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DEVON AREA
INTERNAL REPORT

ENVIRONMENT AGENCY

Investigation into Failures of the River Dalch from Canns Mill Bridge to Below Lapford Sewage Treatment Works

July 2001
DEV/EP/07/00
(CATCHMENT 30D)

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Investigation into Failures of the River Dalch from Canns Mill Bridge to Below Lapford Sewage Treatment Works.

1.0 Introduction

The River Dalch significantly failed to meet it's River Quality Objective (RQO) of RE2 (River Ecosystem use class), in 1997 and marginally failed in 1998 (see appendix 1 for table of RE standards & appendix 2 for a table of historical routine sample results). The failure was due to elevated Biochemical Oxygen Demand (BOD) and elevated ammonia in 1997, and elevated BOD in 1998 (Ref.1). Devon Area Investigations were asked to investigate the cause of the failure and make recommendations to improve water quality in the River Dalch.

1.1 Background

The River Dalch is a tributary of the River Yeo. It rises to the north of Puddington and flows in a south-westerly direction until it's confluence with the River Yeo at Lapford. Lapford Sewage Treatment Works (STW) discharges into the Dalch approximately 300m above the confluence with the Yeo.

A weir is situated at the confluence of the rivers (see figure 2 & figure 4: plate 1). This has the effect of backing up the rivers forming a pond behind the weir. The final effluent from Lapford STW is discharged approximately 20m above the upstream end of the ponding. A Mill Leat is positioned above the weir and takes water from the River Dalch side of the weir (see figure 4: plate 2).

There are three routine sample points on the River Dalch in the vacinity of the confluence with the Yeo (see figure 2). The sample points and their descriptions are listed below:

- 73040211, U/S STW used to classify stretch from Cann's Mill Bridge to U/S STW (since Feb '98).
- 73020207, D/S STW historically used to classify Cann's Mill Bridge to below Lapford STW has been changed to D/S STW FE discharge (since Feb '98).
- 73040202, Dalch at confluence of River Yeo new site from Feb '98 used to classify stretch U/S STW to confluence of Dalch and Yeo.

1.2 Site History

Prior to February 1998 the stretch of river from Cann's Mill Bridge to downstream of Lapford STW (see figure 1) was classified using sample point 73020207. Sample point 73020207 was changed in February 1998 to the down stream site for the STW discharge, and sample point 73040211 was subsequently used to classify the river from Cann's Mill Bridge to above Lapford STW. The area Environment Protection Officer (EPO) requested these changes due to a belief that the combined effect of the final effluent and ponding of the river was giving results unrepresentative of the complete stretch of river in question.

The stretch from upstream STW FE to confluence with the Yeo is now regarded separately and shall be the focus of this investigation.

1.3 Aims & Hypothesis

The aim of this investigation is try and identify the causes of the failures in the stretch of the River Dalch and to make recommendations in an attempt to prevent further failures. It is suspected that the ponding effect of the weir combined with the final effluent discharge is having a deleterious effect on water quality. The investigation will aim to test this theory.

1.4 Project Team

Project Manager – Trevor Cronin
Project Leader & Author – Stuart Hunter
Project Officers – Emma-May Harrison, Peter Rose and Robin Pearson

2.0 Method

An initial site visit was made with the EPO on Thursday 19th August 1999, during this visit the STW and its discharge were inspected and the stream was visually inspected to the weir. An on site risk assessment was carried out, a copy of this can be seen in appendix 6.

Seven sample points were chosen; four on the Dalch: routine sites U/S STW 73040211, D/S STW 73040207, at confluence 73040202 and a site at the weir. One site down stream of the weir and one in the Mill Leat, finally the final effluent from the works (sampled in the works). These sites were chosen to give a representation of water quality throughout the catchment and to allow safe access for the sampling officers.

Flow was measured at the upstream site using a Global Water flow probe. At the weir the percentage cover was estimated i.e. 100% whole of weir covered, 50% half of weir covered and so on.

Two surveys were planned. The first during very low flows in an attempt to highlight the impact to water quality from the STW final effluent discharge believed to be exacerbated by the ponding effect of the weir. The second during high flows after a period of wet weather (but not raining on the day of the survey) in an attempt to show that the flushing effect of increased flow increases water quality.

The low flow survey took place on 16th September 1999 and the high flow survey took place on 15th December 1999. The surveys started at 06:00 and runs were conducted every two hours, the last run starting at 18:00. The Mill Leat and final effluent were sampled on alternate runs. All samples were analysed for BOD, Total Ammonia and suspended solids only. In situ measurements of dissolved oxygen were taken using a WTW Multiline P4.

Two YSI 6920 water quality monitors were deployed on Friday 17th March 2000. One positioned upstream of the STW FE discharge and the other at site 73040202 upstream of the Dalch Yeo confluence. The monitors were retrieved on Monday 20th March. These monitors were set up to measure dissolved oxygen, total ammonia, turbidity and pH every 10 minutes.

A biodiversity appraisal form for the area to be covered by the investigation was sent to Conservation & Recreation.

3.0 Results

The biodiversity appraisal highlighted two areas of interest within the vicinity of the investigation. The sites are County Wildlife Sites, one secondary woodland and the other an area of marshy grassland, see appendix 3 for exact location of sites.

3.1 Historical Data & Rainfall Data

Changes to the routine monitoring sites now mean that the river from Cann's Mill Bridge to the confluence with the Yeo has been divided into two sections. The first from Cann's Mill Bridge to upstream Lapford STW and the second from upstream Lapford STW to the confluence with the Yeo. Due to these changes long term RQO's have not yet been assigned to these stretches.

Rainfall data was collected (Devon Area Hydrometrics) from the nearest two Gauging Stations to the River Dalch at Lapford. These were Hollocombe NGR SS 636 110 Gauge ref. 392291 and Washford Pyne NGR SS822 116 Gauge ref. 391497. A graph was plotted to see if there is any correlation between periods of low rainfall (and low flow) and high BOD concentrations and also periods of high rainfall and failures. See figure 3.

As the graphs show it can be seen that there are eleven failures with BOD concentrations over 4.0 mg/l. Three failures clearly are associated with heavy rainfall; 10th October 1997 11.1mg/l, 4th March 1998 6.3mg/l and 29th May 1998 9.0mg/l. Two failures occurred in very dry periods these were 12th July 1996 29.1mg/l and 9th July 1996 466.0mg/l (confirmed with the Lab as it is a very high result). The sample from 19th May 1997 had a BOD of 20.2mg/l, rainfall on the 17th and 18th was 0.3mm and 0.0mm respectively, on the 19th it was 16.3mm. The rainfall day is recorded from 0900 to 0900, the sample was taken at 1050 and may well have been before any rainfall.

3.2 Low flow Survey

The results from the low flow survey can be seen in appendix 4. Unfortunately the ARG chosen for the sample analysis had a detection limit for Ammonia of 0.5 mg/l, thus many of the sample results from the survey have ammonia concentrations of < 0.5 mg/l. The limit for a RE 2 watercourse is 0.6 mg/l. Most of the samples which were greater than 0.5 mg/l were class failures, the highest value was 1.16 mg/l found at site 2 on the second run. Overall six samples had ammonia concentrations greater than 0.6 mg/l.

The class limit for Biochemical Oxygen Demand (BOD) is 4.0 mg/l, only 28 % of the samples achieved this standard. The highest value found was 11.0 mg/l at site 2 during run 1.

During run 1 suspended solids were 8.1 mg/l at site 1 and 84.0 mg/l at site 2, all other downstream sites have values of less than 8 mg/l. During the rest of the survey the concentrations of suspended solids increase at all sites (with the exception of the FE).

Dissolved oxygen concentrations exhibited a trend of being highest at site 1 then decreasing downstream (with lowest concentrations found in the Mill Leat), then increasing at site 5 below the weir. Three samples failed to meet the RE2 limit of 80%, these were: the Mill Leat in run 1, site 4 in run 2 and site 5 in run 6.

Two flow measurements were taken during the survey at sample point 1. The first at 09:15 was 3.8 m/s the second at 10:40 had increased to 6.3 m/s. Observations of percentage cover of the weir were also made. There was 20% cover for run 1 increasing to 70% during run 2 and approximately 100% for the rest of the survey.

3.3 High flow Survey

The results from the high flow survey all comply with RE2 standards, the results can be seen in appendix 5. The ARG was changed during this survey to allow lower concentrations of ammonia to be accurately detected. The highest concentration of ammonia found was 0.131 mg/l at site 5 during run 4.

The highest BOD concentration was 2.0 mg/l at sample point 2 during run 4.

Suspended solid concentrations decreased over the day. The lowest recorded concentration was 12.6 mg/l at site 4 during run 7 and the highest was 27.4 mg/l at site 1 during run 1.

Dissolved oxygen concentrations were recorded until 12:17, unfortunately the probe failed after this reading. The results obtained were all well within the class limits and show only minor variation between sites.

Flow measurements at site 1 were made during each run, the highest was 10.8m/s and the lowest 9.04 m/s. Flow over the weir was 100% for the duration of the survey.

Figures 5, 6 & 7 are graphs showing comparisons between the low and high flow surveys.

3.4 Data from YSI Water Quality Monitors

The data collected from the two probes can be seen in figure 8. The upstream and downstream data show very similar trends over the period of deployment. All the results collected were within the RE2 class limits.

The flow over the weir was 100% throughout deployment.

4.0 Discussion

The surveys were designed to show a decrease in water quality during periods of low flow in the watercourse, and an increase during periods of high flow. During the high flow survey conditions were planned so that there was high flow but no rain on the day of the survey. This was to ensure that no storm sewage discharges would impact upon the survey results and that hopefully the catchment would be flushed through of polluting matter. These conditions were achieved with heavy rainfall prior to the survey but no rain for at least two days before the survey.

The low flow survey began with very low flows, in fact there was no flow over the weir at all (all flow was through defects in the weir structure, see figure 4: plates 3 & 4), unfortunately a very heavy downpour increased river flow and triggered the STW storm sewage overflow. Consequently only the first run of the survey took place in ideal conditions; the rain did clear

to leave a dry day but the river levels rose to almost 100% cover of the weir. This was taken into account when analysing the data obtained.

Due to the non-ideal conditions during the low flow survey, two YSI 6920 water quality monitors were deployed during a dry period in an attempt to supplement the data. The deployment was after two weeks without significant rainfall. But water levels in the river were still high and flow over the weir was 100% over the deployment.

4.1 Historical Data

The historical data show that failures have occurred during both high flow (wet weather) and low flow (dry weather) conditions. During wet weather diffuse pollution caused by runoff from agricultural land is expected and would cause an increase in ammonia and BOD concentrations. This increase could potentially lead to failures of the RQO. However, during dry weather, point source pollution is likely to have the greater impact on water quality. If the final effluent from Lapford STW is not receiving adequate mixing and dilution in the river, due to the ponding behind the weir, it has the potential to cause failures and the very high concentrations of pollutant found in some of the routine samples.

This point was highlighted in an internal memo from Andy Leyman (EPO) to Richard Walmsely (Ref. 2). In which Andy highlighted that the routine sample results from the River Dalch; Lapford STW to the confluence with the River Yeo were unrepresentative of the stretch from Canns Mill Bridge to Below Lapford STW. This was because of the combination of the FE discharge and ponding behind the weir. Subsequent to this memo the stretches were reclassified as shown in section 1.1.

4.2 Low Flow Survey

The low flow survey was planned to see if a decrease in water quality in the River Dalch was linked to low flow conditions. Due to the heavy rain in the between 0730 and 0830 the results from run 2/3 onwards are influenced by operation of the storm overflow and runoff from the land.

In Run 1 the sample at site 1 (U/S FE) has a BOD of 1.7 mg/l and total ammonia of < 0.5 mg/l. Sample Site 2 (D/S STW) shows a large increase with BOD 11.0 mg/l and total ammonia 0.85 mg/l, both these results are RE 2 failures. Downstream of site 2 concentrations of BOD are higher than the upstream site but within class limits. Dissolved oxygen (percentage saturation) decreases from site 1 to site 4 and in the Mill Leat.

4.3 High Flow Survey

Although there are no current standards for suspended solids concentrations in the River Ecosystem Use Class framework. Under the old National Water Council (NWC) river classification system the standard for suspended solids for river classes 1A, 1B and 2 was 25 mg/l calculated as an arithmetic mean over the year (Ref. 3), the average for this survey was 17.7 mg/l well within the old guidelines.

4.4 Data from YSI Water Quality Monitors.

The data from the YSI monitors shows that for the period of deployment there was no impact to water quality from the final effluent discharge. The differences in the results are within the margins of error stated for the equipment.

Although there had been no rain for at least a week prior to the deployment of the probe, the river levels were still high with 100% flow over the weir for the duration that the data was collected.

The results were all well within class limits and show good water quality in the River Dalch. The conditions were very similar to those of the high flow survey and show that under high flow conditions the water quality is very good.

Also, it was noted that the Mill Leat had been cleared out since the last survey. The Mill Leat is situated on the Dalch side of the weir and thus it is assumed that the majority of the flow in the Leat is made up from the Dalch. The increased flow would help reduce the ponding effect in the River Dalch.

4.5 Other influences

The misconnection of a number domestic property to the storm overflow were identified. The area EPO has now resolved these.

The effects of cattle crossing the watercourse and entering to drink from it.

The operation of the storm overflow. Lapford STW storm overflow is to be improved under AMP3: target date for completion of improvement 2005.

The effect of rotting leaf matter that accumulates in the still water above the weir.

5.0 Conclusions

5.1 Historical Data

The historical data show that failures of the River Dalch downstream Lapford STW discharge have occurred during period of low flow and no rainfall. These failures are potentially due to the ponding effect caused by the weir and the impact of the final effluent discharge.

5.2 Low Flow Survey

The results from the low survey before the rainfall showed that there was an impact from the final effluent in the river. The impact was sufficient to cause a failure at site 2 of both BOD and ammonia, with increases at sites 3 and 4 but no further failures.

5.3 High Flow Survey

The results from the high flow survey show no significant impact from the final effluent on the River Dalch. All samples from the survey are within RE2 standards (in fact they all comply with RE1 standards).

5.4 Data from YSI Water Quality Monitors

The data collected from the YSI water quality monitors shows no impact from the final effluent discharge on the River Dalch. Deployment conditions were very similar to the high flow survey.

6.0 Recommendations

The Mill leat should be opened up to increase flows and water movement from the pond. (Site visit on Friday 17th March 2000 revealed that this recommendation had already been undertaken prior to the deployment of the two YSI 6920 water quality monitors).

The weir should be repaired, consideration should also be given to the construction of a fish pass on the Dalch side of the weir to increase flow in the Dalch and aid salmonid fish migration.

Action: Environment Protection Officer

If the river stretch continues to fail a possible solution would be to relocate the FE discharge downstream of the weir; this would increase the dilution and aid mixing in the increased flow.

7.0 References

1. Environment Agency, 2000. *Local Environment Agency Plan, Taw Action Plan from February 2000 to February 2005.*

2. Internal memo, 21st November 1996. *GQA Monitoring Point – Downstream Lapford STW.* From Andy Leyman to Richard Walmsley.

3. Broome R.J, (1992). *Annual Classification of River Water Quality 1991.* Internal Report, No. FWS/92/003

Figure 1

Map Showing River Stretch Cann's Mill Bridge to Downstream Lapford STW.

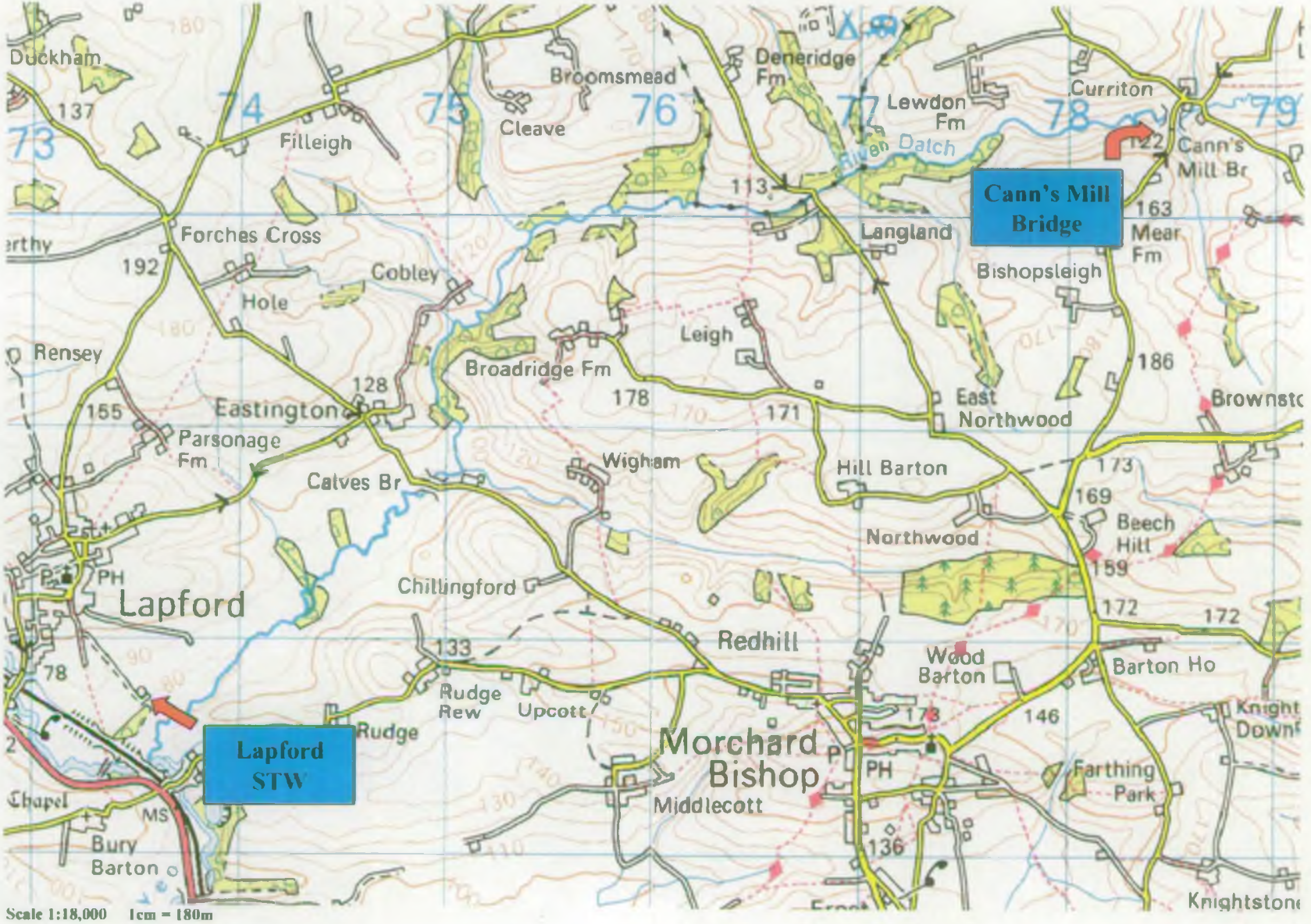


Figure 2

Map showing Lapford STW, River Dalch, Routine and Investigation Sample Points

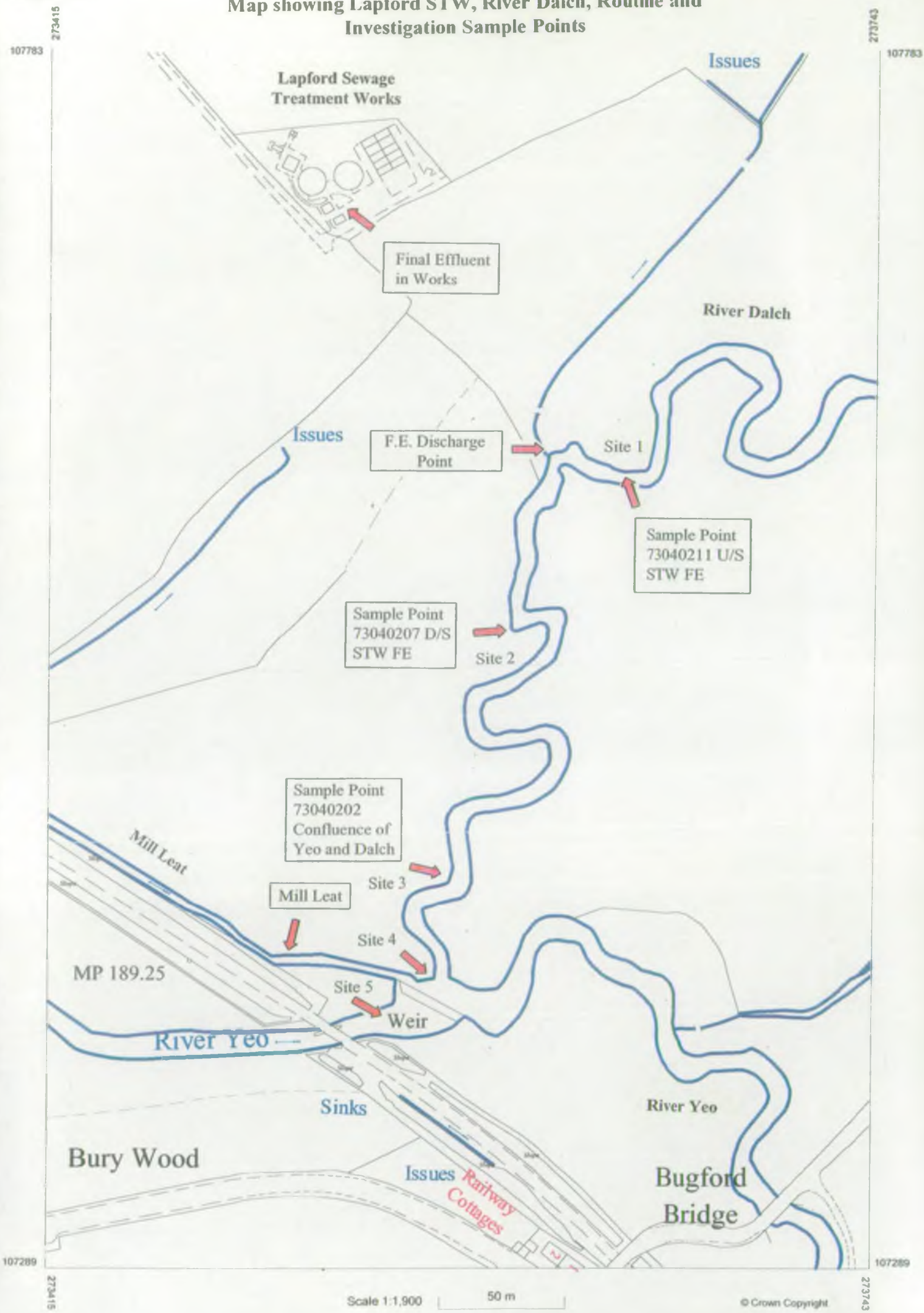


Figure 3

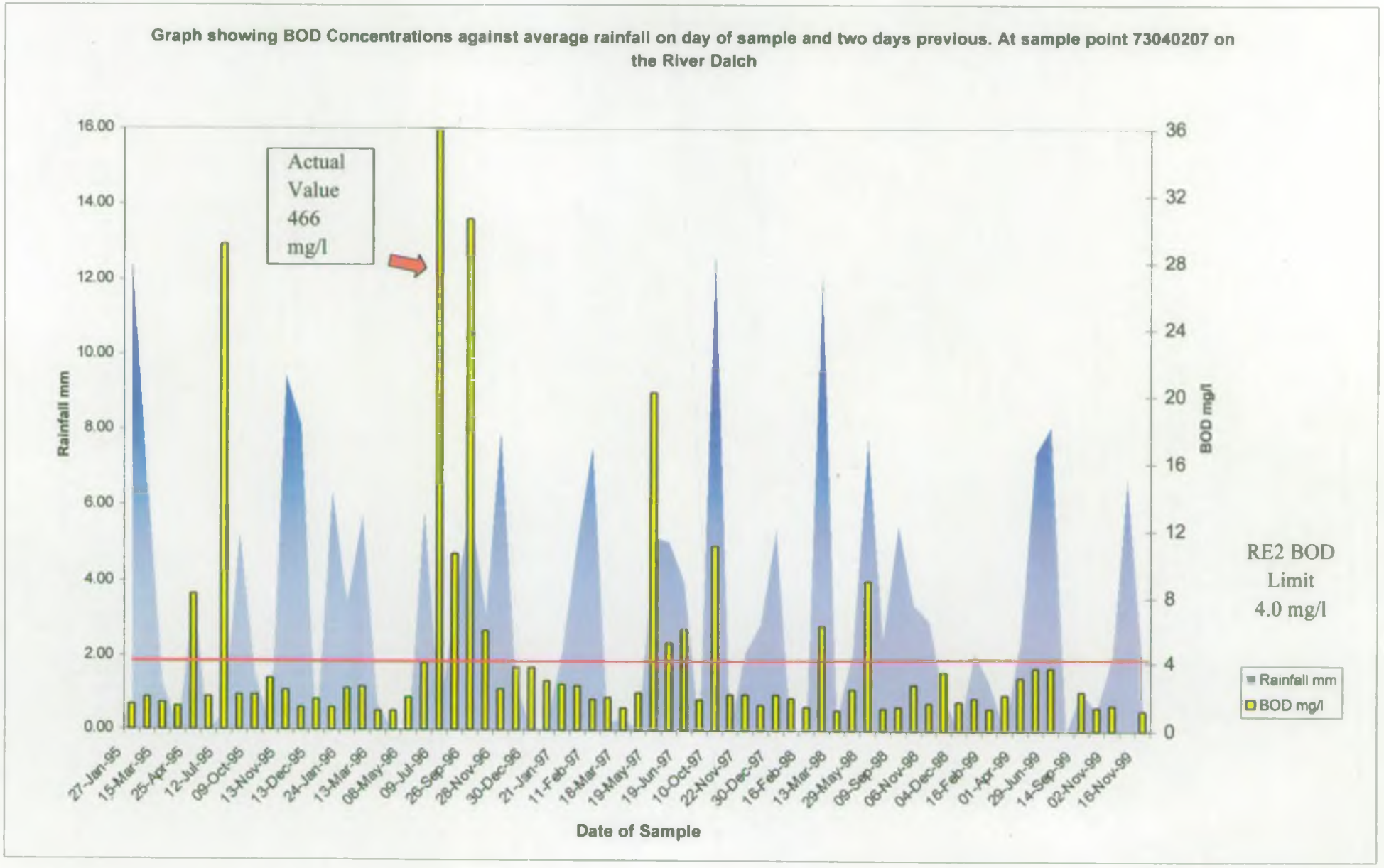

Graph showing BOD Concentrations against average rainfall on day of sample and two days previous. At sample point 73040207 on the River Dalch
Actual Value 466 mg/l
Rainfall mm
BOD mg/l
RE2 BOD Limit 4.0 mg/l
Rainfall mm
BOD mg/l
Date of Sample
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
36
32
28
24
20
16
12
8
4
0
27-Jan-95
15-Mar-95
25-Apr-95
12-Jul-95
09-Oct-95
13-Nov-95
13-Dec-95
24-Jan-96
13-Mar-96
08-May-96
09-Jul-96
26-Sep-96
28-Nov-96
30-Dec-96
21-Jan-97
11-Feb-97
18-Mar-97
19-May-97
19-Jun-97
10-Oct-97
22-Nov-97
30-Dec-97
16-Feb-98
13-Mar-98
29-May-98
09-Sep-98
06-Nov-98
04-Dec-98
16-Feb-99
01-Apr-99
28-Jun-99
14-Sep-99
02-Nov-99
16-Nov-99

Figure 4

Plate 1

Weir at confluence of River's Dalch and Yeo

Plate 2

Mill Leat enterance from River Dalch Side of Weir.

Plate 3

Showing very low flow conditions. No flow over top of weir.

Plate 4

Close up showing breach in weir. During low flow levels all river flow is through breaches not over weir.

Figure 5

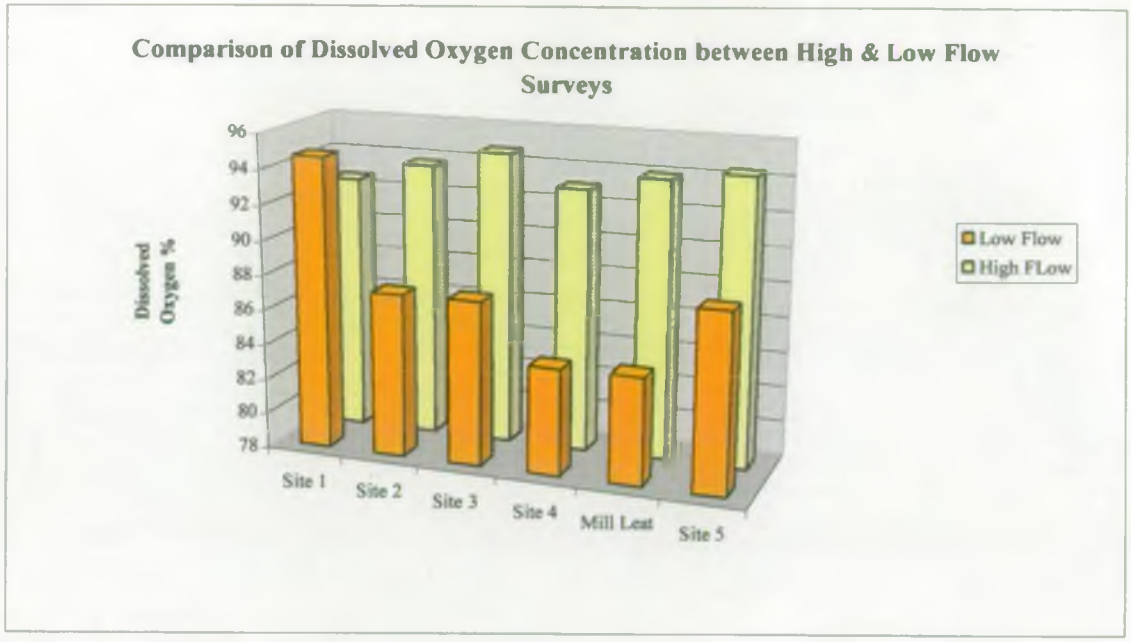


Figure 6

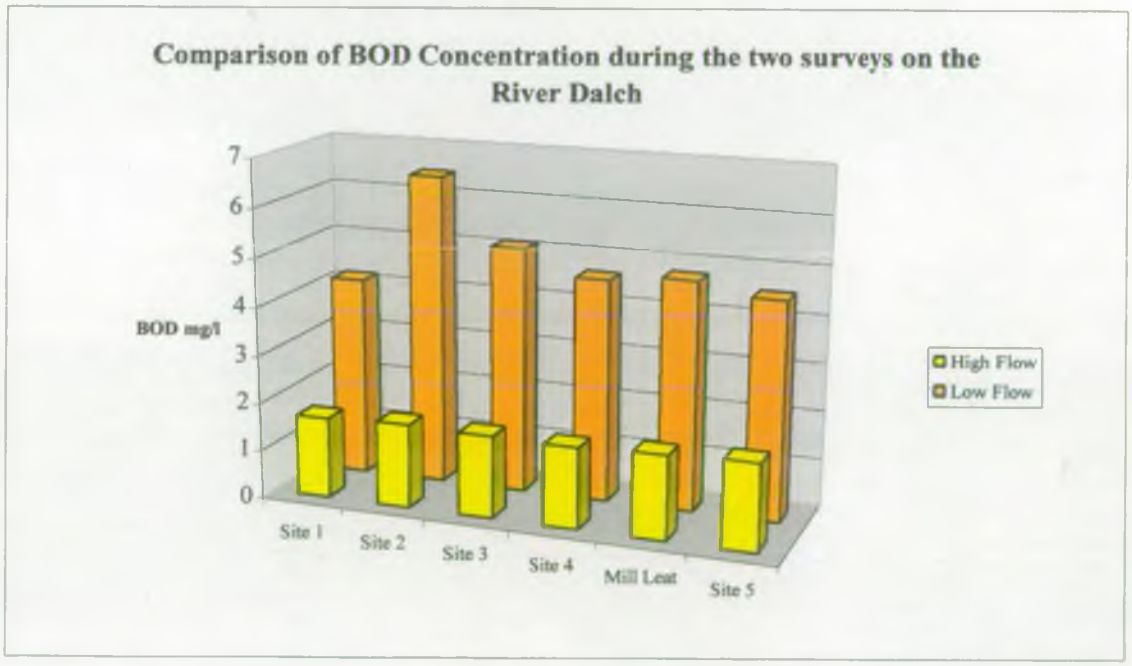


Figure 7

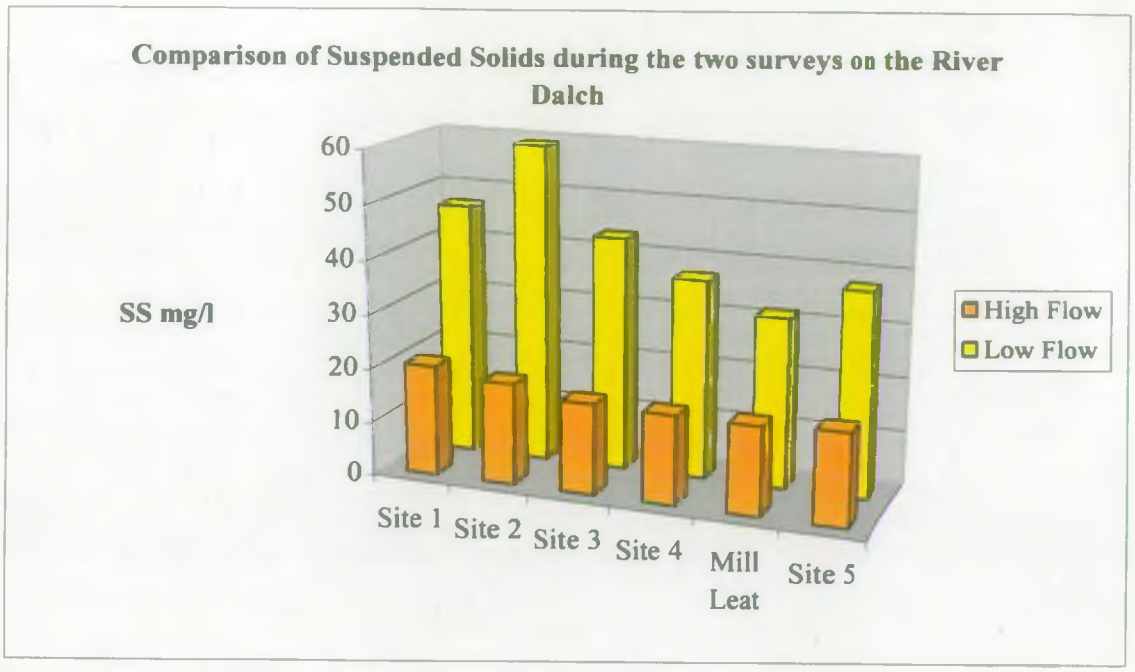
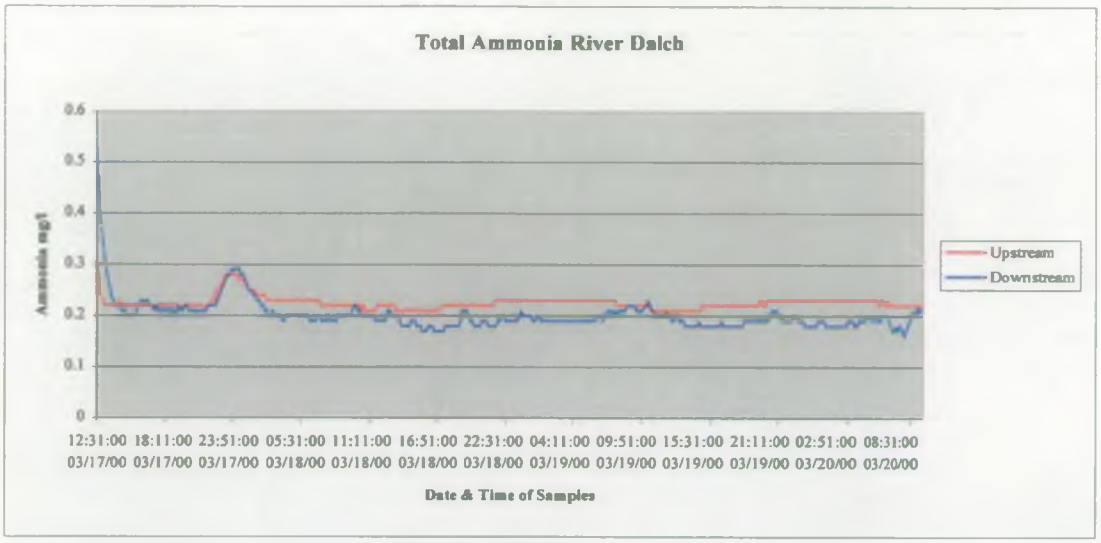
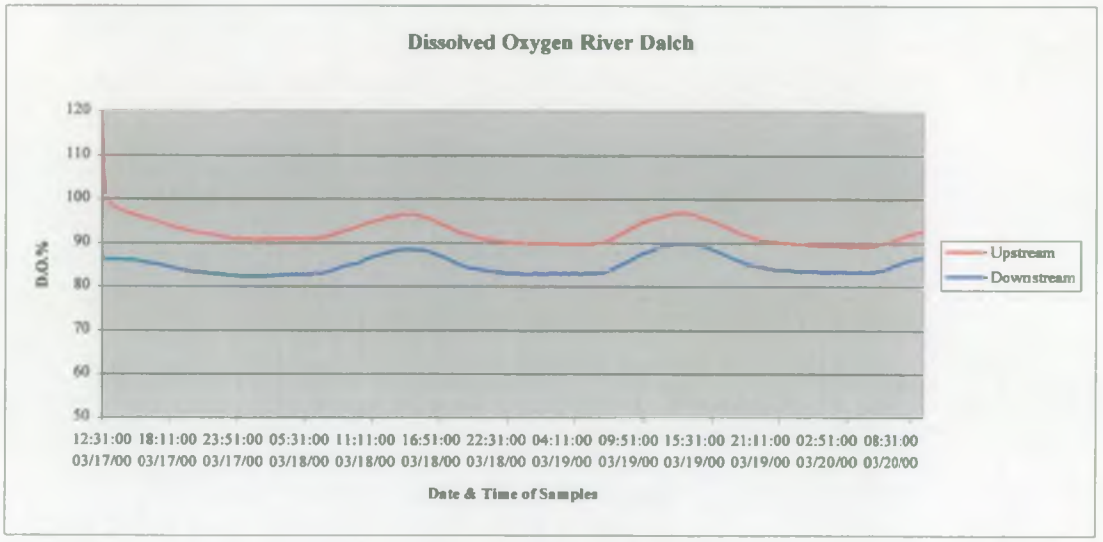
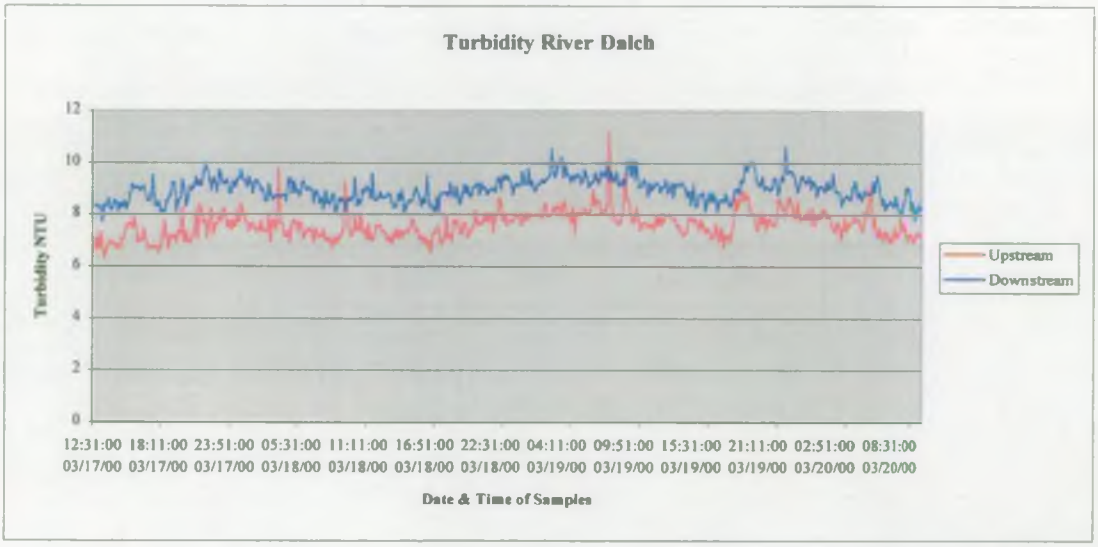

Comparison of Suspended Solids during the two surveys on the River Dalch
SS mg/l
60
50
40
30
20
10
0
Site 1
Site 2
Site 3
Site 4
Mill Leat
Site 5
High Flow
Low Flow

Figure 8 Data from YSI 6920 Water Quality Monitors.







APPENDICES

Appendix 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 Ca CO_3	Disolved Copper ug/l 95%ile	Total Zinc ug/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	2 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	2 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	2 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	2 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

Appendix 2

River Dalch Investigation

Historical Data for site 73040207, D/S STW

Used to classify Cann's Mill Bridge to Below Lapford Sewage Treatment Works

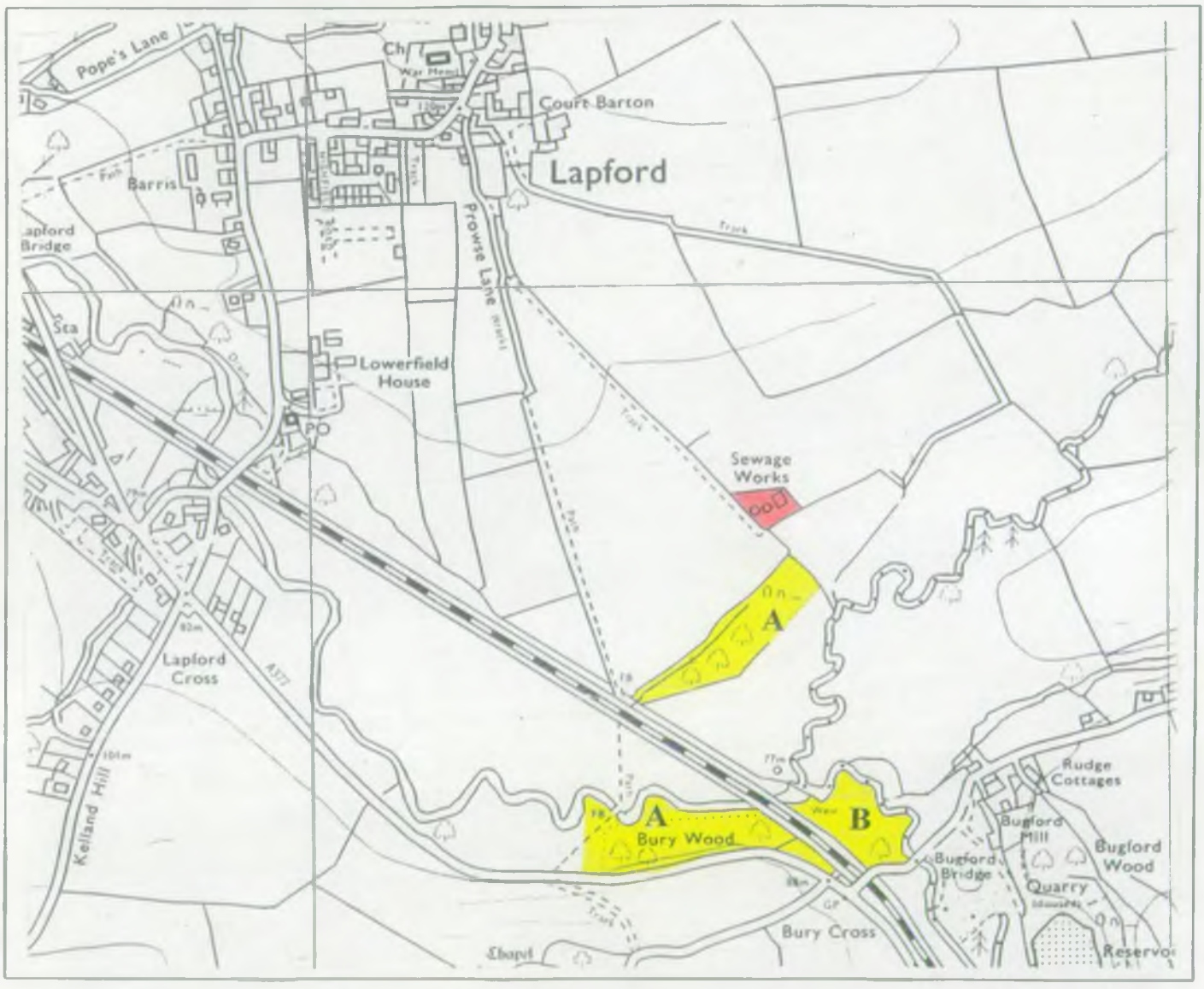
--Samples --		85	111	119
				Un-ionised
		BOD ATU	Total Ammonia	Ammonia
Date	Time	mg/l	mg/l	mg/l
03-Jan-97	11:00	2.9	**0.96**	0.0026
21-Jan-97	10:15	2.7	0.11	0
04-Feb-97	10:00	2.6	**0.64**	0.0026
11-Feb-97	11:25	1.8	0.08	-
26-Feb-97	10:30	1.9	0.07	0.0003
18-Mar-97	11:10	1.3	0.15	0
21-Mar-97	09:50	2.2	0.38	0.0024
19-May-97	10:50	**20.2**	**2.3**	0.0132
20-May-97	11:10	**5.3**	0.17	0
19-Jun-97	10:10	**6.1**	**1.1**	0.0064
17-Sep-97	12:15	1.8	0.066	0.0006
10-Oct-97	10:20	**11.1**	0.279	0.0014
29-Oct-97	09:50	2.1	0.124	0.0007
22-Nov-97	09:00	2.1	0.042	0.0002
22-Dec-97	12:00	1.5	0.03	0.0002
30-Dec-97	11:05	2.1	0.153	0.0009
02-Feb-98	11:45	1.9	0.089	-
16-Feb-98	12:20	1.4	0.095	-
04-Mar-98	10:55	**6.3**	0.279	-
13-Mar-98	10:15	1.2	0.047	-
17-Apr-98	11:35	2.4	0.215	-
29-May-98	11:10	**9**	0.491	-
30-Jul-98	11:30	1.3	0.104	-
09-Sep-98	11:20	1.4	0.094	-
13-Oct-98	10:45	2.7	0.075	-
06-Nov-98	09:45	1.6	0.073	-
20-Nov-98	10:05	3.4	0.138	-
04-Dec-98	10:35	1.7	0.033	-

Failures in RED

Appendix 3

Biodiversity Appraisal

Map showing areas highlighted by Conservation & Recreation. The areas are both County Wildlife Sites; area A: secondary woodland, area B: marshy grassland.



Appendix 4

River Dalch Survey Results 16 September 1999

Weather started dry then rained heavily from 07:30, cleared at 08:30

Run Number	Time sample Taken	Sample Site	BOD ATU mg/l	Ammonia mg/l	Suspended Solids @105 °C	Dissolved Oxygen %	Water Temp °C	Flow m/s	pH	% Cover of Weir
1	06:40	1	1.7	0.5 <	8.1	91	11.1			
1	06:49	2	11	0.85	84	84	12.7			
1	06:55	3	2.1	0.5 <	4.1	84.5	11.9			
1	07:09	4	2.4	0.5 <	3.3	80.1	11.8			
1	07:14	5	1.8	0.5 <	5.5	80.9	11.9			20
1	07:19	Mill Leat	2.4	0.5 <	7.5	79	11.9			
2	08:09	FE	16.7	3.92	28.7					
2	08:15	1	2.2	0.5 <	15.2	91	11.6			
2	08:21	2	8.2	1.16	32.7	88.8	12.8			
2	08:28	3	6.7	0.86	37.1	81.2	12.6			
2	08:34	4	1.8	0.5 <	3.5	78.4	11.8			70
2	08:37	5	2.1	0.5 <	11.8	84.3	11.9			
	09:15	1						3.8		
3	10:00	1	2.9	0.5 <	34.5	90.7	11.5			
3	10:06	2	3.6	0.5 <	32.4	90	12.1			
3	10:11	3	4.4	0.5 <	19.3	88.1	12.5			
3	10:16	4	5.5	0.86	26.5	82.1	12.5			
3	10:20	5	5.6	0.74	31.1	86.6	12.5			
3	10:23	Mill Leat	5.5	0.7	25.2	82.1	12.6			100
	10:40	1						6.3		
4	12:08	1	6.3	0.5 <	68	94.4	12.4		7.39	
4	12:31	2	6.3	0.5 <	64.3	90.2	12.2		7.25	
4	12:41	3	5.7	0.5 <	57.3	88.3	12.3		7.36	
4	12:48	4	5.5	0.5 <	51.8	88.6	12.4		7.43	
4	12:53	5	5	0.5 <	43	91.2	12.3		7.47	
4	12:16	FE	8.4	2.23	9.7	77.1	16.3	5.7 l/s	6.96	
5	14:05	1	5.4	0.5 <	56.3	92.8	12.5		7.46	
5	14:12	2	4.8	0.5 <	56	91.9	12.5		7.47	
5	14:21	3	5.9	0.5 <	43	91	12.7		7.39	
5	14:26	4	6.2	0.5 <	43.3	89.4	12.4		7.32	
5	14:34	5	6.2	0.5 <	49	92	12.5		7.39	100
5	14:38	Mill Leat	6	0.5 <	37	88.9	12.4		7.44	
6	16:00	FE	13	2.35 <	25.1	59.8	16.6	5.6 l/s	7.01	
6	16:12	1	5.7	0.5 <	79	93.4	12.3		7.35	
6	16:20	2	6.1	0.5 <	78	80.1	13.1		3.48!!	
6	16:28	3	5.7	0.5 <	79	84.7	13.2		7.59	
6	16:34	4	5.7	0.5 <	77	80.8	13		7.9	
6	16:42	5	5.8	0.5 <	60	78.8	12.6		7.64	99
7	18:00	1	4.9	0.56	66.8	109.5	12.8		7.75	
7	18:07	2	5.1	0.5 <	66.8	86	12.6		7.82	
7	18:18	3	5.2	0.5 <	63	93.7	13		8.03	
7	18:25	4	5.2	0.5 <	53	89.1	13.1		7.39	99
7	18:30	5	5.1	0.5 <	63	103.5	12.6		7.82	
7	18:33	Mill Leat	5.1	0.5 <	56	86.5	12.8		7.8	

R.E. 2 Failures in red

Appendix 5

RIVER DALCH HIGH FLOW SURVEY 15 DECEMBER 1999

Sample Point : 73049999 CATCHMENT 30D

Dry weather all day.

Run Number	Time sampl Taken	Sample Site	BOD ATU mg/l	Ammonia mg/l	Sld Sus@105 °C mg/l	Dissolved Oxygen %	Water Temp °C	Flow m/s	% Cover of Weir
1	06:05	1	1.9	0.049	27.4	93.3	5.7	10.2	
1	06:15	2	1.8	0.052	22.8	94.4	5.7		
1	06:25	3	1.7	0.057	21.1	94.3	5.8		
1	06:30	4	1.6	0.05	16.8	93.5	5.8		
1	06:35	5	1.9	0.056	17	94.6	5.8		100%
1	06:40	Mill Leat	1.7	0.049	18.7	95.3	5.7		
2	08:03	1	1.7	0.042	21.7	94.3	5.8	9.3	
2	08:12	2	1.6	0.045	17.9	94.2	5.7		
2	08:17	3	1.7	0.044	15.3	94	5.7		
2	08:20	4	1.7	0.043	20.2	93.6	5.6		100%
2	08:28	5	1.7	0.053	20.8	95.1	5.7		
2	08:45	F E	3.1	0.075	6.8	No result	No result		
3	10:02	1	1.5	0.042	20.8	91.8	5.5	9.04	
3	10:08	2	1.8	0.046	19.1	92.6	5.6		
3	10:12	3	1.5	0.056	17.2	94	5.6		
3	10:20	4	1.7	0.04	17.5	92	5.6		
3	10:24	5	1.8	0.043	17	93.4	5.5		
3	10:28	Mill Leat	1.7	0.041	15.7	92.5	5.6		
4	12:02	1	1.7	0.073	22.1	91.2	5.3	9.23	
4	12:10	2	2	0.074	18.9	93.6	5.9		
4	12:17	3	1.8	0.08	17.7	* 96	5.6		
4	12:22	4	1.7	0.072	19.1	** No re	No result		100%
4	12:26	5	1.5	0.131	16.6	No result	No result		
4	12:40	F E	4.4	1.07	7	No result	No result		
5	14:20	1	1.5	0.048	17.9	No result	No result	10.8	
5	14:27	2	1.8	0.05	18.7	No result	No result		
5	14:30	3	1.6	0.051	14.3	No result	No result		
5	14:33	4	1.8	0.048	14.3	No result	No result		100%
5	14:35	5	1.9	0.053	16.2	No result	No result		
5	14:37	Mill Leat	1.8	0.049	14.7	No result	No result		
6	16:00	F E	5.7	0.664	7.2	No result	No result		
6	16:08	1	1.7	0.047	16.4	No result	No result		
6	16:13	2	1.6	0.046	16.6	No result	No result		
6	16:15	3	1.8	0.051	16.6	No result	No result		
6	16:18	4	1.6	0.05	14.9	No result	No result		100%
6	16:20	5	1.9	0.047	16	No result	No result		
7	18:00	1	1.7	0.039	17	No result	No result	9.58	
7	18:05	2	1.5	0.041	17	No result	No result		
7	18:10	3	1.8	0.039	15.3	No result	No result		
7	18:15	4	1.6	0.041	12.6	No result	No result		100%
7	18:20	5	1.8	0.041	15.8	No result	No result		
7	18:25	Mill Leat	1.6	0.041	14.9	No result	No result		

R.E. 2 Failures in red

* Recalibrated D.O. Probe

** D.O. Probe failed

DEVON AREA INVESTIGATIONS TEAM ACTIVITY RISK ASSESSMENT

Date last modified 23/11/99 by (name) R Pearson

SITE: LAPFORD STW, RIVER DALCH

CATCHMENT: 30 D

Date of Assessment: 19-8-1999

Name of Officer: STUART HUNTER

CONSIDERATION	YES	NO	ACTIONS REQUIRED
(A) GENERAL			
1. Do you need to notify site manager/ landowner of Agency presence?		✓	I have spoke to farmer (Mr Mills) and he is happy for us to use his land.
2. Do you need to be accompanied by site staff?		✓	
3. Does task require more than one person?	✓		If sampling in the dark.
4. Are you working outside daylight hours?	✓		
5. Is the site isolated	✓		
5. Do you need to employ Lone Worker procedures?		✓	
6. Is protective clothing required?		✓	
7. Will seasonal factors affect site safety?	✓		High flows in River may increase danger.
8. Are there dangers from the following			
chemicals		✓	
biological hazard	✓		Wear gloves when sampling F.E.
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?	✓		
(B) VEHICLE ACCESS			
1. Is there safe vehicle acces to site?	✓		
2. Can vehicles be parked/left safely?	✓		

(C) FOOT ACCESS

	YES	NO	
1. Is there safe foot access to the site?	✓		
2. Are there fences/ditches etc. to cross?		✓	Gates are available

(D) BANK SITES

1. Are banks steep or slippery?		✓	
2. Might banks be undercut?		✓	
3. Is water deep/strong currents?		✓	

(E) CLIFF OR SIMILAR SITES

1. Are there dangers from falling?		✓	
2. Is the terrain steep/slippery?		✓	
3. Might the cliff be overhanging?		✓	
4. Are ropes required?		✓	

(F) CONFINED SPACES

1. Are confined spaces involved? IF *YES* YOU MUST COMPLETE THE CONFINED SPACE FORM HELD IN OFFICE		✓	

(G) BOAT WORK

1. Is boat work involved? IF *YES* YOU MUST COMPLETE THE BOAT WORK FORM HELD IN OFFICE		✓	

(H) MANHOLES

1. Is the area around the manhole safe?		✓	
2. Are bollards/cones required?		✓	
3. Can cover be lifted safely?		✓	
4. Are cover keys/other equipment needed?		✓	

(I) AGGRESSIVE BEHAVIOUR

1. Are people likely to be aggressive?		✓	
2. Are guard dogs/farm dogs/other livestock a risk?		✓	

(J) OTHER
