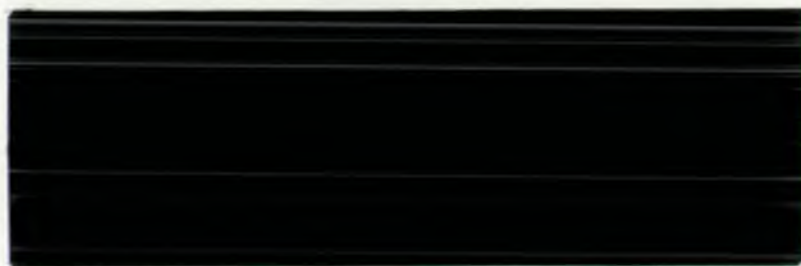


NRA-WALES 195

NATIONAL RIVERS AUTHORITY
AWDURDOD AFONYDD CENEDLAETHOL

WELSH REGION
RHANBARTH CYMRU



NRA

Guardians of the Water Environment
Diogelwyr Amgylchedd Dŵr

DEE CATCHMENT MANAGEMENT PLAN

BIOLOGICAL ASSESSMENT OF
AGRICULTURAL CATCHMENTS

REPORT EAN/93/05

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ENVIRONMENT AGENCY



128279

SUMMARY

1. Biological surveys utilising bankside assessment methods were carried out in a total of fourteen subcatchments in the lower Dee during a period from 2nd - 6th August, 1993.
2. The surveys were aimed at identifying specific sources of agricultural or other organic pollution as well as identifying localised areas for further, more detailed investigation.
3. A total of nine specific inputs and ten areas for further investigation was identified

DEE CATCHMENT MANAGEMENT PLAN

BIOLOGICAL ASSESSMENT OF AGRICULTURAL CATCHMENTS

1. INTRODUCTION

This report describes an extensive biological survey carried out in August 1993 in the lower Dee tributaries to assess agricultural impacts on water quality in intensively farmed areas.

The survey had three objectives:

- a) To identify suspected inputs areas whose impacts had not demonstrated by spot water quality sampling due to intermittent and/or chronic pollution.
- b) To identify areas where more investigations were needed to pinpoint polluting sources.
- c) To provide contemporary biological data to support development of the Dee Catchment Management Plan.

Objectives a & b are the subject of this report which summarises the results and makes recommendations for future action by the E & Q section. Objective c will be achieved through a separate exercise in which biological data will be compared with water quality data from routine monitoring sites.

2. AREAS SAMPLED

Sub-catchments to be sampled were selected in consultation with Area Pollution Control Officers and were confined to the middle and lower Dee tributaries downstream of its confluence with the River Ceiriog (Fig.1). The sub catchments comprised the following:

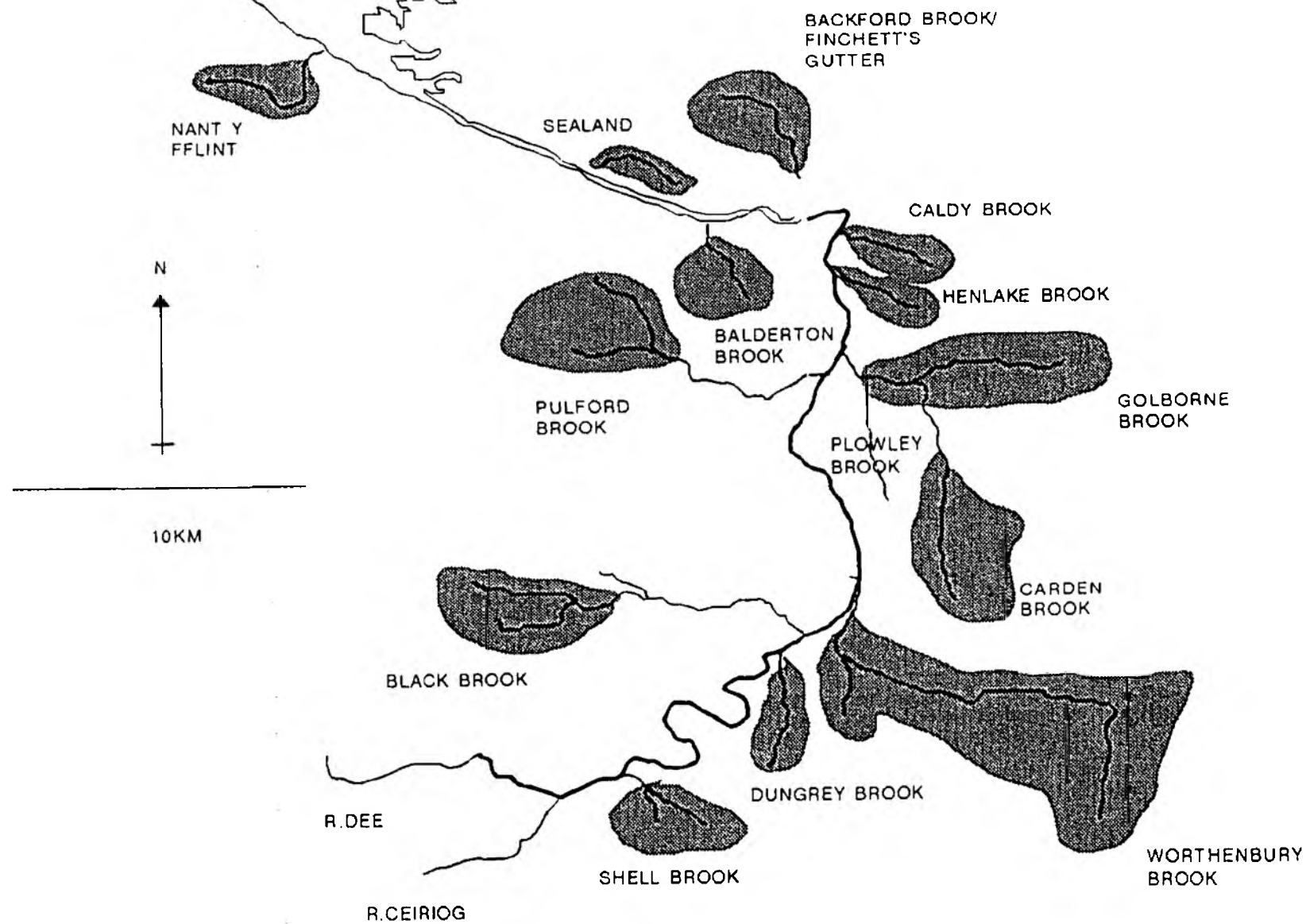
AREA 4: Shell Brook
 Dungrey Brook
 Black Brook

AREA 5: Worthenbury Brook - Red Brook
 Alford Brook - Carden Brook
 - Golborne Brook
 - Plowley Brook

 Pulford Brook
 Caldey Brook
 Henlake Brook

AREA 6: Balderton Brook
 Sealand
 Nant y Fflint
 Finchett's Gutter/Backford Brook

FIG 1. MAP SHOWING CATCHMENT AREAS
SAMPLED. AUGUST, 1993



3. METHODS

In the case of each sub-catchment, initial sites were chosen in consultation with Pollution Control officers in order to confine sampling efforts to specific areas suspected of being impacted. A one minute sample (kick or sweep depending on the conditions) was taken and examined in a tray on the bankside for a maximum of 20 minutes. The families present in each sample were identified and used to produce a BMWP Score which was used to categorise the biological quality of each site, as follows:

<u>BMWP SCORE</u>	<u>QUALITY</u>
>150	Excellent
100-149	Good
50-99	Moderate
25-49	Poor
>25	Very Poor

Also, the presence and abundance of certain families, in conjunction with the presence or percentage cover of sewage fungus was used to label each site as one of five Agricultural Pollution Groups (APG) ranging from "unpolluted" to "seriously organically polluted" (Rutt, 1992) as follows:

<u>APG</u>	<u>LEVEL OF IMPACT</u>
1A	Unpolluted
1B	Mild input - no impact on fauna
2	Moderate/historic input - impact on fauna
3	Moderate organic pollution - impact on fauna
4	Serious organic pollution - gross impact on fauna

A decision was made on-site regarding the presence and magnitude of any biological impact, based on the biological assessment and the Pollution Control Officer's local knowledge, and the next site selected in order to isolate specific suspected inputs. In this way single sources of contamination or specific small areas causing potential problems were pinpointed.

4. RESULTS & RECOMMENDATIONS

SHELL BROOK: SAMPLED 2/8/93 (Fig.2)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
	<u>Shell Brook</u>				
1	DS Kilhendre Brook	355402	33	3	Slight foaming observed and sewage smell evident
2	US Kilhendre Brook	354411	66	3	80% <u>Cladophora</u> cover indicating organic input.
3	Road Bridge DS Top farm	362394	51	3	
4	DS Goblindale	382385	7	4	70% cover with active sewage fungus. Strong smell of farm effluent.
	<u>Kilhendre Brook</u>				
5	US Shell Bk	354412	14	4	Dead invertebrate present
6	Road Bdge US Plas Thomas	351393	24	4	Dead invertebrates present. Faint smell of sheep dip chemicals.
7	DS Kilhendre Farm	386353	8	4	80% sewage fungus cover
8	DS Brook Farm	356378	23	4	
9	US Brook Farm	355377	31	3	

NOTES

1. Kilhendre Brook was adversely affecting the quality of Shell Brook downstream of their confluence
2. The Trench farms upstream of site 4 are the subject of investigation by the E & Q section. No further biological samples were taken upstream of this point due to low flows. Visual observations indicated that the problem was attributed to the Trench watercourse and Trench farms.
3. A discharge from a septic tank was observed upstream of site 5. this may have been responsible for the slight foaming and sewage smell evident at site 1.

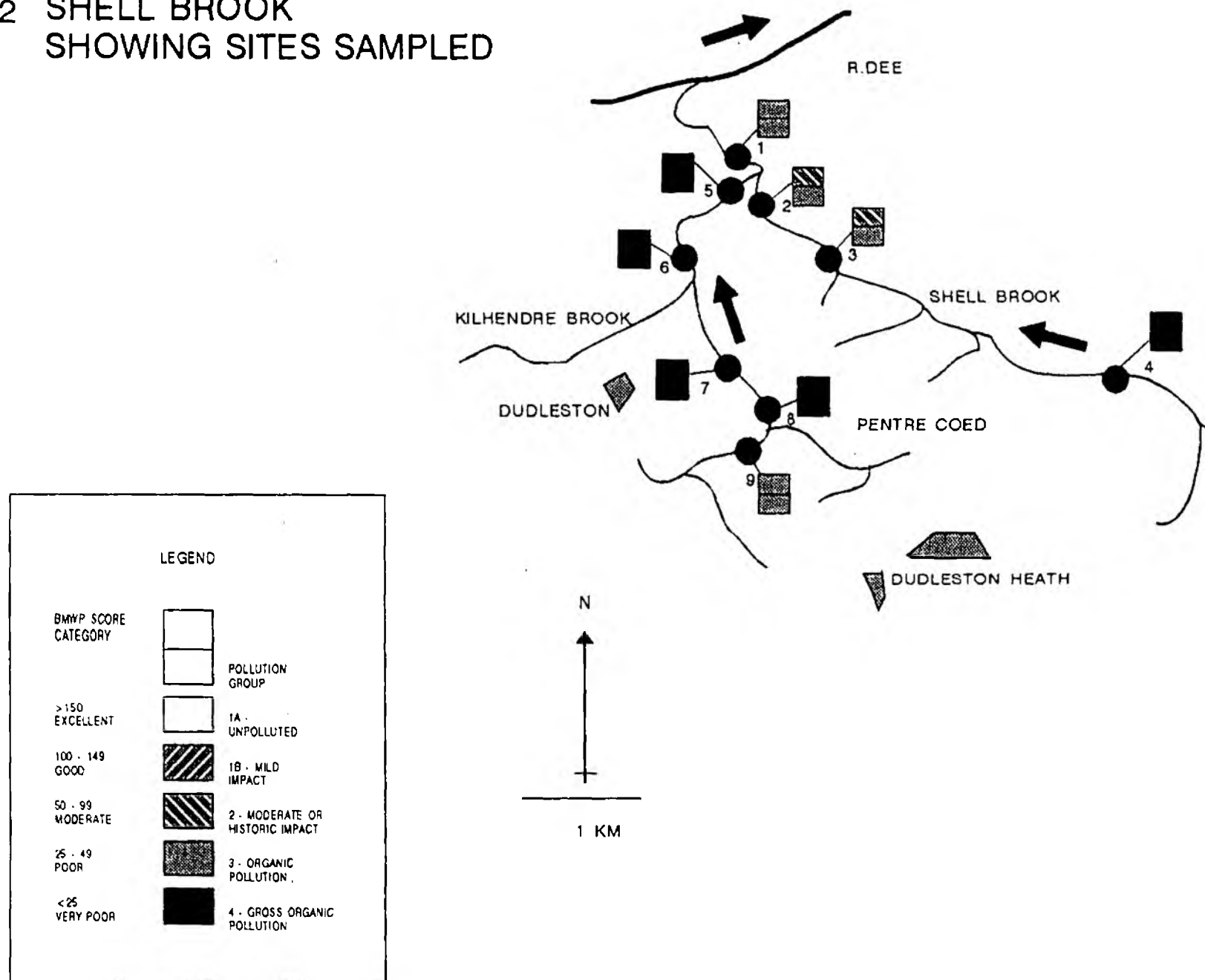
4. A drainage ditch from Kilhendre farm (US site 7) was discharging farm waste at time of sampling. This was stopped immediately after consultation with the owner. The nearby Kilhendre Hall farm was suspected of discharging sheep dip into the watercourse but due to the masking effect of the discharge from Kilhendre farm no firm conclusions could be drawn. Further investigations are required to identify all the polluting influences.

RECOMMENDATION 1

5. The poor biological quality at sites 8 & 9 was attributed to problems with sewage treatment works and septic tanks further upstream in the Dudleston Heath area. No further biological samples could be taken due to the unsuitability of the habitat (low flows, silty substratum). Further water quality investigations, however, could pinpoint specific sources.

RECOMMENDATION 2

FIG.2 SHELL BROOK
SHOWING SITES SAMPLED



DUNGREY BROOK: SAMPLED 2/8/93 (Fig.3)

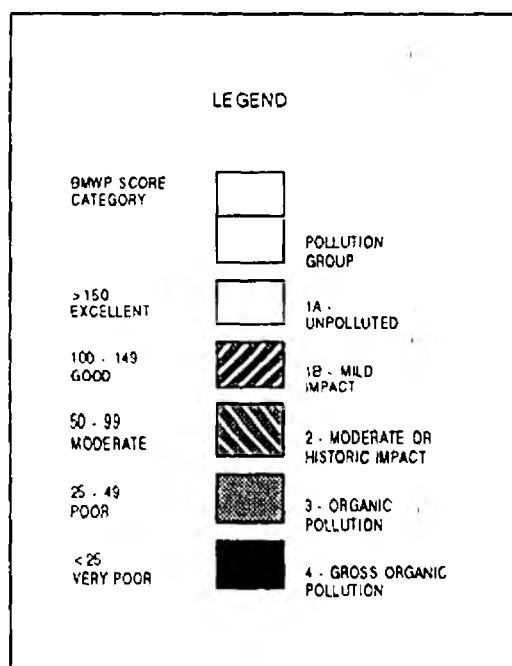
SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	B5069 Road Bridge	399458	19	4	
2	Trib. DS Orchards farm	402445	16	4	Silty substratum
3	DS Cloy Bank farm	398447	15	4	Silty substratum
4	US Cloy Hall ditch	397438	2	4	
5	Cloy	396433	3	4	Black anoxic mud on stream bed
6	Near Nant	395427	25	4	Silty substratum
7	US Cae Dyah	391419	20	4	Silty substratum
8	Near Hill farm	385411	21	3	
9	DS Overton	371408	14	4	

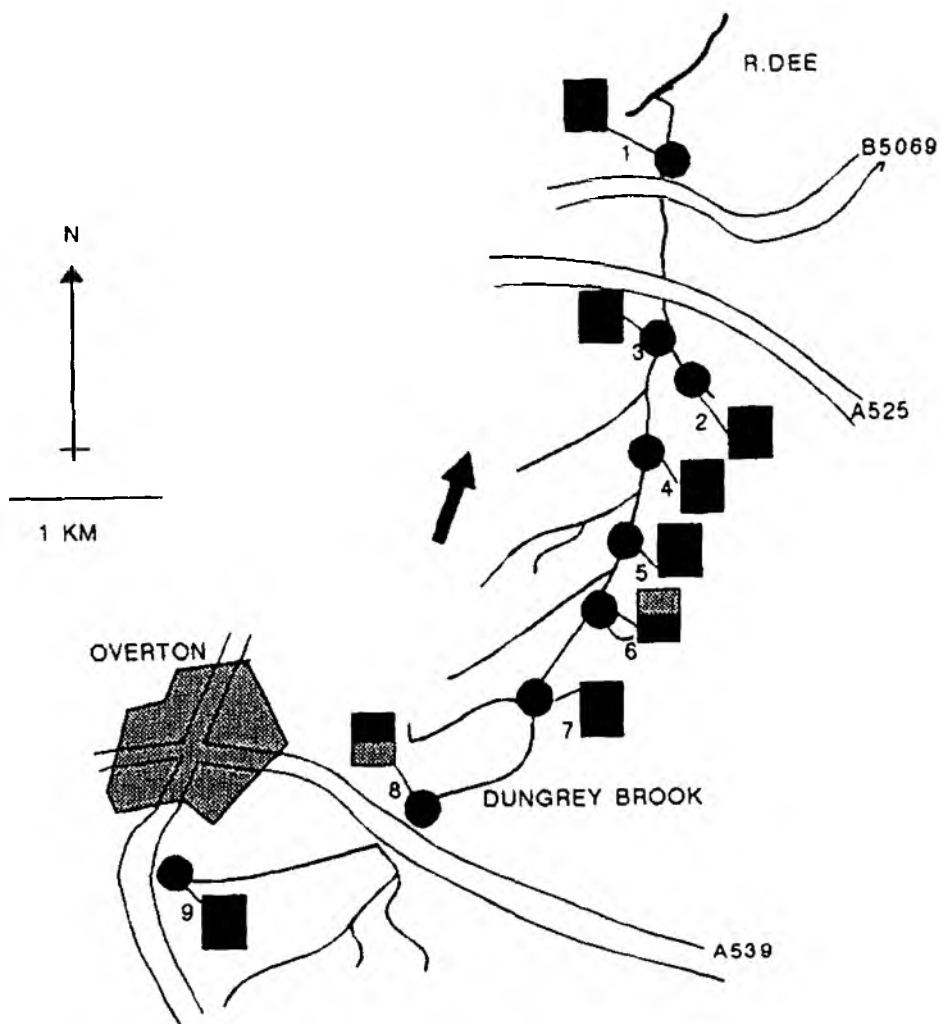
NOTES

1. The Cloy area of Dungrey Brook has been the subject of a previous biological impact assessment study which highlighted a problem in the area (EAN\93\TM08)
2. All sites sampled in this catchment were severely polluted and this exercise was unable to distinguish the impact of any specific discharge. It appears that the poor quality may be due to the combined effects of many polluting influences from several farms in the area. This should be the subject of further investigation.

RECOMMENDATION 3

FIG.3 DUNGREY BROOK
SHOWING SITES SAMPLED





B5069

BLACK BROOK: SAMPLED 5/8/93 (Flg.4)

SITE NO.	NAME/LOCATION	NCR (SJ)	BMWP SCORE	AGP	COMMENTS
	<u>Black Brook</u>				
1	At Erddig Park	327488	45	3	
2	US Glan yr Afon Brook	323477	63	3	
3	DS Hafod	322457	27	3	
	<u>Afon Goch</u>				
4	DS Gardden Industrial Estate	303448	13	4	Strong smell of diesel
5	DS Gardden Hall farm	301456	25	4	No sewage fungus evident
6	US Gardden Hall farm	295457	58	4	
7	Cae Einion	297465	-	-	No sample taken - stream practically dry. Large amounts of litter.
	<u>Glan yr Afon Brook</u>				
8	US Black Brook	321479	40	3	60% of green filamentous algae
9	DS Glanyrafon road bidge.	315485	1	4	Large quantities of sewage litter present. No sewage fungus.
10	Black Saddle Bridge	305477	73	2	
11	DS Legacy WTW outfall	297481	4	4	Dense algal mat on streambed.
12	US Legacy WTW outfall	296481	81	1A	
13	DS Bronwylfa	285483	35	4	No sewage fungus

NOTES

1. Gardden Industrial estate is suspected of causing pollution, however the specific influences of a number of surface water discharges in the area have been difficult to distinguish. this should be the subject of further investigation.

RECOMMENDATION 4

2. A drainage ditch from Gardden Hall farm was observed to contain sewage fungus and may be a source pollution. This should be investigated.

RECOMMENDATION 5

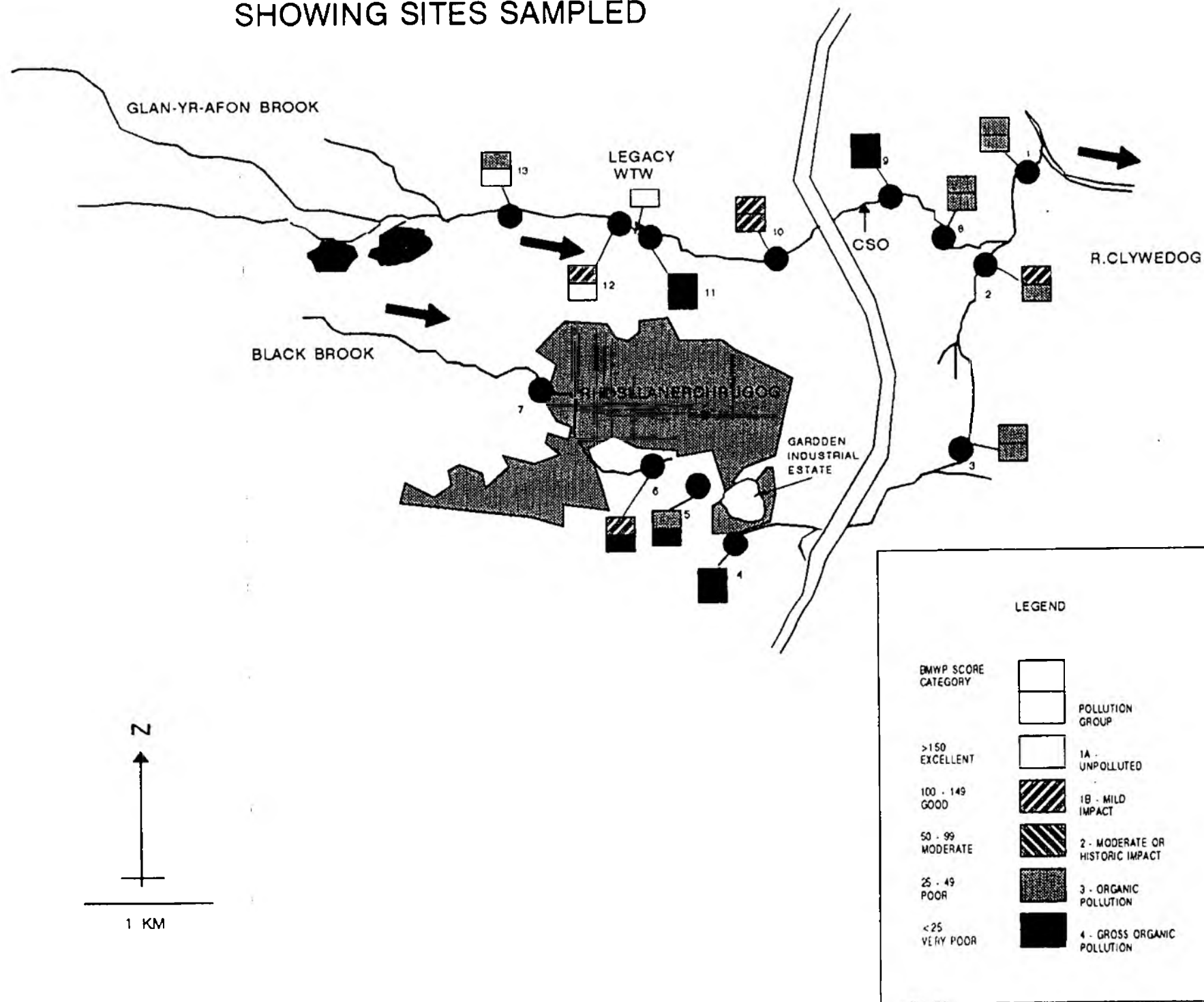
- 3 An unconsented Combined Sewer Overflow at Colliery Rd. Rhostyllen (NGR SJ 3143 4837) is known to discharge at intervals upstream of site 9 on Glan yr Afon Brook. This requires further investigation as the impact on the river is very significant.

RECOMMENDATION 6

4. Potential intermittent contamination was observed at Plas-y-Fron farm, upstream of site 13, which could explain the poor biological quality at that site and requires further investigation.

RECOMMENDATION 7

FIG.4 BLACK BROOK CATCHMENT
SHOWING SITES SAMPLED



WORTHENBURY BROOK: SAMPLED 4 & 5/8/93 (Fig.5)

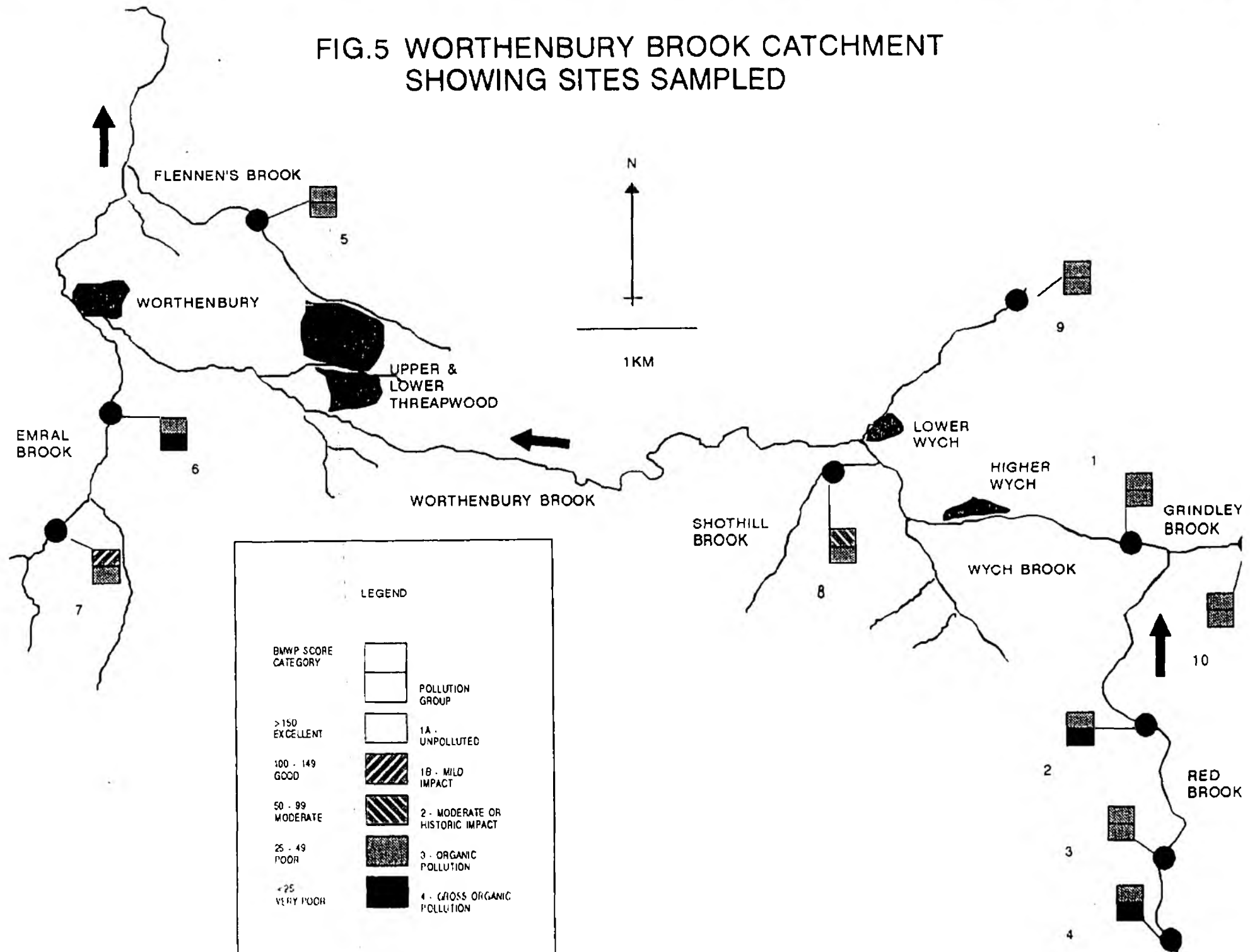
SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
	<u>Wych/Red Brook</u>				
1	Wolvesacre	509432	26	3	
2	US Red Brook Bridge	512412	36	3	
3	Trib.Red Brook	511398	39	3	
4	Blackoe	511390	47	4	Silty substratum
	<u>Flenner's Brook</u>				
5	Flenner's Brook Bridge	434470	34	3	
	<u>Emral Brook</u>				
6	Emral Bridge	421449	48	4	
7	Haighton Mill	416435	58	3	
	<u>Shothill Brook</u>				
8	US Wych Brook	483441	52	3	
	<u>Trib. Wych Brook</u>				
9	Hough Bridge	497457	46	3	
	<u>Grindley Brook</u>				
10	Horse & Jockey	520432	29	3	

NOTES

1. The whole of the upper reaches of this catchment is of poor biological quality
2. In particular, contaminating influences in the upper reaches of Red Brook and the middle reaches of Emral Brook require further investigation

RECOMMENDATION 8

FIG.5 WORTHENBURY BROOK CATCHMENT
SHOWING SITES SAMPLED



CARDEN BROOK: SAMPLED 6/8/93 (Fig.6)

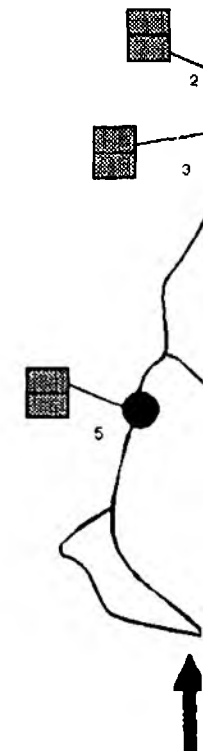
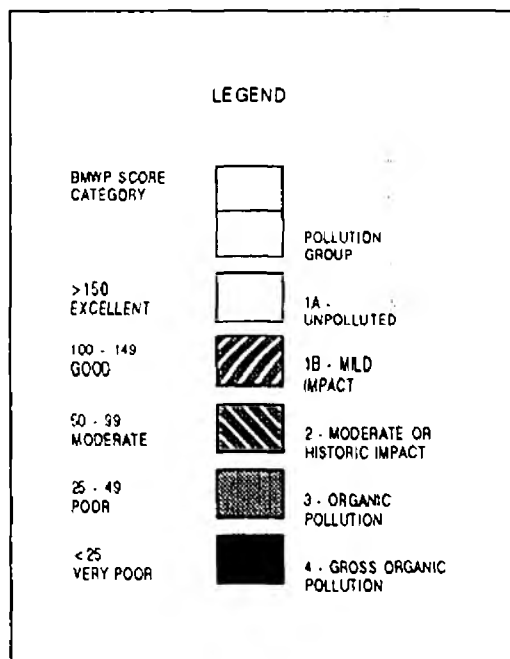
SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	A534 Road bridge	457543	42	3	
2	Tilston Road bridge	454519	40	3	
3	Trib @ Little Tilston	455517	40	3	
4	Trib. DS Horton Green	454494	42	3	
5	Parr Green Hall	448496	40	3	Silty substratum
6	DS Cherry Hill farm	455474	29	3	Trace of sewage fungus present
7	Chorlton Lodge	468470	8	4	

NOTES

- 1 Carden Brook at Tilston has been the subject of a previous biological impact assessment of the effects of farm effluent (EAN\93\TM11).
- 2 Influences from septic tanks at Cuddington Heath upstream of site 7 require investigation.

RECOMMENDATION 9

FIG.6 CARDEN BROOK
SHOWING SITES SAMPLED



CODDINGTON BROOK

A 534

CARDEN BROOK

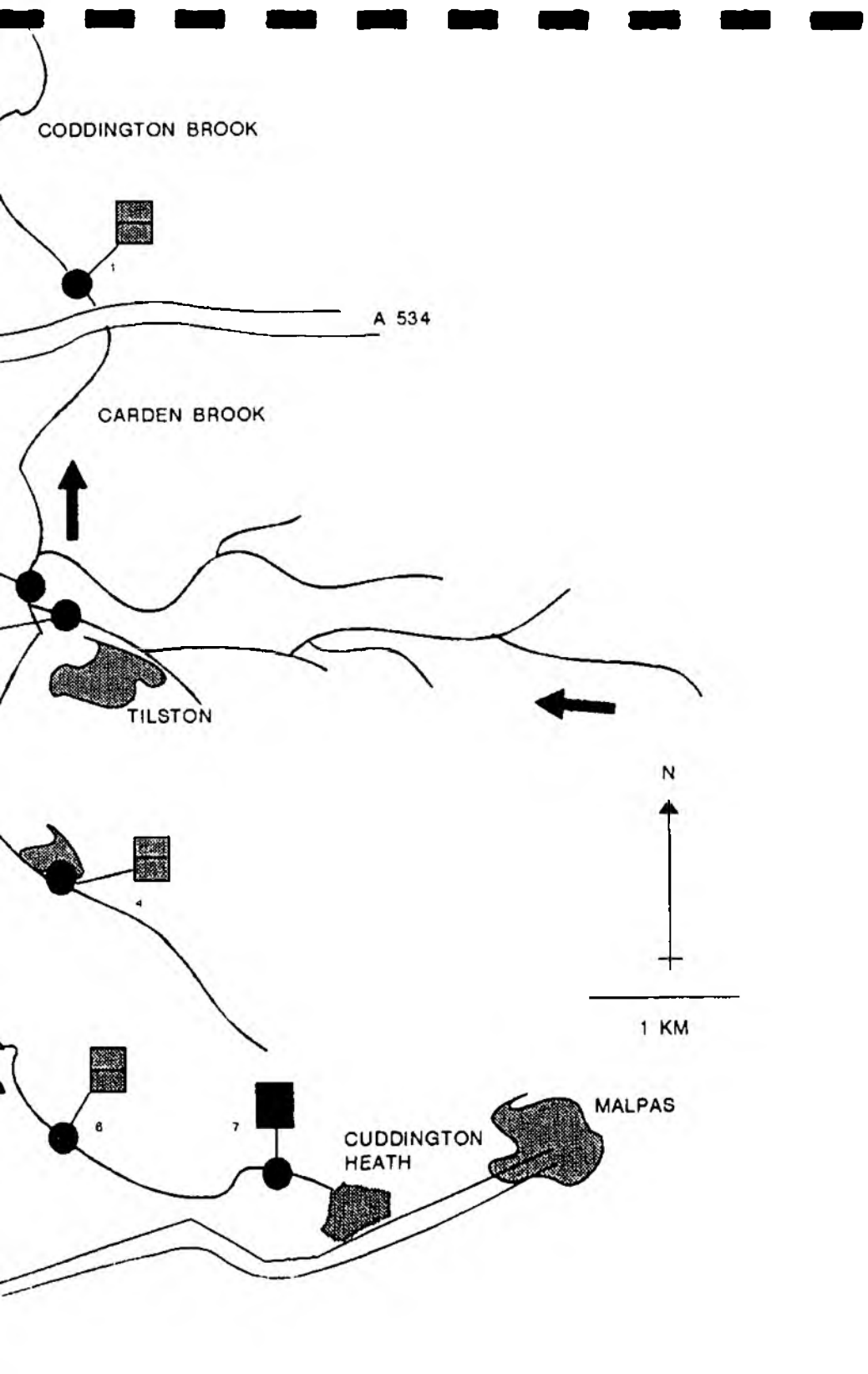
TILSTON

N

1 KM

CUDDINGTON
HEATH

MALPAS



ALDFORD/GOLBORNE BROOK: SAMPLED 4/8/93 (Fig.7)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
	<u>Aldford Brook</u>				
1	Lea Hall	435584	43	4	Sweep sample taken
2	DS Coddington Brook	443482	49	4	Sweep sample taken
	<u>Coddington Brook</u>				
3	US Aldford/Golborne Bk.	444583	54	3	Silty substratum
	<u>Golborne Brook</u>				
4	US Coddington Brook	444584	43	4	Silty substratum
5	DS Lea Newbold farm	447589	42	3	Silty substratum
6	Milton Green	461591	30	3	
7	DS Russia Hall and Tattenhall STW	474592	26	3	Trace of sewage litter present
8	Keys Bk US Mills Bk	480591	6	4	
9	Mills BK US Keys Bk	481599	50	3	

NOTES

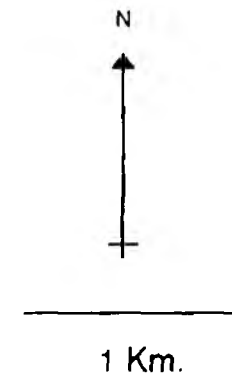
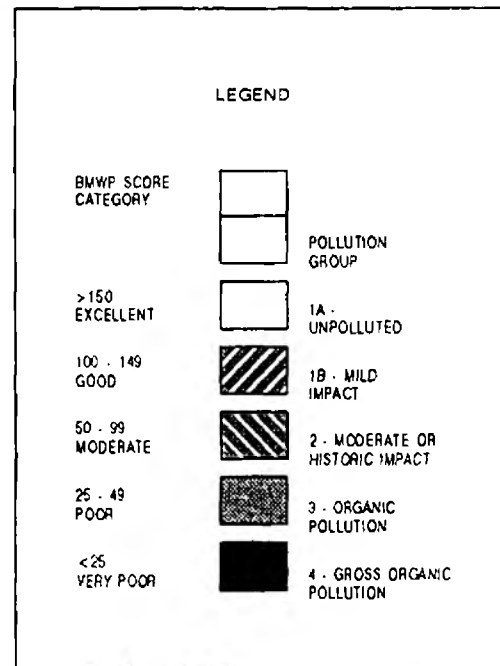
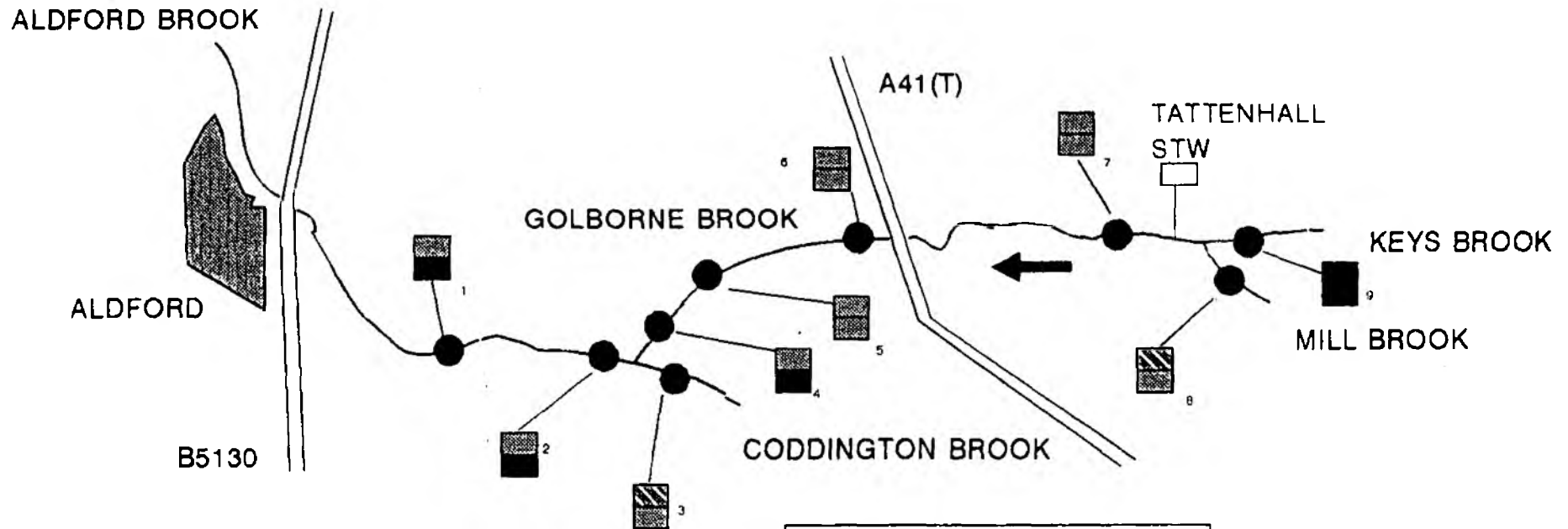
1. Sites in Aldford Brook, Coddington Brook and the lower reaches of Golborne Brook were of a slow-flowing silty nature suitable for sweep or kick/sweep sampling only. The poor results obtained at these sites could be a reflection of the poor habitat rather than indicators of organic pollution.
2. Golborne Brook upstream of site 5 was organically polluted due, possibly to contamination from Tattenhall STW, though the effects from this source may be masked by a severe organic contamination of Keys Brook upstream of site 8 which requires further investigation.

RECOMMENDATION 10

PLOWLEY BROOK: 4/8/93

No samples were taken from this catchment due to low flows.

FIG.7 ALDFORD/GOLBORNE BROOK
SHOWING SITES SAMPLED



PULFORD BROOK: SAMPLED 3/8/93 (Fig.8)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	DS Old Moor drain <u>Trib. Pulford Brook</u>	358599	18	4	Silty substratum
2	Burton Green	347588	45	3	Layer of silt on cobbles and gravel
3	Golly <u>Brad Brook</u>	337584	43	3	Layer of silt on cobbles and gravel
4	New Lane <u>Stringer's Brook</u>	347606	50	3	
5	Stringer's Bridge	338597	36	3	
6	DS Town Drain farm <u>Warren Dingle</u>	328590	55	4	
7	Trib. DS Kinnerton PS	336620	17	4	
8	Trib. US Kinnerton PS	335620	25	4	
9	County Boundary	341622	37	4	
10	Trib @ playing fields	335622	25	4	
11	Trib. DS Broughton	335624	34	4	

NOTES

1. Old Moor Drain is known to have caused contamination in the past, though this was dry at the time of sampling
2. The tributary US of Golly is suspected of being contaminated by sewage from septic tank influences in the Caer Estyn area. This requires further examination.

RECOMMENDATION 11

3. A dry ditch at Town Drain farm contained sewage fungus suggesting intermittent contamination which requires further investigation.

RECOMMENDATION 12

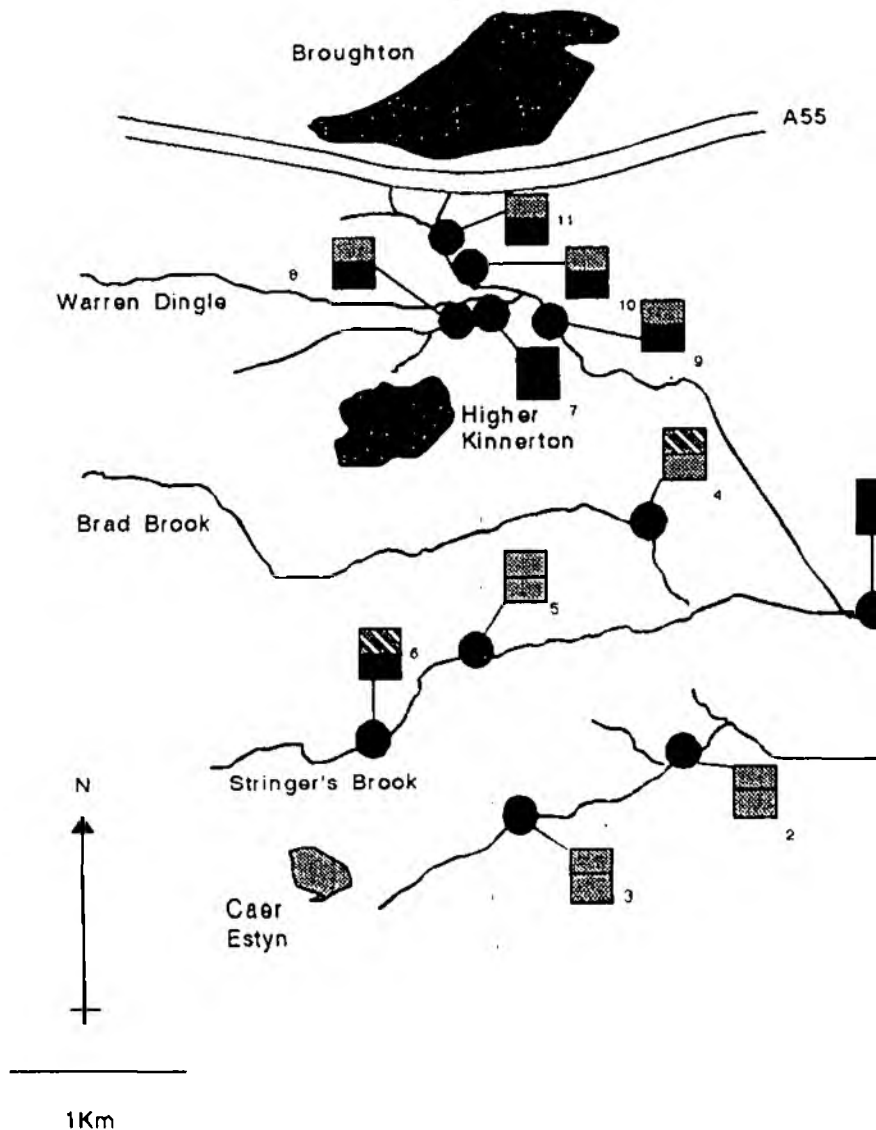
4. The tributary of Warren Dingle at Kinnerton is severely affected by organic pollution due to intermittent contamination from farms in the area which require further investigation.

RECOMMENDATION 13

5. The tributary of Warren Dingle flowing through Broughton is severely organically polluted, perhaps as a result of influences from the Broughton conurbation. This requires further investigation.

RECOMMENDATION 14

FIG.8 PULFORD BROOK SHOWING
SITES SAMPLED.



LEGEND

BMWP SCORE
CATEGORY

>150
EXCELLENT

100 - 149
GOOD

50 - 99
MODERATE

25 - 49
POOR

<25
VERY POOR



POLLUTION
GROUP



1A -
UNPOLLUTED



1B - MILD
IMPACT



2 - MODERATE OR
HISTORIC IMPACT



3 - ORGANIC
POLLUTION



4 - GROSS ORGANIC
POLLUTION

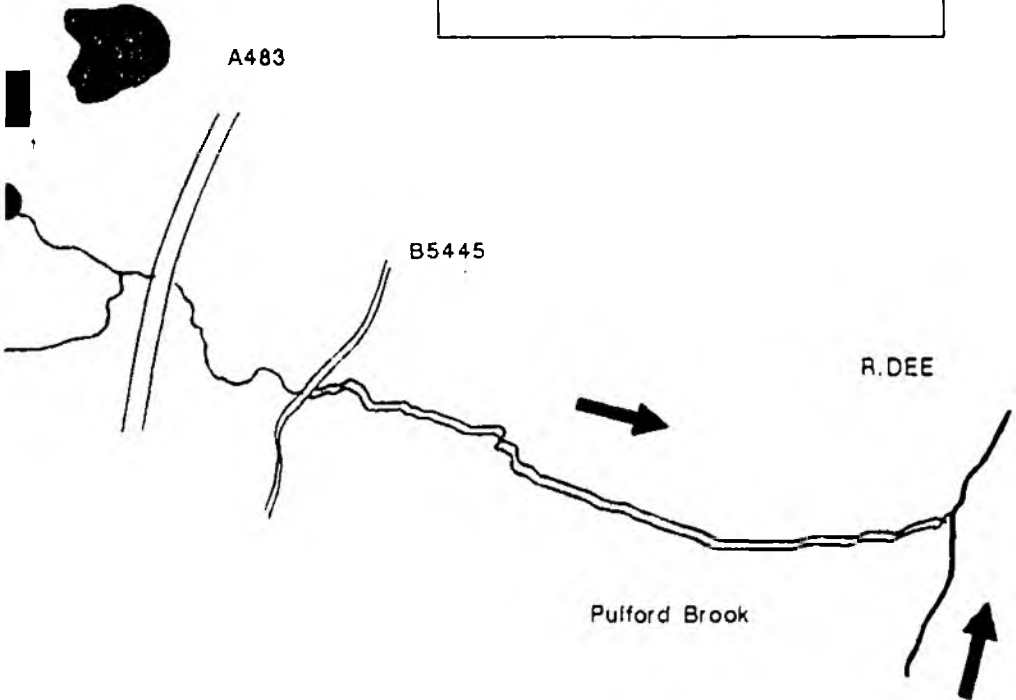
Dodleston

A483

B5445

R. DEE

Pulford Brook



CALDY & HENLAKE BROOKS: SAMPLED 3/8/93 (Fig.9)

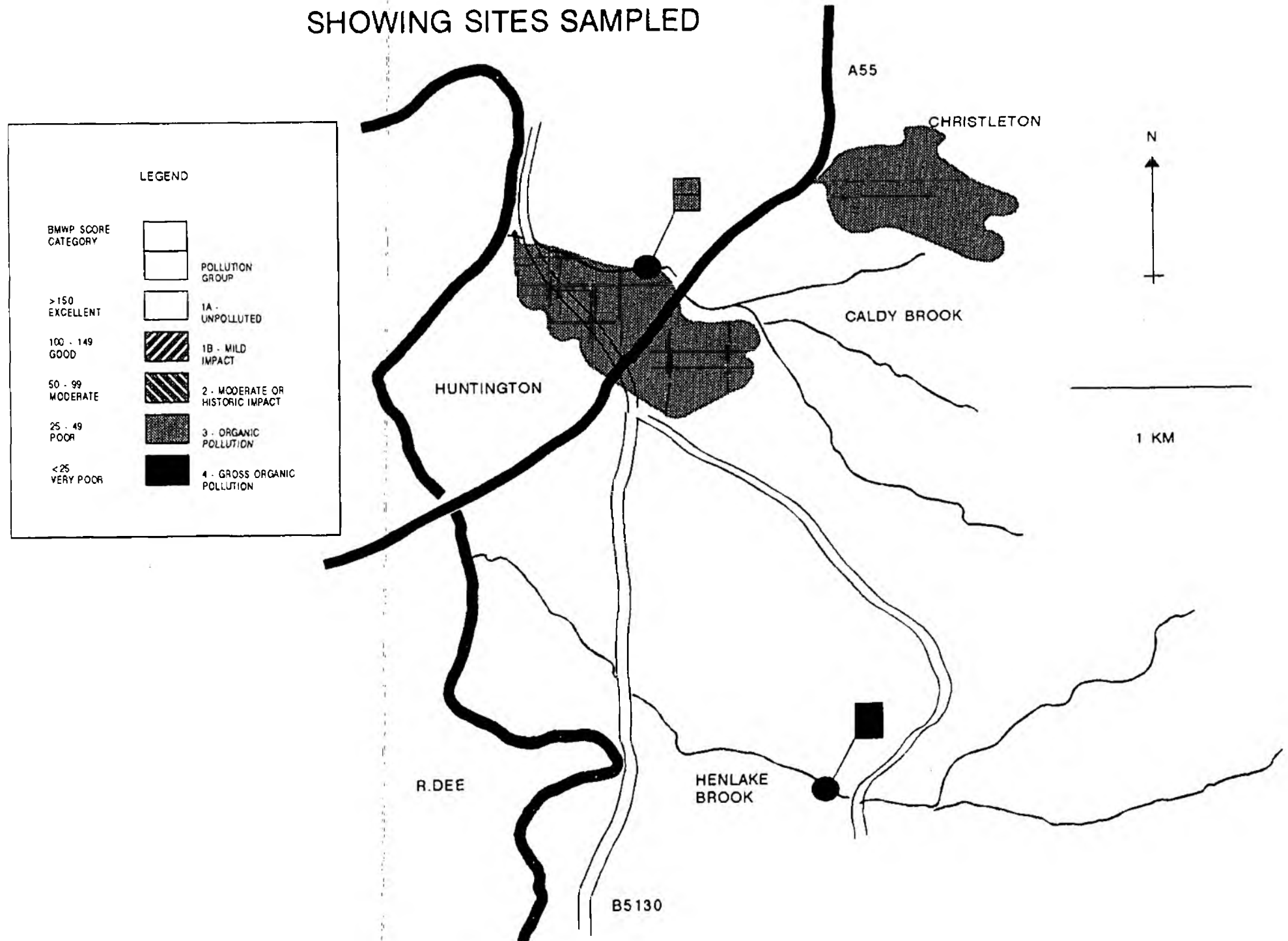
SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	<u>Caldy Brook</u> At Caldys Bridge	427649	34	3	
2	<u>Henlake Brook</u> At the Lodge	437612	2	4	Stream very discoloured at time of sampling

NOTES

1. Caldys Brook at this site is known to be adversely affected by sewage discharge from hitherto untraced domestic sewage discharge via a surface water drain. This is currently under investigation
2. Henlake Brook, upstream of the sampling site is of very poor biological quality and should be the subject of further investigation.

RECOMMENDATION 15

FIG.9 CALDY & HENLAKE BROOKS
SHOWING SITES SAMPLED



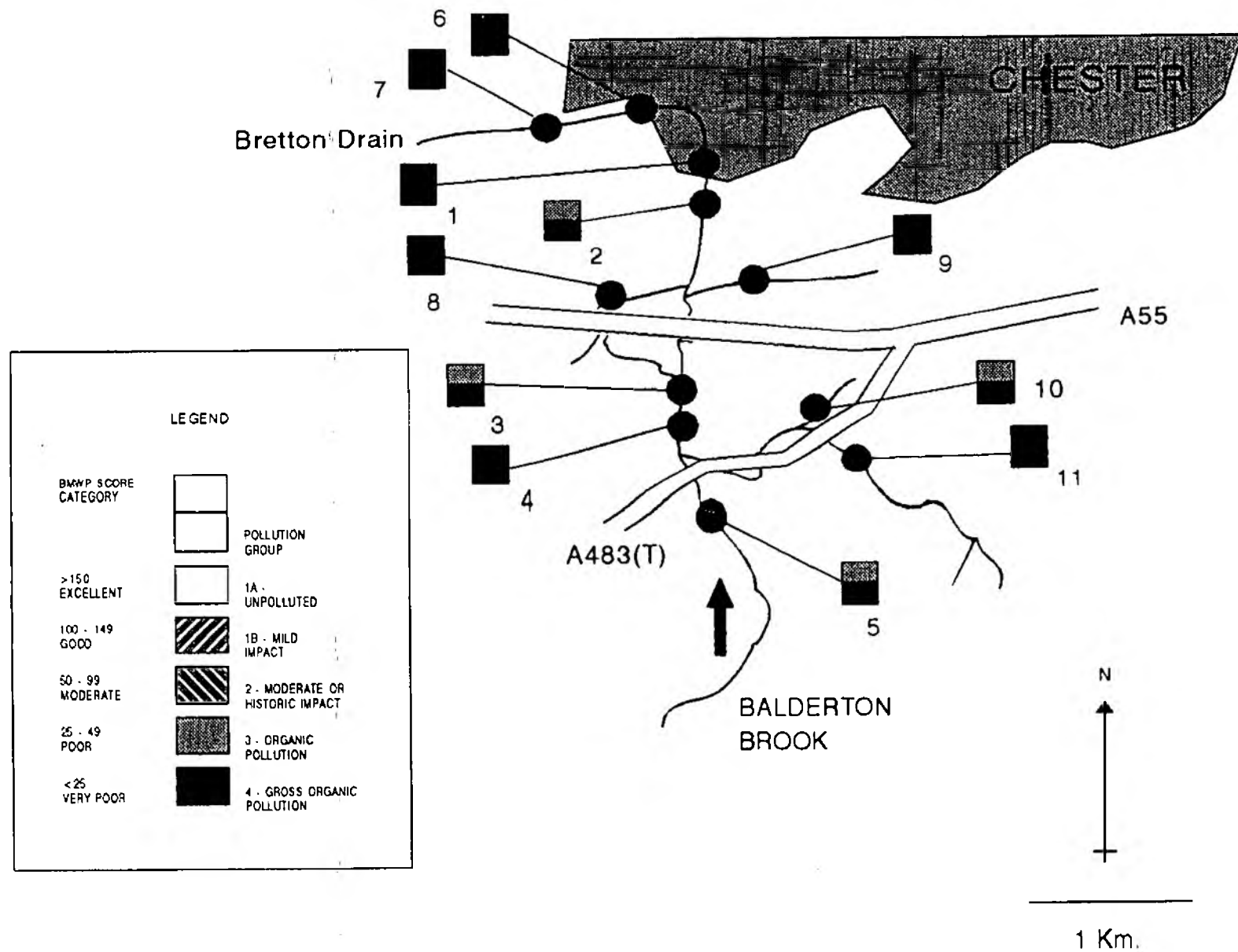
BALDERTON BROOK: SAMPLED 5/8/93 (Fig.10)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	Sandy Lane	377641	15	4	Silty substratum
2	US Sandy Lane	378641	31	4	Silty substratum
3	DS Rough-hill	378632	42	4	Silty substratum
4	US Rough-hill	378622	19	4	Silty substratum
5	DS Oldfields farm	379614	26	4	Silty substratum
	<u>Bretton Drain</u>				
6	Sandy Lane	375648	23	4	Sweep sample taken
7	US Meadow House	369647	13	4	Sweep sample taken
	<u>Tributaries</u>				
8	DS Common farm	373629	11	4	Sweep sample taken
9	DS Moat farm	384632	16	4	
10	DS Two Mile House	388621	36	4	Silty substratum
11	DS Belgrave Bridge	388618	23	4	

NOTES

1. Despite the poor habitats found at all sites it is evident that this whole sub catchment is badly organically polluted.
2. Specific discharges were discovered between sites 1 & 2; 3 & 4 and upstream of site 5. These are the subjects of current further investigations
3. The upper reaches of the tributaries upstream of sites 7, 8, 9 & 10 are also being investigated further by pollution control staff.

FIG.10 BALDERTON BROOK CATCHMENT
SHOWING SITES SAMPLED.



SEALAND DRAIN: SAMPLED 3/8/93 (Fig.11)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	At Deeside Cottages	352682	32	4	Sweep sample taken
2	At Bees Nursery	357678	37	4	Silty substratum
	<u>Waterloo Drain</u>				
3	US Sealand Drain	343689	45	4	Sweep sample taken
	<u>Yewtree Drain</u>				
4	US Sealand Drain	359675	24	4	Silty substratum

NOTES

1. The deep, slow flowing, silty ditches in this area were not ideally suited to this type of biological assessment. Nevertheless, the indications were that there was organic pollution at all sites. This should be followed up by a detailed water quality investigation.

RECOMMENDATION 16

NANT Y FFLINT: SAMPLED 3/8/93 (Fig.12)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
1	At Halkyn Road	238718	66	2	
2	At Sylfan Farm	222718	68	3	
3	At "The Catch"	211732	38	3	Foaming observed on surface
	<u>Cornistwic stream</u>				
4	DS Cornist Hall	235725	23	3	Low flow, sandy bed & domestic litter
	<u>Afon Conwy</u>				
5	Maes Gwyn Bridge	234711	67	2	

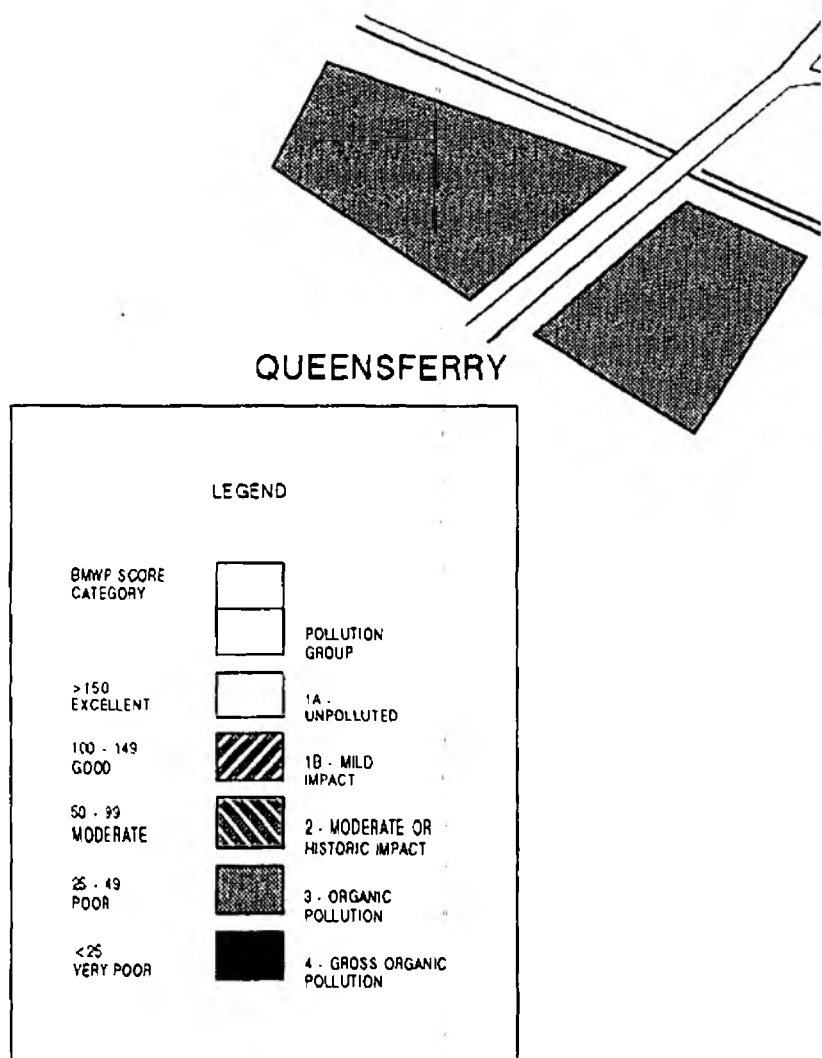
NOTES

1. The deterioration observed at the farthest upstream site (site 3) could not be investigated further at the time due to low flows upstream of this point. It was thought that there may have been problems due to agricultural runoff in this area which may require further investigation.

RECOMMENDATION 17

FIG.11

SEALAND DRAIN SHOWING SITES SAMPLED



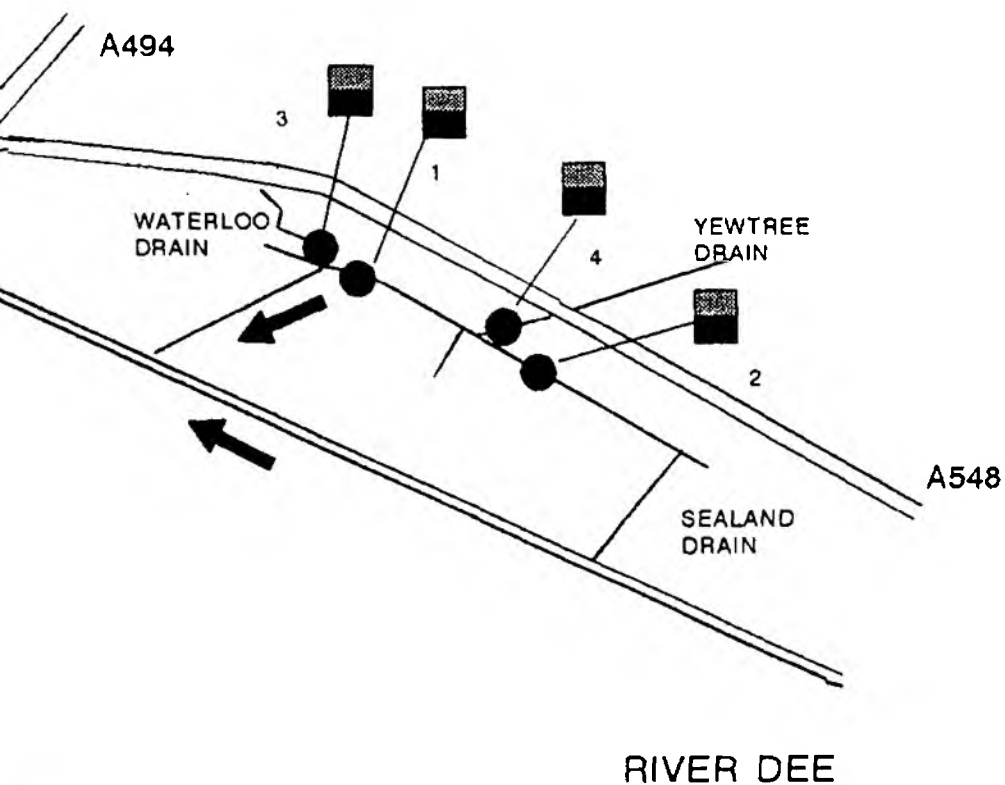
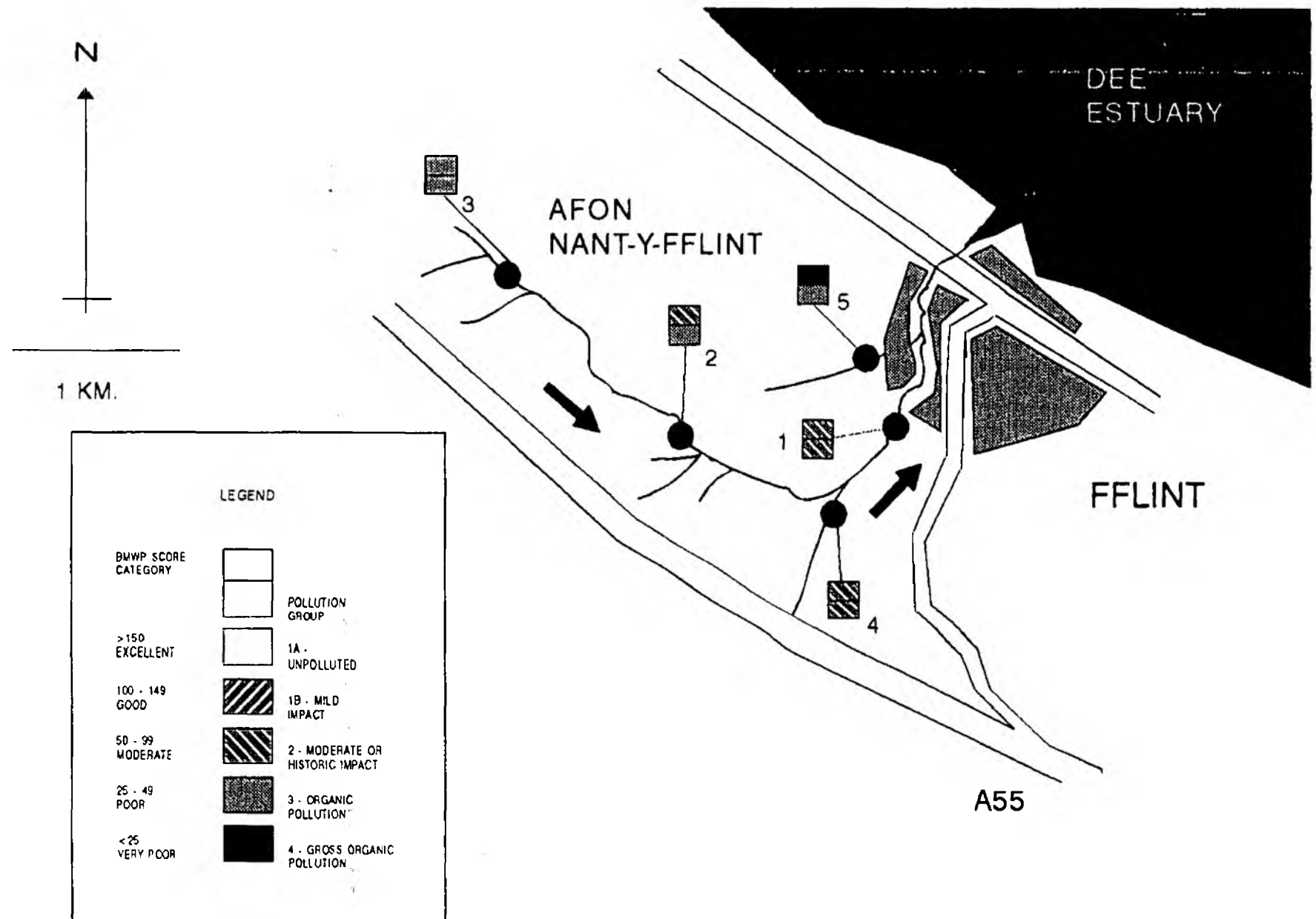


FIG.12 NANT-Y-FFLINT CATCHMENT
SHOWING SITES SAMPLED



FINCHETT'S GUTTER/BACKFORD BROOK: SAMPLED 6/8/93 (Fig.13)

SITE NO.	NAME/LOCATION	NGR (SJ)	BMWP SCORE	AGP	COMMENTS
	<u>Finchett's Gutter</u>				
1	US Bache Brook	399679	23	4	Silty substratum
2	At Knoll's Bridge	395693	21	4	
3	DS Chester Zoo	396696	25	4	Sandy substratum
	<u>Backford Brook</u>				
4	At Station Road	397713	24	4	10% sewage fungus cover. Sewage smell evident
5	US Lea Hall FB	396716	19	4	Foaming on water surface
6	DS Lea Manor Hall farm	390719	19	4	>10% sewage fungus cover
	<u>Bache Brook</u>				
7	At Countess Way	398679	36	4	Trace of sewage fungus together with gross sewage litter

NOTES

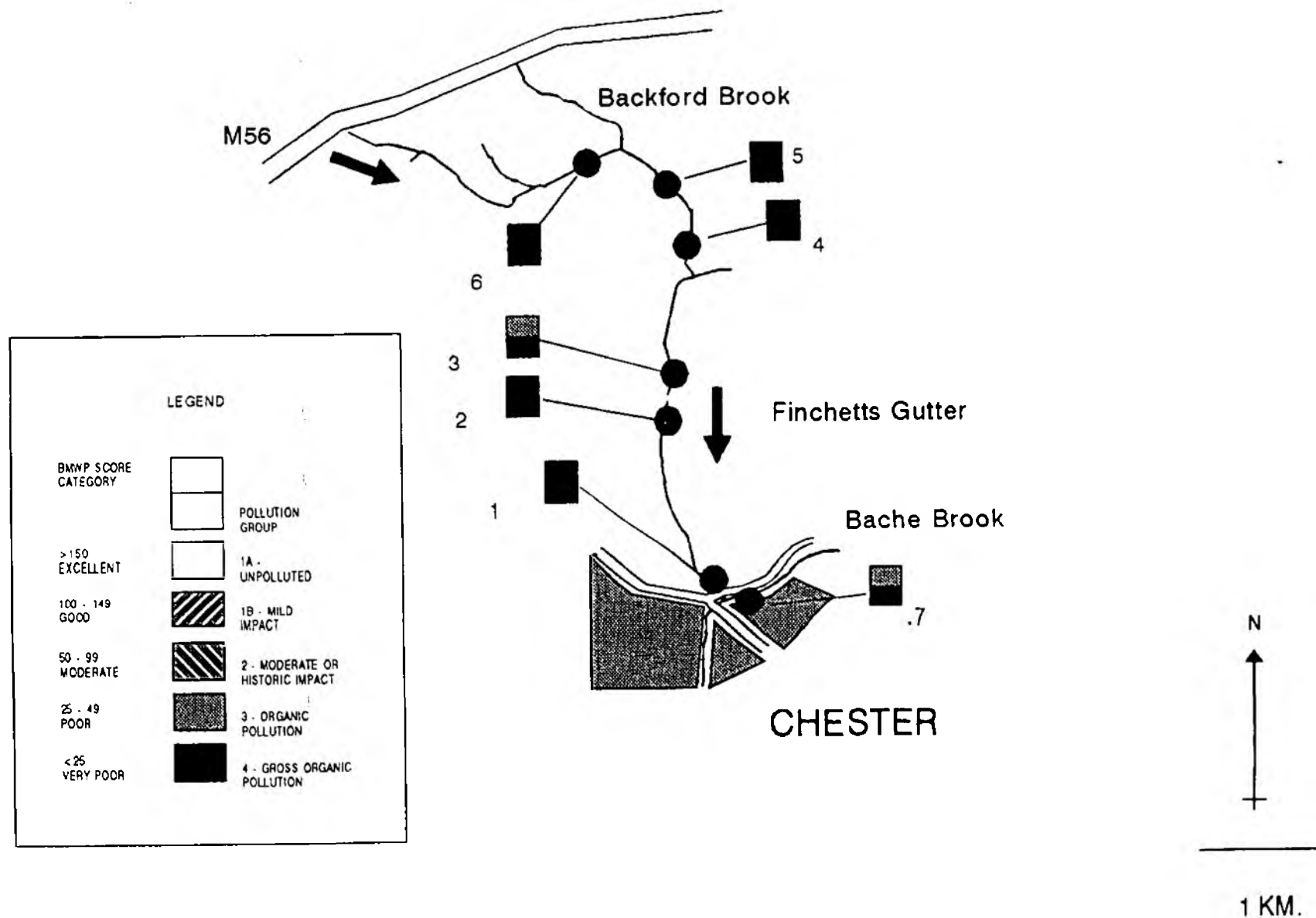
1. Finchetts Gutter, was adversely affected by tip laechate from a disused landfill site and, possibly, by leachate from a settlement lagoon associated with a now defunct cheese processing plant, both located between sites 2 & 3. These were the subject of investigations by pollution control staff.
2. Sites in Finchetts Gutter upstream of site 2 and all sites in Backford Brook were also of very poor biological quality. This may be attributed to intermittent sewage discharges between sites 3 & 4 and to occasional discharges of waste from Lea Manor farm, upstream of site 6. These sources should be investigated further.

RECOMMENDATION 18

- 3 A series of Combined Sewer Overflows located upstream of site 7 cause severe sewage pollution of Bache Brook. This requires action.

RECOMMENDATION 19

FIG.13 BACKFORD BROOK SHOWING SITES SAMPLED



CONCLUSIONS

1 The biological quality in all catchments surveyed was generally very poor. In total, fourteen subcatchments were sampled at ninety seven sites on five consecutive working days. The resource used consisted of 20 staff days, shared equally between pollution control and EAU staff, for sampling and about 10 EAU staff days in production of this report. In effect, however, pollution control staff were made aware of the specific problems in terms of inputs and areas requiring investigation at the time of the survey, since they were actively involved in the field assessment. This report formalises those assessments in the form of specific recommendations, many of which will have already been acted upon. These can be summarised as follows; (Fig.14)

2 Specific inputs which require further examination are:

Kilhendre Brook	Kilhendre farm Kilhendre Hall farm
Glan yr Afon Brook	Gardden Hall farm CSO at Rhostyllen Plas y Fron farm
Stringer's Brook	Town Drain farm
Backford Brook	Lea Manor farm Sewage discharge near Chester Zoo
Bache Brook	CSOs

3. Areas within the subcatchments sampled which require more detailed investigation are:

Kilhendre Brook	Septic tank influences in the Dudleston heath area.
Dungrey Brook	The whole subcatchment
Glan yr Afon Brook	Gardden Industrial Estate
Worthenbury Brook	Upper reaches of Red Brook Middle reaches of Emral Brook
Carden Brook	Septic tank influences in the Cuddington Heath area.
Aldford Brook	Keys Brook upstream of Tattenhall STW
Pulford Brook	Septic tank influences in the Caer Estyn area. Trib. Warren Dingle in the Kinnerton area Trib. Warren Dingle in the Broughton area.
Henlake Brook	The whole subcatchment
Sealand Drain	The whole subcatchment
Nant y Fflint	The upper reaches.

FIG 14. MAP SHOWING SITES & AREAS
IDENTIFIED AS PROBLEMS

