

RECOMMENDATIONS FOR A
SCHEME OF WATER QUALITY
CLASSIFICATION FOR SETTING
STATUTORY WATER QUALITY
OBJECTIVES

ENVIRONMENT AGENCY



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National Rivers Authority
Information Centre
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1. INTRODUCTION

The Water Act 1989, now consolidated into the Water Resources Act 1991, allows for the Secretaries of State to prescribe by regulations a system of classifying controlled waters and, through this system, to set Water Quality Objectives for specific bodies of such waters. The NRA's role in this process is that, once set, it has a joint duty with the Secretaries of State to ensure that the Water Quality Objectives are met, in so far as it is practicable to do so, by the exercise of the powers available to it. So far, Water Quality Objectives have only been introduced in relation to long-standing EC Directives on the permissible concentrations of certain 'dangerous substances' in both fresh and marine waters, and in relation to bathing water quality.

The NRA agreed with the Department of the Environment (DoE) that it would advise on a more general and consistent approach to the derivation of classification schemes and their use for setting Water Quality Objectives. In order to do so, the NRA put together a number of ideas and concepts and, before providing the Secretaries of State with its considered advice, published a consultation document in December 1991 (NRA Water Quality Series No 5) in order to obtain the widest possible public view. An open public discussion forum was also held. Three months were allowed for written responses, but the majority of the detailed replies were not received until after that date.

The proposals which the NRA initially put together centred around the concept of having specific Use-Related Classes (URCs) which could be applied to specific bodies of water. These would provide the principal driving force to maintain, or improve where necessary, water quality such that the dischargers concerned, and the public, could see the specific advantages to be obtained from improving the quality of that particular body of water. Because these would, of necessity, be different from one body of water to another, it was also proposed to have a means of generally classifying waters such that the totality of the use-related objectives could be assessed on a common basis every five years or so. The need to accommodate EC Directives had also to be taken into account.

2. OUTCOME OF THE CONSULTATION PROCESS

The publication of the consultation document stimulated considerable interest from a wide range of national and regional organizations, and local interest groups. Over 160 responses were received, with comments that covered a multitude of issues related to both the structure and technical aspects of the proposed scheme, and how it might be implemented in practice. All of these responses have been considered by the NRA and a short overview of these is given in this section.

2.1 General Comments

The majority of responses reflected broad support for the introduction of Statutory Water Quality Objectives as the basis for future water quality management. There was strong support for the principle that they should be set with respect to uses to which the water is, or could be, put, and that the targets should be based on standards which would protect those uses.

The purpose of introducing such objectives is to ensure that water quality is either maintained or, where necessary, improved. There was a widely-held view that the principle of "no deterioration" should be a fundamental feature of the scheme, and that it should be made explicit as to how this principle would be applied in practice. Where improvements in water quality are deemed to be necessary, many respondents felt that full account had to be taken of the costs and the benefits of bringing about the desired improvements as a crucial step in the decision making process.

2.2 Does the Proposed Scheme Strike the Right Balance Between Conflicting Criteria?

The proposed scheme was perceived by many to be too complex and would consequently be confusing, particularly to the general public who would ultimately have to bear the costs of water quality improvements. It was noted that the proposals centred mainly on classification schemes for rivers, and that systems for other controlled waters would need to be developed. There were areas of the proposed scheme where standards were not yet available. Where new approaches had been proposed, such as the biological and aesthetic quality classifications, some expressed the view that they had been insufficiently tested and validated to be included forthwith into a statutory scheme.

2.3 Should the New Scheme be Implemented in a Phased Manner?

A phased approach was generally felt to be the most sensible way of moving forward. The proposal to start with rivers was broadly supported, although some water industry responses pointed out that a substantial proportion of the current investment programme is directed at estuaries and coastal waters in relation to the EC Urban Waste Water Treatment Directive. A range of views was expressed on the criteria for prioritisation. Conservation bodies felt that the first phase of implementation should be directed at river stretches designated as Sites of Special Scientific Interest (SSSIs) and those top-class waters which had recently deteriorated. Others felt that areas where investment had already been planned or was underway should be dealt with first, and that the most important criterion for prioritisation is the ability to demonstrate that any improvements would be cost-effective.

2.4 What is an Appropriate Timescale for Seeking Improvements?

Three to five years was felt to be appropriate by many, although flexibility in setting timescales was seen to be important, particularly where solutions will be complex. The concept of setting "stepping-stones" towards an ultimate target was also supported by many, although some commented that it should be made clear as to how this might be brought about in practice. Where improvements would necessitate major capital expenditure, such as re-sewering or the building of new treatment facilities, the use of interim targets was thought to be inappropriate and the establishment of a "one-off" longer-term target was seen as the right approach. The water industry consistently commented that the setting of timescales had to take account of the OFWAT Periodic Review and the investment planning process.

2.5 Role of the General Classification Scheme

Support for, and disagreement with, the inclusion of a General Classification Scheme (GCS) within the statutory framework for setting formal water quality targets was divided across the range of respondents. Arguments put forward in support of the inclusion of GCSs as an integral part of the overall scheme were:

- there was a fear that without the GCS, insufficient protection would be given to stretches already of 1A quality;
- that the GCS provided an important absolute measure of water quality irrespective of the uses which might themselves change over time; and
- that it was the obvious means by which "stepping stone" improvements could be brought about by moving from one class to the next - many of the URCs proposed were simply pass/fail and would not provide a suitable means of setting interim targets.

The arguments put forward against the inclusion of GCSs were that:

- the URCs provided a perfectly adequate means of setting quality objectives and the GCS would be unnecessary and potentially confusing;
- there was no obvious relationship between the GCS and the URCs and therefore conflicts in setting specific or general targets could arise; and
- there were uncertainties over the reliability of the proposed GCS, particularly with respect to the biological "over-ride".

A large number of comments were received on the nature of the proposed GCS. Some felt that because of the confusion over the way that biological information had been applied, the most obvious thing to do would be to amalgamate the two into a single classification. Others expressed the view that the proposed GCS for rivers was not sufficiently comprehensive as an absolute measure of quality and should, at least, contain criteria for nutrients. Some commented that the biological "over-ride" must have been wrongly set because it generally upgraded rather than downgraded the quality class. The concept of an "over-ride" itself was viewed by some as being fundamentally flawed in that it pre-supposed a clear relationship between chemical and biological quality; it was considered better by some to use these two quite different measures in parallel rather than to attempt to integrate them.

2.6 Proposed Use of Biological Techniques

There was a high degree of support for the principle of using biological assessment in water quality management, although doubts were expressed by many as to whether the techniques were sufficiently well-developed at this stage to provide a reliable basis for setting biological targets on a statutory basis, which would have to be met by a specific date.

The concerns expressed by consultees covered both the nature of the tools and how they were proposed to be used. Some were unhappy with the way that the River Invertebrate Prediction And Classification System (RIVPACS) had been used to reduce biological information down to various biotic scores. A potential problem was seen with the use of standards based on computerised predictive models, particularly if challenged in the courts.

Another major concern was that biological targets were not helpful in setting consents and for planning improvements in water quality. Even if water quality were to be improved, there was no guarantee that a higher ecological quality would result because of all the other factors (many of which are quite natural) which affect biological communities. There was also some confusion over the way that biological criteria had been applied, and the proposed classification systems were thought to be unnecessarily complicated.

Many, and particularly the conservation bodies, expressed the view that the use of macro-invertebrates alone as a measure of ecological quality was too restricted and that plant communities at least should be included as an additional measure; although none actually put forward any proposals as to the means by which a measure of plant community status could be incorporated into a formal classification.

2.7 Standards Proposed for the Use-Related Classes

While there was a high level of support for the principle of applying use-related criteria as the driving force for setting objectives, it was noted that the proposals for some of the URCs are insufficiently developed. There was general support for the principle that the Regulations should make provision for the amendment of existing standards and, where necessary, the introduction of new standards to take account of scientific developments, without the need for complicated legislative procedures.

i. Basic Amenity

There was some support for the principle of setting aesthetic targets, but others expressed doubts that the inherent subjectivity of the proposed scheme would make it unsuitable for statutory application. A potential problem was seen with the fact that qualities such as colouration, foaming, turbidity, and odour are also influenced by entirely natural processes. Because of this, and the problems of controlling dumping and littering, it was felt that there would be potential difficulties in achieving aesthetic targets once set. Some held the view that the aesthetic criteria were much better placed in a GCS (as proposed for estuaries and coastal waters) as part of the general quality description.

ii. General Ecosystem

The majority of comments on this URC, as already stated, related to the use of an Ecological Quality Index (EQI). While the principle of incorporating biological assessment into the proposed scheme was generally supported, concerns were expressed over the use of EQIs to set formal targets. Even by improving water quality, there was no guarantee these targets would be met, because water quality is only one of the plethora

of different factors affecting the status of biological communities, although some of these are taken into account through the application of RIVPACS.

iii. Special Ecosystem

There was broad support for the inclusion of this URC. Some felt that criteria for ammonia, nutrients and BOD should be included as a minimum, although there were few clear views as to whether there should be one nationally-applicable classification or whether, because of the differing requirements of different sites, the criteria should be site-specific.

iv. Fisheries

A large number of comments were received on the URCs proposed for fisheries. Many felt that, because of the differing water quality requirements of salmonid and cyprinid fish, the separate URCs could be combined into a single hierarchical classification system which reflected those requirements. The need for a separate migratory fish category was questioned, particularly in view of the fact that the water quality requirements of migratory fish species (e.g. salmon and eel) are quite different.

Questions were also raised by some over the relationship between the proposed URCs and the requirements of the EC Freshwater Fisheries Directive. Some respondents felt that if a stretch was considered to be suitable for supporting salmonid and/or cyprinid fisheries it should automatically be designated under the Directive.

v. Harvesting of Fish/Shellfish

There was little comment on these URCs. The few points raised included the need to consider criteria for shellfish affected by algal toxins, and the possibility of extending this use to freshwater.

vi. Water Contact Activity

There was widespread support for this URC; indeed, many felt that the recreational/sports aspect had not been given sufficient weight in the scheme. The principle of setting standards within a hierarchical classification according to the health risk of different activities was thought to be the best way forward, provided that it proved to be technically feasible. Some fears were expressed, however, that the consequences of applying this URC would be that many areas currently used for water sports would no longer be seen as suitable and access would have to be restricted. There were also concerns that if this URC was to be applied widely, and particularly to rivers, it would require wholesale sterilisation of sewage effluent.

vii. Abstraction for Potable Supply

As for the Fisheries URCs, there was some confusion over the need for a separate URC when protection of waters for this Use is already provided for through the requirements of the EC Surface Water Directive.

viii. Industrial/Agricultural Abstraction

Some specific points were raised over individual standards for the protection of waters abstracted for irrigation and livestock watering.

2.8 How Can a Precautionary Approach be Implemented via Statutory Water Quality Objectives?

The precautionary approach is widely accepted as a principle which should be fundamental to pollution control practice in the UK, although few concrete views were put forward by respondents as to how it should be implemented through the setting of water quality objectives. Existing legislation on Integrated Pollution Control already provides a mechanism for applying standards which are technology-based. It was suggested that, for effluents from prescribed processes where the principle of Best Available Techniques Not Entailing Excessive Cost (BATNEEC) is applied to the process and water quality objectives are applied to receiving waters, the emission standards should be based on the most stringent of the two approaches. Industry did point out, however, that by applying the principles of Best Practicable Environmental Option (BPEO), which is itself now a statutory requirement, it was not necessarily possible to apply BATNEEC to control emissions to all media simultaneously.

With regard to Environmental Quality Standards, it was suggested that the precautionary approach should be based on taking full account of bioaccumulation potential in setting the standards. This has not received full consideration in the past and standards have generally been derived by applying arbitrary safety factors to acute toxicity data.

3. ISSUES TO BE RESOLVED

The consultation process thus raised several fundamental issues which needed to be resolved.

3.1 Complexity of the Scheme

The concerns expressed over the complexity and terminology of the proposed scheme were principally related to the extent to which the various 'users' and the public in general would understand the scheme and have a clear idea of what the objectives were once they had been set. Others felt that the scheme was necessarily complex; the framework for the future management of water quality needed to be both comprehensive and technically robust. The question is: can these two viewpoints be brought together to bring about a simplification of the scheme to address the apprehensions about public understanding whilst at the same time not compromising on comprehensiveness and robustness?

The NRA believes that this can be achieved by re-arranging the architecture of the scheme without losing any of its vital components. It is suggested that simplification can be achieved, and potential confusion avoided, by making a clear separation of the roles of the URCs and the GCS and by changing some of the terminology. A further simplification can be brought about by a rationalisation of the URCs and the combination

of related URCs, such as Salmonid, Cyprinid and Migratory Fisheries, into a single hierarchical classification.

3.2 Use-Related and General Water Quality Targets

Non-statutory River Quality Objectives (RQOs) have been agreed for many rivers across England and Wales, and have in the past provided the basis for water quality management and the planning for improvements. These local RQOs have usually been expressed in terms of the National Water Council (NWC) class to be reached within a fixed timescale. Difficulties have been encountered in the past with the NWC Scheme, mainly because it was open to subjective interpretation and, in consequence, had been applied differently across the country. Another difficulty was that it functioned as a General Classification Scheme but was loosely use-related in that a description of the uses which should be protected is given against each class. For most classes more than one use applies. This is a source of potential confusion, particularly where the uses of a stretch of water may change over time. To overcome these problems, the NRA proposed that a clear separation should be made between the use-related standards which would be set at a level to protect various local uses, and the standards of General Classification Schemes which would be used to provide a general measure of water quality irrespective of the uses. The question raised in the consultation document was whether or not the General Classification Scheme should be used in addition to the Use-Related Classes for the purpose of setting statutory water quality targets.

There was strong support for the application of use-related standards as the basis for setting targets, not least because it was perceived to be fair in that it provides the obvious means of assessing the case for water quality improvements in terms of the local benefits which will accrue in protecting various uses of specific bodies of water. It would be much more difficult to argue why an individual stretch of water should be moved up from one class to another within a General Classification Scheme, simply because it might be seen to improve the national overall picture. Nevertheless, any new classification scheme needs to take account of the existing RQOs and the investment planning and action which has been based upon them. In introducing the new scheme, a clear link should therefore be made with the criteria which have been used in the past as the vehicle for establishing RQOs.

Taking these arguments into account, and recognising the need for simplicity, the NRA therefore concludes that the targets should be set with respect to the uses to which the water is, or could be, put. The General Classification Scheme should not therefore be used for setting statutory targets but should be applied as the basis for periodic assessment and reporting of water quality status, as in previous national quinquennial surveys. The need to take account of the existing system of RQOs could be accommodated by introducing a hierarchical classification into the Use-Related Classes. It is therefore proposed that a new Classification, called "Fisheries Ecosystem", be introduced which reflects the differing levels of water quality required for different categories of fisheries and the ecosystems which support them. This Classification would replace those previously proposed for different types of fisheries, be applied to all waters, and would provide the means of translating the existing framework for water quality planning into

the new scheme. It is also proposed that other Use-Related Classifications be introduced as described in Section 4.1 and Table 2.

3.3 The Role of Biological Assessment

The proposal that biological information should be consistently incorporated into national water quality classification schemes has generally been well received. The advantages of using biological information in conjunction with the more traditional chemical assessment methods has been widely recognised. The existing NWC scheme for rivers and canals does not include biological criteria - although allowance was made for such information in some areas - and this is seen by many as a major shortcoming. Descriptive biological criteria are, however, applied in the existing national classification scheme for water quality in estuaries.

Biological assessment has been used extensively in the past for local investigations and, to some extent, to support water quality planning decisions. Biological information has also been used in national river quality surveys, notably in 1980, and again in the 1990 Survey conducted by the NRA covering several thousand sites throughout England and Wales. Surveys using identical techniques were also carried out in Scotland and Northern Ireland. Thus it has been possible, for the first time, to collate a major national database of the biological quality of rivers which can be used to derive a classification system for consistent application across the country. There are nevertheless two major issues to be resolved: first, what should be the role of biological assessment in the overall scheme; and second, how should biological information be used and criteria established in any national classification system?

The consultation document considered two ways in which biological information could be used in a national water quality classification scheme. The first was that biological criteria could be set within a URC, termed 'General Ecosystem', and that this URC could be used for setting biologically-based targets. While this principle was supported by many, there are a number of potential difficulties with it, particularly over the translation of biological targets into discharge consents, which would inevitably have to be set primarily in physico-chemical terms, and the use of such targets as the basis for investment planning. Even if biological targets were set, there would be no guarantee that they would be achieved through improving water quality because biological communities are inherently variable and their status often affected by factors which are entirely natural.

The second possible application of biological information is as part of the General Classification Scheme in addition to the chemical criteria. Various options were considered as to how this might be achieved, including the use of a 'biological over-ride'. One of the potential advantages of integrating chemical and biological information by means of an 'over-ride' is that better precision might be achieved in placing a river stretch in a class. In practice, however, the subsequent statistical analysis of the 1990 Survey database showed that this was not the case. There is also an argument that, if the General Classification Scheme is not to be used for setting statutory water quality targets and its primary purpose will be for reporting the results of national surveys, the biological information should be reported in parallel with the chemistry rather than integrated with

it, in order to maximise the information reported to the public. Weighing up these various arguments, and drawing upon the information derived from the 1990 Survey, the NRA considers that the most appropriate application of biological information is in the general assessment of water quality status rather than for setting statutory water quality targets. The reporting of biological information in parallel with the chemistry is also favoured, rather than having an integration of these two quite different measures of water quality into a 'biological over-ride' system.

3.4 EC Directives

The process of translating EC legislation into water quality classifications under what is now the 1991 Water Resources Act has already begun with the issuing of the various Statutory Instruments prescribing the Classifications and Notices served on the NRA to implement them. Questions have rightly been raised, however, over the relationship between the EC Directives and the proposed URCs. It has been noted that the potable supply abstraction, freshwater fisheries, shellfisheries and water contact sports uses are all covered to some extent by the requirements of corresponding EC Directives.

One possible option might be to extend the designations under the respective EC Directives to all waters where these uses are considered to apply. This is clearly a matter for the Secretary of State; however, there are several drawbacks with this option. First, there are cases, such as the EC Bathing Waters Directive, where the consensus of scientific opinion is that some of the determinands to be measured under the Directive are inappropriate and that the water quality standards need to be revised. It would therefore seem unreasonable to extend the conditions of the Directive to waters other than those already designated. On the other hand, a system of domestic URCs would provide the opportunity to set standards which have a sound and defensible basis for the protection of the various uses, and to disregard those standards which are not germane to achieving a specific quality for a specific use. Secondly, there are cases where the compliance criteria specified in the EC Directives have proved difficult to operate in practice. A system of URCs, again, would provide the opportunity to ensure that compliance with the water quality standards is properly assessed using sound statistical principles. Thirdly, there are some EC Directives, such as that concerning Surface Water Abstracted for Potable Supply, which apply only to a particular point - in this case, the point at which water is abstracted for drinking water supply. The advantage of a URC here is that it can be applied upstream of that point to ensure that the quality of water at the designated point of abstraction complies with the conditions of the Directive. Fourthly, there will be cases where particular uses of water may be required at some stage in the future and objectives will need to be set now to ensure that the necessary improvements in water quality are brought about. For example, where future plans involve new abstractions for potable supply, the URC will need to be applied to set the objectives to ensure that water quality will become compliant with the conditions of the EC Directive over an agreed timescale. And finally, not all uses are covered by existing EC Directives. This is the case for industrial/agricultural abstraction, water contact sports other than bathing, and ecosystem protection. Separate URCs will therefore be needed to ensure that these quite legitimate uses are protected.

Taking all these different issues into account, the NRA concludes that there is a real need for a separate system of Use-Related Classes which should be applied in addition to the existing set of conditions which apply through EC Directives at designated points and stretches. Practical guidelines are currently being developed to ensure that the criteria specified in EC Directives and the various Use-Related Classes are applied in a consistent manner.

3.5 The 'No Deterioration' Principle

The purpose of setting water quality objectives on a statutory basis as set out in the 1991 Water Resources Act is to maintain and improve water quality. It can therefore be taken that they should not be set in such a way that would allow a deterioration in water quality. This raises the question as to how this principle would work in practice.

The first potential difficulty lies in the translation from the existing water quality planning system based on the NWC classification to a new system of Use-Related Classes. A mechanism is required which will allow the existing NWC Classes to be transferred into equivalent classes to ensure that the existing water quality will be maintained. The proposed new system therefore needs to include a hierarchical classification structure which does provide a degree of comparability with the existing NWC scheme. This should ensure that deterioration in water quality does not occur by changing from one system to another. It will also provide the basis for planning improvements as a series of 'stepping stones' - a principle which was widely supported by consultees.

A further potential difficulty, however, is that because of sampling error there will always be some uncertainty in making judgements over whether or not the quality of a stretch of water really has been either maintained or improved. There will always be an inherent risk of mis-classification, for the simple reason that random changes in class can occur because of the influence of chance on sampling. The problem can be addressed by using statistical principles to assess whether or not apparent changes in class are significant. This matter was discussed in detail in the consultation document and a methodology set out to reduce the risk of mis-classification.

3.6 Water Quality and Water Abstraction

Many consultees raised the question over the relationship between water quality and water quantity in both the setting and the planning for achievement of water quality targets. Water abstraction may, in certain circumstances, exert a significant influence on river flows and consequently reduce the available dilution for wastewater discharges. This is a matter which will need to be given careful consideration by the NRA in putting forward proposals for individual stretches of water. The NRA has powers over abstraction licensing and the consenting of discharges; both will have to be considered in planning the achievement of future water quality targets. There will be situations where water quality improvements are required to protect certain water uses. Where water abstraction has a significant influence on river flow, there may be a case for the alteration or even revocation of abstraction licenses to achieve a particular water quality target rather than place more stringent consents on dischargers. These potential conflicts will need to be

dealt with through the process of catchment planning, taking full account of the economic arguments and the costs and benefits of each option.

Once the quality objective is set, potential problems may arise where the flows in rivers are reduced during periods of dry weather. Where these situations are acute, the NRA has powers to issue Drought Orders to alleviate problems. However, there may be situations where river flows are reduced for long periods. Where this is the case, the balance between water abstraction and wastewater discharge will need to be assessed and cost-effective solutions identified to ensure that the statutory quality targets are met. Where applications for licenses for new abstractions are made, these, as with applications for new discharge consents, will also need to be considered taking account of the statutory quality requirements.

4. RECOMMENDED WATER QUALITY CLASSIFICATION SCHEME

Taking all of these views into account, it is proposed (Table 1) to rearrange the original proposals into:

- different Use Classifications (UCs) for setting targets relating to the actual or proposed use of the water, on a statutory basis i.e. Statutory Water Quality Objectives; plus
- a General Quality Assessment (GQA) scheme, for assessing general overall progress on a periodic basis.

4.1 Use Classifications

The recommended scheme of UCs is given in Table 2. Six UCs are now proposed to cover the principal uses of controlled waters. The aesthetic and biological criteria originally proposed in the Basic Amenity and General Ecosystem classes have been incorporated into the General Assessment Scheme, taking account of the concerns over the setting of formal and binding aesthetic and biological targets. Further simplification has been brought about by combining the previously proposed Salmonid, Cyprinid and Migratory Fishery UCs into a single hierarchical classification.

i. Fisheries Ecosystem

The proposed hierarchical classification establishes different levels of water quality suitable for different categories of freshwater fish and the protection of the ecosystems which support them. This classification is relevant only to rivers - similar schemes for other controlled waters may need to be developed. The classification incorporates the three 'sanitary' determinands, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Total Ammonia, which provide a measure of the extent to which waters are affected by organic pollution. The class-limiting criteria are generally set at a level which reflects the class distinctions for salmonid/cyprinid fish in the existing NWC scheme. There are, however, several differences in the proposed new scheme. The first is that the compliance criteria have been set as 90 percentiles compared with the use of 95 percentiles in the existing scheme. (The analysis of the chemical data from the 1990

TABLE 1: PROPOSED WATER QUALITY CLASSIFICATION STRUCTURE

CLASSIFICATIONS FOR SETTING STATUTORY WATER QUALITY OBJECTIVES (SWQOs)											CLASSIFICATIONS FOR PERIODIC WATER QUALITY SURVEYS							
Use Classes						EC Directive Classes					General Quality Assessment Schemes							
	R	L	E	C	G		R	L	E	C	G		R	L	E	C	G	
1. Fisheries Ecosystem (-hierarchical Classes 1-6)	*	*	*	*		1. Freshwater Fisheries	*	*				Classifications to include chemical, biological, nutrient and aesthetic criteria	*	*	*	*	*	
2. Abstraction for Potable Supply	*	*			*	2. Surface Water Abstracted for Potable Supply	*	*										
3. Industrial/Agricultural Abstraction	*	*	*	*	*	3. Bathing Waters			*	*								
4. Water Sport Activity	*	*	*	*		4. Dangerous Substances +	*	*	*	*								
5. Special Ecosystem	*	*	*	*		5. Shellfish Waters			*	*								
6. Commercial Harvesting of Fish/Shellfish for Human Consumption			*	*		6. Titanium Dioxide			*	*								

R = Rivers & Canals

L = Lakes

E = Estuaries

C = Coastal Waters

G = Groundwaters

+ Includes all dangerous substances covered by EC Directives and Environmental Protection Act 1990 prescribed substances

TABLE 2: USE CLASSIFICATIONS

USE CLASS	WATER QUALITY CRITERIA																																																																																																							
	Class	DO % sat 10%ile	BOD (ATU) mg/l 90%ile	Total Ammonia mgN/l 90%ile	Un-ionised Ammonia mgN/l 95%ile	pH 95%ile	List II Substances	Class Description																																																																																																
1. Fisheries Ecosystem	1	80	2.5	0.2	0.021	6-9	Standards for 'sensitive' aquatic life	Water quality suitable for high class salmonid and cyprinid fisheries																																																																																																
	2	70	4.0	0.6	0.021	6-9	Standards for 'sensitive' aquatic life	Water quality suitable for sustainable salmonid and high class cyprinid fisheries																																																																																																
	3	60	6.0	1.3	0.021	6-9	Standards for 'other' aquatic life	Water quality suitable for high class cyprinid fisheries																																																																																																
	4	50	8.0	2.5	-	6-9	Standards for 'other' aquatic life	Water quality suitable for sustainable cyprinid fisheries																																																																																																
	5	20	15.0	9.0	-	-	-	Some species may be present but water quality unsuitable for sustainable fishery																																																																																																
	6	<20	-	-	-	-	-	Fish unlikely to be present																																																																																																
	2. Abstraction for Potable Supply	Hierarchical classification according to Surface Water (Classification) Regulations 1989, SI 1989/1148 arising from EC Directive 75/440/EEC for classifications DW1, DW2 and DW3. Standards for List II substances for 'Direct Abstraction to Potable Supply' (DoE Circular 7/89)																																																																																																						
3. Water Sport Activity	Hierarchical classification based on health-related risk associated with different activities - to be developed																																																																																																							
4. Industrial/Agricultural Abstraction* a. Irrigation	<table border="0"> <tr> <td>pH</td> <td>5.5-8.5</td> <td colspan="6"></td> </tr> <tr> <td>Chloride</td> <td>100-600mgCl/l</td> <td colspan="6">} dependent upon crop type and volume of water applied</td> </tr> <tr> <td>Boron</td> <td>2-8mgB/l</td> <td colspan="6">}</td> </tr> <tr> <td>Chromium</td> <td>2.0mgCr/l</td> <td colspan="6"></td> </tr> <tr> <td>Copper</td> <td>0.5mgCu/l</td> <td colspan="6"></td> </tr> <tr> <td>Iron</td> <td>1-2mgFe/l</td> <td colspan="6"></td> </tr> <tr> <td>Lead</td> <td>2.0mgPb/l</td> <td colspan="6"></td> </tr> <tr> <td>Nickel</td> <td>0.15mgNi/l</td> <td colspan="6"></td> </tr> <tr> <td>Zinc</td> <td>1.0mgZn/l</td> <td colspan="6"></td> </tr> <tr> <td>Molybdenum</td> <td>0.03mgMo/l</td> <td colspan="6"></td> </tr> <tr> <td>Selenium</td> <td>0.02mgSe/l</td> <td colspan="6"></td> </tr> <tr> <td>Vanadium</td> <td>0.08mgV/l</td> <td colspan="6"></td> </tr> </table>								pH	5.5-8.5							Chloride	100-600mgCl/l	} dependent upon crop type and volume of water applied						Boron	2-8mgB/l	}						Chromium	2.0mgCr/l							Copper	0.5mgCu/l							Iron	1-2mgFe/l							Lead	2.0mgPb/l							Nickel	0.15mgNi/l							Zinc	1.0mgZn/l							Molybdenum	0.03mgMo/l							Selenium	0.02mgSe/l							Vanadium	0.08mgV/l						
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b. Livestock Watering (Requirements may be more stringent for poultry)	pH 6-9 Chloride 1,000mgCl/l Sulphate 250mgSO ₄ /l Fluoride 2.0mgF/l Dissolved Oxygen 30% sat Arsenic 0.2mgAs/l Chromium 1.0mgCr/l Copper 0.2mg/Cu/l Lead 0.05mgPb/l Nickel 1.0mgNi/l Zinc 5.0mgZn/l * All standards applied as annual averages; standards for metals as total concentrations
5. Special Ecosystem	Standards to be identified and applied according to the special requirements of sites requiring protection for nature conservation reasons
6. Commercial Harvesting of Marine Fish/ Shellfish	Standards for dangerous substances (List I, List II and EPA 1990 Prescribed Substances) apply; standards for any other substances of concern for human health reasons would be applied by NRA if required by competent Authority

River Quality Survey demonstrated that the inherent error in assigning a quality class to a stretch of water can be reduced appreciably by moving to the 90 percentile without compromising the need to take account of the variability in water quality when setting discharge consents.) Another difference is that an extra class has been inserted which effectively divides the equivalent of the existing NWC Class 2 into two separate steps. This has been done to resolve difficulties that have been experienced in the past with the very wide range of water quality covered by NWC Class 2, and to accommodate the historic regional differences in strategies for controlling water quality (particularly Total Ammonia) for waters falling into this class band.

In addition to the 'sanitary' determinands, the UC also incorporates a range of parameters which are particularly relevant to the protection of fisheries and their ecosystem. The standards are generally well established.

This UC provides the backbone of the scheme of quality objectives and is applicable in setting targets for all river stretches. By retaining a degree of comparability with the existing NWC system, it would provide the means by which the existing system of local RQOs can be transferred into formal quality objectives on a statutory basis allowing continuity in the planning of water quality improvements to be maintained.

ii. Abstraction for Potable Supply

The need for a UC for this use in addition to the EC Directive on Surface Water Abstracted for Potable Supply is that it will allow upstream targets to be set to ensure that the quality of the water at the downstream point of abstraction will meet the requirements of the EC Directive.

iii. Industrial/Agricultural Abstraction

This UC covers the abstraction of water for several different activities. The water quality requirements for industrial abstraction will vary according to the nature of the industry, e.g. cooling waters, food processing. Site specific criteria will therefore need to be applied to meet these different needs. For irrigation and livestock watering, two different sets of standards are needed; these are based on ADAS guidelines and other recognised sources.

iv. Water Sport Activity

The principle of developing a risk-based classification scheme for this UC which reflects the health risks associated with different water sport activities is widely supported. The development of such a scheme will, however, need to be supported by a well-defined R&D programme and advice from the Department of Health. Some health-related R&D studies are already in progress, investigating the risks associated with bathing and canoeing activities. It is recommended that the results of these studies are examined when they have been completed with a view to establishing the feasibility of developing a water quality classification system which would cover a range of different water contact activities.

v. Special Ecosystem

The need to take account of the water quality requirements of sites which need special protection for nature conservation reasons in a separate UC is widely supported. Because the requirements are likely to vary according to the special needs at each site, it is recommended that standards should be derived and set on a site-specific basis.

vi. Commercial Harvesting of Marine Fish/Shellfish

To put this UC into effect, relevant water quality standards will need to be derived; these should reflect the need to protect the health of the fish/shellfish populations themselves and that of the consumers. Clearly these two requirements are distinct, and the standards may be quite different. Water quality standards need to be derived in consultation with MAFF to protect against the potentially harmful effects of bioaccumulation.

4.2 General Quality Assessment Schemes

If such Statutory Water Quality Objectives are to be set, as outlined above, then at any one time the only national statement which could be made of the quality of controlled waters would be that of a 'black and white' map indicating whether or not individual stretches of water were meeting their specific, local, objectives. It therefore seems desirable to be able to make a statement about the general state of controlled waters at periodic intervals - say every five years. Such statements need also to be based on hierarchical classifications, here termed General Quality Assessment (GQA) schemes. They should, nevertheless, not be subject to change - otherwise long-term general improvements would be difficult to discern because of changes in the assessment procedure as well as actual changes in the environment. That is not to say, however, that improved assessment techniques should not be used; but they would be additional and in parallel to what is already in place.

Effectively, therefore, it is useful to look every now and then at controlled waters through different 'windows', each of which gives separate valuable information and which collectively provide the means of diagnosing what is happening and indicate what remedial or additional measures need to be taken. Overlapping one 'window' with another serves only to confuse rather than clarify the situation, although using them in different combinations can be helpful.

4.2.1 Rivers

Table 3 outlines the recommended GQA for rivers. The first part, a Chemical Classification, incorporates the same chemical criteria for DO, BOD and Total Ammonia as the proposed Fisheries Ecosystem UC and is, essentially, a sub-set of it. A Biological Classification would also be introduced and applied in parallel with the chemical information. This should be based on class-limiting criteria expressed as Ecological Quality Indices although the issue of whether a single EQI or a combination of EQI

TABLE 3: GENERAL QUALITY ASSESSMENT SCHEME FOR RIVERS & CANALS

CLASS	CHEMICAL CLASSIFICATION			BIOLOGICAL CLASSIFICATION EQI (indicative)	AESTHETIC CLASSIFICATION Basic Amenity Score (indicative)	NUTRIENT STATUS CLASSIFICATION (N and P) - to be developed
	DO % sat 10%ile	BOD mg/l 90%ile	Ammonia mgN/l 90%ile			
A	80	2.5	0.2	0.95	10	
B	70	4.0	0.6	0.75	8	
C	60	6.0	1.3	0.50	6	
D	50	8.0	2.5	0.20	4	
E	20	15.0	9.0	<0.20	2	
F	<20	-	-			

expressions should be used still needs to be resolved. In addition to the chemical and biological components, the GQA should also incorporate a classification related to the Aesthetic properties of waters. Dependent upon the outcome of the field trials, the originally proposed Basic Amenity classification, or probably a simplified version of it, would provide the obvious tool for this. Further field trials will be required to produce a reliable and properly validated Aesthetic Classification system which can be applied during the next major national water quality survey.

There is also a strong argument for the inclusion of nutrient (N and P) levels in a GQA. As for biological and aesthetic quality, a Nutrient Classification could be developed and applied in parallel to the Chemical (sanitary) Classification. Again, the development of a Nutrient Classification would need to involve comprehensive testing and validation before it could be used for the next national water quality survey.

Thus, eventually, it should be possible to view progress on the state of the aquatic environment by looking at it through these four different 'windows' - those of chemical, biological, nutrient status, and aesthetic criteria. A baseline has been established for the Chemical Classification, and possibly for the Biological Classification, as a result of the data obtained in 1990/91. Further work still needs to be carried out before a finalised GQA for rivers can be recommended; this may take several months. This will involve further analysis of both the chemical and biological information collected during the 1990 Survey. When this is complete, the 1990 Survey chemical and biological results will be published, the former certainly according to the new classification system. It is expected that a published report will be released early in 1993.

4.2.2 Canals

The existing NWC scheme for rivers is also relevant to canals and has been used in the past for quinquennial surveys of water quality in canals. However, canals are fundamentally different from rivers in many respects and probably share more similarities with lakes than with rivers. This is particularly relevant if biological classification systems are to be extended to canals. It is recommended that further work is carried out to investigate this issue further and come to a conclusion on whether or not a separate classification system is needed for canals.

4.2.3 Lakes

The development of a classification system for lakes is currently being addressed through the NRA's national R&D programme. A framework scheme has been proposed which takes account of a series of fundamental characteristics of lakes. This scheme requires further development but is planned to be completed by March 1993.

4.2.4 Groundwaters

The development of a national classification scheme for groundwater quality would clearly be a significant undertaking, not only in developing the scheme itself, but also in establishing a national network of sampling points. The scheme would also need to take account of the NRA's proposed 'Groundwater Protection Policy'. It is recommended that

further work is carried out to assess the feasibility and costs of developing and implementing a classification scheme.

4.2.5 Estuaries and Coastal Waters

Outline proposals for classification schemes for estuaries and coastal waters were set out in the consultation document. Considerable progress has now been made towards the development of these schemes through the NRA's national R&D programme. Feasibility assessments and project definition studies have been carried out and the costs of development and implementation of the schemes have been estimated. The development of some components of the proposed schemes may take several years. It is therefore recommended that the necessary R&D programmes are put into place as soon as possible.

5. CONCLUSION

In summary, it is recommended that a system of Use Classifications should be used to provide the basis for establishing targets for maintaining or improving the quality of specific bodies of water by specific dates, alongside the existing statutory requirement to achieve compliance with EC Directives. Because this will result in different stretches of water being improved for different uses, by different times, in different places, a system for assessing the general state of the aquatic environment at, say, five yearly intervals is also required. This General Quality Assessment Scheme should examine the state of the waters using different criteria - basic chemical, biological, aesthetic and nutrient status - such that strategies for general improvement can be better developed in the future over and above that required of individual dischargers into specific stretches of water.