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AN INVESTIGATION INTO THE
EFFECT OF FARNHAM STW
ON THE RIVER WEY

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ENVIRONMENT AGENCY



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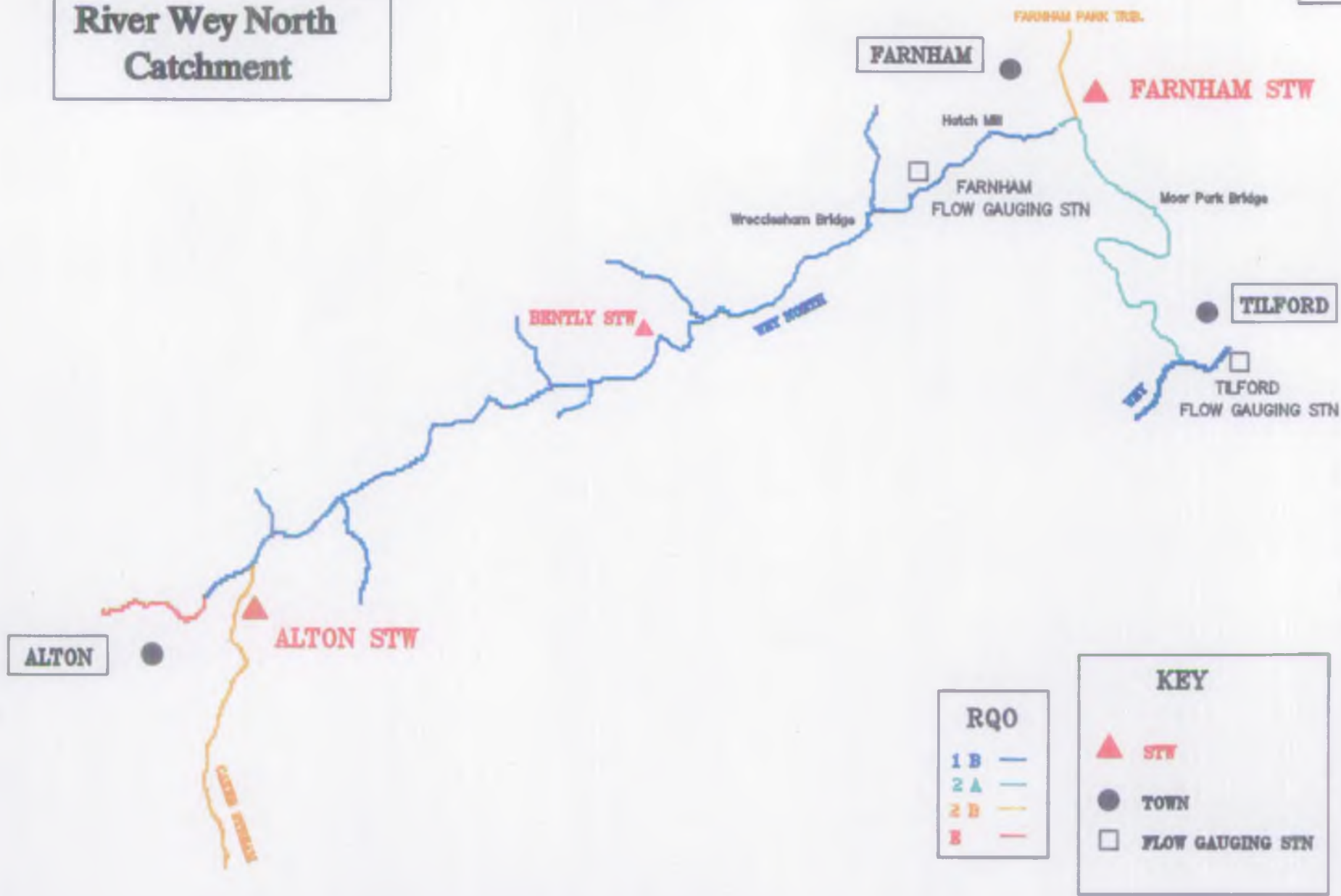
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Fig.1

River Wey North Catchment



An Investigation into the effect of Farnham STW on the River Wey (North Arm)

1. Introduction

This study was carried out to determine the effect of the effluent from Farnham STW on the water quality in the north arm of the River Wey. The effluent quality was examined for compliance to the discharge consent. The quality of the water found in the river, both upstream and downstream of the effluent discharge, was studied to see if it complied with current R.Q.O. standards. The current RQO's were also examined to determine if they were appropriate for the uses of the river and to see if they should be changed at all to reflect water quality on river usage.

The River Wey's North arm rises in the Alton area and flows north-east through largely agricultural land. The main sewage treatment works upstream are at Alton and Bentley which are both a considerable distance away and should have no effect on the water quality at Farnham. The only major tributary is the Caker Stream which is right at the head of the catchment and there are no other major discharges into the river. (See Fig. 1)

During the past two years the Wey North has suffered from very low flows as the chalk aquifers which feed the river have been depleted. Much of the flow (<60%) at the upper end of the catchment results from Alton STW's effluent. The RQO of the river from Alton to Farnham is set at 1B and due to low flows and little dilution of effluent RQO failures have been recorded here. From Farnham to the confluence with the Wey South at Tilford the RQO is set at 2A. This change in RQO is due to historically bad effluent from Farnham STW.

The designation of the rivers fisheries also closely matches the RQO designations. The river from Mill Court, Wyck to the mouth of the Farnham Park Tributary is designated as an E.C. Salmonid fishery whilst from the Farnham Park Tributary to the confluence with the Wey South is designated as a coarse fishery.

The aim of this study is to assess whether these RQO's are appropriate given the quality of the water in the Wey North and the effluent produced by Farnham STW.

2. Methods Used

i. Sites Studied (See Fig. 1)

Wrecclesham Bridge

A D.O. Survey was carried out at this site to determine water quality prior to the river entering Farnham. There have been some reports of sewage coming from surface water sewers in Farnham and any wrong connections would affect the downstream water quality. This is not a programmed sampling point and thus no archive data exists for this site.

Hatch Mill URN: PWER.0022

The site is sampled as part of the core programme and archive data was studied. Both a D.O. survey and a 24 hour sampling run were carried out at this site in May 1992. This site is in Farnham Town Centre, upstream of the Sewage Treatment Works. There are many surface water drains along the river here but no other discharges. The RQO is set at 1B here and the reach is designated as a Salmonid fishery. This site was studied to examine the water quality of the river upstream of Farnham STW.

Farnham STW URN: PWEE.0078

The sewage works discharges into the Farnham Park Tributary a short distance above its confluence with the Wey North (see below). The consent is set at 35/25/11. The works has recently been extended and the archive data was studied to see what effect this has had on effluent quality. A 24 hour sampling run was also carried out to assess current effluent quality outside of normal sampling hours.

Farnham Park Tributary u/s Wey URN: PWER.0126

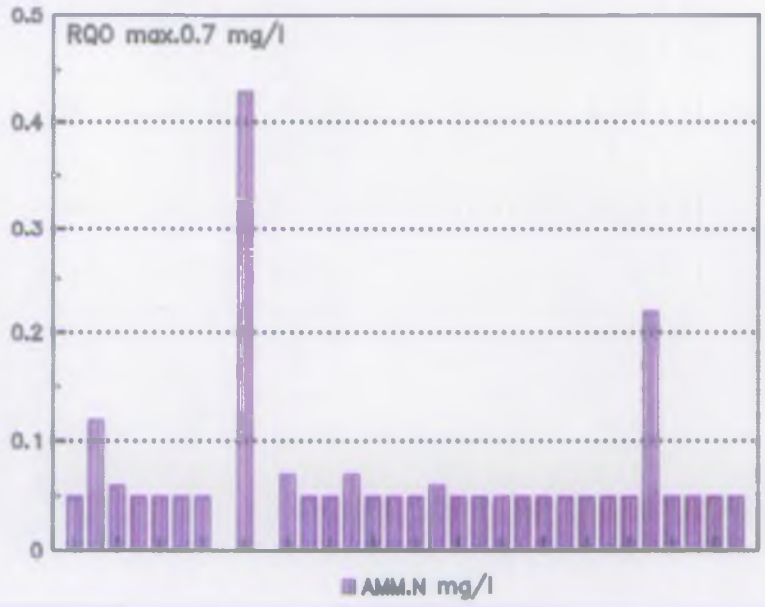
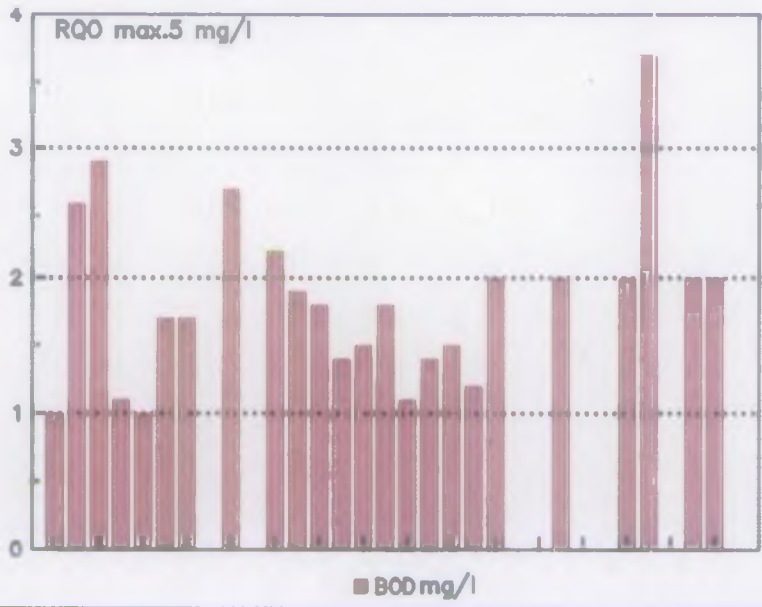
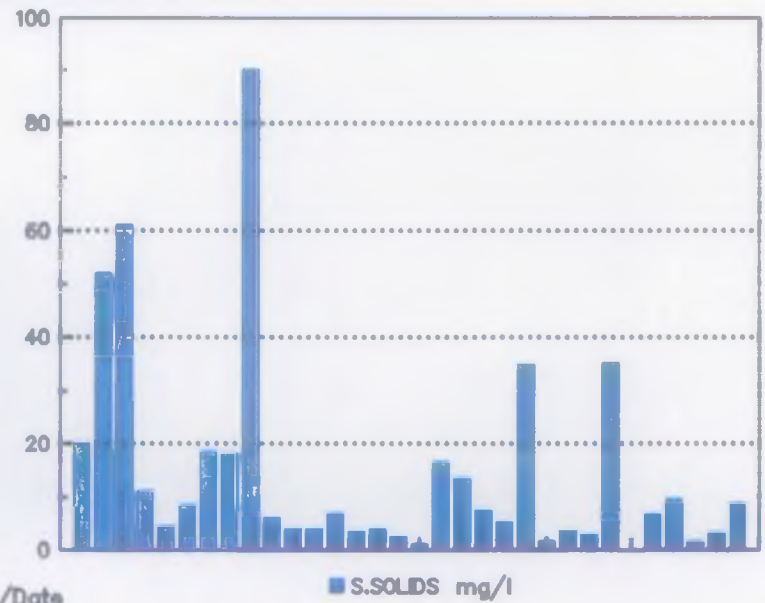
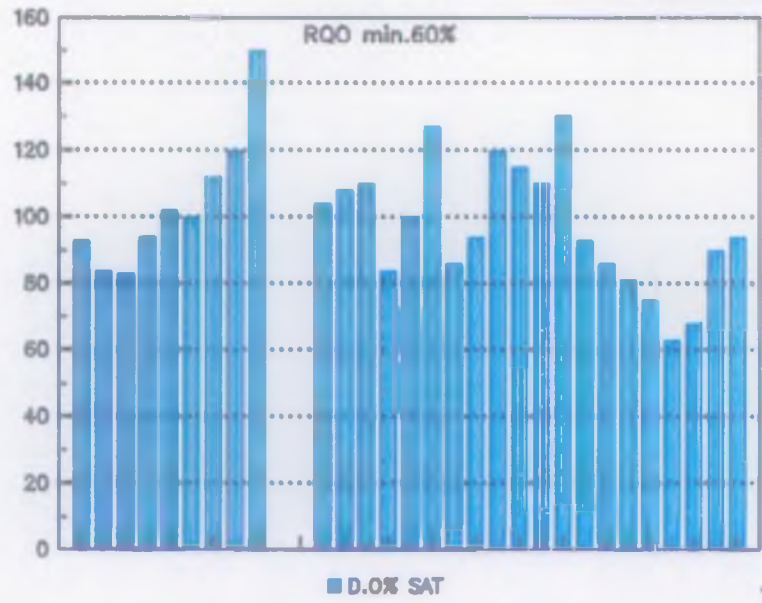
The site is a short way downstream of the works outfall and the RQO is set at 2B here because of the use of the stream, which is fairly limited. The head waters of the stream have suffered some sewage pollution due to wrong connections to the north of Farnham Park. There is little flow in the stream and the effluent is not diluted by much at this site. A 24 hour sampling run was carried out at this site to examine the quality of water entering the Wey North at the point where the RQO changes.

Moor Park Bridge URN: PWER.0024

This site is about 2.5km downstream of the mouth of the Farnham Park Tributary and is the RQO sampling point for the Farnham to Tilford reach. The RQO is set at 2A for this reach. Archive data for this site was studied to examine what effects the improvements in effluent quality has had on the receiving watercourse. A D.O. survey and a 24 hour sampling run were again carried out to assess water quality outside of the usual sampling "windows".

**Wey North Hatch Mill Farnham
Archive Data 1990-1991**

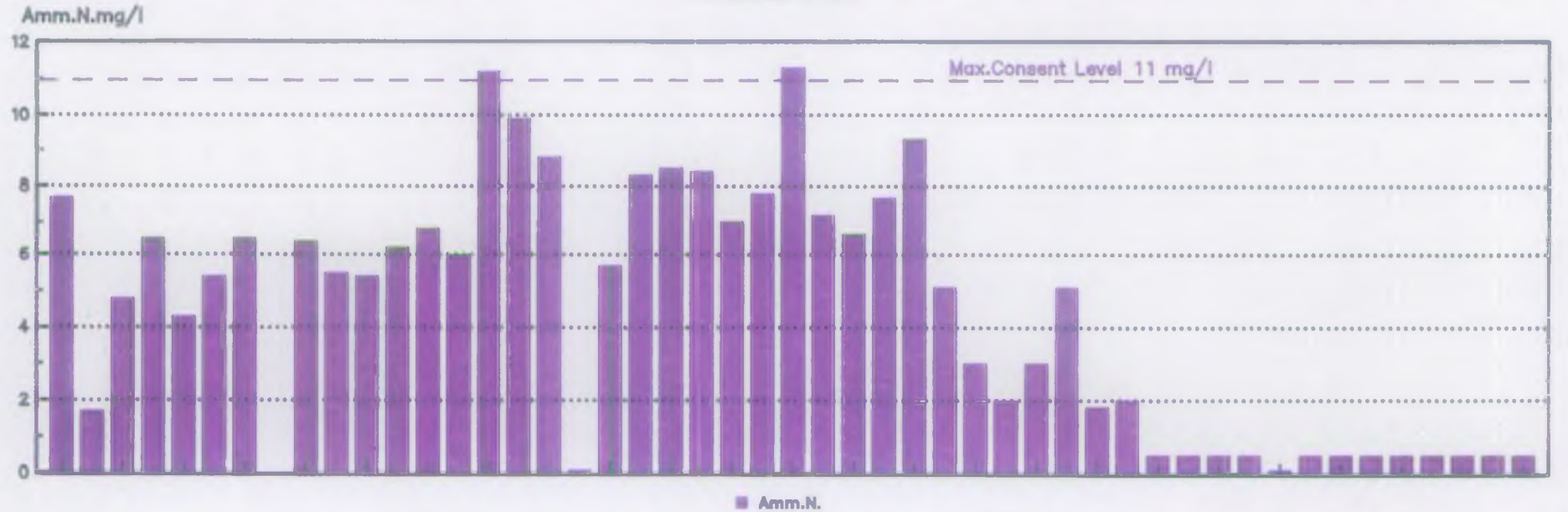
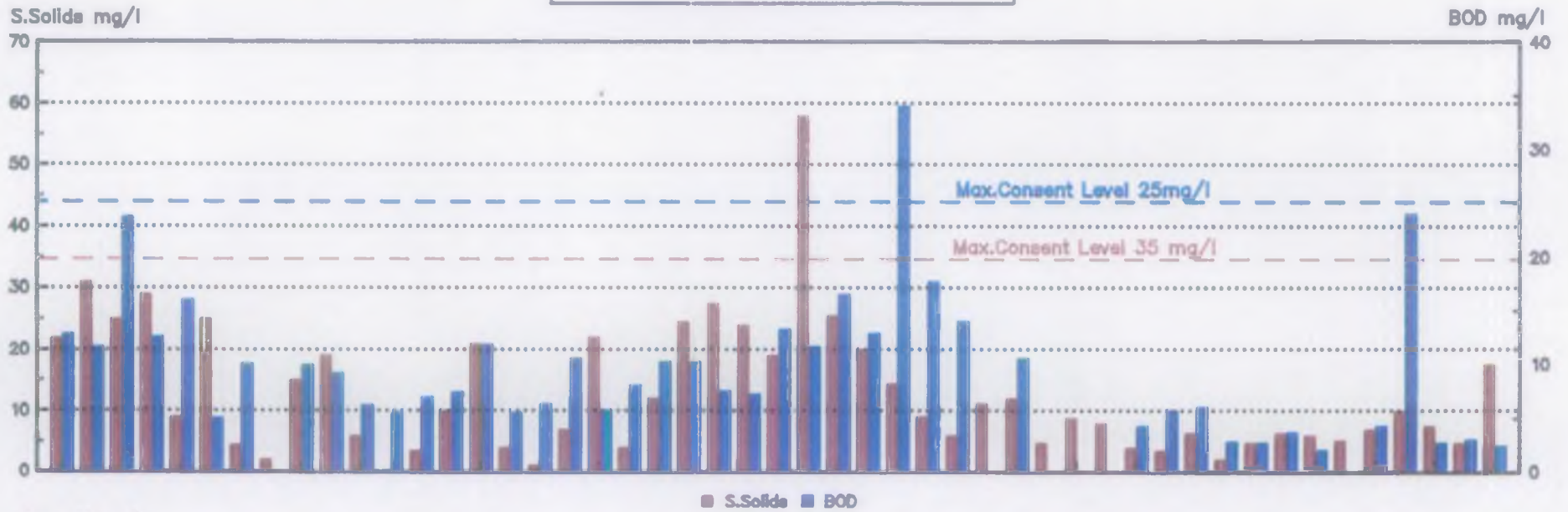
Fig.2

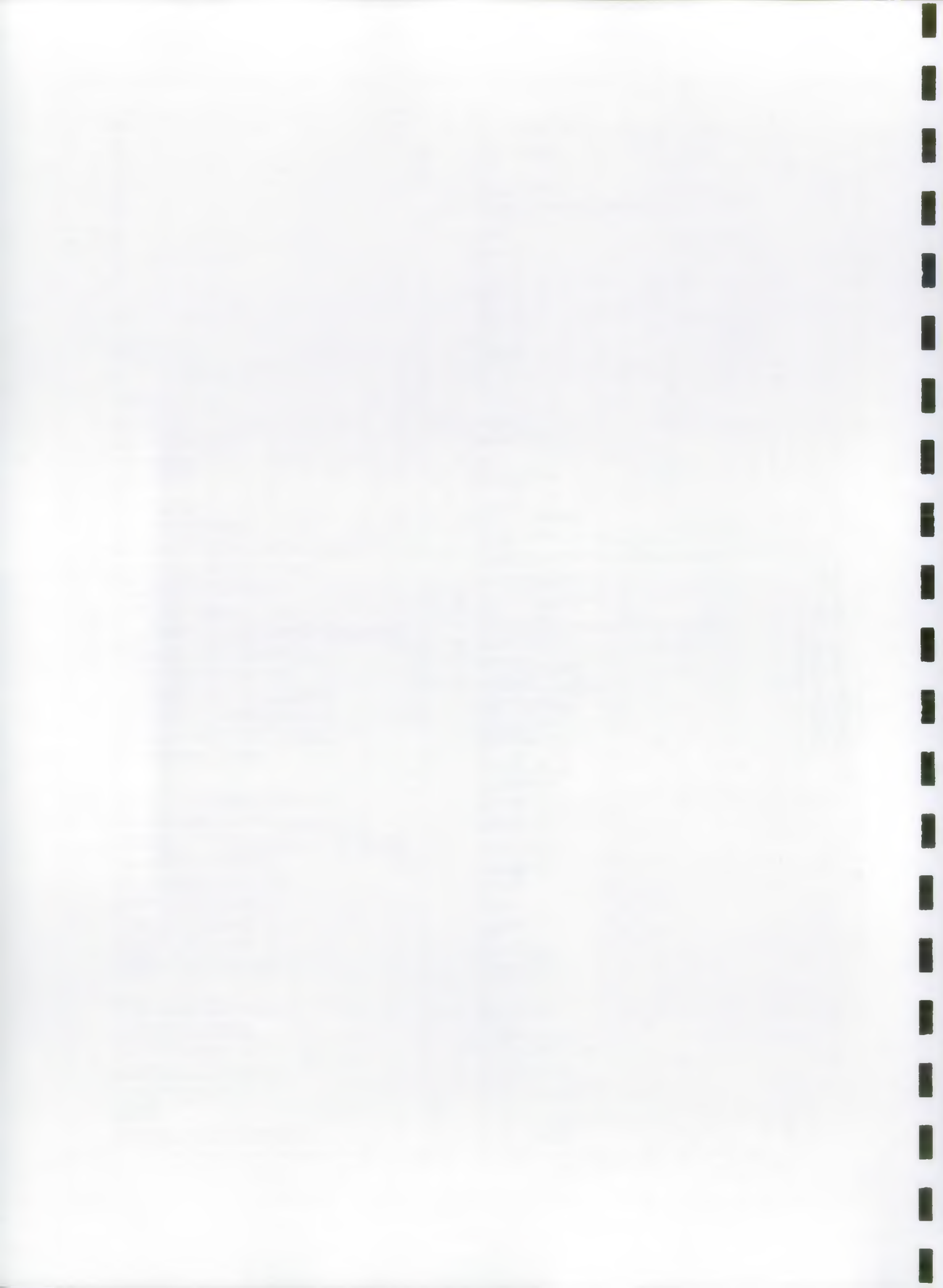




Farnham Sewage Treatment Works
Archive Data 1990-1991

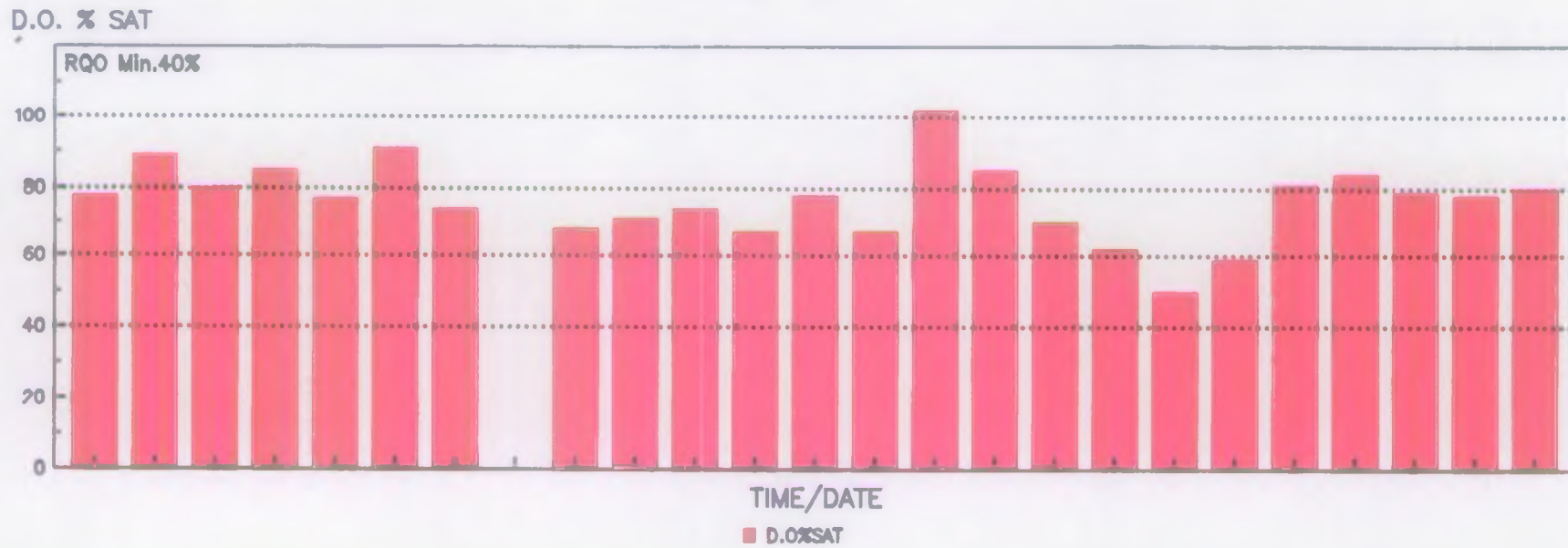
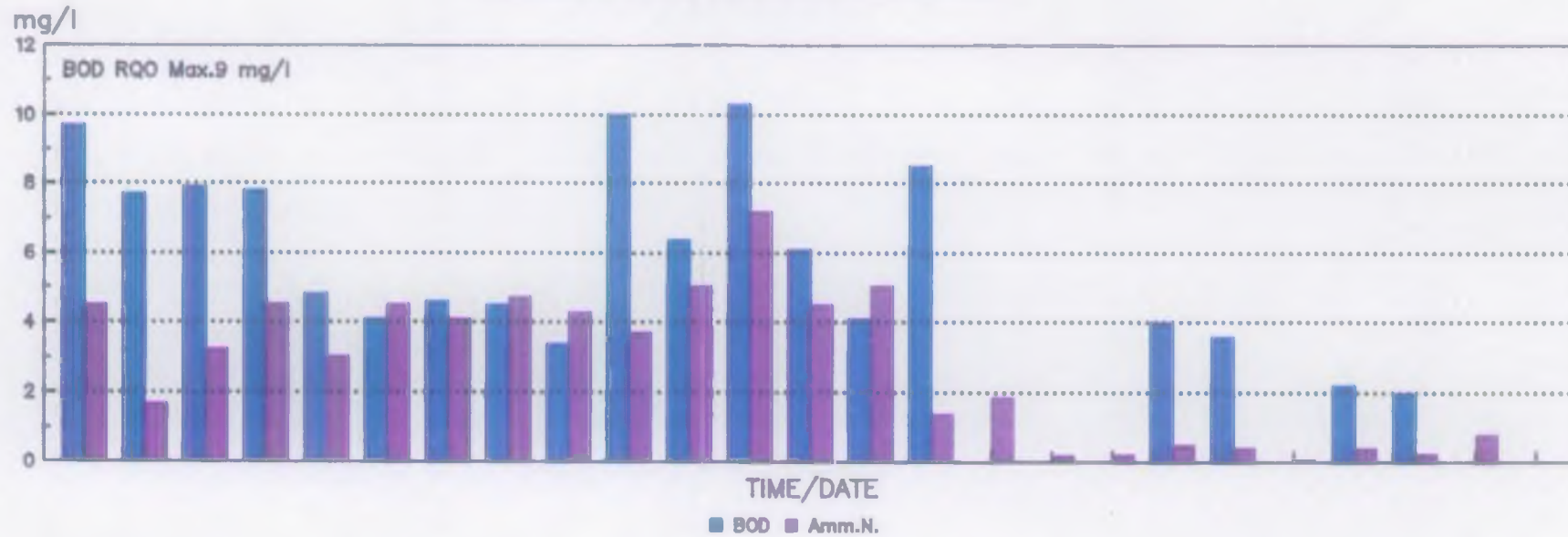
Fig.3





Farnham Park Trib.U/S Wey North
Archive Data 1990-1991

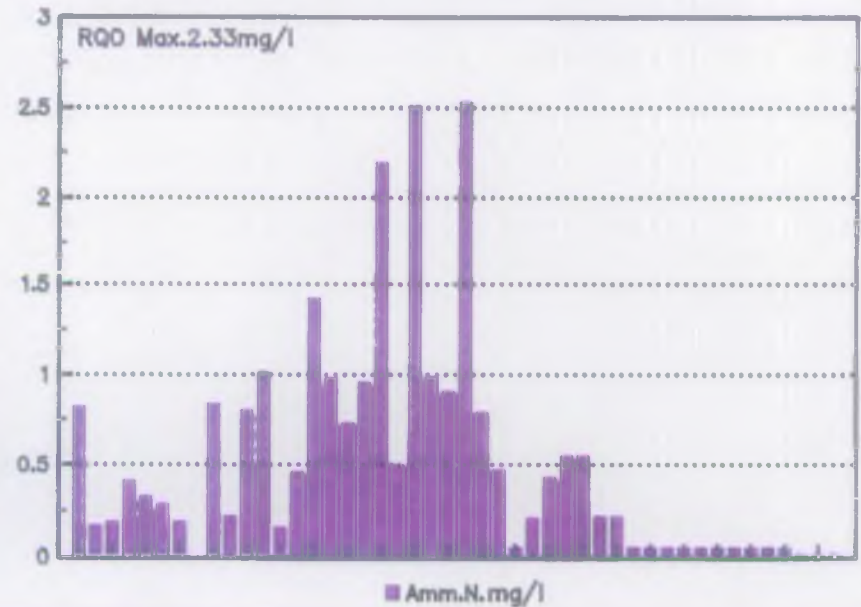
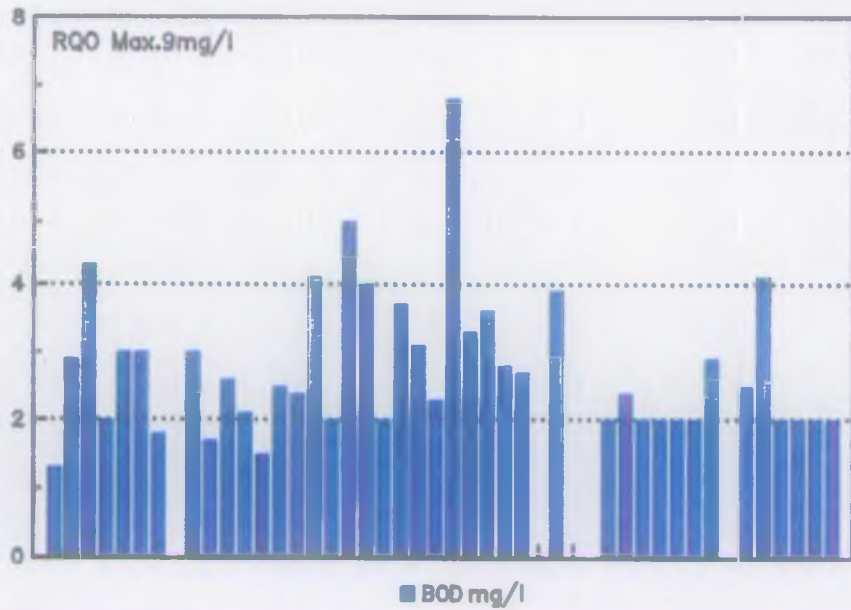
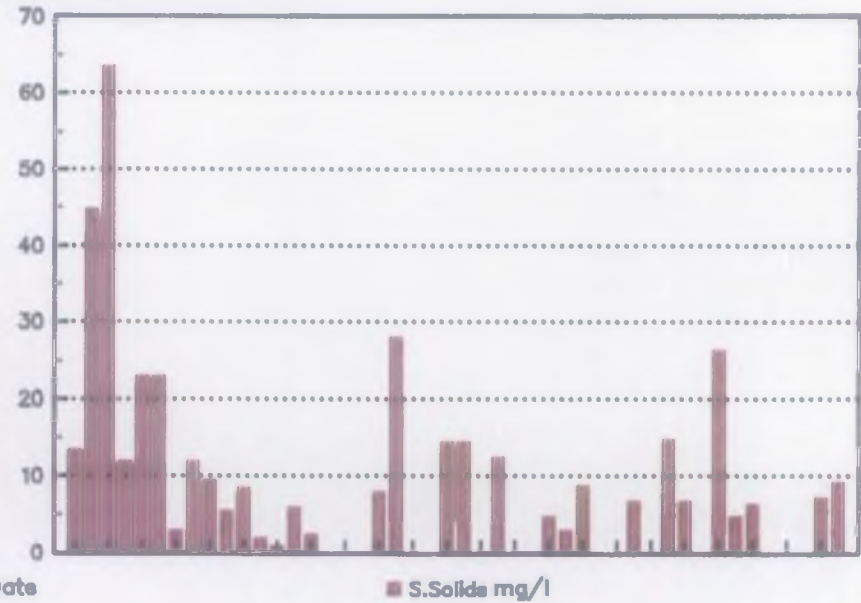
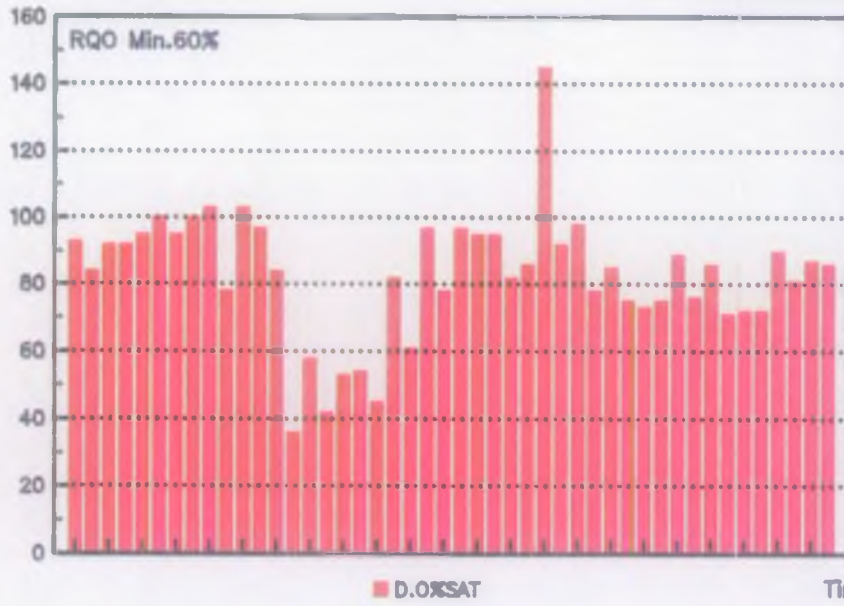
Fig.4





Wey North Moor Park Bridge Farnham
Archive Data 1990-1991

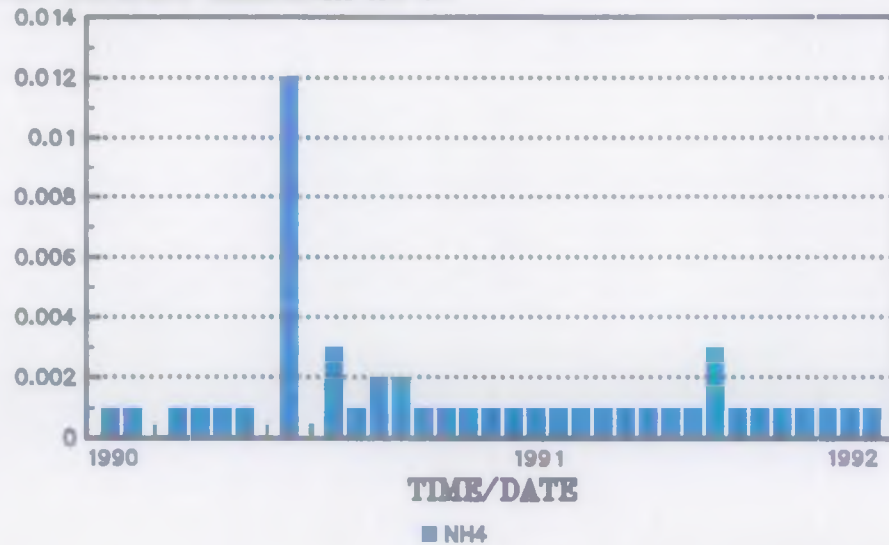
Fig.5





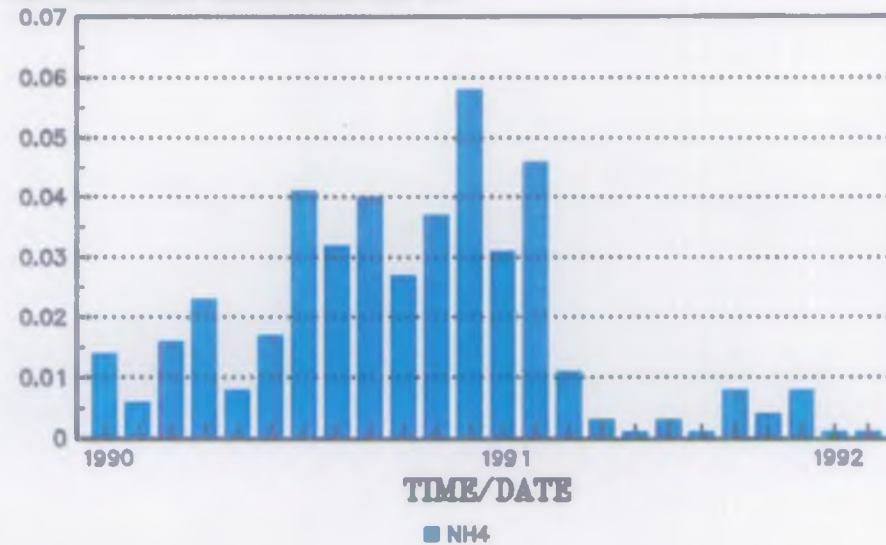
WEY NORTH HATCH MILL FARNHAM

UN-IONISED AMMONIA AS N.



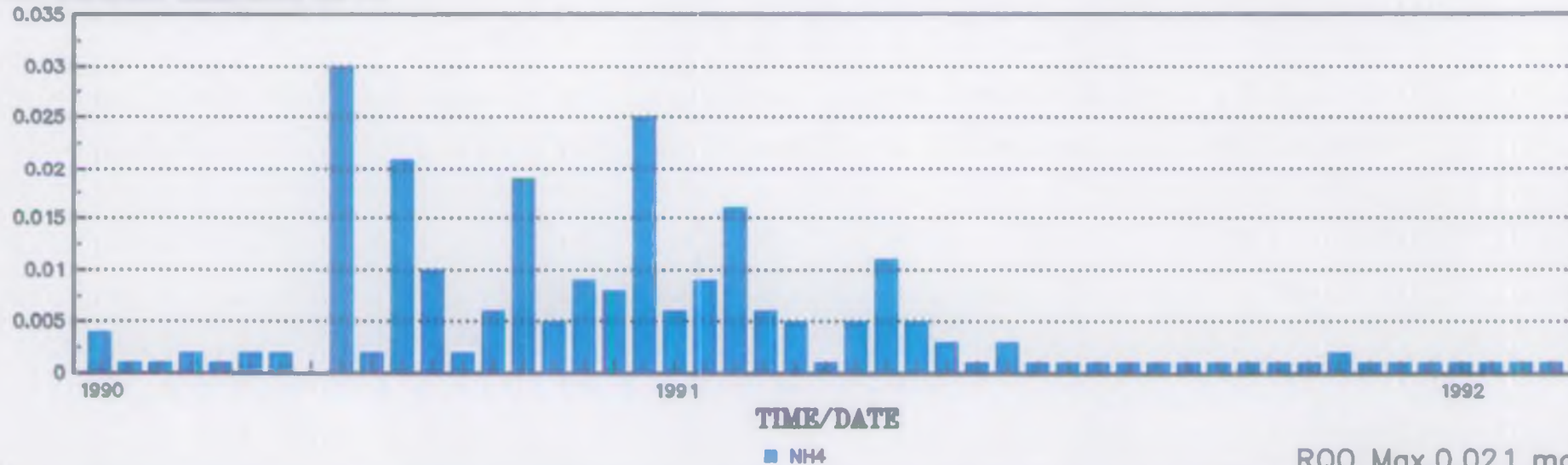
FARNHAM PARK TRIB.U/S WEY

UN-IONISED AMMONIA AS N.



WEY NORTH MOOR PARK BRIDGE

UN-IONISED AMMONIA AS N.



RQO Max.0.021 mg/l

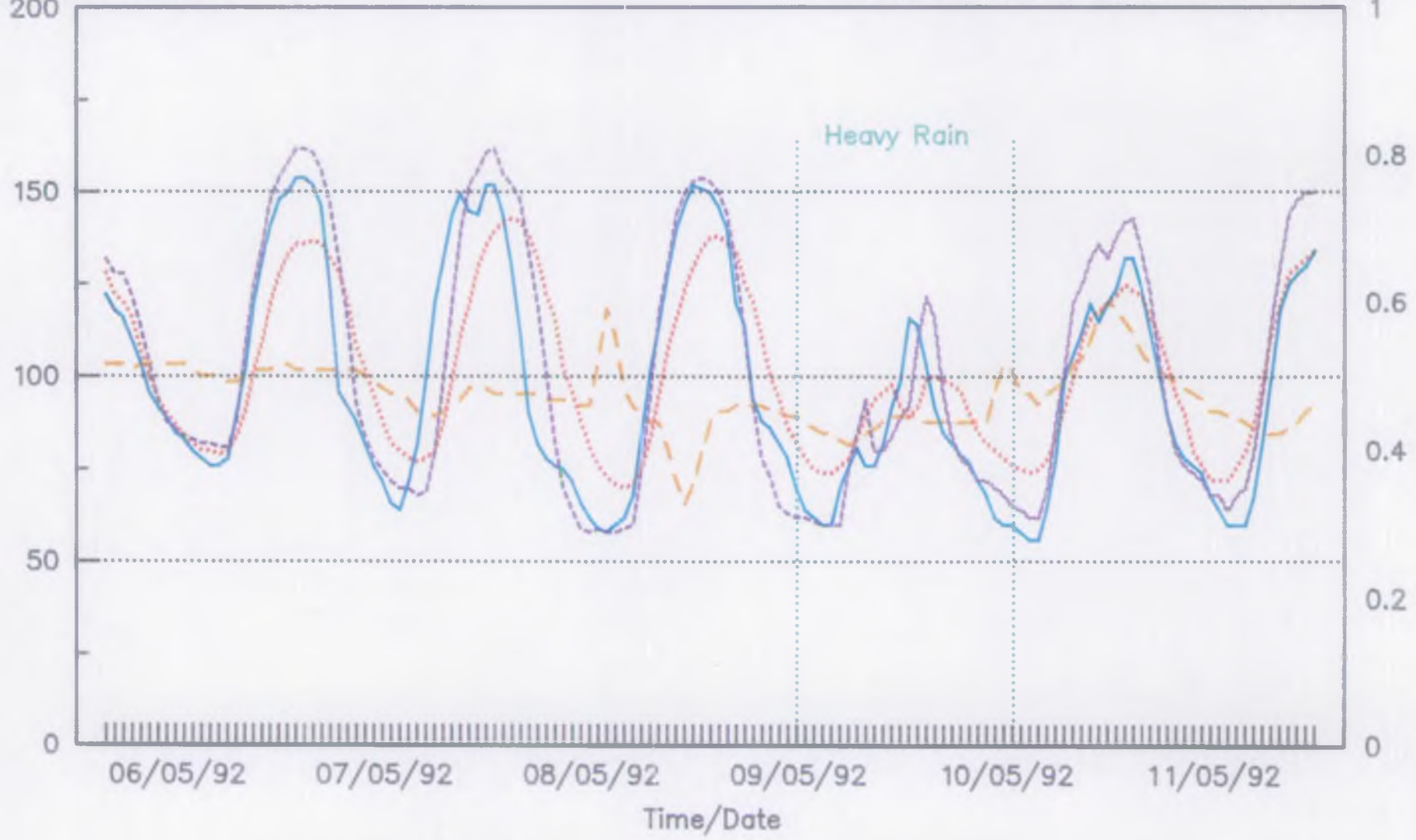


Wey North Farnham Area Recording D.O. Survey

Fig.7

D.O.% saturation
200

Flow at Farnham Gauging Station Cumecs
1



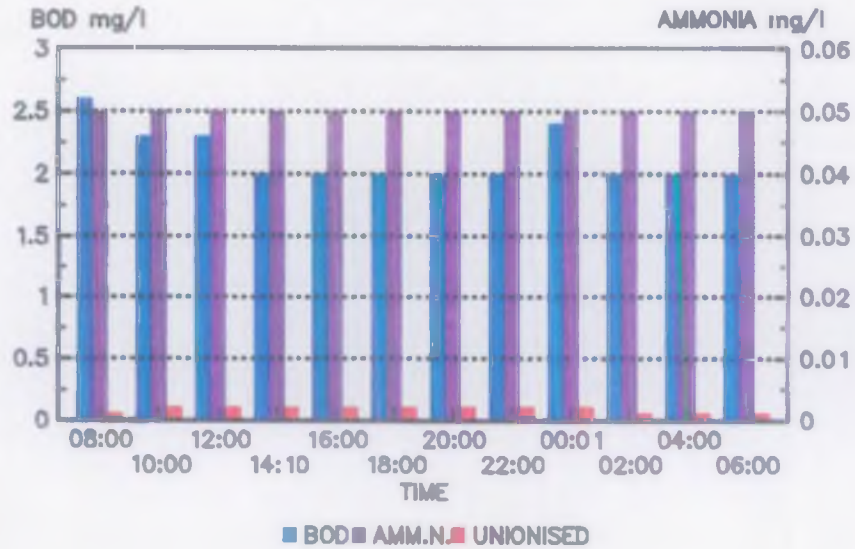
Wrecclesham Bridge Hatch Mill Moor Park Bridge Flow



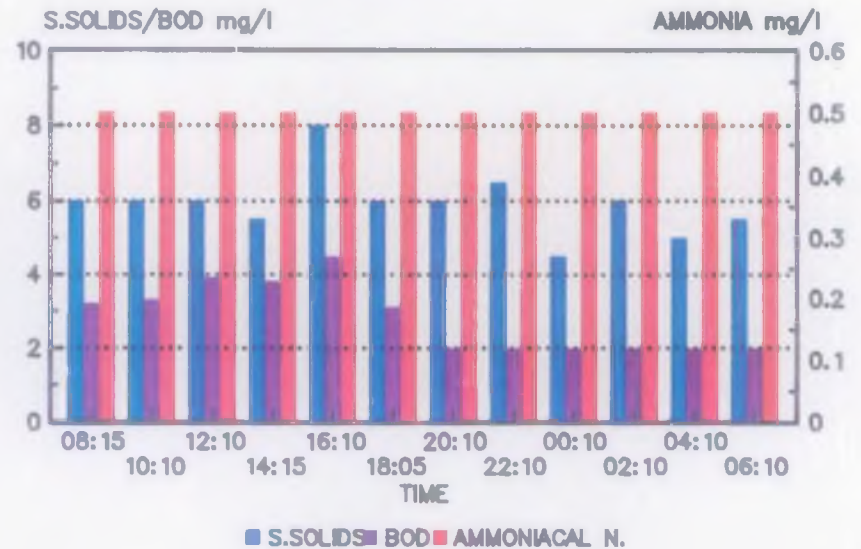
WEY NORTH 24 HOUR SURVEY 20-21/05/1992

Fig.8

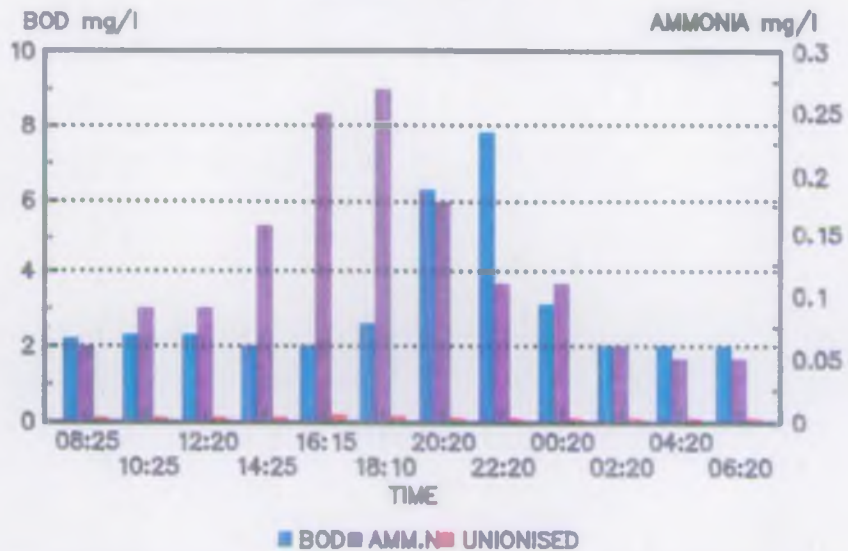
HATCH MILL FARNHAM



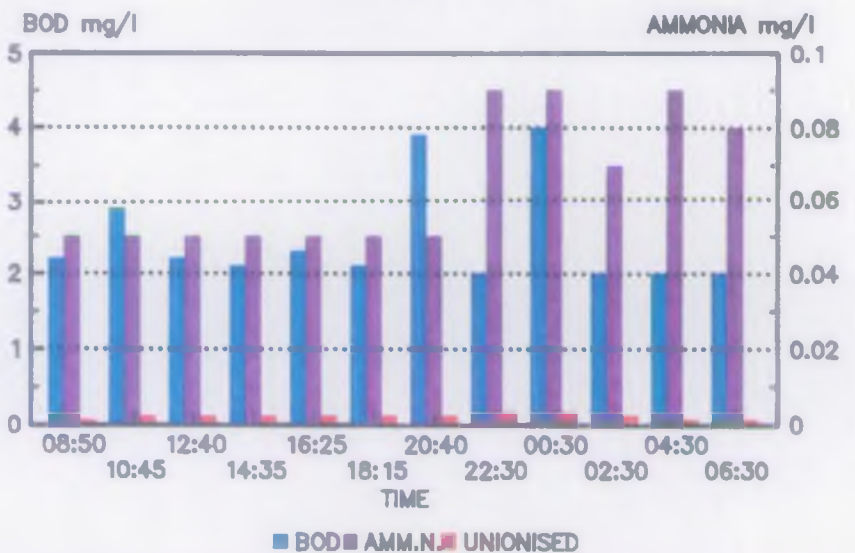
FARNHAM STW



FARNHAM PARK TRIB



MOOR PARK BRIDGE

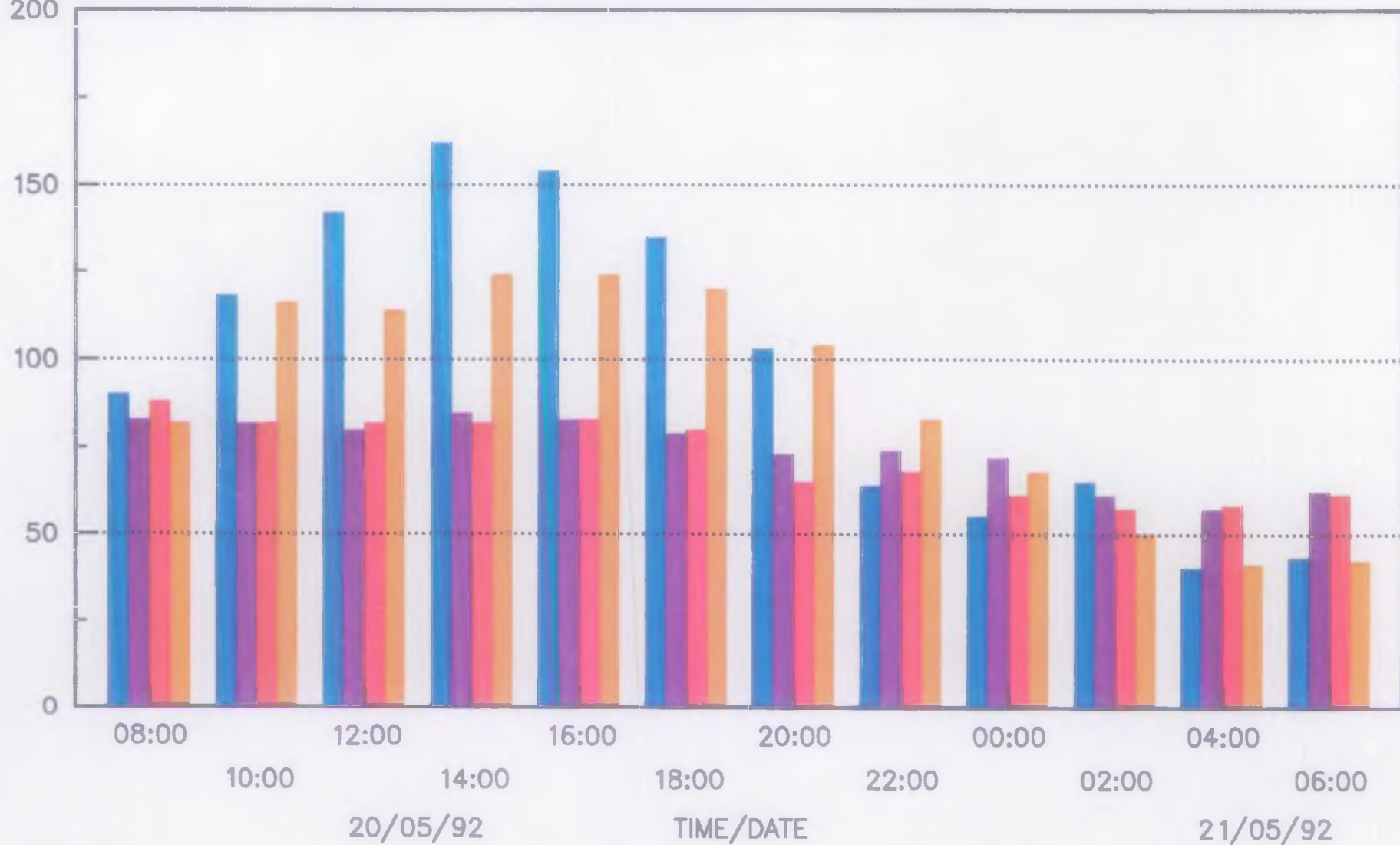




FARNHAM AREA 24HR SURVEY DISSOLVED OXYGEN

Fig.9

D.O % SATURATION
200



■ HATCH MILL
 ■ FARNHAM STW
 ■ FARNHAM PARK TRIB
 ■ MOOR PARK

National Rivers Authority - Thames Region

GAUGE REFERENCE : 280825 STATION NAME : Farnham R30
 M.O. REFERENCE : 280825 LOCATION :
 GAUGE TYPE : Tipping Bucket GRID REF : SU856481
 RAIN DAY START : 09:00 GMT ALTITUDE : 0.0 m

Annual Summary : 1992 Record Type : Archive file

Daily Rainfall totals recorded in mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	-	-	5.2	-	-								1
2	-	0.4	0.2	-	2.4								2
3	2.2	-	-	-	-								3
4	2.0	-	-	-	-								4
5	0.2	-	1.0	0.6	0.2								5
6	-	-	-	6.2	-								6
7	4.4	0.2	-	2.2	-								7
8	4.4	0.2	-	-	0.8								8
9	1.6	1.8	0.6	-	9.4								9
10	-	9.6	3.0	-	0.4								10
11	-	0.2	0.2	-	-								11
12	0.4	5.2	0.8	0.6	-								12
13	-	0.2	0.2	-	-								13
14	-	3.8	0.6	18.8	0.2								14
15	-	-	2.4	5.4									15
16	-	1.2	-	6.2									16
17	0.2	2.0	-	-									17
18	-	1.0	0.2	-									18
19	0.2	-	-	-									19
20	-	-	2.2	-									20
21	-	-	2.0	-									21
22	-	-	0.2	0.6									22
23	-	-	3.6	-									23
24	-	-	1.0	4.8									24
25	3.6	-	6.0	1.8									25
26	-	-	2.0	2.4									26
27	-	1.6	1.2	14.0									27
28	0.2	-	2.4	4.0									28
29	-	-	10.6	0.6									29
30	-	-	6.6	12.0									30
31	0.2	-	21.8										31

Totals: 19.6 27.4 74.0 80.2 13.4 M
 Mx.Day: 4.4 9.6 21.8 18.8 9.4

Annual Total : 214.6 mm M

Quality Key : E = Edited S = Snow ? = Suspect M = Incomplete

3. Interpretation of Results

a. Archive Data

i. Hatch Mill (See Fig. 2)

The RQO is set at 1B here which would give permitted maxima of 5mg/l for BOD, 0.7mg/l for Ammoniacal Nitrogen and 0.021 for unionised ammonia. The archive data shows that the samples taken easily conform to these parameters. The occasional peaks in the archive data are thought to be due to the effects of urban run-off in Farnham which affects the Hatch Mill site very soon after rainfall. The site is largely surrounded by paved areas where flow of surface water into the river would be very rapid. The archive data for dissolved oxygen shows that all samples taken are above the 60% minimum for a 1B watercourse.

ii. Farnham STW (See Fig. 3)

The consent here is set at 35/25/11. The archive data shows that generally this has been adhered to with one failure out of 43 for BOD, 1 out of 48 for suspended solids and 2 out of 48 for Ammoniacal Nitrogen (These represent compliance rates of 97.7%, 98% and 95.9% respectively). The more recent samples show a great improvement in effluent quality as a result of the works being extended. It must be noted that these samples have been taken generally between 10.00 and 15.00 and probably do not reflect the overall effluent quality.

iii. Farnham Park Tributary (See Fig. 4)

The RQO at this site is set at 2B which give a maximum level of 9mg/l for BOD, but no level of ammonia is designated. The archive samples show several RQO failures but recent samples have shown a rise in water quality to better than 2A standard. This sampling point is downstream of the works outfall and thus the water quality directly reflects the works effluent. The D.O. shows a compliance of 100% to the 40% RQO minimum. The time of travel to this site for the works outfall is very short and thus the samples taken reflect only effluent quality in the usual sampling window.

iv. Moor Park Bridge (See Fig. 5)

The archive data for Moor Park also shows a recent improvement in water quality due to the extension to Farnham STW being built. The DO is generally above the 40% minimum for a 2A watercourse and conforms to the 1B minimum of 60% in the majority of samples. The permitted BOD maximum is 9mg/l for a 2A watercourse and all samples

conform to this. Assessed against the 1B standard to 5mg/l only one sample fails on BOD. The archive samples for ammonia show some samples which reach the RQO 2A maximum of 2.33mg/l. The more recent samples again show a marked drop in ammoniacal nitrogen levels to below the 0.7mg/l level which is the 1B maximum. These results would tend to suggest that the Wey North downstream of Farnham STW could conform to the RQO 1B parameters. However, these samples do not reflect the overall water quality as they have been taken in a restricted time period.

v. **Unionised Ammonia Levels (See Fig. 6)**

The unionised ammonia level is set at 0.021mg/l (as N) for 1A, 1B and 2A watercourses. This level is set due to the toxic effects on fish of unionised ammonia above this concentration. The effect of unionised ammonia is particularly seen in salmonid fish. The levels of unionised ammonia in the works effluent is not measured but the level in the Farnham Park Tributary should be closely related. A comparison between unionised ammonia levels at the three river sites can be made to understand the effect on water quality.

The levels at Hatch Mill are generally very low, close to detection levels of 0.001mg/l. The occasional higher value seen is probably due to urban run-off in the Farnham area (see above). The results for Farnham Park Tributary are likely to reflect directly effluent quality and these show a marked recent fall in the concentration of unionised ammonia which matches the other archive results. The Farnham Park Tributary, it should be noted as a 2B river has no ammonia limits placed on it.

At Moor Park Bridge only one sample taken has failed the 0.025mg/l limit. The more recent samples have again seen a much lower level present and unionised ammonia at this level should not be a limiting factor on the fishery.

b. **Recording DO Survey (See Fig. 7)**

A recording DO meter survey was carried out on 3 river sites during May 1992. DO meters were placed at Wrecclesham (Coxheath) Bridge, Hatch Mill and Moor Park Bridge. Flow data was also obtained from Farnham flow gauging station which is between Wrecclesham Bridge and Hatch Mill.

The three DO traces obtained show a very close relationship to one another considering some 5km of river exists between them. The initial part of the survey was carried out during hot dry weather when there was a considerable amount of algal growth in the river. This led to a very high diurnal range in DO at all three sites. However, on the 19th May 9.4 mm of rain was

The 24 hour sample run results for the sewage effluent show a 100% compliance to the consent. The levels of all three determinands are very low and show a very high quality of effluent being produced. This survey was carried out during time of dry weather and this performance may be different if the flow to the works is increased.

The results for the Farnham Park tributary are again seen to reflect the sewage works effluent. A peak in the levels of BOD and ammoniacal nitrogen can be seen during the early evening. There is again virtually no unionised ammonia seen in the river here. The BOD maximum of 9.0mg/l is much less than the RQO 2B maximum of 17mg/l and just conforms to the 2A level. It should be noted that there is a history of pollution of this watercourse by sewage from wrong connections which could contribute to the BOD and ammonia levels seen. However, the overall level of ammonia seen is still very low, and would conform to an RQO 1A level.

The results for Moor Park Bridge show a compliance to the 2A RQO limits for all samples. The results also conform to the 1B standard. The peak in BOD and ammonia is seen some 4 to 6 hours later which reflect the time of travel from the STW to Moor Park Bridge at Dry Weather Flows. These results were obtained at a time when dilutions of the effluent would have been at a minimum due to low flow in the river.

The spot D.O. readings taken show a similar pattern to the recording D.O. meter survey (Fig. 9). The results from Hatch Mill and Moor Park Bridge again show a very high day time peak and a low level at night. The night time levels of D.O. seen caused RQO failures at Hatch Mill. The D.O. of the sewage works and the Farnham Park tributary stay fairly consistent throughout this period and at night time are higher than the river levels. This would explain why at some times the D.O. level at Moor Park is higher than Hatch Mill as seen in both this and the recording D.O. survey.

4. Conclusion

The results of this survey have shown that the recent investment at Farnham STW has resulted in a considerable improvement in Water Quality in the Wey North downstream of the confluence of the Farnham Park Tributary. The standard of effluent seen is now very good and the river downstream can be seen to conform to an RQO standard of 1B. The uses of the river do not change downstream of Farnham and there is a salmonid fish population in this stretch. Thus with the improvement in water quality a change in the RQO from 2A to 1B would seem to be logical.

The results also show that sampling of the Farnham Park tributary downstream of the works outfall is of limited value because such a large component of the flow is effluent. If the whole watercourse is to be assessed then the sampling point should be moved upstream.

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