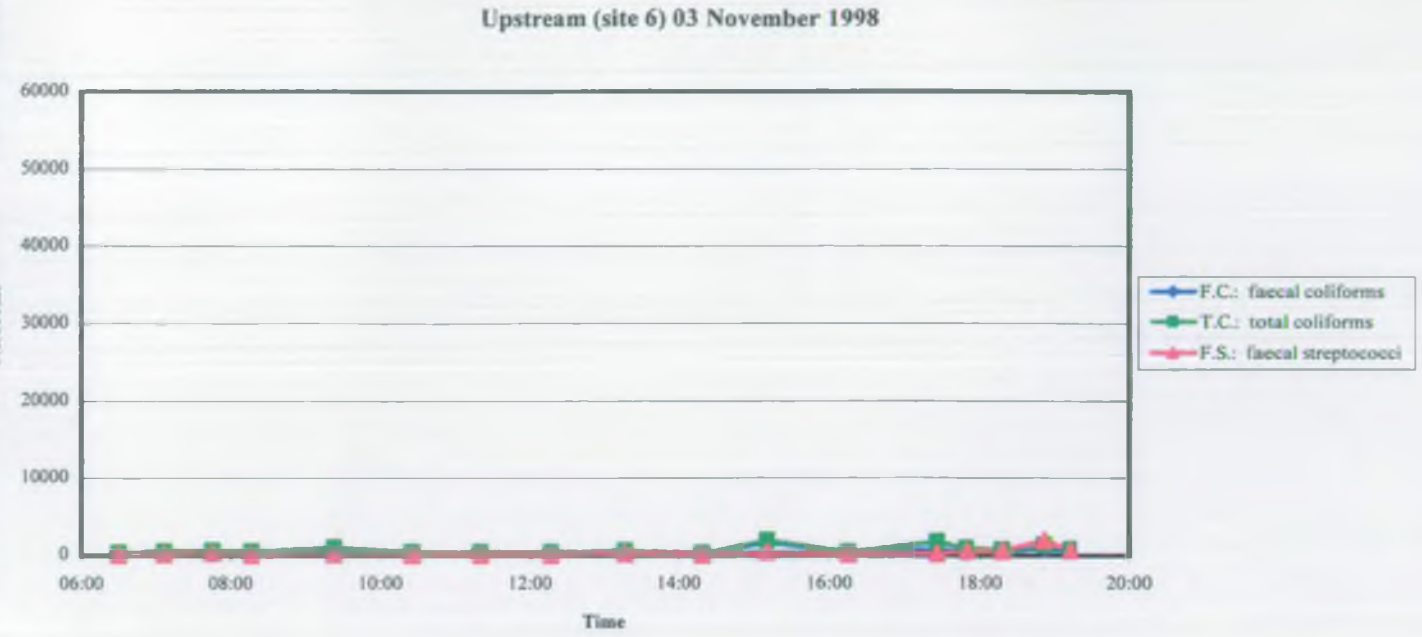
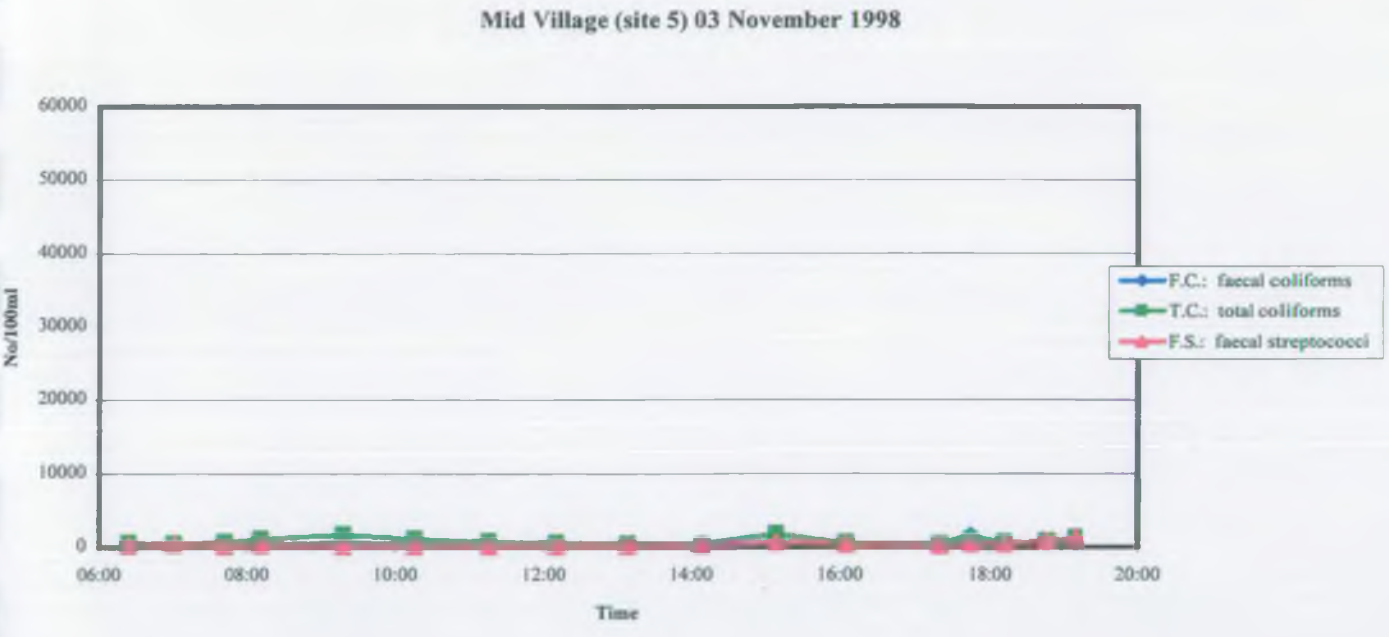


Figure 7. Charts comparing the same bacteria groups for each sample site: 03 November 1998





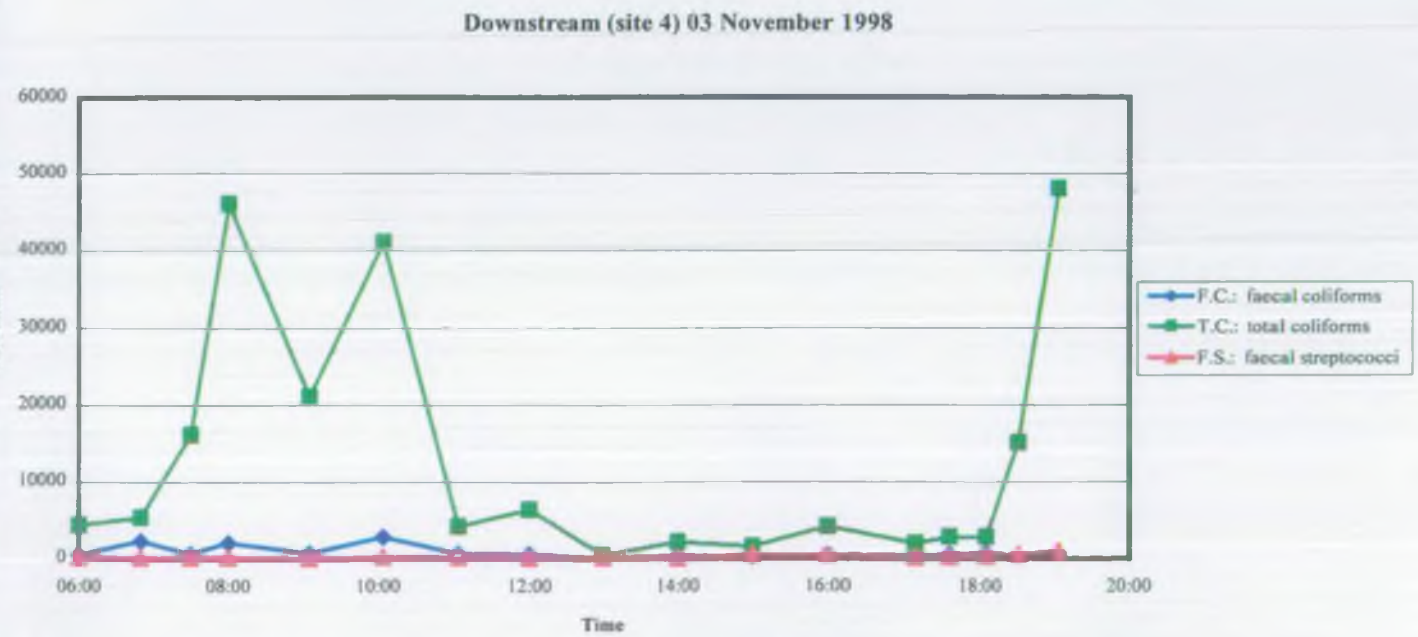
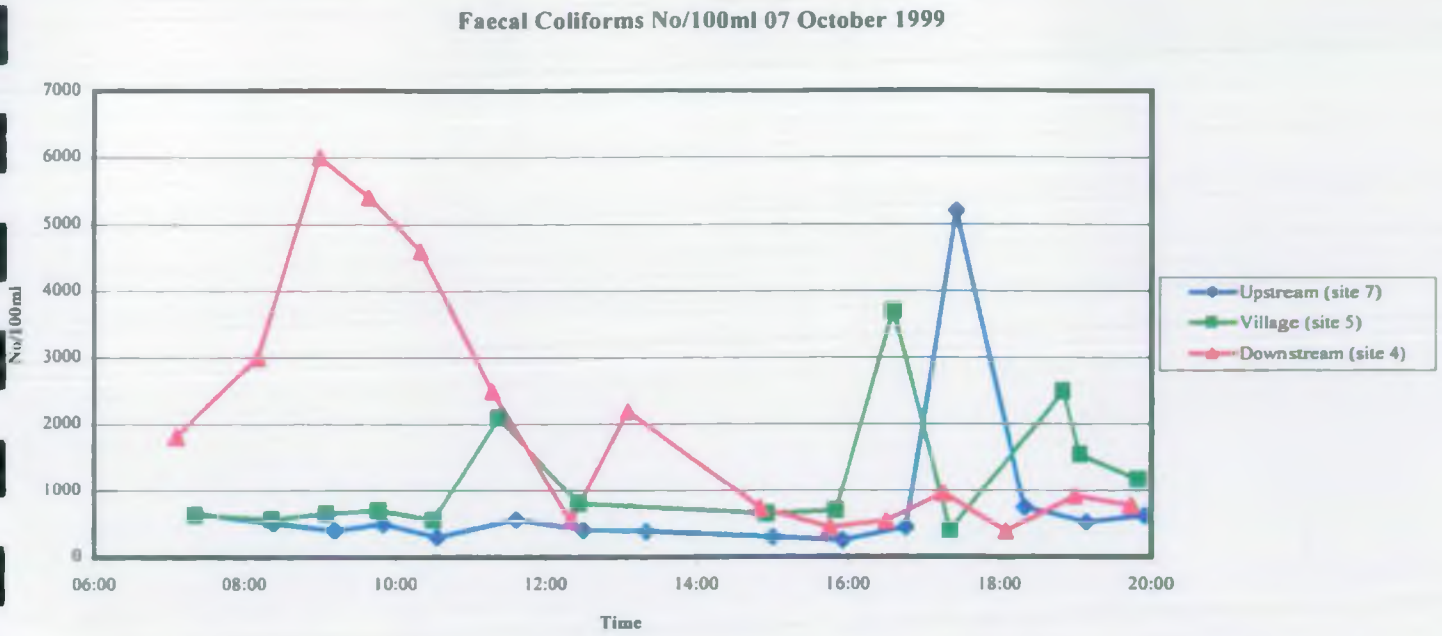
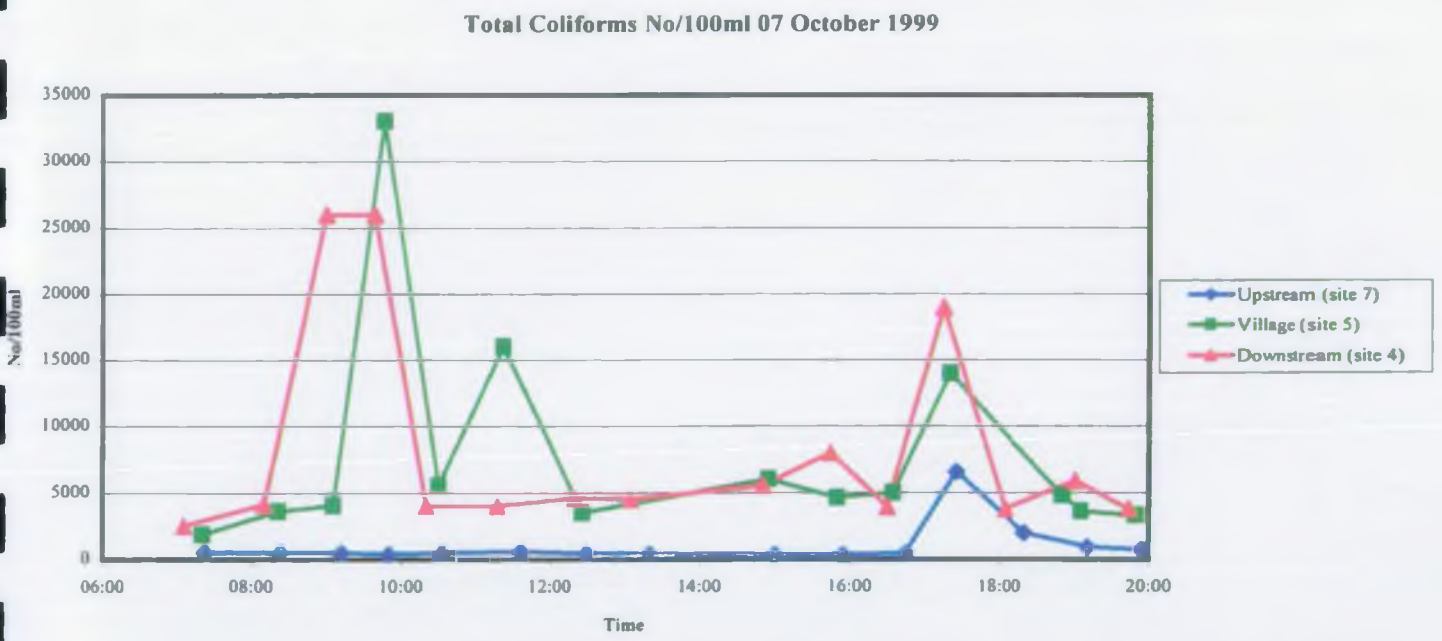


Figure 8. Charts comparing the same bacteria groups for each sample site: 07 October 1999





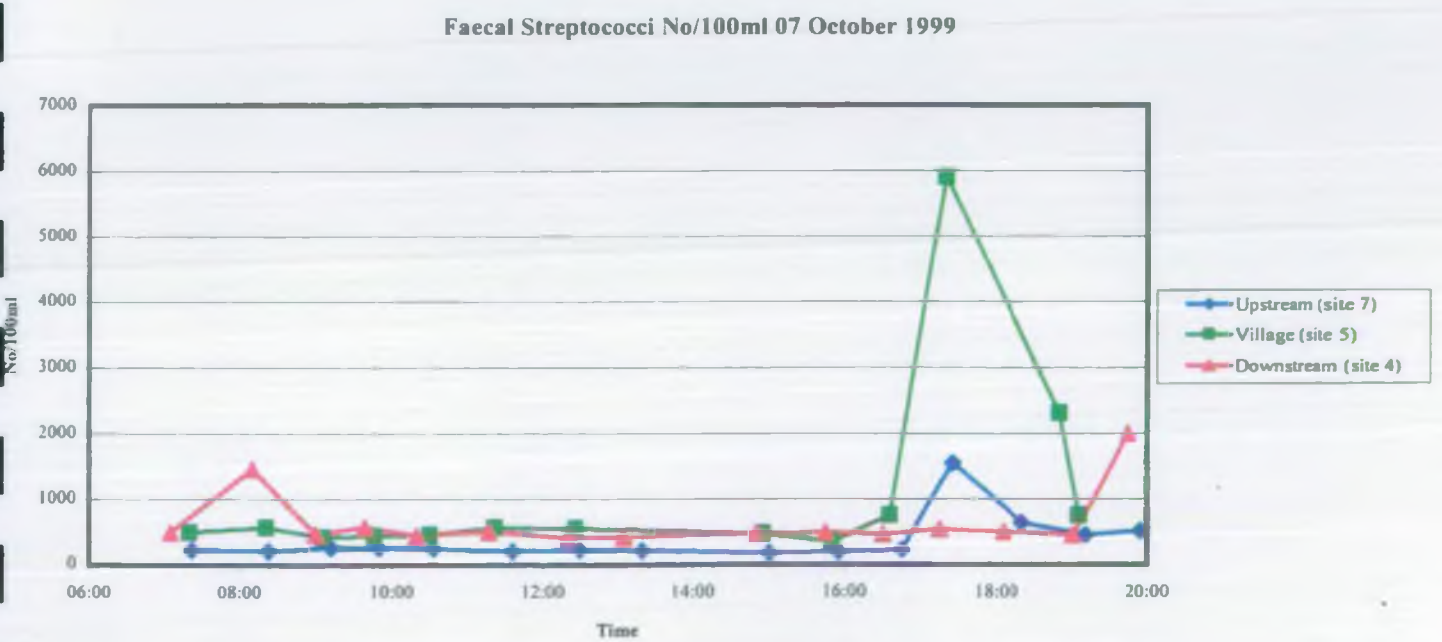
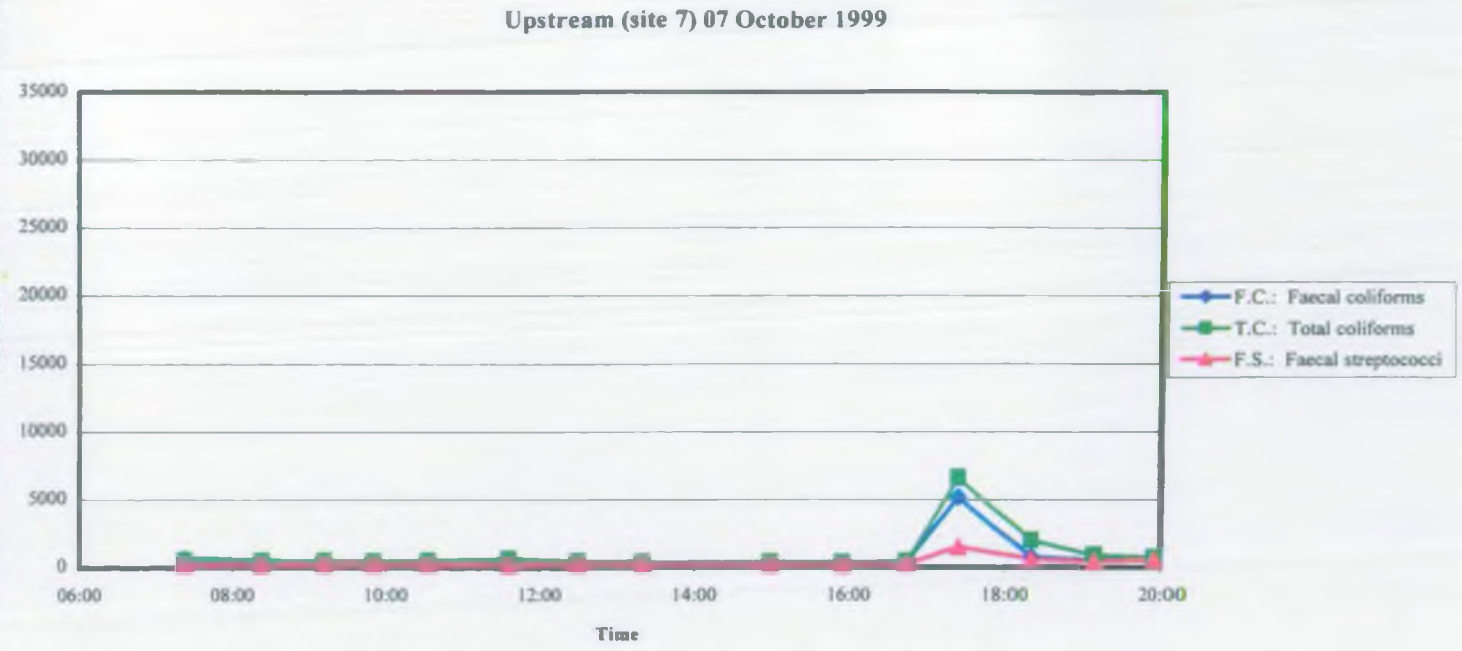
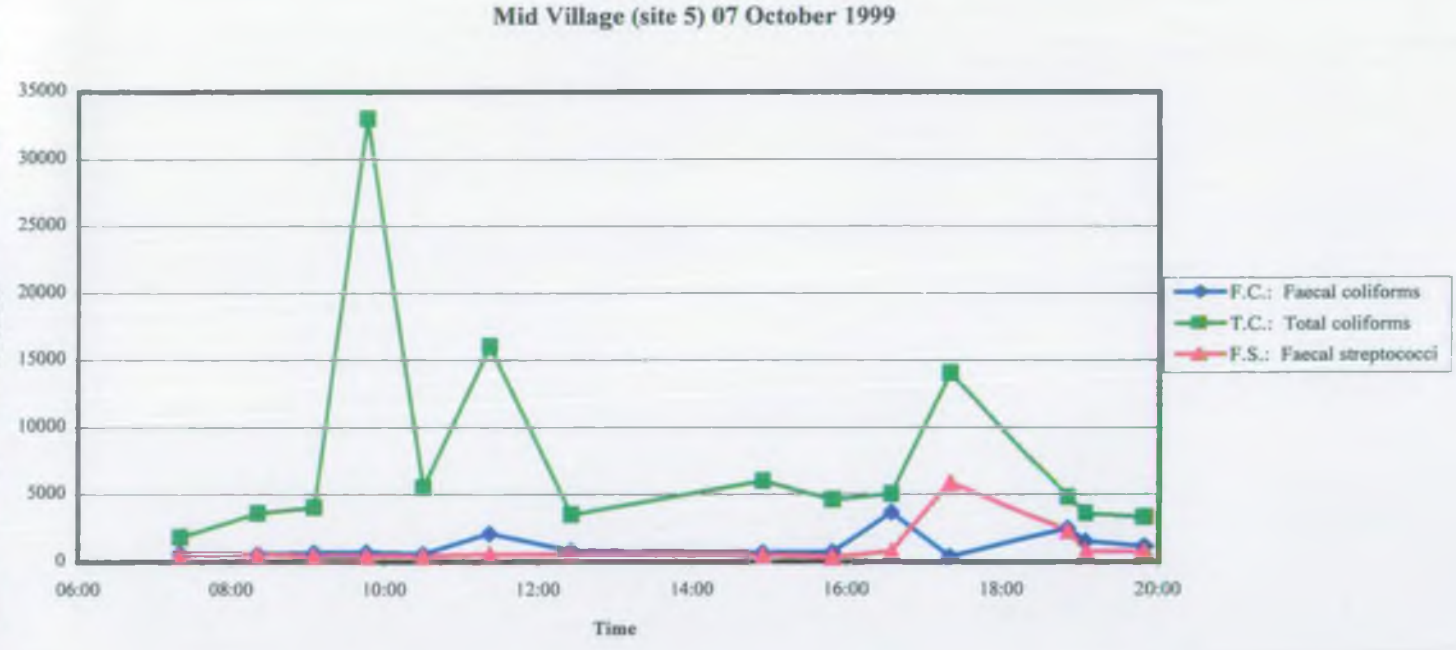
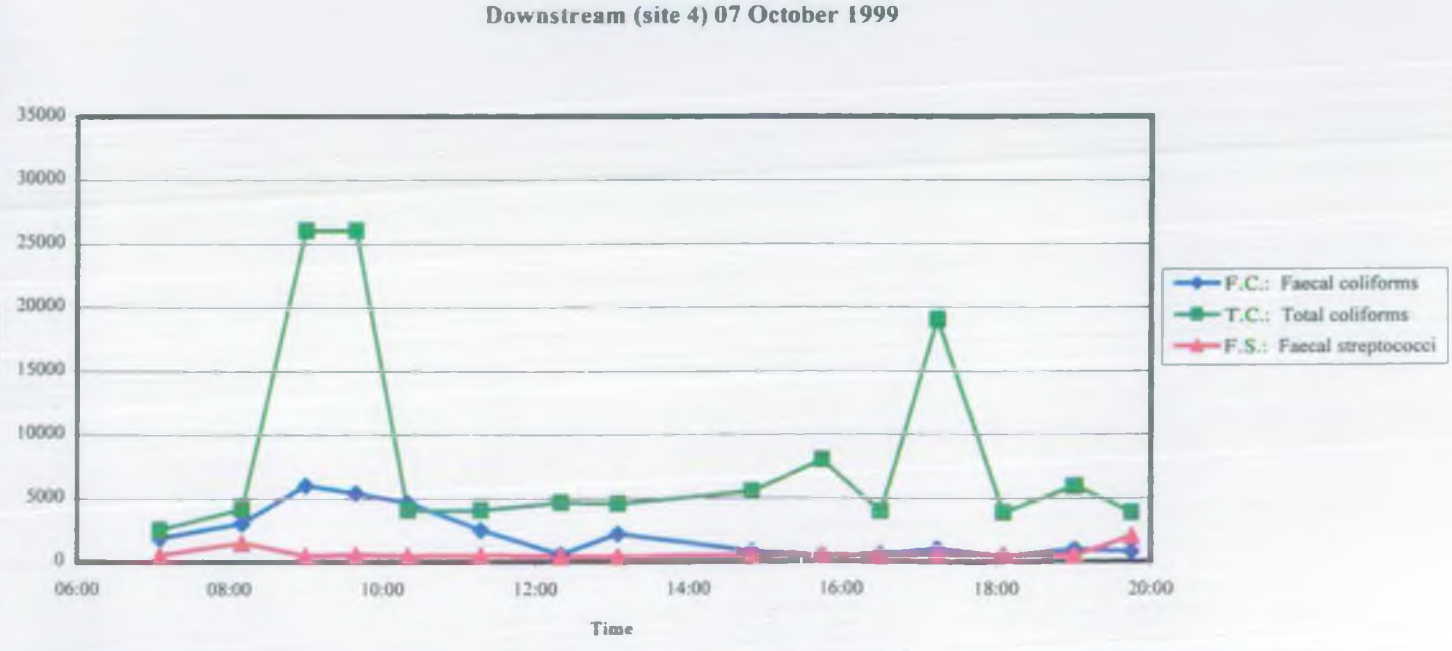


Figure 9. Charts comparing the same sample sites for each bacteria groups: 07 October 1999







APPENDIX I

APPENDIX II

Biodiversity Appraisal Form

TO: CONSERVATION
Date: 27/9/99

FROM: DEVON AREA INVESTIGATION
Name: Peter Rose **Ext:** 6105

An investigation is currently being undertaken at Buckland Stream Bantham Beach NGR See below.

Please could you check your records for any possible conservation sites or environmentally sensitive areas at or in close proximity to the investigation.

MAP SHOWING SITE OF INVESTIGATION AND SURROUNDING AREA

Nature of investigation:
Bantham beach EQBW failure investigation. Buckland Stream suspected - Sampling over 12 hr period for bacti + Basic San; evidence possibly to be used for "First time Sewerage" scheme.
NGR Range SX 6599 4386 to SX 6921 4471

INVENTORY OF WILDLIFE SITES IN SOUTH HAMS DISTRICT 1994

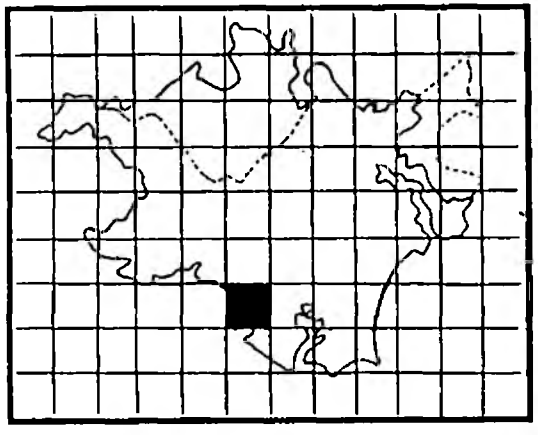
Scale: 1:25,000

miles

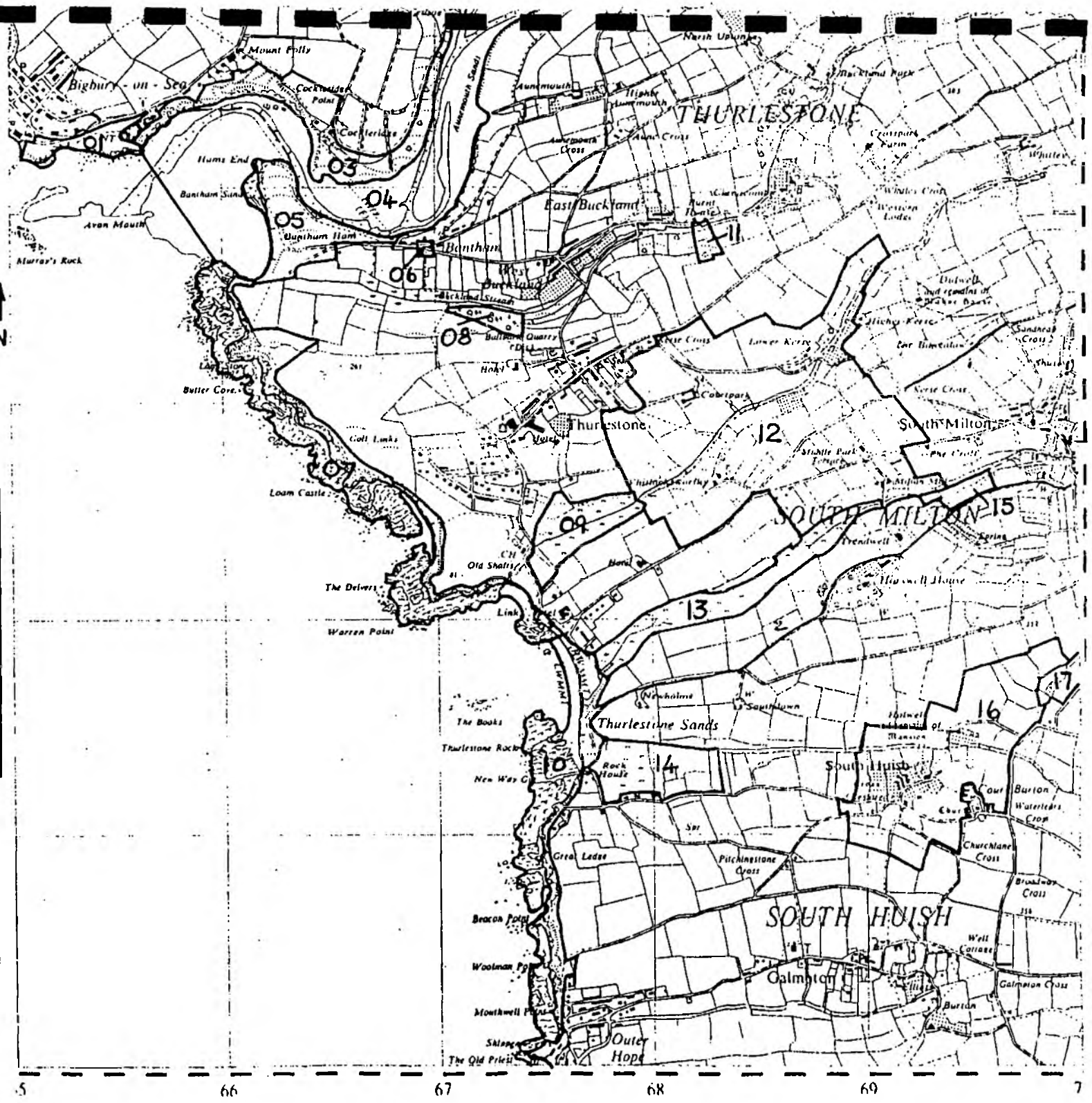
kilometres

N

SX 64 SE



DEVON wildlife TRUST



APPENDIX III

DEVON AREA INVESTIGATIONS TEAM ACTIVITY RISK ASSESSMENT

Date last modified 22/06/99

SITE: Buckland Stream / Banthar Beach.

CATCHMENT: 08A

Date of Assessment: 27/9/99

Name of Officer: P Rose

CONSIDERATION	YES	NO	ACTIONS REQUIRED
(A) GENERAL			
1. Do you need to notify site manager/ landowner of Agency presence?	✓		Banthar beach if before 9.00am to unlock gate. Project manager to arrange
2. Do you need to be accompanied by site staff?		✓	
3. Does task require more than one person?	✓		During hours of dark or v. bad weather at B. beach.
4. Are you working outside daylight hours?	✓		depending on date of surveys, early morning or early evening.
5. Is the site isolated	✓		at times of darkness see above
5. Do you need to employ Lone Worker procedures?		✓	Double manning at times above.
6. Is protective clothing is required?	✓		Wellies, gloves, life jacket for beach + Sample pole.
7. Will seasonal factors affect site safety?	✓		V. rough weather, danger on beach, some rocks slippy.
8. Are there dangers from the following			
chemicals		✓	
biological hazard		✓	
explosive gases		✓	
inhalation of fumes/dust/asbestos		✓	
moving vehicles		✓	
machinery		✓	
falling objects		✓	
9. Are overhead power supplies present?		✓	
10. Is site secure for equipment installation?			N/A
(B) VEHICLE ACCESS			
1. Is there safe vehicle acces to site?	✓		
2. Can vehicles be parked/left safely?	✓		

APPENDIX IV

Number	Site	Date	Time (BST)	Sal g/kg	Wind Direction	Weather Precipitatio	Cloud Cover	Wind Speed Beaufort	State of Sea	Vis Pollutio	F. strep No/100ml	T. coli No/100ml	F. coli No/100ml
70815410	Site 1 SX 6630 4355	07-Oct-99	07:11	0							153	490	390
70815410	Site 1 SX 6630 4355	07-Oct-99	08:01	0							108	2000	430
70815410	Site 1 SX 6630 4355	07-Oct-99	08:39	0							108	400	400
70815410	Site 1 SX 6630 4355	07-Oct-99	09:17	0							63	520	310
70815410	Site 1 SX 6630 4355	07-Oct-99	10:14	0							63	410	350
70815410	Site 1 SX 6630 4355	07-Oct-99	11:17	0							99	260	230
70815410	Site 1 SX 6630 4355	07-Oct-99	12:17	0							117	350	240
70815410	Site 1 SX 6630 4355	07-Oct-99	13:00	0							210	2700	1545
70815410	Site 1 SX 6630 4355	07-Oct-99	14:32	0							153	220	350
70815410	Site 1 SX 6630 4355	07-Oct-99	15:30	0							135	570	270
70815410	Site 1 SX 6630 4355	07-Oct-99	16:31	0							117	580	250
70815410	Site 1 SX 6630 4355	07-Oct-99	17:16	0							153	570	270
70815410	Site 1 SX 6630 4355	07-Oct-99	18:00	0							189	560	320
70815410	Site 1 SX 6630 4355	07-Oct-99	18:52	0							117	550	270
70815410	Site 1 SX 6630 4355	07-Oct-99	19:30	0							117	480	225
70816005	Site 2 SX 6623 4380	07-Oct-99	07:24	33.3	SW	Dry	8/8	Moderate Breeze	Light	None	27	99	99
70816005	Site 2 SX 6623 4380	07-Oct-99	08:10	33.8							18	54	54
70816005	Site 2 SX 6623 4380	07-Oct-99	08:45	34.4	W	Dry	7/8	Moderate Breeze	Light	None	< 10	27	18
70816005	Site 2 SX 6623 4380	07-Oct-99	09:25	34.5							< 10	< 10	27
70816005	Site 2 SX 6623 4380	07-Oct-99	10:25	32.5	W	Showery	8/8	Moderate Breeze	Light	None	< 10	171	54
70816005	Site 2 SX 6623 4380	07-Oct-99	11:28	26.3							54	310	200
70816005	Site 2 SX 6623 4380	07-Oct-99	12:26	26.8	SW	Showery	8/8	Fresh Breeze	Moderate	None	36	310	171
70816005	Site 2 SX 6623 4380	07-Oct-99	13:06	29.8							27	153	81
70816005	Site 2 SX 6623 4380	07-Oct-99	13:53	31.4	SW	Dry	8/8	Moderate Breeze	Light	None	< 10	63	18
70816005	Site 2 SX 6623 4380	07-Oct-99	14:39	31.9							< 10	72	36
70816005	Site 2 SX 6623 4380	07-Oct-99	15:39	31.9	SW	Dry	1/2	Fresh Breeze	Light	None	430	200	135
70816005	Site 2 SX 6623 4380	07-Oct-99	16:37	32.1							81	126	90
70816005	Site 2 SX 6623 4380	07-Oct-99	17:24	32.4	SW	Dry	7/8	Moderate Breeze	Light	None	36	270	280
70816005	Site 2 SX 6623 4380	07-Oct-99	18:08	32.4							54	153	108
70816005	Site 2 SX 6623 4380	07-Oct-99	18:58	32.9	SW	Showery	7/8	Moderate Breeze	Light	None	36	243	126
70816005	Site 2 SX 6623 4380	07-Oct-99	19:37	33.3							162	198	180
70816008	Site 3 SX 6575 4420	07-Oct-99	07:43	34.3							18	< 10	< 10
70816008	Site 3 SX 6575 4420	07-Oct-99	08:20	33.8							45	72	27
70816008	Site 3 SX 6575 4420	07-Oct-99	08:58	28							63	280	135
70816008	Site 3 SX 6575 4420	07-Oct-99	09:31	23							153	540	240
70816008	Site 3 SX 6575 4420	07-Oct-99	10:36	17.2							135	430	340
70816008	Site 3 SX 6575 4420	07-Oct-99	11:40	12.8							108	1182	430

Number	Site	Date	Time (BST)	Sal g/kg	Wind Direction	Weather Precipitatio	Cloud Cover	Wind Speed Beaufort	State of Sea	Vis Pollutio	F. strep No/100ml	T. coli No/100ml	F. coli No/100ml
70819999													
70819999	Site 7 SX 6846 4386	07-Oct-99	07:22	-							230	510	650
70819999	Site 7 SX 6846 4386	07-Oct-99	08:23	-							210	480	500
70819999	Site 7 SX 6846 4386	07-Oct-99	09:12	-							260	480	400
70819999	Site 7 SX 6846 4386	07-Oct-99	09:50	-							260	410	490
70819999	Site 7 SX 6846 4386	07-Oct-99	10:33	-							250	470	300
70819999	Site 7 SX 6846 4386	07-Oct-99	11:36	-							210	600	560
70819999	Site 7 SX 6846 4386	07-Oct-99	12:30	-							225	420	410
70819999	Site 7 SX 6846 4386	07-Oct-99	13:20	-							220	370	390
70819999	Site 7 SX 6846 4386	07-Oct-99	15:00	-							180	360	300
70819999	Site 7 SX 6846 4386	07-Oct-99	15:55	-							200	350	250
70819999	Site 7 SX 6846 4386	07-Oct-99	16:45	-							230	450	450
70819999	Site 7 SX 6846 4386	07-Oct-99	17:25	-							1545	6600	5200
70819999	Site 7 SX 6846 4386	07-Oct-99	18:20	-							640	2000	750
70819999	Site 7 SX 6846 4386	07-Oct-99	19:10	-							450	910	520
70819999	Site 7 SX 6846 4386	07-Oct-99	19:55	-							510	710	620
70819999													
70819999	Site 12 SX 6924 4471	07-Oct-99	07:50	-							330	2000	3200
70819999	Site 12 SX 6924 4471	07-Oct-99	08:36	-							420	2900	2800
70819999	Site 12 SX 6924 4471	07-Oct-99	09:24	-							2600	18000	9818
70819999	Site 12 SX 6924 4471	07-Oct-99	10:01	-							1545	7400	9455
70819999	Site 12 SX 6924 4471	07-Oct-99	10:50	-							910	5000	4600
70819999	Site 12 SX 6924 4471	07-Oct-99	11:41	-							430	3600	4400
70819999	Site 12 SX 6924 4471	07-Oct-99	12:47	-							380	3300	2500
70819999	Site 12 SX 6924 4471	07-Oct-99	13:35	-							400	4400	4100
70819999	Site 12 SX 6924 4471	07-Oct-99	15:10	-							360	2800	3900
70819999	Site 12 SX 6924 4471	07-Oct-99	16:07	-							973	17000	9636
70819999	Site 12 SX 6924 4471	07-Oct-99	16:50	-							600	9455	780
70819999	Site 12 SX 6924 4471	07-Oct-99	17:40	-							3700	49000	48000
70819999	Site 12 SX 6924 4471	07-Oct-99	18:36	-							2000	19000	24000
70819999	Site 12 SX 6924 4471	07-Oct-99	19:20	-							1455	35000	46000
70819999	Site 12 SX 6924 4471	07-Oct-99	20:10	-							3900	24000	22000

Follow up survey 01 December 1999

			Time GMT										
70819999	Site 7 SX 6815 4380	01-Dec-99	12:32								126	260	144
70819999	Site 8 SX 6857 4398	01-Dec-99	13:08								210	440	180
70819999	Site 9 SX 6859 4396	01-Dec-99	13:05								300	270	171
70819999	Site 10 SX 6861 4412	01-Dec-99	13:12								410	340	200
70819999	Site 11 SX 6911 4468	01-Dec-99	13:51								450	430	390

APPENDIX V

ENVIRONMENT AGENCY - DEVON AREA

BIOLOGICAL SURVEY SHEET - INVESTGATIONS

RIVER Buckland Stream	SITE U/S Buckland (3)		
SITE REF NUMBER	NGR	SAMPLING OFFICER	DATE 8/10/98
SAMPLING METHOD 3min 1 search	AVE WIDTH M 1.25m		AVE DEPTH M
SHADE % 30	FLOW M/SEC	TURBIDITY	COLOUR

MACROPHYTES PRESENT(% COVER): Oenanthy. 10%

ALGAE (% COVER)
GREEN FILAMENTOUS
GREEN NON-FILAMENTOUS
DIATOMS
OTHER

BRYOPHTES (% COVER)	0
OCHRE (% COVER)	0
SEWAGE FUNGUS (TOTAL % COVER)	0

SUBSTRATE (% COVER)	ROCK PAVEMENT 15	BOULDERS (>256MM) 0	
COBBLES (64 - 256MM) 10	PEBBLES (16-64MM) 40	GRAVEL (2-16MM) 20	
SAND (0.0625 - 2MM) 10	SILT 5	CLAY 0	

COMMENTS

			BMWP SCORE
EPHEMEROTERA			
BAETIDAE	4	√C	
CAENIDAE	7		
EPHEMERELLIDAE	10		
EPHEMERIDAE	10	√A	
HEPTAGENIIDAE	10	√A	
LEPTOPHLEBIIDAE	10		
POTAMANTHIDAE	10		
SIPHLONURIDAE	10		
ODONATA			
AESHNIDAE	8		
CALOPTERYGIIDAE	8		
COENAGRIIDAE	6		
CORDULEGASTERIDAE	8		
CORDULIIDAE	8		
GOMPHIDAE	8		
LESTIDAE	8		
LIBELLULIDAE	8		
PLATYCNEMIDIDAE	6		
PLECOPTERA			
CAPNIIDAE	10		
CHLOROPERLIDAE	10		
LEUCTRIDAE	10	√A	
NEMOURIDAE	7	√A	
PERLIDAE	10		
PERLODIDAE	10		
TAENIOPTERYGIDAE	10	√B	
HEMIPTERA			
APHELOCHEIRIDAE	10		
CORIXIDAE	5		
GERRIDAE	5		
HYDROMETRIDAE	5		
MESOVELIDAE	5		
NAUCORIDAE	5		
NEPIDAE	5		
NOTONECTIDAE	5		
PLEIDAE	5		
VELIIDAE	5		
MEGALOPTERA			
SIALIDAE	4		
NEUROPTERA			
OSMYLIDAE			
SISYRIDAE			
TRICHOPTERA			
BERAEIDAE	10		
BRACHYCENTRIDAE	10	√A	
EDNOMIDAE	8		
GLOSSOSOMATIDAE	7		
GOERIDAE	10	√B	
HYDROPSYCHIDAE	5	√A	
HYDROPTILIDAE	6		
LEPIDOSTOMATIDAE	10		
LEPTOCERIDAE	10		

			BMWP SCORE
LIMNEPHILIDAE	7	√A	
MOLANNIDAE	10		
ODONTOCERIDAE	10	√B	
PHILOPOTAMIDAE	8		
PHRYGANEIDAE	10		
POLYCENTROPODIDAE	7		
PSYCHOMYIDAE	8		
RHYACOPHILIDAE	7	√B	
SERICOSTOMATIDAE	10	√A	
LEPIDOPTERA			
PYRALIDAE			
DIPTERA			
ATHERICIDAE			
CERATOPOGONIDAE			
CHAOBORIDAE			
CHIRONOMIDAE	2		
CULICIDAE			
DIXIDAE			
EMPIDIDAE			
MUSCIDAE			
PSYCHODIDAE			
PTYCHOPTERIDAE			
RHAGIONIDAE			
SIMULIIDAE	5	√B	
STRATIOMYIDAE			
SYRPHIDAE			
TABANIDAE			
THAUMALEIDAE			
TIPULIDAE	5	√B	
COLEOPTERA			
CHRYSOMELIDAE	5		
CURCLIONIDAE	5		
DRYOPIDAE	5		
DYTISCIDAE	5	√A	
ELMIDAE	5	√B	
GYRINIDAE	5		
HALIPLIDAE	5		
HYDRAENIDAE	5		
HYDROPHILIDAE	5		
HYGROBIIDAE	5		
NOTERIDAE	5		
SCIRTIDAE	5		
CRUSTACEA			
ASELLIDAE	3	√A	
ASTACIDAE	8		
BRANCHIURA			
CLADOCERA			
COPEPODA			
COROPHIDAE	6		
CRANGONYCTIDAE	6		
GAMMARIDAE	6	√A	
OSTRACODA			

			BMWP SCORE
CHELICERATA			
ACARI			
MOLLUSCA			
ACROLOXIDAE	6		
ANCYLIDAE	6	√A	
BITHNIIDAE	3		
DREISSENIDAE			
HYDROBIIDAE	3	√B	
LYMNAEIDAE	3		
NERITIDAE	6		
PHYSIDAE	3		
PLANORBIDAE	3		
SPHAERIIDAE	3	√A	
UNIONIDAE	6		
VALVATIDAE	3		
VIVIPARIDAE	6		
BRYOZOA			
OLIOCHEATA	1	√B	
HIRUDINEA			
ERPOBDELLIDAE	3	√A	
GLOSSIPHONIIDAE	3		
HIRUDIDAE	3		
PISCIOLIDAE	4		
NEMATOMORPHA			
NEMATODA			
PLATYHELMINTHES			
DENDROCOELIDAE	5		
DUGESIIDAE	5		
PLANARIIDAE	5		
PORIFERA			

BMWP SCORE	155
ASPT SCORE	6.46
NO. OF SCORING TAXA	24
NO. OF NON-SCORING TAXA	0
TOTAL TAXA	24

ENVIRONMENT AGENCY - DEVON AREA

BIOLOGICAL SURVEY SHEET - INVESTIGATIONS

RIVER Buckland Stream	SITE (2) Buckland Village		
SITE REF NUMBER	NGR	SAMPLING OFFICER PR	DATE 8/10/98
SAMPLING METHOD 3 mk. + Search	AVE WIDTH M 1	AVE DEPTH M	
SHADE % 70%	FLOW M/SEC	TURBIDITY	COLOUR

MACROPHYTES PRESENT(% COVER) 0

ALGAE (% COVER)
GREEN FILAMENTOUS 0
GREEN NON-FILAMENTOUS 5%
DIATOMS 0
OTHER

BRYOPHTES (% COVER) 20

SEWAGE FUNGUS (TOTAL % COVER)

OCHRE (% COVER) 0

0	5	0	0	0	0	10	0	5	TT

SUBSTRATE (% COVER)	ROCK PAVEMENT 0	BOULDERS (>256MM) 30
COBBLES (64 - 256MM) 15	PEBBLES (16-64MM) 20	GRAVEL (2-16MM) 15
SAND (0.0625 - 2MM) 10	SILT 10	CLAY 0

COMMENTS

			BMWP SCORE				BMWP SCORE				BMWP SCORE
EPHEMEROTERA				LIMNEPHILIDAE	7			*CHELICERATA*			
BAETIDAE	4	C		MOLANNIDAE	10			ACARI		A	
CAENIDAE	7			ODONTOCERIDAE	10	B		*MOLLUSCA*			
EPHEMERELLIDAE	10			PHILOPOTAMIDAE	8			ACROLOXIDAE	6		
EPHEMERIDAE	10			PHRYGANEIDAE	10			ANCYLIDAE	6	B	
HEPTAGENIIDAE	10			POLYCENTROPODIDAE	7			BITHNIIDAE	3		
LEPTOPHLEBIIDAE	10			PSYCHOMYIDAE	8			DREISSENIDAE			
POTAMANTHIDAE	10			RHYACOPHILIDAE	7	B		HYDROBIIDAE	3	B	
SIPHLONURIDAE	10			SERICOSTOMATIDAE	10	B		LYMNAEIDAE	3		
ODONATA				*LEPIDOPTERA*				NERITIDAE	6		
AESHNIDAE	8			PYRALIDAE				PHYSIDAE	3		
CALOPTERYGIIDAE	8			*DIPTERA*				PLANORBIDAE	3		
COENAGRIIDAE	6			ATHERICIDAE				SPHAERIIDAE	3		
CORDULEGASTERIDAE	8	A		CERATOPOGONIDAE				UNIONIDAE	6		
CORDULIIDAE	8			CHAOBORIDAE				VALVATIDAE	3		
GOMPHIDAE	8			CHIRONOMIDAE	2	A		VIVIPARIDAE	6		
LESTIDAE	8			CULICIDAE		A		*BRYOZOA*			
LIBELLULIDAE	8			DIXIDAE				OLIOCHEATA	1	B	
PLATYCNEMIDIDAE	6			EMPIDIDAE				*HIRUDINEA*			
PLECOPTERA				MUSICIDAE				ERPOBDELLIDAE	3	A	
CAPNIIDAE	10			PSYCHODIDAE				GLOSSIPHONIIDAE	3	A	
CHLOROPERLIDAE	10	A		PTYCHOPTERIDAE				HIRUDIDAE	3		
LEUCTRIDAE	10	B		RHAGIONIDAE				PISCIOLIDAE	4		
NEMOURIDAE	7	A		SIMULIIDAE	5	C		*NEMATOMORPHA*			
PERLIDAE	10			STRATIOMYIDAE				NEMATODA			
PERLODIDAE	10			SYRPHIDAE				*PLATYHELMINTHES*			
TAENIOPTERYGIDAE	10	A		TABANIDAE				DENDROCOELIDAE	5		
HEMIPTERA				THAUMALEIDAE				DUGESIIDAE	5		
APHELOCHEIRIDAE	10			TIPULIDAE	5	A		PLANARIIDAE	5	A	
CORIXIDAE	5			*COLEOPTERA*				*PORIFERA*			
GERRIDAE	5			CHRYSOMELIDAE	5						
HYDROMETRIDAE	5			CURCLIONIDAE	5						
MESOVELIDAE	5			DRYOPIDAE	5						
NAUCORIDAE	5			DYTISCIDAE	5			BMWP SCORE	148		
NEPIDAE	5			ELMIDAE	5	B		ASPT SCORE	6.16		
NOTONECTIDAE	5			GYRINIDAE	5			NO.OF SCORING TAXA	24		
PLEIDAE	5			HALIPLIDAE	5			NO. OF NON-SCORING TAXA	2		
VELIIDAE	5			HYDRAENIDAE	5			TOTAL TAXA	26		
MEGALOPTERA				HYDROPHILIDAE	5						
SIALIDAE	4			HYGROBIIDAE	5						
NEUROPTERA				NOTERIDAE	5						
OSMYLIDAE				SCIRTIDAE	5						
SISYRIDAE				*CRUSTACEA*							
TRICHOPTERA				ASELLIDAE	3	B					
BERAEIDAE	10			ASTACIDAE	8						
BRACHYCENTRIDAE	10	A		BRANCHIURA							
EDNOMIDAE	8			CLADOCERA							
GLOSSOSOMATIDAE	7	A		COPEPODA							
GOERIDAE	10	A		COROPHIDAE	6						
HYDROPSYCHIDAE	5	C		CRANGONYCTIDAE	6						
HYDROPTILIDAE	6			GAMMARIDAE	6	B					
LEPIDOSTOMATIDAE	10			OSTRACODA							
LEPTOCERIDAE	10										

ENVIRONMENT AGENCY - DEVON AREA
BIOLOGICAL SURVEY SHEET - INVESTIGATIONS

RIVER Buckland Stream	SITE (1) D/S Works		
SITE REF NUMBER	NGR	SAMPLING OFFICER PR	DATE 8/10/98
SAMPLING METHOD 3 min + 1 search		AVE WIDTH M	AVE DEPTH M
SHADE % 60	FLOW M/SEC	TURBIDITY	COLOUR

MACROPHYTES PRESENT (% COVER)
Oenanthe 5%

ALGAE (% COVER)
GREEN FILAMENTOUS
GREEN NON-FILAMENTOUS 20%
DIATOMS 5%
OTHER

BRYOPHTES (% COVER) 10%

SEWAGE FUNGUS (TOTAL % COVER) 30%/20%/20%/10

OCHRE (% COVER) 0

SUBSTRATE (% COVER)	ROCK PAVEMENT	BOULDERS (>256MM) 20%
COBBLES (64 - 256MM) 10%	PEBBLES (16-64MM) 20	GRAVEL (2-16MM) 25%
SAND (0.0625 - 2MM) 5	SILT 10%	CLAY 10

COMMENTS [illegible] shells.
Water scorpion.
eel
Bullhead.

			BMWP SCORE
EPHEMEROTERA			
BAETIDAE	4	✓B	
CAENIDAE	7		
EPHEMERELLIDAE	10		
EPHEMERIDAE	10		
HEPTAGENIIDAE	10	✓A	
LEPTOPHLEBIIDAE	10		
POTAMANTHIDAE	10		
SIPHLONURIDAE	10		
ODONATA			
AESHNIDAE	8		
CALOPTERYGIIDAE	8		
COENAGRIIDAE	6		
CORDULEGASTERIDAE	8	✓A	
CORDULIIDAE	8		
GOMPHIDAE	8		
LESTIDAE	8		
LIBELLULIDAE	8		
PLATYCNEMIDIDAE	6		
PLECOPTERA			
CAPNIIDAE	10		
CHLOROPERLIDAE	10		
LEUCTRIDAE	10		
NEMOURIDAE	7		
PERLIDAE	10		
PERLODIDAE	10		
TAENIOPTERYGIDAE	10	✓A	
HEMIPTERA			
APHELOCHEIRIDAE	10		
CORIXIDAE	5		
GERRIDAE	5		
HYDROMETRIDAE	5		
MESOVELIDAE	5		
NAUCORIDAE	5		
NEPIDAE	5		
NOTONECTIDAE	5		
PLEIDAE	5		
VELIIDAE	5		
MEGALOPTERA			
SIALIDAE	4		
NEUROPTERA			
OSMYLIDAE			
SISYRIDAE			
TRICHOPTERA			
BERAEIDAE	10		
BRACHYCENTRIDAE	10	✓A	
EDNOMIDAE	8		
GLOSSOSOMATIDAE	7	/	
GOERIDAE	10	✓A	
HYDROPSYCHIDAE	5	✓B	
HYDROPTILIDAE	6		
LEPIDOSTOMATIDAE	10		
LEPTOCERIDAE	10		

			BMWP SCORE
LIMNEPHILIDAE	7	✓A	
MOLANNIDAE	10		
ODONTOCERIDAE	10	✓A	
PHILOPOTAMIDAE	8		
PHRYGANEIDAE	10		
POLYCENTROPODIDAE	7		
PSYCHOMYIDAE	8		
RHYACOPHILIDAE	7	✓A	
SERICOSTOMATIDAE	10	✓B	
LEPIDOPTERA			
PYRALIDAE			
DIPTERA			
ATHERICIDAE			
CERATOPOGONIDAE			
CHAOBORIDAE			
CHIRONOMIDAE	2	✓A	
CULICIDAE			
DIXIDAE			
EMPIDIDAE			
MUSCIDAE			
PSYCHODIDAE			
PTYCHOPTERIDAE			
RHAGIONIDAE			
SIMULIIDAE	5	✓C	
STRATIOMYIDAE			
SYRPHIDAE			
TABANIDAE			
THAUMALEIDAE			
TIPULIDAE	5	✓B	
COLEOPTERA			
CHRYSOMELIDAE	5		
CURCLIONIDAE	5		
DRYOPIDAE	5		
DYTISCIDAE	5		
ELMIDAE	5	✓A	
GYRINIDAE	5		
HALIPLIDAE	5		
HYDRAENIDAE	5		
HYDROPHILIDAE	5		
HYGROBIIDAE	5		
NOTERIDAE	5		
SCIRTIDAE	5		
CRUSTACEA			
ASELLIDAE	3	✓B	
ASTACIDAE	8		
BRANCHIURA			
CLADOCERA			
COPEPODA			
COROPHIIDAE	6		
CRANGONYCTIDAE	6		
GAMMARIDAE	6	✓A	
OSTRACODA			

			BMWP SCORE
CHELICERATA		✓	
ACARI			
MOLLUSCA			
ACROLOXIDAE	6		
ANCYLIDAE	6	✓B	
BITHNIIDAE	3		
DREISSENIDAE		/	
HYDROBIIDAE	3	✓D	
LYMNAEIDAE	3	✓A	
NERITIDAE	6		
PHYSIDAE	3		
PLANORBIDAE	3		
SPHAERIIDAE	3		
UNIONIDAE	6		
VALVATIDAE	3		
VIVIPARIDAE	6		
BRYOZOA			
OLIOCHEATA	1	✓B	
HIRUDINEA			
ERPOBDELLIDAE	3	✓A	
GLOSSIPHONIIDAE	3	✓A	
HIRUDIDAE	3		
PISCIOLIDAE	4		
NEMATOMORPHA			
NEMATODA		✓	
PLATYHELMINTHES			
DENDROCOELIDAE	5		
DUGESIIDAE	5		
PLANARIIDAE	5	✓A	
PORIFERA			

BMWP SCORE	141
ASPT SCORE	5.88
NO. OF SCORING TAXA	24
NO. OF NON-SCORING TAXA	2
TOTAL TAXA	26

APPENDIX VI

TABLE 1 : STANDARDS FOR THE FIVE RIVER ECOSYSTEM USE CLASSES

Use Class	DO % sat 10%ile	BOD (ATU) mg/l 90%ile	Total Ammonia mgN/l 95%ile	Un-ionised Ammonia mgN/l 95%ile	pH 5%ile & 95%ile	Hardness mg/l $CaCO_3$	Dissolved Cupper 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

500

ORDNANCE SURVEY

HEIGHTS IN METRES

PLAN SX 6643-6743

SX 6644-6744

BIGBURY C P

DEVONSHIRE

KINGSBRIDGE R D

663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679

River Avon

Bantham

West Buckland

East Buckland

Thurlestone

Golf Course

The Downs

Court Park

TOTNES CO CONST

THURLESTONE C P

SX 6642-6742

CONVERSION SCALES

HECTARES-ACRES

METRES-FEET

ABBREVIATIONS

SYMBOLS

BOUNDARIES

AREAS

NATIONAL GRID REFERENCE

SX 6643-6743