Environment Agency

SEPA
Scottish Environment Protection Agency

Draft River Basin Management Plan for the Solway Tweed River Basin District

Foreword

This draft river basin management plan for the Solway Tweed river basin district sets out our vision for the water environment until 2027. SEPA and the Environment Agency have worked closely with the people who use and enjoy the water environment to ensure this plan presents an effective balance between:

- protecting and improving the water environment;
- achieving sustainable economic development;
- the interests of those who depend on our water environment for their quality of life.

The plan sets out the actions needed to produce environmental improvements during the next six years and over the longer term. The actions are based on what is technically feasible and the achievement of environmental gains at reasonable cost. The plan also covers those actions required to ensure our waters of special value (e.g. for drinking, wildlife, shellfish or bathing) meet the required standards or maintain their quality if they already meet these standards.

It is important that this plan is used to influence sustainable future development. Its implementation should see us all working together to ensure our use of the water environment is sustainable for future generations to continue to value.

This is only a draft plan – the final version will be published in December 2009. We welcome your views on the proposals presented in this document.

Contents

Section 1	**Public consultation – make your views known**	**4**
	1.1 Consultation period	4
	1.2 Consultation questions	4
Section 2	**Introduction to this draft plan**	**5**
	2.1 About this plan	5
	2.2 Who has been involved in developing this plan?	7
	2.3 Strategic environmental assessment	7
	2.4 Impact assessment	8
Section 3	**About the Solway Tweed river basin district**	**9**
	3.1 The value of our water environment	9
	3.2 From 2004 risk assessment to 2007 classification	12
	3.3 The new classification scheme	16
	3.4 Designation of heavily modified water bodies and artificial water bodies	17
	3.5 The current state of our environment	17
	3.6 Condition of protected areas	20
	3.7 Summary of reasons for not achieving good status in 2007	20
	3.8 Reviewing the results obtained with the new classification scheme	21
Section 4	**Environmental objectives –setting targets for 2015 until 2027**	**22**
	4.1 What needs to be considered when setting targets?	22
	4.2 Improvement objectives 2009–2015	23
	4.3 Improvement objectives 2021–2027	24
	4.4 Protected areas	26
	4.5 Meeting the objective targets	26
Section 5	**Achieving the improvement objectives**	**27**
	5.1 Priorities for action	27
	5.2 Developing a programme of measures	27
	5.3 Making links to other plans and processes	28
	5.4 Continued improvements	28
Section 6	**Pollution – an overview**	**29**
	6.1 Identifying pollution	29
	6.2 What the classification results reveal about pollution	29
Section 7	**Pollution from agriculture**	**32**
	7.1 Where is the issue?	32
	7.2 What action are we taking?	32
	7.3 What are the benefits?	32
Section 8	**Pollution from forestry**	**35**
	8.1 Where is the issue?	35
	8.2 What action are we taking?	35
	8.3 What are the benefits?	37
Section 9	**Pollution from wastewater**	**38**
	9.1 Where is this issue?	38
	9.2 What action are we taking?	38
	9.3 What are the benefits?	39

Section 10 Changes to morphology – overview **41**
10.1 What the classification results reveal about morphology 41

Section 11 Changes in morphology due to agriculture **43**
11.1 Where is the problem? 43
11.2 What actions are we taking? 43
11.3 What are the benefits? 45

Section 12 Changes to morphology due to forestry **46**
12.1 Where is the issue? 46
12.2 What actions are we taking? 46
12.3 What are the benefits? 46

Section 13 Abstraction and flow regulations (water resources) – overview **47**
13.1 What the classification results reveal about abstraction and flow 47

Section 14 Abstraction and flow regulation due to electricity generation **49**
14.1 What actions are we taking? 49
14.2 What action are we taking to promote sustainable water use? 51
14.3 What are the benefits? 51

Section 15 Abstraction and flow regulation from public water supplies **52**
15.1 Working with Scottish Water 52
15.2 Working with United Utilities 52
15.3 Working with Northumbrian Water 53
15.4 Private water supplies 53
15.5 Promoting sustainable water use 53
15.6 What are the benefits? 54

Section 16 Abstraction and flow regulation for agriculture **55**
16.1 Developing actions together 55
16.2 What action are we taking to promote sustainable water use? 55
16.3 What are the benefits? 56

Section 17 Invasive non-native species **58**
17.1 What does classification reveal about invasive non-native species? 58
17.2 What action are we taking? 58
17.3 What are the benefits? 59

Section 18 Ensuring that good status is reached by 2027 **60**
18.1 Options for continued improvements 60

Section 19 Climate change **61**
19.1 What is the environmental impact? 61

Section 20 Developing the final river basin management plan **63**
20.1 Taking into account your views 63
20.2 Next steps 63

Section 1 Public consultation – make your views known

This draft river basin management plan presents proposals for maintaining and, where appropriate, improving the water environment in the Solway Tweed river basin district. It is part of a range of consultation activities and opportunities taking place in this river basin district to enable you to tell us what you think of these proposals. An electronic version of this document and a consultation response form are available on the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx).

1.1 Consultation period

The consultation period is between 22 December 2008 and 22 June 2009. We would appreciate an early response as we will be carrying out a first review of responses received before 22 March 2009. We would also prefer to receive responses to this consultation by email to rbmp@sepa.org.uk though written responses can be sent to:

Jackie Galley
River Basin Planning Coordinator
SEPA
Rivers House
Irongray Road
Dumfries
DG2 0JE

1.2 Consultation questions

This consultation focuses on the actions proposed in the draft river basin management plan to address the pressures on the water environment in the Solway Tweed river basin district. The consultation responses will be used, where appropriate, in developing the final river basin management plan, or inform river basin planning during this first cycle.

Classification	This document includes a summary of the overall classification results. Detail on individual water bodies is given on the interactive map found on the SEPA website www.sepa.org.uk/water/river_basin_planning.aspx. **Question 1:** Are there water bodies whose condition you think we have described incorrectly? If so, please provide details.
Objective setting	**Question 2:** This plan sets out the objectives for the water environment for the next six years and beyond. To what extent do you agree with what we are planning to achieve in terms of: • the level of improvements proposed by 2015? • the level of improvements proposed by 2027? **Question 3:** Are there water bodies where you think the objective for the future should be different? If so, please provide details.
Implementing the plan	**Question 4:** We have identified the most important problems for our water environment and the measures that will help to improve them. How can you help deliver these actions or any future actions? **Question 5:** We need to work together to deliver the river basin management plan. Do you have suggestions on how we could work better together?
Making links to other plans	**Question 6:** To be effective this plan has to influence other planning processes. Have you any suggestions on how to improve the way this plan links to other planning processes?

Section 2 Introduction to this draft plan

This draft plan provides a summary of the proposals for ensuring the water environment in the Solway Tweed river basin district is maintained and, where necessary, improved over the next 18 years. Its development has been reviewed by people who use water in their businesses, value it for its wildlife and whose livelihoods depend on it.

Key message

We need to manage the water environment in the long term, achieving realistic environmental improvements while supporting a wide range of uses. This draft plan sets out, for consultation, our proposed environmental objectives for the next three river basin planning cycles to 2015, 2021 and 2027.

2.1 About this plan

The production of this draft river basin management plan represents an important step in the river basin management planning process established by The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004, which transposed the Water Framework Directive (see Box 1). The plan's publication is one of the requirements of the river basin planning process which will see similar plans being put in place across Europe.

Once finalised the plan will provide everyone with:

- a comprehensive framework for co-ordinating and integrating the management of the water environment;
- a basis against which to review environmental progress.

The draft plan describes the condition of rivers, lochs/lakes, estuaries, seas and groundwater in the Solway Tweed river basin district. It sets out the proposed environmental objectives for these waters and explains how these can be achieved. It is important that these objectives strike the correct balance between:

- the protection and improvement of the water environment;
- maintaining a valuable wildlife resource;
- the interests of those who depend upon the water environment for their prosperity or quality of life.

The draft river basin management plan for Solway Tweed has the following three components (see Figure 1).

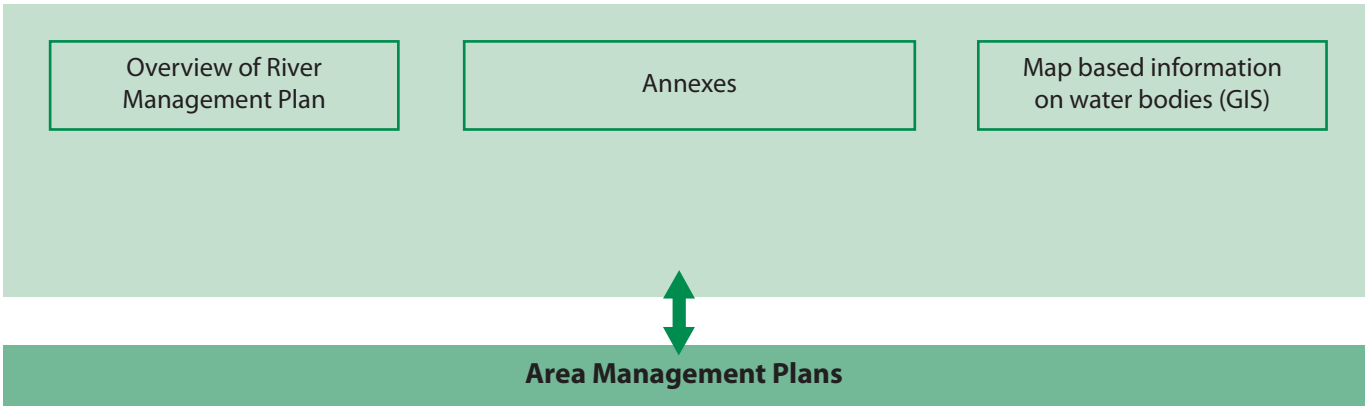
- This overview document gives information on what is planned to protect and improve the water environment.
- A series of annexes provide technical detail on each of the key aspects of the river basin planning process.
- A web-based interactive map provided by a geographical information system (GIS) offers detailed information on individual rivers, lochs/lakes, estuaries, coastal waters and groundwater. The map at www.sepa.org.uk/water/river_basin_planning.aspx provides information on the condition of each water body and the proposed objectives for that water body.

In addition, three area management plans give more detail on what is planned at a local level. These are also available on the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx) and cover:

- Tweed sub-basin;
- north Solway;
- south Solway (Eden, Waver and Wampool).

The Solway Tweed river basin management plan must be finalised by 22 December 2009. It will then be updated every six years.

Figure 1: Components of the draft river basin management plan



Box 1: The Water Framework Directive

The Water Framework Directive (WFD) seeks to achieve an integrated approach to the protection, improvement and sustainable use of the water environment. It applies to all surface freshwater bodies (including lochs/lakes and rivers), groundwater, estuaries and coastal waters out to three nautical miles in Scotland and one nautical mile in England. It also encourages the water environment to be managed to a consistent framework throughout the European Union.

The Water Framework Directive establishes a framework for Member States to use to achieve the following aims for surface waters:

- prevent deterioration in status of water bodies;
- aim to achieve good ecological and chemical status in water bodies by 2015;
- aim to achieve good ecological potential for artificial and heavily modified water bodies by 2015;
- achieve the objectives and comply with the standards for protected areas, where relevant;
- reduce pollution from priority substances, discharges and emissions;
- cease losses of priority hazardous substances into the aquatic environment.

In summary, the environmental objectives for groundwater are to:

- prevent deterioration in status;
- aim to achieve good quantitative and chemical status by 2015;
- reverse any significant and sustained upward trend in pollutant concentrations;
- comply with objectives and standards for protected areas, where relevant;
- prevent or limit input of pollutants into groundwater.

The Water Framework Directive is implemented through river basin planning which introduces a six-yearly cycle of planning, action and review.

Further information on the Water Framework Directive can be found on the European Union website (http://ec.europa.eu/environment/water/water-framework/index_en.html).

Further information on river basin planning can be found on the Environment Agency website (www.environment-agency.gov.uk/wfd) and the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx).

2.2 Who has been involved in developing this plan?

In July 2006 two Area Advisory Groups were established to provide advice and support to SEPA and the Environment Agency (the Agencies) in developing and implementing river basin planning in the Solway Tweed river basin district. To achieve a balanced approach, these groups include a wide cross-section of water users from both the Scottish and English parts of the Solway Tweed river basin district. The membership of the Area Advisory Groups and the background on how they were set up are given in Solway Tweed River Basin Planning: A Plan of Action and on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx). Support and advice were also received from the national advisory groups – the National Advisory Group in Scotland and the National Liaison Panel in England.

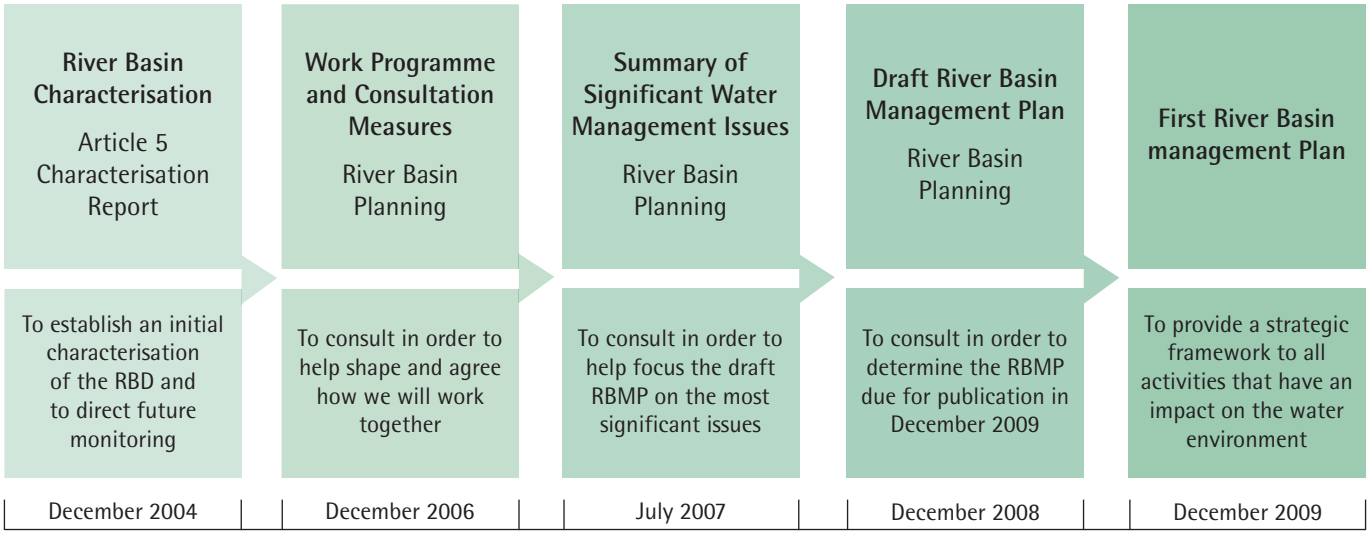
In addition, a small working group was set up with the specific remit to contribute and review early versions of this draft plan. The purpose of the working group was to develop a fair and even-handed approach to how the issues are presented and the potential solutions proposed.

All these groups will continue to provide a vital role in implementing the plan and monitoring its success. It is essential that this is a two-way process and that river basin planning is integrated into the plans and policies of the other bodies represented by Area Advisory Group members. In Scotland, some agencies have been designated responsible authorities and have legal requirement to do this.[2]

The plan for the Solway Tweed river basin district has to take into account the strategic direction of both the Scottish Government and the Department for Environment, Food and Rural Affairs (Defra). To help the process the two Governments issued guidance[1] in December 2007 which included instructions on how the agencies should work together to adopt a joint approach, where appropriate, for the river basin district.

This draft plan is the main outcome of the river basin planning process so far. It builds on the information and consultation responses received from the previous documents prepared as part of the river basin planning process (see Figure 2). In particular, the consultation responses from the Significant Water Management Issues document have been reviewed and acted on, where appropriate, during the development of this draft plan.

Figure 2: Documents developed as part of the river basin planning process



2.3 Strategic environmental assessment

Certain public plans are subject to strategic environmental assessment. This is the case with this draft river basin management plan as it aims to deliver net environmental improvements. A copy of the strategic environmental assessment for the draft plan can be found from a link on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx).

The agencies are also required to carry out an appropriate assessment of the implications of the river basin management plan for Natura 2000 sites. Their report will be available to support the final plan.

[1] www.scotland.gov.uk/Publications/2007/12/05141702/0
[2] www.scotland.gov.uk/Resource/Doc/95743/0023195.pdf

2.4 Impact assessment

Scottish and English ministers are jointly responsible for approving the draft plan and ensuring that it reflects appropriate and proportionate levels of protection and improvement for the Solway Tweed water environment. An impact assessment in line with English and Scottish guidelines and which outlines the costs and benefits of the draft river basin management plan is available alongside this consultation. A copy can be found from a link on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx).

In 2009 ministers will consider the measures and objectives identified in this draft river basin management plan alongside the other plans for England and Scotland. Costs and benefits and the responses to this consultation will form part of the approval process of the final river basin management plan for Solway Tweed.

Section 3 About the Solway Tweed river basin district

The Solway Tweed river basin district straddles the Scotland–England border and has a reputation as a high quality water environment. The benefits of a clean, healthy water environment include:

- good quality drinking water;
- a rich variety of wildlife;
- opportunities for tourism;
- 'high brand' products such as salmon and shellfish.

This draft plan contains proposals to maintain and enhance the water environment to ensure such activities can continue and thrive. To do so, we need to understand where and why our water environment is not meeting the standards required under the Water Framework Directive and the most effective methods of improving them.

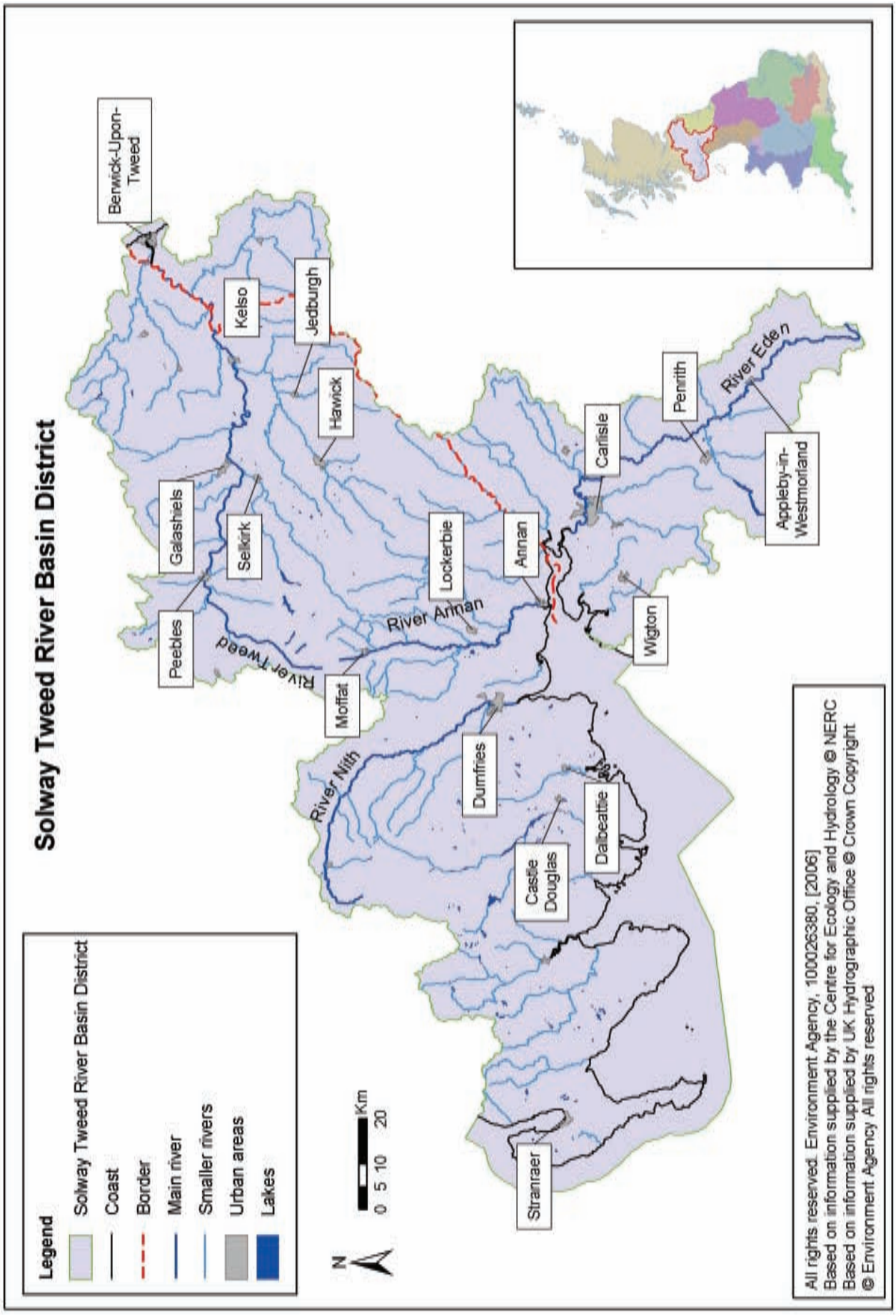
This chapter looks at the current state of the water environment. It outlines the characteristics of the Solway Tweed river basin district and provides a summary of the results from the monitoring and classification scheme introduced to meet the requirements of the Water Framework Directive.

3.1 The value of our water environment

The Solway Tweed river basin district (see Map 1) covers around 17,500km^2 of land and water from south Ayrshire and south Lothian in Scotland southwards to Kirkby Stephen and Wooler in England[3].

[3] www.sepa.org.uk/water/water_publications/characterisation_reports.aspx

Map 1: Solway Tweed river basin district



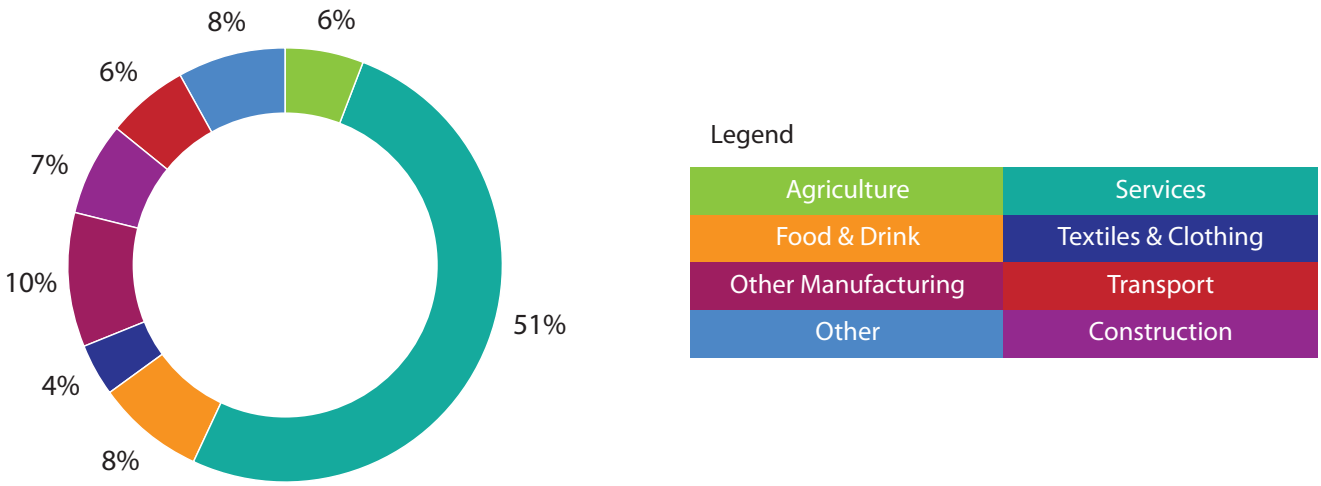
The water environment in the Solway Tweed is an important economic, social and environmental asset.

The economic importance of water in the Solway Tweed was in the economic characterisation report for the river basin district published in 2005.[4] Industries operating in the Solway Tweed with particular links to the water environment include:

- Services
- textiles and clothing;
- agriculture, forestry and fishing;
- food and drink.

In 2002 the gross output for the Solway Tweed area (measured in gross value added terms) was £4.37 billion.[4] Figure 3 shows how this was divided between the sectors.

Figure 3: Solway Tweed output by industry



Source: Experian Business Strategies Limited, 2004 (from characterisation report)

The services sector is the most important contributor to the Solway Tweed economy and includes tourism and recreation related businesses. These businesses are an important part of the Solway Tweed economy; in 2004, tourism related jobs accounted for 11.4% of all employment in Dumfries and Galloway and 7.3% in the Scottish Borders compared with 8.8% for Scotland as a whole.[5]

The regional economy within Northumberland is also highly dependant on tourism. Parts of the Lake District National Park, the Northumberland National Park and the Northumberland Coast Area of Outstanding Natural Beauty (AONB) are within the Solway Tweed river basin district and are all major tourist attractions. According to ONE North East[6] , tourists visiting the Northumberland National Park spent over £40 million (this equates to over two million visitor days) and those in the coastal AONB over £72 million (4.9 million visitor days in 2003).

The River Tweed is considered one of the most important salmon rivers in Scotland and England; a recent study commissioned by the River Tweed Commission estimated that it generates just under £18 million per year and supports 487 full-time jobs.[7] The River Eden and the rivers in Dumfries and Galloway are also important resources for employment and income.

Agriculture is a significant industry in the area; when combined with fisheries and forestry, the sector contributes around 6% to regional output compared with less than 2% for Scotland as a whole. Farming in the area is very mixed. Dumfries and Galloway has 37% of all dairy cows in Scotland, while around 45% of all farmed land in both the Scottish Borders and Dumfries and Galloway is managed crops or grass and the remaining 55% is rough grazing.[8] This indicates relatively intensive farming in the area compared with the rest of Scotland, for which 65% of the farm land is rough grazing. Northumberland and Cumbria have a relatively high proportion of rough grazing, equating to 24% compared with 5.9% for England as a whole.[9]

[4]Solway Tweed economic characterisation report, 2005
[5]South of Scotland Labour Market and Economic Intelligence Project, 2007 (www.southlmi.org)
[6]The Economic Value of Protected Landscapes in the North East of England, August 2004
[7]Tweed Economic Survey undertaken by SQV Ltd, 2007 (www.rtc.org.uk/About_/Tweed_Economic_Survey/tweed_economic_survey.html)
[8]Agricultural census by geographic area: June 2007, Scottish Government, 2008 (www.scotland.gov.uk/Publications/2008/03/11093631/0)
[9]June 2007 Agricultural and horticultural survey – England, Defra, 2008 (www.defra.gov.uk/esg/work_htm/publications/cs/farmstats_web/default.htm)

The value of the Solway Tweed river basin district is also reflected in the range and number of natural heritage Natura 2000 sites designated under the Habitats and Birds Directive. The Solway Firth European marine site crosses the border between Scotland and England and the River Tweed Special Area of Conservation also includes Scottish and English water bodies. The Solway mosses Special Area of Conservation incorporates lowland raised mires in both north Cumbria and Dumfriesshire. In all, there are 35 Special Areas of Conservation or Special Protection Areas in the Solway Tweed river basin district (Table 1). For more detail see the strategic environmental assessment report available on the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx).

Table 1: Natura 2000 sites in the Solway Tweed river basin district

Type	Number
Special Area of Conservation (SAC)	23
Special Protection Area (SPA)	12
Total	**35**

Bathing waters (as identified under the revised European Directive on bathing waters) are an asset for tourism. These high profile sites provide a focus for water quality issues due to the more stringent standard for bacterial levels. In the Solway Tweed there are eight bathing waters.

The Water Framework Directive also requires a number of other economically important protected areas to be taken into account such as shellfish growing waters. These are discussed in more detail in Annex 5 (www.sepa.org.uk/water/river_basin_planning.aspx).

Having a clean and healthy water environment has many knock-on benefits. For example, the return of otters to many of our rivers is attributed to an increase in water quality as well as enhanced protection.

The reputation of this river basin district as a clean and healthy place gives people the confidence to live here, to start up businesses and to visit on holiday.

3.2 From 2004 risk assessment to 2007 classification

In 2004 SEPA and the Environment Agency completed the first ever comprehensive assessment of the pressures and impacts on the water environment (including surface waters and groundwater) in the Solway Tweed river basin district as part of their work to produce the characterisation and impacts analyses report.[10] In addition, work was undertaken by the UK Technical Advisory Group[11] to develop a set of standard reference conditions for all the water environments in the UK.

Since then the Agencies have sought to refine their understanding of the risks to the water environment. This work included:

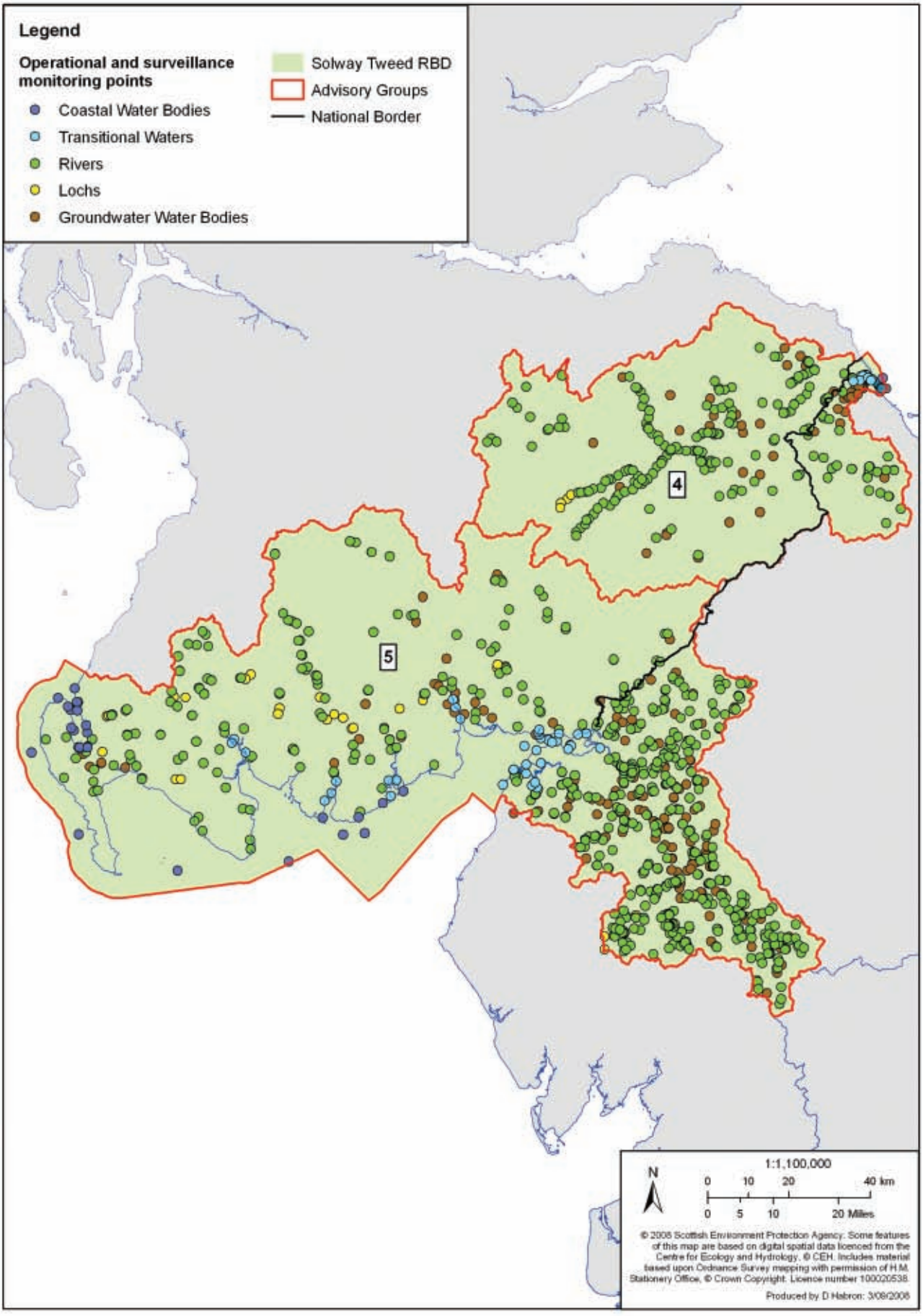
- improving the information on the pressures on the water environment;
- re-directing some of the monitoring work;
- refining the risk assessment methods on the basis of the environmental standards developed by the UK Technical Advisory Group based on the latest research on the conditions needed for healthy aquatic ecosystems.[12]

In December 2006 a new monitoring programme began to allow us to meet the needs of the Water Framework Directive. Map 2 shows the operational monitoring network, which provides much of the data required for the WFD classification scheme (see Section 3.3). The monitoring results will also help to direct our priorities for river basin planning over the next 18 years. Some aspects, such as the presence of non-native invasive species and compliance with the Habitats Directive, have been provided by partner organisations, namely Scottish Natural Heritage and Natural England. Further details on the new monitoring programme can be found on SEPA's website (www.sepa.org.uk/water/monitoring_and_classification.aspx).

To help describe the water environment it has been divided up into units called water bodies. These have been delineated so as to reflect differences in their characteristics (e.g. altitude). The water bodies include stretches of rivers, an area of coastal water or an underground aquifer. Maps 3 and 4 show the location of the surface and ground water bodies in the river basin district respectively. Information on individual water bodies, including classification results, can be accessed using the interactive map on the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx).

[10] www.sepa.org.uk/water/characterisation_reports.aspx
[11] www.wfduk.org
[12] These standards were subsequently published by the Scottish Government as a Direction to SEPA and in River Basin Planning Guidance issued to the Environment Agency by Defra and the Welsh Assembly Government.

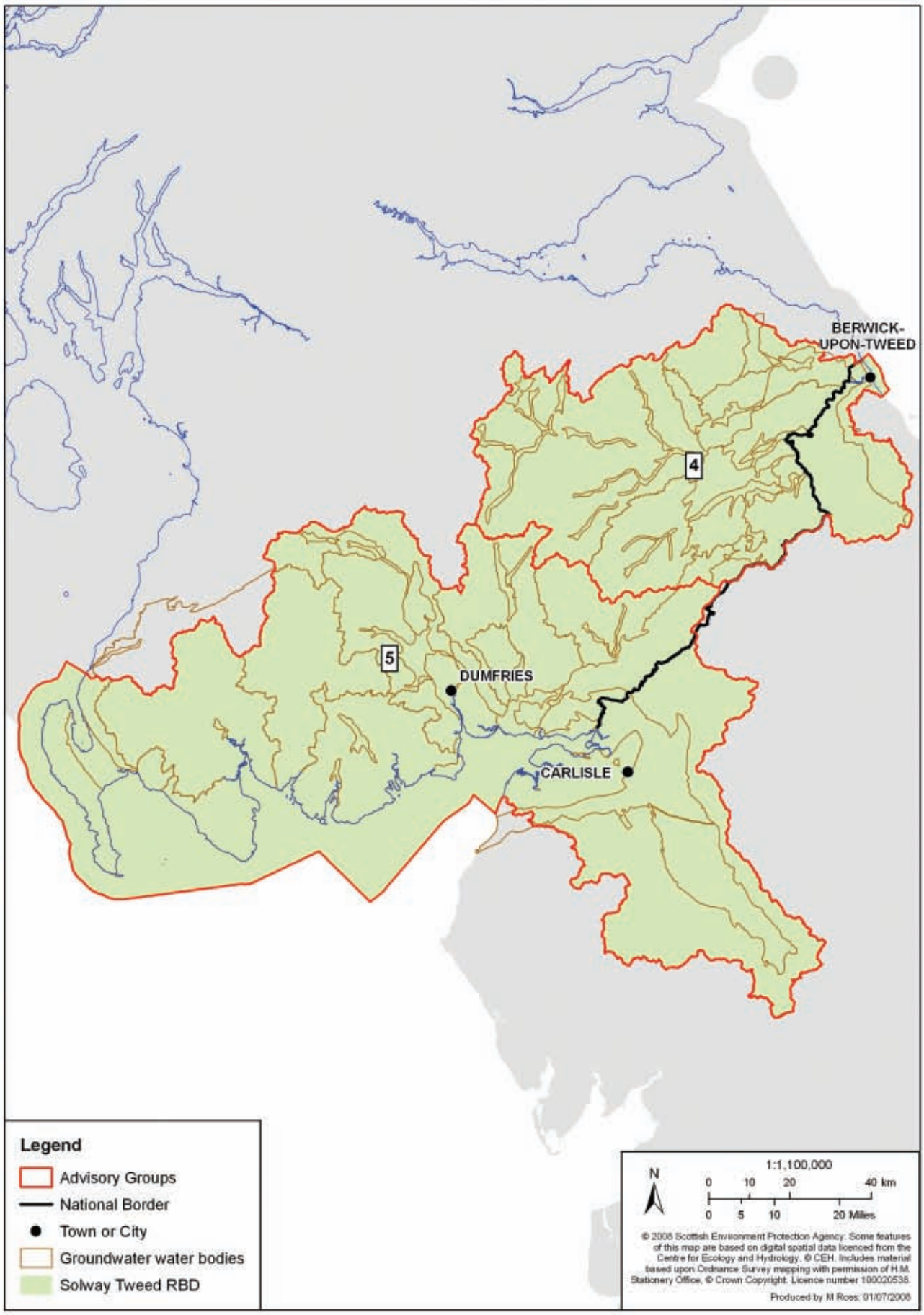
Map 2: Operational monitoring network in the Solway Tweed river basin district



Map 3: Surface water bodies in the Solway Tweed river basin district



Map 4: Groundwater bodies in the Solway Tweed river basin district



3.3 The new classification scheme

The Water Framework Directive classification scheme includes assessments for:

- the presence of pollution, such as chemicals in the water;
- biological factors, such as water insects, fish and other small animals
- the amount and flow of water;
- morphology (the physical condition of the watercourse, its banks and bed);
- the presence of non-native species, such as American signal crayfish.

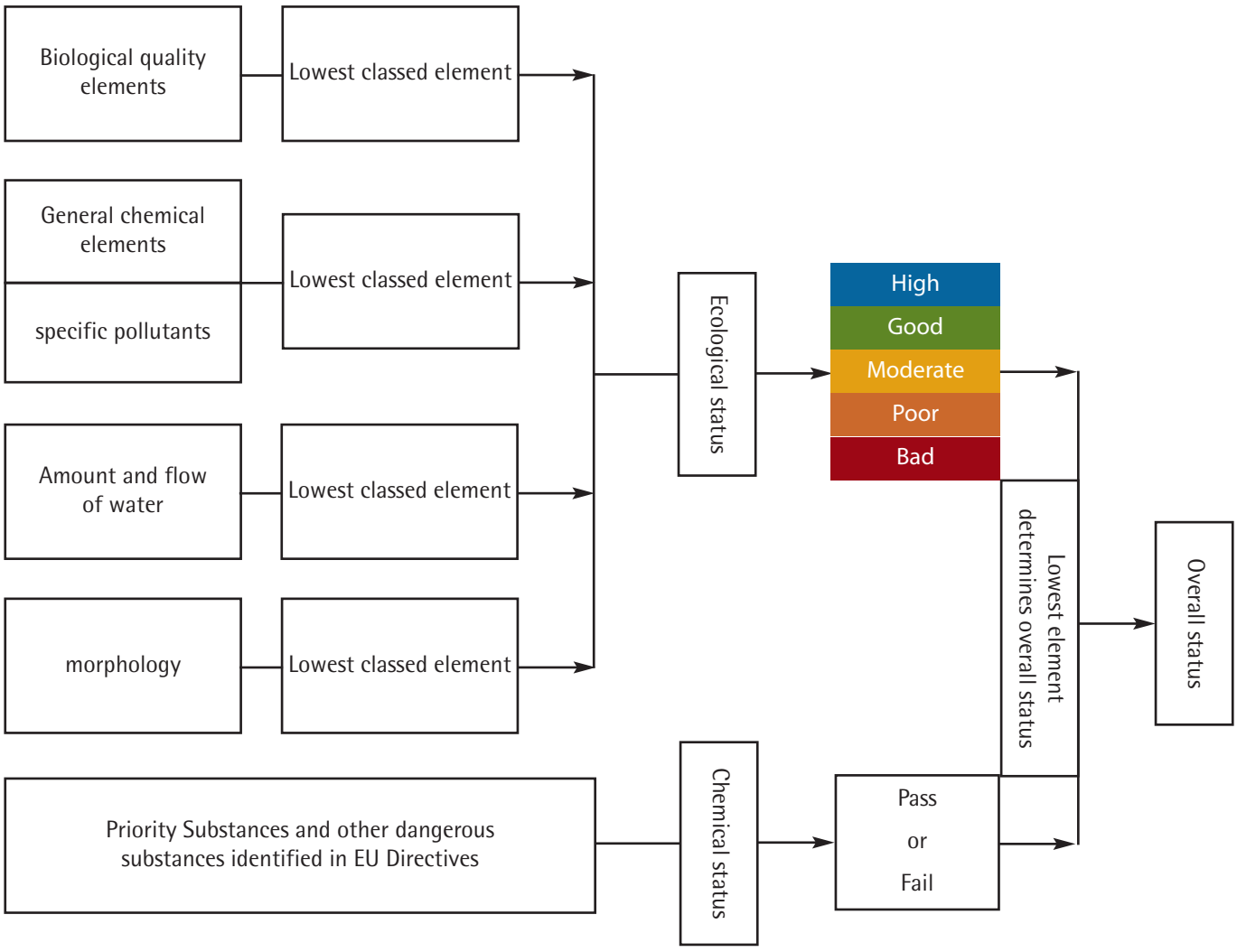
Each of these aspects has its own specific parameters which are tested to assess its condition. Each of these chemical and biological factors must meet their own individual standard. The Water Framework Directive requires all the factors monitored must meet the standards set before a water body can be considered to be at good status.

Surface water and groundwater are considered separately:

- **Surface water.** The classification of a surface water body has an ecological and a chemical component, which are measured separately first and then combined into a single final classification. Ecological status is measured on the scale high, good, moderate, poor and bad. Chemical status is measured as pass or fail.
- **Groundwater.** The status has a quantitative and a chemical component, which together provide a single final classification – good or poor status.

The classification scheme is based on three years of data, where available, which includes much of the monitoring previously undertaken. However, some aspects, such as morphology, are new for the Water Framework Directive and were monitored for the first time in 2007. As a consequence, there is less confidence in these data sets than in the long-term pollution monitoring.

Figure 4:



This new classification scheme is being used across the UK. This means that, for the first time, there is a common framework for assessing the overall state of the water environment in the UK. In the Solway Tweed river basin district, SEPA and the Environment Agency have been working together to ensure that monitoring and classification schemes are co-ordinated for water bodies that cross the boundary between Scotland and England. The Agencies have also been working with other Member States to try to ensure that classification schemes are also comparable across the European Union.

Information on some aspects of the classification such as the presence of non-native invasive species and compliance with the Habitats Directive has been provided by partner organisations – Scottish Natural Heritage and Natural England. The final river basin management plan will be based on the 2008 classification results.

3.4 Designation of heavily modified water bodies and artificial water bodies

The Water Framework Directive recognises that specified uses of the water environment will have changed some water bodies to such a degree that they can no longer be restored to their original condition without compromising their current use. Examples include rivers dammed to provide a source of drinking water such as Haweswater or hydropower such as at Earlston on the River Dee system.

Where such water bodies cannot be restored to good status without having a significant adverse impact upon their use, the Water Framework Directive allows them to be defined as heavily modified water bodies (HMWBs). For those water bodies that have been created by people and do not have the same physical features as natural water bodies, such as canals, the Directive allows them to be defined as artificial water bodies (AWBs).

HMWBs must meet good status for the entire classification scheme other than those biological elements likely to be impacted by the modification. In the case of Earlston, for example, it must continue to meet chemical good status but, because it is designated as heavily modified, it has an additional classification scheme based on its potential.

This approach to assessing ecological potential is new and it has not been possible to assess all HMWBs in terms of their ecological potential. However, they will be assessed for their ecological potential by the time the final plan is published in December 2009.

Further information on the process used to designate HMWBs and AWBs in the Solway Tweed can be found in Annex 4 (www.sepa.org.uk/water/river_basin_planning.aspx).

3.5 The current state of our environment

The results of the 2007 classification (see Table 2) show that:

- 40% of all water bodies are at high or good status or potential;
- a further 39% are at moderate status or potential;
- only 3% are at bad status or potential
- 7% of water bodies have still to be assessed (these are either HMWBs or AWBs).

Table 2: Summary of 2007 classification results (including HMWBs)*

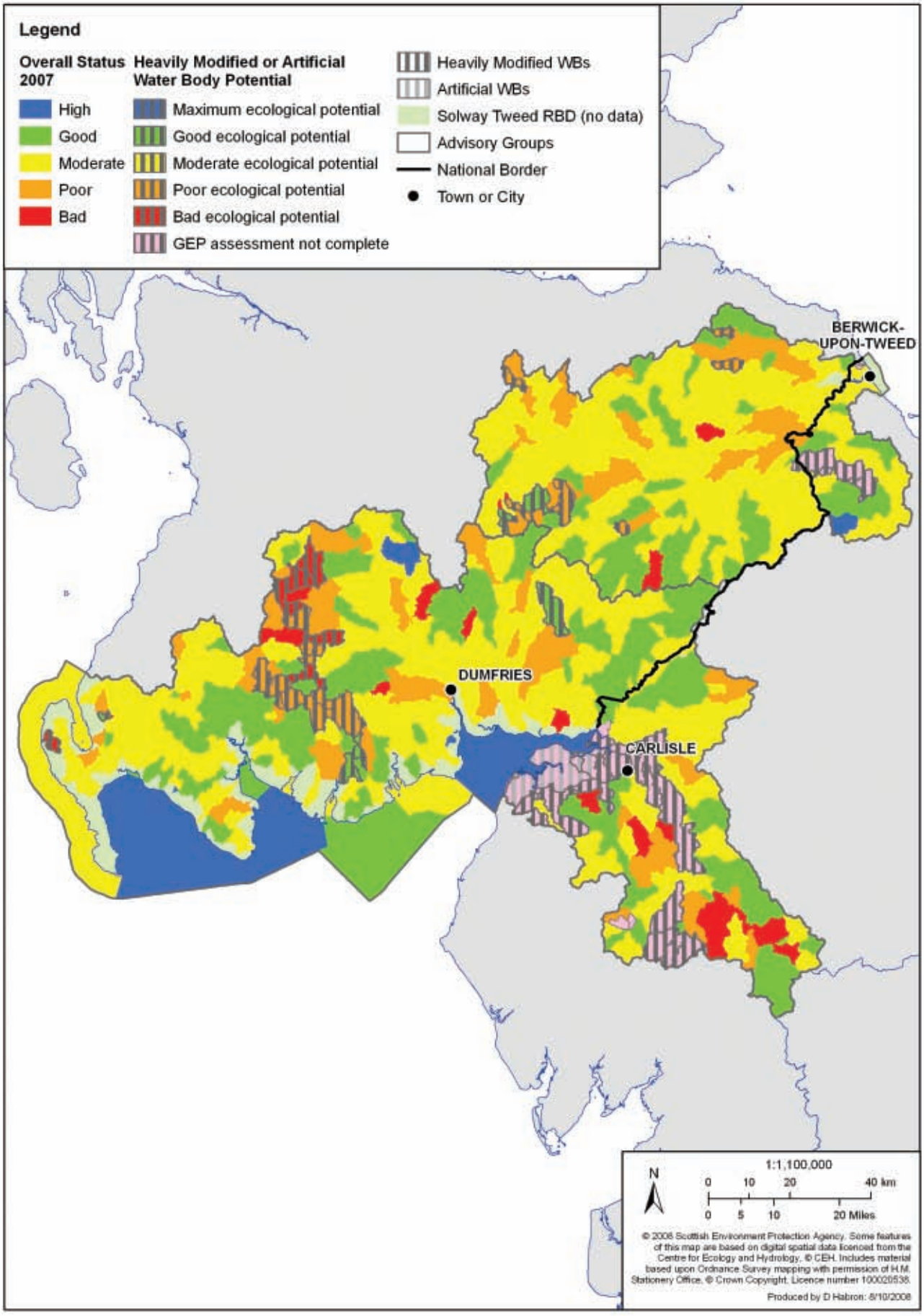
Water body category	Overall status/potential					Not yet assessed	Total
	High	Good	Moderate	Poor	Bad		
River	5	160	228	53	16	2	464
Loch/lake	1	3	12	3	0	2	21
Estuary	2	3	5	0	0		10
Coastal	2	2	4	0	0		8
HMWB at ecological potential	0	5	0	15	5	38	63
AWB at ecological potential	0	0	0	0	0	7	7
Total (surface)	10	173	249	71	21	49	573
Percentage	2%	30%	44%	12%	4%	8%	
Groundwater		68		5		0	73
Total (all water bodies)	10	241	249	76	21	49	646
Percentage	2%	38%	39%	11%	3%	7%	

* Grey shading denotes that the status is not relevant.

Significant improvements in the water quality have been achieved over the past few decades. However, the Water Framework Directive requires the assessment and monitoring of a wider range of impacts on the water environment than just chemical status. One consequence of this is that the number of water bodies not reaching good status under the Water Framework Directive classification scheme is greater than reported under the previous schemes in either Scotland or England.

The new classification system makes it clear that there is a significant challenge for everyone involved in water management in the Solway Tweed river basin district to aim to get all water bodies to good status by 2015.

Map 5: Classification and ecological potential results for surface water bodies, 2007



3.6 Condition of protected areas

The Water Framework Directive gives particular protection to certain areas designated under other national or European legislation which either protects surface water or groundwater, or conserves habitats or species that depend directly on these waters. The protected areas may be part of a water body (e.g. bathing waters) or may be a group of water bodies (e.g. freshwater fish sites).

The Agencies may assess some of these protected area types for additional pollutants or quality elements that are not included in the Water Framework Directive. For example, levels of bacteria such as faecal coliforms are assessed in bathing waters. The management and condition monitoring may also be the responsibility of partner organisations.

A summary of the condition of protected areas is presented in Table 3. More information can be found in Annex 5 (www.sepa.org.uk/water/river_basin_planning.aspx).

Table 3: Summary of the condition of protected areas in 2007

Type	Number	Number/percentage achieving their objectives in 2007
Protected areas for species or habitats of international importance, e.g. Natura 2000 sites	35	69% of Natura 2000 sites were at favourable condition.
Protected areas for economically important shellfish (shellfish growing waters)	4	All four (100%) achieved the mandatory standards. Three (75%) achieved the guide standards.
Protected areas for economically important freshwater fish: • cyprinid • salmonid	252 salmonid 4 cyprinid	Salmonid areas: 250 (99%) achieved the mandatory standards and 94 (37%) achieved the guide standards. Cyprinid areas: four (100%) achieved the mandatory standards and three (75%) achieved the guide standards.
Protected areas for bathing	8	Seven (88%) achieved the mandatory standards.
Protected areas for water supplies intended for human consumption	74	See Annex 5.*
Nutrient sensitive areas: • Nutrient Vulnerable Zones • Urban Waster Water Treatment Directive	9 12	See Annex 5.*

* www.sepa.org.uk/water/river_basin_planning.aspx

3.7 Summary of reasons for not achieving good status in 2007

In the Solway Tweed river basin district, the classification results indicate that the main reasons why a water body may be at less than good status are:

- pollution, particularly nutrient enrichment (diatoms in the river classification and total phosphorus in the loch classification are significant reasons why water bodies are at less than good status);
- acidification of the water environment;
- significant changes to the physical habitat (morphology) of our rivers and lochs/lakes;
- changes to the quantity of water – as shown by the hydrology impacts of abstraction and flow of water;
- the impact of barriers to fish due to impoundments such as dams;
- limited fish classification data from England – though further monitoring is required (see Section 3.8).

There are a number of additional reasons for failure.

- water bodies fail the standard for priority substances (Annex 10[13]). Further research is underway to identify the source of these failures.
- Non-native invasive species occur in a number of water bodies. Although they are not widespread they represent a significant risk to the water environment.
- Groundwater is in good condition (Scotland-only data show 96% of water bodies at good status) but there is some evidence of negative trends.

3.8 Reviewing the results obtained with the new classification scheme

SEPA and the Environment Agency have begun the process of reviewing the classification results. They have already identified the following areas as requiring further work to refine the tools or assessments used.

- The morphology classification is the newest component of the classification scheme in Scotland. Extensive validation work will be undertaken during the period leading up to publication of the final river basin management plan.
- The number of water bodies being classified as impacted by acidification is much lower than expected. Monitoring data are available, but the tool to classify acid-sensitive species is still under development.
- Further work is required to develop biological tools to monitor the impact of hydromorphological pressures in Scotland. SEPA is also working to develop a fish monitoring and classification tool.
- There is a need to improve the assessment of the impacts of hazardous substances.
- Further information and analysis are required for fish data in England. The Environment Agency is looking to obtain fish data for the River Till and apply the classification system to this river.
- There will be further assessment of the artificial and heavily modified water bodies in the river basin district.

In addition, the Agencies have started collating individual water body results which local knowledge suggests may be incorrect and are checking whether the classification process has been applied correctly in these cases.

Key message

The new Water Framework Directive classification scheme will, for the first time, describe the full range of impacts upon Solway Tweed's water environment leading to a step change in our understanding. The scheme will be progressively developed as new tools and new data become available.

[13] www.sepa.org.uk/water/river_basin_planning.aspx

Section 4 Environmental objectives –setting targets for 2015 until 2027

The setting of environmental objectives for the water environment is central to the river basin planning process. Environmental objectives are set for all surface water bodies and groundwater bodies on a water body by water body basis. The objective is the status that the water body is expected to achieve by the end of the plan period.

The objective set for a water body may often be achievable only with the support and actions of partner organisations. The information available from the river basin planning process will assist many of our partners to assess the impact of their decisions.

This plan presents the objectives until 2027. However the focus is on this first cycle and the improvements that can be achieved by 2015.

Key message

In setting environmental objectives, it is necessary to achieve an appropriate balance between protecting the water environment and the interests of those who depend upon it. This plan sets objectives to deliver challenging but realistic improvements in the water environment over the period until 2027.

4.1 What needs to be considered when setting targets?

The setting of objectives for water bodies is guided by Water Framework Directive requirements and government policies. Details on how the objectives are set are given in Annex 3[14] and summarised below.

It is necessary to take into account the following considerations when setting objectives so as to reach a balance between environmental improvement and sustainable development.

4.1.1 Prevent deterioration

The minimum objective for all water bodies is to ensure that the status of rivers, lochs/lakes, estuaries, coastal waters and groundwater are protected from deterioration. This objective will be applied to all water bodies no matter what their status. However the Water Framework Directive provides for exemptions or reasons why this primary objective should not be followed (see below).

4.1.2 Alternative objectives

The Water Framework Directive recognises that achieving good status for surface water may not be possible within the first cycle because:

- the scale of improvements may take several cycles due to technical feasibility;
- carrying out the improvements by 2015 may be disproportionately expensive;
- natural conditions do not allow for timely improvements.

In such cases, as long as the water body does not deteriorate, the necessary improvement can take several cycles.

There are other exceptions where alternative objectives can be set. This includes the less stringent objective to meet good ecological potential if the water body is designated heavily modified or artificial.

4.1.3 Permitted development

Although protecting the environment is a key priority, some developments of the water environment can provide important benefits to human health, human safety and/or sustainable development. Such benefits can include:

- public water supply;
- flood alleviation;
- hydropower generation;
- navigation.

It is often impossible to undertake such activities without causing deterioration of status. Where a proposed water use activity could provide significant benefits, its merits will be taken into account to decide whether to allow an exemption from the general objective of preventing deterioration of status.

[14] www.sepa.org.uk/water/river_basin_planning.aspx

Information on the exemptions allowed prior to the publication of this draft plan is included in Annex 3. Information on any future exemptions will be included in the next update of the river basin management plan in 2015.

4.1.4 Protected areas

Some water bodies may form part or all of a protected area. They areas are considered in Section 4.4.

4.2 Improvement objectives 2009–2015

The river basin planning process offers an important opportunity to restore or enhance those parts of the water environment that are not at good status. Such improvements can provide benefits for:

- production of safe drinking water;
- abundance of economically important species such as Atlantic salmon;
- quality of life;
- opportunities for recreation;
- conservation of the natural heritage.

By the end of the first planning cycle (2009–2015), the aim is to improve the water bodies from 40% meeting good status or higher (Table 2) to 43% meeting good status or higher (see Table 4).

To identify the proposed improvement objective, the following were taken into account:

- the degree of improvement needed to restore the water body to good status;
- the measures and sources of funding to promote the measures available or identified so far for achieving improvements;
- the scale of the resulting benefits to the water environment.

Table 4: Proposed objectives for water bodies by 2015

Water body category	Overall status/potential					Not yet assessed	Total
	High	Good	Moderate	Poor	Bad		
River	8	181	207	50	16	2	464
Loch/lake	1	3	8	6	1	2	21
Estuary	3	2	5	0	0	0	10
Coastal	2	2	4	0	0	0	8
HMWB at ecological potential		9	5	8	3	38	63
AWB at ecological potential		0	0	0	0	7	7
Total (surface)	14	197	229	64	20	49	573
Percentage	2%	34%	40%	11%	4%	9%	
Groundwater		68		5		0	73
Total (all water bodies)	14	265	229	69	20	49	646
Percentage	2%	41%	35%	11%	4%	7%	

* Grey shading denotes that the status is not relevant.

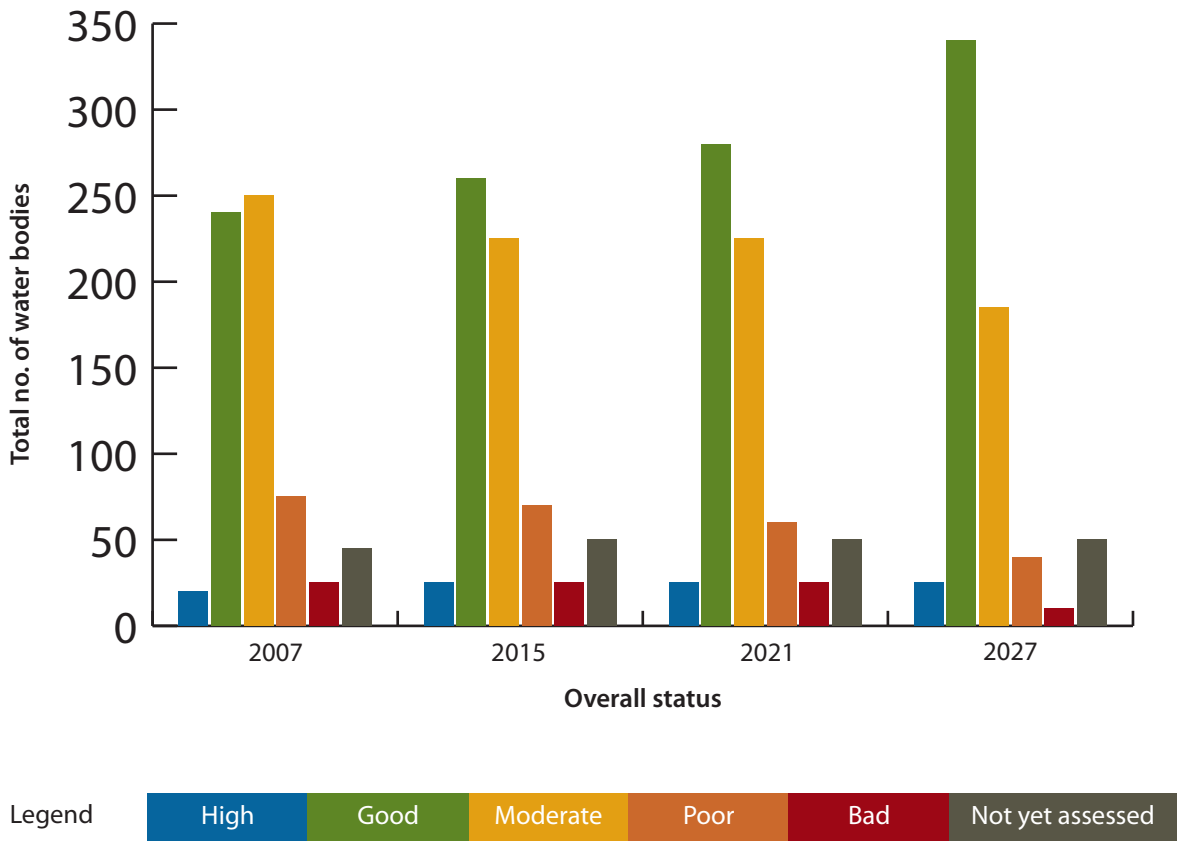
These summaries give only a partial picture of the extent of improvements that will be achieved. This is because the actions taken to improve some water bodies will result in their condition being significantly improved without their overall status changing. For example, for some water bodies, it is expected to be able to reduce pollution and so significantly improve water quality by 2015. However other environmental problems in the water bodies (e.g. alterations to their morphological characteristics) will have to be phased over a longer period of time.

Information on the improvements to water quality, water resources and morphological conditions that we expect the plan to deliver are described in Annex 3. Information on the improvement objectives for individual water bodies can be accessed from the interactive map on the SEPA website (www.sepa.org.uk/water/river_basin_planning.aspx).

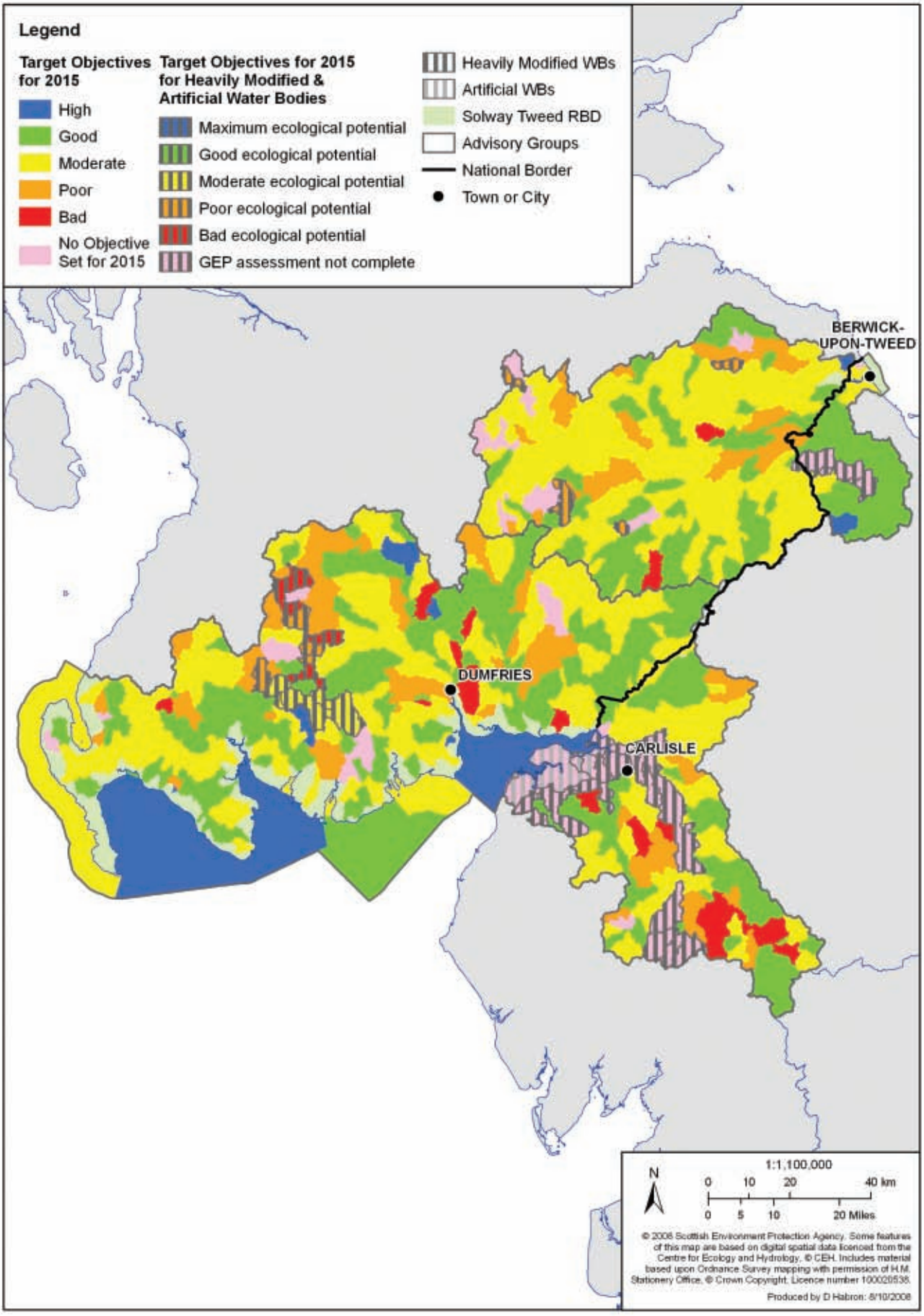
4.3 Improvement objectives 2021–2027

Figure 5 provides a forward look at the improvements expected over the following two cycles. But additional measures may be required for this level of improvement to take place. These are considered further in the Scottish Government and Environment Agency impact assessment consultation and outlined in Section 18.1 (Options for continued improvements). Map 6 shows the target objectives for 2015 for water bodies in the Solway Tweed river basin district.

Figure 5: Improvement objectives over the three planning cycles



Map 6: Target objectives for 2015 in the Solway Tweed river basin district



4.4 Protected areas

Protected areas are water bodies that have been identified under other European Directives because of their particular economic, environmental or social importance.[15] A register of protected areas for the Solway Tweed river basin district can be found on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx).

Most protected areas relate to areas identified for protection under other legislation. Bringing the management of these areas into the framework of the river basin planning process will:

- help streamline our monitoring and assessment work;
- integrate their protection into the wider management of the river basin.

Further information on the different protected areas and the objectives that apply to them is provided in Annex 5 (www.sepa.org.uk/water/river_basin_planning.aspx).

4.5 Meeting the objective targets

In order to meet these objectives it is necessary to put in place a series of actions or measures. This programme of measures has been tailored for each water body. Details of how this programme was developed are given in the next chapter.

[15]As set out in paragraph 4, Schedule 1 of The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004.

Section 5 Achieving the improvement objectives

This chapter identifies the key issues for the water environment in this river basin district and outlines how the proposed programme of measures to tackle these issues has been drawn up.

The interactive map on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx) is the main source of information for any specific measures that will be applied to a particular water body in addition to any national measures that must be adhered to such as General Binding Rules.

The development of a programme of measures builds on the work already carried out for the Significant Water Management Issues report and the responses received as part of its consultation (see www.sepa.org/water/water_publications/swmi.aspx).

In addition to water body measures there are the wider links between river basin planning and other planning processes such as development planning. These are considered in Annex 8.[16] Section 19 outlines the potential impacts of climate change.

Key message

This plan brings together measures planned by a wide range of organisations across the Solway Tweed to meet the environmental objectives set out in this plan. This is the first time this work has been co-ordinated. It means we will be able to achieve the objectives more effectively and, as a result, deliver a wide range of benefits for the people and the environment of the Solway Tweed.

5.1 Priorities for action

The work on classification and setting objectives identifies those issues that are the priorities for action in the Solway Tweed river basin district. These issues are:

- pollution, particularly nutrient enrichment and acidification of watercourses;
- morphological change, including the presence of barriers to fish movement;
- changes to the hydrology through abstraction and flow of water;
- non-native invasive species.

5.2 Developing a programme of measures

An important part of the river basin planning process has been the development of a programme of measures for the Solway Tweed river basin district. This includes all measures that:

- Prevent deterioration – many of the actions undertaken by water and land managers on a daily basis protect the water environment from potentially damaging existing or new activities;
- Make improvements – where it is necessary to improve the quality of a water body, we have identified the most appropriate measure or set of measures based on the most cost-effective and feasible way of achieving the improvement.

There are a wide range of existing measures that can contribute to achieving the environmental objectives. These are outlined in the Significant Water Management Issues report (www.sepa.org.uk/water/water_publications/swmi.aspx).

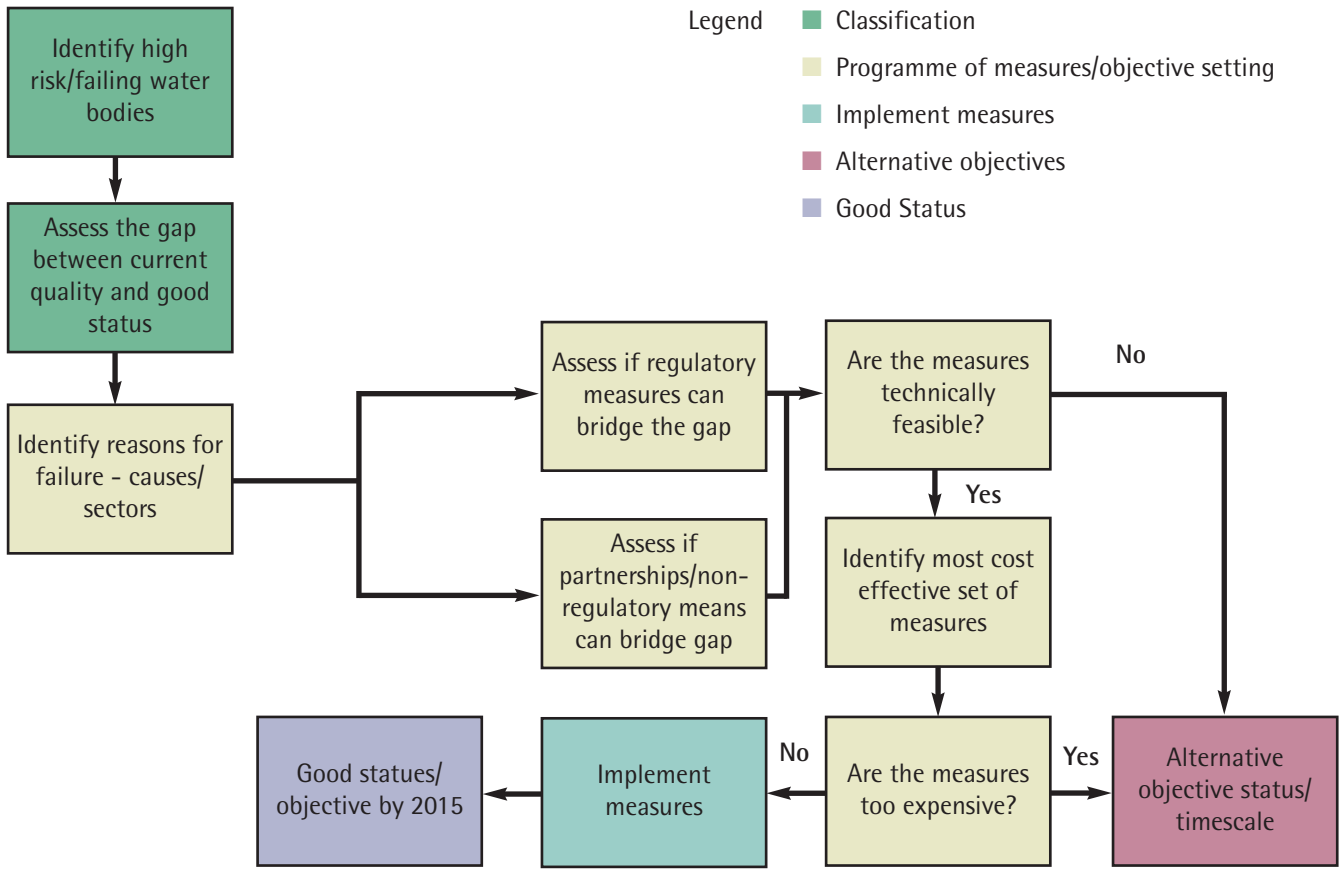
As part of the development of this draft river basin management plan, SEPA and the Environment Agency worked with the Solway and Tweed Area Advisory Groups, the national advisory groups and local stakeholders to identify how these measures apply on a water body by water body basis in the Solway Tweed river basin district. More information on this can be found in the Area Management Plans available on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx).

From the discussions undertaken to collate the measures it is clear that many local people, owners and groups are already making a significant contribution to the improvement and protection of the water environment through their own actions. Often, the greatest improvement is seen when people work together to combine resources and understanding. One of the main aims of the river basin planning process in the Solway Tweed is to encourage this positive way of working.

Most of the measures use regulatory or voluntary frameworks that were in place prior to the Water Framework Directive. In addition some measures have been put in place specifically for the Water Framework Directive, including the Controlled Activities Regulations (CAR)[17] in Scotland. However, a number of potential new measures could become available to managers during this first planning cycle (see Section 5.4).

[16] www.sepa.org.uk/water/river_basin_planning.aspx
[17] The Water Environment (Controlled Activities) (Scotland) Regulations 2005

Figure 6: Cyclical process for developing and agreeing measures



Note: Presented as a linear process for simplicity. The actual process is likely to be iterative as more information becomes available during the process.

5.3 Making links to other plans and processes

As well as individual actions, it is important that river basin planning is integrated into the plans and policies that could have an impact on the water environment at a strategic level. Annex 8 (www.sepa.org.uk/water/river_basin_planning.aspx) considers the following planning processes:

- land use planning;
- agriculture;
- climate change;
- coastal planning;
- flood risk management planning;
- fisheries;
- forestry;
- natural heritage planning;
- water supply and wastewater treatment.

5.4 Continued improvements

Where further measures could help to maintain the rate of improvement in the Solway Tweed water environment, England and Scotland are continuing to explore the wider packages of measures available through national policy initiatives such as Defra's WFD preliminary Cost Effectiveness Analysis (pCEA) process and the Scottish Government's proposed consultation on continued improvements.

Where additional measures/activities are potentially very relevant to making improvements to the Solway Tweed water environment, they are also considered under the impact assessment and strategic environmental assessment consultations.

Section 6 Pollution – an overview

6.1 Identifying pollution

Under the Water Framework Directive, pollution is identified by a number of specific chemical and biological factors. In some cases there is a direct link between these factors and the pollution. In other cases they are used as indicators.

The level at which these factors are considered to be causing a pollution impact is based on the use of environmental standards for surface water and groundwater. These standards or condition limits have been set for each status class on the basis of the best available information on ecological impacts as recommended by UK Technical Advisory Group. To assess whether a standard has been failed, the Agencies compare the results of monitoring for water bodies against the environmental standards.

6.2 What the classification results reveal about pollution

Various parameters are used to indicate nutrient enrichment including:

- the presence of phytobenthos (diatoms) – rivers and lochs/lakes;
- nitrogen levels – coastal waters and estuaries (transitional waters);
- phosphorus levels – rivers and loch/lakes.

Maps 7 and 8 show the extent of water bodies in the Solway Tweed river basin district failing to reach good status because of these nutrient parameters.

As noted in Section 3.8, the impact of acidification is under-recorded. There is a concentration of water bodies in the Galloway hills which are known to be affected by acidification.

More information on pollution can be found in Annex 1[18] and the Significant Water Management Issues report (www.sepa.org.uk/water/water_publications/swmi.aspx).

As summarised in Table 5, the classification results suggest that the priorities for action for pollution reduction in Solway Tweed are:

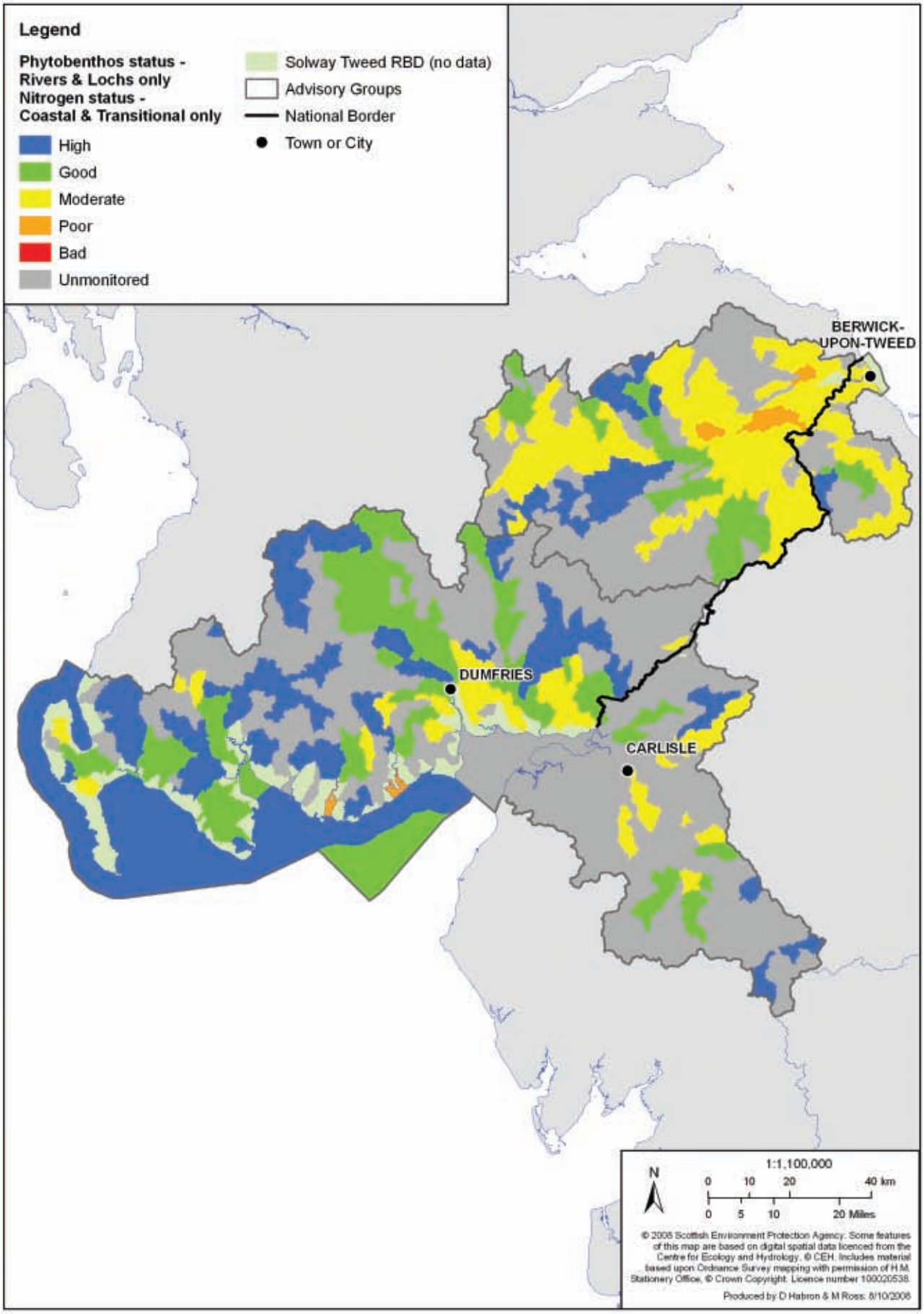
- pollution from agriculture (see Section 7);
- pollution from forestry (see Section 8);
- pollution from wastewater (see Section 9).

Table 5: Main sectors associated with the causes of pollution

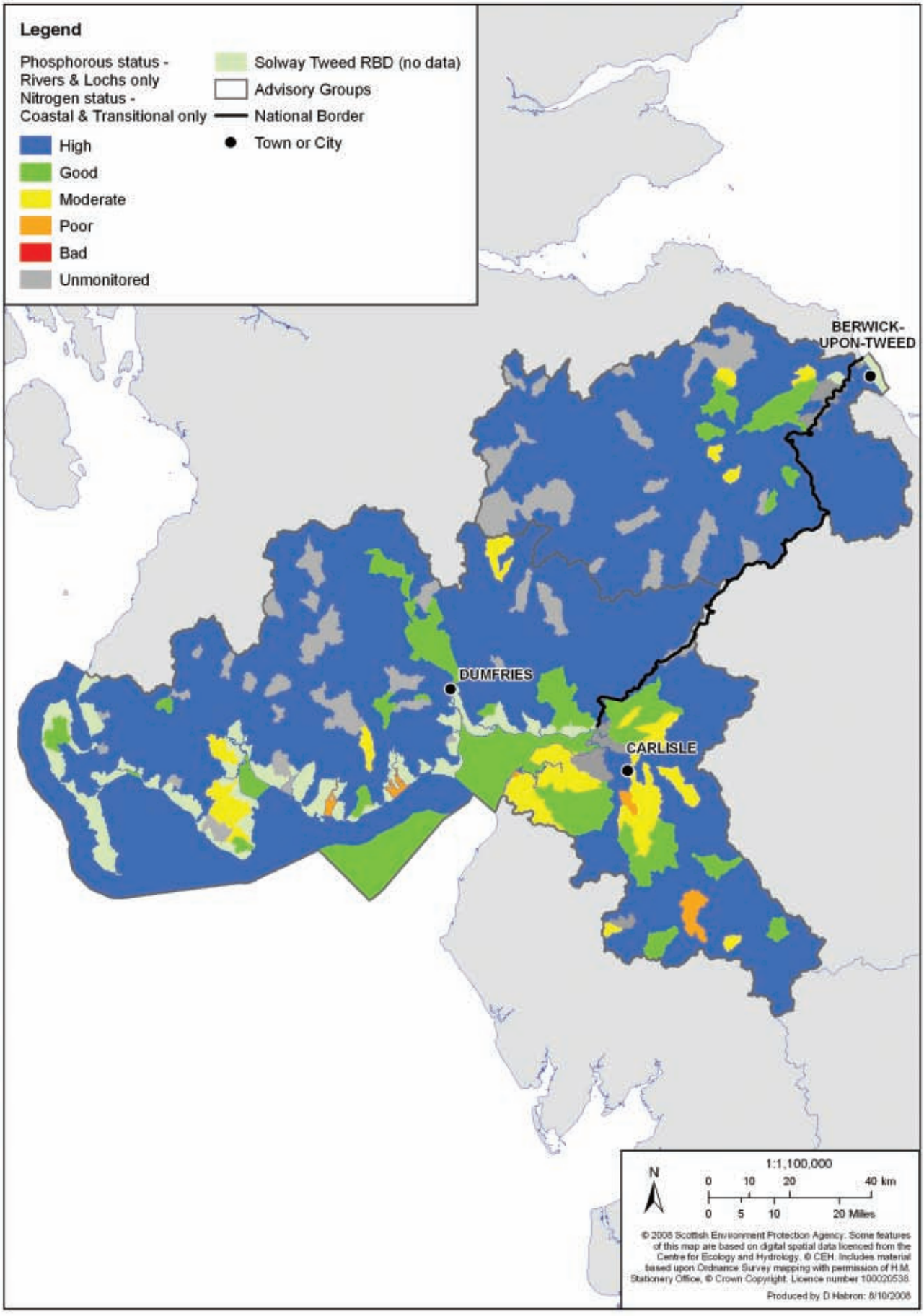
Classification parameter	Agriculture	Forestry	Wastewater
Nutrient enrichment of rivers – phytobenthos (diatoms) and benthic invertebrates	√	√	√ (sewage)
Nutrient enrichment of lochs/lakes –phosphorus		√	√
Nutrient enrichment of coastal waters –nitrogen	√		√
Acidification – pH value		√	
Priority substances	√	√	√

[18] www.sepa.org.uk/water/river_basin_planning.aspx

Map 7: Nutrient enrichment – phytobenthos (diatom) status of rivers and lochs/lakes and nitrogen status of coastal and transitional waters



Map 8: Nutrient enrichment – phosphorus status of rivers and lochs/lakes and nitrogen status of coastal and transitional waters



Section 7 Pollution from agriculture

Agriculture dominates land use in the Solway Tweed river basin district. It is not surprising, therefore, to find that this industry also contributes to the range of failures to meet good status.

Key message

Diffuse agricultural pollution is the most significant cause of pollution in rivers, lochs/lakes and groundwater in the Solway Tweed river basin district. There is an improved understanding of how diffuse pollution happens and the measures needed to address it. New regulatory and financial mechanisms, supported by advice and guidance, have the potential to deliver improvements in the water environment.

7.1 Where is the issue?

The 2007 classification results show that diffuse pollution is a common issue across the Solway Tweed river basin district with a concentration of water bodies failing to meet good status in:

- the Leet, Lambden, Blackadder and Till in the Tweed catchment;
- the Waver and Wampool, Leith and Petteril in the Eden catchment;
- the Machars in the Solway sub basin

7.2 What action are we taking?

A wide range of regulations already apply to the agricultural sector including those implementing Nitrate Vulnerable Zones (NVZs), the Groundwater Directive and Cross Compliance. There are also many best practice guides such as the Prevention of Pollution from Agricultural Activity (PEPFAA) code and the Pesticides Voluntary Initiative. These are crucial 'no deterioration' measures and an important action is to continue to provide advice to land managers to ensure best practice is followed.

In the English part of the river basin district, the England Catchment Sensitive Farming Delivery Initiative sees farmers and regulators working together to raise awareness of best practice and how to address any potential problems. This approach has been shown to work on the River Till and several of the Eden sub-catchments have benefited from this approach.

An important economic incentive in both Scotland and England is the Rural Development Programme (RDP), which can provide an incentive for carrying out actions on water bodies at risk from diffuse pollution. Its benefits can be increased by farmers and land owners working together within a catchment.

In Scotland, recent developments such as the new Diffuse Pollution General Binding Rules (GBR), funding under Scotland Rural Development Programme (SRDP), Cross Compliance and the Scotland's Environmental and Rural Services (SEARS), as well as the basin planning process provide a major opportunity to address the pressures from diffuse pollution at a national scale for the first time.

The following are proposed in Scotland as part of the river basin planning process.

- A national approach to raising awareness, guidance and training and other support is required in relation to the Diffuse Pollution Regulations in the Scottish part of the Solway Tweed and other measures.
- A more targeted approach that identifies 'priority catchments' where farm visits will be undertaken to identify hotspots, identify specific measures and deliver one-to-one advice. These catchments will be identified on the basis of effectiveness of measures assessments, multiple benefits and the priorities of the Area Advisory Groups.

Table 6 summarises the proposed actions for 2009–2015 to improve those water bodies affected by pollution from agriculture.

7.3 What are the benefits?

The actions proposed in this plan will:

- improve the water environment;
- improve efficiency on farms with economic benefits to farming;
- less pollution entering groundwater and, in the longer term, improved drinking water quality;
- additional benefits for bathing waters and Natura 2000 sites, particularly the Solway estuary;
- less erosion and loss of soil from valuable agricultural land and reduced smothering of fish spawning gravels;
- improved appearance of our waterways for local communities and visitors.

Many of the actions identified here will also have benefits for the morphological impacts on farms. For example, fencing of water margins for diffuse pollution can also have a positive impact on stream-side vegetation.

[19] www.scotland.gov.uk/Resource/Doc/37428/0014235.pdf
[20] www.voluntaryinitiative.org.uk
[21] Scotland Rural Development Programme (SRDP) (www.scotland.gov.uk/Topics/Rural/SRDP) and the Rural Development Programme for England (RDPE) (www.defra.gov.uk/rural/rdpe/index.htm)
[22] Water Environment (Diffuse Pollution) (Scotland) Regulations 2008

Table 6: Summary of measures to tackle pollution from agriculture

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Reduction in nutrient inputs	Nutrient management plans In-field measures to minimise soil erosion Buffer strips Measures to manage 'dirty water', e.g. constructed farm wetlands	Farmers	CAR General Binding Rules No. 18, 19, 20 and 21* Guidance Enforcement measures	SEARS
			Code of Good Agricultural Practice	Environment Agency
			NVZ Action Programme Regulations Guidance and enforcement	Government
			Education initiatives, promotion of guidance and advice	SRPBA/CLF, NFUS/NFU SAC/ADAS/FWAG
			Trial catchment projects and demonstration farms in Scotland	SRPBA/NFUS/ SEARS/SAC/ FWAG
			Rural Development Programme measures	Scottish and English Governments
			Environment Stewardship schemes	Natural England
			England Catchment Sensitive Farming Delivery Initiative	Environment Agency/Natural England
Reduction in pesticide inputs	Crop protection management planning Sprayer testing Biobeds Buffer strips	Farmers	CAR General Binding Rule No. 23* Enforcement measures	SEARS SEPA
			Education initiatives, promotion of guidance, information provision and advice	SEARS
			Pesticides Voluntary Initiative	SRPBA/CLF, NFUS/NFU/, CLBA
			Groundwater Regulations	Environment Agency
			Code of good agricultural practice	Environment Agency
			Rural Development Programme measures	Scottish and English Governments

Table 6: Summary of measures to tackle pollution from agriculture continued

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Reduction in organic waste (organic matter, faecal pathogens and ammonia)	Farm waste management plans Management of steading run-off, e.g. separation of clean and dirty water Livestock tracks and gates Fencing of water margins	Farmers	CAR General Binding Rules Nos. 10, 18 and 19* Guidance Enforcement activities and campaigns	SEARS SEPA/ Environment Agency
			Silage, slurry and agricultural fuel oil regulations Guidance and enforcement	SEPA Environment Agency
			Education initiatives, promotion of guidance, information provision and advice	SRPBA,NFUS,SEARS
			Rural Development Programme measures	Scottish and English Governments
			Catchment Sensitive FarmingEnvironment Agency/	Natural England
			Trial catchment projects and demonstration farms	SAC, FWAG, Agencies
Catchment-based action	Focus advice and enforcement on identified areas	SEPA	Identification of priority catchments	SEARS, SAC, FWAG, SRPBA, NFUS
	Till Ponds project	Tweed Forum/FWAG	Demonstration project on multifunctional role of wetlands	Tweed Forum/ FWAG/ Environment Agency/ Leader+
	Catchment campaigns	Eden Rivers Trust	Advice on nutrient/organic waste management	Eden Rivers Trust/ Environment Agency

* Water Environment (Diffuse Pollution) (Scotland) Regulations 2008
CLBA = Country Land and Business Association; CLF = Contaminated Land Forum; FWAG = Farming and Wildlife Advisory Group; NFU = National Farmers Union; NFUS = National Farmers Union Scotland; SAC = Scottish Agricultural College; SRPBA = Scottish Rural Property and Business Association

Section 8 Pollution from forestry

Forestry is now a major land use in the Solway Tweed river basin district. In common with most of the UK the area of native ancient woodland is small but, in places, is an important component of the riparian vegetation. However, the majority of the woodland cover is made up of large-scale non-native plantations.

Key message

The forestry sector demonstrates that economic incentives and regulatory controls can dramatically reduce the adverse environmental impact associated with land management. Targeted action is required to address key issues such as acidification to ensure the positive benefit of forestry to the environment is maintained.

There are three main potential causes of pollution from forestry. These are:

- acidification of watercourses exacerbated by forestry plantations scavenging atmospheric pollution;
- nutrients (phosphorus) either from fertiliser application during tree planting or released during the disturbance of soils during clear felling operations;
- suspended solids (silt) caused by soil disturbance associated with road building, tree planting and clear felling.

8.1 Where is the issue?

Woodland cover is present across the river basin district, but its distribution tends to be limited to less productive farmland. The river network has important native woodlands associated with it such as the aspen woodlands of the upper Nith, but these tend to be small and isolated. Improvements to upland burns and streams by schemes such as the Cree Valley Community Woodland are important, though limited in geographical coverage.

Forestry cover is most extensive in the Scottish part of the Solway sub-basin where there are large non-native plantations. This includes the Galloway forests which are associated with the risk of acid-sensitive water bodies becoming acidified.

8.2 What action are we taking?

Linking the provision of forestry grants to compliance with the Forests & Water Guidelines (2003)[23] has led to their successful application across the forestry sector. Until recently, however, there was no mechanism for requiring compliance with good environmental practice when forestry operations were undertaken without a grant. The recently introduced General Binding Rules in Scotland developed from the existing advice within Forests & Water Guidelines (2003) for diffuse pollution require all operators to comply with minimum standards of environmental practice.

General measures to address pollution from forestry are listed in Table 7.

8.2.1 Acidification

The combination of poor air quality due to atmospheric pollutants, an acidic (non-buffering) geology and planting of conifer forests close to watercourses has caused some of the water bodies in Galloway (part of the Scottish Solway sub-basin) to become acidified (the trees 'scavenge' acid pollutants from the air which, following rain, the acid pollutants then enter the adjacent burn or river). This has impacts on the ecology of these waters, reducing their diversity and causing a loss of fish communities.

As discussed in Section 3.8, the classification scheme for 2007 does not include a full assessment of acidification. This will be available for the final river basin management plan. The impact of acidification shown by SEPA monitoring data will be used to inform the development of any projects or measures to ensure actions focus on those water bodies requiring improvement.

The Freshwater Fish Directive requires the Agencies to monitor certain designated rivers to ensure fish populations are safeguarded from the harmful consequences of pollution. Stretches of four designated rivers (Cree, Bladnoch, Dee and Tarff) have all, at some time, failed the imperative standards for pH set by this Directive.

Air pollution – the primary source of this issue – is slowly falling owing to the control of emissions. As a result, some waters are showing evidence of recovery. But this recovery is slow and, in some catchments, the presence of high densities of mature conifers may be delaying the process. As improvements arise, the rate of recovery may be improved by reducing the area of mature conifers, for example, by diversifying the age structure of plantations, replacing conifers with deciduous trees and leaving more open ground.

Under the auspices of the river basin planning process, the Forestry Commission, SEPA and the Galloway Fisheries Trust are working together to identify catchments that are especially vulnerable to acidification.

[23] www.forestry.gov.uk/PDF/fcgl002.pdf/$FILE/fcgl002.pdf

8.2.2 Nutrient enrichment

This draft river basin management plan provides information to enable the identification of freshwater lochs/lakes at risk of additional nutrient input from forestry. In conjunction with the Agencies, this information can form the basis for future planning within the forestry industry in the Solway Tweed river basin district. This process will be updated as more information becomes available through monitoring and classification.

To reduce the nutrient loading into sensitive water bodies, it will be necessary to limit the scale of annual planting and felling operations based on the overall size of the catchment. This is supported by the guidance for best practice for sensitive catchments in Forests & Water Guidelines (2003).

Nutrients tend to be 'bound up' with the soil particles and so can also enter the water body with any suspended solids released during forestry operations. This can be avoided by following best practice as discussed below.

8.2.3 Suspended solids

The release of suspended solids into watercourses is most likely to occur during forestry operations such as clear felling, site preparation for planting or from forestry roads (particularly when subject to heavy vehicular use). Suspended solids can cause damage to water courses including the smothering of fish spawning beds.

Forests & Water Guidelines (2003) sets out working methods which, when applied correctly, will prevent suspended solids entering watercourses. It is important to ensure that all forestry operators are aware of, and apply, best working practice through the provision of training – particularly raising awareness of the new General Binding Rules.

Table 7: Summary of measures for tackling pollution from forestry

Improvement required	Measure/action	Responsible organisations/sectors	Delivery mechanism	Support provider
Controlling nutrient inputs to lochs/lakes	Provide information on nutrient sensitivity of lochs/lakes	SEPA/Environment Agency	GIS map showing available capacity in lochs/lakes	Forestry Commission
	Promote best practice in most sensitive catchments and ensure compliance with Forest & Water Guidelines and Diffuse Pollution Regulations*	Forestry Commission Private forestry companies Land owners SEARS SEPA	Forestry planning SEARS Information campaigns	SEPA/Environment Agency
Controlling sediment inputs	Promote best practice in most sensitive catchments and ensure compliance with Forest & Water Guidelines and Diffuse Pollution Regulations*	Forestry Commission Private forestry companies Land owners SEARS SEPA		SEPA/Environment Agency
Best practice measures in non-grant aided forestry management	Promote and raise awareness and ensure compliance with the Forests & Water Guidelines and the diffuse pollution General Binding Rules	Forestry Commission		SEPA
Reducing impact of forestry and acidification	Identify catchments (or sub-catchments) vulnerable to acidification	Forestry Commission SEPA Galloway Fisheries Trust	Develop project for diffuse pollution – acidification	Landowners and private forestry companies

* Water Environment (Diffuse Pollution) (Scotland) Regulations 2008
SEARS = Scotland's Environmental and Rural Services

8.3 What are the benefits?

The benefits of reducing the impact of diffuse pollution from forestry such as the increase in diversity of species in waters that are less acidic can be identified and monitored. However, we do not expect these benefits will be seen during the first planning cycle due to the recovery time required and the long-term planning for forestry restructuring.

Improvements expected over a number of river basin planning cycles include:

- a more positive image of the river basin district (less risk of algal blooms in lochs, less association with 'acid rain');
- support for a greater diversity of species by water bodies;
- return of fish populations to water bodies where they previously spawned successfully before the extensive planting;
- increase in the economic value of river stretches due to improvement in fish catches;
- prevention of deterioration in status.

Section 9 Pollution from wastewater

Sewage disposal is a long-standing source of pollution that has progressively been reduced over the past hundred years. The extensive wastewater collection and treatment systems in the Solway Tweed river basin district protect the environment and public health.

Key message

The most serious pollution problems from sewage disposal in the Solway Tweed river basin district are now associated with:

- the capacity of sewers and the management of urban surface water drainage;
- nutrients from sewage treatment works;
- private sewage treatment works.

9.1 Where is this issue?

Sewage disposal issues fall into the following types:

- current issues associated with existing sewage treatment works or sewers that need investment to ensure they meet modern environmental standards;
- future pressures from housing and other developments or impacts from climate change that may require additional levels of treatment;
- localised environmental problems in rural areas caused by sewage from houses, small hotels, caravan parks and industry that are typically treated by public septic tanks or small treatment works.

9.2 What action are we taking?

Discharges of sewage to water are regulated, with all but the very smallest requiring consent from SEPA or the Environment Agency.

There is a defined process that identifies how much water companies can spend on improving their sewerage network and sewage treatment works in order to improve the water environment. The level of investment and the priorities for the programme are decided by government and are made in the context of the scale of charges that can be afforded by customers. In England this is the Periodic Review/Asset Management Plan process. In Scotland it is the Quality and Standards (Q&S) process.[24] These determine the investment objectives for a five and eight year period respectively in the context of ministerial decisions on the scale of charges that are appropriate.

General measures to address pollution from wastewater are listed in Table 8.

9.2.1 Improvements by Northumbrian Water

Several Northumbrian Water sites in the Tweed and Till catchments have been highlighted for improvement during the Asset Management Plan 4 period (2005–2010). These are mostly to improve the visual aspects of the receiving freshwater environment.

In addition, an investigation of Northumbrian Water discharges that may be compromising bathing water quality at Spittals Beach to the south of Berwick identified some combined sewer overflows (CSOs) as significant contributors to impaired quality. A scheme has been put forward for funding in the Periodic Review 2009 to improve these assets in Asset Management Plan 5 (2010–2015).

9.2.2 Improvements by United Utilities

A number of improvements to sewage discharges and wastewater treatment works are being implemented, planned or proposed by United Utilities. These projects will improve water quality in a number of water bodies within the Solway Estuary, River Eden, River Waver and River Wampool catchments.

- The existing sewage discharges to the Solway estuary at Bowness-on-Solway, Port Carlisle, Drumburgh and Glasson will be transferred to a new treatment works at Glasson.
- A number of septic tank discharges in the Penrith area will be transferred to the Penrith treatment works and secondary treatment will be provided for some other septic tank discharges. Improvements to the Penrith sewer network are also planned.

[24] See Annex 9 (www.sepa.org.uk/water/river_basin_planning.aspx) for details of the Quality & Standards investment process explaining how investments in the sewerage system are planned.

- First time rural sewerage schemes will be implemented at Mealsgate, Moorhouse, Colby, Linstock, Cliburn, Crosby Ravensworth, Hackthorpe, Great Strickland and Aikton where either new treatment works will be built or discharges transferred to existing treatment works.
- Upgrades will reduce the amount of phosphorous in discharges from the Kirkby Stephen, Carlisle, Dalston, Brampton, Winskill and Skirwith treatment works.
- The upgrade to Shap sewage treatment works will improve biological oxygen demand (BOD), ammonia, phosphorous and suspended solid levels in the discharge to the River Leith.
- Included in draft business plan submission, which is subject to funding, is a proposal to move the discharge from Little Bampton treatment works to protect the Biglands Bog Special Site of Scientific Interest (SSSI).

9.2.3 Improvements by Scottish Water

Over the period up to 2015, Scottish Water will invest £2.5 million in the sewerage network and wastewater treatment plants which, in turn, will improve the water environment. The measures for the period 2006–2010 have been agreed by ministers and are now being implemented and delivered by Scottish Water. Provisional measures for the period 2010–2014 are included in this draft river basin management plan although they are still subject to further consideration and ministerial approval (due in 2009). The measures for delivery in 2014 in this plan are based on the position as of June 2008.[25]

Reducing pollution at source lowers the costs associated with its treatment and produces environmental benefits. This is especially true for hazardous substances, nutrients and sanitary litter. For example, not using certain substances in domestic products (e.g. using phosphate-free detergents) reduces the need for treatment to remove them from waste water and lowers their concentration in sewage sludge. Scottish Water's 'Bag It and Bin It' campaign promotes the disposal of rubbish such as cotton buds in the bin rather than flushing them down the toilet; this keeps them out of the sewage stream altogether, preventing them from being discharged from CSOs during heavy rain or choking the fine screens at treatment works – both of which can cause pollution.

Over the next year SEPA will review the investment required after 2015 and will work with the Area Advisory Groups to prioritise the environmental issues to develop indicative lists of projects. These lists will prioritise schemes on the basis of the scale of the environmental, social and economic benefits that can be delivered. The output from this process will be the basis of SEPA's submission to the next Scottish Water investment round (Quality and Standards IV) and will be used to provide the basis of identifying indicative Water Framework Directive objectives for 2021 and 2027.

9.3 What are the benefits?

Expected benefits from these measures include:

- improved water quality through investment by water companies;
- protection of bathing beaches, providing greater opportunities for tourism and recreation;
- protection of shellfish waters, supporting the further development of the shellfish industry;
- protection of waters designated for freshwater fisheries resulting in greater fishery potential with associated local economic and recreational benefits;
- protection of rivers and lochs/lakes resulting in a greater diversity of aquatic plants and animals which, in turn, will support wider recreational and amenity use;
- prevention of deterioration of watercourses by better planning of new housing infrastructure.

[25]Technical Expression, version 5.

Table 8: Summary measures for tackling pollution from wastewater

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Reduction in pollution	Better discharge quality from treatment works, where identified under the Quality & Standards (Q&S) programme or Asset Management Plan (AMP) process Reduced operation of sewer overflows	Water companies	Identification of improvement within Q&S/AMP Review of permits/licence	Scottish Government SEPA/Environment Agency Defra Ofwat Consumer Council for Water
	Reduced operation of sewer overflows	Local authorities	Diversion of surface water flows from sewer during redevelopment of sites	SEPA/Environment Agency
		Scottish Water	Introduction of effluent charges in proportion to area drained	Water Industry Commission for Scotland
Supporting development	Identify where sewerage capacity is limited	Water companies	In Scotland: Memorandum of Understanding between Scottish Water and SEPA In England: existing planning arrangements	Local authorities/Environment Agency
	Provide sewerage capacity for future development	Water companies	In Scotland: Memorandum of Understanding between Scottish Water and SEPA In England: existing sewerage provision mechanism	SEPA/Environment Agency Local authorities
Reduction in pollution from sewage and surface water discharges	Develop publicity material – where appropriate	Water companies	Leaflets for householders	Waterwatch Scotland Consumer Council for Water

Section 10 **Changes to morphology – overview**

The Water Framework Directive requires the physical shape, structure and habitat of a water body (i.e. its morphology) to be taken into consideration as this can affect the health of the wildlife and plants the water body supports.

There are very few truly natural water bodies in the Solway Tweed River Basin District (currently only 2% of surface water bodies are at high status). This reflects the long history of management of the structure and habitat of water bodies for agriculture, forestry, transport, industry and to protect people and properties. This management includes:

- straightening of rivers;
- deepening of rivers, lakes/lakes, estuaries and coastal waters;
- engineering structures (e.g. dams) within the water environment that become barriers to fish passage, gravel movement, etc.

The link between morphology and environmental quality is complex and our understanding is still developing, although there are some good examples of where improvements to morphology have made significant difference to the overall health of a water body.

Where the morphology of a water body has been modified for specific uses (e.g. flood defence or water storage), it may not be possible or desirable to achieve good status. In these cases a water body may be designated as a heavily modified water body (HMWB) or an artificial water body (AWB). Such water bodies have different environmental objectives – see Annex 4 (www.sepa.org.uk/water/river_basin_planning.aspx) for a more detailed explanation.

Chapters 10 -12 focus on those modifications to waterbodies that do not qualify as an AWB/HMWB and may require action to meet the environmental objectives set out in this draft river basin management plan for the Solway Tweed river basin district.

10.1 What the classification results reveal about morphology

There are slightly different approaches to the classification of morphology between Scotland and England. SEPA is working to develop a fish monitoring and classification tool to be used to assist with the morphological and hydrological elements of classification. The Environment Agency approach measures the effects of morphology through the biological elements of its classification scheme (except in high status water bodies where it is considered in its own right).

In Scotland, SEPA did not have any power to regulate engineering works in freshwaters until the introduction of the Water Environment and Water Services (Scotland) Act (WEWS) 2003. The new classification scheme includes a method to take into account the previous morphological changes. As a consequence, 39% (147) river water bodies on the Scottish side of the Solway Tweed river basin district are considered to be at less than good status for morphology. However, extensive validation work will be undertaken before the final river basin management plan is published. Measures will only be implemented to bring about morphology improvements where there is confidence in that aspect of the classification.

In England, the Environment Agency has a range of regulatory powers to protect and enhance morphology through land drainage consents, the Food and Environment Protection Act (FEPA) for estuaries and coastal waters and the Habitats Directive. Morphology is also a consideration in a number of planning systems including Catchment Flood Management Plans, Shoreline Management Plans and the spatial planning system. There are also a number of national, regional and local partnerships in England that are focused on restoring morphology (e.g. Wetlands Vision restoration fund and Cumbria Wetland Project see Box 2).

Existing controls to prevent morphological deterioration include:

- Controlled Activities Regulations (CAR) in Scotland;
- Rural Development Plans
- Land drainage requirements in England;
- Habitats Directive requirements;
- Catchment Flood Management Plans and Shoreline Management Plans;
- Land use and spatial planning legislation and policy.

In Scotland, SEPA has powers under the Controlled Activities Regulations (CAR) to ensure that new proposals for river and loch engineering works are undertaken only where the benefits clearly outweigh the environmental impacts. Appropriate mitigation measures will be required for any proposals for new engineering work.

The next two chapters look in more details at the main activities/sectors which contribute to water bodies being at less than good status for morphology. There is also a requirement to ensure there is no deterioration in water body status due to activities that could change its morphology.

In the Solway Tweed River Basin District, the priorities for action are:

- changes to morphology due to agriculture (see Section 11);
- changes to morphology due to forestry (see Section 12).

Note: Changes in morphology due to electricity generation and public water supply are dealt with in the abstraction and flow chapters (Sections 14 and 15) as the changes in morphology such as dams are often the mechanisms by which the changes to abstraction and flow rates are undertaken.

Section 11 Changes in morphology due to agriculture

Some of the Solway Tweed's most productive farmland is found alongside watercourses. Over many years, these rivers have been modified to enable farmers and land managers to manage the risk of flooding and to increase the area of land available to cultivation. While these changes enable increased agricultural productivity they do result in a loss of naturalness of the river system. This can have a negative impact on the ecology of watercourses and potentially increase the risk of flooding downstream.

Key message

Agricultural land alongside rivers, lochs/lakes and estuaries has often been cultivated through centuries of investment to protect it from flooding and to improve drainage. Constraining the space available to these water bodies can damage the availability and quality of habitat, and create flooding and silt problems for downstream landowners, properties and communities. It is important to achieve the correct balance between the interests of individual land managers and the overall benefits to society.

11.1 Where is the problem?

Morphological changes are widespread across the Solway Tweed river basin district.

11.2 What actions are we taking?

Typically farmers do not create hard engineering structures which require removal if a water body is to be restored. In many cases it is sufficient to give rivers more space by fencing or by creating buffer strips and then allowing natural processes which permit the water environment to recover its natural diversity and structure.

Because this type of restoration work is closely related to the way land is managed, there is a link between the measures and mechanisms required to address diffuse pollution and those required to address the morphology impacts of agricultural activities. Indeed, addressing the morphological impacts of agricultural activities may also reduce diffuse pollution impacts.

The key mechanisms for delivering morphological improvements with the agricultural sector are:

- Controlled Activities Regulations (CAR) in Scotland;
- Rural Development Plans – for example by linking agri-environment funding at restoration schemes and projects to move agricultural production back from rivers;
- Land drainage and FEPA consenting requirements in England;
- Habitats Directive;
- Flood Management Planning;
- providing buffer strips between a watercourse and arable land as required by General Binding Rule No. 20.
- the provision of good practice information to farmers by the Agencies and non-government organisations;

The proposed measures are summarised in Table 9.

Table 9: Summary of the priority measures to tackle changes in morphology due to agriculture

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Riparian vegetation and habitat	Buffer strips Fencing of water margins Planting	Landowners	CAR General Binding Rules No. 20*	SEARS
			Education initiatives, promotion of guidance and advice	SEARS, SRPBA, NFU (E&S), SAC, FWAG, ECSFDI, Environment Agency, Natural England, NWDA, Rivers Trusts, CLBA, RSPB
			Trial catchment projects and demonstration farms	SEARS, SRPBA, NFU (E&S), SAC, FWAG, ECSFDI, Environment Agency, Academic Institutes
			Rural Development Programme	Scottish Government, SEARS, Defra, NWDA, Natural England
Habitat remediation or improvement	Improve physical habitat of rivers, loch/lakes and estuaries	Landowners Fishery Boards/Trusts	Partnership projects	SEPA, Scottish Natural Heritage, River Restoration Centre, Rural Development Programme, Environment Agency, ECSFDI, Natural England, Rivers Trusts, Wildlife Trusts, RSPB

* Water Environment (Diffuse Pollution) (Scotland) Regulations 2008
FWAG = Farming and Wildlife Advisory Group; NFU (E&S) National Farmers Union & National Farmers Union Scotland; SAC = Scottish Agricultural College; SRPBA = Scottish Rural Property and Business Association; ECSFDI = England Catchment Sensitive Farming Delivery Initiative; NWDA = North West Development Agency; CLBA = Country Landowners and Business Association (England)

The Cumbria Wetlands Project (see Box 2) is an example of the actions happening in the English part of the Solway Tweed to address morphology issues from agriculture. Many of the water bodies in the Waver are designated as AWBs/HMWBs, so these actions will contribute to achieving good ecological potential (see Section 3.4).

Box 2: Case Study – Cumbria Wetlands Project

The Cumbria Wetlands Project is a three-year partnership project led by the RSPB, jointly sponsored by the Environment Agency with support from Natural England. This ambitious project follows on from the highly successful Cumbria Wetland Bird Recovery Programme which began in 2005 and which has restored 400 hectares (990 acres) of wetland habitat across four landscape-scale wetland target areas in Cumbria. The target areas within the Solway Tweed river basin district are the Holme Dub complex on the River Waver and Sandford/Ploughlands near Appleby on the River Eden.

The Cumbria Wetlands Project employs a part-time project officer who works in the target areas with farmers and land managers to restore wetland habitats by raising water levels, controlling rushes and encouraging cattle grazing to create optimum conditions for the target bird species (breeding wading bird species including lapwing, snipe, curlew and redshank) and target habitats (wetland Biodiversity Action Plan habitats).

As well as continuing to expand the wetland areas in the four 'original' areas, new sites along the Waver and Wampool river systems will be targeted over the next three years using Higher Level Stewardship.

Through a scoping exercise on the Solway Basin area undertaken with partners, new opportunities for restoring wetlands have been identified which link to the existing Holme Dub complex. Ultimately, a wetland network across the Solway Basin area could be formed, linking to existing wetlands of high nature conservation value such as the Solway raised mires designated as Special Areas of Conservation.

Wetland management through the project will have several direct benefits including restoring Biodiversity Action Plan habitats (through favourable water and grazing management) and enhancing breeding wading bird populations. Indirect benefits will include:

- less intensive ditch management regimes;
- no inputs of inorganic fertiliser onto floodplain fields;
- flood storage;
- lower stocking densities leading to less bankside erosion and siltation
- opportunities in certain situations (as led by statutory organisations) to allow rivers to re-connect to floodplains.

11.3 What are the benefits?

The actions proposed in this plan will:

- prevent further deterioration in status;
- contribute to the achievement of the Water Framework Directive objectives where the morphology is causing an ecological element to fail;
- enable sustainable agricultural activities;
- contribute to wider benefits such as improving wildlife and habitats, reducing diffuse pollution and re-connecting rivers to floodplains.

These measures will provide a wide range of other benefits including improvements to fisheries which, in turn, may generate a range of economic benefits.

Section 12 Changes to morphology due to forestry

The large-scale programme of upland conifer afforestation in the middle decades of the 20th century caused a number of problems for the water environment. Until the early 1990s the planting of conifer trees did not leave space for watercourses, a strategy that maximised the productive area but damaged the condition of rivers. More recently Forests & Water Guidelines (2003) discourages conifer planting up to the edges of watercourses and, as a preference, promotes open spaces containing deciduous trees.

Key message

The prioritisation of felling in areas where there are impacts is currently being assessed by the Forestry Commission.

12.1 Where is the issue?

Woodland is present throughout the river basin district. There are extensive areas of planting in the north Solway sub-basin, particularly the Galloway Forest, Ae Forest and Eskdalemuir Forest. In the Tweed catchment, the large plantations include Glentress Forest.

12.2 What actions are we taking?

The Forestry Commission is reviewing the water bodies considered to be at risk from morphological impacts and the timing and extent of changes that can be brought about through the existing Forest Design Plan timetable. This work will allow the likelihood of a water body meeting its objective for improvement for morphology to be assessed.

Where additional benefits can be gained by bringing a felling plan forward, this will be discussed with the owner (if in private ownership). These additional benefits can relate to watercourse morphology and to other factors such as acidification.

Prioritisation of improvements is an important consideration in the Solway Tweed river basin district where the extent of forestry cover is high.

The proposed measures are summarised in Table 10.

12.3 What are the benefits?

The actions proposed in this plan will:

- prevent further deterioration in status;
- contribute to the achievement of the Water Framework Directive objectives where the morphology is causing an ecological element to fail.

These measures will provide a wide range of other benefits. For example, improvements in fisheries will generate a range of economic benefits. Many of the measures will deliver flood risk reduction and the impacts of diffuse pollution.

Table 10: Summary of measures to tackle changes in morphology due to forestry

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/ regulator
Riparian vegetation	Removal of non-native conifers to create a buffer zone adjacent to water Planting/establishment of native broadleaves within the buffer zone	Forestry Commission Land managers	Forest Design plans/ Forest Plans	Forestry Commission
			Forests & Water Guidelines (2003)	
			Rural Development Programme	English and Scottish Governments SEARS
Improved in-stream habitat	Allow space for rivers during new planting Management of machinery during the creation of road networks	Forestry Commission Land managers	Forest Design plans/ Forest Plans	Forestry Commission
			Forests & Water Guidelines (2003)	

Section 13 Abstraction and flow regulations (water resources) – overview

Water is taken out of the rivers, lakes/lochs and groundwaters in the Solway Tweed:

- for drinking water;
- for hydropower;
- to water farm crops;
- to provide drinking water for farm animals;
- by some industrial processes.

These are all essential uses but the abstraction of too much water from rivers, lochs/lakes or groundwater is harmful to the environment. It can also compromise the water resources needed by other water users.

When water is abstracted it can reduce the amount of water in the system to an extent where it starts to affect habitats and wildlife. It can also mean that there is less water available to dilute discharges, which can make pollution worse. In extreme cases, rivers can dry up or salt water can be drawn into groundwater.

Dams and weirs are often constructed to allow the abstraction of water. These structures modify river flows and can cause environmental problems downstream.

13.1 What the classification results reveal about abstraction and flow

The Environment Agency has been regulating abstraction for several decades and there is an archive of information available to form the basis of the classification system in England. The exception is the River Till, where abstraction controls have been slightly different (see Box 3). In Scotland, the power to regulate abstraction is new.

In summary, the classification schemes are as follows.

- In Scotland. The assessment of hydrological impacts is based on the use of environmental standards for rivers, lochs and estuaries set for each status class on the basis of the best available information on ecological impacts as recommended by UK Technical Advisory Group. To assess whether a standard has failed, SEPA uses the information in licences on abstraction levels and dam compensation flows to determine the degree of change from modelled natural river flows or loch/lake levels. This assessment is used to determine whether environmental standards will fail.
- In England. Flow is used only to classify those water bodies at high status. For other status categories, the effects of flow are not assessed directly as they are reflected in the biological elements of the classification systems (in particular the fish, macrophyte and invertebrate elements). For example, an abstraction may mean a water body is at less than good status for fish.

Classification shows that the priorities for action are:

- abstraction and flow regulation due to electricity generation (see Section 14);
- abstraction and flow regulation due to public water supply (see Section 15);
- abstraction and flow regulation due to agriculture (see Section 16).

Box 3: Border rivers and the River Till

The Water Resources Act 1963 exempted inland waters that were part of the River Tweed in England from requiring a licence to abstract from surface waters. Furthermore, the Northumbrian Water Authority Act 1981 provided an exemption for abstraction from groundwaters of up to 50,000 gallons/day and one million gallons per year. The Water Act 2003 introduced powers to remove exempt area status and these catchments will be subject to the normal licensing regime. Abstractions (surface water and groundwater) above the default threshold of 20m^3/day will require an abstraction licence. This work is governed by a Defra timetable which is expected to commence in 2009.

Most of the River Till and its tributaries are designated as Special Areas of Conservation and Sites of Special Scientific Interest. Natural England consents potentially damaging activities in the Special Areas of Conservation and will continue to do so until the Environment Agency has powers to license abstractions.

As the Environment Agency was developing its Catchment Abstraction Management Strategy (CAMS) for the Till, it became apparent that the catchment had been over-consented according to the CAMS objectives. As a result, Natural England worked with the Environment Agency to reduce these consented volumes over a period of three years so that, by 2008, they

were down to an acceptable level. When reducing the consented volumes the Environment Agency and Natural England also worked closely with the North Northumberland Agricultural Abstractors Group.

The Environment Agency is currently working with SEPA with regards to cross-border liaison and assessment. This will help meet Water Framework Directive targets for the Tweed estuary and will ensure both organisations are aware of activities on either side of the border which can affect the amount of water in the lower reaches of the River Tweed. The Agencies also aim to reduce bureaucracy for those water users who are regulated.

Good control of all abstractions mean that the water environment can be managed effectively, thereby safeguarding the environment as well as the business interests of the abstractors.

Section 14 Abstraction and flow regulation due to electricity generation

There is one large-scale hydropower scheme in the Solway Tweed river basin district which is owned and operated by Scottish Power. The Galloway Hydro scheme has modified many of the major rivers and lochs in the River Dee catchment. It consists of six power stations, seven main reservoirs, various dams, tunnels and aqueducts.

Many of the water bodies associated with this scheme have been designated as heavily modified (see Section 3.4 and Annex 4[26]). One of the impacts of the dams and other structures is that they act as barriers to migratory fish, particularly Atlantic salmon. One of the measures to achieve good ecological potential is to review the feasibility of installing fish passes (see Table 11).

Key message

Getting the balance right between supporting hydropower development and protecting and improving the water environment is a key challenge for this and future river basin management plans.

There are a number of small scale 'run-of-river' hydropower plants (installed capacity <2MW) in the river basin district owned by private companies and individuals. These small-scale schemes may remove water from a river, pass it through a turbine and return it to the same river.

As part of Scotland's contribution to combating climate change, ministers have set targets to increase renewable energy generation to 31% of electricity generated in Scotland by 2011 and 50% to come from renewable sources by 2020. Hydropower is one of Scotland's largest sources of renewable energy and it is important to further develop hydropower in order to meet the Scottish Government's renewable energy targets and to reduce carbon dioxide emissions.

14.1 What actions are we taking?

The challenge is to deliver Water Framework Directive objectives while aiming to ensure there is no loss of renewable energy generation.

In the Solway Tweed river basin district, SEPA and Scottish Power jointly assessed whether measures which represent good environmental practice are in place and used this assessment to classify the ecological potential of the affected water bodies. The focus is on getting the balance right between promoting renewable energy generation and producing benefits for the water environment.

The proposed measures are summarised in Table 11.

[26] www.sepa.org.uk/water/river_basin_planning.aspx

Table 11: Summary of measures to tackle abstraction and flow issues due to major electricity generation schemes within Scotland

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Improve flows in rivers and levels in lochs Allow fish migration	Provide compensation flows and freshets, where appropriate	Hydropower companies	Licence reviews	SEPA
	Provide for fish passage at dams and weirs, where technically feasible	Hydropower companies	Licence reviews	SEPA
Support new hydropower development	Provide information to assist in planning new schemes.	FREDS	Maps showing potential for new hydropower development and distribution of other potentially conflicting water uses	Scottish Government SEPA Scottish Natural Heritage RAFTS* Sport Scotland
Decision-making process for new hydropower schemes	Shorten the time taken to make decisions	Scottish Ministers SEPA	Co-ordination between Scottish Government Energy Consents Unit, SEPA and Fisheries Committee Memorandum of Understanding between Fisheries Committee and SEPA Joint guidance between Fishery Committee, Scottish Natural Heritage and SEPA	Fishery Committee Scottish Natural Heritage Scottish Government

* RAFTS is the Association of Scottish River & Fishery Management Trusts

14.2 What action are we taking to promote sustainable water use?

A study of the potential for further hydropower generation in Scotland by the Forum for Renewable Energy Development in Scotland (FREDS) identified is a capacity of 709 MW of financially viable hydropower development remaining in Scotland. The FREDS study looked at a range of potential constraints such as the capacity of the national grid and nature conservation designations, both of which reduce the practical potential of development. The assessment did not include an examination of other considerations with respect to amenity and recreational uses such as fishing and canoeing. Any additional considerations associated with the water environment would be examined by SEPA as part of the process of determining a Controlled Activities Regulations (CAR) licence. Overall these additional considerations are unlikely to make a significant difference to the overall capacity that could be developed.

The Scottish Government, SEPA, the Fisheries Committee, Fisheries Research Services and Scottish Natural Heritage are working to simplify the regulatory process. The intention is to provide single guidance on information requirements for new hydropower developments and to streamline the decision-making process. This should allow operators to submit good quality applications which will avoid the delays that currently often occur at the start of the process when additional information has to be requested.

There are no major hydropower schemes in England although enquires about small-scale schemes are becoming more popular as people look at alternative sources of power. The control of hydro-schemes by the Environment Agency in the English part of the river basin district is covered by existing legislation including abstractions licensing, land drainage and Habitats Directive requirements because most of the River Eden and River Till are Special Areas of Conservation.

14.3 What are the benefits?

Benefits from the improvements proposed for the Galloway Hydro scheme include:

- increased generation from hydropower;
- improvements in ecology, in particular phased introduction of improvements to fish passes (where feasible);
- prevention of deterioration in status.

Section 15 Abstraction and flow regulation from public water supplies

Water supply systems have developed over many decades and the Solway Tweed river basin district is an important source of water. For example, Scottish Water provides drinking water to 1.2 million people from sources in the Solway Tweed river basin district.

Key message

River basin planning will be used to promote efficient use of water to ensure water resources are used wisely and water is not wasted. This will minimise existing impacts and the need for additional investment to develop new sources that would have adverse impacts on the water environment.

Water supply systems face a number of challenges:

- our demand for water for domestic purposes has increased progressively over the last few decades;
- communities are expanding within the river basin district and in adjacent towns and cities supplied by water from our upland areas, resulting in increased demand for drinking water;
- leakage from the supply network.

The two main approaches to meeting these challenges are to:

- develop new supplies that take more water from our rivers and groundwaters. This might involve building new reservoirs. Any new supplies would need to meet the Water Framework Directive's 'no deterioration' requirement.
- reduce demand through more efficient use of water in existing and newly built houses. Water companies could also reduce the amount of leakage from the pipes in their distribution networks

Water companies need to achieve the correct balance between developing new supplies, reducing our demands for more water and reducing their leakage rates. These aspects are considered in their Water Resources Plans.

15.1 Working with Scottish Water

Over-abstraction from water bodies harms the environment. The primary measure used to manage abstraction is regulation. However, in order to reduce the amount of water drawn directly from a water body, Scottish Water has focused on improving its distribution system and set targets for year-on-year reductions in leakage levels. This approach has resulted in a halt and reversal in the demand for water, with a consequent reduction in the volume of water abstracted from the environment. There is also an improvement in the security of supply to customers during drought as well as support for ongoing economic and domestic growth.

Scottish Water is required to support all new developments to provide drinking water supplies at reasonable cost. This may place demands on existing water resources that are not sustainable – particularly in isolated rural areas where sources can be small and with few (if any) alternatives supplies.

The overall level of funding for Scottish Water is determined by ministerial decisions. The spending programme is identified and managed by a public planning process called Quality and Standards. The current programme includes funding to mitigate the environmental impacts of Scottish Water's dams and abstractions at a specified list of sources by implementing improvement measures required by the Water Framework Directive. This programme is delivered through close liaison and technical working groups involving Scottish Water, SEPA, the Drinking Water Quality Regulator for Scotland and Water Industry Commission Scotland. It includes a review with Scottish Natural Heritage to determine if the current abstraction regime had led to any detrimental impacts on the designated features of any Natura 2000 site.

All Scottish Water's abstraction and impoundment activities are authorised under the Controlled Activity Regulations (CAR). SEPA has identified a number of water resource zones where it considers the current abstraction and/or impoundment activity represents a risk to meeting good status. These zones are to be addressed either in the current Scottish Water investment period (2006–2010) or have been highlighted for inclusion in the next investment period (2010–2014) subject to ministerial approval.

The remainder of Scottish Water's licences will be reviewed during the first planning cycle to determine whether the activities covered represent a significant impact on the environment. Further improvements will be prioritised as necessary following this review and promoted in the Quality and Standards planning process.

15.2 Working with United Utilities

United Utilities operates the water supply network in north-west England. Part of this network includes the strategically important aqueducts that allow water from the Haweswater Reservoir system to be transported to supply Manchester and the surrounding area. There are further abstractions on the River Eden at Cumwhinton and on the River Gelt, both of which provide

the water supply for Carlisle.

All abstractions by United Utilities are controlled through licences.

Within the River Eden Special Area of Conservation, all major public water supply licences have recently been assessed under the Habitats Directive Review of Consents project. This project reviewed the abstraction licences and the ecological needs of Special Area of Conservation species and habitats and, where necessary, identified any changes to licences necessary to protect the Special Area of Conservation.

Licence changes within much of the Lowther system and the River Gelt abstraction will be made in the coming years. These changes include:

- increases to compensation and/or hands off flows (where necessary);
- building of fish passes;
- changes to gravel management plans to make sure in-river structures do not prevent the downstream migration of important spawning gravels.

These improvements are funded under United Utilities Asset Management Plan 4 and further investigations are being considered for the Period Review 2009 (PR09). See Section 9.2 for more detail on these funding processes.

15.3 Working with Northumbrian Water

Northumbrian Water abstracts from groundwaters to supply the towns of Berwick-upon-Tweed and Wooler. This abstraction operates as a separate resource zone in the north-east of Northumberland (Berwick water resource zone). The resource zone is separate in terms of available water sources and treatment capacity; it needs to be protected and managed in a sustainable manner.

Work is underway to remove the hydraulic constraints between the Berwick area in the north of the resource zone and Fowberry to the south. This will improve the security of water supplies in the area. Northumbrian Water has requested funding (through PR09) to investigate the groundwater over the next five years. This should help to inform and support the river basin management plan.

15.4 Private water supplies

Local authorities in Scotland and England have a duty to record and monitor private drinking water abstractions. As this information becomes available to SEPA and the Environment Agency, it will be possible to assess whether there is likely to be cumulative environmental impacts. This assessment will take place over the first plan cycle.

15.5 Promoting sustainable water use

The water companies in England and Scotland are engaged in a number of planning activities aimed at managing water supplies for the long term. These include:

- water resource plans that consider supply and demand management over a 25-year time horizon;
- asset maintenance and leakage plans;
- developing Drinking Water Safety Plans;
- drought planning.

Many of these activities require close working with the Environment Agency/SEPA and are informed by Agency planning activities such as:

- Habitats Directive Review of Consents (Environment Agency and SEPA);
- Catchment Abstraction Management Strategies (CAMS) (Environment Agency).

Promoting sustainable water use is important when considering new housing development. The Environment Agency, SEPA, water companies and local and regional planning authorities need to work in partnership to make sure robust policies are included in the spatial planning system. These policies need to ensure that:

- new housing is located where a water supply/capacity is available;
- the houses are constructed using water efficient fittings.

Promoting water efficiency across all water users is an important aspect for managing future demand. Some improvements can be achieved through planning conditions where changes to existing buildings require planning permission. Increased uptake of the use of water meters can also reduce the amount of water people use.

Considerable effort is going into educating people on the wise use of water. We need to continue the partnerships between the Environment Agency, SEPA, water companies, local authorities and others to continue to promote this message.

More details on water resources planning can be found in Annex 9 (www.sepa.org.uk/water/river_basin_planning.aspx).

15.6 What are the benefits?

The actions identified will ensure benefit for all users as well as the environment and include:

- improved status of water bodies;
- water bodies prevented from deteriorating.
- greater capacity for growth of the economy
- encourage sustainable use of water, including increased water efficiency
- increased ability to deal with the impact of droughts through water resource planning
- improved wildlife and amenity value of water courses.

Section16 Abstraction and flow regulation for agriculture

Abstraction of water for agriculture serves many purposes including water for crop irrigation and drinking water for livestock.

Abstraction for irrigation has increased substantially over the past 10 years and is expected to continue to increase. Regulatory controls on abstraction for irrigation have only recently been introduced for most of the Solway Tweed river basin district. These will progressively reduce any over-abstraction, improving the environment and ensuring that enough water is available for other users.

Limited water resources are available during dry periods when irrigation is most required. In addition, the combination of climate change and higher food prices may increase the demand for irrigation. This river basin management plan must seek to ensure resources are used efficiently so that water is available to sustain the environment.

Key message
Reducing the impact of abstraction for agriculture is an important aim for this river basin management plan. This can be achieved through both regulatory and voluntary actions.

16.1 Developing actions together

In the Solway Tweed river basin district, slightly different regulations for agricultural abstractions apply either side of the border (see Section 13).

In Scotland, the power to regulate abstraction under the Controlled Activities Regulations (CAR) is a recent development. To help farmers take action to minimise the impacts caused by over-abstraction from rivers, SEPA is developing a map that identifies:

- those catchments that are currently over-abstracted (coloured red);
- those catchments where capacity for new abstraction is available (coloured green);
- those catchments with limited capacity (coloured amber).

This web-based map will be available from SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx) and will be updated regularly to reflect improvements in SEPA's understanding of the impacts of irrigation. SEPA will focus its regulatory efforts on delivering environmental improvements in catchments that are over-abstracted.

SEPA will work with its partners in Scotland's Environmental and Rural Services (SEARS) to provide information to farmers in over-abstracted catchments on how to minimise environmental impacts. The effectiveness of this work will be enhanced by support from industry associations such as the Scottish Rural Property and Business Association (SRPBA) and the National Farmers Union of Scotland (NFUS).

In England, abstraction in the Eden, Waver, Wampool and English Esk catchments has been controlled for several decades. The situation on the River Till is different and the Environment Agency is implementing abstraction regulates licences from April 2009 – more details can be found in Box 3 (see Section 13.1). Catchment Abstraction Management Strategies (CAMS) provide the framework for decisions on abstraction licensing control in England. CAMS can be found on the Environment Agency's website (www.environment-agency.gov.uk/cams).

The strategy for the River Eden catchment indicates that agricultural abstractions do not present significant issues at the moment.

The main focus of Environment Agency work in the River Till catchment is to:

- implement the abstraction licensing regime;
- start to collect detailed water resources data so the CAMS can be updated and refined.

The Environment Agency will also continue to promote the efficient use of water by farmers in the Till catchment through the Northumberland Agricultural Abstractors Group.

16.2 What action are we taking to promote sustainable water use?

Table 12 provides a summary of proposed measures to promote sustainable water use in agriculture. These actions will not only result in environmental benefits but they will potentially enable farmers to apply for new or higher levels of abstraction where the environment allows.

Both the SEPA web-based map and Environment Agency CAMS documents indicate where there is potential capacity to take more water and will provide information for farmers to allow them to identify where applications for new abstractions licences can be made. Where farmer are looking to make abstractions they should avoid applying for licences in those catchments that are over -abstracted or have limited capacity. All applications for abstraction licences will still require an assessment of the possible impacts before it can be granted.

16.3 What are the benefits?

The benefits of this approach include:

- improved status of water bodies;
- prevention of deterioration in status;
- promotion of sustainable water use to farmers;
- greater capacity for growth of the economy;
- increased ability to deal with the impact of droughts;
- improved wildlife and amenity value of water courses.

Table 12: Summary of measures to tackle abstraction and flow issues due to agriculture

Improvement required	Measure/action	Responsible organisation/sector	Delivery mechanism	Support provider/regulator
Support expansion of irrigation	Manage water resources to provide water for new entrants	SEPA/Environment Agency	Provide map of available capacity /CAMS and implement measures below to ensure efficient water use	SEARS
Improve flows in rivers and levels in groundwater	Review licensed abstraction rates to reflect levels actually used at present	Farmers	CAR licence review Environment Agency reviews/ implementation of licensing in the Till	SEPA Environment Agency
	Improve efficiency of use	Farmers	Information and advice Require efficient water use by CAR licence review	SEARS/SRPBA/NFUS SEPA/Environment Agency
	Manage timing of abstractions	Farmers	Develop catchment agreements on timing of abstractions (CAR licence review) Abstraction licence review in England	SEPA Environment Agency
	Build farm storage ponds to store winter abstractions for summer use	Farmers	Scottish Rural Development Programme funding Advice on construction of farm storage ponds CAR licence review	SEARS SEPA Environment Agency
Sustainable use of water	Abstraction licensing Improved efficiency of use Data collection Catchment Abstraction Management Strategies (CAMS)	SEPA Environment Agency Farmers	Existing regulatory measures and introduction of licensing for the River Till Advice to farmers on water efficiency	Farmers SEPA Environment Agency

Section 17 Invasive non-native species

Invasive non-native species are fauna and flora generally from outside the UK that successfully establish themselves in aquatic ecosystems, resulting in damage to natural biodiversity and creating potentially significant economic impacts.

Key message

Overcoming problems with invasive non-native species in order to achieve the Water Framework Directive's environmental objectives will remain a challenge. Eradication of an invasive species is costly and difficult to achieve once it has been introduced and become established. Preventing introduction in the first place is by far the most cost-effective approach.

17.1 What does classification reveal about invasive non-native species?

The number of water bodies currently at less than good status where non-native species are a contributory reason is very small compared with other parameters such as morphology. However it is generally agreed that, for invasive non-native species, 'prevention is better than cure'.

In December 2007, the UK Technical Advisory Group provided an updated list of species[28] that should be taken into account when classifying water bodies in England and Scotland based on their impact on quality elements related to good status (i.e. biological and physico-chemical quality elements) and high status (i.e. hydromorphological quality elements). The following species from this list are present and considered a high priority in the Solway Tweed river basin district:

- North American Signal crayfish (*Pacifastacus leniusculus*);
- Common cord grass (*Spartina anglica*);
- Wireweed (*Sargassum muticum*);
- Australian swamp stonecrop (*Crassula Helmsii*).

Other high impact species on the UK Technical Advisory Group list cause problems at a local scale in the river basin district and need to be considered in future cycles of the river basin management plan. These include:

- invasive riparian plant species such as giant hogweed and Japanese knotweed;
- translocated species, i.e. those that have moved into the Solway Tweed river basin district from another area of the UK where they occur naturally.

17.2 What action are we taking?

Existing legislation, policy and initiatives include:

- The Invasive Non-Native Species Framework Strategy for Great Britain: protecting our natural heritage from invasive species[29] – published jointly by Defra, the Welsh Assembly Government and the then Scottish Executive in 2007;
- Section 14 of the Wildlife and Countryside Act 1981 – makes it an offence to release (or to plant) non-native species to the wild (further proposed amendments to Schedule 9 include a wider range of problem species);
- Proposed use of Section 14A of the Wildlife and Countryside Act 1981 to ban the sale of species specified in an Order (list of proposals being consulted on);
- Control of Pesticides Regulations 1986/Plant Protection Products Regulations 1997 – use of herbicides to control invasive plants in or near water;
- The Prohibition of Keeping or Release of Live Fish (Specified Species) (Scotland) Order 2003;
- Aquaculture and Fisheries Act (Scotland) 2007;
- Species Action Plans (in Scotland).

Many successful local partnership measures are in place including those of the Tweed Forum, Cumbria Wildlife Trust and Galloway Fisheries Trust. See the Area Management Plans (www.sepa.org.uk/water/river_basin_planning.aspx) for more details.

[28]Annex B of Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive (www.wfduk.org/UKCLASSPUB/LibraryPublicDocs/sw_status_classification)

[29]http://www.nonnativespecies.org/documents/Invasive_NNS_Framework_Strategy_GB_E.pdf www.nonnativespecies.org/documents/Draft_StrategyV6.4.pdf

Measures specific to the first river basin planning include:

- identification of appropriate actions to manage invasive non-native species that threaten high and good status sites, together with identification of potential sources of re-infestation in the surrounding area;
- establishment of detection/surveillance/control strategies for key invasive non native species;
- risk assessment of pathways for entry of problem invasive non-native species into the Solway Tweed river basin district;
- research and development to define invasive non-native species causing deterioration of good ecological status/potential and to identify new methods of control.

We want to work with the Area Advisory Groups to identify local priorities for, and the feasibility of, controlling or eradicating populations of high impact invasive non-native species where these put at risk the achievement of Water Framework Directive objectives. In particular we want to develop a partnership approach that:

- gives priority to measures to prevent introductions of invasive non-native species;
- establishes a network that can detect newly introduced non-native species and, where appropriate, undertake rapid action to prevent their establishment;
- develop longer term mitigation measures such as containment or control for established invasive non-native species where these put at risk ecological status or other Water Framework Directive objectives.

17.3 What are the benefits?

The benefits of this approach include:

- maintenance of the ecological status of water bodies;
- financial savings from the reduced need to carry out control programmes;
- prevention of a negative economic impact on recreational angling;
- more tourists attracted to the area by its pristine environment.

Section 18 Ensuring that good status is reached by 2027

Production of this draft river basin management plan has allowed us to identify progress towards meeting the environmental objectives of the Water Framework Directive. However, our work has also identified where there are gaps in the measures needed to manage key pressures.

18.1 Options for continued improvements

The process of objective setting in the Solway Tweed river basin district suggests that the following environmental problems in particular need additional measures to reduce their impacts:

- nutrient enrichment in our rivers, lochs/lakes, estuaries and groundwaters;
- changes to the physical habitat of the rivers/barriers to fish migration.

Tackling the problem of non-native invasive species requires a more focused partnership approach, making best use of existing available tools to respond to government policies.

In order to maintain the rate of improvement of the Solway Tweed's water environment, Government and agency programmes are evolving to take into account:

- increasing evidence as to the best course of action to sustainably manage the water environment and address the most significant pressures;
- cost-effective and proportionate action to manage the pressures on the water environment.

Other Government policy initiatives such as marine, coastal planning and flooding related legislation will also enhance the management of the water environment and lead to environmental improvements in the Solway Tweed river basin district.

Additional measures and actions will be considered to allow us to make progress in delivering more effective management of the water environment. These measures and actions include:

- additional investigative programmes (not currently funded) by the Agencies to identify priorities and the best way to target measures in this and subsequent river basin management plans;
- the need to undertake and prioritise work on catchments where diffuse pollution may lead to failure to comply with Water Framework Directive standards and protected area obligations;
- the development of restoration partnerships, policies and on-the-ground actions that could improve water bodies downgraded by historic engineering impacts;
- undertaking a programme of work to prevent the further spread of invasive non-native species that could downgrade water bodies from good status.

However we need to ensure the implications of measures for continued improvement are considered in terms of environmental outcomes as well as social and cost implications. We will do this in two ways.

- The strategic environmental assessment report (see Section 2.3) will consider the implications of the river basin management plan for wider management of the environment.
- The associated impact assessment (see Section 2.4) and the Scottish Government's consultation on continued improvements will address:
  - the implications for co-delivery of government policy;
  - investment needs;
  - the implications for people and industry.

The background to national policy initiatives supporting the management of the water environment in line with the Water Framework Directive and the consultation on continued improvements can be found on the Defra and Scottish Government websites. Alternatively follow the links from the river basin planning page on SEPA's website (www.sepa.org.uk/water/river_basin_planning.aspx).

During 2009 the agencies and Governments will consider:

- the implications of these initiatives at a river basin district and a national level;
- which initiatives should be considered when producing the final river basin management plan for the Solway Tweed;
- which initiatives require further development in subsequent river basin planning cycles.

We also need to take account of the implications of climate change for the environment (see Section 19).

Section 19 Climate change

Climate change is evident in the Solway Tweed from observed trends in temperature, rainfall and snow cover. It is causing changes in the growing, breeding and migration seasons, shifts in species abundance and diversity, higher rainfall intensity and river flows leading to changes in flood risk, and sea level rise causing flood risk and erosion. Left unchecked, climate change will accelerate causing damaging effects on physical, biological and chemical processes with significant consequences for Solway Tweed's environment, economy and society. Climate change is different from the other issues discussed previously in that it affects all aspects of managing the water environment across the UK, not just the Solway Tweed.

The impact of climate change is also considered in the strategic environmental assessment (see www.sepa.org.uk/water/river_basin_planning.aspx).

19.1 What is the environmental impact?

Climate change has a wide variety of implications for the environment in the UK (see Table 13). Rising water temperatures and changes in precipitation patterns are of particular importance to surface water ecosystems. Such changes are likely to affect how ecosystems function, especially in combination with other man-made pressures such as chemical pollution. For example, warmer standing waters receiving greater nutrient run-off as a result of higher intensity rainfall events could exacerbate algal blooms and eutrophication. Significant changes in average temperature, precipitation and soil moisture are likely to affect water demand in most sectors but especially agriculture, forestry and public supply. Irrigation water needs are likely to increase across the east coast.

Groundwater supplies are less susceptible than surface water to short-term climate variability; they are influenced more by long-term trends. However, groundwater levels may fall along the east coast during the summer with knock-on consequences for river flows. The surface water temperature will fluctuate more rapidly with reduced volumes of water causing direct impacts on fish populations and indirect consequences by exacerbating the effects of pollution.

Table 13: Summary of the implications of climate change on the water environment

Aspect	Implications
Pollution	• Higher river flows may reduce the impact of pollution in rivers. • Increased run-off of pollutants from coastal areas may increase the risk of the failure of microbiological standards in bathing waters and shellfish waters. • Higher intensity rainfall will increase the loading on sewers, which may change the frequency and volumes of sewage-bearing discharges. It is also likely to result in more diffuse pollution from rural areas. • Lower summer river flows, together with higher temperatures reducing the dissolved oxygen in water bodies, will provide less dilution for any discharges to those water bodies. • Enhanced plant/algal growth due to increased temperature may exacerbate the effects of eutrophication. • Climate change variables that could affect acidification include higher temperatures, increased summer drought and sea-salt events, which may affect the frequency or intensity of acid episodes.
Abstraction and flow regulation	• Demand for water for domestic purposes, the leisure industry, agriculture and industrial production is likely to increase as a result of higher temperatures. • This demand could be combined with less available water in the environment due to an increase in summer droughts. • It may become more difficult to maintain compensation flows.
Changes to morphology	• More frequent and severe river flooding may increase requirements for improving flood risk management defences and sustainable urban drainage schemes. • There may be higher rates of river erosion as rivers are likely to be more flashy and have greater power to erode during storm events and a greater capacity to move a greater sediment load. • Increased intensity of rainfall is likely to result in greater contamination of run-off of sediment from both rural and urban areas. This could lead to siltation of fish spawning gravels and increased nutrient loading to lochs/lakes and the sea.

Aspect	Implications
Biodiversity and invasive alien species	• Higher temperatures may provide more favourable conditions for invasive non-native species. • There will be changes in the abundance and distribution of native species and the length of growing season. • Higher temperatures will be less favourable for some native species.

It is likely that the risk of not achieving the Water Framework Directive's objectives due to a number of man-made pressures will increase as a result of climate change. It is important that river basin planning adapts and changes to the future climate. As part of the screening process for the strategic environmental assessment (see Section 2.3), it was determined that the vast majority of measures will help to tackle these pressures.

Adapting to climate changes includes investment in new works or better management of current sites. Of particular significance is infrastructure whose effectiveness could be compromised by flooding.

This section will be developed further for the final plan following the release of the UK climate change scenarios in December 2008.

Section 20 Developing the final river basin management plan

Between now and the publication of the final river basin management plan for the Solway Tweed river basin district in December 2009, the main tasks will be to:

- refine the classification assessments and update them with data collected during 2008;
- continue to work together with partners to identify, develop and implement measures (actions) to deliver the plan's objectives;
- discuss and agree how the plan will be implemented in partnership;
- revise the objectives and measures of the plan based on guidance issued by the Scottish Government following its consultation for continued improvements and the impact assessment consultation
- consider all responses to the strategic environmental assessment consultation and update the plan if required.

20.1 Taking into account your views

This draft plan has been developed in partnership with a wide range of stakeholders to help ensure that it presents a fair and representative view of how we can protect and improve our water environment over the next six years and looking further forward for subsequent plans. We are actively seeking views on this draft plan during the formal consultation period and we propose to consider them as follows:

- SEPA and the Environment Agency will review responses throughout the consultation period and, where relevant, appropriate and practical, we will incorporate the responses into the process of developing the final plan.
- The agencies will discuss unresolved responses with the Solway Tweed Editorial Team (made up of Area Advisory Group members) and the relevant stakeholders to ensure we fully consider the responses and take a fair approach.
- As set out in the Solway Tweed Guidance, the agencies will report any significant unresolved responses and our proposed approach for dealing with them to Ministers when we submit the final plan for approval.

This process will ensure that the final plan is developed in a fair and timely manner and that the Ministers are fully informed on any remaining issues

20.2 Next steps

This draft river basin management plan for the Solway Tweed river basin district, puts forward proposals to prevent the water environment from deteriorating and, where necessary to bring about improvements. It recognises that to achieve this ambition, it is necessary to build on what is already working well in the Solway Tweed. Many of the actions proposed will be carried out by businesses and land managers as part of their routine management. Some require more targeted effort and bringing people together to develop a better understanding of the issues and the potential solutions.

The Solway Tweed Area Advisory Groups will continue to advise SEPA and the Environment Agency and one of their main tasks is to oversee the implementation of the final plan. By working with the Area Advisory Groups and listening to the wide range of views and values that the group represents and by considering all of the consultation responses, the outcome will be a balanced and appropriate programme of measures to ensure that the water environment is used in a way that safe-guards it for all our needs.

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