



NRA

DEVON AREA INTERNAL REPORT

**A DESK TOP STUDY INTO THE PROBABLE
CAUSES OF POOR WATER QUALITY AT
HIGHER HOLLACOMBE FARM (R05K013) ON
THE HOLLACOMBE LAKE**

DECEMBER 1995

DEV/22/95

**Author: P ROSE
INVESTIGATIONS TECHNICIAN**

*National Rivers Authority
South Western Region*

**G R Bateman
Area Manager (Devon)**

614.77
NAT

C. 1 50

A DESK TOP STUDY INTO THE PROBABLE CAUSES OF POOR WATER QUALITY AT HOLLACOMBE FARM (R05K013) ON THE HOLLACOMBE LAKE.

614.77/NAT
NATIONAL RIVERS AUTHORITY
A desk top study into the
probable cause of poor
AJSY c. 1 50 .00

1. INTRODUCTION

The Hollacombe Lake is a tributary of the River Yeo and rises at Higher Hollacombe Farm west of Crediton. The river flows east then south for approximately 3 km before its confluence with the River Yeo in the region of Folly Bridge.

There are two sites routinely chemically monitored on the Hollacombe Lake. The first site is at Higher Hollacombe Farm (R05K013 at NGR SS 7958 0043) and the second is downstream prior to the confluence with Pitt Stream (R05K014 at NGR SS 8108 0025); this site has recently been added to the programme at the request of Andy Layman, the Water Quality Officer (WQO) for the area (see APPENDIX I)

The Hollacombe Lake has a current short term River Ecosystem Use (RE) Class target of 5 and a long term target of 3 (River Exe Catchment Management Plan consultation report). However, standards previously set in 1993 (see APPENDIX II, letter from M. Newton) are still believed to be active for the site at Higher Hollacombe Farm.

2. TERMS OF REFERENCE

2.1 OBJECTIVES

A request was received from Regional Water Quality (RWQ) to briefly investigate the area around Higher Hollacombe Farm at the head of the Hollacombe Lake watercourse. The site has had historically poor water quality suspected to be due to contaminated ground water from the nearby Punchbowl Tip site and possibly exacerbated by a septic tank present on the farm.

In this study, the area concerned has been investigated to clarify and identify the cause of poor water quality of the watercourse.

2.3 PROJECT TEAM

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

3. METHOD

- 1. Analysis of routine water quality data to establish any trends and / or relationships between water quality and other factors such as rainfall and drought.

2. Talk to the Water Quality Officers (WQO) / Groundwater Protection section to gain information and an insight into possible causes of poor water quality (see APPENDIX II).
3. Carry out a localised investigation using hand held meters and field test kits to track down problem areas.

4. RESULTS

4.1 HISTORIC RESULTS

Analysis of routine water quality data taken at Higher Hollacombe Farm between the period of 01 January 1993 and 13 November 1995 (see data in APPENDIX II) show the following exceedances (using EQS's also stated in APPENDIX II, percentiles taken as face value):

Dissolved Oxygen	29	(from 41 samples taken) EQS >60 % as 95 %-ile
BOD	5	(from 43 samples taken) EQS <5.0 mg/l as 95 %-ile
Total ammonia	37	(from 43 samples taken) EQS <0.70 mg/l as 95 %-ile
Non-ionised ammonia	13	(from 43 samples taken) EQS <0.021 mg/l as 95 %-ile
Chloride ion (1993)	276.5 mg/l annual average,	EQS = 250 mg/l annual average

The exceedances were not particularly associated with rainfall.

4.2 INVESTIGATION RESULTS

See Figure 1.

The total ammonia concentration and conductivity levels increase up towards the marsh area. Conversely, the percentage saturation of dissolved oxygen in the stream decreases towards the marsh and spring issue point.

5. DISCUSSION

The routine monitoring point is situated at the west garden wall. A septic tank within the garden (which had a discharge point approximately 20 metres downstream) was at one point suspected of leaking and contaminating the stream at the routine monitoring site. This probably contributed to the generally poor water quality observed at this site.

However, the septic tank overflow pipe was replaced by a land soakaway in mid 1994 (see APPENDIX III) and as demonstrated at the time of this investigation was not impacting on the stream either at the routine monitoring site or downstream.

The general increase of total ammonia concentration / conductivity levels (high concentration of 0.59 mg/l and level of 1554 μ S/cm respectively) and a decrease of dissolved oxygen saturation in the stream from the garden area up towards the site of issue for the spring demonstrates the contamination of the watercourse by leachate from Punch Bowl Tip.

As indicated by the WQO for the area, the routine monitoring site at Higher Hollacombe Farm (R05K013) should continue but the data should be used for monitoring the effect of the tip leachate and not be used in GQA or RE classification programmes; the site downstream prior to the confluence with Pitt Stream (R05K014) should be used for the purpose of the watercourse classification (see APPENDIX I).

The groundwater Protection section is very aware of the impact Punchbowl tip leachate is having on the surrounding groundwater and following that the contamination of surface waters. The current position and concerns of the section regarding this site is given in APPENDIX II.

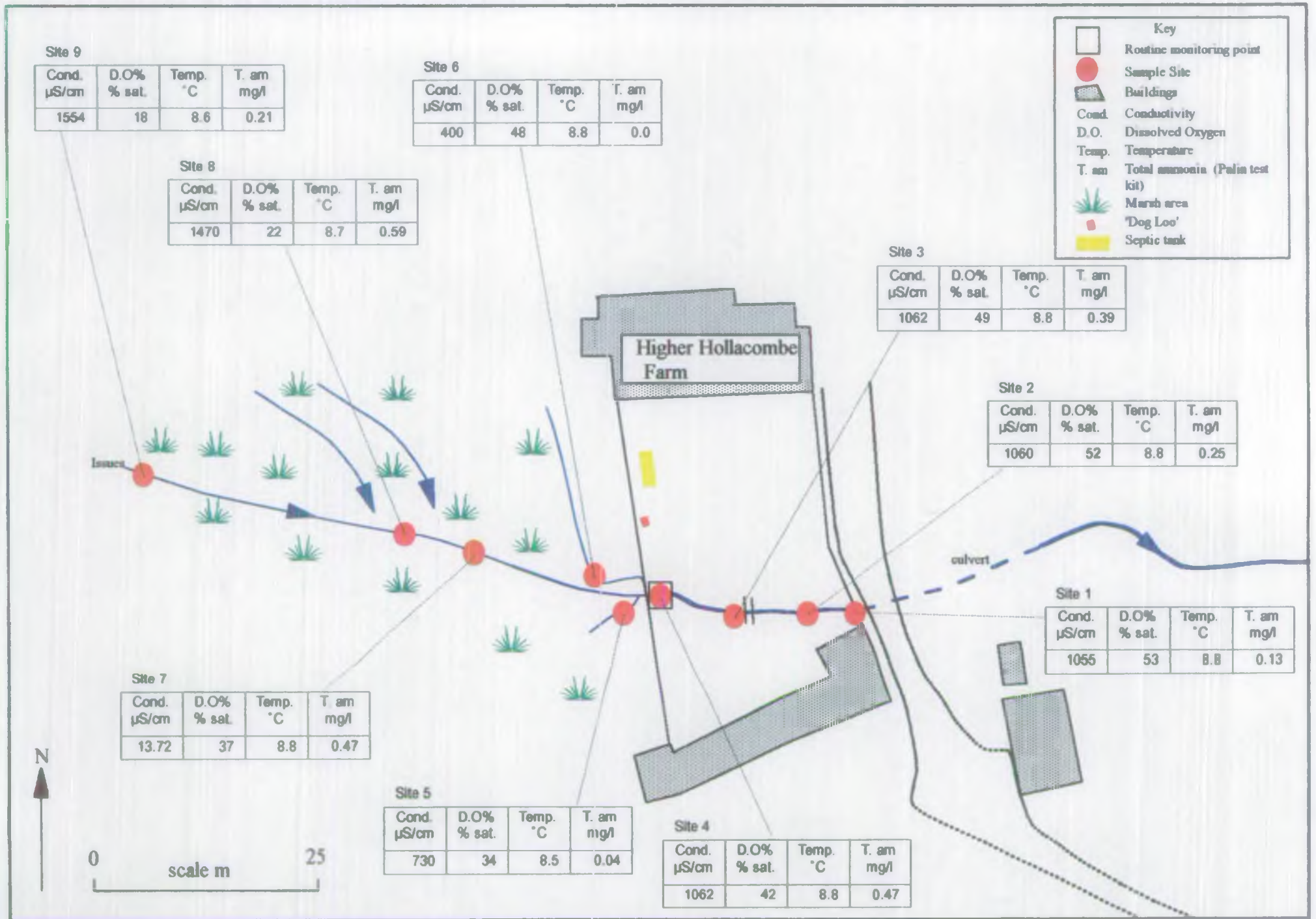
6. CONCLUSION

1. The poor water quality at Higher Hollacombe Farm (R05K013) can be attributed to contamination of the surface water by leachate from Punchbowl tip.
2. The septic tank present at Higher Hollacombe Farm has a new soakaway to land and was not causing an impact on the watercourse at the time of investigation.
3. By request of the WQO a new routine site is being chemically monitored downstream prior to the confluence with Pitt Stream and should be used for GQA and RE classification purposes.

7. RECOMMENDATIONS

1. Continue to use data collected from the Higher Hollacombe Farm routine monitoring site to monitor impact of the leachate on the watercourse but not to use this site for river classification purposes: Action RWQ
2. Continue to monitor river water quality at the site prior to Pitt Stream confluence and to use this data for river classification purposes: Action RWQ
3. Discussions between Groundwater Protection (GP) and RWQ with respect to future development of the Punchbowl tip contamination problem:
Action GP & RWQ

Figure 1. Map of Higher Hollacombe Farm showing routine monitoring point and marsh area.



APPENDIX I

MEMORANDUM

To: R Walmsley
From: A Leyman, Water Quality Officer
Extn: 2007
Our Ref: ACL/05K/HB
Your Ref:
Date: 6 October 1995

Subject: GENERAL QUALITY ASSESSMENT - HOLLACOMBE LAKE R05K013

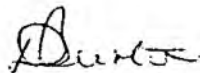
Just a short note to confirm discussions I have had with Nick Maye and Roseanne Broome.

The Hollacombe Lake stretch for GQA purposes is monitored immediately downstream of the Punchbowl Landfill site. Consequently leachate has contaminated the groundwater which forms the Hollacombe lake giving it a GQA grade of E due to high Ammonia and low dissolved oxygen concentrations. For historical reasons the Hollacombe Lake samples have continued to be taken at its source rather than the downstream limit, two kilometres away. Consequently the information in this years GQA is incorrect.

GQA sampling should commence at the downstream limit SS 8120 0018 whilst sampling of the source should also continue but for operational purposes only. Obviously a new URN needs to be set up for the new set of data.

However, at some stage I consider we should remove the Hollacombe Lake from the GQA and rely on the Pitt Stream R05K014 for GQA purpose as it already includes the Hollacombe Lake within its length.

Please contact me if you would like to discuss any of these issues.



AP
A LEYMAN
Water Quality Officer

nb: I have attached a copy of results from both Hollacombe water sites showing the different concentration at the two sites.

APPENDIX II

MEMORANDUM

To: Peter Lucey Water Protection Officer
From: Peter Rose Investigations Technician Devon Area
Extn: 2037

Our ref: PUNC1
Your ref:

Date: 29 November 1995

SURFACE WATER QUALITY AT HIGHER HOLLACOMBE FARM D/S OF PUNCH-BOWL TIP

Enclosed are all the routine water quality data collected from Higher Hollacombe farm just D/S of Punch-Bowl tip.

The data show consistently high concentrations of total ammonia, BOD, Chloride-ion and conductivity levels. This combined with the low dissolved oxygen concentrations would tend to indicate contamination of the spring by tip leachate.

I would be most grateful if you would advise on the present groundwater quality in this area and if this could in turn be effecting the surface water.

I have spoken to the Water Quality Officer for the area regarding a septic tank on the farm that may have also been influencing the water quality. The tank was upstream of the routine site and was probably contributing to the problem. However, this was replaced with a new tank and soak-a-way approximately 1 year ago and is now considered to be no longer a problem.

The Water Quality Officer asked for routine samples to be taken D/S, prior to confluence with Pitt Stream, for use in the GQA and RE programmes, and for the data to be still collected at Higher Hollacombe to monitor the tip but not to be used in the classification of the watercourse. From talking to the survey team, this extra site is currently being sampled.

I will be writing to Rosanne Broome notifying her of the probable causes of poor water quality at this site. I would like to be able to recommend NRA actions on this matter.

Any suggestions?!?

Many thanks for your help on this matter,

PETER ROSE
Investigations Technician Devon Area

c.c. Gordon Clark
Trevor Cronin

encs.

Date	ph	Conductivity µs/cm	DO% saturation	BOD atu mg/l	Nitrogen total oxidized mg/l	COD mg/l	Cadmium total µg/l	Ammonia total mg/l	Ammonia Un ion mg/l	Nitrate mg/l	Nitrite mg/l	Sus solids 105' mg/l	Hardness total mg/l	Alkalinity 4.5 mg/l	Orthophosphate mg/l	Silicate Reactive Diss mg/l
26-Jan-93	7.3	1140	55	1.2	6.5	20 <	0.20 <	2.10	0.0100 <	6.4	0.080	5	342	263	0.06	14.2
05-Feb-93	7.4	1160	47	1.0 <	7.2	22	0.20 <	2.30	0.0100 <	7.0	0.120	5	337	271	0.07	14.7
26-Feb-93	7.4	1170	55	1.0 <	7.5	18	0.20 <	0.64	0.0100 <	7.3	0.110	7	378	270	0.07	15.8
11-Mar-93	7.2	1220	53	1.0	6.7			0.61	0.0100 <	6.6	0.080	7		278	0.06	15.6
31-Mar-93	7.4	1270	68	1.0	5.3	22	0.20 <	0.62	0.0027	5.2	0.070	14	434	292	0.05	15.8
30-Apr-93	7.3	1330	43	1.0 <	4.7	19	0.20 <	0.81	0.0034	4.6	0.080	5	455	325	0.07	16.2
17-May-93	7.5	1200	54	2.3	3.1			0.84	0.0054	3.0	0.070	12		301	0.09	14.2
07-Jun-93	7.4	1490	55	1.4	7.3	24	0.20 <	2.70	0.0184	7.0	0.230	7		343	0.06	16.8
17-Jun-93	7.4	1410	52	1.1	4.8			4.00	0.0234	4.6	0.190	5		335	0.06	15.9
12-Jul-93	7.5	1350	39	1.1	5.2	28	0.20 <	2.00	0.0140	5.0	0.130	6	422	331	0.06	16.2
04-Aug-93	7.5	1470	53	7.0	4.7			1.50	0.0117	4.4	0.210	12		337	0.07	16.3
12-Aug-93	7.4	1390	49	1.2	5.0	29	0.20 <	0.85	0.0053	4.8	0.150	18	442	326	0.06	17.3
20-Sep-93	7.3	1450	47	2.4	6.2			2.30	0.0105	6.0	0.197	29		322	0.08	15.7
07-Oct-93	7.4	1300	54	2.2	5.2	57	0.20 <	2.00	0.0104	5.0	0.175	22	431	309	0.05	15.5
15-Oct-93	7.6	1430	41	1.8	4.3	29	0.20 <	4.80	0.0339	4.1	0.120	10	411	335	0.04	14.8
23-Oct-93	7.5	1380	51	12.4	3.3	33	0.20 <	5.30	0.0252	3.1	0.190	16	408	358	0.02	15.1
05-Nov-93	7.5	1290		5.7 >	3.6	40	0.20 <	4.70	0.0297	3.4	0.126	16	395	338	0.10	14.6
19-Nov-93	7.3	1320	44	2.2	4.6	22	0.20 <	4.16	0.0148	4.5	0.049	12	406	321	0.04	14.6
07-Dec-93	7.2	1250	47	1.4	4.9			2.73	0.0070	4.8	0.056	9		300	0.07	15.0
06-Jan-94	7.7	1150	58	9.0	2.5	43	0.20 <	7.10	0.0481	2.4	0.092	8	330	288	0.07	9.4
28-Jan-94	7.5	1260	60	1.9	3.8	35	0.20 <	6.10	0.0300	3.7	0.032	10	345	306	0.08	12.6
25-Feb-94	7.7	1350	60	6.1 >	3.0	51	0.20 <	8.70	0.0665	2.9	0.079	18	389	351	0.07	11.2
14-Mar-94	7.5	1170	56	1.7	4.8	30	0.20 <	5.90	0.0350	4.7	0.048	16	380	295	0.05	12.5
14-Apr-94	7.5	1160	89	1.0 <	5.9	34	0.20 <	4.20	0.0261	5.8	0.101	5	336	282	0.05	13.4
08-Jun-94	7.2	1250	46	1.0	4.9	26	0.20 <	4.10	0.0136	4.8	0.096	14	411	298	0.06	15.7
11-Jul-94	7.5	1230	70	1.3	5.1	35	0.20 <	2.80	0.0228	4.9	0.200	7	430	285	0.06	15.4
08-Aug-94	7.5	1160	55	2.3	5.4	26	0.20 <	2.10	0.0171	5.2	0.175	27	407	288	0.09	16.6
16-Sep-94	7.5	1160	62	1.7	5.8	34	0.20 <	2.50	0.0176	5.6	0.174	22	379	275	0.08	16.0
21-Oct-94	7.3	1140	60	1.0 <	5.4	27	0.20 <	1.30	0.0054	5.2	0.124	18	406	280	0.09	15.8
10-Nov-94	7.3	1180		1.3	18.0	30	0.20 <	1.90	0.0070	17.7	0.330	15	387	250	0.07	15.6
25-Nov-94	7.3	1190	57	2.2	12.0	26	0.20 <	2.00	0.0084	11.5	0.539	14	367	259	0.08	14.8
16-Jan-95	7.4		49	1.0 <	7.1			4.10	0.0179	6.9	0.153			248	0.07	
01-Feb-95	7.6		52	4.3	4.0			5.50	0.0404	3.7	0.250			278	0.03	
06-Mar-95	7.5		61	1.5	5.2			6.10	0.0309	5.1	0.082			285	0.05	
16-Mar-95	7.5		62	1.2	6.4			5.40	0.0303	6.2	0.117			266	0.06	
10-May-95	7.3		54	1.2	6.3			2.30	0.0092	6.1	0.171			271	0.06	
01-Jun-95	7.3		41	1.0 <	6.4			2.10	0.0086	6.2	0.165			267	0.06	
05-Jul-95	7.2		41	1.2	6.3			1.80	0.0073	6.0	0.221			275	0.06	
14-Aug-95	7.3		39	1.0 <	6.6			0.51	0.0025	6.4	0.172			262	0.06	
02-Oct-95	7.4		64	1.3	7.1			0.65	0.0043	6.9	0.141			260	0.08	
17-Oct-95	7.3		66	2.8	6.6			0.68	0.0036	6.4	0.147			279	0.08	
03-Nov-95	7.2		43	1.1	6.5			0.96	0.0031	6.4	0.099			263	0.07	
13-Nov-95	7.1		60	1.0	9.2			0.77	0.0021	9.1	0.090			246	0.11	

MEMORANDUM

To: Peter Rose, Devon Area Investigations Technician
From: Peter Lucey, Water Protection Officer
cc Malcom Newton
Roseanne Broome
Andy Leyman
Date: 5th January 1996



Subject: SURFACE WATER QUALITY D/S PUNCH BOWL LANDFILL

Please find comments below relating to the queries you raised over evidence shown by the routine surface water monitoring programme of pollution downstream of Punchbowl Landfill.

- 1 Assessment of this site by Marcus Hodges Environment undertaken on behalf of Devon Waste Management, who were until recently responsible for this site, has identified that the landfill is the primary candidate for pollution observed in the Higher Hollowcombe Stream.
- 2 Evidence presented in their report produced in 1992 shows that while chloride monitored over a period of twenty years shows a slow steady rise to concentrations which now commonly exceed 40 mg/l Cl, ammonia concentrations were generally below 1mg/l.
- 3 Together with evidence of a plume of contaminated groundwater (with ammonia levels up to 1000mg/l), this indicates a potential for gross ammonia contamination of the brook. It appears that at present, substantial attenuation of ammonia is taking place within the ground so that only marginal failures have so far been observed. Additional treatment may also be provided by assimilation of N by the wetland vegetation present below the landfill in the areas where polluted groundwater is discharging to the stream.

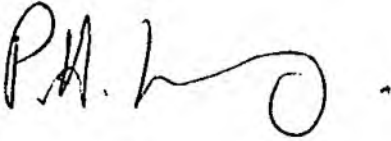
As the site has only recently stopped receiving wastes the pollution load entering the ground is only now at a peak and given that leachate will continue to be produced for many tens of years, there is concern that as cation exchange sites associated with clays within the rock matrix are increasingly populated by ammonium ions the attenuation capacity of the ground will be overwhelmed. In these circumstances the stream quality will deteriorate gradually over a period of years.

4. An NRA letter, dated March 1993, to Devon Waste Management (DWM) as the site operators is attached. This sets out the NRA's objectives for protection of water uses in the watercourse below the landfill. More recently the R. Exe catchment management

plan consultation report (December 95) proposes an RE5 RQO qualified by a long term RQO of RE2.

5. DWM and their consultants, Marcus Hodges Environment, outlined a series of measures that would be undertaken to ensure surface water quality complied with set standards.
6. In October 1994 Devon Waste Management handed back their site licence to Devon County Council. The site is now closed and "managed" by the Waste Disposal Authority of the County Council. None of the remedial measures proposed by MHE were implemented by DWM before site closure.
7. Devon WDA have recently submitted a "remediation statement" to the NRA for comment. A programme works has been produced by their consultants, Babbie Environmental. The works outlined do not appear to satisfactory in maintaining surface waters quality standards at Higher Hollowcombe stream. A response is to be made to DWDA shortly.
8. Sanctions may be available to the NRA/Agency in the longer term to ensure that appropriate mitigation measures are implemented through issuing of a remediation notice under the Environment Act (1994). In addition active management of leachate (which is a controlled waste) for example by pumping from a sump, is likely to be subject to waste management licensing.

For the future it is recommended that the NRA/agency continues to liaise with Devon County Council to ensure that appropriate mitigation measures are implemented to protect the water course, and that the NRA maintains the Higher Hollowcombe sampling point within the routine monitoring programme to monitor surface water impact from the landfill.


Peter Lucey
Water Protection Officer (Groundwater)

CC sent 19/3 BLM/PL/JH, G.M.

N.M. - for info.
P. Wade - ownr

DAVIES, B.Sc.
Environmental Protection Manager

Telephoning ask for:
Newton
2325

Ref:
MN/DSC

Date: 18 March 1993

Water

QUALITY STANDARDS FOR THE HOLLACOMBE LAKE

During our meeting to discuss environmental aspects of the Punchbowl site on 17th March 1993 I can confirm the following.

The NRA has statutory duties and responsibilities under the Water Resources Act 1991 to the quality of the aquatic environment which are both general and specific. A general duty is imposed on the NRA to conserve and enhance the natural beauty and amenity of inland and coastal waters and of the land associated with them. The NRA is also specifically responsible for water quality in controlled waters.

The NRA manages surface water quality by setting objectives to protect the uses of surface waters. These objectives have associated river quality standards which need to be maintained in order to protect the uses.

Currently objectives are based on the National Water Council Classification system. However, Sections 82 and 83 of the Water Resources Act 1991 gives power to the Secretary of State for the Environment to set up a system classifying water quality and establishing Statutory Water Quality Objectives (SWQO's) for controlled waters. Section 84 then requires the NRA to use its powers to ensure they are achieved and also places an obligation on the NRA to monitor the extent of pollution. As I mentioned at our meeting, plans are currently being developed for the introduction of SWQO's in the Exe catchment at some point in 1993. There will be a period of consultation by the NRA with those effected by these proposals. The Department of the Environment will also be consulting publicly on these proposals.

Continued

Mr P Pepper
Devon Waste Management
Marwood House
60 St Davids Hill
Exeter
EX4 4SY

Continuation

3. The NRA will be requesting the Waste Regulatory Authority to include conditions in any new licence for waste disposal at Punchbowl requiring treatment of the leachate polluted groundwater emerging from the spring which forms the source of the Hollacombe Lake. The emerging groundwater will require treatment to standards commensurate with a class 1B watercourse and to protect sensitive aquatic life including salmonid fish.
4. If Devon Waste Management procure the land around the headwaters of the stream. The NRA will accept that this area can be used as part of the treatment system and that the standards should be met at the point where the stream forms a continuous watercourse at Hollacombe Farm.
5. The following standards would be required to be met:

Dissolved oxygen	>60%	(95%ile)
BOD (ATU)	<5mg/l	(95%ile)
Total ammonia	<0.7mg/l	(95%ile)
Non ionised ammonia	<0.021mg/l	(95%ile)
pH	>5.0 & <9.0	(5ile & 95%ile)
Suspended solids	<25mg/l	(Annual mean)
Copper (dissolved)	<112µg/l	(95%ile)
Zinc (total)	<500µg/l	(95%ile)
Iron (dissolved)	<1mg/l	(Annual average)
6. Many of the above standards are currently being met. However, there are current problems with total ammonia and dissolved oxygen. I would suggest further investigation of both these problems, but if it is the result of contamination from the waste disposal site a time-table of improvements via treatment will need to be agreed with the NRA.
7. The discharge from any treatment system developed should be a piped and will be consented by the NRA under Section 88 of the Water Resources Act 1991.
8. There are proposals for the NRA to introduce standards for Chloride and Sodium for the protection of sensitive aquatic life including salmonid fish. These are as follows.

Chloride	250mg/l	(Annual average)
Sodium	170mg/l	(Annual average)

Continued

Continuation

Our results indicate there could be problems achieving both these standards as a result of contamination from the waste disposal site. Again assessment of the options for improvement would be required and a timetable for achieving these improvements agreed with the NRA.

9. You may appeal to the Secretary of State against any consent conditions imposed by the NRA.

I trust this clarifies our position. If you require further information I shall be away on leave until 1 April. In the meantime I suggest you contact Barry Milford, the Water Quality Planner.

Yours sincerely



Freshwater Officer

APPENDIX III

ACL (F) 05K/P PUN PUNCHBOWL TIP,
CREDITON.

Our Ref: ACL/05K/JAH
Your Ref:

Date: 24 February 1994

Mr A Vicary
Compliance Engineer
Devon Waste Management
Marwood House
60 St Davids Hill
EXETER
Devon
EX4 4SY

Dear Mr Vicary

SEPTIC TANK DISCHARGE - HIGHER HOLLACOMBE FARM, NR CREDITON

Following our telephone conversation of the 11 February I am writing to confirm the points raised on the above subject.

The septic tank serving the above property has an overflow pipe discharging direct to the Hollacombe Lake. This is an illegal discharge under the terms of the 1991 Water Resources Act and should be replaced by a land soakaway (information for which I have enclosed).

This work should be completed by the end of this year.

If you require further advice or information please contact me on the number below.

Yours sincerely

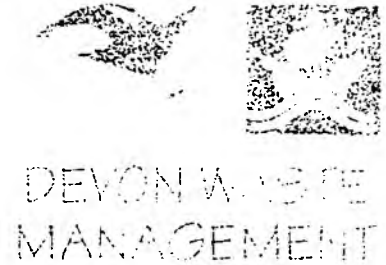
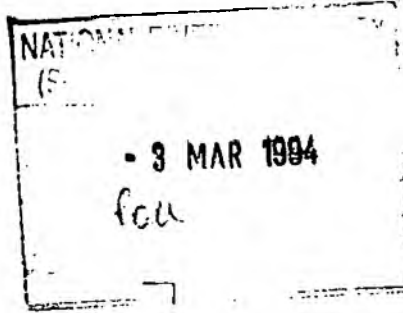
ANDY LEYMAN
Water Quality Officer

Encs.

Please ask for: Andy Leyman, extn: 2007

ACL (F) 05K/P

PUN PUNCHBOWL
TIP.



F.A.O. Mr A Leyman
National Rivers Authority
South Western Region
Manley House
Kestrel Way
Exeter EX2 7LQ

DEVON WASTE MANAGEMENT
MARWOOD HOUSE
60 ST DAVIDS HILL
EXETER
EX4 4SY

Your ref:

Date: 2nd March 1994

Phone: Exeter (0392) 423388 (5 lines)

My ref: AJV.jed

Please ask for: Mr A J Vickery

Fax: Exeter (0392) 433773

Dear Mr Leyman

SEPTIC TANK DISCHARGE - HIGHER HOLLACOMBE FARM NR. CREDITON

I acknowledge receipt of your letter dated 24th February 1994 concerning the above.

I confirm that this septic tank direct discharge will be modified to a land soakaway. I anticipate this work will be completed within 6 months.

We will shortly discuss with you our proposed modifications for your approval prior to construction.

Yours sincerely

A handwritten signature in black ink, appearing to read "Andy Vickery".

MR ANDY VICKERY
Compliance Engineer

andy020394av.03



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DEVON COUNTY COUNCIL



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