Royal Society for the Protection of Birds

Water Framework Directive
Review of the River Basin Management Plan for the River Kennet

May 2009

Action for the River Kennet

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1		First draft for RSPB, ARK committee and EA Thames region	17 April 2009	JDL
2	1	Final report for RSPB and general circulation	18 May 2009	JDL

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Abbreviations and Glossary

Abbreviations

AMP(5 or 6)	Water company Asset Management Plan (2010 to 2014 for AMP5, or 2015 to 2019 for AMP6)
AONB	Area of outstanding natural beauty
ARK	Action for the River Kennet
BMWP	Biological Monitoring Working Party
BW	British Waterways
CEH	Centre for Hydrology and Ecology
cHMWB	Candidate heavily modified water body
EA	Environment Agency
K&A	Kennet & Avon canal
KCRP	Kennet chalkstream restoration project
Ml/d	Megalitres (million litres) per day
NE	Natural England
RSPB	Royal Society for the Protection of Birds
SSSI	Site of special scientific interest
TW	Thames Water
WFD	Water Framework Directive
WLMP	Water level management plan
µg/l	Micro-grams per litre – millionth of a litre

Glossary

Diatom	A mobile plant of microscopic single cell or colonial algae
Macro-invertebrates	Invertebrates (without a backbone) which are visible to the naked eye – river bugs
Macrophytes	A macrophyte is an aquatic plant that grows in or near water and is either emergent, submergent, or floating
Q95 flow	The flow rate that is exceeded for 95% of the time, typically a low summer flow
Mean Trophic Rank	A biological assessment of the impact of nutrient levels in a watercourse achieved by assessing the

	aquatic plant populations in rivers. The mean trophic rank (MTR) approach uses a scoring system based on species and their recorded abundances.
Perennial	A stream or river which flows all year round
Perennial head	The point at which a winterbourne becomes a perennial river
Water body	A sub-division of the Thames river basin, typically 10 to 20 km of a river or stream
Winterbourne	A stream or river which is dry during the summer months

SUMMARY

Report purpose

This report reviews the effectiveness of the draft Thames River Basin Management Plan in addressing problems in the River Kennet. It is intended to help RSPB to respond nationally to consultation on the plan. It will also be used by ARK in responding to the consultation locally.

Primary conclusions

ARK's primary conclusions are:

1. The draft plan underestimates the Kennet's problems, particularly those relating to the biological impacts of poor water quality and the impacts of the interaction of the river with the Kennet & Avon canal.

2. The proposed programme of measures is vague, unambitious and unacceptable in failing to achieve any improvements by the Water Framework Directive's target date of 2015 or even by 2021; we have no confidence in the proposed measures achieving good ecological status even by 2027.

3. By using the Water Framework Directive to focus and drive the widespread activities that EA and others already have in hand, many of the Kennet's problems could be resolved by 2015 and all of them by 2019.

4. The main features of ARK's recommended 10-year plan are:

    - Production of a sub-basin plan for the Kennet by the end of 2009
    - Implementation of all the channel improvements proposed in the existing Water Level Management Plan and Kennet Restoration Strategy by 2015
    - Intensive monitoring for 3 years to support the recommended detailed studies, followed by long term monitoring of the effectiveness of improvement actions
    - Detailed studies of i) poor water quality and its biological impact, ii) low flows including the upper Kennet, building on the existing Axford and Ogbourne studies and iii) the canal/river interaction problem – all to be completed by 2012
    - Using the results of the studies to drive sewage works improvements and abstraction changes in Thames Water's 2015-2019 business plan, and targeted action to deal with diffuse pollution from farms and roads
    - Implementing the outcomes of the canal/river study by 2018, involving either full separation of the canal from the river or equivalent works to enable good ecological status for an un-modified river

Classification of the River

The main differences between the classifications proposed in the plan and ARK's assessment are:

1. ARK considers that none of the water bodies should be considered heavily modified, but that the middle Kennet water body should be split, with the section between Hungerford and Newbury separated to reflect its worse condition due to interaction with the Kennet & Avon canal

2. We consider the upper Kennet to be at poor status as compared with the EA's assessment as good, on account of flows and water quality

3. We think that the river between Hungerford and Newbury should be classified as poor ecological status, rather than the EA's proposed moderate ecological potential for a heavily modified water body

4. The main area of disagreement between the EA's classification and our own is phosphate levels and their impact on algal growth and river life – ARK recommends that Natural England's phosphate target of 60 µg/l for the River Kennet SSSI should be the WFD target for good ecological status in the Kennet, rather than EA's target of 120 µg/l.

The phosphate and algal problem has been recognised and quantified in numerous study reports and research papers. The consequent impacts on fish, plant life and fly life have not, in ARK's opinion, been fully registered in the plan because of deficiencies in the monitoring system. However, the biological impacts are recognised in Natural England's unfavourable assessment of the condition of the Kennet SSSI, consultants' reports and in various reports prepared by the EA's own staff, which have not been used in the classification of the river.

This report presents the evidence that ARK has used in reaching these conclusions, using the EA's monitoring data for the water framework directive, but supplemented by much data from other sources.

Adequacy of monitoring and completeness of classification in the Plan

We consider that the EA's biological monitoring of the river for the WFD has been inadequate for algal growth, water plants and fish. The weaknesses have led to many gaps in the EA's classification of water bodies. For the four water bodies under consideration, of the total 16 biological factor which should have been classified in the four water bodies, only 5 have been classified in the plan.

We recommend that in the final Plan, EA should either complete all the biological classifications or specify the dates by which they will be completed – not later than 2011.

ARK has used data available from other reports on projects and research programmes to complete its own classification of the water bodies covering all the factors, showing that all 16 fail to reach good quality.

The proposed measures for improvement

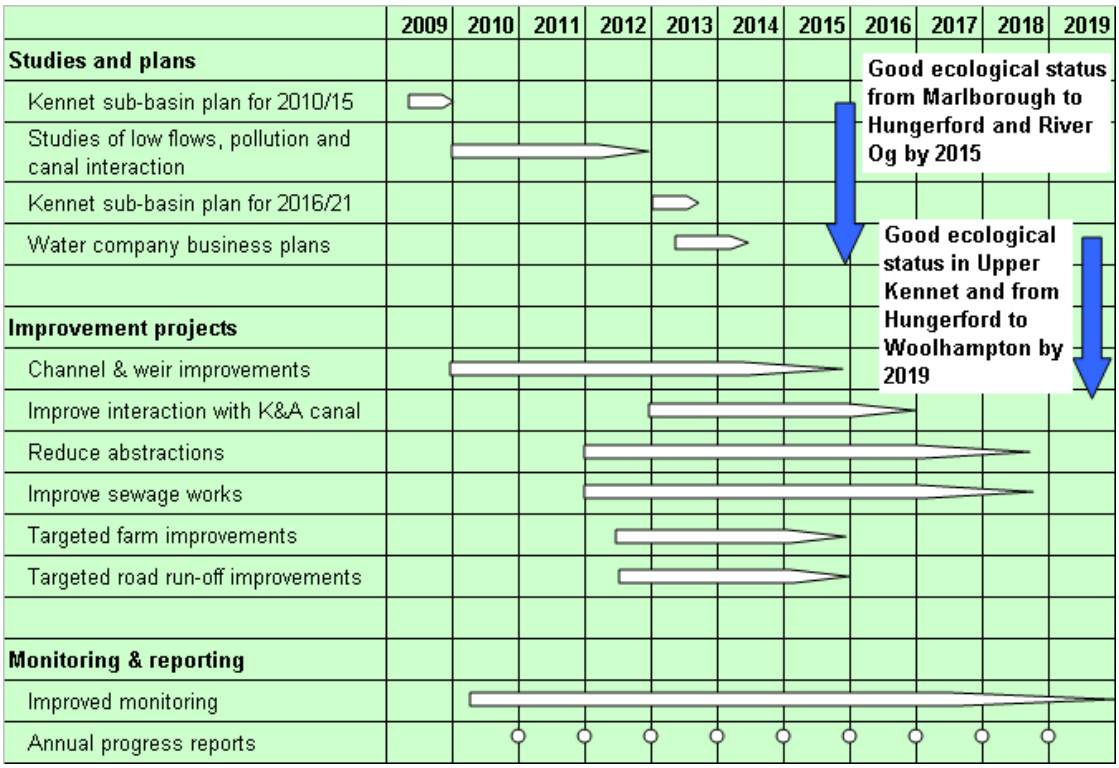
The draft River Basin Management Plan shows no improvements to any of the water bodies before 2027. The lack of commitment to improvements is consistent with our perception of weakness and lack of focus in the Plan's proposed measures.

Aside from a proposal for studies and possible improvements to four sewage works, all the measures proposed in the Plan are generic in nature and not targeted at the Kennet's specific problems.

The major weakness of the measures is that they fail to build on the many studies which have been undertaken of improvement measures in the Kennet, usually involving EA's local staff. These include Thames Water's low flow studies, a water level management plan and restoration strategy which deal with physical modifications and habitat restoration, studies of the problem of interaction of the river with the canal and a fisheries action plan.

ARK's recommended action plan

ARK's recommended programme of activities includes the proposals contained in all the recent studies to develop an action plan which would achieve good ecological status in the River Og and Middle Kennet by 2015 and in the other two water bodies by 2019:



ARK's recommended programme to achieve good ecological status

We recommend that these activities are fully costed and coordinated into a programme for the final River Basin Management Plan.

We consider that the condition of the river and its status as a chalkstream SSSI justify the production of a separate sub-basin plan for the Kennet as provided for in Article 13 of the EU Water Framework Directive. This report could form a starting point for a sub-basin plan and ARK would like to assist in developing it. We recommend that the sub-basin plan should be completed by the end of 2009 and incorporated in the final River Basin Management plan.

Effectiveness of implementation of the Water Framework Directive

ARK is deeply disappointed by the draft River Basin Management Plan which had been promised by the former head of the EA Thames Region as being the solution to all the River Kennet's problems. We think that the plan has failed to recognise the river's problems and has failed to produce a coherent programme of activities to deal with them.

A major weakness appears to have been a centrally driven approach to the plan which has failed to engage local EA staff and does not make use of the large amount of good work which has already been undertaken under the EA's local management. Rather than using the Water Framework Directive to coordinate and drive the existing activities, they have been subsumed into vague generic measures with no clear targets.

We consider the lack of any environmental data in the Plan and the difficulty in obtaining it to be a major deficiency. This review of the Plan has only been possible through the cooperation of local EA staff in making data available and attending meetings with us. We understand that this degree of access to information is not generally available and no one else has asked for it in the Thames Region – in ARK's opinion, this is a sign of apathy and disillusionment with the Plan, rather than acceptance of it.

In ARK's opinion, the lack of access to detailed information will undermine the consultation process. The regional consultation meetings we have attended have had little value to us because of lack of information to provide common ground for discussion. Without access to the information on which the draft River Basin Management Plan has been based, we consider that responses to the consultation will be of limited value.

We recommend that EA should establish a database with access to information at an equivalent level of detail to the CD which accompanies this report.

The recommendations of this report are highlighted in bold throughout the text and collated in Section 6 on page 65 of the report, with cross references to their origin.

1 Introduction

1.1 Objectives and Terms of Reference

This report reviews plans for the River Kennet as put forward in the Environment Agency's draft River Basin Management Plan for the Thames river basin district, published for consultation in December 2008. The aim of the report is to analyse the approach taken to river basin planning by the Environment Agency, using the River Kennet as a case study. The report is to be used by RSPB as a stand-alone document providing evidence in its response to the RBMP consultation. In addition, it will be used by RSPB to develop a national approach to lobbying for improved implementation of the Water Framework Directive, also using similar reports which are being developed for the Eden and Wye/Usk catchments.

The report has been prepared by Action for the River Kennet under contract to the RSPB, working to the terms of reference given in Appendix A.

Action for the River Kennet is a charity whose objective is to improve the environment of the River Kennet for the benefit of the local population and wildlife. More details can be seen at: http://www.riverkennet.org/about_ark.php. ARK will use this report as evidence to support their own response to the consultation on the draft river basin management plans.

The report includes many recommendations for improvements in the River Basin Management Plan and actions to deliver the Water Framework Directives objectives.

1.2 The Kennet Catchment

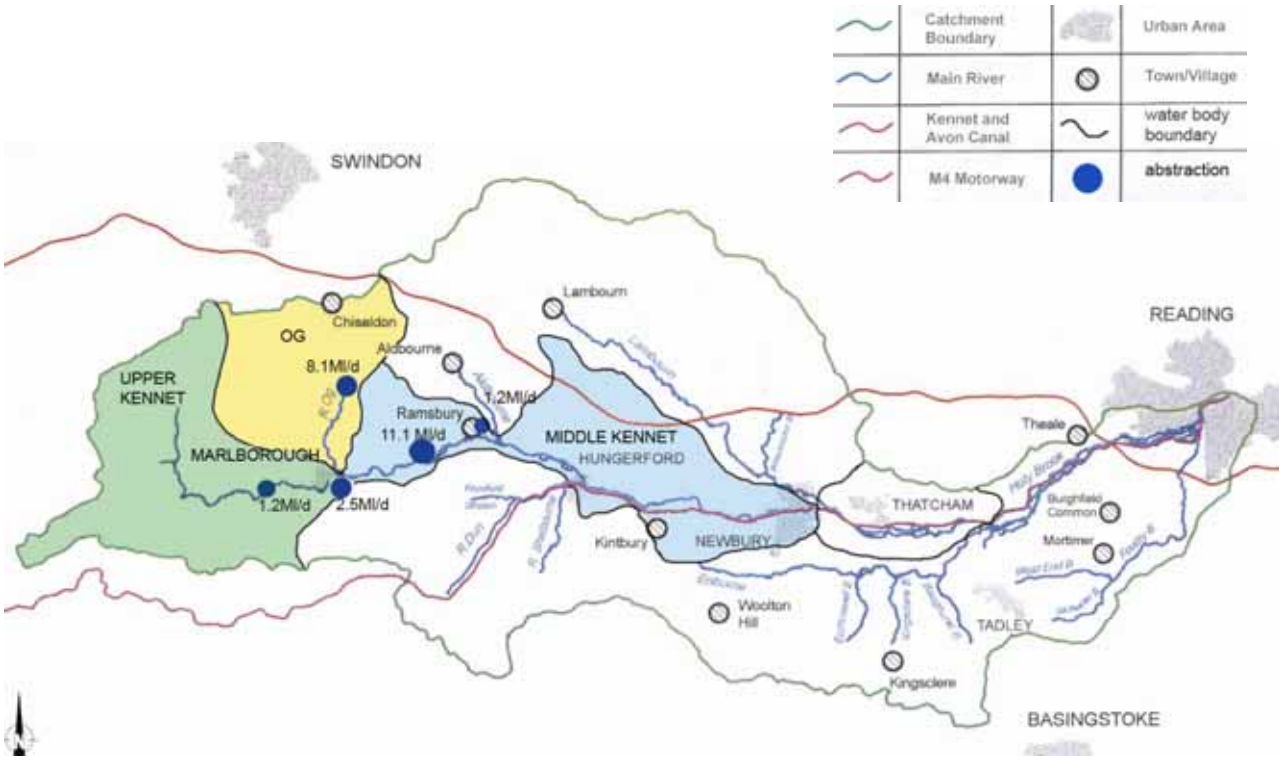


Figure 1 – The River Kennet Catchment

Most of the River Kennet between Marlborough and Woolhampton lies within the North Wessex AONB and has been classified as a Site of Special Scientific Interest. The citation for the SSSI provides a good description of what the Water Framework Directive should be aiming to restore and protect:

"The River Kennet has a catchment dominated by chalk with the majority of the river bed being lined by gravels. The Kennet below Newbury traverses Tertiary sands and gravels, London Clay and silt, thus showing a downstream transition from the chalk to a lowland clay river.

As well as having a long history of being managed as a chalk stream predominantly for trout, the Kennet has been further modified by the construction of the Kennet and Avon Canal. In some places the canal joins with the river to form a single channel. There are also many carriers and channels formerly associated with water meadow systems.

The river flows through substantial undisturbed areas of marshy grassland, wet woodland and reed beds. The flora of the River Kennet is species-rich and diverse, having the highest average number of species per site surveyed of any other lowland river in Britain. The Kennet shows a clear downstream succession in plant communities reflecting variations in geology and flow rate as well as the influence of the canal. The flora is considered to be intermediate in character between the classic

chalk rivers of the south and the oolitic rivers to the north. Stream water-crowfoot (ranunculus), starwort and watercress dominate the upper half of the river where shallow water and gravel are typical. In the slower, deeper water found downstream a much wider range of species occurs. This includes four species of pondweed and horned pondweed. Other plants occurring here include spiked water-milfoil, yellow water-lily, common club-rush and bur-reed species. Below Newbury there is a larger volume of water and less chalk influence and river water-crowfoot occurs for the first time. River water dropwort, a nationally scarce species of larger chalk streams, has been recorded from the mid to lower Kennet.

Aquatic invertebrates are abundant and the Kennet is especially noted for its large hatches of mayflies, including *Ecdyonorus insignis* and *Ephemerella notata* which have a very local distribution. These are associated with moderately flowing water in calcareous areas. Also worthy of mention are the beautiful and banded demoiselle damselflies. The nationally scarce cranefly (the larvae of which live in vegetated stream and riverside) has been recorded from the Kennet. The caddis fly *Ylodesconspersus*, also ranked as nationally scarce, has also been found along the river.

The Kennet supports good populations of kingfisher, grey wagtail, mute swan and little grebe, as well as sedge and reed warblers. Common sandpiper and redshank frequently use this river on passage.

The Kennet has a varied and mixed fishery including healthy, self-sustaining populations of wild brown trout, grayling, perch, chub, dace, roach, pike, gudgeon and bullhead."

The condition of the river SSSI was assessed by Natural England as "unfavourable unchanged" in 2002 [1] and again in 2008 [2]. The reasons for the unfavourable condition were inappropriate weirs dams and other structures, invasive freshwater species, siltation, water abstraction, and water pollution from agricultural run-off and sewage discharges.

The Kennet catchment has changed substantially since the 1930s. The drivers have been farm land use, with a switch from pasture to arable crops starting in the Second World War, and population growth accelerated by construction of the M4 motorway in the 1960s. The profound changes in agriculture and population are illustrated in Figure 2 [3].

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[1] Natural England 2002 assessment of the condition of the Kennet SSSI
[2] Natural England 2008 assessment of the condition of the Kennet SSSI
[3] Impact of land use changes on the Kennet Catchment, Paul Whitehead et al 2002

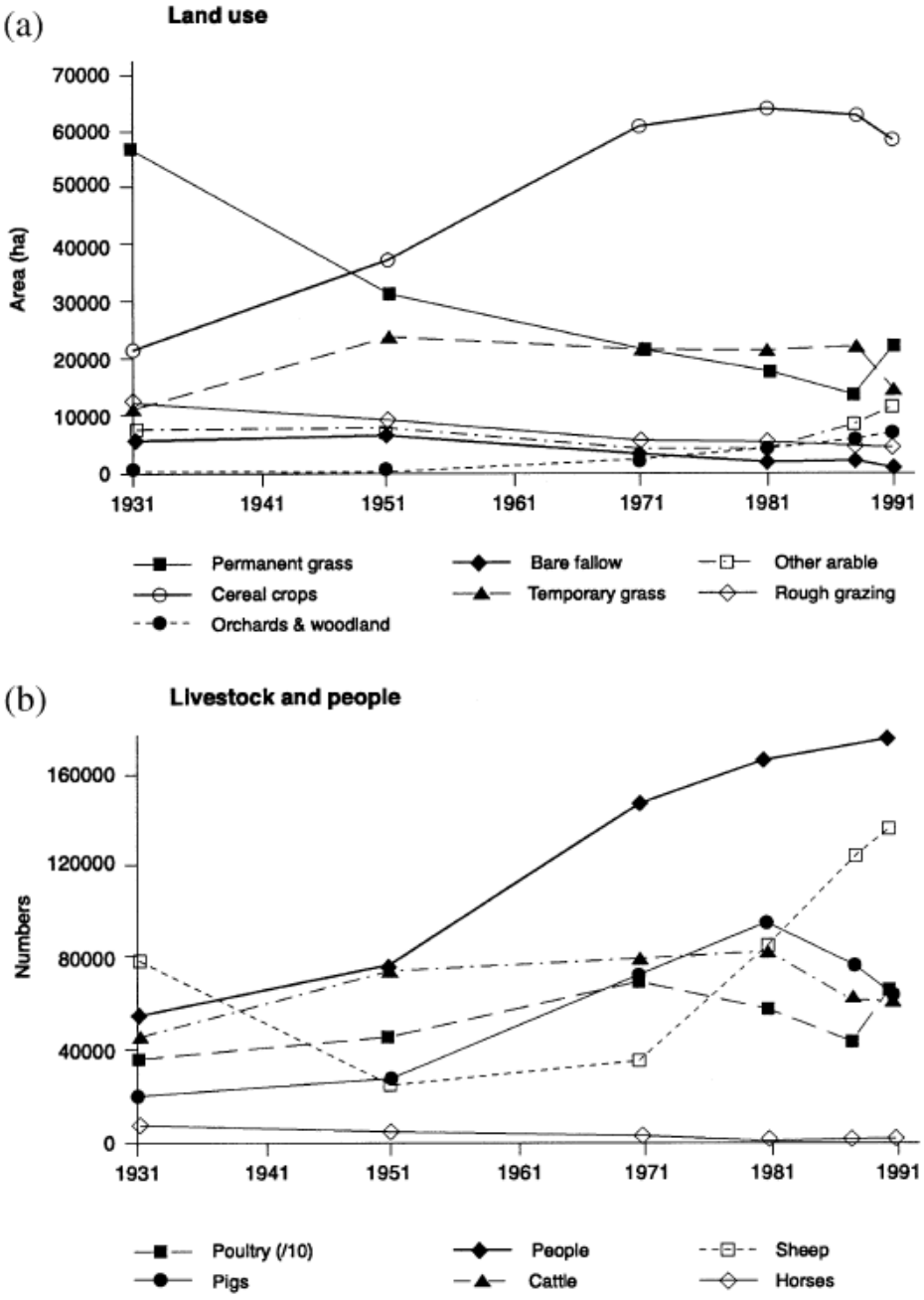

Figure 2 – Land use, livestock and population changes in the Kennet catchment

We do not have access to data since 1991, but would expect that the switch from pasture to arable will have stabilised, whilst population has continued to expand.

The changes in land use have had a big impact on the river Kennet. The area of pasture has been cut to a third since the start of the Second World War and the area of arable land has trebled. This has led to a large increase in use of fertilisers and pesticides, greater rainfall run-off from cultivated land and diffuse pollution from both agri-chemicals and sediments. There is also likely to have been a substantial change in groundwater recharge and river flow due to the difference in crop water

requirement between cereals and pasture – a fact which is generally not recognised when low river flows are considered.

The population of the Kennet valley has trebled since the 1930s. This has affected the river through increases in abstraction for public water supplies, sewage discharges and run-off from built-up areas.

A further major change in the Kennet catchment has been the re-opening of the Kennet & Avon canal in the 1990s. The canal runs adjacent to the river from Hungerford to Reading. There are numerous interchanges of water between the canal and the river, and a shared channel in several places. The re-opening of the canal has had a big impact on the water quality and ecology of the river from Hungerford to its confluence with the Thames at Reading.

1.3 Recent studies of the river Kennet

The Kennet has been the subject of an extraordinary amount of scientific and engineering study in the past 20 years. This has been driven by concerns over the condition of the river, as a recognised classic chalk stream subject to widespread man-made influences. The major studies have included:

- Low flow investigations of Thames Water's abstractions for public water supply at Axford (between Marlborough and Hungerford) undertaken by consultants WS Atkins [4] [5]

- Low flow investigations of Thames Water's abstractions for public water supply in the Og valley undertaken by consultants WS Atkins [6]

- A detailed case study for the EU of the Kennet as a heavily modified water body prepared for the Environment Agency by a team led by the Centre for Hydrology and Ecology in 2002 [7] – in effect an early version of a management plan including data, problem analysis and possible solutions to a greater level of detail than presented in the latest draft RBMP

- A water level management plan prepared by EA to address the impacts of numerous weirs and channel alterations contributing to the unfavourable SSSI condition[8]

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4 Atkins summary report on the Axford low flow investigation, 2005
5 Atkins final Axford report including ecology studies and data, 2005
6 Atkins Powerpoint on progress on Og investigation, March 2009
7 CEH report to EU on a case study of the River Kennet as a heavily modified water body, 2002
8 EA 2006 report on Water Level Management Plan

- A long running investigation into water quality and algal growth undertaken mainly by CEH and Reading University, coordinated by the Environment Agency and leading to numerous published scientific papers

- Investigations into problems caused by the interaction of the river Kennet and the Kennet & Avon canal, undertaken by consultants Halcrow [9] [10] for the Environment Agency and consultants Environmental Planning & Assessment [11] for estate owners

- A River Kennet restoration strategy[12] produced by EA staff in 2007 which identified and prioritised all the areas where channel improvements were needed in the Kennet catchment.

- A fisheries action plan[13] for the Kennet and Pang catchments in 2008 under the EA's auspices which has identified many actions to improve the environment of the Kennet and its fish population, often citing the other work listed above.

These studies have provided a substantial evidence base for a river basin management plan for the Kennet.

1.4 Water bodies assessed

Under the terms of the Water Framework Directive, the catchment is subdivided into water bodies, with the draft river basin management plan giving a separate assessment of each individual water body. This report focuses on four water bodies in the chalk-based Kennet catchment (see Figure 1):

- The upper Kennet from source to Marlborough (water body 23171)

- The middle Kennet from Marlborough to Newbury (water body 23172)

- The River Og (water body 23180)

- The lower Kennet from Newbury down to the Enbourne confluence (water body 17420)

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9 Halcrow report on canal problem
10 EA summary of canal problems
11 Environmental Planning Associates report on canal problem
12 EA River Kennet restoration strategy, 2007
13 EA Kennet & Pang fisheries action plan, 2008

The work has concentrated particularly on the upper Kennet, the middle Kennet and the Og, which comprise the classic chalk stream sections of the Kennet and which are the focus of ARK's overall activities. However, we have also provided some commentary on the more urbanised and industrialised section of river below Newbury.

The water bodies are served by four principle flow gauging stations as shown in Table 1:

Gauging station	Location	Catchment area	Gauged Mean flow	Gauged Q95 flow
Marlborough	Bottom of upper Kennet water body	142 sq km	76 Ml/d	7 Ml/d
Knighton	Centre of middle Kennet water body	295 sq km	220 Ml/d	52 Ml/d
Newbury	Top of lower Kennet water body	548 sq km	415 Ml/d	159 Ml/d
Og	Bottom of water body	59 sq km	28 Ml/d	0.7 Ml/d

Table 1 – Hydrological characteristics

1.5 Data acquisition

The draft river basin management report contains no data on the condition of the river. The EA's web-site "What's in your backyard",

http://maps.environment-agency.gov.uk/wiyby/wiybyController

which is cited by EA as a source of background information, also contains no data, but merely statements of results of EA assessments, for example good or bad, or grade 1 to 6.

The RBMP makes use of monitoring data collected by the EA for the Kennet to classify the condition of the river and the actions needed to improve it. By not supplying any of this data in the plan in the form of graphs and summary tables, the EA is asking its consultees to accept its findings on trust, thereby, in ARK's opinion, invalidating the consultation process:

- Without any data to provide evidence of the condition of the river, how can consultees comment meaningfully on EA's assessment?

- Without any data to back consultees' own views of the river, how can they make any comments that are not entirely subjective?

Therefore, as provided for in Article 14 of the EU Water Framework Directive, ARK made a request for information to the Environment Agency to acquire the data upon which the river basin management plan has been based. A copy of the information request is given in Appendix C, which also shows the outcome of discussions of the request with the EA at a meeting on 2 March 2009 to clarify the information request and discuss what information might realistically be available. A detailed response to the request was received on 16 March 2009 and was discussed further at another meeting on 25 March 2009. The notes of these two meetings with the Environment Agency are contained in Appendix C, together with a paper describing how the river was classified, which was the centrepiece of EA's response. A further revised and augmented response to the information request was received on 10 April. A list of the data received is given in Appendix E and full details of the data are given on the CD which accompanies this report.

The information received from the Environment Agency's WFD team was supplemented by information and data from various other sources including Thames Water and its consultants WS Atkins, the Centre for Ecology and Hydrology, the Kennet Chalkstream Restoration Project (via John Hallett of the EA) and John Towner, consultant to Sutton Estates. All of the data and reports received are listed in Appendix E and copies are included on the CD supplied with this report. Cross references to the data and reports are included throughout this report.

1.6 Meetings with riparian owners

As part of this assignment, ARK held meetings with the following organisations to get their views on the condition of the river and to discuss their plans for improvements, in the context of the Water Framework Directive:

- Manor Farm, Avebury Trusloe
- Stonebridge Lane, Marlborough (Wild Trout Trust Advisory Visit)
- Combe Farm, Stitchcombe
- Priory Farm, Ramsbury Estate
- Ramsbury Manor Estate
- Ramsbury Mill
- Hungerford Town and Manor Fishery
- Sir Richard Sutton Settled Estates, Marsh Benham

Notes of the meetings with these organisations are given in Appendix D.

2 Monitoring and Classification

2.1 *The existing EA monitoring network*

Figure 3 shows maps of the monitoring network used for river classification.

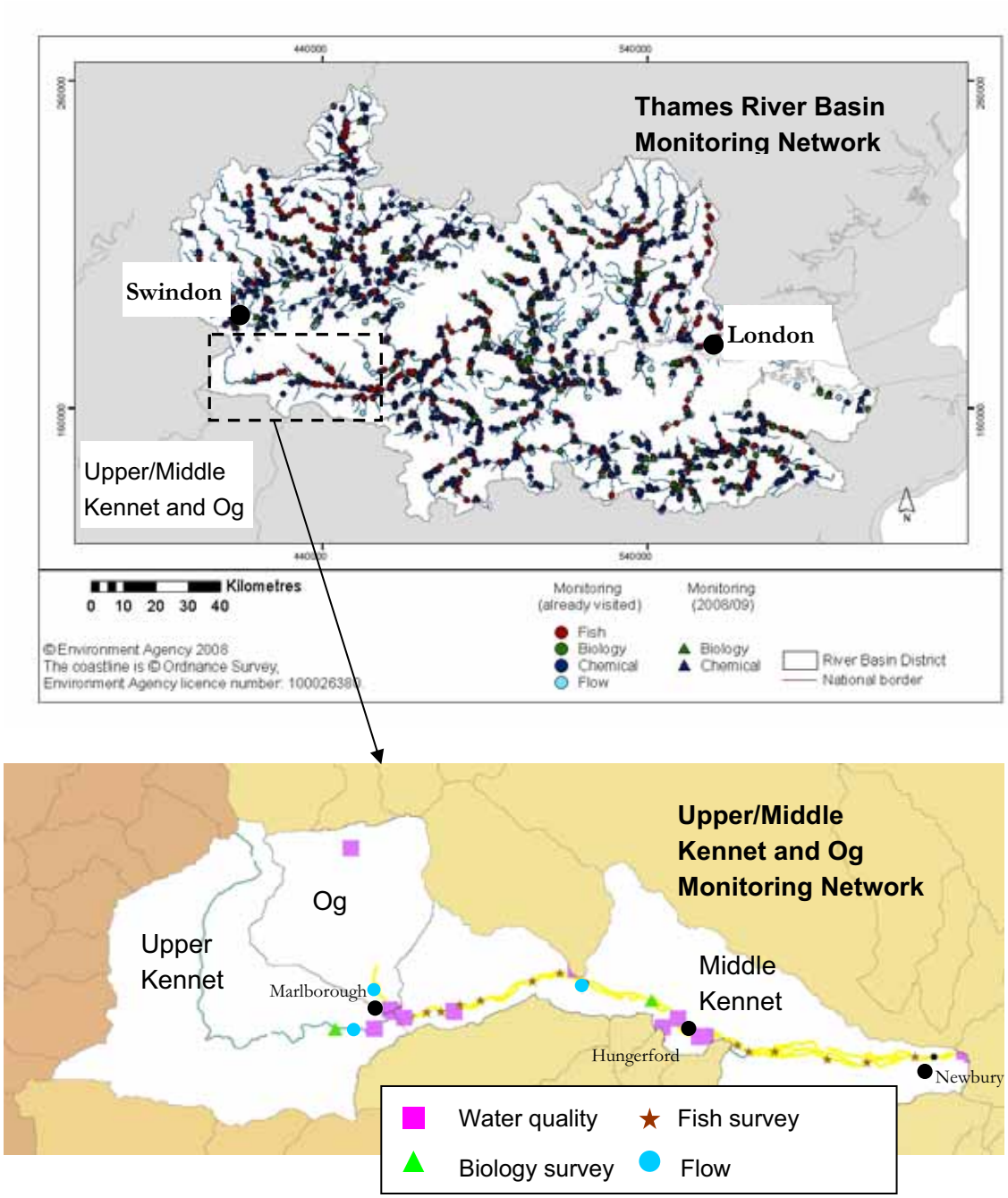

Figure 3 – Location of monitoring stations

In response to ARK's request for information, the EA stated that the monitoring information used in river classification was as shown in Table 2 below.

Water Body	Types of WFD monitoring available	Number of stations and details
Upper Kennet	Water flow, chemistry and macro-invertebrates	River gauging station Physico-chemical site ID: PKER.0041 Macro-invertebrate site ID: 36079
Og	Water flow, chemistry, diatoms and macro-invertebrates (plus diatom R&D monitoring)	River gauging station Physico-chemical site ID: PKER.0074 Macro-invertebrate site ID: 35965 Diatom site ID: 70364 (35965)
Middle Kennet	Water flow, chemistry, fish, diatoms and macro-invertebrates	River gauging station Physico-chemical site ID: PKER.0041, PWER.0011, PKER.0045, PKER.0052, PKER.0092, PKER.0160, PKER.0179, PKER.0180, PKER.0205, PKER.0263 Macro-invertebrate site ID: 35491, 34379, 35490 Diatom site ID: 70364 Fish site IDs: 10233, 10236, 10242, 10300, 12321, 12506, 13652, 13655, 7295, 7299, 8982, 8983, 9366

Table 2 – Details of monitoring stations used in river classification

The data for water quality, fish and macro-invertebrates were supplied by the EA and are included on the accompanying CD[14] [15] [16]. Fisheries reports for 2004, 2005 and 2006 were also received[17] [18] [19].

ARK's views on the adequacy of the monitoring for assessing the condition of the river and classifying it for the purpose of the Water Framework Directive are as follows:

[14] EA water quality data used for classification
[15] EA macro-invertebrate data used for classification
[16] EA fisheries data used for classification
[17] EA 2004 fish survey report
[18] EA 2005 fish survey report
[19] EA 2006 fish survey report

1. The river flow gauging stations are sufficient, with continuous flow records available for the Kennet at Marlborough and Knighton and the Og about 500 m above its confluence with the Kennet.

2. Water quality monitoring in the Kennet between Marlborough and Newbury is adequate in terms of the number of measuring stations, with monitoring taking place above and below all the main sewage works. The range of water quality parameters measured is also sufficient, covering all the factors likely to affect the biological condition of the river, including nutrients and hazardous chemicals. However, the frequency of readings is only about once a month, which is inadequate to pick up short-term increases in nutrients and pollutants due to rainfall. It is noted that water quality has been collected at weekly or shorter intervals by the Centre for Ecology and Hydrology, but this information does not appear to have been used by the Environment Agency in classification of the river or assessment of its problems for the purpose of the RBMP. ARK has used the CEH data in its review of the classifications in the RBMP (see Sections 2.4 and 2.6).

3. Monitoring of the upper Kennet water body is generally inadequate. This uppermost 15 kms of river is about 50% perennial and 50% winterbourne. The only water quality monitoring is at the downstream end in Marlborough. The only biological surveys are for invertebrates at one location – there has been no monitoring of algal growth, fish or macrophytes.

4. The monitoring of the Og has also been very sparse. The water quality monitoring station at the top of the catchment is no longer used, so the only regular monitoring is just above the confluence with the Kennet. Biological monitoring has been limited to one macro-invertebrate location. There has been no fish or macrophyte monitoring.

5. In general, monitoring of algal growth has been very sparse. There has been some monitoring in the Og catchment as part of a Bristol University R&D project and also some limited monitoring of the Kennet below Newbury. In both cases, significant algal growth was noted, which ultimately drove the ecological status of the water body. Noting the widespread concerns about algal growth in the Kennet, the lack of algal monitoring is a major shortcoming, which should be addressed by the studies that ARK is proposing in Section 4.4.

6. Macrophyte monitoring has been inadequate, noting the importance of ranunculus for holding up river levels and for fly life and fish. Some monitoring has taken place at Stitchcombe, Chilton Foliat and the lower River Og, but the data has not been used to classify macrophytes.

7. Fish surveys have been undertaken regularly between Hungerford and Newbury, but only once between Marlborough and Hungerford, and not at all in the upper Kennet nor Og. Noting the concerns over the lack of natural spawning of trout in the Kennet and its tributaries above Hungerford, ARK considers that the fish monitoring has been inadequate and should have been targeted at the health of juvenile populations and natural recruitment. ARK proposes improved fish monitoring as described in Section 4.4.

Recommendation: The RBMP should include actions to improve monitoring. This should include diagnostic monitoring to support studies needed to improve understanding of the river's problems and long term monitoring to measure the effectiveness of river improvement measures. See Section 4.4 for more details

2.2 Other available monitoring and data sources

The Kennet has been the subject of various studies and data collection in recent years, as described in Section 1.3, and ARK has acquired the following information to supplement the data used by EA in the RBMP:

- Thames Water provided information on ground water modelling and low flow investigations associated with the Axford and Ogbourne borehole abstractions, including some ecological data collected during these investigations[20] [21]

- The Centre for Ecology and Hydrology (CEH) provided papers on their work on water quality monitoring on the River Kennet over the past 10 years[22] [23] [24] [25]

- The Kennet Chalkstream Restoration Project, under the management of the Environment Agency's John Hallet, provided information on the KCRP's recent and projected programmes of work, including studies of the interaction of the River Kennet with the Kennet and Avon Canal [9] [10]

- The EA's conservation staff have undertaken river habitat surveys and reported on habitat quality assessments and habitat modification scores in their 2007 document "River Kennet Restoration Strategy" [12].

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[20] WS Atkins Axford groundwater modelling report, 2005
[21] APEM Og ecology progress report, Nov 2007
[22] CEH paper on Kennet phosphate concentrations and ecology, 2002
[23] CEH paper on point and diffuse pollution in the Kennet, 2008
[24] Reading Univ/CEH paper on modelling of phosphate stripping, 2002
[25] CEH data on weekly phosphate monitoring, 2009

- John Towner, consultant to Sutton Estates, provided information collected for the Sutton estate fisheries, particularly relating to the river/canal interaction [11]

This information, which is all listed in Appendix E and provided in full on the accompanying CD, has provided important insights into the condition of the river and its problems. It is surprising that the EA has not made full use of all this information in preparing the RBMP.

Recommendation: the RBMP should make full use of all available data and studies, not just the "official" data held centrally by EA. Local EA staff should be more involved to provide information and ensure that all available information and local knowledge is used in classifying the river.

2.3 Overview of classification

The EA's classification of each water body is detailed in Annex B of the RBMP and the relevant excerpts for the Kennet water bodies are given in Appendix B of this report. In summary the classification of the four water bodies is:

- Upper Kennet – candidate Heavily Modified Water Body, but ecological potential not assessed
- Middle Kennet - candidate Heavily Modified Water Body, at moderate ecological potential
- Lower Kennet from Newbury to the Enbourne confluence, unmodified water body at poor ecological quality
- River Og – unmodified water body at moderate ecological quality

The RBMP classification of individual parameters for each water body is given in Table 2 below:

	Upper Kennet	Middle Kennet	Kennet (Lambourne to Enbourne)	Og
	Source to Marlborough	Marlborough to Newbury	Newbury to Woolhampton	Source to Marlborough
	23171	23172	17420	23180
Overall status/potential			High	Medium
Modification status	cHMWB	cHMWB	None	None
WQ Dissolved oxygen & ammonia				
WQ Phosphates and nitrates		Low	Low	Low
WQ Hazardous chemicals		Low		
Flow	Low	Low		High
Fish		High	Medium	
Invertebrates	Medium			
Macrophytes				
Algae			High	Medium
Hydromorphology				

Note: The wording in the boxes shows EA's confidence in the assessment, for example

Medium

signifies good status with medium confidence in the assessment.

Key

Status Classification
High
Good
Moderate
Poor
Not assessed
cHMWB — Candidate heavily modified water body

Table 3 – Classification of Water Bodies in Annex B of RBMP

Thus all four water bodies are assessed in the RBMP as failing to achieve good ecological status or potential. The coverage of assessments of individual parameters is sparse, particularly of biological elements, and the confidence in many of the assessments is low. The patchy coverage and low confidence is consistent with the shortcomings in the monitoring described in Section 2.1. Further comments on classification of individual water bodies are given below, assisted by EA's paper on classification of the Kennet (see Appendix C) and other responses to ARK's request for information[26].

2.4 The Upper Kennet

The upper Kennet from source to Marlborough has been designated a candidate Heavily Modified Water Body (cHMWB). The reason is not stated in the RBMP. In response to ARK's request for more information, the EA has said that the designation was on the grounds of modification for flood protection and the presence of in-channel sluices and structures. Details of the reasons for the cHMWB designation and proposed mitigation measures have been provided by EA in various papers and spreadsheets.[27] [28] [29] [30].

[26] EA response to ARK queries on classification, April 2009
[27] EA HMWB spreadsheet

In the opinion of ARK, the modification for flood defences and land drainage are relatively minor, affecting a small proportion of the river length. The presence of several old water meadow sluices is as expected for the upper reaches of a chalkstream and adds to habitat diversity. The old water meadow sluices no longer serve a function, so they cannot be used to justify the HMWB designation. Furthermore, their impact on ecology is slight and, if anything, beneficial in terms of added habitat diversity.

The only old mill is at Manton Mill. Although the original sluice is still in place there is no evidence that it is impeding fish passage. The mill owner has seen trout and grayling swimming up it. There is good ranunculus growth upstream and the mill pool is home to moorhens, grey wagtails, grayling and trout.

The river of the upper Kennet largely follows its natural course and profile. In the few places where the river channel has been adversely affected by inappropriate dredging or straightening, channel improvements are needed and are feasible.

Recommendation: The upper Kennet should be classified as un-modified river. The channel improvements proposed by EA as mitigation of the "modifications" should be carried out as already planned for the Water Level Management Plan and the River Kennet Restoration Strategy (see Section 4.4).

The local EA staff are also understood to consider the cHMWB station to be inappropriate and have applied for it to be changed. We understand that this change is likely to be accepted, but it raises the question of why local EA staff were not involved earlier in the process.

The water body classification details in Annex B of the RBMP (see excerpt in Appendix B to this report) show the ecological potential as "not yet assessed". ARK considers that the ecological status of the upper Kennet should be poor good, based on the evidence presented below:

1. **Abstraction**: there are Thames Water abstractions averaging 3 Ml/d at Clatford and Marlborough, as compared with the gauged Q95 at Marlborough of 7 Ml/d – the abstraction is therefore of the order of 40% of the naturalised dry weather flow. TW's argument that the abstraction has negligible impact because the flow is returned through Marlborough sewage works is invalid because the sewage effluent returns to the river well downstream of the abstractions.

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[28] EA initial assessment of Kennet HMWBs
[29] EA assessment of impacts and mitigation for Kennet HMWBs
[30] Spreadsheet of impacts and mitigation for upper Kennet HMWB

There are also farm and private water supply abstractions in the upper Kennet, as well as significant Wessex Water abstractions close to the catchment boundary. There is strong anecdotal evidence that the upper Kennet has been severely affected by abstractions as recorded in a series of interviews with farmers and riparian owners in 1991, with recollections going back to before the Second World War.

The recorded anecdotal evidence [31] suggests that the perennial head of the Kennet has moved downstream by about 8 km from Swallowhead springs to Marlborough, with substantial changes to the frequency and size of winterbourne flows upstream. Flows between Swallowhead springs and Marlborough were reported to have been much reduced with consequent reported impact on ranunculus growth, birds and fish.

Later parts of this Section 2.4 discuss the poor biological condition of the upper Kennet. Reduced flows contribute to the high phosphate levels due to lower sewage effluent dilution, algal growth, poor ranunculus growth and poor conditions for wild trout.

The changes in flow were seen by local residents in the 1991 interviews as being linked to increases in abstraction at Marlborough and Clatford. There were also concerns that the Wessex Water boreholes on the south-west catchment boundary were affecting the Kennet. Some extracts from the residents' interviews are given in Figure 4 and the report[31] is included in full in the CD which accompanies this report.

[31] ARK report on interviews with local residents in 1991

THE DECLINE OF THE UPPER RIVER KENNET, 1970 TO 1991

(A descriptive report compiled by ARK from Interviews with 22 Residents from Avebury down to Hungerford)

In early 1991, people living along the upper Kennet valley were outraged to hear that the National Rivers Authority considered this river's condition 'not bad enough' for inclusion in the list of English chalk streams most urgently needing to be saved from extinction.

Dr and Mrs B. Cameron, of East Kennett Manor and Farm, East Kennett, have lived there and as a family farmed a riparian stretch since the 1940s. They say that there has been a steady lessening since the 1970s in the amount of water in the river and the length of time it flows each year. In the 1950s, 1960s and 1970s it was a proper flowing river for 9 months of the year, usually drying up in October or November until its return around Christmas or New Year, but occasionally flowing all year. Often in winter and spring there was a five feet depth of water at their footbridge - since the late 1970s it is never more than 2 feet deep there. During the 1980s, the river declined steadily overall (with some years better, then worse still). In 1990, the second drought year running, the river flowed at all only in January till late June in this stretch. In winter/spring 1991, the 3 springs in their water meadows (normally flowing January to April) remained dry for the first time in their more than 40 years there. The Kennet is no longer a fishing river in this stretch (which of course involves a financial loss on the value of their property), for no brown trout have been seen here since the late 1970s. The Camerons' stable yard well dried up for the first time ever (to their knowledge) in 1985 or 1986, and has done on occasions since then - the well is 35 ft deep and they have observed that the river flows when there is 20 ft of water in the well.

Figure 4 – Extracts from ARK interviews with local residents in 1991

However, despite the flow from Fyfield, Mrs Audrey Goodwin, who has owned Clatford Hall, Clatford a mile or so downstream from Fyfield since 1977, has still suffered a considerable deterioration in water levels along her stretch down to Clatford bridge. In 1977 the depth of water in the river here was a maximum of 3 feet in normal (non-spate) conditions, but by the mid 1980s onwards it was only about 18 inches deep at maximum flow periods. The river flowed all year here from 1977 till 1988, with gradually dropping levels, but in 1988, 1989 and 1990 there were spells at the end of the year when there was no flow. In 1981 a brown trout weighing 6 lb 3 oz was caught in the Kennet at Clatford! Now there are hardly any trout (despite re-stocking), no kingfishers, no frogs, no moorhens, any more. Mrs Goodwin has been caused financial loss through losing the estate's fishing amenity and because the water meadows no longer flood (which used to enrich the grazing each year).

Mr V. Paradise, of Ashcroft, High Street, Avebury, used to work for the water board. At the time when the Cherhill R.A.F. Camp was closed down in the 1960s, and the Cherhill Borehole (under the Cherhill White Horse near the A4 towards Calne) was handed over to Wessex Water, Mr Paradise was told of a test that was undertaken some years earlier to determine which catchment area that borehole affected. A dye was put into the Cherhill Borehole and, to people's surprise, appeared later in the water issuing from the Swallowhead Spring, the traditional head spring of the Kennet river (the map contours show that Swallowhead is several metres higher than the Cherhill borehole). Water is still being pumped (at a rate of 342.858 ML per annum in 1990, compared with 242.373 ML in 1981) from the Cherhill borehole valley to Calne, out of the Kennet valley. This may be a further factor in the Kennet's decline, as may the abstractions from the Shepherds Shore pumping station to Devizes (653.964 ML per annum in 1981, but cut back to 377.019 ML in 1990). It will need proper geological-hydrological studies to resolve these two points, which may be most important to the deterioration of the Kennet river.

Figure 4 (continued) - Extracts from an ARK report on interviews with local residents in 1991

The upper Kennet flow status in Annex B of the RBMP is said to be "not support good" , ie insufficient to support good ecological status, but with low confidence. In response to ARK's request for a justification of this classification, EA supplied the flow duration curves as shown in Figure 5 for the upper Kennet at Marlborough and the River Og[32] [33].

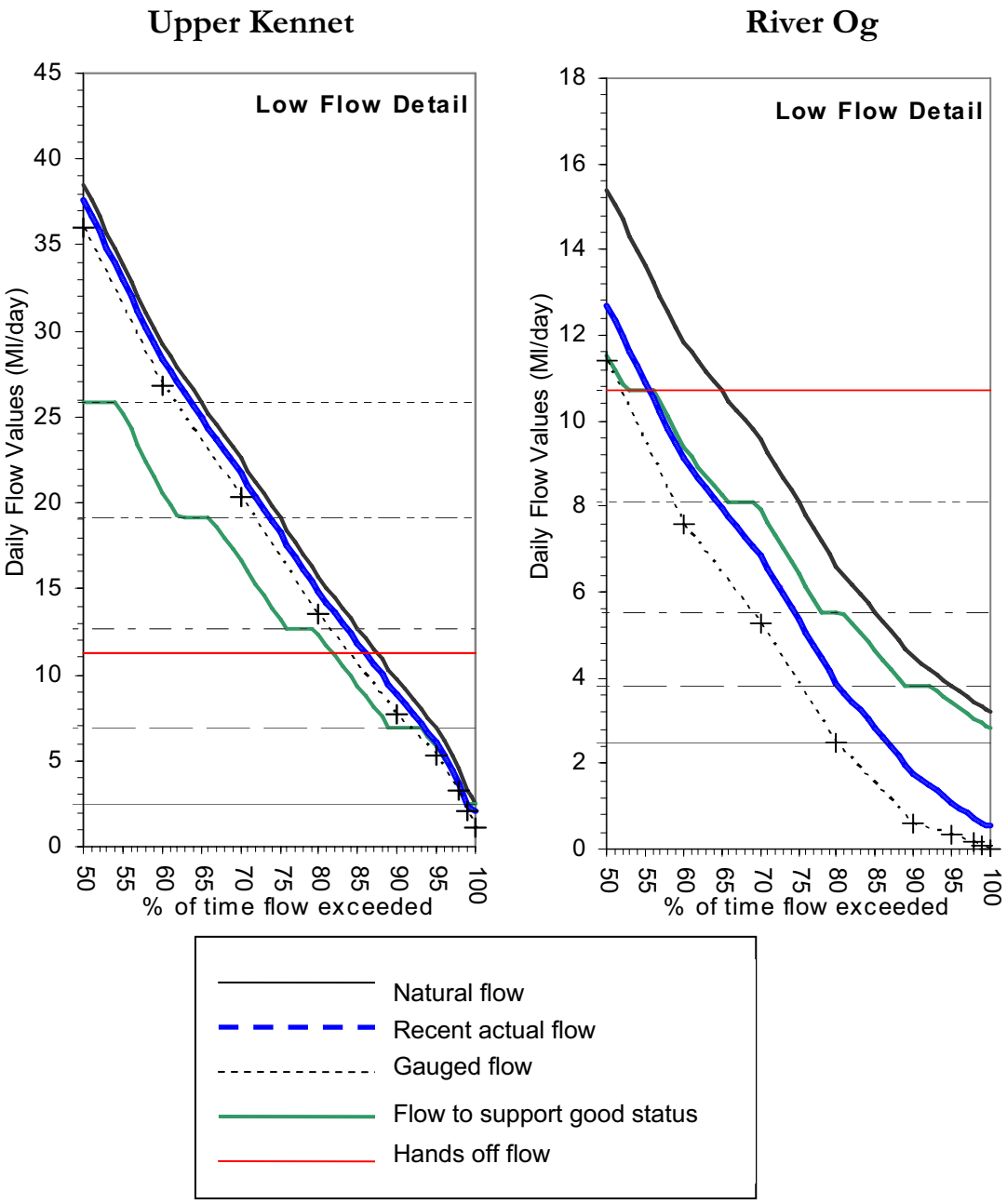


Figure 5 – Comparison of flow duration curves for the Upper Kennet and Og

[32] Flow duration curves supplied by EA
[33] EA responses to ARK queries

Comparison of the flow duration curves for the upper Kennet and the Og raises a number of questions:

1. Why do the natural flows shown for the upper Kennet tail away at low flows (less than 90% probability) in the manner characteristic of a winterbourne? – Compare with the curve for the River Og which retains the shape for a perennial stream despite a catchment less than half the size (59 sq km for the Og and 142 sq km for the upper Kennet)?

2. Why has the minimum flow to support good status at all times (100% probability) for the upper Kennet been set at only 2.5 Ml/d, 3% of the mean flow, when the corresponding figure for the smaller Og is 3 Ml/d, 10% of the mean flow?

3. Why does the difference between the recent actual flow and the natural flow for the upper Kennet only appear to be about 1 Ml/d when the abstractions upstream amount to at least 3 Ml/d (1.9 Ml/d at Marlborough, 1.1 Ml/d at Clatford), plus private abstractions, plus possibly the Wessex Water abstractions on the catchment boundary?

4. Why did the RBMP classify the upper Kennet flows as not supporting good in apparent contradiction of the flow duration curves which, as they stand, show that recent actual flows exceed the target for good ecological status?

5. Why have the hands-off flows been set at about 11 Ml/d for both the upper Kennet and the Og, the upper Kennet having more than double the catchment and mean flow of the Og? How are the hands-off flows related to the flows need to support good status and how are they used in setting flow objectives?

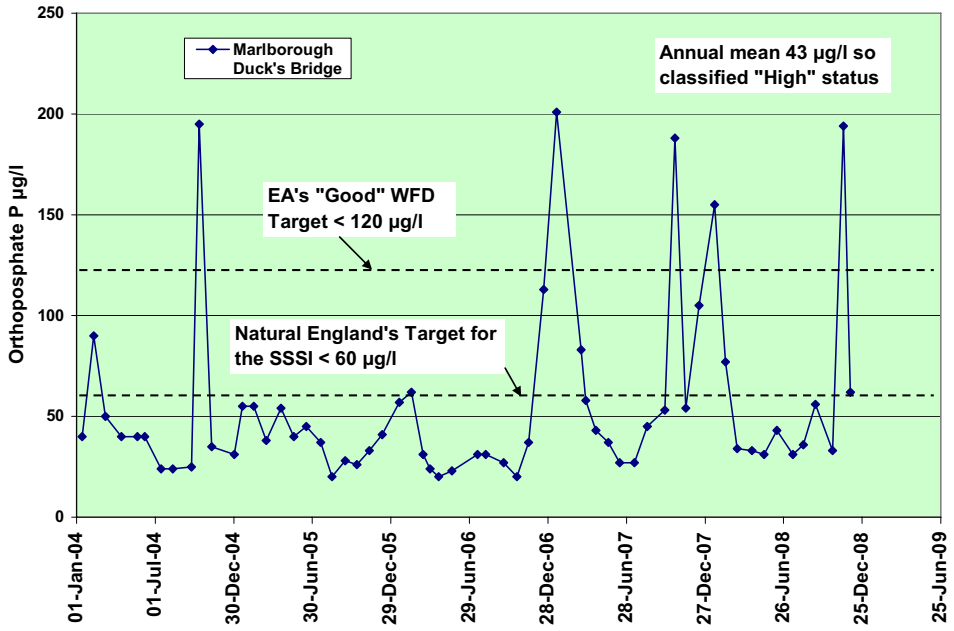
The overall impression from EA's low flow analysis is that it has started with the assumption that existing flows are near-natural and set flow targets accordingly. In ARK's opinion, the unnaturally low gauged flows at Marlborough are a strong indication that abstraction is having a significant impact. We believe that the impact of abstraction on flows in the upper Kennet has never been properly addressed.

Recommendation: A full low flow investigation should be undertaken for the upper Kennet, based on groundwater modelling and linked to recent low flow investigations for the Axford and Ogbourne abstractions. The investigation should look at all abstractions, ie including private abstractions and the Wessex Water abstractions close to the western catchment boundary. The study should seek to optimise all abstractions above Hungerford to minimise ecological damage (ie to consider shifting some of the abstractions further downstream where they would be less damaging). This investigation should also look at land use changes in the

upper Kennet and how changing crop water requirements might have affected river flows.

2. **Water quality:** The EA has assessed the status of water quality as high/good in terms of dissolved oxygen, ammonia, phosphates and hazardous chemicals. This is based on a 3 year record of monthly water quality measurements in Marlborough, as shown in Figure 6a for phosphates. On the basis of a 43 µg/l mean annual value of the monthly phosphate record in Marlborough as shown in Figure 6a , the upper Kennet was classified at "High" (ie excellent) status for phosphates.

a) Upper Kennet Phosphates in Marlborough



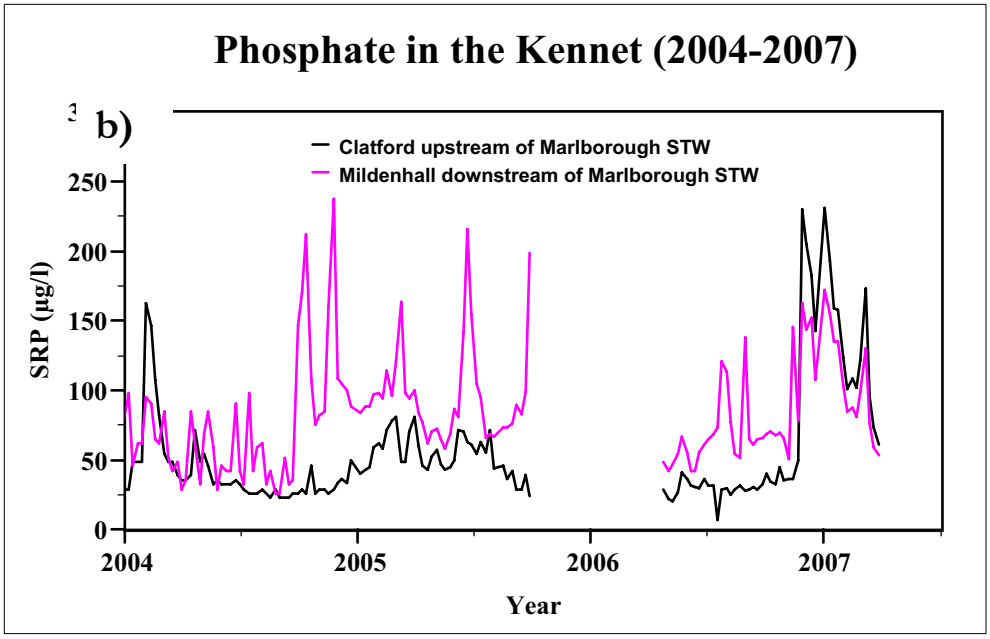


Figure 6 – Phosphate levels in the Upper Kennet

We believe that there is a serious problem due to phosphate levels in the upper Kennet, with major impacts on macrophytes and fish. Our evidence for this is:

- The 3-year record shows several "spikes" of phosphate concentrations over 150 μg/l as shown in Figure 6a, demonstrating that short term high phosphate levels are occurring regularly (note that the readings are monthly so the duration of spikes is unknown and some spikes will be missed).

- Weekly water quality monitoring by the Centre for Ecology and Hydrology over the past 10 years has not been taken into account in the RBMP and demonstrated much higher phosphate levels at Clatford (4 km above Marlborough) in the past two years, averaging about 100 μg/l in 2007/08 as shown on Figure 6b [25].

ARK also has concerns that the boundary between good and moderate phosphate status is set far too high at an average of 120 μg/l because this masks the ecological damage caused by short term phosphate increases. The Natural England unfavourable assessment of the condition of the River Kennet SSSI sets the phosphate target at a mean 60 μg/l. From discussion with Natural England, we understand that this figure is based on their assessment of the mean phosphate level to avoid algal blooms. This figure is consistent with the CEH finding that algal blooms were triggered by peaks over 100 μg/l [22].

At a conference on chalkstream restoration in Poole in March 2009, Lawrence Talks, EA's chairman of the Chalk Rivers Habitat Action Plan said that the target phosphate level in chalkstreams should be 60 μg/l generally and 40 μg/l in headwaters, on the grounds that they are the levels needed to avoid biological damage through eutrophication. In the opinion of ARK, the 60 μg/l phosphate limits should be the criteria for good status in the river Kennet and the criteria should also recognize the damaging impact of short term increases in phosphate levels, rather than being based only on annual average levels.

In ARK's opinion, it would be reasonable to aim to reach phosphate levels comparable to those occurring in the adjacent river Lambourn which joins the Kennet at Newbury and has a similar catchment area to the Kennet at Ramsbury (midway between Marlborough and Hungerford). Phosphate levels in the Lambourn just above its confluence with the Kennet are shown in Figure 7:

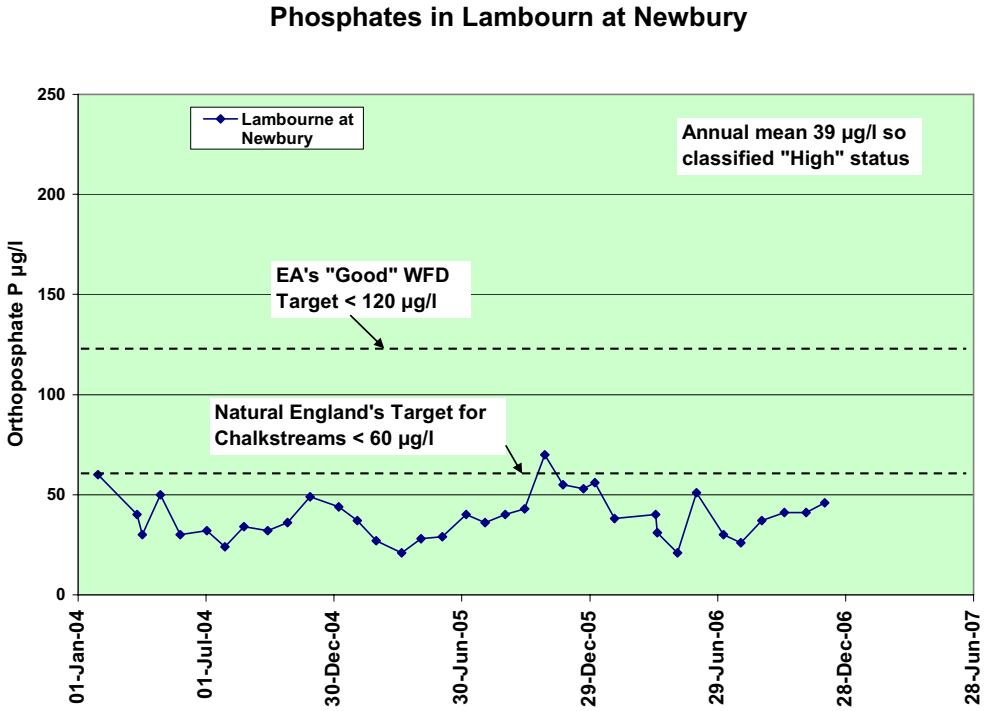


Figure 7 – Phosphates in the River Lambourn at Newbury

Recommendation: the mean phosphate target for the River Kennet should be Natural England's target of 60 µg/l with an absolute upper limit of 100 µg/l, the level at which CEH has found algal blooms are triggered.

Recommendation: CEH's recent data for Clatford should be used to classify the nutrient status of the upper Kennet. On this basis, it would fail to meet the good standard.

3. **Algal growth:** There are serious algal problems in the upper Kennet as evidenced by:

   - a black algal growth observed in August/September 2008 partially covering the river bed between Preshute and Manton (see Photo 1) and smothering the river bed from bank to bank in Marlborough (see Photo 2)

   - a brown algal growth observed above Lockeridge in March/April 2009

   These algal growths have been reported to the EA, but not investigated as far as we know. The smothering of vegetation is likely to be responsible for poor ranunculus growth and natural trout recruitment (see below).

Photo 1 - Kennet below Manton in September 2008. Up to 5 years ago, this section had heavy ranunculus growth. Now the bed is bare with a partial covering of algae. There is no cover for fish and none to be seen.

Photo 2 - Kennet at Marlborough College in September 2008. River bed totally covered by algae. Some starwort, but no ranunculus.

Recommendation: in the absence of any diatom monitoring, the photographic evidence of algal growth should be used to justify the classification of phytobenthos as "poor".

4. **Macrophytes**: There has been a sharp decline in ranunculus growth in the upper Kennet. An example is shown in Photo 1 where the bare gravel of the river bed can be seen at a location which had heavy ranunculus growth as recently as 5 years ago (personal communication with Geoff Doel, formerly part-time fishery manager).

   Channel vegetation was assessed at three sites in the upper Kennet by EA staff for the 2007 River Kennet Restoration Strategy [12], rating one as poor and two as extremely poor, with the channels significantly or severely modified for land drainage.

Recommendation: The macrophytes in the upper Kennet should be classified as poor, based on the assessments for the Kennet Restoration Strategy and the photographic evidence.

5. **Fish**. The upper Kennet used to have a substantial self-sustaining trout and grayling population, at least as far upstream as Clatford[31]. Now, there are some large stocked trout in places, but few visible signs of smaller, naturally recruited trout or grayling (a few small trout have been observed recently around Lockeridge above Clatford, showing that they are not extinct). There has been no fish monitoring undertaken in the upper Kennet for the WFD to confirm or refute ARK's view of poor fisheries condition.

Recommendation: the upper Kennet should be classified as an un-modified river at poor ecological status, based on the evidence above for phosphates, algal growth, macrophytes and fish.

2.5 The Middle Kennet – cHMWB status

The middle Kennet from Marlborough to Newbury has been designated a candidate Heavily Modified Water Body in the RBMP, with no reason given in the plan. The EA's recent spreadsheet on HMWB's[34] shows the designation is based on the river's use for navigation, where it forms part of the Kennet & Avon canal for about 3 km between Hungerford and Newbury. This has substantial impact on the river downstream in terms of sedimentation and water quality, as well as severely altering the ecology in the region of the shared water course.

The local EA staff have proposed that this water body should be split into two, with the section between Marlborough and Hungerford designated a normal river, and only Hungerford to Newbury designated a cHMWB.

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[34] EA spreadsheet with data on middle Kennet HMWB

Recommendation: the middle Kennet water body should be split in two and the reach from Marlborough to Hungerford should be designated a normal river.

ARK queries whether the stretch from Hungerford to Newbury should be designated heavily modified. Article 4 Section 3 of the EU Water Framework Directive states that a water body should only be designated heavily modified when "the beneficial objectives served by the artificial or modified characteristics of the water body cannot, for reasons of technical feasibility or disproportionate cost, reasonably be achieved by other means which are a significantly better environmental option." In our opinion, the "beneficial objectives", ie navigation of the canal for recreational use, could be achieved by "a significantly better environmental option" - engineering works to separate the canal from the river.

The canal/river problem has been significantly studied by consultants Halcrow in recent years, looking at the practicality and cost of works to separate fully the river from the canal, and the effectiveness of the lower cost option of mitigating the impact of the shared channel. No firm conclusions have yet been reached on the best course of action [9] [10] [11]. The EA are favouring trials of various mitigation measures on a suck-it-and-see basis, whereas riparian owners and their consultants are pressing for determination of the effectiveness of options through computer modelling, probably leading to the conclusion that full separation is the only truly effective option.

Recommendation: the RBMP should include an action for more studies of the canal/river interaction to target resolution of the best option by 2012, whilst leaving the stretch from Hungerford to Newbury as normal unmodified river for the moment. This classification could be revised if the outcome of the studies concludes that the reach should become a HMWB for reasons of technical infeasibility or disproportionate cost of the improvement works.

2.6 ***The Middle Kennet – ecological status from Marlborough to Hungerford***

Assuming that the stretch from Marlborough to Hungerford is re-designated as normal un-modified river, ARK consider that its ecological status should be at best moderate on account of hydromorphology, flows, water quality, algal growth, macrophytes and fish. Our evidence to support this is:

1. **Hydromorphology:** The hydromorphology has been affected by about 50 weirs and numerous channel alterations, often centuries old. Whereas many of these alterations are normal for a chalk stream and contribute to its diversity, some are causing siltation and obstruction to fish movement, particularly where the channel has been deepened or widened for land drainage or flood control. This is a major factor in Natural England's assessment of the SSSI condition as unfavourable for this stretch. The water level management plan for the SSSI [8] identified six locations in this stretch which are a priority for action. The EA's

2007 Kennet River Restoration Strategy [12] identified 10 other sites where river channel improvements are needed.

2. **Flows**: These have been assessed in the RBMP as "not support good". ARK agrees with this assessment, based on studies of the impact of the Axford abstraction.

3. **Water quality and algal growth**: The RBMP classifies all parameters as high status, including phosphates. The high (ie excellent) status of phosphates is based on the monthly measurements shown in Figure 8.

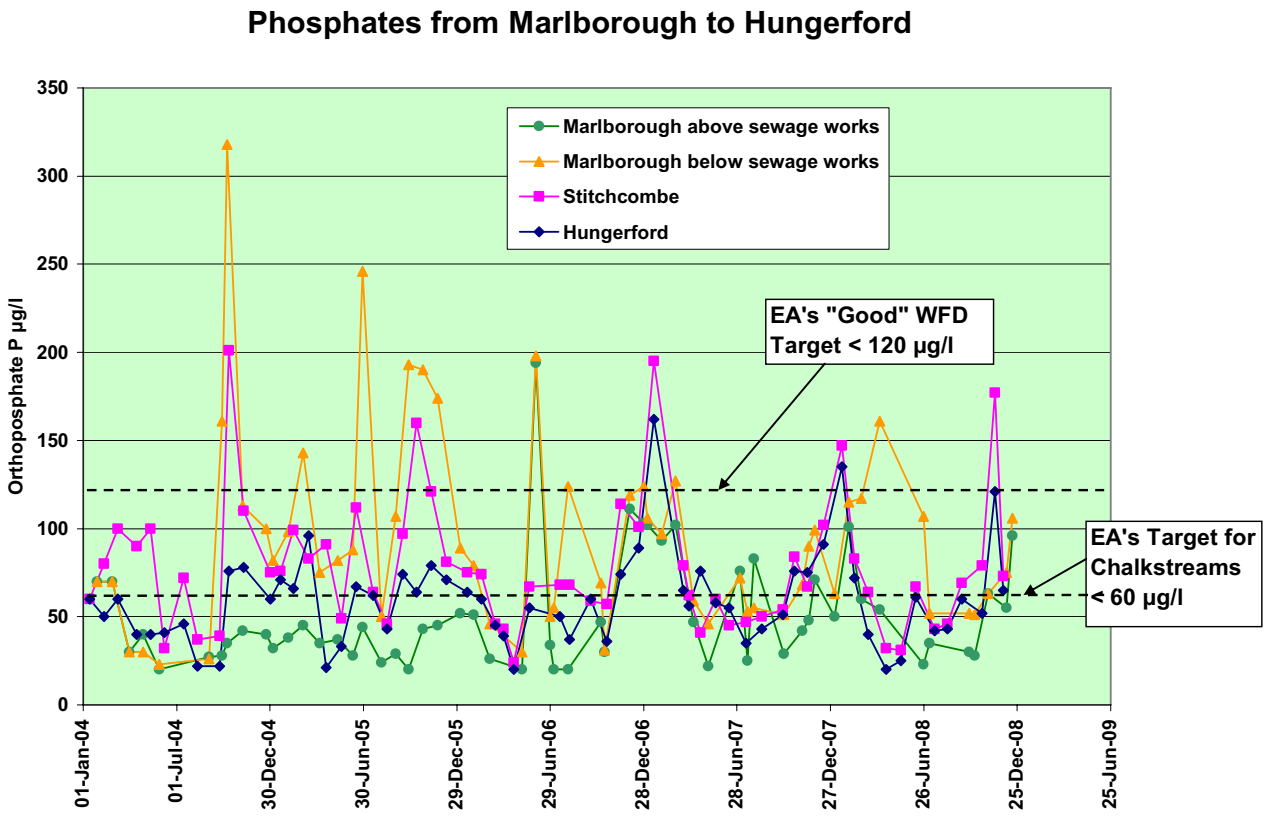

Figure 8 – Phosphates between Marlborough and Hungerford

ARK considers that phosphates remain a problem, despite the introduction of phosphate stripping at Marlborough sewage works in 1998. Figure 8 shows the monthly phosphate levels downstream of Marlborough, with frequent spikes in excess of 150 µg/l, but masked by EA's use of the mean annual concentrations and the setting of the good/moderate boundary for chalkstreams at 120 µg/l.

The Centre for Hydrology and Ecology's weekly monitoring of phosphate levels, as reported in a 2002 paper by Helen Jarvie[22], found phosphate levels below

Marlborough sewage works regularly over 100 µg/l with peaks in excess of 200 µg/l as shown in Figure 9.

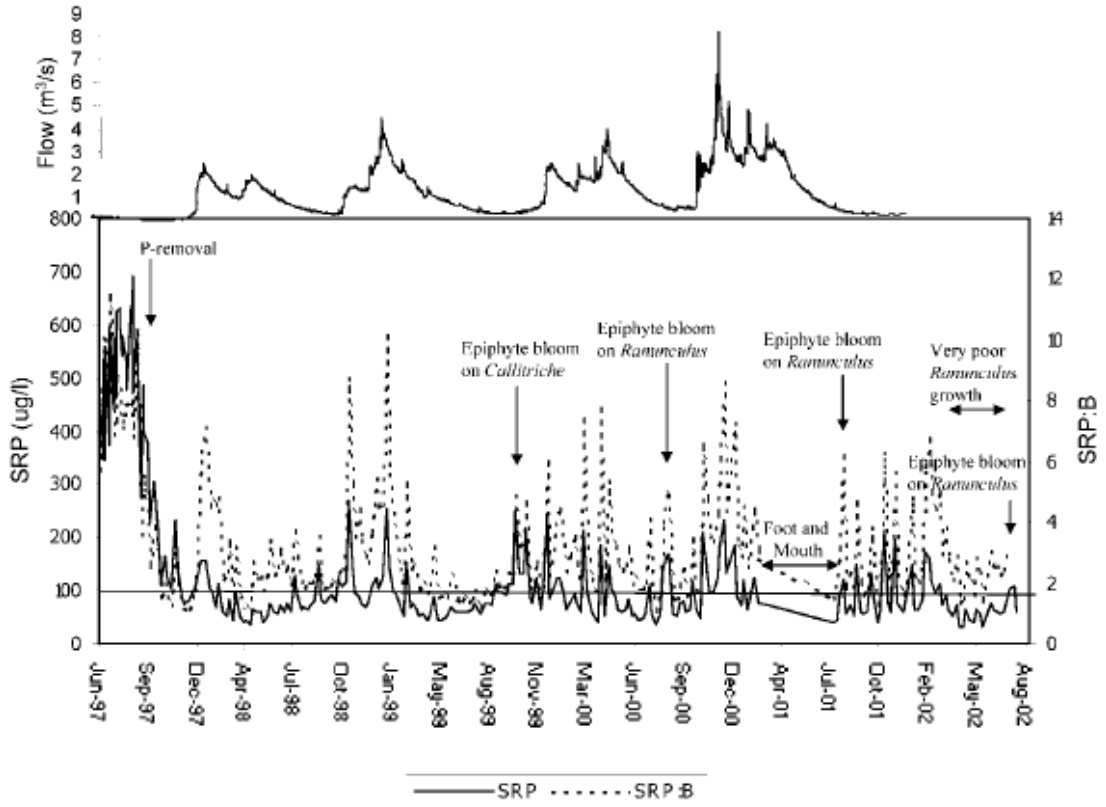

Figure 9 – Phosphate levels and algal blooms in the Kennet at Mildenhall

The figure also shows onset of algal growth and the 2002 paper suggested that the algal growth was triggered by phosphate levels over 100 µg/l. The paper makes reference to the "large scale and progressive degradation of the classic chalk stream ecology of the Kennet since 1998", linking high phosphates, algal growth and decline in ranunculus.

The paper also makes the point that, whereas there is strong evidence to link algal growth with raised phosphate levels, the relationship is complex and not clearly understood, for example the relative influences of sewage works, highway run-off and agricultural diffuse pollution. The paper recommends intensive monitoring of water quality and biological changes to enable solutions to the algal growth problem and its knock-on impact on plants, invertebrates and fish. As far as ARK is aware, only limited further studies have been undertaken by CEH and any data and conclusions reached have not been used in either classifying the river or developing measures for improvement.

The problem of algal growth continues to the present, with widespread occurrence in the Kennet in September 2008 and April 2009 (Photos 3 & 4).

Photos 3 & 4 – Extensive algal coverage of the river bed at Mildenhall in September 2008. No ranunculus present.

Recent studies of phosphates and algal growth in the middle Kennet between Hungerford and Newbury[11] have concluded that algal growth has been responsible for heavy sedimentation, poor ranunculus growth and poor conditions for trout spawning. ARK considers that the same applies in the stretch above Hungerford, although to a lesser extent.

4. **Macrophytes**: Despite the known problem of algal growth and low flows inhibiting macrophytes, especially ranunculus, between Marlborough and Hungerford, macrophytes were not monitored for the RBMP nor has their status been classified, although survey data from two sites are available and were

sent to the national office by EA local staff. That survey data shows a diversity and abundance of macrophytes one would expect to find in a chalk stream.

The EA's 2007 Kennet River Restoration Strategy [12] undertook habitat quality assessments at five locations between Marlborough and Hungerford, rating one as extremely poor, two as poor, one as moderate and one as good. However, these were all in places with significant degrees of channel modification, so the seemingly poor overall picture is not representative of the whole stretch.

Ranunculus is perceived as an indicator of good ecological status for chalk streams and is also explicitly recognised as an important habitat under the EU Habitats Directive and UK BAP. Poor ranunculus growth limits the available habitat for invertebrates and fish. Good ranunculus growth 'holds up' water levels during summer low flows thereby improving habitat for fish. Poor ranunculus growth was identified by W S Atkins in their 2005 studies of low flows due to the Axford abstraction [5].

There have been some improvements to the reach through river restoration works and planting of ranunculus by river keepers, but in the opinion of ARK the macrophyte status should be moderate overall, recognising its patchy distribution.

5. **Invertebrates**: have been classified as high status between Marlborough and Hungerford, based on monitoring data from two sites over 20 years. The scores range from poor (BMWP of 82) to healthy (BMWP 204). In ARK's opinion, the high classification is an over-statement arising from the choice of sites for monitoring by kick-sampling – these are always in gravelly sections with riffles where invertebrate populations thrive. If the kick-samples were undertaken in the numerous places where there is heavy sedimentation and a muddy bottom, a different picture would emerge. Riparian owners and river keepers complain about the decline in fly life over the past 30 years. ARK consider that an invertebrate classification of moderate would be a more accurate representation of the whole water body, but consider that the river has the potential to reach 'high' status given good flow and suitable habitat.

6. **Fish**: have been classified as moderate between Marlborough and Hungerford, based on just one electro-fishing survey at 3 locations in 2005. These surveys showed good densities of trout (in locations where substantial stocking is taking place for anglers), as well as some juvenile trout, suggesting that some natural recruitment is taking place. However, a review of the data for ARK by the Wild Trout Trust commented[35], "Are the small, apparently one year old fish derived from wild production or are there any fry stocking programmes being

[35] Wild Trout Trust review of EA fishery monitoring reports

undertaken using perhaps incubator boxes? It seems odd to find juvenile fish on sites with no spawning habitat. Certainly some of the sites appear to be very healthy with good numbers of trout over several year classes. I would, however, love to know just how many of the 300 mm plus fish were wild born." With the knowledge that incubator boxes have indeed been used by river keepers, ARK also doubts the validity of the fish survey in demonstrating a healthy self-sustaining trout population.

In ARK's opinion, the fisheries status is worse than moderate, because the heavy stocking of brown trout masks a serious loss of spawning and nursery habitat for trout due to the problems mentioned earlier.

Recommendation: an intensive study of water quality and ecology for the whole catchment above Hungerford should be completed by 2012, including intensive monitoring of phosphates, algal growth, macrophytes and natural trout reproduction. The study should include identification of sewage works improvements for implementation in Thames Water's AMP6 business plan, as well as targeting hotspots for diffuse pollution.

2.7 ***The Middle Kennet – ecological status from Hungerford to Newbury***

As discussed in Section 2.5, the middle Kennet has been classified as a candidate heavily modified water body, due to the interaction with the Kennet & Avon canal. The ecological potential has then been assessed as moderate on the grounds of absence of mitigation measures for the modifications.

Photo 5 – plume of sediment laden water entering the river at Copse Lock

In ARK's opinion, the reach should not have been classified as heavily modified, as discussed in Section 2.5, and the ecological status should have been classified as poor on the grounds of poor water quality and its biological impacts, as well as hydromorphological changes:

1. **Water quality:** The RBMP classifies the phosphate status as good on the grounds of mean annual phosphate concentrations just under 120 µg/l. The data are shown in Figure 10.

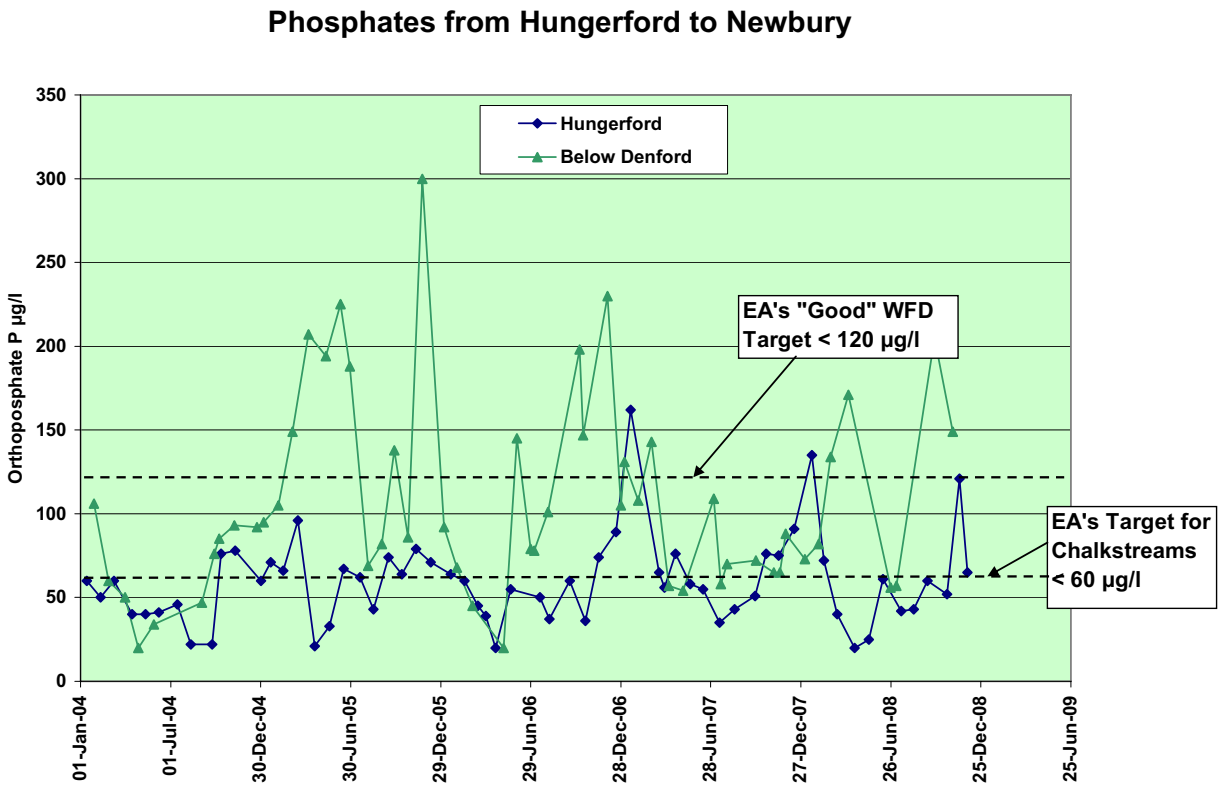

Figure 10 – Phosphate levels between Hungerford and Newbury

The studies of interaction of the Kennet with the Kennet & Avon canal in this reach, including extensive data collection, have concluded that there is a major problem due to high nutrient levels, algal growth, turbidity and sedimentation. These studies include the 'Kennet Canal/River Interaction Scoping Final Report' (January 2007) [9] produced by Halcrow for the Kennet Chalkstream Restoration Project and a study by John Towner (Environmental Planning Associates) [11] commissioned by The Craven Fishery and Sir Richard Sutton Settled Estate Park Fishery (December 2007) which explores in more detail the relationship between water quality, diatom activity and algal growth.

The Natural England unfavourable condition assessment for the SSSI in this reach concluded that suspended solids were mostly around target but occasionally failing target by some way, and phosphates were below target as an annual mean but with peaks well above target.

In ARK's opinion, the water quality should have been classified as poor, using the results of the expert studies of the canal/river interaction. For example, the report

on causes of sedimentation in Sutton Estate's fisheries by Environmental Planning Associates in 2007 [11] concluded:

- The nutrient levels found at both fisheries, and most particularly phosphate, were found to be extremely high, and this would seem to be related to sewage and agricultural inputs.

- The sedimentary material seems to comprise a complex floc, including either fresh of recently demised diatom (based on colour) material that forms a loose structure(possibly bound by polysaccharides), which adheres to surfaces, including aquatic plants such as ranunculus

- The canal seems to be the source of the floc material, and the water quality data and field observations are consistent on this point

- The rivers that contribute water flows to the canal, to top up losses caused by lockages, also provide substantial phosphate levels, as is evidenced by the high nutrient levels found in the river upstream of Copse Lock.

The EA's assessment of good water quality and nutrient levels appears to have ignored the detailed studies and reached its conclusion using mean annual values of monthly readings. The monthly average at Denford of 111 μg/l is only just within EA's 120 μg/l limit and well over the 60 μg/l target proposed by Natural England for the SSSI.

Recommendation: the water quality between Hungerford and Newbury should be classified as poor on the grounds of mean phosphate levels almost double Natural England's 60 μg/l target and the frequency of spikes over 150 μg/l.

2. **Biological quality:** The EA assessed the fisheries status for this reach as moderate with a high level of confidence. In response to ARK's request for more information, EA provided analysis of fish data for five locations between Hungerford and Newbury which assessed one location as good, one as moderate, two as poor and one as bad (see Appendix C). In ARK's opinion, this should have led to a poor fisheries classification which would be consistent with local river keepers who say that natural recruitment of trout is very low due to siltation of spawning gravels, so that the seemingly healthy population of trout can only be achieved by heavy stocking.

The EA has not classified macrophytes in its water body assessment. Natural England's assessment of aquatic plants in 2002 [1] referred to "reduced aquatic plant abundance" and "loss of aquatic macrophytes" due to sewage works discharges and interaction with the canal. Local river keepers bemoan the absence of ranunculus and

have been generally unsuccessful in their efforts to re-establish it. Macrophyte data for the Kennet at Hungerford (200m downstream of Hungerford sewage works) collected by the EA in 1998 record a Mean Trophic Rank of only 15, suggesting serious eutrophication, pollution or physical damage.

The EA's 2007 River Restoration Strategy reported habitat quality assessments at three sites between Hungerford and Newbury, reporting them all as good quality. This finding is at odds with Natural England's assessment and the views of river keepers. In ARK's opinion, the macrophyte status should be moderate on balance.

The invertebrate status for the middle Kennet is high in the RBMP. ARK has not seen the data on which this score was based. River keepers and riparian owners consistently report a decline in fly life over the past 30 years. Reflecting this and our earlier comments that only good sites selected for invertebrate kick sampling, ARK considers that a classification of moderate would be appropriate.

3. **Hydromorphology:** in addition to the physical modifications due to interaction with the canal, there are numerous other areas where channel alterations and structures are adversely affecting the river. The water level management plan prepared for the SSSI [8] identified 5 locations between Hungerford and Newbury where changes to river structures should be targeted as a high priority. There are a number of reaches where the river has been inappropriately widened or deepened, typically dating back to the 1970s when riparian owners misguidedly thought this would improve the fishing. All these alterations prevent good ecological status being achieved in the areas affected, usually through creating canal-like channels and encouraging sedimentation.

Recommendation: The river between Hungerford and Newbury should be classified as poor ecological status on the grounds of failing phosphate levels, Natural England's assessment of macrophytes and the results of the fisheries monitoring.

2.8 The Lower Kennet from Newbury to Woolhampton

The RBMP assesses this reach as a normal unmodified water body and its condition as poor. It is surprising that the EA have not proposed this stretch to be a cHMWB, because it suffers from a similar degree of interaction with the Kennet & Avon canal to the stretch from Hungerford to Newbury which EA have designated a cHMWB. Nevertheless, ARK agrees that it should not be a cHMWB, on the same grounds that we put forward for Hungerford to Newbury as discussed in Section 2.5. This could change during the first RBMP cycle, if studies conclude that there are no feasible solutions to problems caused by interaction with the canal.

This stretch is the lowest part of the Kennet SSSI. It was assessed as unfavourable status by Natural England in 2002 [1] on the grounds of turbidity and siltation problems due to connection to the canal, limited aquatic plant growth, invasive species and pollution from agricultural run-off and point discharges. The 2008 SSSI assessment was unfavourable and unchanged.

The RBMP assesses water quality as generally good, but moderate for phosphates. Figure 11 shows the monthly data which EA used for this assessment.

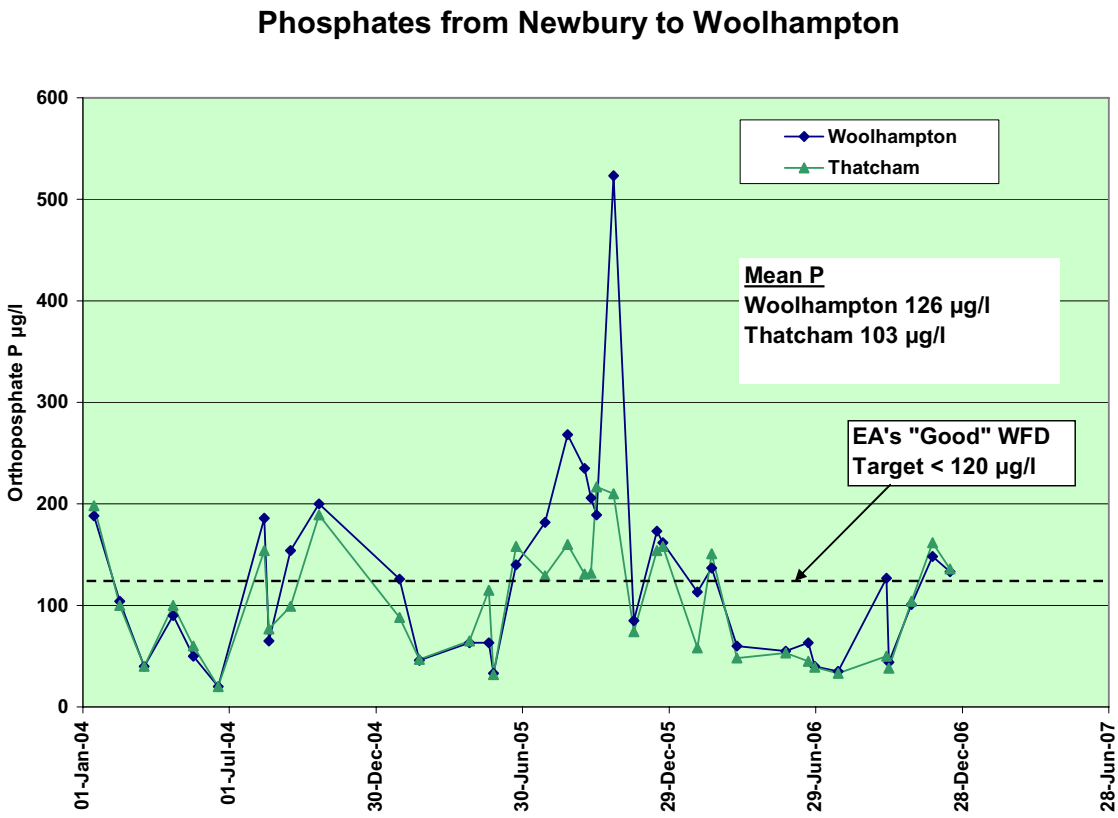

Figure 11 – Phosphates between Newbury and Woolhampton

The Thatcham mean from Jan 2004 to Dec 06 is 103 µg/l and the Woolhampton mean is 125 µg/l – just over the good target of 120 µg/l and presumably leading to the classification as moderate. However, Figure 11 demonstrates that the phosphate levels are frequently over 150 µg/l, peaking at over 500µg/l. From June to October 2005, the Woolhampton phosphate averaged 249 µg/l. In ARK's opinion this constitutes poor water quality.

A recent EA note on phosphate concentrations in 2008 [36], shows phosphate levels much improved at Woolhampton, although noting that this may be due in part to high dilution in a wet summer.

The RBMP rates phytobenthos (algal growth) as poor with a high degree of confidence. This drives the overall poor ecological status. ARK has seen no data or report on algal growth, but the finding suggests that high phosphate levels and sedimentation are a serious matter, as for the reach from Hungerford to Newbury.

The RBMP classifies the fishery as moderate with a medium degree of confidence. The fisheries data show a good range of mostly coarse fish.

Recommendation: ARK's proposed further studies of the interaction of the river with the K&A canal by 2012 should include the river between Newbury and Woolhampton. If the studies conclude that the high phosphate levels are in part due to sewage effluent discharges these should be addressed in Thames Water's AMP 6 business plan.

2.9 The River Og

The River Og has been assessed as moderate status. This classification has been driven by moderate algal growth which was measured as part of a research project undertaken by Bristol University to develop an algal classification tool for the EA. In addition, flows were assessed as "not support good" with a high level of confidence. All other parameters were classified as good or high. ARK considers that the condition of the River Og is poor on the grounds of flows, algal growth and fish. Our evidence for this is as follows:

1. **Flows**: The average recent abstraction from the Ogbourne borehole is about 4 Ml/d and the licensed abstraction is 8 Ml/d. Abstraction was higher in the 1970s, typically 6 to 7 Ml/d. These flows compare with the gauged mean flow at the confluence with the Kennet of 28 Ml/d and a gauged Q95 of 0.7 Ml/d. The flow duration curve for the Og 0.5 km from its confluence with the Kennet is shown in Figure 12.

[36] EA note on phosphate level improvements in 2008

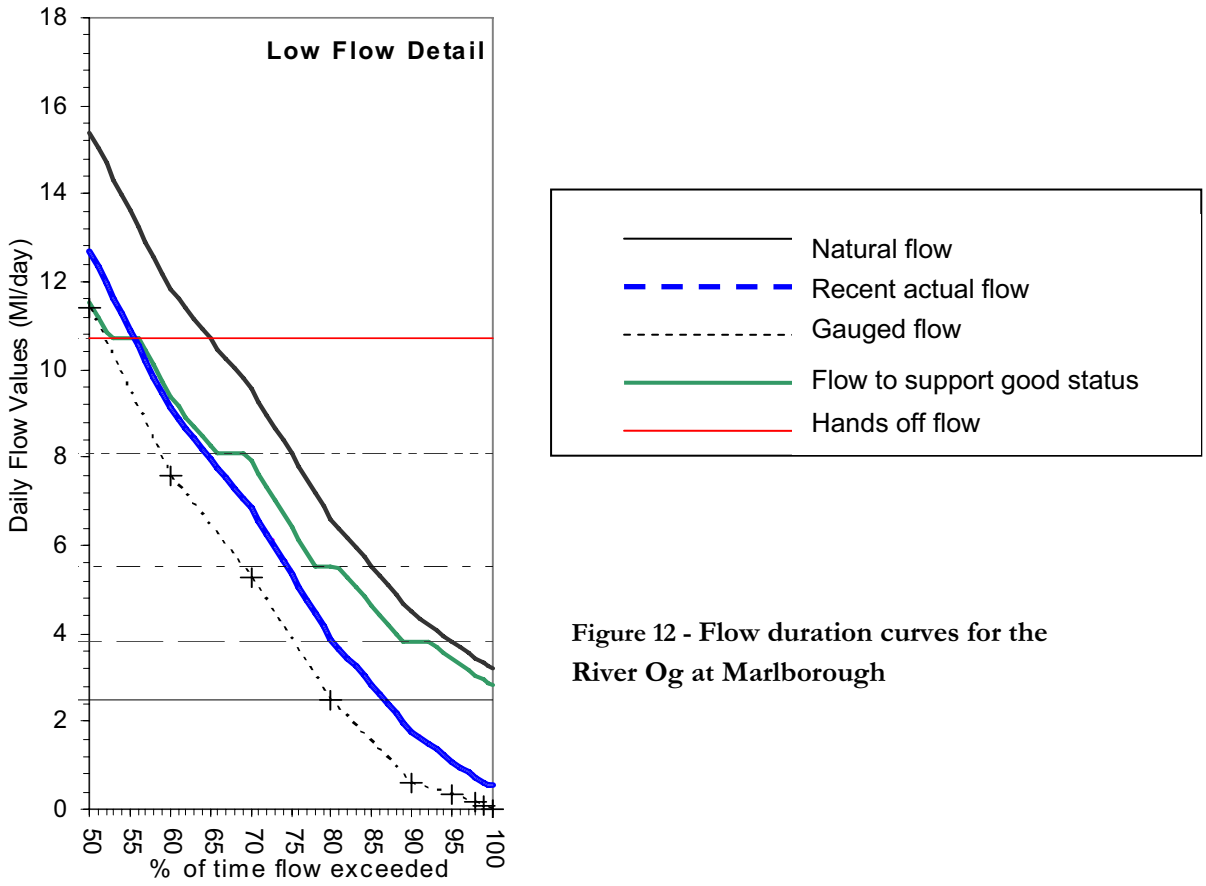

Figure 12 - Flow duration curves for the River Og at Marlborough

Figure 12 shows that the recent actual flows are substantially below the natural flows and the flow needed to support good ecological status. In practical terms the effect of the abstraction is:

- to dry the river out completely at times of drought when the river would still be flowing naturally
- to move the perennial head downstream about 3 km from its believed natural position at Ogbourne St Andrew
- to substantially reduce the duration of flows each year in the winterbourne part of the river north of Ogbourne St Andrew

ARK believes that the abstractions have had a major impact on the ecology of the river, particularly its fish and agrees with EA's assessment that the flows do not support good ecological status.

2. **Water quality and algal growth**: the Og suffers from serious algal growth – see Photos 6 and 7.

Photos 6 & 7 – Algal growth in the River Og below Ogbourne St George in March 2009

3. Algal growth was found by investigations into diatoms in April 2004 and September 2005 which classified the algal status as moderate at a location about 100 m above the Kennet confluence. The problem is always much more severe further upstream where flows are lower.

   The likely cause of the algal growth is high phosphates. Figure 13 shows phosphate levels from EA's monthly monitoring:

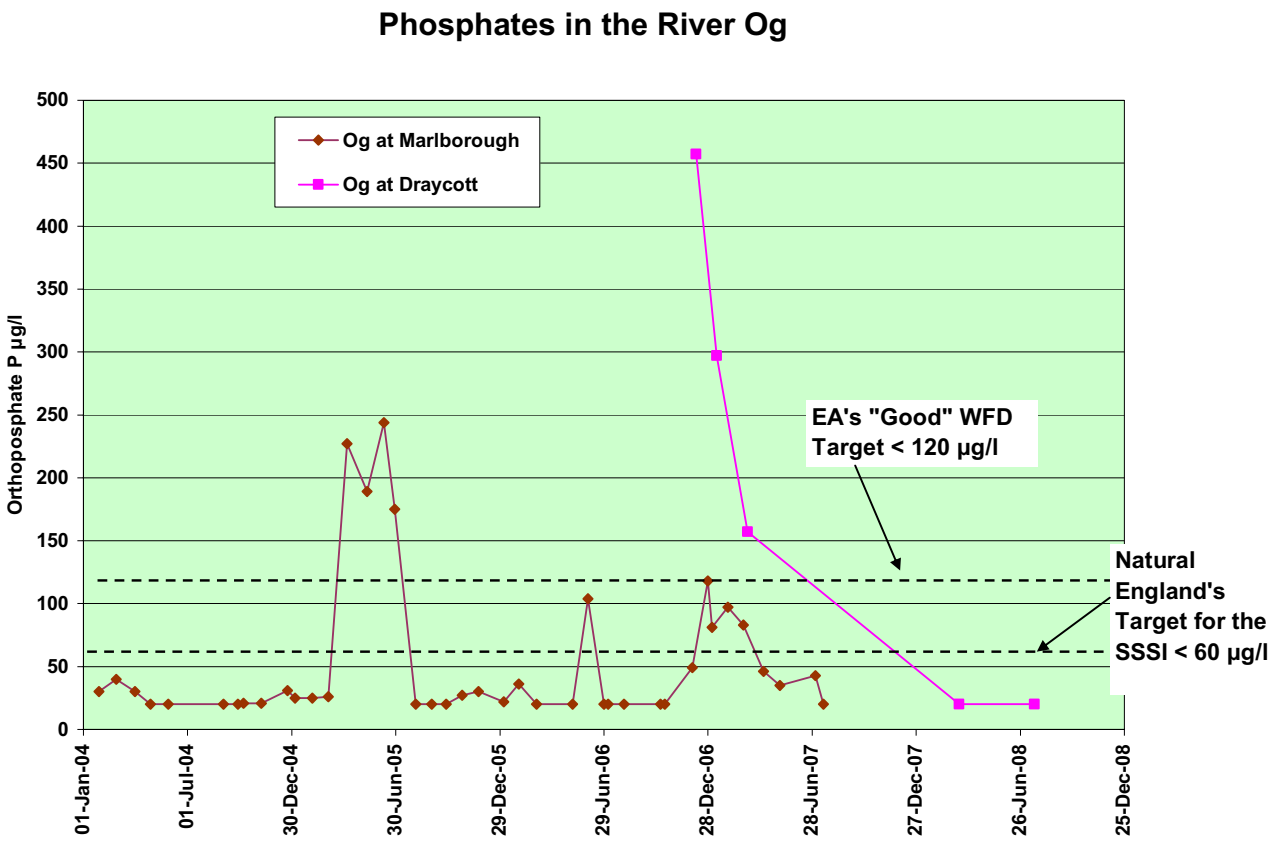

Figure 13 – Phosphates in the River Og

Whereas phosphate levels are generally low, there some sustained peaks of up to 200 µg/l. The few measurements at Draycott Farm about 4 km above Ogbourne St George, showing some very high levels, demonstrate that the source is probably diffuse pollution from farming.

3. **Fish**: The Og was an active trout fishery in its lowest 1 km in the 1960s and was a good trout spawning stream. Now trout are rarely seen above the lowest 200 m and there has been no EA fish survey since 1995. ARK believes that about 3 km of good trout spawning area has been lost and the fisheries classification should be poor. Fish surveys are needed to confirm or refute this.

Recommendation: the River Og should be classified as poor status on the grounds of flows, algal growth and fish.

Recommendation: a programme for re-establishing natural trout spawning in the upper Kennet and Og should be undertaken, working with the Wild Trout Trust and the Kennet Chalkstream Restoration Project, achieving good status for fish by 2015 as measured by the enhanced fisheries monitoring programme.

3 Summary of problems which the RBMP should address

3.1 *Summary of ARK's assessment of ecological status*

Based on the evidence gathered in the review of classification in the previous chapter, ARK's assessment of the current condition of the river is summarised in Table 4:

	Upper Kennet	Middle Kennet		Kennet (Lambourne to Enbourne)	Og
	Source to Marlborough	Marlborough to Hungerford	Hungerford to Newbury	Newbury to Woolhampton	Source to Marlborough
Overall ecological status					
Modification status	Un-modified	Un-modified	Un-modified	Un-modified	Un-modified
WQ – Dissolved oxygen & ammonia					
WQ – Phosphates and nitrates					
WQ – Hazardous chemicals					
Flow					
Fish					
Invertebrates					
Macrophytes					
Algae					
Hydromorphology					

Key — **ARK's Status Classification**

- High
- Good
- Moderate
- Poor

Table 4 – ARK's assessment of the current condition of the water bodies

In summary, using the evidence presented in Section 2 based on the data listed in the references and provided on the accompanying CD, ARK assesses the river's ecological status as moderate from Marlborough to Hungerford and poor elsewhere. This assessment adopts the EA's criterion of assigning the overall ecological status at the level of the worst individual factor. The primary causes of problems are low flows, particularly in the upper Kennet and Og, and high phosphate levels leading to algal growth and its impacts on plants, fish and invertebrates. Changes to the river

channel are also a problem in places, but this only has a severe impact between Hungerford and Newbury due to interaction with the Kennet & Avon canal.

In ARK's opinion, none of the water bodies should be classified as heavily modified, but the stretch from Marlborough to Newbury should be split into two water bodies, recognising the much worse condition between Hungerford and Newbury due to the canal interaction. In the event that current studies conclude that there is no technically or economically viable solution to the problem of canal interaction, the reach from Hungerford to Newbury should be classified as a heavily modified water body. However, in ARK's opinion, until such a conclusion is reached, this part of the river should continue to be treated as un-modified and classified accordingly.

The following sections summarise the problems of flows, water quality and algal growth, physical modifications and biological shortcomings.

3.2 Flows

The low flows caused by abstraction at Ogbourne and Axford have long been recognised by the EA and account for flows in the Og and middle Kennet being classified as "not support good", which ARK agrees. The Axford and Ogbourne abstractions have been the subject of detailed low flow investigations, as discussed in the next chapter on measures.

However, the EA appears to be ambivalent on flows in the upper Kennet. The RBMP reports them as "not support good" with a low level of confidence, but their analysis of low flows supplied in response to ARK's request for information shows the existing flow regime to be better than the requirement for good ecological status. In ARK's opinion, there is probably a serious problem with flows in the upper Kennet which justifies at least a detailed investigation.

The impact of abstraction affects the perennial heads of the upper Kennet and Og so that boundaries between winterbourne and permanent river have been moved downstream as assessed by ARK by about 8 km in the upper Kennet (based on the interviews with local residents in 1991 [31])and 3 km in the Og.

In ARK's opinion, low flows are not a problem below Newbury where the catchment is larger and the impacts of abstraction comparatively insignificant.

3.3 Water quality and algal growth

In ARK's opinion, there is strong evidence of a widespread problem of excessive phosphate levels and consequent algal growth throughout the river. The problem is severe in the upper Kennet, the lower Kennet below Hungerford and the Og leading to, in ARK's opinion, poor ecological status. The problem is less severe between Marlborough and Hungerford, but still significant.

The causes of the problem have been determined through various expert studies to be a combination of sewage works discharges, diffuse pollution and interaction with the canal, exacerbated at times by low flows. However, the causes are not fully understood and need to be studied further in developing the improvement measures.

There has been no routine monitoring of algal growth by the EA, a deficiency which should be addressed in the WFD measures.

3.4 Physical modification

Although the Kennet channel has been subjected to numerous man-made changes over the centuries, in ARK's opinion the impacts are often benign (for example, many former water mills and water meadow hatches). However, there still many places where localised impacts need to be addressed, particularly where channels have been over-widened, straightened or deepened.

Channel modifications: Dredging and channel widening has occurred historically on the River Kennet either to alleviate flooding or to 'improve' fisheries. The impact of this has been to leave artificially straight, deep and wide channels, often with low flow velocity, high siltation and no natural gravel bed. These artificial channels rarely support macrophyte growth and are often devoid of marginal vegetation. In rural settings the original course of the river can often be clearly seen on the surrounding floodplain. The EA's River Kennet Restoration Strategy, 2007 [12] identified and prioritised reaches of the river which would benefit from physical enhancement and restoration work. This report is not referred to in the RBMP

Photo 8: Channel modification for land drainage at Ramsbury Manor Estate

Weirs and structures: The Kennet's course is punctuated by numerous weirs often linked to historic mills or flow gauging stations. These are both an obstacle to fish passage and create upstream impoundment with an associated decrease in flow velocity which causes sediment deposition. The structures have a significant impact on hydro-morphological conditions Very few structures serve a purpose today and there is alternative technology available to replace flow gauging weirs.

The impact of weirs on Kennet SSSI has been well studied. The water level management plan (WLMP) produced by the Environment Agency [8] identified the structures and a number of priority actions to address their adverse impact on the SSSI. It is surprising that the WLMP is not referenced in more detail in the RBMP, because it reflects detailed and considered research with a direct link to ecological drivers, which seem ideally suited to become 'measures' under the WFD.

Interaction with the Kennet & Avon canal: The canal has had a major impact on water quality and aquatic life, particularly since its re-opening in 1990. Solution to this problem should be a priority in the programme of WFD measures. The solution to the problem should also address the day-to-day management and maintenance of the canal and its spillways by British Waterways, to minimise detrimental impacts on river water quality.

Urbanisation: An increasing urban population, particularly in Swindon and Marlborough and evidenced in Figure 2, is creating more pressures on the Kennet, which all need to be addressed by the RBMP:

- Increased flashy runoff carrying sediment and nutrient laden water into the river with less water percolating into the aquifer
- Sediment laden runoff from highways
- Increased frequency of combined sewer discharge
- Increased load on sewage works: some of the benefits of increased P stripping are negated by the increased volume of discharge. The impact of sewage discharges is greater in times of low flow, when there is less water in the river to dilute the effluent.
- Increased load on small sewage works (e.g. Clatford) where phosphate stripping is unlikely to be installed due to the small size of the works. A particular unexplored problem is what happens to phosphates when sewage works discharge into dry winterbournes.
- Increased demand for drinking water

- Urban river management regimes which remove chalkstream characteristics. Problems include lack of marginal vegetation, poor tree management causing over-shading, lack of bank maintenance causing erosion, uniform channel width and depth which limits habitat.

Photo 9 – Typical urban chalkstream in Marlborough with over-shaded straight channel, uniform bed profile and no marginal or in-stream vegetation

Photo 10 – combined sewer discharge next to the river Kennet at Cooper's meadow Marlborough in wet weather, foul water flowing directly into the river

All these issues need to be addressed by the RBMP measures, which need to be strengthened as recommended by ARK in Section 4.4.

3.5 Biological shortcomings

The primary impacts of the water quality, algal growth and flow problems have been on water plants, especially ranunculus, fish and, to a lesser extent, invertebrates.

Water Plants: Ranunculus is perceived to be a key indicator of ecological condition of chalk streams but its distribution on the Kennet is very patchy. There is a widespread belief amongst riparian owners and river keepers that ranunculus growth has declined severely in the past 30 years. The highly fluctuating levels of ranunculus growth have lead to reduced habitat diversity and reduced invertebrate population.

The reasons for its uneven distribution are not entirely understood. Detailed studies on ranunculus growth in the Kennet by Paul Franklin (PhD Thesis, Reading 2007) showed that the relationship between flow, water quality and ranunculus growth is complex, but that flow remains a critical element. This confirmed the findings of a 2002 study by Reading University, which concluded that flow was the more important element controlling growth of ranunculus than in-stream phosphate concentrations.

The EA's monitoring programme for the WFD has paid minimal attention to macrophytes, but habitat quality assessments carried out by EA staff have confirmed poor macrophyte growth at sites where the river channel has been modified.

Trout: The impacts of flow and water quality changes on fish have been masked by heavy stocking of brown trout for angling in most of the river between Marlborough and Newbury. ARK shares the views of most river keepers that natural spawning of trout has been severely reduced or eliminated altogether. The EA's monitoring of fish appears to have focused on numbers of species and biomass density, rather than spawning and juvenile densities. Furthermore the monitoring has focused largely on the river below Hungerford, with little monitoring between Hungerford and Marlborough and none in the upper Kennet or Og.

ARK's interviews with river keepers and riparian owners as reported in Appendix E showed a that few reaches, for example Ramsbury Mill, have good natural brown trout populations with healthy natural recruitment and spawning in carrier streams. Many other reaches, for example Stonebridge Lane at Marlborough, have apparently good habitat but surprisingly low natural fish populations and little evidence of spawning. The Wild Trout Trust assesment of Stonebridge Lane in February 2009 observed that 'There was evidence of one or two redds having been dug but generally, despite the section having considerable potential for trout spawning, there was little evidence of spawning activity.'

Upstream of Marlborough there appear to be some wild trout as far as Lockeridge, but beyond that few fish are present (personal communication, Peter Griffiths-Jones, Lockeridge House and Michael Maude, Manor Farm, West Overton). However it does appear that following two wet years brown trout are moving upstream, with the first brown trout for several years seen at West Overton in April 2009. The planned construction of a deep holding pool for trout during dry years may help the population to survive.

Overall the wild brown trout populations are considered by river keepers to be much lower than would be expected in a good chalk stream.

Grayling: There has been a dramatic decline in grayling e.g. at Benham Marsh where as recently as 15 years ago a grayling fishing competition was held, but today there were no grayling on the reach. Recently some grayling have been observed upstream of Marlborough (Personal communication, Tim Clarke, Manton Mill) and some in the Mill Pool at Town Mill.

In ARK's opinion, the re-establishment of natural spawning of brown trout and grayling should be a major objective of the WFD programme.

Invertebrates: River keepers, fishermen and residents report that fly life has deteriorated dramatically over the last 30 years (Appendix E). For instance, a Chilton Foliat resident describes how, when cycling over Chilton Foliat bridge in summer he had to wear a coat and hat to keep the mayfly off. The 20 year data record collected at two sites in the middle Kennet and one site on the Og does not reflect this perception, although they shows variations in abundance and diversity over time. Data at Stitchcombe show a slightly decreasing trend as well as a suggestion that fly life increase with higher flows as shown in Figure 14.

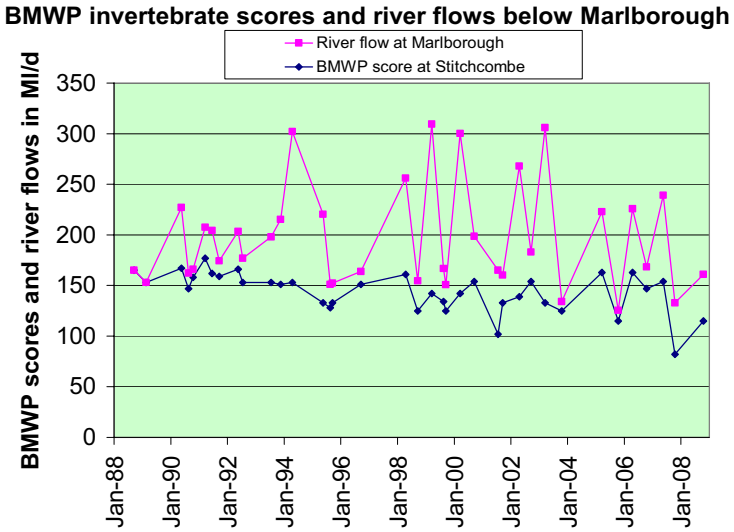

Figure 14 – Invertebrate scores and river flows at Stitchcombe

In our view, the apparently good invertebrate monitoring data set should not be used to show that there is no fly life problem in the Kennet. An acknowledged limitation of the sampling method is that kick-sampling sampling sites are selected for the availability of habitat and accessibility. Invertebrate abundance is habitat dependent. For convenience of sampling, good habitat sites tend to be selected. A kick sample taken on a silty bed of canalised river with no marginal vegetation would produce a much lower invertebrate score than the same sampling method carried out on a gravel riffle with good in-stream weed growth and marginal vegetation, despite the fact the two sites might be within 100 metres of each other.

In ARK's opinion, the invertebrate classification for all the water bodies can be no better than moderate, reflecting the recognised problems of low flows, water quality, algal growth and channel modifications.

Recommendation: all the invertebrate classifications should be reviewed by the EA in the light of concerns that sampling locations have been selected which favour good invertebrate scores (ie avoiding heavily silted locations). Future invertebrate monitoring should be planned accordingly.

4 Measures to address identified problems

4.1 *Overview of existing RBMP proposals*

The EA's proposals for actions needed to improve the river are listed in Annex B to the RBMP, with the relevant extracts given in Appendix B to this report. The measures are sub-divided into three categories: Scenario A measures which are already funded and in hand (for example in Thames Water's business plans), Scenario B measures which are planned and expected to be implemented through the current RBMP by 2015 and Scenario C measures which have not yet been justified and for which funding is not currently available.

Measures relevant to the water bodies ARK has examined can be summarised as:

Scenario A:

- Reduction in water demand through water efficiency, metering and rising block tariffs
- Water leakage control
- Possible improvements to sewage works at Marlborough, Great Bedwyn and Chilton Foliat to be studied and implemented by 2015 if necessary
- Investigations of impacts of water abstraction on unspecified sites of nature conservation interest

Scenario B:

- Reduce diffuse pollution from agriculture through targeted Catchment Sensitive Farming and regulatory farm visits (targets unspecified)
- Develop links with British Waterways to manage canal discharges and abstractions (locations not specified)
- Investigate emissions from Kintbury sewage works and reduce emissions in next phase RBMP if necessary (ie by 2021)
- Implement water level management plans (no details given)
- Engage with local authorities and stakeholders to tackle diffuse pollution and river restoration through the Kennet Chalkstream Restoration Project (no details specified)

Scenario C:

- Further monitoring of the Og to improve understanding of the hydrological regime
- Investigate impacts of sediments on ecological status
- Further studies of habitat and channel restoration to achieve good ecological status (locations unspecified)
- Identify hotspots for pollutants from highway run-off

The only actions related to specific sites in the four Kennet water bodies are the studies of sewage effluents at Marlborough, Great Bedwyn, Chilton Foliat and Kintbury. There is no commitment to any subsequent action.

One of the Scenario B measures refers to dealing with diffuse pollution and channel restoration through the Kennet Chalkstream Restoration Project. These measures are being actively pursued as evidenced by recent meeting notes [37]. However, the project team has no clearly defined programme of work to achieve WFD objectives. This seems like a missed opportunity – the WFD could be used to drive the KCRP's programme and to enable funding and consents for projects.

Most of the other measures relate to general programmes of activities at unspecified locations – for example, catchment sensitive farming, dealing with highway run-off and habitat restoration. ARK has seen evidence of how these measures might be applied in general terms [38], but nothing specific in terms of when or where. ARK has asked EA for details of where such measures would be applied or how they would be targeted, but no information was available.

There is a conspicuous lack of commitment to implementing solutions to the Axford and Ogbourne low flow problems. Axford is not mentioned in the measures and Ogbourne is only mentioned in terms of monitoring.

Overall, ARK views the measures as weak and lacking in focus. Many of the measures could lead to significant improvements if they were energetically targeted at the Kennet's specific problems. However, in the EA's response to our requests for more details of the measures, both in writing and at meetings, we have seen no evidence that the necessary focus will be applied.

4.2 Achievement of good ecological status through the current draft RBMP

The middle Kennet, lower Kennet and Og water bodies are recognised in the RBMP as currently failing to achieve good ecological status or potential. The condition of the upper Kennet has not been assessed. For all four water bodies, the plan would only achieve good ecological status by 2027.

No justification is given in the plan for not achieving good ecological status by 2015 or 2021. ARK has requested a justification but none has been supplied.

In the four water bodies, there are a total of seven elements which are considered in the draft plan to be at less than good status and there is no commitment to improve any of them before 2027. Of these, four give a justification of disproportionately

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[37] Notes of meeting of the River Kennet Restoration Project, 24 Feb 2009.
[38] List of potential diffuse pollution measures

expensive and three give no justification. ARK has requested details of the justifications but none have been supplied.

Overall, ARK views the commitment to improvements in the draft RBMP to be deeply and unacceptably unambitious. The lack of commitment to improvements is consistent with the weakness and lack of focus of the plan's proposed measures.

4.3 River improvement activities already in hand

ARK perceives a major inconsistency between the weakness of the measures that EA has put in the plan and the extent of improvement activity currently in progress on the Kennet, all known to the EA and much of it involving their staff. These activities include:

1. Thames Water's low flow investigations into the Axford and Ogbourne abstractions.

2. The long running investigations into problems of water quality and algal growth by CEH, Reading University and others.

3. The studies and proposals for river restoration undertaken under the banners of the water level management plan for the SSSI, the river Kennet restoration strategy, the Kennet chalkstream restoration project and ARK's own programme of river restoration projects.

4. Various studies of the major problem of the impact of the interaction of the river with the Kennet & Avon canal.

5. The fisheries action plan for the Kennet and Pang catchments prepared in 2008 under the EA's auspices which proposes many actions to improve the environment of the Kennet and its fish population, often referring to activities listed above.

Recommendation: all of the activities in existing programmes of work on the River Kennet should be developed, programmed and coordinated to produce a programme of measures which would achieve many of the WFD's objectives by 2015 and all of them by 2021.

ARK are surprised by the EA's seeming reluctance to build on their own good work to produce a coherent and effective programme of measures to achieve good ecological status. In talking to EA staff, there appears to be a reluctance to list specific projects as 'measures' because funding sources are uncertain, consents might be difficult to achieve and cooperation and funding contribution from riparian owners might not be forthcoming. They seem to fear that an excellent project with funding could fail to be delivered because a riparian owner does not co-operate. In ARK's opinion, these concerns are over-stated.

Recommendation: the EA should commit to a firm programme of specific measures and use the water framework directive as a justification for obtaining the necessary consents and funding. If some projects have to be changed or even dropped as implementation of the plan proceeds, the programme can be adjusted accordingly.

4.4 ARK recommended programme and targets for the first RBMP

To address ARK's summarised assessment of problems, we propose that the programme and targets for the first RBMP should be:

1. **To improve monitoring:**

    - Working with CEH, EA to design a programme of monitoring to enable the problem of water quality and algal growth to be fully understood and solutions put forward. The system should be in place by spring 2010 and should remain in place for long term monitoring.

    - EA's fisheries surveys to be intensified to focus on natural recruitment of wild trout and grayling and to increase coverage above Hungerford, including the upper Kennet and Og. This monitoring should start in summer 2009 and make use of man-power available from ARK and river keepers. We propose that a fish monitoring programme should be designed with help from the Wild Trout Trust. The programme is likely to include semi-quantitative electro-fishing and visual redd count surveys.

    - EA conservation staff to undertake habitat quality assessments on a revolving three year programme to monitor the effectiveness of RBMP measures

2. **To improve flows**

    - Thames Water to implement the agreed solution to the Axford over-abstraction by the end of AMP5, ie by 2014, reverting to the base annual licence of 9.3 Ml/d and daily abstractions limited to 6 Ml/d when Knighton gauged flows are less than 100 Ml/d.

    - Thames Water to complete the Ogbourne low flow investigation by 2009 and implement the agreed solution in AMP5, ie by 2014.

- To complete a comprehensive low flow investigation of the whole catchment above Hungerford by 2012, focusing on the upper Kennet above Marlborough and encompassing the findings of the Axford and Ogbourne investigation. The study to consider all abstractions, including private supplies and Wessex Water's boreholes close to the catchment boundary. This investigation should also look at land use changes and how changing crop water requirements might have affected river flows. The study to be jointly steered by EA, Thames Water and ARK.

- To identify agreed solutions for AMP6 business plans, ie for implementation by 2019.

- To achieve "support good flows" in the middle Kennet and Og by 2015 and in the upper Kennet by 2019.

3. To deal with water quality and algal growth

- EA to undertake a study of water quality changes and algal growth by 2012, including identification of the sources of problems, measurable targets for water quality and algal growth specifically for the Kennet and feasibility studies of means of meeting these targets. The study should be linked to the low flow study proposed above and the findings coordinated. The study should be jointly steered by EA, Thames Water and ARK.

- To get any required sewage treatment improvements into Thames Water's AMP6 business plan in 2013 and to implement all improvements and achieve targets by 2019 **-** good water quality and algal status would thus be achieved in the second RBMP.

- To use the proposed study of water quality and algal growth to identify diffuse pollution hotspots by 2012. This should then be used to drive an intense programme of improvements to pollution from farming and road run-off between 2012 and 2015. The study steering group of EA, Thames Water and ARK should be expanded in 2012 to draw in representatives of farming, highways management and local authorities.

4. For physical modifications

- A fully costed list of required works, as identified in EA's "River Kennet Restoration Strategy" in 2007 and in the WS Atkins 2006 "Water Level Management Plan", to be drawn up by the EA in collaboration with ARK by the end of 2009 for inclusion in the RBMP.

- To complete all required and feasible river channel improvements and modifications to weirs and other structures for the whole catchment above Hungerford by 2015.

- Through the above works, achieve good hydromorphological status for the whole catchment above Hungerford by 2015. To an extent, this depends on obtaining landowners' agreement to the required works. However, in ARK's judgement agreement will achievable with a sufficient proportion of landowners for this target to be realistic.

- To complete a full study of options to deal with problems of interaction with the Kennet & Avon canal by 2013 and to implement improvement works in the second RBMP, achieving good status by 2021. The study should be jointly steered by EA, British Waterways, riparian owners and ARK

5. To improve biological quality

- The programme of activities detailed in EA's 2008 fisheries action plan to be worked up by EA into a fully costed programme coordinated with other actions for inclusion in the final RBMP by the end of 2009. All the actions in the fisheries action plan should be completed by 2015, except those dependent on flow and water quality improvements programmed for the second plan cycle.

- Working with the Wild Trout Trust and the Kennet Chalkstream Restoration Project, to undertake a programme for re-establishing natural trout spawning in the upper Kennet and Og by 2015, achieving good status for fish as measured by the enhanced fisheries monitoring programme proposed above.

- Working with the Wild Trout Trust and the Kennet Chalkstream Restoration Project, to establish a programme for improving natural trout spawning between Marlborough and Hungerford by 2015, achieving good status for fish by 2019, by which time improvements to water quality and algal growth should have been achieved as above.

- Through the programme of work to achieve good hydromorphological status as described above, to achieve habitat quality assessment scores of good or better at all sites above Hungerford by 2015 and below Hungerford by 2021.

In ARK's opinion all of these targets can be achieved if the EA commits to them in the first RBMP. The first step is to prepare detailed costs and programmes for each measure and to prepare a coordinated overall programme for all the measures for the final version of the RBMP by the end of 2009.

Article 13 Section 5 of the EU Water Framework Directive states that river basin management plans may be supplemented by the production of more detailed programmes and management plans for sub-basin, sector, issue or water type, to deal with particular aspects of water management. In ARK's opinion, the status of the Kennet as a chalkstream SSSI that has been substantially impacted by human activity justifies the production of a sub-basin plan.

Recommendation: all of the activities proposed by ARK in section 4.4 and the measures proposed by EA should be pulled together to produce a sub-basin plan for the River Kennet by the end of 2009. ARK should be involved in preparation of the sub-basin plan.

4.5 ARK proposed programme to achieve good ecological status

The activities described in Section 4.4 could be delivered through the programme shown in Figure 15:

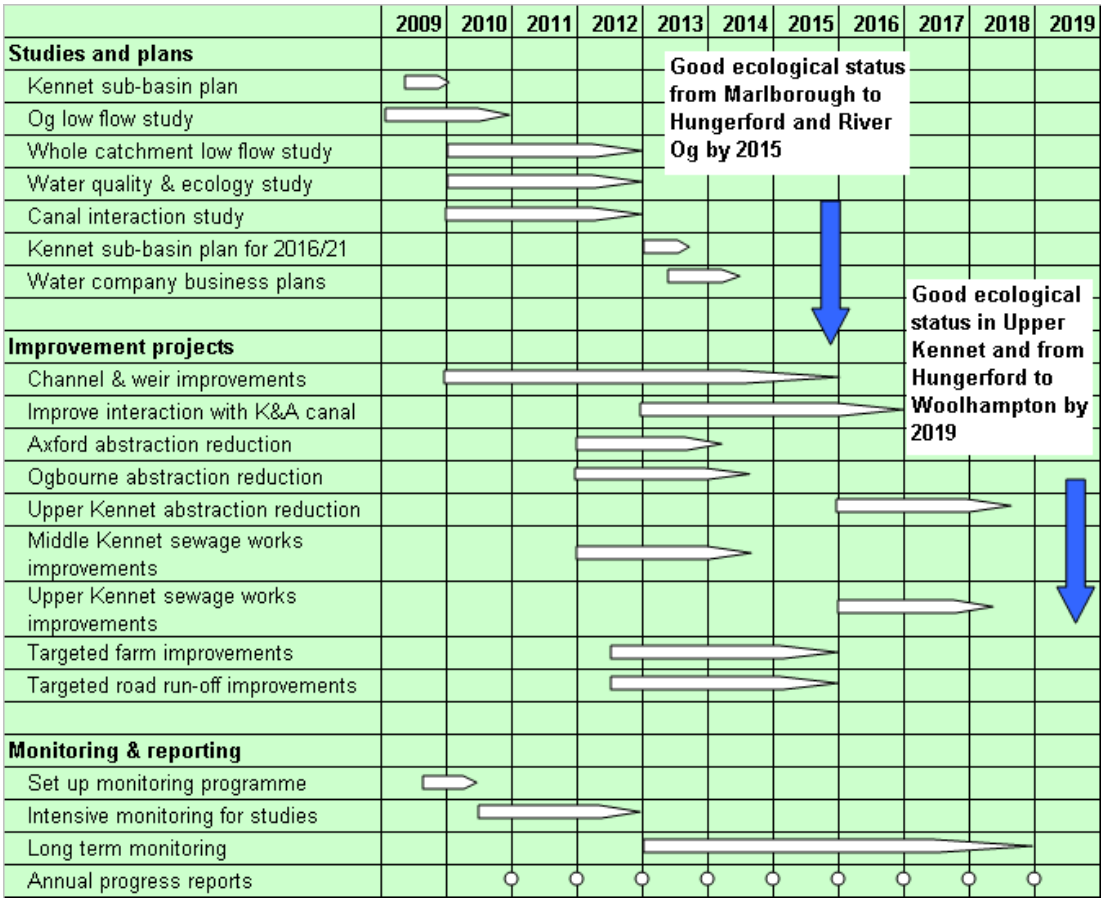


Figure 15 – ARK's proposed programme for achieving good ecological status

The first step would be to complete a sub-basin plan by the end of 2009.

From 2010 to 2012, the three major studies of low flows for the whole catchment, water quality and ecology, and the river/canal interaction would proceed in parallel. During this period, the channel and weir improvements proposed in the Water Level Management Plan and River Kennet Restoration Strategy would also proceed, in parallel with improvements already agreed in Thames Water's AMP5 business plan. The outcomes of the major studies would then be taken forward through:

- Implementation of recommended improvements to abstraction and sewage discharges through Thames Water's AMP 6 business plan
- Implementation of the solutions to the canal/river interaction problem
- Action on diffuse pollution targeted at hotspots identified through the studies and improved monitoring.

Through this programme, good condition could be achieved in the various elements leading towards good ecological status as shown in Table 5:

	Upper Kennet	Middle Kennet		Kennet (Lambourne to Enbourne)	Og
	Source to Marlborough	Marlborough to Hungerford	Hungerford to Newbury	Newbury to Woolhampton	Source to Marlborough
Overall ecological status	**2021**	**2015**	**2021**	**2021**	**2015**
Modification status	Un-modified	Un-modified	Un-modified	Un-modified	Un-modified
WQ Dissolved oxygen & ammonia					
WQ Phosphates and nitrates	2015	2015	2019	2019	2015
WQ Hazardous chemicals					
Flow	2019	2015	2015		2015
Fish	2019	2015	2019	2019	2015
Invertebrates	2019	2015	2019	2019	2015
Macrophytes	2019	2015	2019	2019	2015
Algae	2015	2015	2019	2019	2015
Hydromorphology	2015	2015	2019	2019	

Key

ARK's Current Classification

High

Good

Moderate

Poor

Example

2019

Signifies currently poor status, but achieving good status by 2019

Table 5 – ARK proposed target dates for achieving good ecological status

Table 5 shows ARK's assessment of the current classification of the water bodies and the dates by which good status could be achieved for each factor. In this programme, good ecological status would be achieved in the Kennet between Marlborough and Hungerford and the River Og by 2015. For the upper Kennet and

the Kennet below Hungerford, overall good ecological status would not be achieved until 2019, but the targets for some of the factors contributing to good ecological status would be achieved earlier.

5 Conclusions

5.1 *On monitoring*

The EA's routine monitoring of the River Kennet for the Water Framework Directive has been inadequate for classification of water bodies and the design of improvement measures. Particular weaknesses have been the infrequency of monitoring of water quality, the lack of monitoring of algal growth, insufficient geographic extent of the fisheries monitoring and lack of focus on natural recruitment, and lack of monitoring of macrophytes. Monitoring has been particularly weak for the upper Kennet above Marlborough.

In addition to the monitoring carried out specifically for the Water Framework Directive, there has been significant collection of environmental data for improvement projects and research into specific issues. This additional data does not appear to have been used by the Environment Agency in preparing the draft River Basin Management Plan.

5.2 *On classification*

The weaknesses in monitoring have led to many gaps in the EA's classification of water bodies. For the four water bodies under consideration, of the total 36 factors which could have been classified, 15 have not been classified in the River Basin Management Plan. ARK has used data available from other reports on projects and research programmes to produce its own classification of the water bodies covering all the factors.

The Environment Agency has classified the upper Kennet to Marlborough and the middle Kennet from Marlborough to Newbury as heavily modified water bodies. ARK disagrees with this assessment:

- From Hungerford upstream, there are numerous weirs for watermills and watermeadow systems as well as many sections where the river has been deepened or widened for various reasons. In ARK's opinion, this degree of modification is normal for a chalk stream and in most cases adds to habitat diversity. In the few locations where adverse impacts have been identified, they can be addressed through channel improvements as already planned by the Kennet chalkstream restoration project.

- Below Hungerford, the river has been severely impacted by interaction with the Kennet and Avon canal. However, the Water Framework Directive says that a water body should only be considered heavily modified if the reason for the modification, ie navigation, cannot be achieved by another

technically feasible option. In this case, the navigation could be achieved by separation of the canal from the river and this is currently being studied along with other options to deal with the canal interaction. In ARK's opinion, this section of river should only be deemed heavily modified if and when the studies demonstrate that the separation or equivalent improvement works are not feasible.

Therefore, ARK has concluded that none of the water bodies should be considered heavily modified, but that the middle Kennet water body should be split into two, with the section between Hungerford and Newbury separated to reflect its worse condition.

ARK disagrees with much of the classification of water bodies in the River Basin Management Plan:

- We consider the upper Kennet to be at poor status (not classified in the RBMP).

- We agree that the middle Kennet should be classified as moderate ecological status between Marlborough and Hungerford

- We think that the river between Hungerford and Newbury should be classified as poor ecological status, rather than the EA's proposed moderate ecological potential.

The main area of disagreement between the EA's classification and our own is phosphate levels and their impact on algal growth. This problem has been recognised and quantified in numerous research papers, but the EA has classified the phosphate status as good and not monitored or recognised the algal problem throughout the river above Hungerford.

The differences between EA and ARK on classification of phosphates come down to the method of monitoring phosphates and the targets used. EA's monitoring is on a monthly basis and classified by comparing the annual average with a target of 120 μg/l to achieve good status. ARK believes that the monthly monitoring misses short term phosphate peaks and the target of 120 μg/l is too high for a chalkstream. ARK has proposed use of Natural England's SSSI target of an average of 60 μg/l, with no peaks over 100 μg/l, a target which is easily achieved by the comparable River Lambourn at Newbury

The consequent impacts of high phosphates and algal growth on fish, plant life and fly life have not, in ARK's opinion, been fully registered because of deficiencies in the monitoring system. However, the biological impacts are recognised in numerous project and research reports, Natural England's assessment of the condition of the

Kennet SSSI and in various reports prepared by the EA's own staff, which have not been used in the classification of the river.

5.3 ***On the programme of measures***

The draft River Basin Management Plan shows no improvements to any of the water bodies before 2027. ARK views the commitment to improvements in the plan to be deeply and unacceptably unambitious. The lack of commitment to improvements is consistent with our perception of weakness and lack of focus in the plan's proposed measures.

Aside from a proposal for studies and possible improvements to four sewage works, all the measures proposed in the plan are generic in nature and not targeted at the Kennet's specific problems. ARK has requested details of how and where the generic measures might be applied in the Kennet catchment, but the EA supplied no details either in writing or at meetings.

The major weakness of the measures is that they fail to take into account the numerous studies which have been undertaken of improvement measures in the Kennet. These include Thames Water's low flow studies, a water level management plan and restoration strategy which deal with physical modifications and habitat restoration, studies of the problem of interaction of the river with the canal and a fisheries action plan which encompasses all these studies.

ARK has proposed a programme of activities including the proposals contained in all these studies to develop an action plan which would achieve good ecological status in the River Og and Middle Kennet by 2015 and in the other two water bodies by 2019. We propose that these activities should be fully costed and coordinated into a programme for the final River Basin Management Plan.

We consider that the condition of the river and its status as a chalkstream SSSI justify the production of a separate sub-basin plan for the Kennet as provided for in Article 13 of the EU Water Framework Directive. This report could form a starting point for a sub-basin plan and ARK would like to assist in developing it.

5.4 ***On the overall effectiveness of WFD implementation and the RBMP***

ARK is deeply disappointed by the draft River Basin Management Plan which had been promised by the former head of the EA Thames Region as being the solution to all the River Kennet's problems. We think that the plan has failed to recognise the river's problems and has failed to produce a coherent programme of activities to deal with them.

A major weakness appears to have been a centrally driven approach to the plan which has insufficiently engaged local EA staff. It does not make use of the large amount of good work which has already been undertaken under the EA's local management, neither does it recognise the knowledge and expertise within the

organisation at a local level. Rather than using the Water Framework Directive to coordinate and drive the existing activities, they have been subsumed into vague generic measures with no clear targets.

We consider the lack of any environmental data in the Plan and the difficulty in obtaining it to be a major deficiency. This review of the Plan has only been possible through the cooperation of local EA staff in making data available and attending meetings with us. We understand that this degree of access to information is not generally available and no one else has asked for it in the Thames Region – in ARK's opinion, this is a sign of apathy and disillusionment with the Plan, rather than acceptance of it.

In ARK's opinion, the lack of access to detailed information will undermine the consultation process. The regional consultation meetings we have attended have had little value to us because of lack of information to provide common ground for discussion. Without access to the information on which the draft River Basin Management Plan has been based, we consider that responses to the consultation will be of limited value.

Recommendation: EA should establish a database with access to information at an equivalent level of detail to the CD which accompanies this report.

6 Recommendations

		See Page Number
1.	The RBMP should specify actions to improve monitoring. This should include diagnostic monitoring to support studies needed to improve understanding of the river's problems and long term monitoring to measure the effectiveness of river improvement measures. See section 4.4 for more details.	16
2.	The RBMP should make full use of all available data and studies, not just the "official" data held centrally by EA. Local EA staff should be more involved to provide information and ensure that all available information and local knowledge is used in classifying the river.	17
3.	The upper Kennet should be classified as un-modified river. The channel improvements proposed by EA as mitigation of the "modifications" should be carried out as already planned for the Water Level Management Plan and the River Kennet Restoration Strategy (see Section 4.4).	19
4.	A full low flow investigation should be undertaken for the upper Kennet, based on groundwater modelling and linked to recent low flow investigations for the Axford and Ogbourne abstractions. The investigation should look at all abstractions, ie including private abstractions and the Wessex Water abstractions close to the western catchment boundary. The study should seek to optimise all abstractions above Hungerford to minimise ecological damage (ie to consider shifting some of the abstractions further downstream where they would be less damaging). This investigation should also look at land use changes in the upper Kennet and how changing crop water requirements might have affected river flows.	24
5.	The mean phosphate target for the River Kennet should be 60 µg/l with an absolute upper limit of 100 µg/l, the level at which CEH has found algal blooms are triggered.	27
6.	CEH's recent data for Clatford should be used to classify the nutrient status of the upper Kennet. On this basis, it would fail to meet the good standard.	27
7.	In the absence of any diatom monitoring, the photographic evidence of algal growth should be used to justify the classification of phytobenthos in the upper Kennet as "poor".	28

		See Page Number
8.	The macrophytes in the upper Kennet should be classified as poor, based on the assessments for the Kennet Restoration Strategy and the photographic evidence.	29
9.	The upper Kennet should be classified as an un-modified river at poor ecological status, based on the evidence for phosphates, algal growth, macrophytes and fish.	29
10.	The middle Kennet water body should be split in two and the reach from Marlborough to Hungerford should be designated a normal river.	30
11.	The RBMP should include an action for more studies of the canal/river interaction to target resolution of the best option by 2012, whilst leaving the stretch from Hungerford to Newbury as normal unmodified river for the moment. This classification could be revised if the outcome of the studies concludes that the reach should become a HMWB for reasons of technical infeasibility or disproportionate cost of the improvement works.	30
12.	An intensive study of water quality and ecology for the whole catchment above Hungerford should be completed by 2012, including intensive monitoring of phosphates, algal growth, macrophytes and natural trout reproduction. The study should include identification of sewage works improvements for implementation in Thames Water's AMP6 business plan, as well as targeting hotspots for diffuse pollution.	35
13.	The water quality between Hungerford and Newbury should be classified as poor on the grounds of mean phosphate levels almost double Natural England's 60 µg/l target and the frequency of spikes over 150 µg/l.	37
14.	The river between Hungerford and Newbury should be classified as poor ecological status on the grounds of failing phosphate levels, Natural England's assessment of macrophytes and the results of the fisheries monitoring.	38
15.	ARK's proposed further studies of the interaction of the river with the K&A canal by 2012 should include the river between Newbury and Woolhampton. If the studies conclude that high phosphate levels are in part due to sewage effluent discharges these should be addressed in Thames Water's AMP 6 business plan.	40
16.	The River Og should be classified as poor status on the grounds of flows, algal growth and fish.	43
17.	A programme for re-establishing natural trout spawning in the upper Kennet and	

		See Page Number
	Og should be undertaken, working with the Wild Trout Trust and the Kennet Chalkstream Restoration Project, achieving good status for fish by 2015 as measured by the enhanced fisheries monitoring programme.	43
18.	All the invertebrate classifications should be reviewed by the EA in the light of concerns that sampling locations have been selected which favour good invertebrate scores (ie avoiding heavily silted locations). Future invertebrate monitoring should be planned accordingly.	51
19.	All of the activities in existing programmes of work on the River Kennet should be developed, programmed and coordinated to produce a programme of measures which would achieve many of the WFD's objectives by 2015 and all of them by 2021.	54
20.	The EA should commit to a firm programme of specific measures and use the water framework directive as a justification for obtaining the necessary consents and funding. If some projects have to be changed or even dropped as implementation of the plan proceeds, the programme can be adjusted accordingly.	55
21.	All of the activities proposed by ARK in Section 4.4 and the measures proposed by EA should be pulled together to produce a sub-basin plan for the River Kennet by the end of 2009. ARK should be involved in preparation of the sub-basin plan.	58
22.	EA should establish a database with access to information at an equivalent level of detail to the CD which accompanies this report.	64

Appendix A ARK's Terms of Reference

Aim of project: To 'ground-truth' and critique in detail the approach taken to river basin planning by the Environment Agency.

Outline of proposal: Within their clearly defined catchment area, Action for the River Kennet will consider in detail:

- The delineation of water bodies. Do they agree with the water bodies identified? Are any missing? Do they consider any should be disaggregated or aggregated? (given WFD rules on this)
- Monitoring network and risk assessments. The classification is made based on information from monitoring and on assessment of risk from a variety of pressures. Is the monitoring network adequate to pick up all the threats to water status, or is it failing to identify some? What additional monitoring, if any, is recommended? Are the risk maps and the underlying analysis behind them adequate?
- The proposed classification of water bodies into different status classes. Using EA data and any additional data available, do they agree with the classification made, and the levels of confidence associated with each status label? Is there any evidence of mis-classifications?
- The proposed measures. Do they agree with the proposed measures to bring the water body up to good status? Are there any other measures we would suggest, that we do not think are disproportionately costly or technically infeasible? Do we accept the use of any exemptions where water bodies will not meet the default WFD objective of Good Status?

Timescale: The draft RBMPs were released on 22nd December 08 for a 6-month consultation. This work should be completed within the first three to four months of the consultation (Jan – mid April 09), to ensure maximum impact of any suggestions and to allow for preparation of any glossy lobbying materials.

Final product: This will be a comprehensive document, including summary and recommendations, data and analyses. The information should be sufficient that it can be used to inform two key documents. Firstly, it should be adequate to be used for submission as a response to the RBMP consultation, and secondly it will form the basis of national lobbying document, combined with other similar reports from different catchments.

Management: Ralph Underhill and Sarah Oppenheimer at the RSPB will manage and oversee this work. Sarah will be a first point of contact until she goes on maternity leave at the end of March 09.

B.9 Kennet and Pang catchments

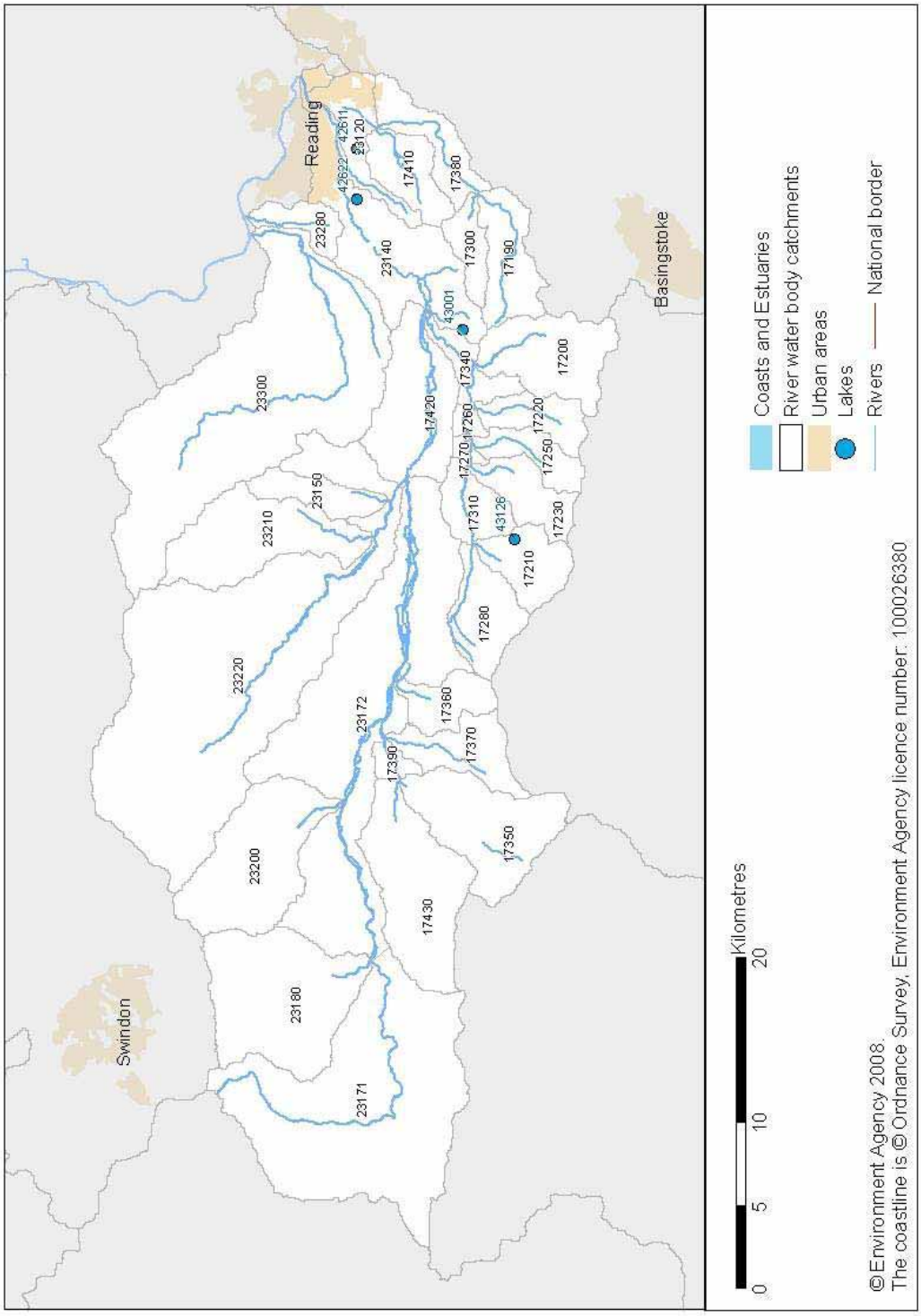
Rivers and Lakes

There are 31 river water bodies and 4 lake water bodies within the Kennet and Pang catchments.

Figure B.9.1 **Proposed status objectives for rivers and lakes in the Kennet and Pang catchments**

	Proposed status objective					
Water body category	**Good or high in 2015**	**Good or high in 2021**	**Good or high in 2027**	**Less than good**	**Not yet assessed**	**Total number of water bodies**
Rivers	13	13	27	0	1	28
Lakes	0	0	0	0	2	2
Rivers proposed as heavily modified	0	0	2	0	1	3
Lakes proposed as heavily modified	0	0	0	0	0	0
Proposed artificial water bodies	2	2	2	0	0	2

Figure B.9.2 **River and lake water bodies in the Kennet and Pang catchments**
Note: the map reference numbers are the last five digits of the water body ID



Proposed actions for rivers and lakes in the Kennet and Pang catchment

There are a number of actions that are being proposed and which will benefit rivers and lakes in the catchment. Figure B.9.3 below describes these. The objectives for water bodies in this catchment have been set based on the actions in scenarios A and B only. We have also listed in this table those scenario C actions specific to this catchment to help you respond to this consultation. These are actions that may be worthwhile but require additional information to reduce uncertainty, primarily in relation to ensuring that costs are proportionate and actions are technically feasible. It is hoped that your response on actions in scenario C will improve the certainty of the effectiveness and benefits of these actions enabling some to move to scenario B. Annex E explains these scenarios in more detail.

National and river basin district level actions are shown in Annexes F and C respectively.

Figure B.9.3 **Actions that will benefit rivers and lakes in the Kennet and Pang catchment**

Pressure	Sector	Description of the Action			Means of Delivery	Lead Organisation	Driver for Action
		What will happen	When it will happen	Where it will happen			
Scenario: A							
Abstraction and other artificial flow pressures	Environment Agency	Investigations at other water dependent nature conservation sites perceived to be adversely affected by abstraction	2010	Applies to many catchments across the Thames River Basin District	Environment Act 1996 - Management of Abstraction	Environment Agency	Reduction of uncertainty
Abstraction and other artificial flow pressures	Environment Agency	Sites of Special Scientific Interest - Modification of Abstraction licences to ensure no adverse impact on conservation objectives	2015	Applies to many catchments across the Thames River Basin District	Water Resources Act 1991, The Wildlife & Countryside Act 1981	Environment Agency. Natural England	Defra Public Service Agreement
Abstraction and other artificial flow pressures	Fisheries and conservation	Agri-environment scheme	2012	Kennet and Lambourn Floodplain SAC	Environmental Stewardship Scheme	Natural England	PSA

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Nutrients	Fisheries and conservation	Agri-environment scheme	2012	River Lambourn SAC	Environmental Stewardship Scheme	Natural England	PSA
Sediment (as a direct pollutant)	Fisheries and conservation	Agri-environment scheme	2012	River Lambourn SAC	Environmental Stewardship Scheme	Natural England	PSA
Nutrients, Organic pollutants	Fisheries and conservation	Discharge/PPC consent	2012	River Lambourn SAC	Water Resources Act 1991, Water Act 2003	Environment Agnecy	PSA
Nutrients	Fisheries and conservation	Existing Local Project	2012	River Lambourn SAC	Partnership working	Natural England	PSA
Sediment (as a direct pollutant)	Fisheries and conservation	Existing Local Project	2012	River Lambourn SAC	Partnership working	Natural England	PSA
Abstraction and other artificial flow pressures	Fisheries and conservation	Implement AMP Scheme	2012	Kennet and Lambourn Floodplain SAC	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water compnaies	PSA
Abstraction and other artificial flow pressures, Nutrinets, Organic pollutants	Fisheries and conservation	Implement AMP Scheme	2012	River Lambourn SAC	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water compnaies	PSA

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Physical modification	Fisheries and conservation	River restoration project	2012	River Lambourn SAC	Partnership work	Environment Agency, Natural England	PSA
Sediment (as a direct pollutant)	Fisheries and conservation	Undertake specific management works	2012	River Lambourn SAC	Partnership work	West berkshire Council	PSA
Abstraction and other artificial flow pressures	Fisheries and conservation	Water Abstraction licence - revoke/amend	2012	Kennet and Lambourn Floodplain SAC	Restoring Sustainable Abstraction Programme	Environment Agency	PSA
Abstraction and other artificial flow pressures	Fisheries and conservation	Water Abstraction licence - revoke/amend	2012	River Lambourn SAC	Restoring Sustainable Abstraction Programme	Environment Agency	PSA
Abstraction and other artificial flow pressures	Fisheries and conservation	Water level management plan	2012	Kennet and Lambourn Floodplain SAC	River Restoration Strategy	Environment Agency	PSA
Abstraction and other artificial flow pressures	Fisheries and conservation	Water level management plan	2012	River Lambourn SAC	River Restoration Strategy	Environment Agency	PSA
Abstraction and other artificial flow pressures	Industry, manufacturing and other business	Disincentives / incentives to encourage purchase of water efficient appliances.	2012	Thames Water London Zone SWOX Zone SWA Zone	Fiscal measures and incentives	Water Companies	WFD - basic measure (Art 11.3 c)
Abstraction and other artificial flow pressures	Industry, manufacturing and other business	Reduction of demand through labelling of water efficient appliances (Market Transformation)	2010	Applies to many catchments across the Thames River Basin District		DEFRA Water Savings Group	WFD - basic measure (Art 11.3 c)

Pressure	Sector	Description of the Action: What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Abstraction and other artificial flow pressures	Industry, manufacturing and other business	Reduction of demand through offering of tax incentives (enhanced Capital Allowances) for the purchase and use of efficient plant and fittings by commercial organisations	2010	Applies to many catchments across the Thames River Basin District	Fiscal measures and incentives	DEFRA, HMRC and Envirowise	WFD - basic measure (Art 11.3 c)
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, Organic pollutants	Water Industry	AMP4	2010	Ashamstead (The Stubbles) STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water companies	G1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, Organic pollutants	Water Industry	AMP4	2010	Baydon STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water companies	G1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, Organic pollutants	Water Industry	AMP4	2010	East Ilsey STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water companies	G1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, Organic pollutants	Water Industry	AMP4	2010	Newbury STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water companies	I1, U2

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Abstraction and other artificial flow pressures	Water Industry	Coordinated education and awareness on water efficiency and re-use to promote value of water	2010	Thames Water London Zone SWOX Zone SWA Zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	East Shefford STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	FLOW1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Great Bedwyn STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	I1, FLOW1, G3
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Hampstead Norreys STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	FLOW1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Marlborough STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	FLOW1

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Stratfield Mortimer STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	FLOW1
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Upper Dun	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	I5
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients, organic pollutants	Water Industry	Impact of sewage treatment works effluent quality to be modelled under the Periodic review (2010-2015) and altered to protect the environment and prevent deterioration.	2015	Washwater STW	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Water Companies	FLOW1
Abstraction and other artificial flow pressures	Water Industry	Reduction of demand through promotion of free household meters	2008	Thames Water London Zone SWOX Zone SWA Zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Abstraction and other artificial flow pressures	Water Industry	Reduction of demand through specification of water efficient fittings in new and refurbished homes under Building Regulations	2010	Applies to many catchments across the Thames River Basin District	Regulations	CLG	WFD - basic measure (Art 11.3 c)

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Abstraction and other artificial flow pressures	Water Industry	Reduction of demand through use of rising block tariff at metered properties	2016	Thames Water London Zone SWOX Zone SWA Zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Abstraction and other artificial flow pressures	Water Industry	Reduction of leakage through active leakage control and customer supply pipe repair policies	2008	Thames Water London Zone SWOX zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Abstraction and other artificial flow pressures	Water Industry	Reduction of summer peak demands through use of seasonal tariffs	2016	Thames Water London Zone SWOX Zone SWA Zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Abstraction and other artificial flow pressures	Water Industry	Schools based education and awareness campaigns for sustainable water use	2010	Thames Water London Zone SWOX Zone SWA Zone	Water Company Plans (WA 2003)	Water Companies	WFD - basic measure (Art 11.3 c)
Scenario: B							
Nutrients, Organic pollutants, Sediment (as a direct pollutant), Priority hazardous substances priority substances and specific pollutants	Agriculture and rural land management	Reduce diffuse pollution from agricultural sources through the English Catchment Sensitive Farming Delivery Initiative in priority catchments.	2015	Applies to Kennet & Pang, Loddon, and Roding, Beam & Ingrebourne catchments	English Catchment Sensitive Farming Delivery Initiative	Natural England, DEFRA, Land managers, NFU, Environment Agency	WFD, PSA
Sediment (as a direct pollutant), Organic pollutants	Environment Agency	Further develop links with British Waterways to manage canal discharges and abstractions	2015	Dun, Shalbourne, Kennet and Avon Canal	Working agreements	British Waterways, Environment Agency	WFD

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Priority Hazardous Substances, Priority Substances and Specific Pollutants	Environment Agency	Further water quality monitoring to determine the sources of Hazardous Substances	2015	Applies to Cotswolds, Kennet &Pang, Thame Vale of White Horse, and Cherwell catchments	Investigation	Water Companies, Environment Agency	WFD
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Sediment (as a direct pollutant)	Environment Agency	Influence Local Planning Authority to enforce Circular 03/99 (Land use planning guidance) in relation to non-mains drainage.	2015	Apllies to Cherwell, Cotswolds, Kennet and Pang, Thames and Vale of White Horse catchments	Working agreements	Environment Agency	WFD
Nutrients, Sediment (as a direct pollutant), Priority hazardous substances priority substances and specific pollutants, organic pollutants	Environment Agency	Target high risk farms and undertake regulatory farm visits using, pollution prevention notices and advisory letters where necessary	2015	Applies to many catchments across the Thames River Basin District	Water Resources Act/Environment Act	Environment Agency	WFD
Nutrients, Sediment (as a direct pollutant)	Fisheries and conservation	English Catchment Sensitive Farming Delivery Initiative	2012	River Lambourn SAC	English Catchment Sensitive Farming Delivery Initiative	Natural England	PSA
Sediment (as a direct pollutant), Organic pollutants	Fisheries and conservation	Further develop links with British Waterways to manage canal discharges and abstractions	2015	Dun, Shalbourne, Kennet and Avon Canal	Working agreements	British Waterways, Environment Agency	WFD
Physical modification	Fisheries and conservation	Implement Public Service Agreement/Water Level Management Plan physical habitat restoration programme	2015	Kennet, Lambourn	River Restoration Strategy	Natural England, Environment Agency	WFD, PSA, Habitats Directive

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Physical modification	Fisheries and conservation	Investigations into causes of declining fish stocks	2015	Enborne	Investigation	Environment Agency	WFD
Nutrients	Fisheries and conservation	Regulatory Investigation - diffuse pollution (WPZ)	2012	River Lambourn SAC	Water Resources Act	Environment Agnecy	PSA
Sediment (as a direct pollutant)	Fisheries and conservation	Regulatory Investigation - diffuse pollution (WPZ)	2012	River Lambourn SAC	Water Resources Act	Environment Agency	PSA
Priority Hazardous Substances, Priority Substances and Specific Pollutants	Industry, manufacturing and other business	Investigate emissions from installations and appraise options (to reduce at source or treat, up to BATNEEC) to meet EQS and reduce/cease emissions in this or subsequent rounds, focussing on ship yards, timber treatment plants or treated timber storage are	2015	Sites contributing to potential EQS failures	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Industry	WFD
Priority Hazardous Substances, Priority Substances and Specific Pollutants	Industry, manufacturing and other business	Investigate losses from contaminated land, groundwater and sediments and appraise options for remediation to meet EQS and reduce/cease losses in this or subsequent rounds	Not in first round	Contaminated Land	Government framework on how to deal with contamination, Notices under Part 2A Environmental Protection Act 1990	Environment Agency	WFD
Organic pollutants, Nutrients, Sediment (as a direct pollutant), Direct biological pressures, Physical modification	Local Government	Engage with local authority and local stakeholders to devise methods to tackle diffuse rural and urban pollution and river restoration through Kennet Chalkstream Restoration Project	2015	Kennet, Lambourn	Working agreements	Local Authorities	WFD

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Organic pollutants, Nutrients, Sediment (as a direct pollutant), Direct biological pressures, Physical modification	Local Government	Engage with local authority and local stakeholders to devise methods to tackle diffuse rural and urban pollution and river restoration through Kennet Chalkstream Restoration Project	2016	Kennet, Lambourn	Working agreements	Local Authorities	WFD
Priority Hazardous Substances, Priority Substances and Specific Pollutants	Water Industry	Investigate emissions from installations and appraise options (to reduce at source or treat) to meet EQS and reduce/cease emissions in this or subsequent rounds	2015	Aldershot Town STW	PPC Regs 2000	Water Companies	WFD
Priority Hazardous Substances, Priority Substances and Specific Pollutants	Water Industry	Investigate emissions from installations and appraise options (to reduce at source or treat) to meet EQS and reduce/cease emissions in this or subsequent rounds	2015	Silchester STW	PPC Regs 2000	Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and appraise options (to reduce at source or treat at STW) to meet EQS and reduce/cease emissions in this or subsequent rounds	2015	Kintbury	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and appraise options (to reduce at source or treat at STW) to meet EQS and reduce/cease emissions in this or subsequent rounds	2015	Reading (New)	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Environment Agency, Water Companies	WFD

Pressure	Sector	Description of the Action					
		What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Nutrients	Water Industry	Investigate emissions from STWs and appraise options (to reduce at source or treat at STW) to meet EQS and reduce/cease emissions in this or subsequent rounds	2015	Silchester	Water Resources Act 1991 s88 (discharge consent) or WRA 91 s90B (enforcement notices)	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and confirm whether further investigation into sources discharging to sewer is required	2010	Aldermaston	Investigation	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and confirm whether further investigation into sources discharging to sewer is required	2010	Chilton Foliat	Investigation	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and confirm whether further investigation into sources discharging to sewer is required	2010	Mortimer (Stratfield Mortimer)	Investigation	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and confirm whether further investigation into sources discharging to sewer is required	2010	Reading (New)	Investigation	Environment Agency, Water Companies	WFD
Nutrients	Water Industry	Investigate emissions from STWs and confirm whether further investigation into sources discharging to sewer is required	2010	Silchester	Investigation	Environment Agency, Water Companies	WFD
Abstraction and other artificial flow pressures	Water Industry	Modification of the West Berkshire Groundwater Scheme (WBGWS) operating agreement to protect the River Lambourn SAC and the Kennet & Lambourn Floodplain SAC Habitats Directive sites from groundwater abstraction via the WBGWS	2015	Winterbourne, Lambourn	Investigation	Environment Agency	WFD

Scenario: C

Pressure	Sector	Description of the Action: What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Sediment (as a direct pollutant), Organic pollutants	Environment Agency	Further develop links with British Waterways to manage canal discharges and abstractions	2015	Dun, Shalbourne, Kennet and Avon Canal	Working agreements	British Waterways, Environment Agency	WFD
Technical feasibility uncertain - further work needed to demonstrate that the measure is technically feasible							
Abstraction and other artificial flow pressures	Environment Agency	Further monitoring to improve understanding of the hydrological regime	2015	Og	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Abstraction and other artificial flow pressures	Environment Agency	Further monitoring to improve understanding of the hydrological regime	2015	Pang	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Abstraction and other artificial flow pressures	Environment Agency	Further monitoring to improve understanding of the hydrological regime	2015	Shalbourne (source to Kennet at Hungerford)	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Nutrients, Organic pollutants, Priority Hazardous substances, priority substances and specific pollutants	Environment Agency	Further water quality monitoring to determine impacts of local Sewage Treatment Works	2015	Applies to many catchments across the Thames River Basin District	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Sediment (as a direct pollutant)	Environment Agency	Investigate impact of sediments on ecological status	2015	Applies to Cherwell, London, Wey, Kennet & Pang and Cotswolds catchments	Investigation	Environment Agency, Natural England, Water Companies, Local Authorities	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Nutrients, Priority hazardous substances priority substances and specific pollutants	Environment Agency	Local pollution prevention campaign (including, where appropriate, campaigns to raise awareness of existing marketing and use restrictions)	2015	Sites contributing to potential EQS failures	Locally targeted pollution prevention campaigns based on national guidance	Environment Agency	WFD
Uncertain if cost of measure is proportionate - further work needed to improve confidence in expected benefits.							

Pressure	Sector	Description of the Action: What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Nutrients	Environment Agency	Pollution Prevention advice and campaigns	Ongoing	Applies to many catchments across the Thames River Basin District	Local action including use of anti-pollution works notices under WRA91 Section 161, 161A to D as detailed in the Anti-Pollution Works Regulations 1999, and enforcing prohibition under WRA91 Sections 85, 91A, 91B, 92 & 96	Environment Agency	WFD
Uncertain if cost of measure is proportionate - further work needed to improve confidence in expected benefits.							
Organic pollutants	Fisheries and conservation	Further investigations to improve understanding of habitat restoration required to achieve GES.	2015	Applies to many catchments across the Thames River Basin District	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Physical modification	Fisheries and conservation	Further investigations to improve understanding of habitat restoration required to achieve GES.	2015	Applies to many catchments across the Thames River Basin District	Investigation and partnerships	Environment Agency	Investigation
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Physical modification	Fisheries and conservation	Further investigations to improve understanding of habitat restoration required to achieve GES.	2015	Applies to many catchments across the Thames River Basin District	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Direct biological pressures	Fisheries and conservation	Invasive species control programme	2012	River Lambourn SAC	Partnership work	Environment Agency, Natural England	PSA
Uncertain if cost of measure is proportionate - further work needed to improve confidence in expected benefits.							

Pressure	Sector	Description of the Action: What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Physical modification	Fisheries and conservation	Investigate channel restoration projects to improve flow regime and habitat creation	2015	Applies to many catchments across the Thames River Basin District	Investigation	Environment Agency, Water Companies, other abstractors, Local Authorities , Developers, Thames River Restoration Trust	WFD
Uncertain if cost of measure is proportionate - further work needed to improve confidence in expected benefits and/or Technical feasibility uncertain - further work needed to demonstrate that the measure is technically feasible							
Abstraction and other artificial flow pressures, Direct biological pressures, Nutrients, Organic pollutants, Physical modification, Priority hazardous substances priority substances and specific pollutants, Sediment (as a direct pollutant)	Fisheries and conservation	Investigations into causes of declining fish stocks	2015	Enborne	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives							
Organic pollutants, Nutrients, Sediment (as a direct pollutant)	Urban and transport	Educate builders and developers to design buildings that consider water efficiency, SUDS, rainwater harvesting, and grey water recycling systems and develop good practice for site clearance prior to development.	2015	Sites contributing to potential EQS failures	Codes of practice, targeted campaigns, voluntary agreements with Water Companies	Environment Agency, Local Authorities, Business & Industry	WFD
Technical feasibility uncertain - further work needed to demonstrate that the measure is technically feasible.							
Priority Hazardous Substances, Priority Substances and Specific Pollutants, Sediment (as a direct pollutant)	Urban and transport	Identify hot spots for sediment and other pollutants from highway run-off	2015	Sites contributing to potential EQS failures	Investigation	Environment Agency	WFD
Investigation to reduce uncertainty - may go beyond what is required to achieve WFD objectives.							

Pressure	Sector	Description of the Action: What will happen	When it will happen	Where it will happen	Means of Delivery	Lead Organisation	Driver for Action
Nutrients, Organic pollutants, Sediment (as a direct pollutant), Priority hazardous substances priority substances and specific pollutants	Urban and transport	Increase frequency of street cleaning, and gully cleansing. Co-ordinate Local Authority cleansing programmes.	Pilot in the first plan, ongoing thereafter	Applies to many catchments across the Thames River Basin District	Environment Agency-R&D, local strategic partnerships, clean neighbourhoods campaign, vets.	Local Authorities, Environment Agency	WFD

Uncertain if cost of measure is proportionate - further work needed to improve confidence in expected benefits.

Progress towards achieving good ecological status and good ecological potential

6.5 Kennet & Pang catchment

Currently 81 km of river length (34% of waterbodies) in this catchment are achieving good ecological status/potential. It is expected that by 2015 this will remain at 81 km, but with additional local input this could change.

Water abstraction in the catchment, which is predominately from groundwater sources, is mainly for public water supply. A number of abstraction licences have been investigated to assess their impacts on ecology and measures have been put in place or are planned to reduce these impacts where they have been established as unacceptable (e.g. at Axford on the Kennet). Further investigations are underway on other licences such as at Ogbourne and Pangbourne. Other local measures are aimed at reducing demand for water will be centred on working in partnerships to promote and encourage water efficiency through campaigns and advice.

Surface water quality in the catchment is generally good, although Tributyltin compounds are causing a current failure in the Foudry Brook.

Measures to mitigate against diffuse pollution include promoting and ensuring implementation of Codes of Good Agricultural Practice (CoGAP), promoting the use of soil and nutrient management plans, and providing technical advice cards for farmers covering best practice. Some of this will be delivered through the Kennet Catchment Sensitive Farming Initiative and associated projects with FWAG. Work will continue to understand and mitigate the adverse impacts on river quality due to the interaction between the Kennet and the Kennet & Avon Canal. Other work to combat diffuse pollution includes the provision of pesticide handling advice/education to farmers, industry, golf courses and Network Rail.

Proposed solutions that are intended to deal with point source inputs include further investigation of impacts of emissions from Kintbury and Chilton Foliat STWs to inform options in order to achieve good ecological status. There is also a need to collect water quality and ecological monitoring samples from up and downstream of a number of smaller sewage treatment works along these rivers in order to assess the impact of discharges and to provide information for future actions where additional data is required (i.e. for future AMP schemes).

Physical habitat restoration is needed at a number of locations to address the problems of past engineering and the impacts of control structures where these are severely limiting the ecological potential of the catchment. Some of this work will be done under a programme to restore the River Kennet and River Lambourn SSSIs, but additional works are required for degraded reaches elsewhere.

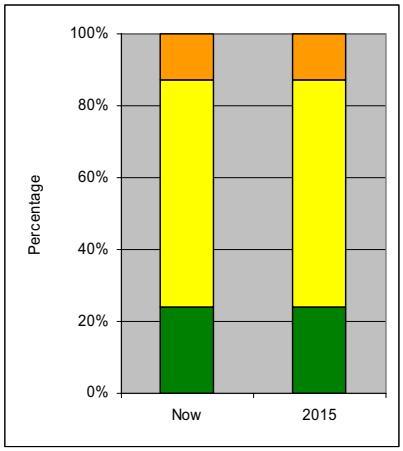


Figure 20 – Expected progress towards achieving good ecological status and good ecological potential in rivers in the Kennet & Pang catchment (as proportion of river length)

Appendix C EA meeting notes and responses

Information Requested from Environment Agency with comments or actions arising from meeting between ARK and EA on 2 March 2009 added in blue text

1. Introduction

Action for the River Kennet are requesting information to help with their response to the Thames region WFD consultation and to assist RSPB as one of a small number of case studies to support their response at the national level. The information will help ARK to formulate their views on:

- the adequacy of existing monitoring and proposals for future monitoring
- the appropriateness of the classification of water bodies (both overall ecological classification and individual ecological parameters)
- the extent of risks
- the adequacy of measures

The request makes frequent use of the phrase "data and reasoning to support the classification". By this we mean reference to the methodology used in the classification (eg the appropriate section of a UKTAG guideline), the detailed calculation and reasoning, and the detailed data used in the assessment.

The request focuses on four water bodies upstream of Reading – the upper Kennet to Marlborough, the middle Kennet from Marlborough to Newbury, the lower Kennet from Newbury to Woolhampton, and the Og. These are listed under each heading below.

2. Upper Kennet Water Body (ref 23171)

Queries relating to the monitoring network (Figure A1 of Annex A):

2.1 Can we have access to the methodology for setting up monitoring points and can we have an explanation for why there is no monitoring for the 15 km of river above Manton?
There are no monitoring points above Manton

2.2 Why is there no monitoring of fish or water quality for any of the upper Kennet shown on Figure A1, although we have seen reference to such data on the Access database v57?
The national data set did not include such data, and the data in v57 was modelled data so has been removed from the draft plan.

2.3 Please can we see a schedule showing frequency of monitoring and determinands recorded at each of the monitoring stations in the water body over the past 5 years, and a schedule showing the equivalent for planned future monitoring.
Existing monitoring had been to meet other targets, only national data sets had been used. Future monitoring would address the needs of the WFD. The new schedule would not be included in the RBMP, but published as a separate document in 2010. EA will provide past monitoring schedule.

Queries relating to classification (Page 330 of Annex B):

2.4 Why are current overall status and proposed status not yet assessed? What monitoring and investigation has been carried out and when is current overall status expected to be reported?

Data arrived too late to be included but would be added.

2.5 Why is it a candidate heavily modified water body and what is the modification that has lead to its designation? How will this modification lead to impacts on the river's ability to reach GES and how would the removal of the modification lead to a significant adverse affect on its function? Please can we see the data and reasoning to support the cHMWB decision (ie data used in Steps 3 to 5 of Figure I.5 of Annex I.)? This was being challenged by local level EA

2.6 Please can we see the data and reasoning supporting the classification of invertebrates as good? Invertebrate data did not exist – the compliance assessment data included in the Access database was a prediction. The HMWB classification meant that no biological data was required. Once this classification had been changed more data would be added.

2.7 Why have fisheries not been classified, although they were classified as moderate on the Access database v57? Please can we see the data and reasoning to support the classification as moderate on the Access database? When is a classification expected to be made? Modelled data used. RI to refer to fisheries colleagues to find out more and provide data if available.

2.8 Please can we see the data and reasoning supporting the classification of flow as not good? Why is the confidence in this assessment low? What investigation is underway or planned to increase this level of confidence? EA to provide

2.9 Why have phytobenthos not been classified, despite a known problem of algal growth in the water body? Please can we see data and reports on investigations into historic algal blooms, eg in summer 2008? EA to investigate what action was taken in response to algal blooms in 2008 and advise ARK.

2.10 Why has chemical status been classified as good, despite poor water quality recorded on the Access database (diffuse and point sources). Please can we see the data and reasoning supporting the chemical classification as good?
Ignore – ARK had erroneously thought that nutrient levels were part of chemical status

Queries relating to measures:

2.11 What measures are proposed in the first RBMP to address quality and dynamics of flow which are stated to be not good on Page 330 of Annex B? What is the evidence to support the statement that good status cannot be achieved by 2015 because it would be "disproportionately expensive – low or uncertain benefits"? No specific measures have been planned. EA would welcome suggestions.

2.12 What measures are proposed in the first RBMP to address fisheries which were stated to be moderate on the Access database v57? No measures planned. EA would welcome suggestions

2.13 What measures are proposed in the first RBMP to address diffuse pollution as evidenced by poor water quality from diffuse sources on the Access database v57? We note the proposed general Scenario B measures in Annex B for addressing diffuse pollution by targeting high risk farms and working with local authorities and stakeholders, but what specific investigations are planned for the upper Kennet and what specific targets have been set for diffuse pollution in the first RBMP? Diffuse pollution will be tackled through KCSRP. ARK to discuss with John Hallett.

2.14 Noting the general measure on Page 279 of Annex B to investigate the impacts of sediment on ecological status, what specific plans are there for investigating the upper Kennet? ARK would like to

see this general measure made specific, including dates by which research will be completed to ensure that actions arising from research could be included in the second round of the RBMP.

2.15 What measures are proposed to address the known problem of algal blooms in the upper Kennet? There were no specific measures to address algal blooms, which were a symptom of water quality, which was being addressed through the KCSRP.

3. Middle Kennet Water Body (reference 23172)

Queries relating to the monitoring network (Figure A1 of Annex A):

3.1 Figure A1 appears to show only one biological monitoring station between Marlborough and Newbury – is this correct?

Map has missing sampling points – RI was waiting for a response from the National team.

3.2 There is a recognised long standing problem with algal growth in this water body – how has this been monitored? As above (KCSRP)

3.3 Please can we see a schedule showing frequency of monitoring and determinands recorded at each of the monitoring stations in the water body over the past 5 years, and a schedule showing the equivalent for planned future monitoring. EA to provide

Queries relating to classification (Page 333 of Annex B):

3.4 Why is it a candidate heavily modified water body and what is the modification that has lead to its designation, how will this modification lead to impacts on the river's ability to reach GES, and how would its removal lead to a significant adverse affect on its function? Please can we see the data and reasoning to support the cHMWB decision (ie data used in Steps 3 to 5 of Figure I.5 of Annex I.)? EA to provide data and reasoning.

3.5 Please can we see the data and reasoning supporting the classification of invertebrates as high? EA have already supplied and will now explain how classification was reached.

3.6 Please can we see the data and reasoning to support the fisheries classification as moderate? EA to provide

3.6 Please can we see the data and reasoning supporting the classification of flow as not good? Why is the confidence in this assessment low, despite detailed low flow investigations relating to Axford? What investigation is underway or planned to increase this level of confidence? National data sets had been used. Local data sets (for example those generated for the Atkins report) had not been used, however local EA is allowed to add local data at this stage. **Action:** ARK to highlight this in their response.

The EA commitment to reduce the Axford licence to 6Ml/d had not been included because a funding route was not secured. **Action:** ARK to suggest its inclusion at least as a Scenario C measure. Local EA were committed to achieving a reduction in abstraction.

3.7 Why have phytobenthos not been classified, despite a known problem of algal growth in the water body? Please can we see data and investigations into historic algal blooms, eg in summer 2008? EA to investigate what action was taken in response to algal blooms in 2008 and advise ARK

3.8 Why have macrophytes not been classified, despite a known problem of poor ranunculus growth in the water body? There is no monitoring data. **Action:** ARK to suggest macrophyte monitoring as a new measure.

3.10 Please can we see the data and reasoning justifying the chemical status as not good? Why is there low confidence in this assessment? What investigation is underway or planned to increase this level of confidence? Ignore – ARK had erroneously thought that nutrient levels were part of chemical status

3.11 Please can we see the data and reasoning supporting the assessment of ecological potential for hydromorphology as moderate or worse? This should include the mitigation measure checklist used in the classification and an explanation of what has been considered a significant adverse affect on function for each modification. Yes – EA to supply

3.12 Why is there no reference to Habitats Directive requirements for this water body? Please can we see details of Habitats Directive assessments for flow and water quality (referred to on the Access database)?
ARK to refer to Annex D. EA to check data availability.

Queries relating to measures

3.13 What specific monitoring and investigation is planned to address the low confidence in the overall moderate status of the water body and the assessment of phosphates as good? Mistake now corrected.

3.14 Noting that it is stated on Page 333 of Annex B that it would be disproportionately expensive to address the "moderate or worse" hydromorphology, what measures have been considered and at what cost? What was the criterion for dismissing the measures as disproportionately expensive? EA to provide

3.15 Why are there no measures proposed in Annex B to address the problem of low flows caused by the Axford abstraction (noting that flows are acknowledged as unacceptable on Page 35 of the main RBMP)? What measures have been considered to address this problem, and what would they cost? As measures have been rejected on the grounds of "disproportionate costs – low or uncertain benefits", what measures are proposed to increase certainty of benefits. Measures are as comments in 3.6

3.16 What measures are proposed in the first RBMP to address fisheries which are stated to be only moderate with a high level of confidence? No measures

3.17 What measures are proposed in the first RBMP to address diffuse pollution as evidenced by poor water quality from diffuse sources on the Access database v57? We note the proposed general Scenario B measures in Annex B for addressing diffuse pollution by targeting high risk farms and working with local authorities and stakeholders, but what specific investigations and actions are planned for the middle Kennet and what specific targets have been set for diffuse pollution in the first RBMP? ARK would like to see specific investigations, actions and targets.

Action ARK to see Helen Jarvie/Paul Whitehead and suggest measures for inclusion.

3.18 Noting the general measure on Page 279 of Annex B to investigate the impacts of sediment on ecological status, what specific plans are there for investigating the middle Kennet? ARK to speak to John Hallet to see KCSRP study

3.19 What measures are proposed to address the known problem of algal blooms in the middle Kennet? As above

3.20 What measures have been considered to address the moderate levels of tributyltin stated on page 334 of Annex B, at what cost and why have they been rejected as disproportionately expensive? What monitoring and investigation has been proposed to address the low confidence in this assessment and when will it be undertaken? EA to provide

4. Og Water Body (reference 23180)

Queries relating to the monitoring network (Figure A1 of Annex A):

4.1 Why is there no monitoring shown for the 8 km of river above Marlborough (apart from flow monitoring)? Please can we see all monitoring data collected in relation to the Og low flow investigation? Local data set – EA to flag up to National team

4.2 Please can we see a schedule showing frequency of monitoring and determinands recorded at each of the monitoring stations in the water body over the past 5 years, and a schedule showing the equivalent for planned future monitoring. Yes – EA to provide

Queries relating to classification (Page 312 of Annex B):

4.3 Please can we see the data and reasoning supporting the classification of invertebrates as good? EA have provided data and will now explain how good classification was reached

4.4 Why have fisheries not been classified, although they were classified as moderate on the Access database v57? Please can we see the data and reasoning to support the classification as moderate on the Access database? No data available

4.5 Please can we see the data and reasoning supporting the classification of flow as not good? Why is the confidence in this assessment high, although Og low flow investigations have not yet been completed? What other data and reasoning has been used to inform this assessment? Classification based on gauged flows and take no account of on-going low flow investigations

4.6

4.6 Please can we see the data and reasoning supporting the phytobenthos classification as moderate?

EA to provide

4.7 Why has chemical status been classified as good, despite poor water quality recorded on the Access database (diffuse sources)? Please can we see the data and reasoning supporting the chemical classification as good?

Ignore – ARK had erroneously thought that nutrient levels were part of chemical status

4.8 Why has no justification been given for failure to achieve GES in this water body by 2015?

EA to provide data sheet when published . Please could EA advise the scope of the data sheets, which Kennet water bodies they will cover and when they will be available.

Queries relating to measures:

4.8 What specific monitoring and investigation is planned to address the low confidence in the good status of phosphates and invertebrates in the water, as stated on page 312 of Annex B? EA to provide

4.9 Please can we see details of the measure proposed on page 279 of Annex B to for "further monitoring to improve understanding of the hydrological regime"? Please could you explain the meaning of the statement "investigation to reduce uncertainty – may go beyond what is required to achieve WFD objectives"? Why is this measure in Scenario C not Scenario B? EA to include Og investigation in list of measures. ARK to highlight Og investigation and measure in their response.

4.10 Noting that the flows in the River Og are recognised as not good on Page 312 of Annex B with high confidence, but any measures dismissed as "disproportionately expensive – measure not worthwhile", please can we see full details of the measures that have been rejected, including their costs and reasons for rejection. What further investigations are planned to find a more cost effective measure? ARK to discuss with Thames Water on 19 March

4.11 What measures are proposed in the first RBMP to address fisheries which are stated to be only moderate on the Access database v57? No data and no measures proposed

4.12 What measures are proposed in the first RBMP to address diffuse pollution as evidenced by poor water quality from diffuse sources which is assessed as high risk on the Access database v57 and has led to moderate amounts of phytobenthos as stated on Page 312 of Annex B? We note the proposed general Scenario B measures in Annex B for addressing diffuse pollution by targeting high risk farms and working with local authorities and stakeholders, but what specific investigations and actions are planned for the Og and what specific targets have been set for diffuse pollution in the first RBMP? No specific measures planned by EA

5. Lower Kennet from Lambourn Confluence to Enbourne Confluence (reference 17420)

Queries relating to the monitoring network (Figure A1 of Annex A):

5.1 Please can we see a schedule showing frequency of monitoring and determinands recorded at each of the monitoring stations in the water body over the past 5 years, and a schedule showing the equivalent for planned future monitoring, both for existing stations and the proposed new monitoring station at Thatcham. Yes – EA to provide

Queries relating to classification (Page 297 of Annex B):

5.1 Why on the mapping tool 'what's in my backyard' does the map appear to show that the predicted ecological quality for 2015 is 'good' (green line) whilst the data in the table says 'poor'. Mistake, would be corrected – an updated version of the database would be sent to ARK in early April.

5.2 Please can we see the data and reasoning supporting the classification of invertebrates as good? EA to provide more explanation

5.3 Please can we see the data and reasoning to support the classification of fisheries as moderate? EA to provide

5.4 Please can we see the data and reasoning supporting the assessment that 'flow support' will be good by 2015. What data supports the current assessment of 'quantity and dynamics of flow' and why is confidence in that assessment low? EA to provide

5.5 Please can we see the data and reasoning supporting the phytobenthos classification as poor? EA to provide

Please can we see data and reasoning supporting the chemical classification as good, noting the high point source pollution recorded on the Access database v57 and the poor phytobenthos status. Ignore – ARK had erroneously thought that nutrient levels were part of chemical status

5.6 Why has no justification been given for failure to achieve GES in this water body by 2015? EA to provide

Queries relating to measures:

5.7 What specific measures are proposed in the first RBMP to result in the current poor phytobenthos status becoming moderate status by 2015? Why has no reason been given for not achieving good status by 2015? Please can we see full details of the measures to achieve good status that have been rejected, including their costs and reasons for rejection. What further investigations are planned to find a more cost effective measure? Diffuse pollution and algal growth will be tackled through KCSRP Diffuse pollution will be tackled through KCSRP. ARK to discuss with John Hallett. ARK to discuss with John Hallett

5.8 Why has no reason been given for not achieving good fishery status by 2015? Please can we see full details of the measures to achieve good status that have been rejected, including their costs and reasons for rejection? What further investigations are planned to find a more cost effective measure? EA to provide

6. Queries applying to several water bodies

We have some queries concerning several Scenario B and C measures applying across a number of catchments, as described on Pages 274 to 282 of Annex B:

6.1 Please can we see details of how the Catchment Sensitive Farming Delivery Initiative is to be applied to the water bodies listed above in the first RBMP? Which water bodies will it apply to, what investigations are planned to identify priority areas and farms, what targets have been set (both input targets in terms of numbers of farms and hectares to be addressed, and out put targets in terms of improved water quality). What is the estimated cost of this measure for the water bodies concerned? No specific details available

6.2 Please can we see full details of what is proposed for the Kennet Chalkstream Restoration Project in the first RBMP? Which water bodies will it apply to, what investigations are planned into specific problems, what specific habitat improvement projects are proposed, what targets have been set (both input targets in terms of numbers of investigations and projects, and out put targets in terms of improvements that can be measured by the monitoring programme)? What is the estimated cost of this measure for the water bodies concerned? ARK to speak directly to John Hallet. EA agreed it was necessary to raise the profile of the project within the plan.

6.3 Please can we see details of the groundwater model that has been used in investigation of low flows in the Kennet and Og, in determining flow regime changes and assessing the effectiveness of measures? What is the technical specification of the model (model type, number of nodes, geographic extent, time period covered, etc)? Please can we see sample output showing modelled groundwater levels and stream flows? Please can we see a list of reports produced using model output? JL was welcome to come to see the Groundwater Model. Thames Water had already supplied some useful data.

6.4 Why is there a specific measure to address declining fish stocks on the Enborne and not on other water bodies which also demonstrate a decline in fish stocks? A similar measure could be suggested for any other water body.

Action for River Kennet , 4 March 2009

Note of meeting between Environment Agency and ARK to discuss ARK's data request of 19 January 2009 (with track changes from Myles Thomas)

Monday 2 March 2009, 10.30 am
Kingsmeadow House, Reading

Present: Myles Thomas (River Basin Programme Manager, EA), Robert Isles (Thames River Basin Manager, EA), John Lawson (Technical Adviser, ARK), Charlotte Hitchmough (Director, ARK).
Apologies: Karen Parker (EA).

In December 2007, during a discussion relating to the Axford abstraction and other pressures on the River, Robert Runcie had assured ARK that the Water Framework Directive would provide a driver to solve many of the Kennet's problems. ARK had been frustrated by the lack of evidence of this in the draft River Basin Management Plan.

ARK would like to play an active and constructive role in the consultation on the draft RBMP. In order to understand how the classifications had been reached, ARK submitted an information request to the Environment Agency on 19 January 2009.

In addition to ARK's own wish to engage in the WFD process, RSPB had commissioned ARK and other organizations to look at how four UK rivers had been treated in the dRBMP. The data request would aid that process.

ARK felt frustration as a consultee and sensed reluctance by the EA to provide the data requested, although thanked the agency for the data received on 26 February, which had been very useful.

The Environment Agency recognized that there was room for improvement in the draft document. The agency was hoping that consultees would respond to the draft by highlighting problems and suggesting measures. However, measures had to be generic and aspirations at a high level to allow flexibility in the plan. The agency was averse to including too many specific, detailed measures because they could not be confident of delivering them.

Comment [R1]: Measures do not need to be generic and there is a mixture of generic and specific in the dRBMP. We will include specific measures in the final plan as long as it is clear how they will be delivered.

The agency would like partners to add measures and actions and comment on existing measures and actions. They were looking for positive engagement.

ARK expressed deep concern about the lack of detail included in the plan. Existing projects and studies, for instance the work on the canal/river interaction as part of the KCSRP, had not been included except as vague statements, for instance 'build relationships with British Waterways'. This lack of detail did not engender confidence that the dRBMP would deliver.

MT said that the national strategy was not to create more detailed plans because the document would become too unwieldy, but agreed to argue the case that more detail should be included some instances.

Comment [R2]: Not quite correct that this was part of the national strategy. We can only include detailed measures where there was reasonable confidence that the measure could be delivered. Where the measure might apply to a range of waterbodies or catchments, a more generic measure terminology has been used. In many cases, more detail of how a generic measure might apply locally is held within the Agenc

JL commented that dRBMP for other rivers (for instance the Wye) did include more detail.

Data availability

ARK thanked the EA for the data they had sent already, which had been useful. JL asked if future data could be accompanied by a short paragraph explaining what had been sent.

ARK's primary focus was to understand the classifications. All ARK's questions on classification were basically the same. ARK would be happy to receive a raw data dump with a worked example which referred to the relevant UK TAG guidance.

ARK were concerned that data used (for example Phosphate) only went up to 2006, despite there being weekly data available up to 2009. ARK requested the weekly phosphate monitoring data from the KCSRP.
Action: CH to ask John Hallet.

EA that standard routine data had been used nationally for the classification process and that it was important to use this data to get a nationally consistent result. Data had been submitted to the National team at the start of the

process, and were the most up to date at the time but more up to date data could now be available. Locally the Agency would argue to national colleagues that recent local data sets should be used. If consultees flagged up the availability of local data this would be helpful. Local staff were aware that there were errors and gaps in the national data sets used to create classifications for the dRBMP.

MT explained that at a local level agency staff were in a few cases struggling to identify which datasets had been used in the dRBMP and that this was part of the reason for the delay in responding to ARK's data request.

Monitoring
JL argued that the EA had missed an opportunity in 2006 (when the WFD work began in earnest) to start collecting missing data for the dRMBP.

EA pointed out that it was not possible to identify all data gaps until the classification was complete and agreed that future monitoring would have to be geared to meeting the requirements of the WFD, however the monitoring strategy would not be revised until the RBMP had been finalized, so would not be included in the plan. A new strategy would be agreed by 2010. ARK suggested that a statement of this intention should be included in the dRBMP.

ARK offered to help collect data. RI welcomed this proposal assuming that it met with EA QA standards. It was agreed that ARK could potentially help with invertebrate data through the Flylife partnership and fishery data from local electrofishing surveys.
Action: ARK to follow up in consultation with appropriate EA staff.

Measures
ARK expressed concern that the plan did not show evidence of existing data or planned research being used to drive measures. ARK would like to see many more specific, date defined targets included in the plan. This would give much more confidence that the plan would deliver actions.

ARK would like to see detail of exactly which measures had been discounted as being 'disproportionately expensive'.

Comment [R3]: I don't recall this being discussed

ARK would like to see a specific measure which treated the Kennet in a holistic way. JL had drafted blocks of text suggesting such a measure for inclusion in the dRBMP, but it had not been included. ARK would be happy to draft terms of reference for such a study and to put a budget together for the work so that it could be included. EA agreed that this would be useful.

ARK would like to see measures to address natural fish recruitment, which appeared to be poor.

In general the EA would like to see ARK propose new measures, support existing measures and help to deliver measures.

Classification
Local EA has already challenged the classification of the whole Upper Kennet as a HMWB. ARK agreed that this classification was not helpful. They suggested that, if it was necessary to recognize the section of river that suffered from canal/river interaction as a HMWB, it should be delineated as a water body in its own right, rather than including the whole stretch downstream of Marlborough, which arguably was in the best condition of all the reaches.

A key purpose of ARK's data request was to understand how classifications had been reached.

Next steps
It was agreed that the EA would try to find as much information as possible in the next two weeks, ie for delivery by 16 March 2009. Progress would be reviewed at a meeting on 25 March. Charging would depend on how long it took to get the necessary information.

Next meeting: Wednesday 25 March, 10.30am, Kingsmeadow House.

Action for the River Kennet
4 March 2009

Note of meeting between EA and ARK to review data request

25 March 2009, 10.30 am
Kingsmeadow House, Reading

Present: Myles Thomas, Fiona Holmes (Sustainable Abstraction Programme, EA), Karen Parker and Robert Isles, John Lawson (Technical Adviser, ARK), Charlotte Hitchmough (Director, ARK).

ARK thanked the EA team for providing the data and discussed a series of queries relating to it.

Phosphate
ARK suggested that a measure was required to relate phosphate levels to ecological impact and then to effort on the ground to address issues (diffuse and point source pollution).

ARK expressed concern that using annual average as the defining criteria for phosphate levels 'smoothed out' evidence of short-term high concentrations ('spikes' in the data). These spikes were believed to cause algal blooms, but another measure could be more research into the impact of short-term increases in P levels.

Taking the example of the Og, the data sets showed that in April May and June 2005, P lelvels exceeded 200mg/l (40mg/l being the target level for headwaters), yet the dRBMP has classified the Og as 'high status' for P. ARK suggested that this classification is wrong. The local EA staff said they would 'tend to agree'.

It was apparent that there is lots of data available for the Kennet, but the difficulty of standardizing it to meet WFD requirements has 'been a challenge' for the EA.

Classification of the Upper Kennet as a HMWB
The local EA team had advised the National team that classification of the upper Kennet was an error, however the re-classification would not be made formal until the final RBMB was published.

The re-classification would put more emphasis on specific ecological factors (fisheries, invertebrates etc.).

ARK suggested urgent action should be taken to fill gaps in the data, for instance a fish survey in the Upper Kennet was required during Summer 2009. EA agreed this would be a start and would check what sampling was already planned for the year. ARK asked the EA to specify a sampling methodology so that ARK could do the survey on behalf of the EA if necessary. EA warned that a single year of data would not have statistical confidence and may not influence the first WFD cycle.

ARK suggested that the water body should be split so that only the section containing the canal was classified as a HMWB. Karen Parker agreed and reported that the local EA team had applied for this change to be made. ARK asked to know exactly where the split would be.

Flow
In terms of the WFD flow alone is a supporting factor, but it needs a link to ecology to drive a measure.

Data used to classify flow for the WFD came from the CAMS assessments and the water resources GIS. They were a simple mass balance equation and did not take into account local pressures.

FH reported that the first RBMP included a measure to investigate the link between flow and ecology.

Perennial heads of the the Kennet and Og
There was a perception that the perennial head of the river was moving upstream. FH confirmed that there was a record of spring surveys which ARK could request (outside the scope of the WFD), which could confirm or refute this.

Additional information requested during meeting
1. A copy of the Bristol University Report containing the diataom data.
2. A map showing the location of the sampling points with their reference numbers

3. Historic data from the abandoned sampling point at Draycot.
4. A briefing note explaining the fish classification system.
5. The data which informed the Fishery Action Plan
6. ARK agreed to fix a meeting with Graham Scholey to better understand the ASPT classification for invertebrates.
7. Karen Parker to tell ARK exactly where amended boundary to the HMWB boundary would be.
8. ARK to ask EA Thames West Customer Liaison Team for 'Springs and Sources Database for the Upper Kennet and Og'.

Action for the River Kennet

28 March 2009

Environment Agency

Thames River Basin District

Response to questions raised by Action for the River Kennet

'Quantity and dynamics if flow'

Flow is a supporting element to the ecology, and abstractions and discharges will have an impact on the flow, which will vary on a day by day basis as flows change.

The Environment Agency has screened abstraction/discharge impacts against 'Environmental Flow indicators' (EFI's) - as described in Appendix E in the dRBMP, and where the impacts are greater than the EFI's we have screened into 3 bands of increased impact.

Calculations on 'Quantity and dynamics of flow' are done in the WR GIS. This is a national system, though the data within the GIS is based on and similar to the data in the WR CAMS ledgers.

The assessment for WFD is done at a WB scale (c8000), whereas CAMS is done at an Assessment Point scale (c1200 sites). Refining of this system will continue over the next few years.

There is uncertainty in the relationship between abstraction impact and ecological change - so EFI's will require further work to assess whether they are valid for screening purposes.

Because of the uncertainties described, screening results on abstraction impact that is greater than the EFI is categorised as poor Low Confidence in most cases.

A programme of work will be undertaken in 1st RBM Planning round to improve the assessment of abstraction/discharge impact, and to improve the understanding of the relationship between abstraction impact and ecological change.

Electro fishing surveys by local fishery owners.

At present fisheries monitoring is carried out by the area monitoring teams. However there are several ways in which ARK could assist the Environment Agency's monitoring.

1. Joining and assisting Agency lead monitoring.

2. Collecting data from the fishery owners.

3. Contracting another third party to survey the river.

Method 1.

There would be significant health and safety and liability issues for the Environment Agency for this method. However in some areas seasonal 'staff' have been employed to assist with fisheries monitoring. These individuals receive all the necessary training etc, and this is probably the best way for ARK members to assist. Enquire about these opportunities should be directed to the local area office.

Method 2

Environment Agency monitoring follows strict methodologies to ensure data are collected in a consistent way etc. In theory, with adequate training, monitoring carried out by third parties could achieve the same. It is important to understand that monitoring activities need to be supervised by a technically competent person that can make sound judgements about the methodologies used and the quality of any data collected.

Method 3

It has been suggested that there are companies and local contacts which ARK could contract

In any survey done it would be advantageous to survey similar locations to previous Environment Agency monitoring points.

It should be noted that the Environment Agency is due to monitor three locations in the Upper Kennet this autumn as part of the routine 5 year monitoring.

Information reliability

The reliability of a single fish survey will depend on the what the data are to be used for. It is important to understand that there is considerable spatial and temporal variation in fish populations. Because of this a single seasons data would have no value whatsoever in terms of detecting temporal trends, but may be a useful indicator of spatial variation and presence/absence. Monitoring programmes are designed to ensure that data collected are fit for purpose, so any ad hoc monitoring needs to be fitted to an organised monitoring regime.

Fish Classification Scheme (FCS)

FCS uses the combined ratio between the expected and observed fish assemblage to arrive at a classification. The boundary between good and moderate status is therefore a point in the distribution of this ratio. It cannot be defined in terms of a particular fish assemblage. FCS also considers a wide range of fish species, some of which may not be the target species of concern. Ie the occurrence of Bullheads for example could well bring up the classification even if brown trout are still low.

Fish survey information

John Hallett will be sending on this information however the data collected may be too far down the river and not cover the Upper reaches of the Kennet as discussed.

Andy Kilingbeck Environment Agency fisheries officer has been in touch previously regarding fish populations.

River Restoration

It is possible there are some locations where river restoration would help the recruitment of brown trout and two projects are on the cards or need funding. These could be put in as WFD measures, in particular Stone Bridge lane and at West Overton.

It is essential that any involvement with river restoration has the full agreement of the Environment Agency. In this way restoration can be integrated into a consistent approach to improving the river as a whole and benefits to the environment can be maximised.

Bristol University diatom surveying

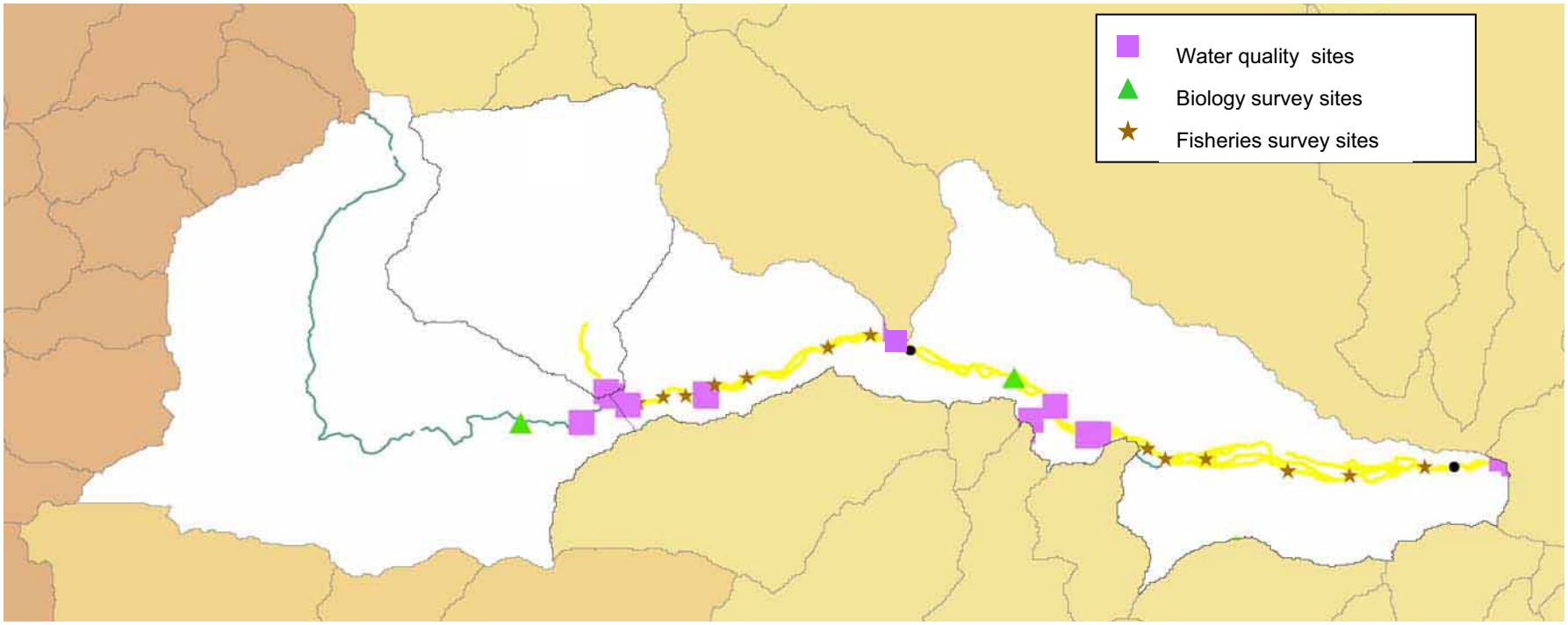
The Bristol University/UCL work and diatom data was required to build the classification tool. The contractors designed a random network of sites across England and Wales in order to get data from differing conditions. The samples were analysed for use in the diatom tool and not for water quality of the individual sites and therefore did not result in a water quality report for the Kennet. This was completed in 2004-2005 and the tool was finished in 2006. There is no interpretation of the local results.

Robert Iles

Principal Officer WFD

Kennet Classification Document
Classification methodology for River Kennet

Kennet: Map of Upper, Middle and Og water bodies



Combining quality element results to provide an overall water body classification

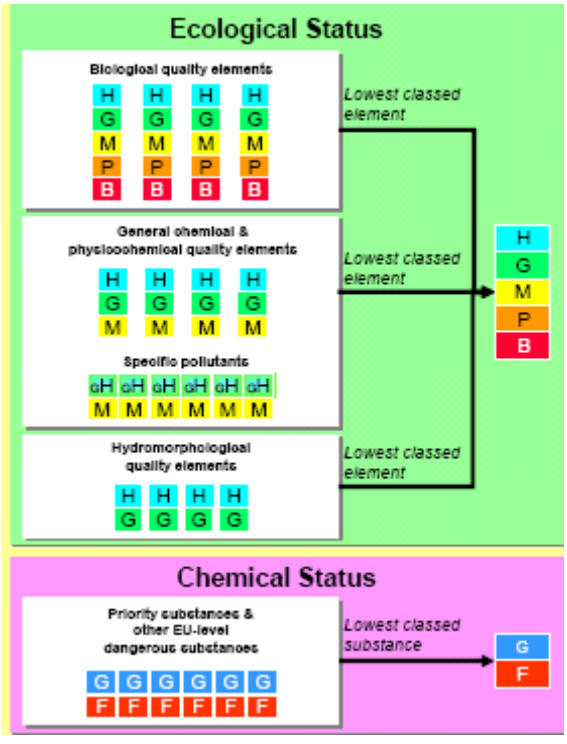
For surface waters there are two, separate, classifications for water bodies, ecological and chemical.

An ecological classification is summarised below and comprises:

- Biological factors (Fish, Invertebrates, Diatoms and Macrophytes)
- Concentrations of supporting physico-chemical elements, (pH, Dissolved Oxygen, Ammonia and Phosphates)
- Specific Pollutants identified within the UK as being a cause of concern to ecology.
- And for high status, largely undisturbed hydromorphology

Ecological status class is recorded on the scale of high, good, moderate, poor or bad. 'High' denotes largely undisturbed conditions and the other classes represent increasing deviation from this undisturbed, or reference, condition. The ecological status classification for the water body is determined by the worst scoring quality element. The following diagram illustrates the criteria determining the different ecological status classes.

We also look at Priority Substances identified by the European Union as being potentially harmful to human health and ecology. These results are not part of the ecological status of a water body. These results are used for a separate chemical classification measures as Pass or Fail.



Most importantly, the lowest classification determines the overall ecological status.

We need to make assessments for the substances where we know they are discharged into the catchment in significant quantities. We establish this in two ways:

- Using data from existing river monitoring data sets to find substances that are close to, or often exceed, the threshold.
- Using knowledge about the discharges that are licensed in the catchment.

We routinely assess rivers down stream of sewage works for a range of priority substances as is the case of Marlborough Sewage treatment works.

Many of the specific pollutant substances, such as copper and zinc, occur naturally in our catchments.

Monitoring Activities

Risk Assessment information

WB ID	Name	Overall risk	Risks
GB106039023171	Upper Kennet	High	Over-abstraction and low flows, morphology, alien species
GB106039023172	Lower Kennet	High	Over-abstraction and low flows, morphology, alien species
GB106039023180	Og	High	Over-abstraction and low flows, morphology

The risk assessment information above shows pressures that may cause water bodies to fail to meet good status by 2015. The assessments in this part of the Kennet identify abstraction, morphological pressures (weirs for example) and alien species. The Environment Agency has classification tools that can be used to measure the impact of abstraction and morphology, but is still developing an approach to assessing the impact of alien species[1].

The classification tools that can be used to detect the impact of abstraction and morphology are RiCT (macro-invertebrates), LEAFPACS (macrophytes) and FCS+ (fish). All three water bodies are surveyed for macro-invertebrates as part of our operational monitoring programme. Surveys carried out for our national fisheries monitoring programme are used to supplement the macro-invertebrate monitoring in the Middle Kennet water body.

We have also made best use of the monitoring we carried out for R&D purposes when developing the diatom classification tool. The Og was monitored in 2004/05 for this purpose and the data supplied by Bristol University has been included in the draft classifications.

[1] Alien species are currently used only to distinguish water bodies at High status from water bodies at Good status.

All water bodies have flow gauging stations at selected locations. The flow conditions can be modelled at any location between gauging stations using Low Flows 2000.

Monitoring points

WB ID	Types of WFD monitoring available	Number of stations and details
GB106039023171	Water chemistry [2] and macro-invertebrates	Physico-chemical site ID: PKER.0041 Macro-invertebrate site ID: 36079
GB106039023180	Water chemistry [3], diatoms and macro-invertebrates (plus diatom R&D monitoring)	Physico-chemical site ID: PKER.0074 Macro-invertebrate site ID: 35965 Diatom site ID: 70364[4] (35965)
GB106039023172	Water chemistry[5], fish, diatoms and macro-invertebrates	Physico-chemical site ID: PKER.0041, PWER.0011, PKER.0045, PKER.0052, PKER.0092, PKER.0160, PKER.0179, PKER.0180, PKER.0205, PKER.0263 Macro-invertebrate site ID: 35491, 34379, 35490 Diatom site ID: 70364 Fish site IDs: 10233, 10236, 10242, 10300, 12321, 12506, 13652, 13655, 7295, 7299, 8982, 8983, 9366

The location of our survey locations are shown in the map. These will have been determined by our local monitoring teams who use the following considerations:

- Selection of a site that can be used to represent the water body as a whole entity[6]
- Selection of a site that allows for safe access the river, including parking of vehicles and access arrangements with land owners

[2] Including specific pollutants
[3] Including specific pollutants and priority substances
[4] This ID is the one used by the diatom tool development R&D Project
[5] Including specific pollutants
[6] Some of our monitoring locations are chosen to provide data for other established monitoring programmes. For example, most of our macro-invertebrate and physico-chemical monitoring locations were designed around our GQA programme. We consider these sites as being appropriate to also use for WFD assessments.

- Practicalities of the survey are also a consideration. For example, macro-invertebrate surveys are based on “kick-sampling” the available habitat, so access to pools and riffles must be possible. Where we need to visit a river on a monthly basis, locations are avoided where the river does not run for several months a year.

Classification data from our monitoring locations

Below are a series of tables that show classification results for each water body, for each quality element, for each site.

Where we have more than one survey location within a water body the overall assessment for each quality element is taken from the average of the scores. Our biological classification tools take a slightly more advanced approach than the mathematical average. The fish classifications tool, FCS+, makes use of Bayesian probability. For river macro-invertebrates[7] we use a model created by WRC[8] that adds an extra safety margin to our overall classification – in case the location of our monitoring sites cause us to miss particularly polluted or impacted sections of river.

All biological classifications are based on the basic principle of dividing an observed survey score by the expected survey score to get an Environment Quality Ration. Generally speaking, 1 is equivalent to high status, 0.1 is equivalent to bad status. Each classification applies its own thresholds. The threshold values will change depending on the physical nature of the water body – the typology.

The supporting physico-chemical classifications are based on environmental standards. The standard is determined by the typology – and the combinations can be found in the UKTAG Environmental standards and conditions document. Generally speaking this catchment is categorised as a ‘low altitude, high alkalinity’ river. So for instance, the soluble reactive phosphorus typology is type 3n or 4n, with the boundary between good and moderate status being an annual mean concentration of 120 ug/l.

[7] And diatoms
[8] Water Research Council, then tool has been given the name VISCOUS.

MONITORING DATA FOR THE MIDDLE KENNET

Abbreviations

CoC – Confidence of Class
GES – Good Ecological Status
Det – Determinant or substance e.g. ammonia
EQR – Environment Quality Ration
Exp – Expected
Conc – Concentration
Conf – Confidence
Prob – Probability
Obs – Observed
SD- Standard Deviation

Table 3. Fish : Water body level classification, from FCS+

Water Body ID	Sampled in 2001-2005?	CoC Bad	CoC Poor	CoC Moderate	CoC Good	CoC High	Probability of good ecological status (GES)	Most probable class
GB106039023172	Yes	0.000	0.340	0.660	0.000	0.000	0.000	Moderate

Table 4. Fish: Site level classification, from FCS+

NFPD Site ID	NGR	Easting	Northing	Region	Location	Site	Site Name	Year	EQR	Class
10233	SU2135869480	421358	169480	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ WERG MILL, MILDENHALL	Werg Mill, Mildenhall	2005	0.293	Moderate
10236	SU2209069506	422090	169506	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ SHEEPDROVE BEND	Sheepdrove Bend	2005	0.310	Moderate
10242	SU2055869285	420558	169285	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ ELCOT	Elcot	2005	0.366	Moderate
10300	SU4619067182	446190	167182	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ NORTHCROFT RECREATION CENTRE - WEST MILLS	Northcroft Recreation Centre- West Mills	2005	0.134	Bad

12321	SU3715367786	437153	167786	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ PIPE STREAM - WILDERNESS	Pipe Stream – Wilderness	2005	0.438	Good
12506	SU3773367447	437733	167447	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ WILLOW STREAM - BARTON COURT	Willow Stream – Barton Court	2005	0.139	Bad
13652	SU4173267037	441732	167037	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ MARSH BENHAM/	Marsh Benham	2005	0.241	Poor
13655	SU4374566895	443745	166895	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ BATHING POOL TO BARNETS HATCH	Bathing Pool to Barnets Hatch	2004	0.282	Moderate
7299	SU2672471092	426724	171092	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ HARBROOK,RAMSBURY	Harbrook, Ramsbury	2005	0.313	Moderate
8982	SU2409870091	424098	170091	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ WHITE BRIDGE - AXFORD/	White Bridge - Axford	2002	0.282	Moderate
8983	SU2811671515	428116	171515	Thames	ALL LOCATIONS/ THAMES/THAMES WEST	THAMES/RIVER KENNET/ HOWE MILL	Howe Mill	2005	0.358	Moderate
9366	SU3905067450	439050	167450	Thames	ALL LOCATIONS/ THAMES/THAMES SALMON REHABILITATION SCHEME	PIPESTREAM RIVER KENNET	Pipestream River Kennet	2002	0.268	Poor

Table 5. Water Quality: Site level classification

SPT Code	Water Body ID	Easting	Northing	Det Name	Conc Summary Stat	Status class	Conf in class %	Conf In class	Conf FAIL GOOD %	Conf FAIL GOOD
PKER0011	GB106039023172	435210	168247	Ammonia	0.114	HIGH class	100	High conf class	0	Pass
PKER0045	GB106039023172	434130	169157	Ammonia	0.0402	HIGH class	100	High conf class	0	Pass
PKER0052	GB106039023172	422759	169488	Ammonia	0.136	HIGH class	100	High conf class	0	Pass
PKER0092	GB106039023172	435200	168200	Ammonia	0.0879	HIGH class	100	High conf class	0	Pass
PKER0160	GB106039023172	435550	168227	Ammonia	1.18	POOR class	73.833	Medium conf class	100	Fail Good High conf
PKER0179	GB106039023172	420220	169186	Ammonia	0.359	GOOD class	82.134	Medium conf	0.397	Pass
PKER0180	GB106039023172	419680	169493	Ammonia	0.0192	HIGH class	100	High conf class	0	Pass
PKER0205	GB106039023172	433350	168700	Ammonia	0.0704	HIGH class	100	High conf class	0	Pass
PKER0263	GB106039023172	435364	168243	Ammonia	0.37	GOOD class	67.098	Medium conf class	6.921	Pass
PKER0011	GB106039023172	435210	168247	Dissolved Oxygen	82.6	HIGH class	78.362	Medium conf class	1.169	Pass
PKER0045	GB106039023172	434130	169157	Dissolved Oxygen	95.1	HIGH class	100	High conf class	0	Pass
PKER0052	GB106039023172	422759	169488	Dissolved Oxygen	88.6	HIGH class	99.587	High conf class	0	Pass
PKER0092	GB106039023172	435200	168200	Dissolved	92.5	HIGH	99.96	High conf	0	Pass

				Oxygen		class		class		
PKER0160	GB106039023172	435550	168227	Dissolved Oxygen	84.7	HIGH class	93.251	Medium conf class	0.096	Pass
PKER0179	GB106039023172	420220	169186	Dissolved Oxygen	81.4	HIGH class	67.52	Medium conf class	1.666	Pass
PKER0180	GB106039023172	419680	169493	Dissolved Oxygen	84.2	HIGH class	89.083	Medium conf class	0.358	Pass
PKER0205	GB106039023172	433350	168700	Dissolved Oxygen	91.4	HIGH class	99.962	High conf class	0	Pass
PKER0263	GB106039023172	435364	168243	Dissolved Oxygen	86.1	HIGH class	97.94	High conf class	0.01	Pass
PKER0045	GB106039023172	434130	169157	Phosphate	0.0542	GOOD class	88.388	Medium conf class	0	Pass
PKER0052	GB106039023172	422759	169488	Phosphate	0.0798	GOOD class	100	High conf class	0	Pass
PKER0092	GB106039023172	435200	168200	Phosphate	0.0289	HIGH class	99.274	High conf class	0	Pass
PKER0160	GB106039023172	435550	168227	Phosphate	0.111	GOOD class	76.855	Medium conf class	23.145	Pass
PKER0179	GB106039023172	420220	169186	Phosphate	0.102	GOOD class	92.858	Medium conf class	7.142	Pass
PKER0180	GB106039023172	419680	169493	Phosphate	0.0421	HIGH class	89.276	Medium conf class	0	Pass
PKER0205	GB106039023172	433350	168700	Phosphate	0.0362	HIGH class	93.579	Medium conf class	0	Pass
PKER0263	GB106039023172	435364	168243	Phosphate	0.0592	GOOD class	83.122	Medium conf	0	Pass

								class		
PKER0011	GB106039023172	435210	168247	pH lower	7.74	HIGH class	100	High conf class	0	Pass
PKER0045	GB106039023172	434130	169157	pH lower	7.78	HIGH class	100	High conf class	0	Pass
PKER0052	GB106039023172	422759	169488	pH lower	7.63	HIGH class	100	High conf class	0	Pass
PKER0092	GB106039023172	435200	168200	pH lower	7.91	HIGH class	100	High conf class	0	Pass
PKER0160	GB106039023172	435550	168227	pH lower	7.75	HIGH class	100	High conf class	0	Pass
PKER0179	GB106039023172	420220	169186	pH lower	7.52	HIGH class	100	High conf class	0	Pass
PKER0180	GB106039023172	419680	169493	pH lower	7.45	HIGH class	100	High conf class	0	Pass
PKER0205	GB106039023172	433350	168700	pH lower	7.87	HIGH class	100	High conf class	0	Pass
PKER0263	GB106039023172	435364	168243	pH lower	7.76	HIGH class	100	High conf class	0	Pass
PKER0011	GB106039023172	435210	168247	pH upper	8.1	HIGH class	100	High conf class	0	Pass
PKER0045	GB106039023172	434130	169157	pH upper	8.34	HIGH class	100	High conf class	0	Pass
PKER0052	GB106039023172	422759	169488	pH upper	8.15	HIGH class	100	High conf class	0	Pass
PKER0092	GB106039023172	435200	168200	pH upper	8.34	HIGH class	100	High conf class	0	Pass
PKER0160	GB106039023172	435550	168227	pH upper	8.09	HIGH class	100	High conf class	0	Pass
PKER0179	GB106039023172	420220	169186	pH upper	7.96	HIGH class	100	High conf class	0	Pass
PKER0180	GB106039023172	419680	169493	pH upper	8.01	HIGH class	100	High conf class	0	Pass
PKER0205	GB106039023172	433350	168700	pH upper	8.33	HIGH class	100	High conf class	0	Pass

PKER0263	GB106039023172	435364	168243	pH upper	8.13	HIGH class	100	High conf class	0	Pass

Table 6. Macro-invertebrate classifications – site level

Run Name	Site ID	Index Name	Year	Obs	Exp	Bias Corr Class	Most Prob Class	Prob of Most Prob Class	Prob of High	Prob of Good	Prob of Moderate	Prob of Poor	Prob of Bad	SD	EQR	Water Body ID Classification
twe2006	34379	NTAXA	2007	34	30.781	H	H	99.65	99.65	0.35	0	0	0	0.10609946	1.11113502	GB106039023172
twe2006	34379	ASPT	2007	5.38	5.439	G	H	49.4	49.4	49.06	1.54	0	0	0.05259257	0.96925941	GB106039023172
twe2006	34379	MINTA	2007			G	H	49.4	49.4	49.06	1.54	0	0			GB106039023172
twe2007	35490	NTAXA	2007	33	31.405	H	H	96.92	96.92	3.06	0.02	0	0	0.09816905	1.020577	GB106039023172
twe2007	35490	ASPT	2007	5.7	5.555	H	H	65.69	65.69	33.88	0.43	0	0	0.05118843	0.98997101	GB106039023172
twe2007	35490	MINTA	2007			H	H	65.69	65.69	33.88	0.43	0	0			GB106039023172
twe2007	35491	NTAXA	2007	25	30.383	G	G	59.98	25.22	59.98	14.63	0.17	0	0.08805245	0.79678779	GB106039023172
twe2007	35491	ASPT	2007	6.28	5.528	H	H	99	99	1	0	0	0	0.05213065	1.08711607	GB106039023172
twe2007	35491	MINTA	2007			G	G	59.98	25.22	59.98	14.63	0.17	0			GB106039023172

Table 7. Macro-invertebrate classifications – water body level

WBID	Boundary	Calculation	No Samples	Calc Date	Class	Conf Class	Rules
GB106039023172	NTAXA_2007	Mean	3	01-May-08	High	94.1685609	Worst Case

MONITORING DATA FOR THE UPPER KENNET

Table 8. Water Quality Classifications – site level

SPT Code	WBID	Easting	Northing	Det Name	Conc Summary Stat	Status class	Conf better class%	Conf in class%	Conf in class	Conf FAIL_GOOD%	Conf FAIL GOOD
PKER0041	GB106039023171	418702	168621	Ammonia	0.00845	HIGH class		100	High conf class	0	Pass
PKER0041	GB106039023171	418702	168621	Dissolved Oxygen	84.7	HIGH class		98.856	High conf class	0	Pass
PKER0041	GB106039023171	418702	168621	Phosphate	0.0434	HIGH class		88.286	Medium conf class	0	Pass
PKER0041	GB106039023171	418702	168621	pH lower	7.39	HIGH class		100	High conf class	0	Pass
PKER0041	GB106039023171	418702	168621	pH upper	7.93	HIGH class		100	High conf class	0	Pass

Table 9. Macro-invertebrate classifications – site level

Run Name	Site Id	Suit Code	Index Name	Year	Obs	Exp	Bias Corr Class	Most Prob Class	Prob of Most Prob Class	Prob of High	Prob of Good	Prob of Moderate	Prob of Poor	Prob of Bad	SD	Water body ID Classification
twe2007	36079	1	NTAXA	2007	29	30.627	H	H	83.52	83.52	16.05	0.43	0	0	0.09647806	GB106039023171
twe2007	36079	1	ASPT	2007	5.17	5.469	G	G	72.36	16.65	72.36	10.96	0.03	0	0.0522428	GB106039023171

twe2007	36079	1	MINTA	2007			G	G	72.36	16.65	72.36	10.96	0.03	0		GB106039023171

Macro-invertebrate classifications – water body level

Water Body ID	Boundary	Calculation	No Samples	Calc Date	Class	Conf Class	Rules
GB106039023171	ASPT_2007	Mean	1	01-May-08	Good	66.2195973	Worst Case

MONITORING DATA FOR THE RIVER OG

Table 10. Water Quality Classifications – site level

Sample point Code	Water body ID	Easting	Northing	Det Name	Conc Summary Stat	Status class	Conf in Class %	Conf in class	Conf FAIL GOOD %	Conf FAIL GOOD
PKER0074	GB106039023180	419498	169628	Ammonia	0.00736	HIGH class	100	High conf class	0	Pass
PKER0234	GB106039023180	417500	177970	Ammonia	0.0704	HIGH class	100	High conf class	0	Pass
PKER0074	GB106039023180	419498	169628	Dissolved Oxygen	82.5	HIGH class	79.172	Medium conf class	0.69	Pass
PKER0234	GB106039023180	417500	177970	Dissolved Oxygen	87.5	HIGH class	94.136	Medium conf class	0.691	Pass
PKER0074	GB106039023180	419498	169628	Phosphate	0.0432	HIGH class	71.766	Medium conf class	0	Pass
PKER0234	GB106039023180	417500	177970	Phosphate	0.457	POOR class	65.464	Medium conf class	83.513	FAIL Good Low conf
PKER0074	GB106039023180	419498	169628	pH lower	7.35	HIGH class	100	High conf class	0	Pass
PKER0234	GB106039023180	417500	177970	pH lower	7.87	HIGH class	100	High conf class	0	Pass

PKER0074	GB106039023180	419498	169628	pH upper	7.9	HIGH class	100	High conf class	0	Pass
PKER0234	GB106039023180	417500	177970	pH upper	8.33	HIGH class	100	High conf class	0	Pass

Table 11. Macro-invertebrate classifications – site level

Run Name	Site ID	Suit Code	Index Name	Year	Obs	Exp	Bias Corr Class	Most Prob Class	Prob of Most Prob Class	Prob of High	Prob of Good	Prob of Mode rate	Prob of Poor	Prob of Bad	SD	EQR	Water body ID
twe2007	35965	1	NTAXA	2007	28	29.851	H	H	76.49	76.49	22.65	0.85	0.01	0	0.0958 6798	0.91707 842	GB106039 023180
twe2007	35965	1	ASPT	2007	5.43	5.438	G	G	52.16	45.94	52.16	1.9	0	0	0.0523 6098	0.96500 789	GB106039 023180
twe2007	35965	1	MINTA	2007			G	G	52.15	45.93	52.15	1.91	0.01	0			GB106039 023180

Table 12. Macro-invertebrate classifications – water body level

Water body ID	Boundary	Calculation	No Samples	Calc Date	Class	Conf Class	Rules
GB106039023180	ASPT_2007	Mean	1	01-May-08	Good	48.814672	Worst Case

Table 13. Phytobenthos (diatom) water body level classification

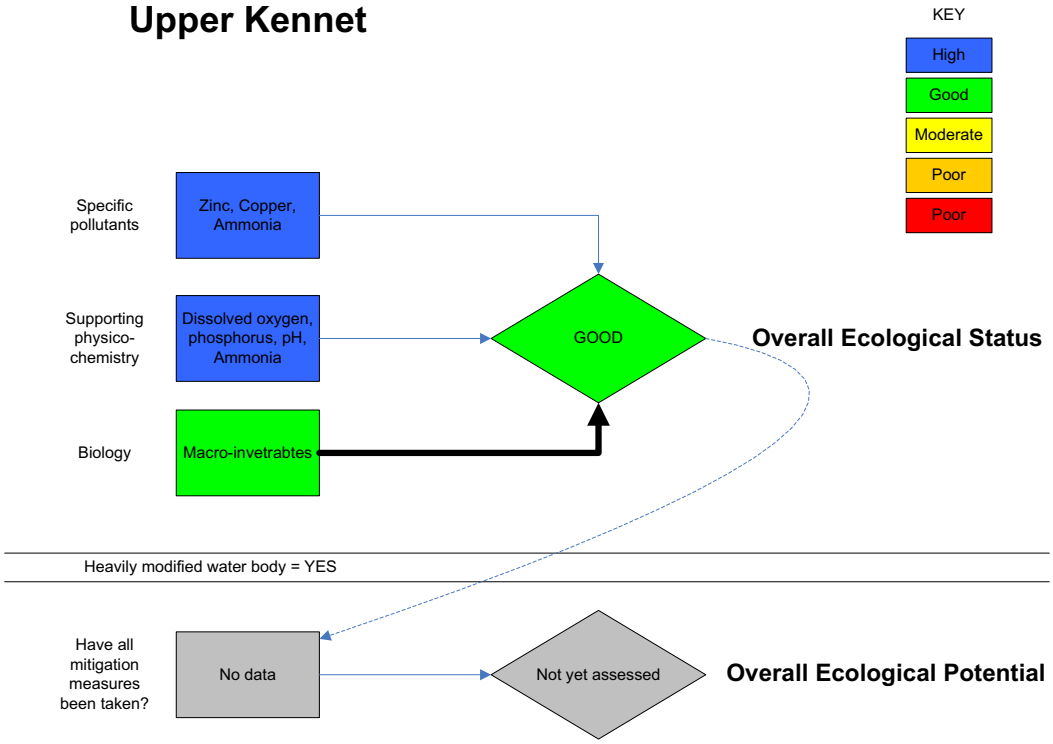
Site No	Collection	Reach	Stream	NGR	Easting	Northing	No. Sample	Min Date	Max Date	Min EQR	Max EQR
70364 (35965)	DARES	100m above Kennet	OG	SU19506960	419500	169600	2	02-Apr-04	07-Sep-05	0.689 6588 47	0.7960 96815

Mean EQR	Min Class	maxClass	meanClass	CoCH	CoCG	CoCM	CoCP	CoCB
0.742877831	Moderate	Good	Moderate	0.096369	33.77227	63.823112	2.3073251	0.000923

Water body ID	Boundary	Calculation	High	Good	Moderate	Poor	Bad	Face Value Class	CoC Face	Most Likely Class	CoC Most Likely
GB10603 9023180	Diatoms-TDI	Mean	1.963190179	28.337382 77	68.62788917	1.0715378 82	0	Moderate	68.62788917	Moderate	68.62788917

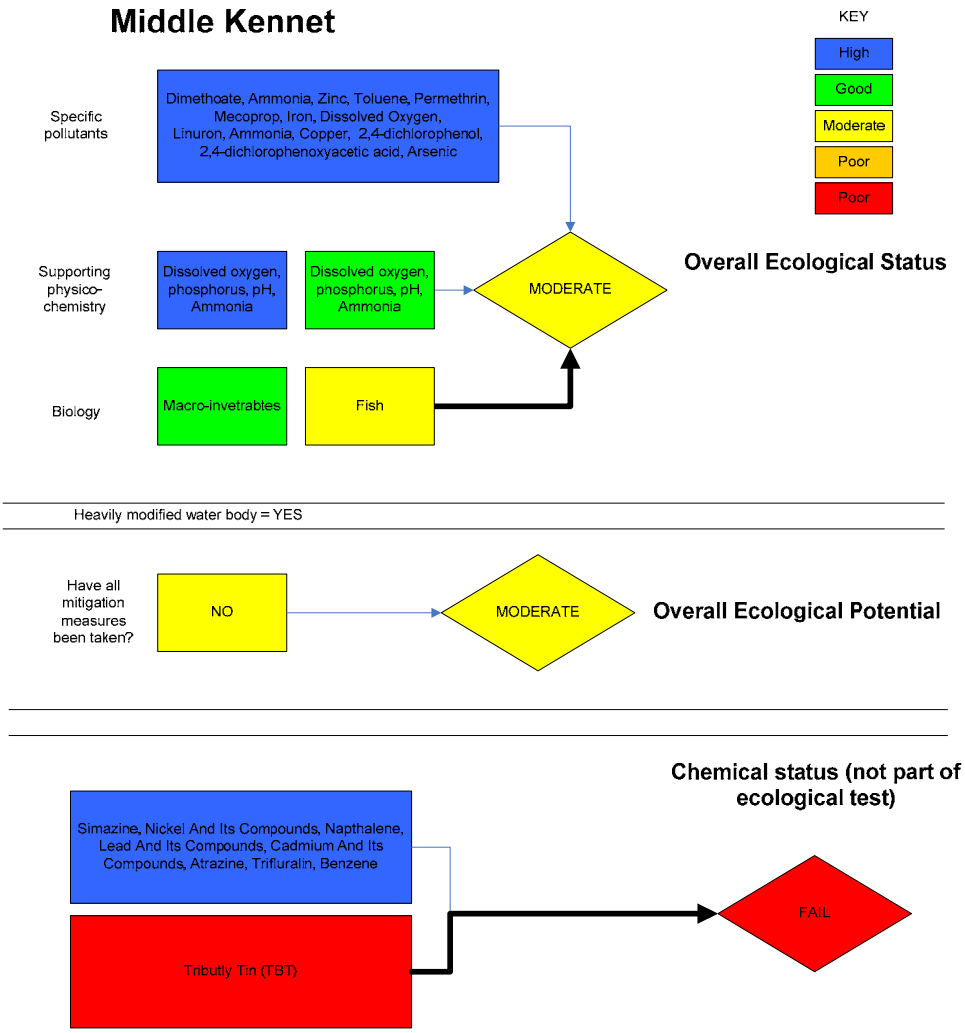
The decision processes for classifying each water body are illustrated below.

For simplicity the hydromorphological quality elements that determine whether a water body is high status or not high status have not been included. In all water bodies the result was 'not high'.



- The Upper Kennet is at good ecological status.
- The element that determines this classification is macro-invertebrates.
- The water body is considered heavily modified (see the Designation Process Summary Note. This part of the classification has been reviewed by local staff and advice sent to national tams that the Upper Kennet be considered a normal river not a Heavily Modified one).
- Heavily modified water bodies need to be assessed in terms of their ecological potential in addition to their current status.
- The first step to establish their potential is to find out whether all the steps we (and others) can do to remove the heavy modifications have been taken[9].
- But the mitigation measures approach was not complete at the time of issuing the draft plans.
- So the overall ecological potential assessment – which should be applied to heavily modified water bodies – is 'not yet assessed'.

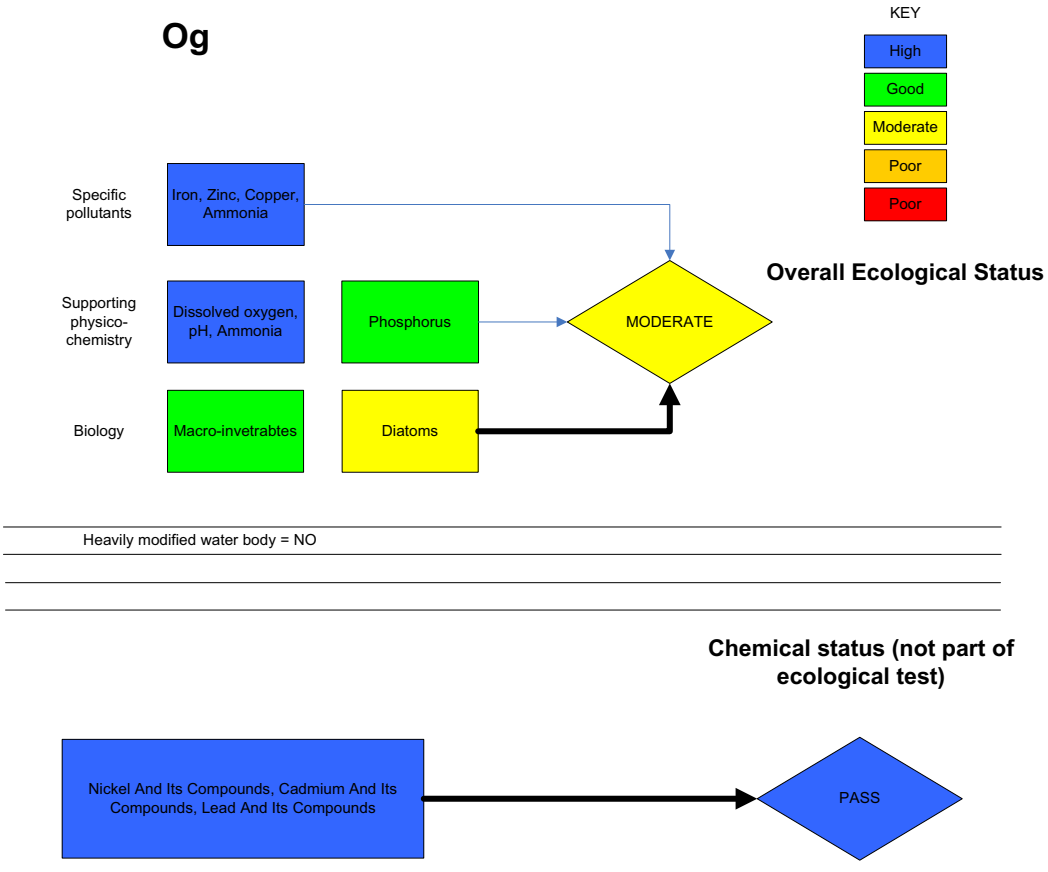
[9] These steps are referred to as mitigation measures



- The middle Kennet is at moderate ecological status.
- The reason is because of the fish classification.
- The middle Kennet is heavily modified.
- Heavily modified water bodies need to be assessed in terms of their ecological potential in addition to their current status.
- The first step to establish their potential is to find out whether all the steps we (and others) can do to remove the heavy modifications have been taken[10].
- If all steps have been taken then the water body can be classed as being at 'good ecological potential'. If not, it defaults to moderate ecological potential.
- In the case of the Middle Kennet, there are still some steps[11] that haven't been taken so the water body defaults to moderate ecological potential.

[10] These steps are referred to as mitigation measures
[11] Increase the diversity of the shape of the river channel

- We then need to do a quick cross-check with the elements that comprise the original status classification to make sure that
    - There is nothing that should make us report the potential as 'poor', or;
    - If all biological elements are either High or Good, we would consider removing the heavily modified designation as it would be clear that modifications do not have an impact.
- Neither of these apply to this water body
- So the overall ecological potential is moderate.
- Because of Marlborough Sewage Treatment Work we also look for priority substances in the Middle Kennet.
- We assess a range of substances, and one of these, TBT, was found to exceed the EU threshold.
- Therefore this water body has an additional chemical classification of 'Fail'.
- Chemical classification is not part of the ecological classification.



- The upper Kennet is at moderate ecological status.
- The element that determines this classification is diatoms.
- The water body is not heavily modified.

Summary of WFD typologies and standards

The Water Framework Directive (WFD) typology (type) categories for rivers are summarised in Tables 1-3 (as taken from the UKTAG Final Phase 1 Report on Environmental Standards & Conditions).

Table 1: WFD 'Basic' river typologies for water quality standards

Altitude (metres)	**Alkalinity** (as mg/l of CaCO3)				
	< 10	**10 – 50**	**50 – 100**	**100 – 200**	**> 200**
< 80 m	**Type 1**	**Type 2**	**Type 3**	**Type 5**	**Type 7**
> 80 m			**Type 4**	**Type 6**	

Similarity of standards across these 7 basic types resulted in a simpler typology for Ammonia and Dissolved Oxygen (including BOD) standards which is:

Table 2: WFD simplified 'DO 2type' river typologies for water quality standards

DO 2type	Description	Basic types this applies to
1	Upland & Low Alkalinity (UpLA)	1, 2, 4, 6
2	Lowland & High Alkalinity (LowHA)*	3, 5, 7

* Note: Where a Lowland & High Alkalinity waterbody is a salmonid river the standards for Upland & Low Alkalinity should be applied.

Table 3: WFD 'Nutrient' river typologies for water quality standards

Altitude (metres)	**Alkalinity** (as mg/l of CaCO3)	
	< 50	**> 50**
< 80 m	**Type 1n (1)**	**Type 3n (3)**
> 80 m	**Type 2n (2)**	**Type 4n (4)**

Table 4 shows the sets of WFD standards that apply to the resulting combinations of type categories.

Table 4: WFD water quality standards for rivers

Target set	DO 2type category	Nutrient type category	DO (% satn) 10%ile	Amm (mg/l) 90%ile	SRP (mg/l) Annual Average
1	**1** (UpLA)	**2**	75	0.3	0.04
2	**1** (UpLA)	**1**	75	0.3	0.05
3	**1** (UpLA)	**3 or 4**	75	0.3	0.12
4	**2** (LowHA)	**3 or 4**	60	0.6	0.12

MEETINGS WITH RIPARIAN OWNERS ON THE KENNET

Date	Location	Contacts
11 March 2009	Manor Farm, Avebury Trusloe	Robin Butler, Manor Farm Tim Clarke, FWAG
5 January 2009	Stonebridge Lane, Marlborough	Andy Thomas, Wild Trout Trust
26 February 2009	Coombe Farm, Stitchcombe, Marlborough	John &Valerie Burrows, Coombe Farm
27 March 2009	Priory Farm, Ramsbury	Alistair Ewing (Estate Manager)
19 February 2009	Rasmbury Manor Estate	William Hughes, Smiths Gore (Estate Agent) Tom Taylor (Estate Manager)
13 March 2009	Ramsbury Mill, Ramsbury	Eddie Starr (Keeper)
13 March 2009	Hungerford Town and Manor Fishery	Rob Starr (Keeper)
24 February 2009	Sir Richard Sutton Settled Estates, Marsh Benham, Newbury	Gary Allen (Keeper) John (Keeper) Jonathan Russell(Estate Manager)

MANOR FARM, AVEBURY TRUSLOE

ARK visited Manor Farm Avebury Trusloe to observe a Catchment Sensitive Farming discussion group run by catchment sensitive farming officers Tim Clarke and Kate Ody. The group was attended by local farmers all of whom managed land on the winterbourne Kennet.

Manor Farm is mixed farm on the winterbourne Kennet (above Swallowhead Springs) at Avebury Trusloe. The farm is managed according to best practice. This includes fencing the river, leaving buffer strips and operating a minimum tillage system. The farmer treats the winterbourne as a watercourse, for instance constructing bridges over the winterbourne streams (photo below) despite the fact they can be dry for months, or even years at a time.

The winterbourne only supports a fish population after sustained flows for a year or more.

Bridge in bottom right corner of picture is constructed over a winterbourne spring which may only flow for a few months.

During their discussion the farmers expressed the strong opinion that much of the water pollution blamed on farmers in fact came directly from roads and the Ridgeway path. They would like to see the **Highway authorities** held to account and forced to include (for instance) sediment traps on highway drains, and to keep drains clear of sediment by clearing them regularly.

During our visit in March the feeder streams were flowing and the winterbourne had been recently dredged by the Environment Agency as a flood control measure (above). Whilst some sections were flowing and clear, others were full of brown algae overleaf).

Brown algae in the upper Kennet, Avebury Trusloe

Heavy rainstorm causing sediment-laden runoff to stream from the Ridgeway, onto the A4 and down the drain to the Kennet (2008). Farmers feel that they are blamed for this runoff.

STONEBRIDGE LANE, MARLBOROUGH

Members of the ARK committee visited Stonebridge Lane with Andy Thomas from the Wild Trout Trust to assess its potential as a demonstration reach. The full report is included on the CD which accompanies this report.

Stonebridge Lane, with laminar flows and a silty bed is a site ripe for enhancement.

COOMBE FARM, STITCHCOMBE

Introduction
Coombe Farm is a 165 acre sheep farm with land bordering the River Kennet above Hoppers Hatches, owned and managed by John and Valerie Burrows.

The reach was part of the Upper Kennet Rehabilitation Project (UKRP), a scheme carried out in partnership between Thames Water, the EA, English Nature, ARK and local landowners in 2002. Seventy-five metres of river were improved by creating a berm and a backwater; raising the river bed depth, increasing flow velocity and planting in-stream weed and marginal vegetation. The Burrows were delighted with the results of the habitat rehabilitation.

The river was not stocked and was occasionally fished by family and friends.

Main concerns
The Burrows were very pleased with the results of the Upper Kennet Rehabilitation Project. Since completion the berm had 'greened up' with native vegetation and there was a perceived increase in warblers and water birds. The river bed was scoured clean and winter flooding was controlled. They were also very happy with the way the contractors behaved and pleased that Nigel Holmes had taken the time and trouble to conduct post-project visits.

Water quality
Two years ago there were huge algal blooms on the river. Since then high summer flows had diluted pollution and water quality had been good. Increased flow rates since the habitat restoration work had scoured the gravel river bed.

Generally the Burrows felt that pressure on the river from agriculture was decreasing. Their sheep farm used no nitrogen. There was only one small dairy local herd. The dairy herd at Grove Farm had been replaced with a smaller beef stock unit. They felt that too much pollution was blamed on farmers and not enough was being done to address pollution from highways and urban environments.

Flylife
Had not noticed either a decline or an increase in flylife.

Other wildlife
There is a colony of rare Barbastrella bats in the Long Bottom Field.

Fish population
The Burrows did not monitor the fish population closely but felt that there was a healthy population of brown trout.

Other pressures
The cormorant population had steadily increased from 1 bird 3 years ago to 5 birds in 2008. Canoeists were an annoying problem, as was the pressure from visitors who used Hoppers Hatches as a picnic site and left litter.

Documents and reports
Upper Kennet Rehabilitation Project Summary Sheets, published by Thames Water, 2003

Hoppers Hatches, a popular summertime picnic site.

Kennet at Hoppers Lane, showing Berm and backwater, constructed in 2002 as part of the Upper Kennet Rehabilitation Project.

THE PRIORY, RAMSBURY ESTATE, AXFORD

Introduction
Alistair Ewing had managed the the Ramsbury Estate for 25 years. The farm is 5,500 acres. The river reach is just over 1 mile long. Over 25 years the most noticeable change had been the general fall in the water table. The water meadows were much dryer than 20 years ago – in the past it would never have been possible to have stock on the meadow between October and May. The farm was within the SSSI and the AONB and was a demonstration site for Catchment Sensitive Farming.

The river is managed as a commercial fishery with 20 rods. He stocks between 400 and 500 diploid brown trout each year. The top section of the fishery (about 400m, near the Red Lion) is left wild and un-stocked.

Alistair believed that stocking destroyed the wild trout population because the large stocked fish eat the wild trout fry, but it would not be commercially viable to run a wild fishery. Having said that he thought there was a wild trout population on his reach, with evidence of redds and some wild fish caught by the fishermen. His aim was to stock as little as possible while maintaining a commercially viable operation.

Alistair was skeptical of 'the EA's aim to remove all hatches and obstructions' because 'to go back to entirely natural flow would remove 300 year of historic chalk stream management'.

Main concerns

Alistair perceived these main issues:
- Abstraction at Axford and Clatford, particularly in low flow conditions
- Pollution in the form of high phosphate and sediment
- Runoff from highways

He said 'The Water Framework Directive should be used to put a lot of people and governments on the spot to tackle the real problems in the rivers.'

'We are blessed with a natural resource which we take for granted' AE

'The health of the river comes down to flow, if there is not enough water the Raunuculus doesn't grow, the are no flies and no fish. I don't want to see the river how it was four years ago in low flows'.

Physical habitat restoration project
Three years ago the Estate proposed a scheme to improve a section of dredged river, where slow flow and high deposition created a poor stretch of fishery, with no weed growth and no fish. It had taken three years to navigate the consenting process, and the final result had been designed, managed and funded (£45K) by the Environment Agency. The project had been completed two weeks before our visit. Two thousand tones of locally sourced gravel had been placed in the river in a series of berms to create fast flowing shallows interspersed with deeper pools.
AE had been very happy with the work, but was 'depressed' to see that the new gravels had been so quickly colonized by a brown algae

Flylife
AE felt that the flylife had declined over the years and was influenced by flow levels. When the river was in good health there were more flies, but in the particularly dry summer of four years ago the flylife and ranunuculus both disappeared. He also noted that in summer 2008 he had seen many mayfly, where as in previous years mayfly had not been a dominant fly so far upstream.

Fish population
The fish population on his reach was dominated by stocked brown trout, although when the EA had carried out an electo-fishing survey in 2007 some wild brown trout had been found.
In the past there had been shoals of grayling, but today there were no grayling.

Landuse
AS perceived that changes in landuse had an impact on the river. He argued that there should be a mechanism through the HLS/ELS schemes to put a premium on good river management.

Cultivated land caused accelerated runoff so less water entered the aquifer and more sediment entered the river. His farm had moved to a minimum tillage system, which reduced runoff. He still felt **a move back to more grassland would reduce siltation in the river.** In Wiltshire sheep farming had declined by 65% and cattle by 35% in the last 30 years, meaning a much greater proportion of land was ploughed.

RAMSBURY MANOR ESTATE

Introduction
The Ramsbury Manor Estate has been in private ownership since the late 1960s and access is strictly controlled. It is managed by Tom Taylor (Estate Manager) and we were also accompanied on our visit by William Hughes (Estate Agent).

The river is managed as a wild trout fishery with no angling permitted. The estate is about 600 acres of woodland and permanent pasture. The river is braided and is bordered by a system of disused water meadows, with the remnants of the drainage ditch system in evidence, and in places the line of the original river course can be seen. The course of the river appears to have been re-routed, possibly at the time when the instream ornamental lake was created. Sections of the river are straight and of even depth and appear to have been dredged. Some sections are shallow, fast flowing and have good weed growth. Tom Taylor and William Hughes had four year experience of the river here.

Photo left showing straight section of river, walkers are on ridge, possibly dredged material. In-stream weed growth is absent. The river bed has some clear gravel, but large areas coated in sediment and algae.

Shallow riffle (right) with some in-stream weed growth and clear gravel bed.

Hatches at upstream end of Ramsbury Manor Estate with 'normal amount' of scum for winter.

The River Kennet as it flows into the upstream end of Ramsbury Manor Estate looking towards the Priory.

Main Concerns
The over-riding concern was low flow and the resultant algal growth. Before 2006 algal growth and eutrophication of the river were serious problems, but over the last 2 years summer flows had been strong and algal growth much less as a result. It was difficult to know whether the improvement in water quality was due to high flows caused by high rainfall or phosphate stripping at Marlborough STW. Generally water was cloudy in winter, but clear in Summer.

Weed growth was poor or absent, with small patches of ranunculus and areas of starwort.

Fish
The estate was managed for wild trout with fish up to 4lb. There were no grayling. The estate managers thought that there was some wild trout spawning.

Fly life
Flylife appeared to have been constant over the last four years.

Other pressures
There were no other perceived pressures.

THE MILL, RAMSBURY

The Mill at Ramsbury is a section of river about two miles long with several backstreams and carriers. It is managed by River Keeper Eddie Starr. The river is kept to a very high standard and Mr Starr thought it supported a good population of wild brown trout. An otter visited regularly and was eating crayfish, leaving piles of shells as evidence. The stretch upstream of the Mill had been dredged in the past and the Keeper was creating a less uniform bed profile using strategically placed sarsen stone to help scour the bed and encourage deposition in other areas.

Main concerns
The Lake upstream at Ramsbury Manor had 'a devastating impact' by polluting the river with algae and sediment. There was also a problem with duck reared for shooting at Shalbourne, which were fed in the river adding to the nutrient load.

Water quality
For the last two years water quality had been good and flows with stong flows. The River Keeper was preparing for a run of dry years by making sure he had channel deflectors in place to kick the flow into the central river channel. The biggest cause of poor water quality was perceived to be Marlborough STW and the lake at Ramsbury.

Fish
There is a healthy brown trout population with spawning in the trout streams.

TOWN AND MANOR FISHERY, FREEMAN'S MARSH, HUNGERFORD

Freeman's Marsh is 27 ha SSSI, within the AONB just upstream of Hungerford, Berkshire. The River Dun, a small tributary of the Kennet, and the Kennet and Avon canal flow through the marsh. At one point the River Dun is culverted underneath the canal. The Trustees employ a full time river keeper: Robert Starr. The marsh is open access land and Registered Common. The land around the river is primarily unimproved meadow with some reedbed and marsh. It is managed by grazing cattle April to October.

Its status as a SSSI is 'unfavourable, recovering' as reviewed in January 2009.

The trustees and river keeper perceive five main problems for the Dun:

1. The quality of the water is normally very good but is frequently polluted by spillage from the K&A Canal.
2. Poor maintenance of canal banks and mismanagement of spillways causes the canal water to enter the Dun (and subsequently the Kennet) which causes serious pollution that rapidly kills the water weed and has been known to kill the fish and other river life. e.g. 1998/99.
3. Leakage from the aqueduct upstream of Cobblers Lock into the River Dun.
4. Pollution from the Shalbourne Brook, a tributary of the Dun, caused by poor farming methods, particularly ploughing to the river edge and intensive duck rearing.
5. Abstraction during low flows further exacerbates the water quality problems.

The impact of polluted canal water entering the river was immediate, causing algal growth and increased sedimentation. There is a strong feeling that the canal/river interaction problems at Freeman's Marsh could be completely avoided by better management of the canal by British Waterways.

The Trustees and river keeper would like to see more EA staff on the ground spotting problems. The Trustees were patrolling the canal to spot problems and notify British Waterways in order to protect their downstream fishery. They also wrote to farmers reminding them of their responsibility to protect the water course, a job they felt the EA should be doing.

Freeman's Marsh is the site of a habitat restoration project, which began in May 2008 run by the trustees of the Town & Manor of Hungerford. The project will see parts of the river fenced off to reduce poaching by cattle, new hedge planting and limits to public access to encourage bird nesting.

Overflow from canal with screen blocked by debris (perceived poor maintenance). If the screens are not kept clear of debris, the level of the canal rises and the excess water flows over the downstream slipways into the River Dun.

Boards across a spillway leading directly to River Dun. Boards are inserted or removed by British Waterway staff to control the canal level.

Photo: Leak from canal (at bottom of picture, out of shot) to River Dun (at top of picture).

BENHAM ESTATE, NEWBURY

Introduction
Benham Valance is just upstream of Newbury and includes around 12 miles of river and carriers within a private estate. The majority of the estate is extensive pasture and woodland. Agricultural runoff is not perceived to be problem. The estate contains a section of about 2 miles of over-dredged and over -wide river (probably dating from 20 years ago). Some physical modifications are being made to address this and other projects are planned, although not certain to go ahead. These could include:
1. Restoration of the gravel beds in the over-dredged sections
2. Realignment of the river to its original course
3. Repair to a leaking pound stream.

River Kennet at Benham Estate

Main Concerns
The keepers described the Kennet as **'an ailing, fragile river'.** Compared to the Test and the Piddle the water quality issues were almost insurmountable.

The dominating concern at for the Benham Estate was the interaction between the River Kennet and the Kennet and Avon Canal upstream from the Estate which causes extreme flocculation, siltation and high nutrient levels. This results in poor water clarity and smothers weed growth. In low flow conditions the Keepers wash the weed by hand to try to keep it clean enough to grow. Ranunculus is almost absent. There is good marginal vegetation. Poor water clarity made it very difficult to run a commercial fishery because fishermen were forced to cast speculatively.

The Estate felt that the problems caused by the canal river interaction would only be solved by separation and were concerned that the 'step-by-step' approach being adopted by the KSRP would simply waste time and money.

River and canal interaction

Fish
Some wild Brown Trout spawn naturally on the Benham Estate, but the brown trout population is stronger on the Wilderness. The keepers perceived that the Brown Trout was declining. Compacted gravels and sedimentation were perceived to be a barrier to spawning.
The EA conduct a fish survey every 3 years. The survey shows a dominance of coarse fish. The Keepers commented that they felt the EA were heavy handed in the way they sampled and that the mortality rate was unacceptably high.

Grayling had been present in the past: as late as 1994 Grayling fishing matches were held, however now there were no Grayling at all.

American Signal Crayfish
The American Signal Crayfish was a huge problem causing bank damage. The keepers actively trapped all summer, catching well over 8,000 from one pot per season. They were trapping in 20 pots.

Flylife
There was a definite decline in fly life, particularly Sedge and Caddis.

Other pressures
Waterfowl reared on in-line ponds caused further deterioration in water quality but it was recognized that alternative income sources (shooting) had to be found, fishing declined.

Reports or other documentation
The Estate commissioned their own report from consultant John Towner into the interaction between the canal and the river.
KCSRP commissioned a scoping report by Halcrow to look at the Canal River interaction (Published Feb 2007).

Appendix E List of references and CD contents

The documents listed below are referenced by number in the main text of this report and included on the CD which accompanies the report.

1) Natural England 2002 assessment of the condition of the Kennet SSSI
2) Natural England 2008 assessment of the condition of the Kennet SSSI
3) Impact of land use changes on the Kennet Catchment, Paul Whitehead et al 2002
4) Atkins summary report on the Axford low flow investigation, 2005
5) Atkins final Axford report including ecology studies and data, 2005
6) Atkins Powerpoint on progress on Og investigation, March 2009
7) CEH report to EU on a case study of the River Kennet as a heavily modified water body, 2002
8) EA 2006 report on Water Level Management Plan
9) Halcrow report on canal problem
10) EA summary of canal problems
11) Environmental Planning Associates report on canal problem
12) EA River Kennet restoration strategy, 2007
13) EA Kennet & Pang fisheries action plan, 2008
14) EA water quality data used for classification
15) EA macro-invertebrate data used for classification
16) EA fisheries data used for classification
17) EA 2004 fish survey report
18) EA 2005 fish survey report
19) EA 2006 fish survey report
20) WS Atkins Axford groundwater modelling report, 2005
21) APEM Og ecology progress report, Nov 2007
22) CEH paper on Kennet phosphate concentrations and ecology, 2002
23) CEH paper on point and diffuse pollution in the Kennet, 2008
24) Reading Univ/CEH paper on modelling of phosphate stripping, 2002
25) CEH data on weekly phosphate monitoring, 2009
26) EA response to ARK queries on classification, April 2009
27) EA HMWB spreadsheet
28) EA initial assessment of Kennet HMWBs

29) EA assessment of impacts and mitigation for Kennet HMWBs

30) Spreadsheet of impacts and mitigation for upper Kennet HMWB

31) ARK report on interviews with local residents in 1991

32) Flow duration curves supplied by EA

33) EA responses to ARK queries in April 2009

34) EA spreadsheet with data on middle Kennet HMWB

35) Wild Trout Trust review of EA fishery monitoring reports

36) EA note on phosphate level improvements in 2008

37) Notes of meeting of the River Kennet Restoration Project, 24 Feb 2009.

38) List of potential diffuse pollution measures