ENVIRONMENT AGENCY

SEPA
Scottish Environment Protection Agency

Strategic Environmental Assessment of the draft Solway Tweed River Basin Management Plan:

Environmental Report

SISTech

enfusion

MWH
BUILDING A BETTER WORLD

Solway Tweed draft River Basin Management Plan
Strategic Environmental Assessment

Technical Report

Main Contributors	Aspect/Section	Notes
MWH UK Ltd	Project Lead Consultancy	
Enfusion	HRA/AA and Review	

Bid/Project Code: 1	Document No: Document and Revision No	Controlled Copy No: *(in COLOUR – not black)*

Rev. No	Date	Description/Amendment	Checked	Reviewed	Authorised for Issue
A	23/06/08	Draft for client review	ED	JW	
B	14/07/08	Draft for Enfusion review	ED	JW	
C	21/08/08	Final draft for Enfusion review	BC	JW	
D	13/10/08	Final draft for client	ED		
Final	17/10/08	Final	ED	JW	

ONLY CONTROLLED COPY HOLDERS WILL BE ISSUED WITH AMENDMENTS TO THIS DOCUMENT.

PLEASE DESTROY ALL SUPERSEDED COPIES OR CLEARLY MARK THEM AS "SUPERSEDED".

Distribution Record *(optional – for use on the original/office copy only instead of a form PQP6/2)*

DISTRIBUTION									
Name									
Controlled Copy No.	**1**								

Solway Tweed draft RBMP Environmental Report
Non-technical summary

Introduction (Chapter 1)

As part of the preparation of the draft Solway Tweed River Basin Management Plan (RBMP), the Scottish Environment Protection Agency (SEPA) and the Environment Agency have undertaken a strategic environmental assessment (SEA) which reports on the significant environmental effects that may arise from implementing the RBMP.

This document, called an Environmental Report, contains all the information about the assessment, including a description of the assessment process, a summary of all the potential environmental effects the plan may have and a programme for monitoring.

How to comment on this report

This Environmental Report is out for consultation for three months between 8th January and 9th April 2009 and sits alongside the six month consultation on the Solway Tweed River Basin Management Plan. The Agencies welcome your comments on both the Environmental Report and the draft RBMP.

To help you provide comments on the report, 8 consultation questions are set at key points on which we particularly seek feedback. You are of course free to raise any other points on any other parts of the Environmental Report.

You comments will be taken into account as the draft RBMP is finalised through 2009 and an explanation as to how each comment has been considered will be provided in a "SEA Statement" which will be published in December 2009 when the final RBMP is published.

Comments should be made in writing by **Thursday 9th April 2009** to either:

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

Or by email to:

rbmp@sepa.org.uk

Enquiries or questions about this Environmental Report can also be directed to SEPA's SEA Gateway at sea.gateway@sepa.org.uk or by phoning Jackie Galley on 01387 720502.

The draft Solway Tweed River Basin Management Plan [link to plan here] (Chapter 2)

River basin management plans are a key part of delivering the objectives of the Water Framework Directive (WFD). Preparation of the Solway Tweed RBMP is the responsibility of SEPA and the Environment Agency. Preparation of the plan is a requirement of the Water Environment and Water Services (Scotland) Act 2003 and the Water Environment (WFD) (Solway Tweed River Basin District) Regulations 2004, the relevant instruments transposing the Directive into UK legislation.

The Solway Tweed RBMP sets the framework for protecting and enhancing the water environment from 2009 to 2015, although some commitments made in the plan may extend to 2021 or 2027. The first RBMP will be published by December 2009. The overall objective of the WFD is to bring about effective co-ordination of water environment policy and regulation across Europe. To achieve this, effective RBMPs are required that identify environmental objectives which represent an appropriate balance between environmental, social and economic interests. Specific overarching objectives of the RBMPs are to:

- prevent deterioration and enhance the condition (status) of aquatic ecosystems, including wetlands and groundwater;
- promote sustainable water use;
- reduce pollution; and
- contribute to the mitigation of floods and droughts.

At the heart of the draft RBMP is the Programme of Measures to be undertaken to meet the objectives set for water bodies by the WFD. These measures are the actions that will be taken to maintain or improve the quality of water bodies to the level required by the WFD.

There are broadly three types of measures:

- ***national measures*** that are applied by the relevant Administrations (e.g. agricultural policies);
- ***regional measures*** that occur across part of the river basin district (e.g. a measure to tackle a particular regional problem – non-native invasive species infestation for example); and
- ***local measures*** that are developed in response to a specific issue, usually targeted at a particular water body or part of a water body.

These ‘measures’ form the building blocks of the draft RBMP. Because the SEA is concerned with identifying significant environmental effects, local measures are unlikely to materially influence the assessment. Hence the SEA has concentrated on assessing the impacts of national and regional measures in order to assess their potential impacts and help inform the plan makers’ selection of these measures

The SEA of the Solway Tweed RBMP has considered the effects of the following groups of measures:

- ***Reference/Baseline*** – existing measures, planned changes (e.g. agreed investments programmes) and in-the-pipe changes (where policy is in place for other drivers that should support implementation of the first RBMP);
- ***Draft RBMP*** – includes priority actions with a reasonable degree of certainty of being implemented in the first round of river management. It assumes there is no need for significant new powers, delivery or funding mechanisms outside those already in place or in the process of being introduced; and
- ***Continued Improvement*** - includes all the measures in the Draft RBMP, plus potential additional measures highlighted by the Scottish Government and Defra that the Agencies (SEPA and the EA) believe are worthwhile exploring in terms of local outcomes for the District. These additional measures have the potential to move the water environment towards the desired objectives even if there is some uncertainty about their implementation

The Reference/Baseline case contains the measures that are existing or planned for reasons unrelated to the WFD. The measures in the other two options act together with the Reference/Baseline measures. Thus, the measures in the Draft RBMP act in combination with the Reference/Baseline measures while the measures in the Continued Improvement option act in combination with both the Draft RBMP and the Reference/Baseline measures.

Policy context (Chapter 3)

An important component of the SEA is consideration of the relationship between the draft Solway Tweed RBMP and other plans, programmes, strategies and environmental objectives that it may influence or be influenced by. Understanding these relationships helps to:

- identify significant environmental effects; and
- understand which plans may be best placed to implement any mitigation measures required.

There are many plans and programmes that can influence the river basin planning process; many of these are the responsibilities of other organisations many of whom have been involved throughout the river basin planning process through the National Advisory Group (NAG) and Area Advisory Groups (AAGs). A detailed assessment of how river basin planning links to other key planning processes (e.g. land use planning) is presented in Annex 11 of the draft RBMP. It is expected that the impacts of the relevant activities of these organisations will be continually assessed against other priorities and responsibilities.

To understand the significant environmental effects of the draft Solway Tweed RBMP, it is necessary to have a reasonable understanding of the areas underlying geology and geomorphology, its geography and current state of the environment. To this end, an environmental baseline report was prepared that considers the present state of the environment under the following headings:

- biodiversity, flora & fauna;
- population;
- human health;

- water;
- air;
- climate factors;
- soil;
- cultural heritage;
- landscape; and
- material assets.

Assessment approach (Chapter 4)

The SEA approach has been largely informed by '*Solway Tweed River Basin Management Plan Strategic Environmental Assessment Scoping Report* and by the guidance document on '*River basin management planning in the Solway Tweed River Basin District*' which makes it clear that SEPA and the Environment Agency are jointly responsible for delivering the draft RBMP in an integrated and coordinated manner.

The Solway Tweed SEA Scoping Report summarised the key issues on which this SEA needed to focus. These issues were identified in consultation with the NAG and AAGs, other stakeholders and the statutory Consultation Authorities. They were also influenced by the Solway Tweed River Basin Characterisation (RBC) and Significant Water Management Issues (SWMI) reports. Eight SEA topics (biodiversity, flora & fauna, population & human health, water, climate factors, cultural heritage, landscape, material assets and soil) were identified. Air quality was scoped out of the assessment as it was considered unlikely that significant effects upon air would result from actions in the Solway Tweed draft RBMP.

The use of environmental objectives is a common method for undertaking SEA to assess whether a plan is moving towards or away from the stated objective. Environmental objectives were developed for each SEA topic, for example, for the SEA topic 'Biodiversity, flora & fauna', an environmental objective was framed to assess the extent to which the draft RBMP will 'protect and, where appropriate, enhance biodiversity, particularly protected areas and protected species.' More detailed assessment criteria were then developed for each environmental objective to account for specific issues in the Solway Tweed draft RBMP. The eight environmental objectives and 32 assessment criteria together form the basis of an assessment matrix.

This assessment matrix was used to assess each measure in the Solway Tweed draft RBMP against each SEA objective and the detailed assessment criteria. Each measure was assessed to determine whether:

- it makes a significant positive or negative contribution, an uncertain contribution, a positive and negative contribution or has no significant effect; and
- it has a short-, medium- or long-term effects.

Where appropriate, evidence was presented to justify the assessment; where there was uncertainty, it was expressed in the assessment matrix. Where potential negative effects were identified, mitigation measures were suggested, and actions for other plans identified.

The mitigation measures seek to prevent, reduce or, as far as possible, offset the adverse effects that have been identified.

The SEA legislation requires the assessment of any reasonable alternatives to the draft RBMP. In this Environmental Report, the draft RBMP and one alternative ("Continued Improvement") were considered.

The impacts of the draft RBMP have been assessed taking into account effects that will already occur through existing measures – i.e. the Reference/Baseline option. The alternative that has been considered is the option of Continued Improvement. The measures in the Draft RBMP act in combination with the measures in the Reference/Baseline case. Hence the impacts of the Draft RBMP are assessed in relation to the Reference/Baseline. Similarly, Continued Improvement includes the measures in both the Reference/Baseline and Draft RBMP plus additional measures. Hence, in assessing the impact of Continued Improvement relative to the Reference/Baseline, the effects of and interactions with the measures in the Draft RBMP have also been taken into account.

Habitats assessment screening

In accordance with Article 6 (3) of the Habitats Directive (92/43/EEC), the competent national authorities must agree to a plan or project only after having ascertained that it will not adversely affect the integrity of European sites. The draft RBMP for the Solway Tweed must therefore be subject to a screening process to determine if the plans would have a significant effect on one or more European sites.

The purpose of Habitats Regulations Assessment/Appropriate Assessment (HRA/AA) is to assess the impacts of a plan or project, in combination with the effects of other plans and projects, against the conservation objectives of a European Site and to ascertain whether it would adversely affect the integrity of that site.

Therefore, an initial screening has been undertaken to determine whether further AA Assessment is required and to guide further assessment of regional and local measures. The report of this HRA screening is included in Appendix E.

Significant environmental effects – assessment findings (Chapter 5)

The significant environmental effects of the national and regional measures have been assessed. The impacts have first been assessed for the Reference/Baseline case, then for the Draft RBMP and finally for the alternative of Continued Improvement.

The significant environmental effects due to the measures in the Reference/Baseline case, the Draft RBMP and Continued Improvement are broadly similar. All the options produce significant positive effects for biodiversity, flora & fauna and for water. Because the measures in the Draft RBMP and Continued Improvement options apply in combination with Reference/Baseline measures, the benefits are likely to be greater for the Draft RBMP than for the Reference/Baseline and would be enhanced further by the measures in Continued Improvement.

Positive Effects

This assessment has found that the Solway Tweed draft RBMP may potentially result in a large number of positive and significant environmental effects. In summary, the key positive environmental effects found were:

Biodiversity, flora & fauna

- measures to address diffuse pollution and point source pollution will improve water quality, reduce eutrophication and therefore have benefits for aquatic ecosystems;
- water efficiency measures could potentially result in more water being available for aquatic ecosystems and for greater dilution of pollutants;
- controlling the rate and timing of abstraction will reduce biological stress (especially during low flow periods) and also provides the additional benefit of a more "natural" hydrological regime;
- measures to improve morphology will lead to direct improvements for aquatic and riparian habitats; and
- measures to deal with non-native invasive species will likely lead to direct biodiversity benefits in the areas affected.

Population and human health

- measures to reduce diffuse and point source pollution will help to protect human health through reducing pollutant loads to protected areas such as drinking waters and bathing waters;
- water efficiency measures could potentially result in more water being available for the dilution of pollutants and hence provide additional protection for protected areas;
- some measures may improve access to waters in the RBD, particularly where measures to improve water quality will enable greater access for bathing or other recreational pursuits; and
- water improvements may increase amenity value of water bodies in the RBD.

Water

- all of the measures in the draft RBMP are designed to address a pressure that is adversely affecting a water body. Accordingly, all measures are designed to produce positive effects on water quality in the water bodies to which they apply.

Climate factors

- many measures will result in positive effects, particularly in relation to sustainable flood management, mitigation of floods and droughts, and to climate change adaptation;
- greater efficiency in water use may reduce the volume of raw water that has to be treated, which may result in some energy and greenhouse gas emission savings; and
- measures relating to abstraction and flow regulation in particular may have positive benefits for the management of floods and droughts.

Cultural heritage

- the majority of measures are not likely to have significant effects on cultural heritage.

Landscape

- the majority of measures are not likely to have significant effects on landscape, although measures to improve downgraded waterbodies (especially where they have been modified) will have positive landscape effects at the local level.

Material assets

- measures aimed at increasing water-use efficiency (e.g. leakage reduction) could result in better use of water and as a result better use of other resources – e.g. energy; and
- as a result of the above, it is possible that this could delay the need for additional new infrastructure.

Soil

- improvements in water quality caused by measures that tackle diffuse and point source pollution may result in improve soil quality as fewer pollutants will be deposited on land;
- measures relating to abstraction and flow regulation may also lead to benefits for soils by reducing erosion by floods or soil loss through drought; and
- measures to improve morphological conditions of channel banks, shorelines, riparian zones and wetland habitats will help to improve infiltration rates, reduce run off and therefore contribute to reducing erosion.

Potential adverse effects

The main SEA topics under which the draft RBMP options have been assessed as having potential significant adverse impact are:

- Biodiversity, flora & fauna – through transfer of impacts from one location to another;
- Population and human health – through possible changes in water supply output;
- Water - through transfer of impacts from one location to another;
- Climate factors – through increased energy consumption and greenhouse gas emissions; and
- Material assets – through increased waste production.

The cumulative effects of the PPS and alternatives have been assessed for two cases:

- the interaction of the Draft RBMP and the Reference/Baseline measures; and
- the interaction of the Continued Improvement alternative with the measures in both the Draft RBMP and the Reference/Baseline case.

Where measures in the Reference/Baseline and the Draft RBMP are affecting the same SEA topics, their effects will be cumulative. Negative cumulative effects are likely to be most marked for climate change and material assets due to the use of energy, production of greenhouse gas emissions and the generation of waste (e.g. sewage sludge).

The Continued Improvement measures will, in general, have the same cumulative effects as the measures in the Reference/Baseline and Draft RBMP apart from where:

- a measure in Continued Improvement mitigates a cumulative effect likely to arise from the other measures, or;
- a measure in Continued Improvement interacts with the other measures in such a way as to create a new significant environmental effect.

The only two SEA topics where different cumulative effects may arise as a result of Continued Improvement are climate factors and material assets. For these two topics, the proposed measure to introduce controls on levels of Phosphorus in detergents may reduce the cumulative impacts on climate factors and material assets from the Phosphorus control measures in the Reference/baseline and Draft RBMP by reducing the incidence of these measures

The draft RBMP will be implemented at the same time as a large number of other plans, policies and strategies. The interaction of the RBMP with these other plans will only be significant where an RBMP option interacts with another plan to create a new significant impact from that plan, or where other plans can effectively mitigate effects from the RBMP.

Finalising the Plan and implementation (Chapter 6)

Four potentially significant adverse environmental effects were identified during the assessment process. The effects, and suggestions for their mitigation, are summarised in the table below.

Potential adverse effect	Cause	Proposed mitigation
Increased waste production	Increased sludge from treatment; waste from invasive non-native species'; sediments; removal of engineering structures.	Compliance with existing legislative and regulatory regimes; promotion of waste hierarchy.
Increased energy consumption / greenhouse gas emissions	Increased treatment standards; additional storage and pumping; additional construction.	Consideration of national climate change strategy; promotion of renewables; through regulation by SEPA/Environment Agency
Change in water supply output	Reduced power generation capacity; reduced abstraction.	Project level assessment; consideration of national policies on renewables and agriculture.
Transferral of environmental problems	Moving effluent discharge points from one water course to another, moving abstraction points.	Project specific assessment and through regulatory controls (e.g. CAR).

The SEA process has considered opportunities for enhancement of the Plan. Given the environmental nature of the Plan there is limited scope for this. However, suggestions have been made to ensure that due consideration is given to effects on Population & human health, Cultural heritage and Material assets during the implementation of measures. Due consideration should be given to particular aspects of these topics: amenity value and health aspects in relation to Population & human health; the cultural value of historic structures in

relation to Cultural heritage; and the importance of hydro capacity and existing infrastructure in relation to Material assets.

This monitoring programme for determining whether the environmental effects identified during the assessment actually occur has been proposed. This monitoring programme is targeted at the four identified potential negative effects. In relation to increased waste production it is suggested that sewage sludge arisings from water treatment companies are monitored. In relation to energy usage it is proposed that water company energy usage for waste water treatment plants is monitored. For water supply issues it is suggested that monitoring can be carried out using abstraction volumes granted under registrations and licenses through the regulator. No suitable monitoring indicator has been identified in relation to issues surrounding the transferral of environmental problems.

Consultation Questions

A series of consultation questions have been prepared to assist those wishing to make comments on this Environmental Report. The questions are:

Question 1 **Do you think SEPA/Environment Agency - in Appendix C - have identified all the other relevant Plans, Programmes and Strategies that the Solway Tweed RBMP may influence or be influenced by?**

Question 2 **Do you think SEPA/Environment Agency have identified the key environmental issues in, and baseline characteristics of, the Solway Tweed River Basin District?**

Question 3 **Do you think SEPA/Environment Agency have identified the potential significant environmental effects likely to arise from waterbody measures already in place (the Reference/Baseline case)?**

Question 4 **Do you think SEPA/Environment Agency have identified the potential significant environmental effects likely to arise from implementing the Solway Tweed draft River Basin Management Plan?**

Question 5 **Do you think SEPA/Environment Agency have identified the potential significant environmental effects likely to arise from implementing the potential additional measures identified under the Scottish Government consultation 'Continued Improvement'?**

Question 6 **Do you think that SEPA/Environment Agency have identified all the potential cumulative effects arising from implementing the draft RBMP and Continued Improvement measures?**

Question 7 **Do you think that SEPA/Environment Agency have identified appropriate mitigation and enhancement measures?**

Question 8 **Do you think that SEPA/Environment Agency have identified appropriate processes and indicators to monitor environmental effects?**

Contents

Appendices

List of Tables

List of Figures

1. INTRODUCTION

As part of the preparation of the draft Solway Tweed River Basin Management Plan (RBMP), the Scottish Environment Protection Agency (SEPA) and the Environment Agency have undertaken a strategic environmental assessment (SEA) which reports on the significant environmental effects that may arise from implementing the RBMP.

This chapter presents the key facts about the draft Solway Tweed RBMP and explains the purpose of this Environmental Report. It puts the Environmental Report in the context of the key stages in the SEA process, setting out the activities already undertaken and the steps that will follow publication of this report and the draft RBMP.

The key facts relating to the Solway Tweed draft RBMP are presented in Table 1.

Table1 Key facts about the Solway Tweed draft RBMP

Responsible authorities	Scottish Environment Protection Agency and the Environment Agency.
Title	Solway Tweed draft RBMP [Link to plan here].
Plan subject	Water management.
Period covered	The Solway Tweed RBMP sets the framework for protecting and enhancing the water environment from 2009 to 2015, although some commitments made in the plan may extend to 2021 or 2027. The first RBMP will be published by December 2009.
Requirement for the plan	Preparation of the Solway Tweed RBMP is a requirement of the Water Environment and Water Services WEWS (Scotland) Act 2003 and the Water Environment (WFD) (Solway Tweed River Basin District) Regulations 2004.
Frequency of updates	The Solway Tweed RBMP must be reviewed every six years, i.e. in 2015, 2021, 2027 and so on.
Plan area	The Solway Tweed River Basin District covers an area of approximately 17,500 km^2 in the Scottish Borders, Dumfries and Galloway, South and East Ayrshire, South Lanarkshire, Cumbria and Northumbria. A map showing the River Basin District is presented in Figure 1.
Summary of content/nature of plan	The overall objective of the Water Framework Directive is to bring about effective co-ordination of water environment policy and regulation across Europe. To achieve this, effective RBMPs are required that identify environmental objectives which represent an appropriate balance between environmental, social and economic interests. Specific overarching objectives of the RBMPs are to: • prevent deterioration and enhance the condition (status) of aquatic ecosystems, including wetlands and groundwater; • promote sustainable water use; • reduce pollution; • contribute to the mitigation of floods and droughts. Further details about the process of preparing the RBMP are given below.

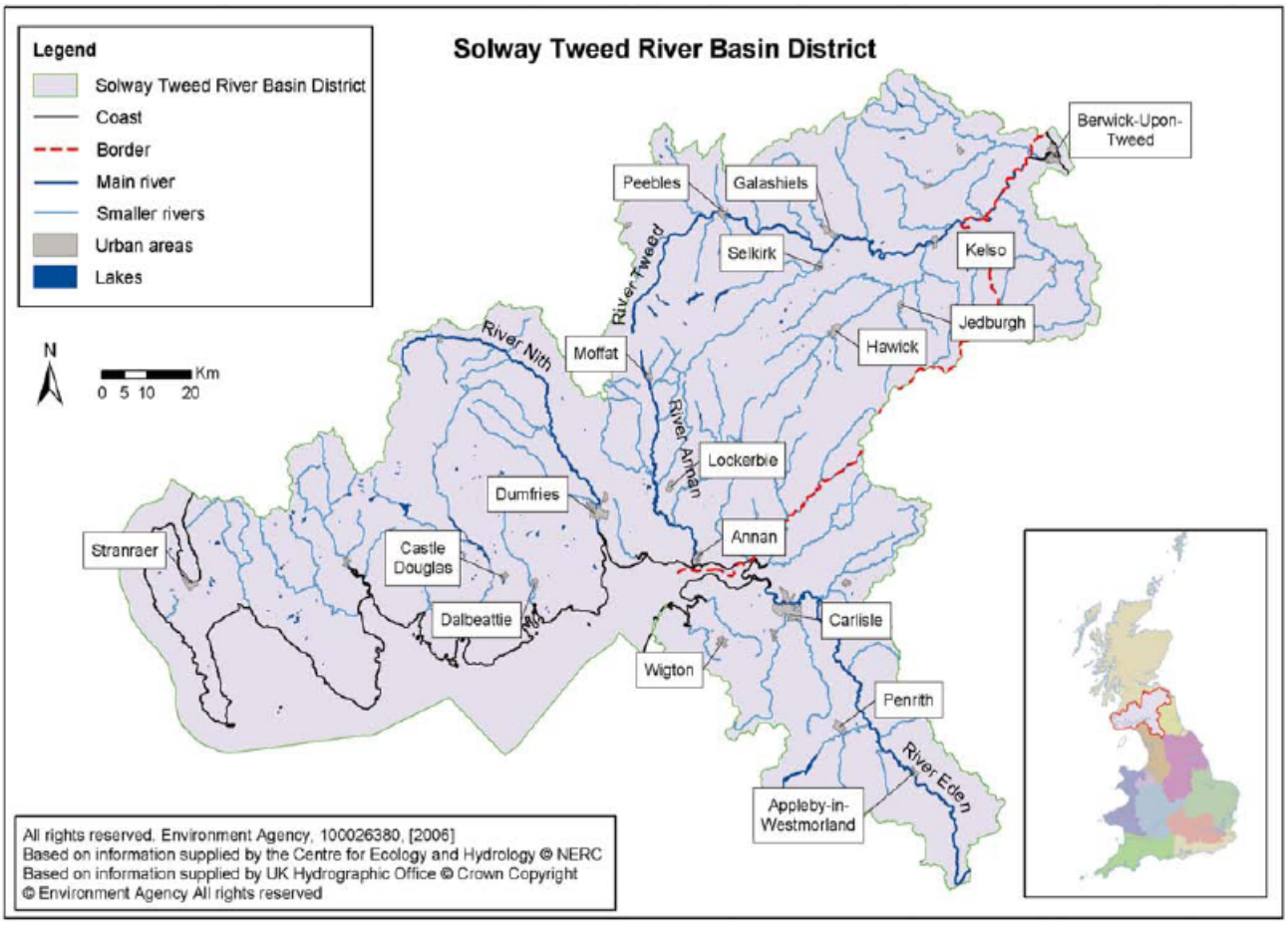

Figure 1 Map of the Solway Tweed River Basin District

1.1. Purpose of Environmental Report

As part of the preparation of the Solway Tweed draft RBMP, the Scottish Environment Protection Agency (SEPA) and the Environment Agency (EA) are carrying out a Strategic Environmental Assessment (SEA). SEA is a systematic method for considering the likely environmental effects of certain Plans, Programmes and Strategies (PPS). SEA integrates environmental factors into PPS preparation and decision making. The process is designed to increase public participation in decision making and facilitates openness and transparency.

The requirement for SEA comes from the European Directive on the Assessment of the Effects of Certain Plans and Programmes on the Environment.[1] As the Solway Tweed draft RBMP covers an area that includes parts of both England and Scotland, the SEA is being undertaken under the Environmental Assessment of Plans and Programmes Regulations (SI 2004 No. 1633)[2] that apply to plans that relate to England and any other part of the UK.

[1] http://ec.europa.eu/environment/water/water-framework/index_en.html.

[2] http://www.opsi.gov.uk/si/si2004/20041633.htm.

The purpose of this Environmental Report is to identify, describe and evaluate the likely significant effects on the environment of implementing the Solway Tweed draft RBMP and its reasonable alternatives. This Environmental Report is the key consultation document in the SEA process because it provides an explanation of the environmental effects together with an opportunity to comment.

1.2. Strategic Environmental Assessment activities to date

The key stages undertaken for this SEA have been:

- **Scoping** to decide on the scope and level of detail of the Environmental Report, and the consultation period for the report – this was is done in consultation with the statutory Consultation Bodies: Scottish Natural Heritage, the Scottish Ministers (Historic Scotland), Natural England and English Heritage. The Scottish National Advisory Group and Area Advisory Groups were also invited to comment at this stage.

- **Environmental reporting** to publish an Environmental Report on the Plan and its effects, and consult on that report.

The scoping of the Solway Tweed draft RBMP considered the baseline environmental conditions, the potential environmental impacts on key receptors and the relationship of the draft RBMP with other PPS. It also considered the scope and level of detail for the SEA and proposed the assessment method and objectives/criteria for the assessment The findings were reported in the Scoping Report[3] published by SEPA and the Environment Agency (England and Wales) EA and issued for consultation in October 2007.

Following the consultation on the Scoping Report, SEPA and the EA appointed consultants to undertake a SEA of the draft RBMP. One of the first tasks undertaken by the consultants was to review the consultation responses and to agree with the Agencies what actions to take.

The actions taken in response to the comments have fallen into two main groups:

1. The majority of the comments were noted and suitable responses were incorporated in the Environmental Report, for example by inclusion of additional items in the reviews of relevant plans, policies and strategies, revisions to the environmental baseline and modifications to the SEA objectives/criteria.

2. For a small number of comments, (less than 10% of the total), no data were available or could reasonably be acquired during the preparation of the Environmental Report to enable a suitable response to be incorporated.

The actions taken in response to all comments have been reported to SEPA and the EA.

Following the review of consultation responses, the remaining work on the SEA was undertaken between May and August 2008 and the findings are presented in this report. The

[3] http://www.sepa.org.uk/pdf/wfd/rbmp/sea_scoping/sea_scoping_report_solway_tweed.pdf.

Environmental Report and the draft RBMP will both be issued for consultation in the latter part of 2008. Responses will be taken into account in preparing the final version of the RBMP that is due to be published in December 2009. More details of the SEA timetable and how this fits with the river basin management planning process are given in Section 2.

The last two stages in the SEA process will follow publication of the final RBMP and will comprise:

- **Adoption** to provide information on: the adopted Plan; how consultation comments have been taken into account; and methods for monitoring the significant environmental effects of the implementation of the PPS.

- **Monitoring** to monitor significant environmental effects in such a manner as to enable the Responsible Authority to identify any unforeseen adverse effects at an early stage and undertake appropriate remedial action.

2. THE SOLWAY TWEED DRAFT RIVER BASIN MANAGEMENT PLAN [LINK TO PLAN HERE]

This chapter outlines the process of river basin planning that is needed to meet the objectives of the Water Framework Directive (WFD) and shows how the timetables for preparation of the Solway Tweed RBMP and the SEA fit together. It introduces the concept of "measures" as the actions to be taken to meet the objectives of the WFD. The grouping of these measures, to provide a Reference/Baseline case and two options for the additional WFD measures, is described. The way in which the SEA has considered these two options, termed the Draft RBMP and Continued Improvement, and how the measures in these options interact with one another and with the measures in the Reference/Baseline is

2.1. Introduction

River basin management plans are a key part of delivering the objectives of the Water Framework Directive (WFD). The Solway Tweed and other RBMPs are the product of the first round of plan making under the WFD following transposition of the Directive into legislation across the UK in 2003. This section briefly describes the process of river basin planning and gives details of the Solway Tweed River Basin District (RBD) and the draft RBMP in order to inform the assessment that follows.

2.2. River basin planning

The WFD presents a unique opportunity to deliver sustainable water environmental policy through a coordinated approach to water and environmental management. The key objective of the Directive is the 'aim to achieve' good status for surface and ground water bodies by 2015. Where this is not possible water bodies can be designated as artificially or heavily modified. The use to which these water bodies are put (e.g. impoundment of water for drinking water supplies or hydropower generation) can then be taken into account. The default objective for these water bodies is Good Ecological Potential (GEP). In some circumstances it is not possible to reach the default objectives, for example, where measures to achieve the objectives are technically infeasible or disproportionately costly. Under these circumstances the Directive makes provision for extending deadlines or setting alternative, less stringent objectives where justification can be provided.

A large amount of work has already been undertaken by the Scottish Government (SG), SEPA, the Department for Environment, Food and Rural Affairs (Defra), the EA and other stakeholder organisations to prepare for implementation of the WFD. Completed milestones include: the development of legislative frameworks, River Basin Characterisation (RBC), the publication of RBMP strategies, the establishment of National and Area Advisory Groups (N/AAG) and Advisory Group Forums (AGF), the identification of Significant Water Management Issues (SWMI) and, as described in Section 1, the publication of SEA Scoping reports. These are all a prelude to the preparation of the first RBMPs for each RBD.

River basin management planning is the strategic decision making process that integrates the management of land and water to deliver the requirements of the Directive. The RBMPs set out what needs to be achieved for all water bodies within the RBDs, and specify the measures or actions to achieve those objectives. The RBMPs therefore need to strike a balance between economic, social and environmental needs within the RBDs. Sustainability, which underlies all of the efforts of the RBMPs, is the end goal.

One component required for the RBMP development process is an Impact Assessment (IA) of the economic, social and environmental impacts of the proposed draft RBMP Programme of Measures (PoMs). The Solway Tweed IA is published alongside this SEA.

The other assessment required to accompany the draft RBMP is the SEA. The inter-relationship between the river basin planning process and the SEA process is shown on Table 2. The SEA will provide the assessment of the impacts of the draft RBMP that will allow plan makers, consultation bodies, and Ministers to comply with existing regulations and to consider any policy issues related to the draft RBMP.

Table 2 Summary of the SEA and river basin planning processes

Date	SEA Activity	RBMP Activity	Notes
2006	Capacity Building and Awareness Raising	RBMP strategy	RBMP strategy included reference to need for and value of SEA in RBMP preparation.
		Plan of Action Report	
2007	Statutory Scoping with consultation bodies and NAG/AAG members	Publication of SWMI report	Scoping included early identification of relationships with other PPS, initial environmental baseline and consideration of assessment methods.
2008	Assessment of Plan during preparation	Prepare draft RBMP, including objective setting and programme of measures	RBMP and Environmental Report (ER) preparation was aligned as much as possible to ensure integration of environmental considerations
Dec. 2008	Publish Environmental Report for statutory public consultation	Publish draft RBMP for statutory consultation	The ER and draft RBMP will be published at the same time, but the ER will have a consultation period of three months, the RBMP six. This is to allow for the ER and views expressed about the ER to be fully evaluated prior to finalisation of the RBMP
Dec. 2009	Publish SEA Statement	Publish final RBMP	The SEA statement will explain how the ER has been taken into account in finalising the plan and how views expressed upon the ER have been considered.
2009 - 2015	Monitor for significant environmental effects	Monitoring of RBMP	

2.2.1. RBMP measures

The draft RBMP will include the Programme of Measures to be undertaken to meet the objectives set for water bodies in accordance with the requirements of the WFD. These measures can be defined as the actions that must be taken to maintain water bodies in a good ecological condition, or to improve their ecological condition to Good Ecological Status (GES), or to attain the less-stringent, alternative objectives that may be set under certain conditions specified in the Directive i.e. GEP.

Three categories of measures have been identified:

- ***national measures*** that are applied within the UK Administrations (e.g. agricultural policies);
- ***regional measures*** that occur across part of the RBD (e.g. a measure to tackle a particular regional problem – non-native invasive species infestation for example); and
- ***local measures*** that are developed in response to a specific issue, usually targeted at a particular water body or part of a water body.

These 'measures' form the building blocks of the draft RBMP and it is these measures that are the basis of the assessment. The methodology used for the assessment is explained in Section 4.

The measures that are proposed in the draft RBMP result from an objective setting process for each water body and an evaluation of the most cost-effective measures or combinations of measures to apply to achieve the objective. At the time of undertaking the SEA this detailed objective setting and evaluation was still ongoing and so the measures to be applied to each water body were not known precisely. However, because the SEA is concerned with identifying *significant* environmental effects, the local incidence and effects of measures are unlikely to materially influence the assessment. Hence the SEA has concentrated on assessing the impacts of national and regional measures in order to assess the potential impacts that may arise from the application of these more widespread measures and help inform the plan makers' selection of these measures.

2.2.2. RBMP options

The SEA of the Solway Tweed RBMP has considered the effects of the following groups of measures:

- ***Reference/Baseline*** – existing measures, planned changes (e.g. agreed investment programmes) and in-the-pipe changes (where policy is in place for other drivers that should support implementation of the first RBMP);
- ***Draft RBMP*** – includes priority actions with a reasonable degree of certainty of being implemented in the first round of river management. It assumes there is no need for significant new powers, delivery or funding mechanisms outside those already in place or in the process of being introduced; and

- ***Continued Improvement*** – includes all the measures in the Draft RBMP, plus potential additional measures highlighted by the Scottish Government and Defra that the Agencies (SEPA and the EA) believe are worthwhile exploring in terms of local outcomes for the District. These additional measures have the potential to move the water environment towards the desired objectives even if there is some uncertainty about their implementation

The option of Continued Improvement is not set out in the draft RBMP but has been included in the SEA as it is considered in the IA.

The Reference/Baseline case contains the measures that are existing or planned for reasons unrelated to the WFD. The measures in the other two options act together with the Reference/Baseline measures. Thus, the measures in the Draft RBMP act in combination with the Reference/Baseline measures while the measures in the Continued Improvement option act in combination with both the Draft RBMP and the Reference/Baseline measures.

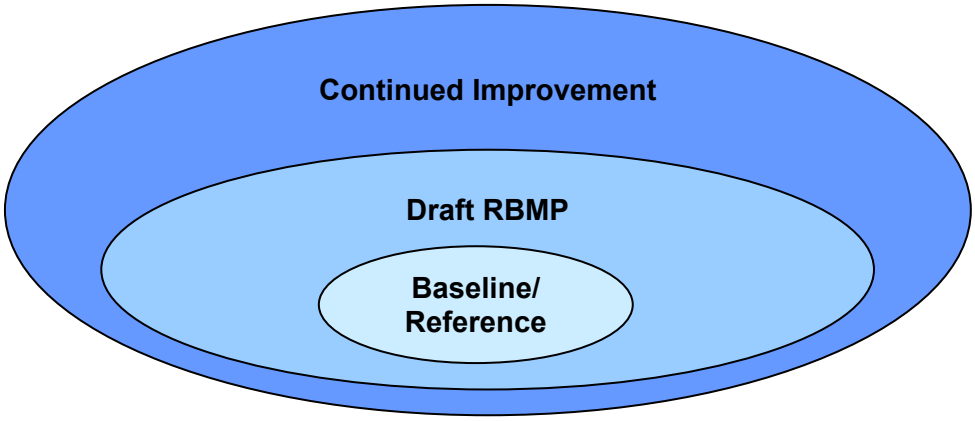

Figure 2 Schematic representation of how measures in different options act in combination

The Reference/Baseline is important in the SEA as it forms the basis against which to assess the environmental effects of the Draft RBMP and Continued Improvement options.

The measures included in the Reference/Baseline, Draft RBMP and Continued Improvement are presented in Appendix A and are discussed in more detail in Sections 4 and 5.

A number of further measures have been proposed in the Continued Improvement option. These potentially include additional funding/approaches, new regulatory approaches and/or other measures. The measures included in Continued Improvement are presented in Appendix A and are discussed in more detail in Sections 4 and 5.

For the SEA of the Solway Tweed draft RBMP, the full range of measures available in both Scotland and England were considered.

3. POLICY CONTEXT

An important component of the SEA is consideration of the relationship between the Solway Tweed draft RBMP and other plans, programmes, strategies and environmental objectives that it may influence or be influenced by. This chapter and the associated appendix give more details of the other relevant plans, programmes and strategies.

To understand the significant environmental effects of the Solway Tweed RBMP it is necessary to have a reasonable understanding of the existing conditions in the district. This chapter summarises the findings of the separate environmental baseline report under the headings of:

- biodiversity, flora & fauna;
- population;
- human health;
- water;
- air;
- climate factors;
- soil;
- cultural heritage;
- landscape; and
- material assets.

3.1. Relationship of draft RBMP to other PPS and environmental objectives

An important component of the SEA is consideration of the relationship between the Solway Tweed draft RBMP and other plans, programmes, strategies and environmental objectives that it may influence or be influenced by. Understanding these relationships will help to:

- identify significant environmental effects;
- understand which plans may be best placed to implement any mitigation measures required.

There are many plans and programmes that can influence the river basin planning process; many of these are the responsibilities of other organisations many of whom have been involved throughout the river basin planning process through the NAG and AAGs. A detailed assessment of how river basin planning links to other key planning processes (e.g. land use planning) is presented in Annex 11 of the draft RBMP. It is expected that the impacts of the relevant activities of the Advisory Group organisations will be continually assessed against other priorities and responsibilities. Appendix C presents a list and brief description of the plans and programmes that are relevant to the Solway Tweed draft RBMP. Reference is made to this information later in the report.

Consultation question 1 - Do you think SEPA/Environment Agency - in Appendix C - have identified all the other relevant Plans, Programmes and Strategies that the Solway Tweed draft RBMP may influence or be influenced by?

3.2. The Solway Tweed River Basin District

The Solway Tweed RBD crosses the border between Scotland and England. It covers an area of around 17,500 km^2 (3,800 km^2 of which falls in England) and has approximately 450,000 people living within its borders. The landscape varies from rolling hills in the Southern Uplands to rocky shorelines and sandy beaches along the west coast. The Southern Uplands are drained by rivers in the west (the Nith, Annan and Esk) which discharge to the Solway Firth estuary. The River Eden rises in the northern Pennines and eastern Lake District fells and flows north to the Solway estuary. The River Tweed drains the eastern part of the District into the Tweed estuary. Land use in the district is mainly agriculture, forestry and woodlands. The rural nature of the District means that it supports important habitats and wildlife, including 36 water-dependent Special Areas of Conservation (SAC) and Special Protection Areas (SPA), notably the River Eden and tributaries and the Solway estuary. The District has a moderately high rainfall relative to the rest of the UK, with rainfall being higher in the west than in the east. Around 90% of the water supply for the District comes from surface waters, the remainder from groundwater. A full description of the river basin's characteristics can be found in the '*Solway Tweed River Basin District Characterisation and impacts analyses required by Article 5 of the Water Framework Directive Summary Report*'.[4]

3.3. Environmental context – Baseline conditions

To understand the significant environmental effects of the Solway Tweed draft RBMP, it is necessary to have a reasonable understanding of the RBD's underlying geology and geomorphology, its geography and current environment. To this end, an environmental baseline report is presented in Appendix B. The environmental baseline report is very similar to that presented in the '*Solway Tweed River Basin Management Plan Strategic Environmental Assessment Scoping Report*' but has been updated to reflect consultee responses and new information such as Bathing Water monitoring data for 2007.

Drawing on the analysis presented in the Scoping Report and the consultee responses, this Section also explains how existing environmental problems will affect or be affected by the Solway Tweed draft RBMP. A short summary of the environmental baseline and the potential environmental issues of the draft RBMP is presented below.

3.3.1. Biodiversity, flora & fauna

Biodiversity is important for our health and wellbeing, as it provides vital ecosystem services that sustain the environment on which humans depend. The District's peat bogs, for

[4] http://www.sepa.org.uk/pdf/publications/wfd/Article_5_Solway_Tweed.pdf.

example, contribute to the purification of water, lock-up carbon dioxide (CO_2) and help mitigate the effects of flooding. The fauna and flora of the District have developed since the last glacial period some 10,000 years ago, and are characterised by species that have good dispersal abilities or which have arrived from neighbouring areas. Many of the District's habitats are internationally important with 27 designated SACs, 10 designated SPAs and over 220 Sites of Special Scientific Interest (SSSI) located within its borders. Further, there are 15 National Nature Reserves (NNRs) and 8 Ramsar sites within the District.

Potential environmental effects

In summary, the key biodiversity issues within the District that may be affected either positively or negatively by the draft RBMP are:

- Nitrogen (N) and Phosphorus (P) levels in surface water bodies from agriculture;
- eutrophication of water bodies due to nutrients, and associated water quality and biological problems;
- changing flooding regimes which affect river habitats and ecosystems;
- frequency of summer droughts and associated biological stress;
- acidification of freshwaters;
- morphological changes that result in habitat loss and potential biodiversity loss;
- non-native invasive species infestation.

3.3.2. Population

Approximately 450,000 people live in the Solway Tweed RBD; consequently the population density is low at around 23 people per square kilometre. Most people are employed in the public administration and service sectors, despite the fact that agriculture and forestry are the key land use activities. Tourism is a growing source of employment and is expected to support 10% of the population and provide 6% of the income by 2015. The natural beauty of the District is an important factor for tourists. In the Visit Scotland Tourism Attitudes Survey of 2005, 92% of the respondents identified scenery as being either important or very important in influencing their choice of Scotland as a tourism destination. A wide variety of recreational activities rely on water in the District including canoeing, kayaking, windsurfing and yachting; these contribute to the District's economy.[5]

Potential environmental effects

In summary, the potential issues for the population relate to the ways in which water is used in the District. The draft RBMP may potentially affect the following:

- recreational use of water;
- tourism and National Parks;
- degraded sites that are improved to remove adverse impacts of water quality;
- commercial activities with an effect on water.

[5] http://www.sepa.org.uk/pdf/publications/wfd/Article_5_Solway_Tweed_Economic.pdf.

3.3.3. Human health

The high quality environmental conditions in the District mean that there are very few negative human health issues that can be directly attributable to the quality of the environment. Of the eight designated Bathing Water areas in the District for which records are currently available, [6] only one area, Sandyhills bathing waters, has experienced poor bathing water quality in the last 3 years (in 2007). The main threat to bathing waters at Sandyhills is from agricultural runoff.

There is a significant export of drinking water from the River Eden tributaries to other parts of North West England via abstraction from Haweswater Reservoir. There are other significant public water supply abstractions in the District, including the rivers Eden and Gelt, which supply to the Carlisle area. The current human health issues in the District are related to the fact that more than a third of the surface water bodies at risk of failing to meet GES in 2015 are due to point and diffuse sources of pollution from sewage disposal activities. These are predominantly in the rural areas where many properties dispose of waste water to septic tanks which may discharge nutrients (N, P, NH3) to the water environment. These discharges also have the potential to increase biological oxygen demand (BOD) in water bodies, reducing oxygen availability for aquatic fauna and flora.

Potential environmental effects

In summary, the potential issues for human health are due to the impact that the draft RBMP may have on water uses that could affect human health. The draft RBMP may potentially affect human health through the following:

- Bathing waters;
- Shellfish waters;
- fin fisheries;
- abstractions of drinking water from surface and groundwater; and
- DWPA.

3.3.4. Water

The key purpose of the Solway Tweed draft RBMP is to protect and enhance the water environment in the District. The work will be targeted at key pressures in the District which have been identified in the '*Solway Tweed River Basin Significant Water Management Issues*' (SWMI) report.[7] A summary of the key issues is presented here.

Although water quality in the District is generally good, there are pressures that may result in some water bodies not achieving good status. The '*Solway Tweed River Basin District*

[6] Two additional Bathing Waters were designated in the District by the Scottish Government in May 2008 and will be included in future monitoring.

[7] http://www.sepa.org.uk/pdf/publications/wfd/swmi_solway_tweed_summary.pdf.

Characterisation and impacts analyses required by Article 5 of the Water Framework Directive Summary Report' estimates that 56% of all water bodies in the District may not meet GES by 2015. Diffuse pollution and morphological pressures are the most common causes for surface water bodies failing GES (289 rivers, 21 lakes), point source pollution and morphological pressures for transitional water bodies failing GES (6 estuaries and river mouths), point and diffuse source pollution for coastal water bodies (2 coastal water bodies) and diffuse pollution for groundwater bodies (16 groundwater bodies).

A summary of these pressures as they relate to the Solway Tweed RBD are presented in Table 3.

Table 3 Summary of pressures in the Solway Tweed RBD

Pressure	Sector	Reason	Effect	Comment
Diffuse pollution	Agriculture	Land use activities such as livestock grazing, cultivation, farm steading runoff.	• nutrient losses and associated eutrophication; • reduced oxygen in water bodies; • soil erosion, adsorbed pollutants, smothering of gravels by fine sediment; • increased micro-organisms and faecal matter in water bodies; • losses of pesticides and veterinary medicines; • groundwater contamination.	80% of water bodies at risk of failing GES by 2015 are affected by diffuse pollution from agriculture.
	Forestry	Spillages, erosion of roads, felling and planting of forests.	• nutrient input to highly sensitive upland lochs/lakes a key concern; • smothering of gravels by fine sediment.	Effects are much lower because of effective application of good agricultural practice. 25% of river and lochs/lakes at risk of failing GES by 2015 are affected by diffuse pollution from forestry.
	Acidification	Acidifying pollutants (oxides of sulphur and nitrogen and ammonia) from the rest of the UK and continental Europe.	• increase in acidity – lower pH; • increased concentrations of sulphate, nitrate and labile aluminium in freshwaters; • reduced acid-neutralising capacity; • environmental effects of above reduce biodiversity, especially fish diversity.	Evidence of damage is most prevalent in south west Scotland, particularly Galloway.
	Sewage disposal activities	Sewer overflows during floods, rural dwellings, hotels and industrial sites not connected to public sewage treatment works (STW).	• removal of oxygen from water body; • eutrophication requiring expensive treatment; • toxic substances bio accumulate in fish and marine animals; • litter affects amenity value of rivers and beaches; • bacteria and viruses affect	>33% of rivers, lochs/lakes at risk of failing GES by 2015 are affected by diffuse and point source pollution from sewage disposal activities.

Pressure	Sector	Reason	Effect	Comment
			human health; • increased BOD.	
Point source pollution	Manufacturing	Various, depends on the process at the factories involved.	• controlled through permitting, but discharges can adversely affect water quality especially during times of low flow when there is less dilution.	One water body at risk of failing GES by 2015 affected by point source pollution from manufacturing.
Abstraction and flow regulation	Water supply	Excessive abstraction of water (volume, timing or distribution) and construction and operation of dams and associated engineering.	• biodiversity of rivers and wetlands; • reduced river base flows due to groundwater level reductions; • variable water levels preventing growth of plants and spawning of fish; • barriers to fish migration; • barriers to sediment movement; • loss of instream and riparian habitat.	25% of water bodies at risk of failing GES by 2015 affected by abstraction for water supply.
	Agriculture	Abstraction for irrigation during dry weather when river flows are low.	• fish stranding and drying out of wetlands; • raised water temperatures and increased fish mortalities; • exacerbates pollution – concentration of pollutants; • impedes fish migration; • damages ecology.	
	Hydropower	Abstraction of water and construction and operation of dams.	• fish stranding and drying out of wetlands; • raised water temperatures and increased fish mortalities; • exacerbates pollution – concentration of pollutants; • impedes fish migration; • damages ecology. However • some sites designated under conservation legislation; • naturally inaccessible rivers opened up to migrating salmon and sea trout; • create angling and recreational opportunities.	

Pressure	Sector	Reason	Effect	Comment
Changes to morphology	Agriculture	Engineering works that directly remove habitat, indirectly change flow or change the natural sediment regime for example, land drainage, flood defences, impoundments, port developments and coastal defences.	• grazing and trampling of riparian zone results in habitat loss; • increased bank and bed erosion reduces habitat and spawning gravels; • embankment construction results in loss of floodplain wetlands and associated biodiversity; • case specific areas of increased flood risk; • channel straightening results in habitat loss.	
	Forestry	From forestry practices over the last 60 years, but are now largely avoided by application of good environmental practice.	• shading from dense planting prevents riparian growth increasing risk of bank erosion and reducing habitat diversity; • culverts on road crossings can reduce fish migration and spawning; • poor land drainage design can increase peak runoff; • forestry machinery can alter channel boundaries; • release of fine sediment can smother gravels.	
Invasive non-native species	Recreational, sporting and cultural activities	Non-native plants or animals compete with, and overrun, native aquatic plants and animals.	• overruns/out competes native aquatic plants and animals; • changes structure and condition of riparian zones; • increased erosion risk during winter months from some non-native riparian plants.	Four non-native invasive species pose a significant risk to GES: North American signal crayfish, Japanese knotweed, Common cord-grass, Australian swamp stonecrop. Large stands of Japanese knot weed and Himalayan balsam are present along some river banks; however their presence does not necessarily indicate that a water body will fail GES but may contribute to negative morphological changes.

Potential environmental effects

In summary, the potential effects of the draft RBMP on water are due to the way in which the draft RBMP changes the pressures and impacts on ecological status. The main pressures are:

- diffuse pollution;
- point source pollution;
- abstraction and flow regulation;
- alterations to morphology;
- non-native invasive species;
- sustainable water use.

3.3.5. Air

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland sets air quality standards and objectives. All local authority areas within the District other than parts of Carlisle meet the required standards. The parts of Carlisle that fail standards are due to nitrogen dioxide emissions from traffic. Given the very good air quality across the area and the very limited effect that the Solway Tweed draft RBMP will have on emissions to air, it is assumed that there will be no significant environmental effects, accordingly air is scoped out of the assessment. This was set out in the Solway Tweed RBMP Scoping Report (page 19) and agreed to by the statutory Consultation Bodies.

3.3.6. Climate factors

Climate change is a cross-cutting issue which will affect a wide range of environmental conditions and have significant implications for the District's social, economic and environmental assets. The UK Climate Change Programme published in 2006 sets out a range of actions to reduce the UK's contribution to climate change but also to adapt to climate change. The Scottish Climate Change Programme supported by a proposed climate change Bill together provide a framework for action in Scotland. Climate change is likely to affect all aspects of the water environment but there is uncertainty about what the impacts will be and where they will occur. The work by UK Water Industry Research Limited (UKWIR) provides technical guidance for the assessment of the impacts of climate change on average monthly river flows and recharge in UK catchments for the 2020s based on scenarios derived from six Global Climate Models (GCMs) (*UKWIR, 2006: Effects of climate change on river flows and groundwater recharge: guidelines for resource assessment and UKWIR06 scenarios*).[8] The possible consequences of climate change are drier summers and wetter winters with more severe rainfall events. It is possible that the effects of climate change on the District will be:

- increased coastal flooding caused by sea-level rise with resultant wetland loss;

[8] For a more detailed assessment of the potential impact of climate change and their relevance to water see http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=353.

- changes in flow volumes and distributions and concomitant variable dilution potential;
- increased flood risk (coastal and terrestrial);
- increased likelihood of summer droughts;
- variable groundwater recharge rates;
- changes in erosion and landslide hazard; and
- changes in aquatic biodiversity (e.g. abundance and distribution of species, growing and breeding seasons).

Potential environmental effects

In summary, the most important potential effects of the draft RBMP on climate factors are through:

- climate change mitigation and adaptation;
- flooding;
- droughts; and
- changes in greenhouse gas emissions from water management activities.

3.3.7. Soil

Soils in the District are generally more organic, more leached and wetter than most other European countries. The erosion of these soils can become a problem, particularly where it is enhanced through poor management on exposed, damaged and unstable soils. The transported soil material may silt up water bodies, harm fish, damage structures such as bridges and pollute water courses with nutrients and chemicals (e.g. pesticides and metals). Erosion of peat soil exposes the peat to drying and oxidation which reduces soil carbon stocks and releases gases that contribute to climate change. There are 18 designated Nitrate Vulnerable Zones (NVZ) in the District, 16 in England and 2 in Scotland. There are also two Environmentally Sensitive Areas which offer incentives to farmers to adopt good agricultural practices to safeguard high value land. Three Catchment Sensitive Farming (CSF) delivery areas occur in the District: the River Waver and Biglands Bog; the River Eden and Tributaries and the English Tweed Catchment Rivers including Lindisfarne.

Potential environmental effects

In summary, the most important potential effects of the draft RBMP on soil are due to impacts on:

- forestry or other types of plant cover;
- land vulnerable to erosion;
- NVZs; and
- other land use practices.

3.3.8. Cultural heritage

The Solway Tweed RBD has a rich cultural heritage, with over 9,600 listed buildings and 2,500 scheduled ancient monuments. Listed buildings receive special treatment under Planning Acts; in England this process is managed by English Heritage, in Scotland by Historic Scotland. Scheduled ancient monuments are designated under the Ancient

Monuments and Archaeological Areas Act 1979 and represent sites of national importance that are afforded legal protection. There is one World Heritage Site in the District, Frontiers of the Roman Empire, part of which is located at Hadrian's Wall. There are no Marine Protected Sites in the District. The potential cultural heritage issues within the District may be:

- loss of historic water-related features such as weirs, mills, fish traps, artificial ponds, dams and canals; and
- loss of wetland archaeology.

Potential environmental effects

In summary, the most important potential effects of the draft RBMP on cultural heritage are due to impacts on:

- nationally designated sites close to water bodies; and
- marine archaeology.

3.3.9. Landscape

The District has a diverse range of landscapes some of which are afforded protection through a range of designations. The key landscape features are the mountainous terrain of the Southern Uplands, the broad river valley landscapes of productive mixed farmland around the Solway Firth, the coast along both the Solway Firth and the North Sea north of Berwick, and the large swathes of semi natural and commercial forestry that is ubiquitous in the District. Scottish Natural Heritage (SNH) and Natural England (NE) have undertaken a Landscape Character Assessment (LCA)[9] which has divided the District into four key landscapes:

- the Eden Valley;
- the Solway Basin;
- Dumfries and Galloway; and
- the Scottish Borders.

Eight other areas are present in parts of the District:

- Northumberland Sandstone Hills;
- Cheviot Fringe;
- Cheviots;
- Border Moors and Forests;
- Cumbria High Fells;
- North Pennines;
- Orton Fells; and
- Yorkshire Dales.

[9] http://www.landscapecharacter.org.uk.

There are three National Parks in the District designated under the National Parks and Access to the Countryside Act (1949): the Lake District National Park, the Yorkshire Dales National Park and the Northumberland National Park. There are also three designated Areas of Outstanding Natural Beauty (AONBs) in the District: the Solway Coast, the Northumberland Coast and the North Pennines. There are five Scottish National Scenic Areas (NSA) in the District.

Potential environmental effects

In summary, the most important potential effects of the draft RBMP on landscape are due to impacts on:

- areas of designated landscape quality (e.g. NSAs, AONB); and
- sites listed in the inventory of gardens and designed landscapes.

3.3.10. Material assets

The following economic activities occur in the District:

- agriculture and forestry (12% of gross value added to the economy of the District; contributes mainly to diffuse pollution pressures);
- aquaculture and fisheries management (requires unpolluted water);
- mining and quarrying (0.8% of gross value added – mainly quarrying);
- food processing;
- manufacturing of textiles and leather products (4.4% of gross value added);
- manufacturing of wood, pulp and paper products;
- electricity hydro (83 MW Galloway scheme);
- amenity and recreation;
- flooding and flood defences; and
- transport infrastructure.

Potential environmental effects

In summary, the most important potential effects of the draft RBMP on material assets are due to impacts on:

- the protection of water related assets including: flood defences, ports and harbours, WWTWs; and
- sustainable use of water.

3.3.11. SEA objectives

The way in which the different receptors and potential environmental effects summarised above have been used to form the objectives and criteria for the SEA is explained in Section 4.2.

3.4. Likely future of the area without the PPS

In the absence of the draft RBMP there are a considerable number of measures in place (for reasons other than achievement of the WFD objectives) that will nevertheless have a

significant effect on the water environment. These Reference/Baseline measures and their likely effects are considered in detail in Section 5.

Consultation question 2 – Do you think SEPA/Environment Agency have identified the key environmental issues in, and baseline characteristics of, the Solway Tweed River Basin District?

4. ASSESSMENT APPROACH

This chapter sets out the approach used in the SEA. The approach to the assessment has been largely informed by '*Solway Tweed River Basin Management Plan Strategic Environmental Assessment Scoping Report*' and by the guidance document on '*River basin management planning in the Solway Tweed River Basin District*'. Based on these documents, an objective-led assessment approach has been adopted

The SEA objectives and more detailed assessment criteria drawn from the Scoping study and they subsequent consultation are presented and the way in which the have been used to form a framework for the assessment is outlined. The steps used in the assessment of the draft RBMP including the process used to screen the national and regional measures to identify those that may produce a significant impact is explained.

This chapter also describes the initial screening that was undertaken to determine whether the measures in the draft RBMP could affect the integrity of European sites and might, therefore, require Appropriate Assessment in accordance with the Habitats Directive.

4.1. Outline approach

The research approach applied in assessing the strategic environmental effects of the Solway Tweed draft RBMP is outlined below. The approach has been largely informed by '*Solway Tweed River Basin Management Plan Strategic Environmental Assessment Scoping Report* and by the guidance document on '*River basin management planning in the Solway Tweed River Basin District*'[10] which makes it clear that SEPA and the EA are jointly responsible for delivering the draft RBMP in an integrated and coordinated manner. The guidance document also stresses that the SEA should be conducted in line with the requisite legislative requirements of the '*Environmental Assessment (Scotland) Act 2005*'[11] and the '*Environment Assessment of Plans and Programmes Regulations 2004 (S12004/1633)*' (the Regulations) and best practice.[12] The assessment method and procedure has been aligned with these legislative requirements and with best practice.

4.2. Method and procedure

4.2.1. Assessment framework

The Solway Tweed SEA Scoping Report summarised the key issues on which this SEA needed to focus. These issues were identified in consultation with the NAG and AAGs, other stakeholders and the statutory Consultation Bodies. They were also informed by the Solway

[10] http://www.sepa.org.uk/publications/wfd/html/rbpf_solway/index.html.

[11] http://www.opsi.gov.uk/legislation/scotland/acts2005/asp_20050015_en_1.

[12] http://www.scotland.gov.uk/Publications/2006/09/13104943/0.

Tweed RBC and SWMI reports. Eight SEA topics (biodiversity, flora & fauna, population & human health, water, climate factors, cultural heritage, landscape, material assets and soil) and the significant environmental effects that needed to be considered for each receptor were identified. The significant environmental issues identified in the Scoping Report have been summarised according to their SEA topics in Sections 3.3.1 to 3.3.10.

The use of environmental objectives is a common method for undertaking SEA to assess whether a plan is moving towards or away from stated objectives. Environmental objectives were developed for each SEA topic. So, for example, for the SEA topic 'Biodiversity, flora & fauna', an environmental objective[13] was framed to assess the extent to which the draft RBMP will 'protect and, where appropriate, enhance biodiversity, particularly protected areas and protected species.' More detailed assessment criteria were then developed for each environmental objective to account for specific issues in the Solway Tweed draft RBMP. The eight environmental objectives and 32 assessment criteria together form the basic building blocks of an assessment matrix. The assessment matrix applied in this SEA has been revised from the original assessment matrix published in the SEA Scoping Report based on consultee responses. The objectives, detailed assessment criteria and SEA topics applied in this assessment are presented in Table 4.

Table 4 Objectives, assessment criteria and SEA topics applied in the SEA and used as the basis of the assessment matrix for the Solway Tweed SEA

SEA objective - to what extent will the RBMP…	Assessment criteria - to what extent will the RBMP…	SEA topic
1. Protect and, where appropriate, enhance biodiversity, particularly protected areas and protected species?	Provide effective protection of 'protected areas' (e.g. SACs, SPAs, SSSIs) defined under the WFD?	Biodiversity, flora & fauna
	Provide effective protection of designated sites?	
	Contribute to UK Biodiversity Action Plan objectives?	
	Support delivery of biodiversity strategies?	
	Reduce impacts by non-native invasive species?	
2. Protect human health in undertaking water management activities?	Maintain and enhance access to and use of the water environment?	Population and human health
	Increase tourism and/or improve National Parks?	
	Protect DWPA and water abstraction?	
	Protect bathing and shellfish protected waters?	
3. Prevent deterioration of the status of water bodies. Enhance, water body status (including groundwater) to good status, as appropriate?	Reduce the impacts on the ecological condition of water bodies, from for example, point source pollution, diffuse source pollution, abstraction and flow regulation, and morphological interventions?	Water
	Prevent the deterioration of water bodies from point source and diffuse pollution?	
	Prevent the physical deterioration of water bodies?	

[13] It should be noted that the SEA regulations do not require the application of objectives, but their use has been adopted as good practice for assessing the effects of a plan.

SEA objective - to what extent will the RBMP…	Assessment criteria - to what extent will the RBMP…	SEA topic
	Promote efficient and sustainable use of water?	
4. Contribute to mitigation of, and adaptation to, climate change?	Promote sustainable flood management?	Climate factors
	Contribute to the mitigation of floods and droughts?	
	Reduce vulnerability of communities and the environment to the effects of climate change?	
	Address the potential impacts of climate change on biodiversity?	
	Address the potential impacts of climate change on human use of water (e.g. water yields, abstraction, recreational uses)?	
	Contribute to reducing greenhouse gas emissions from water management activities?	
	Encourage improved energy efficiency?	
5. Protect and, where appropriate, enhance the character, diversity and special qualities of cultural heritage in the RBD?	Protect and, where appropriate, enhance or restore historic environment features?	Cultural heritage
6. Protect and, where appropriate, enhance the character, diversity and special qualities of all landscapes in the RBD?	Protect and, where appropriate, enhance national designated landscape areas?	Landscape
	Protect and, where appropriate, enhance or restore landscape character and quality?	
	Protect and, where appropriate, enhance or restore landscape value and local distinctiveness?	
7. Protect and make the most effective use of water management infrastructure?	Make the most efficient use of water management infrastructure?	Material Assets
	Protect existing economic infrastructure (e.g. flood defences, ports and harbours, WWTWs and drainage)?	
8. Protect and, where appropriate, enhance the function and quality of the soil resource in the RBD?	Reduce erosion?	Soil
	Improve degraded sites?	
	Protect agricultural land?	
	Safeguard soil quality, quantity and function?	
	Contribute to reducing levels of brownfield, derelict and contaminated land in plan area?	

4.2.2. Components of the assessment matrix

The assessment matrix was used to assess each relevant part of the Solway Tweed draft RBMP (i.e. a measure or measure summary – see Section 4.2.4) against each SEA objective and the detailed assessment criteria to determine whether the effect of each part of the plan (i.e. the measure):

- makes a significant positive or negative contribution, an uncertain contribution, a positive *and* negative contribution, or has no significant effect; and
- has a short-, medium- or long-term effects.

A simple colour code was used to display the significance of the effect (Table 5). It is important to note that in reporting effects, where a measure had both a significant positive *and* negative effect, it was reported as such. Where there was uncertainty about the effects, or where the effects are not a direct result of the measure (i.e. the result of a complex pathway - education, advice and campaign awareness for example), it was also reported as such. Where the measure was unlikely to have an identifiable significant effect on the environment, no further action was taken.

Table 5 Simple colour coding used to display the significance of the effect of a measure in the Solway Tweed RBD

Positive significant effect (pos.S)	Negative significant effect (neg.S)	Positive and negative significant effect (neg. /pos.)	Uncertain (*)	No significant effect

Where appropriate, evidence was presented to justify the assessment; where there was uncertainty, it was expressed in the assessment matrix. Where potential negative effects were identified, mitigation measures were suggested, and actions for other plans identified. The mitigation measures seek to offset, or as far as possible, reduce the adverse effects that have been identified (see Section 4.2.7). Finally, a summary of the effects of the measures were captured and briefly described in the assessment matrix. The method applied to determine cumulative effects is presented in Section 4.2.5.

4.2.3. Alternatives assessed

The SEA legislation requires the assessment of any reasonable alternatives to the draft RBMP. In this Environmental Report, the draft RBMP and one alternative (Continued Improvement) were considered.

The impacts of the draft RBMP have been assessed taking into account effects that will already occur through existing measures – i.e. the Reference/Baseline case. The alternative that has been considered is the option of Continued Improvement. The measures in the Draft RBMP act in combination with the measures in the Reference/Baseline case. Hence the impacts of the Draft RBMP are assessed in relation to the Reference/Baseline. Similarly, Continued Improvement includes the measures in both the Reference/Baseline and Draft RBMP plus additional measures. Hence, in assessing the impact of Continued Improvement

relative to the Reference/Baseline, the effects of and interactions with the measures in the Draft RBMP have also been taken into account.

4.2.4. The draft RBMP measures

The draft RBMP measures form the building blocks of the draft RBMP and it is these measures that have been assessed. The full list of national and regional measures considered for the Solway Tweed draft RBMP is presented in Appendix A (local measures were not considered as they are unlikely to have a significant effect). These measures have been grouped into five pressures (diffuse pollution, point source pollution, abstraction and flow regulation, changes to morphology and non-native invasive species), divided into 15 sectors and further sub-divided by regulatory and non-regulatory mechanisms. The distinction between these two mechanisms has been drawn as follows:

- regulatory mechanisms refer to statuary requirements required under legislation.
- non-regulatory mechanisms refer to non-statutory requirements such as economic incentives, guidance, investment programmes, best practice, partnerships and voluntary initiatives.

The number of national measures assessed for each option for each pressure for the Solway Tweed draft RBMP is presented in Table 6

Table 6 Number of national measures assessed for the Solway Tweed draft RBMP listed by pressure and by option

Pressure	Reference/Baseline	Draft RBMP	Continued Improvement
Diffuse pollution	44	6	1
Point source pollution	42	12	1
Abstraction and flow regulation	17	20	0
Changes to morphology	25	8	8
Invasive non-native species	6	6	3
Total	**136**	**52**	**13**

A total of 104 regional measures were received from SEPA and the EA. Many of these regional measures were not strategically significant, were only locally applicable (i.e. applied to only one or a few water bodies), or would have no significant effect on the environment. These measures were ‘screened out’ of the assessment using a simple procedure (Figure 3). Those measures ‘screened in’ were categorised by option, pressure, sector, regulatory and non-regulatory mechanisms and aligned with the national pressure/sector breakdown. The number of ‘screened in’ regional measures is listed by option and by pressure for the Solway Tweed draft RBMP in Table 7.

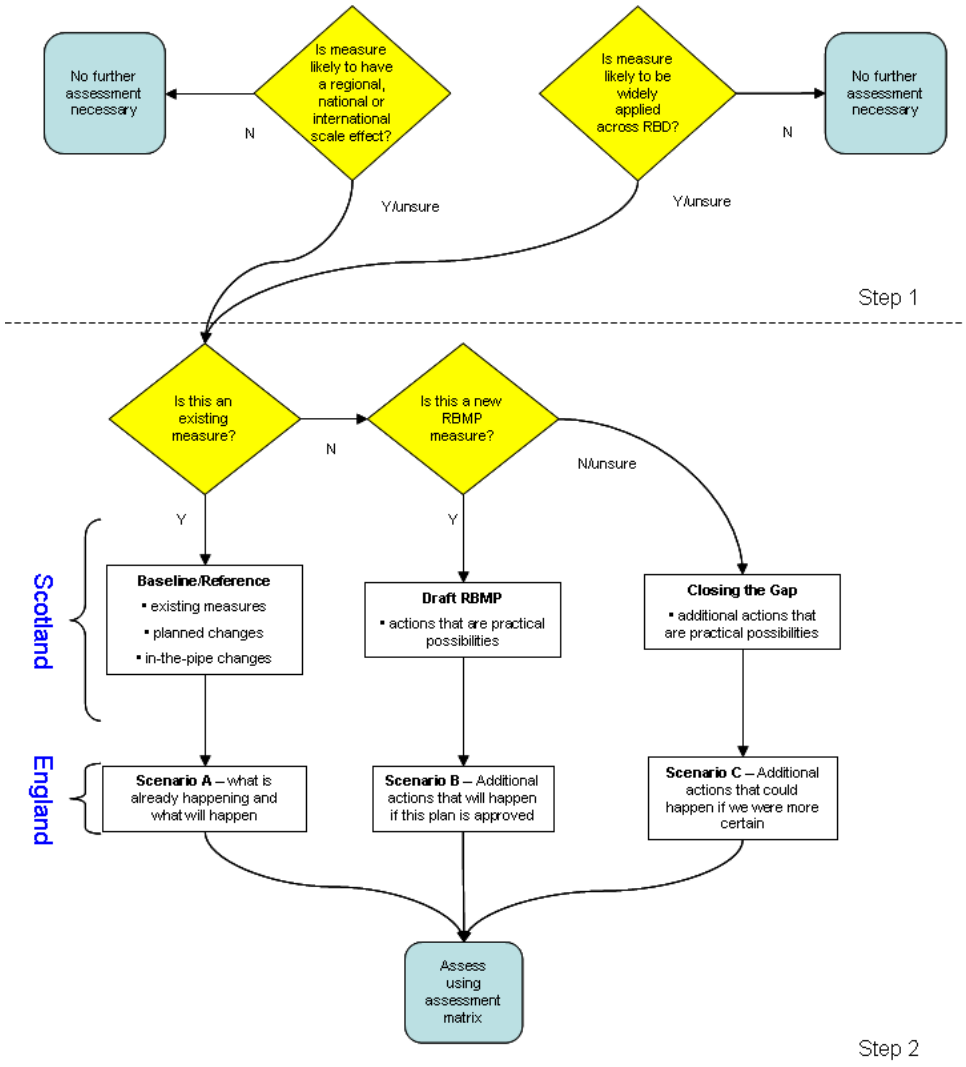

Figure 3 **Process diagram for screening and categorising regional measures for the Solway Tweed draft RBMP**

Table 7 **Number of 'screened in' regional measures for the Solway Tweed draft RBMP listed by pressure and by option**

Pressure	Reference/Baseline	Draft RBMP	Continued Improvement
Diffuse pollution	2	7	0
Point source pollution	3	0	0
Abstraction and flow regulation	0	0	0
Changes to morphology	0	6	4
Invasive non-native species	1	0	0
Total	**6**	**13**	**4**

4.2.5. Assessment of measures

The national and regional measures presented in Appendix A are structured in a nested manner (Figure 4). Each option has individual measures that are nested within regulatory and non-regulatory groups (mechanisms) which are nested in sectors which are nested within pressures which combine to form Options. This presents a dilemma as to the scale at which the effects of the measures might be described using the assessment matrix.

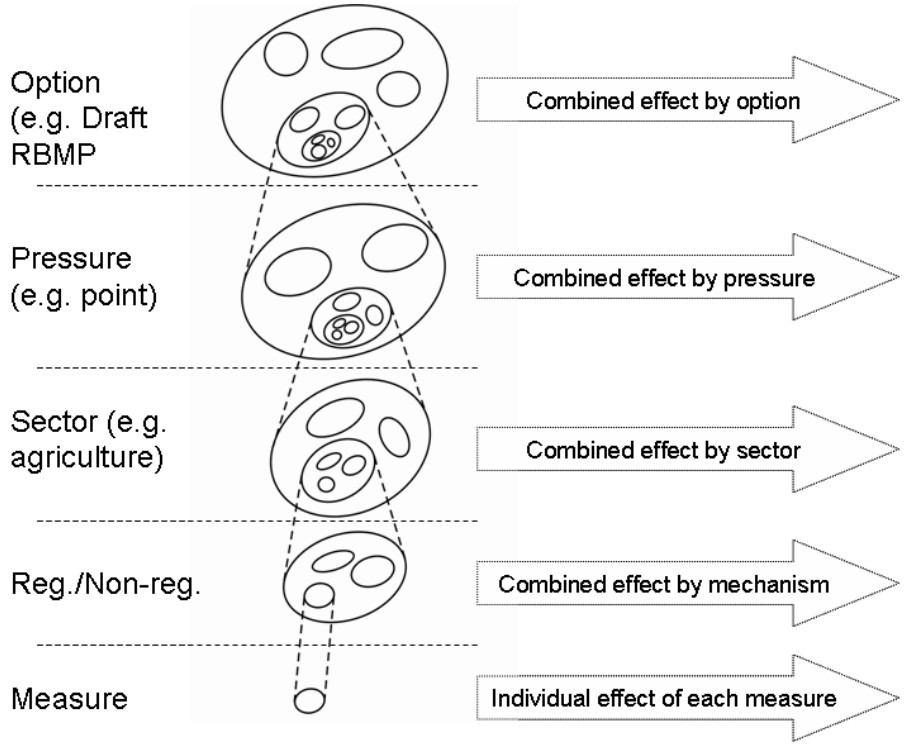

Figure 4 Conceptual diagram demonstrating the nested nature of measures that form part of the Solway Tweed draft RBMP

The step-wise procedure applied in the assessment of the national and regional measures takes account of this nested structure and is described below:

- Step 1 - screened the individual national and regional measures for the draft RBMP and Continued Improvement options to identify those that may produce a significant impact on the SEA topics. The screened in measures were taken forward to Step 2.

- Step 2 - assessed the screened-in individual national and regional measures for the draft RBMP and Continued Improvement options using the assessment matrix.

- Step 3 - RBMPs are new; managing the water environment is not. Accordingly, all the Reference/Baseline measures are currently in place or will be in place by the end of 2009. Consequently, it is neither appropriate nor possible for the SEA process to alter

measures or actions already confirmed or in place. However, the impacts of these measures need to be captured in the assessment of the draft RBMP.
Step 3 therefore involved the development of summary measures for each sector (for regulatory and non-regulatory mechanisms) for the Reference/Baseline and assessing these measures. This involved assessing 45 summary measures for the Reference/Baseline for the Solway Tweed draft RBMP. The summary measures for the Reference/Baseline are presented in Appendix A.

- Step 4 - considered the cumulative effects. It considered firstly the interaction of the draft RBMP with the Reference/Baseline measures and, secondly, the interaction of Continued Improvement with the draft RBMP and the Reference/Baseline case.

- Step 5 - looked at the inter-plan effects of the Draft RBMP and Continued Improvement with other PPS.

.

4.2.6. Habitats Regulations Assessment

In accordance with Article 6 (3) of the Habitats Directive (92/43/EEC), the competent national authorities must agree to a plan or project only after having ascertained that it will not adversely affect the integrity of European sites. The draft RBMP for the Solway Tweed must therefore be subject to a screening process to determine if the plans would have a significant effect on one or more European sites.

The purpose of Habitats Regulations Assessment/Appropriate Assessment (HRA/AA) is to assess the impacts of a plan or project, in combination with the effects of other plans and projects, against the conservation objectives of a European site and to ascertain whether it would adversely affect the integrity of that site. Where significant negative effects are identified, alternative options or mitigation measures should be examined to avoid any potential damaging effects. The scope of the HRA/AA is dependent on the location, size and significance of the proposed plan or project, and the sensitivities and nature of the interest features of the European sites under consideration.

An initial screening has been undertaken to determine whether further AA is required and to guide further assessment of regional and local measures. The report of this HRA screening is included in Appendix E.

4.2.7. Assessment of mitigation and opportunities for enhancement

Mitigation measures have been suggested for the prevention, reduction and offsetting of significant adverse effects. At the same time, opportunities for enhancement have also been identified. These are presented in Section 6.

5. SIGNIFICANT ENVIRONMENTAL EFFECTS

The significant environmental effects of the national and regional measures have been assessed. The impacts have first been assessed for the Reference/Baseline case, then for the draft RBMP and finally for the alternative of Continued Improvement.

This chapter presents the assessment findings, concentrating on the significant impacts. The findings are first presented for each of the groups of measures. The cumulative effects due to the measures acting in combination are then considered. Lastly the interaction of the different options for the draft RBMP with other plans, programmes and strategies is

5.1. Introduction

This section presents the findings of the SEA of the Solway Tweed draft RBMP and is divided into four main sub-sections. The first sub-section (Section 5.2) presents a summary of the measures assessed, while the second sub-section (Section 5.3) describes the significant environmental effects of measures within the draft RBMP. An assessment is also made of the Reference/Baseline measures as this represents the future state of the environment without the draft RBMP, i.e. the effects that will occur without the draft RBMP. The third sub-section (Section 5.4) describes the cumulative effects of the interaction of measures of the Reference/Baseline and the draft RBMP, as well as the additional environmental effects likely to occur from interaction of additional measures included under the Continued Improvement option. The final sub-section (Section 5.5) discusses the cumulative effects arising from the potential inter-relationships with other plans.

5.1.1. Strategic direction of the RBMP

Before assessing the measures, it is important to note the wider contribution that the RBMP will have on integrated and sustainable management of the environment in the Solway Tweed RBD. Although the main way in which the RBMP will achieve the objectives of the WFD is through the programme of measures that will be applied to water bodies, the way in which the plan is developed and the engagement of stakeholders will also contribute to this objective and give it a strategic direction.

The RBMP for the Solway Tweed RBD is intended ensure an effective balance between:

- the protection of the water environment;
- sustainable economic development; and
- the interests of those who depend upon the water environment for their quality of life.

The draft RBMP is aimed at a wide engagement across the RBD to ensure the final plan is based on the best available information and sets out a shared plan for the management of the water environment. The plan identifies where current or historic activities are constraining the quality of the water environment and the biodiversity it supports. It also encompasses the

actions required to ensure that waters of special value to drinking water, biodiversity, shellfish or bathing for example, are brought up to standard or maintain this quality where they already meet these standards.

The plan also sets out the actions needed to deliver environmental improvements over the next 6 years, but also over the longer term. The actions are based on the delivery of environmental gains at reasonable cost.

This plan recognises that a high proportion of the water environment in the Solway Tweed RBD is of good quality. This supports a rich biodiversity, tourism and a wide range of other uses. This plan should be used to influence future sustainable development. It sets out the planning processes that interact with river basin planning and some ideas for tools and information sharing.

The implementation of this plan should see a variety of sectors interacting better and working together to ensure the sustainable use of the water environment.

5.2. Summary of measures by Option

The measures described in the following sections are grouped according to whether they form part of the Reference/Baseline, or are further measures as part of the draft RBMP, or are additional measures as part of the alternative – Continued Improvement. The full list of measures is provided in Appendix A.

5.2.1. Reference/Baseline

The Reference/Baseline national measures consist of all existing measures, planned changes (e.g. agreed investment programmes) and in-the-pipe changes (where policy is in place for other drivers that should support implementation of the first RBMP). The measures have been grouped by pressure and by sector, and are further broken down into regulatory and non-regulatory mechanisms. A summary of these measures is presented in Table 8.

There are few Reference/Baseline regional measures. There is one set of measures aimed at tackling diffuse pollution from agriculture: riparian fencing of four rivers and the construction of wetland filtration systems, a second set of measures to reduce point source pollution from STW, while the Tweed Invasives Partnership offers guidance to reduce and control the impact of INNS. A summary of these measures is presented in Table 8 where the regional measures are listed in *italics*. It is important to stress that the effects of the Reference/Baseline measures will occur without the draft RBMP.

5.2.2. Draft RBMP

Draft RBMP national measures consist of those measures that will be in place for the purposes of implementing the WFD. These include new measures to reduce diffuse pollution source inputs (e.g. from the built environment, in rural catchments, extension of Catchment Sensitive Farming (CSF) in England and Catchment Management Plans (CMPs)). In Scotland, also included are General Binding Rules (GBRs) under the Controlled Activities Regulations (CAR) in Scotland and the continued application of the Silage, Slurry and

Agricultural Fuel Oil (SSAFO) regulations, amendments and economic incentives to reduce diffuse pollution from the agricultural and forestry sectors. In addition, Integrated Pollution Prevention and Control (IPPC) and Water Environment (Controlled Activities) Regulations (Scotland) 2005 (CAR) will continue to reduce point source pollution by applying new (WFD) standards (e.g. Priority Substances, Specific Pollutants).[14] There are also important new CAR measures to control abstraction in Scotland, to move towards naturalising flow regimes and modifying reservoir operating rules. In England, the revision of Catchment Abstraction Management Strategies (CAMS) and the restoring Sustainable Abstraction Programme (SAP) will provide similar benefits. Other new measures include those to improve modified habitat and CAR to prevent new damage to the water environment by engineering works on rivers. There are also measures and regulations to contain, eradicate, capture and control non-native invasive species. Measures such as the Fish Health Directive will also limit fish disease, audit high risk movements and enforce against illegal activity.

The draft RBMP regional measures focus on dealing with point source pollution from agriculture and changes to morphology. These non-regulatory measures aim to target funding and compliance monitoring at WFD pressures, and seek to promote partnerships to encourage the uptake of agri-environmental schemes. The measures to target morphological pressures aim to establish partnerships and preventative measures to improve morphology and to establish targets for river restoration. There is also a measure aimed at blocking moorland grips. A summary of these measures is presented in Table 8 where the regional measures are listed in *italics.*

5.2.3. Continued Improvement

Continued Improvement national measures are additional actions which are viewed as practical possibilities that could make progress to Continued Improvement in meeting WFD objectives over the next three river basin planning cycles to 2027. These measures include additional investment in catchment-related activities and CMPs over successive planning cycles, continued work to address diffuse pollution in rural land uses, and the introduction of a restoration policy framework to target morphology pressures from past human activities. There is also a possible investment programme of prevention that will focus on reducing the effects of key INNS that may downgrade water body status at 2015, while Marine Protected Areas (MPA) represents a national commitment to achieving a coherent network of MPAs to preserve biodiversity and socio-economic uses. Alien species regulations will contribute to controlling INNS fish in aquaculture.

Continued Improvement regional measures are a repetition of the draft RBMP changes to morphology regional measures.

[14] For substances that already had standards, there may be the same or more stringent than current standards. There are also substances for which standards have been introduced for the first time.

Table 8 Summary of Reference/Baseline, draft RBMP and Continued Improvement measures. *Regional measure(s) summary in italics*

Pressure	Sector	Reference/Baseline	draft RBMP	Continued Improvement
Diffuse pollution	All Sectors	Provision of first time sewage.	Reduce diffuse source inputs.	
	Agriculture (regulatory)	IPPC schemes, NVZ programmes, sewage sludge regulations, SSAFO regulations and amendments, Shellfish Hygiene Directive, waste management regulations.	CAR and GBRs, CAR 2005 GBRs, SSAFO and amendments.	
	Agriculture (non-regulatory)	Education, advice and campaign awareness, economic incentives. *Riparian fencing, construction of wetland filtration systems.*	SEPA catchment-related activities, CMPs *Target work, advice, funding at WFD priorities, partnerships and promotion of agri-environmental schemes.*	√
	Forestry (regulatory)	Environmental Impact Assessment (EIA) regulations.		
	Forestry (non-regulatory)	Education, advice and campaign awareness, economic incentives.	Economic incentive SRDP.	
	Acidification (regulatory)	Pollution Prevention and Control (PPC) regulations, planning regulations, air pollution control.		
	Acidification (non-regulatory)	Forests and Water guidance, Emissions Trading Scheme.		
	Urban development (regulatory)	CAR, GBRs		
	Urban development (non-regulatory)	Campaign and awareness raising and best practice.		
Point source pollution	All Sectors	IPPC and CAR.	IPPC and CAR where new standards.	
	Sewage disposal (regulatory)	CAR, Scottish Water Controls and Charging schemes, Scottish Government Standards, Habitats Directive, planning regulations. *Implement first time rural sewage; improve STW discharges, catchment campaigns.*	CAR, Habitats Directive.	
	Sewage disposal (non-regulatory)	Campaign and awareness raising and best practice.		
	Aquaculture/fish farming (regulatory)	CAR, planning regulations, Aquaculture and Fisheries Act 2007.	CAR.	
	Aquaculture/fish farming (non-regulatory)	Campaign and awareness raising, strategic planning, voluntary agreements and best practice.		
	Manufacturing (regulatory)	IPPC, CAR, planning regulations, European chemical controls.	CAR Priority Substances and Specific Pollutants 2008.	√
	Manufacturing (non-regulatory)	Campaign and awareness raising and best practice.		
	Refuse disposal activities (regulatory)	IPPC, waste management licensing and strategy.		
	Mining and quarrying (regulatory)	Environmental Protection Act 1990, Coal Authority Act, planning regulations.		√
	Mining and quarrying (non-regulatory)			√

Pressure	Sector	Reference/Baseline	draft RBMP	Continued Improvement
Abstraction and flow regulation	All Sectors	CAR.	CAR controls, revision of CAMS, restoring SAP.	
	Electricity generation (regulatory)	Planning regulations.	CAR controls and SEPA licences.	
	Electricity generation (non-regulatory)	Campaign and awareness raising, best practice, strategic planning.		
	Water supply activities (regulatory)	CAR, Habitats Directive.	CAR levels of abstraction, management of dams, efficient use of water.	
	Water supply activities (non-regulatory)	Economic incentives, campaign awareness planning and promotion of best practice.	CAR controls on abstraction.	
	Agriculture irrigation (non-regulatory)	Campaign and awareness raising, economic incentives.		
Changes to morphology	All Sectors		Improve modified habitat. *Identify opportunities for improvement, establish prevention measures, identify targets, work with partners.*	
	Historical engineering activities and urban development (regulatory)	Planning and development control, Floods Directive.	CAR to prevent new damage to the water environment. *Identify opportunities for improvement, blocking of moorland grips.*	√
	Agriculture (regulatory)	Planning regulations.	CAR to prevent new damage to the water environment.	√
	Agriculture (non-regulatory)	Campaign and awareness raising, economic incentives.		
	Forestry (regulatory)	EIA, felling licences.	CAR.	
	Forestry (non-regulatory)	Campaign and awareness raising, economic incentives, voluntary measures.		
	Land reclamation (regulatory)	Planning regulations, Food and Environment Protection Act (FEPA).		
	Land reclamation (non-regulatory)	Voluntary management agreements.		
INNS	All Sectors	Measures to control the exploitation of salmon and trout. *Tweed Invasives Partnership.*	Fish Health Directive, Alien species regulations, control INNS.	√
	Recreation, sporting and cultural activities (regulatory)	Control of pesticides regulations, orders.		
	Recreation, sporting and cultural activities (non-regulatory)	Campaign awareness and voluntary agreements.		

5.3. Description of significant environmental effects of measures

The following sections describe the results of the assessment of the national and regional measures by SEA topic. A summary of the results by pressure and sector is presented in Appendix F. The impacts are assessed first for the Reference/Baseline case, then for the draft RBMP and finally for the alternative of Continued Improvement.

Particular attention is paid to those measures that have a significant negative effect, or have both a significant positive *and* negative effect as these might require mitigation measures. The positive effects are also identified and summarised. The description of the effects is made with reference to the environmental issues outlined in Section 3 and other plans, programmes, strategies and environmental objectives (Appendix C) that they may influence or be influenced by the measure(s). The assessment matrices for the Reference/Baseline, the draft RBMP and Continued Improvement are presented in Appendix D.

5.3.1. Reference/Baseline

Biodiversity, flora & fauna

Existing measures continue to have a significant positive effect on the biodiversity, flora & fauna of the Solway Tweed RBD. Diffuse pollution measures contribute to reduced nutrient levels in surface water bodies, with the resultant effect of improved water quality, reduced levels of eutrophication and concomitant biodiversity benefits. The construction of riparian fencing and wetland filtration systems, although regional in extent, contributes to this benefit. Measures to reduce point source pollution, for example, through implementation of first time sewerage in rural areas will reinforce this benefit by further improving water quality. The measures to reduce pollution inputs to water bodies are enhanced by measures such as economic incentives to increase the efficiency of water use and by controlling the rates and timing of discharges. Where efficiency savings are made, more water is potentially available for aquatic ecosystems and for dilution, further reducing the concentration of pollutants. Controlling the rate and timing of abstraction reduces biological stress (especially during low flow periods e.g. summer droughts), but also provides the additional benefit of a more 'natural' hydrological regime which improves the physical habitat of water bodies and hence aquatic ecosystem condition.

The measures to improve morphology will improve aquatic and riparian habitats, and in so doing, provide biodiversity benefits. It is instructive to note that although there is evidence to suggest that morphological improvements do result in biodiversity, flora & fauna benefits, the evidence base is limited. Education, guidance, advice and campaign awareness measures should also contribute biodiversity, flora & fauna benefits, although their overall effects are uncertain. These types of measures are likely to have similar uncertain effects on the other SEA topics across the two options and are not described further.

There are a number of measures that have both positive *and* negative effects on biodiversity, flora & fauna. They include the remediation of water and sediment, regulating the flow regime and reducing the impacts of invasive non-native species. These measures provide benefits in a targeted water body, but could have negative effects in another. For example, while the

remediation of sediment and water is generally positive for the water body undergoing remediation (e.g. improves biodiversity, amenity value, ecological condition), there are potential negative effects associated with the disposal of contaminated sediment, while the disturbance of contaminated sediment may release toxic metals into the water body to be carried downstream. Further, while measures to naturalise flow in a water body are generally positive for the water body concerned (e.g. improves biodiversity, amenity value and ecological condition), it may require the identification of new sources of supply or an alternative supply source to meet the current demand. The effect of the measure may be to simply shift the locus of the problem to a new area/water body. The negative effects of both of these measures can be largely mitigated by finding an appropriate local/regional solution that considers the entire water cycle in an integrated manner.

The national regulatory measures to deal with invasive non-native species in the Solway Tweed RBD are the GB Framework Strategy and Implementation Plans to reduce the impacts of invasive non-native species. The environmental effects of this measure are positive for biodiversity, flora & fauna where the invasive non-native species infestation is being controlled. However, there are risks that areas of new infestation may be created in transporting the invasive non-native species to disposal points, while the use of herbicides to eradicate invasive non-native species may also eradicate native plants if used injudiciously. Measures to control the exploitation of salmon and sea trout will also provide specific benefits for these species.

Population & human health

The effects of Reference/Baseline measures on population and human health are mainly positive. The measures to reduce diffuse and point source pollution across sectors are likely to benefit and protect human health through reducing pollutant loads to protected waters (e.g. drinking water areas, water abstraction areas, bathing and shellfish protected waters), thereby increasing amenity value, improving human access to the water environment, tourism and improving designated National Parks. The economic incentive non-regulatory measures targeted at the water supply and agricultural irrigation sectors focus on improving water use efficiency which has significant positive effects on designated area water quality, while regulatory measures to control and manage the levels of abstraction and use of water (CAR and planning regulations defined in licences) will have a similar positive effect as more water is available for dilution during critical dry periods. However, it is important to note that this assessment is based on the assumption that the controls on abstraction can be undertaken without impacting the supply/demand balance (SDB) and existing entitlements to use water. Where this occurs, water supplies will need to be sourced from elsewhere (or savings made through efficiencies or leakage reductions) which may create negative environmental effects in the new source area.

Water

Many of the existing Reference/Baseline measures will continue to have a significant positive effect on water bodies in the Solway Tweed RBD. The effects of the measures are very similar to those described for the biodiversity, flora & fauna SEA topic, and are not repeated here. Similarly, there are a number of measures that have both positive *and* negative effects on the Water SEA topic. These are measures that provide benefits in a targeted water body, but could

have negative effects in another water body, as described earlier. They include the remediation of water and sediment, naturalising the flow regime and reducing the impacts of invasive non-native species.

Climate factors

As with the Population and human health SEA topic, the effects of Reference/Baseline measures on the Climate factors SEA topic are both positive *and* negative. The reason for this is that while many point source pollution measures have a significant positive effect on criteria such as 'promoting sustainable flood management', 'mitigating floods and droughts', 'reducing vulnerability to climate change' and 'addressing the impacts of climate change on biodiversity', they also have potential negative effects by contributing to GHG emissions and increasing energy consumption (the last two criteria for SEA objective 4). For example, diffuse and point source pollution measures such as implementing first time sewerage, improving STW and improving treatment have beneficial effects on the water environment and contribute to adaptation to climate change, but increase energy consumption, GHG emissions and produce a greater volume of waste (with potentially more contaminants).

The effects of the measures dealing with abstraction and flow regulation and changes to morphology are mostly positive for the Climate factor SEA topic. This is because measures that are targeted at improving water use efficiency, controlling abstraction and reducing flood risk will promote sustainable flood management, the mitigation of floods and droughts, and contribute to mitigating the effects of climate change on biodiversity and the human use of water. Although these measures may increase energy consumption and GHG emissions, these are not judged to be significant and hence the overall effect of these measures is considered to be positive.

Cultural heritage

The Reference/Baseline measures are expected to have no significant effect on the Cultural heritage SEA topic.

Landscape

Other than the measures to implement first time sewerage, the majority of the Reference/Baseline measures are expected to have no significant effect on the Landscape SEA topic. In implementing first time sewerage, if the design of works is not sympathetic to the aesthetics of the landscape, there may be a significant negative effect.

Material assets

The majority of the Reference/Baseline measures are expected to have no significant effect on the Material assets SEA topic. There are, however, a number of positive effects that could occur as a result of the abstraction and flow regulation measures. These relate to measures to improve the efficiency of water use which will not only release more water for aquatic ecosystems, but may also delay the requirement for new water infrastructure to meet increasing demands (e.g. WWTWs, supply network).

Soil

The Reference/Baseline measures to reduce diffuse pollution are expected to have a positive effect on soils. Reducing the concentration and volume of pollutants in the soil bodies of the Solway Tweed RBD will improve soil quality, quantity and function, and in so doing protect valuable agricultural land and contribute to terrestrial biodiversity improvements. Where diffuse pollution is the cause of degraded sites or contaminated land, reducing pollution will have significant benefits. If soil structure and chemistry is improved, it may reduce erosion hazard. Where SuDs[15] form part of a measure, this may reduce peak flows and hence reduce the potential for erosion from direct runoff. The measures to deal with the remainder of the pressures have no significant effect on soils, other than the measure to reduce the impacts of invasive non-native species which will improve degraded riparian zones.

Consultation question 3 – Do you think SEPA/Environment Agencyt have identified the potential significant environmental effects likely to arise from waterbody measures already in place (the Reference/Baseline case)?

5.3.2. Draft RBMP

Biodiversity, flora & fauna

The draft RBMP measures will result in continued improvements to biodiversity, flora & fauna in the Solway Tweed RBD, but will also deliver a number of *additional* benefits. These additional benefits will be affected by reduced pollutant inputs due to the IPPC/CAR 2008 GBR[16] for diffuse pollution, SEPA catchment-related activities and CMPs, the provision of first time sewerage, fencing of buffer strips in capital grants schemes and the retrofitting of SuDs[17]. Where appropriate, these measures will apply new (WFD) standards[18], further improving water quality with concomitant biodiversity, flora & fauna benefits. The measures to target funding and compliance work at WFD priority areas: campaign awareness raising, the co-ordination of partnerships, the promotion of best practice and uptake of agri-environmental schemes should reinforce these benefits.

There are a number of new (e.g. CAR) and revised (e.g. CAMS, SAP) abstraction and flow regulation measures in the draft RBMP that will have a significant positive effect on biodiversity, flora & fauna, and will deliver a number of additional benefits. These measures control the pattern, volume and timing of abstraction (e.g. hands off flows) and provide environmental flows downstream of impoundments for ecological functioning (e.g. habitat improvements, freshets to

[15] The application and retrofitting of SuDs which is a requirement currently in place in Scotland under the WEWs Act.

[16] Scottish Statutory Instruments: 2008 No. 54 Environmental Protection Water. The Water Environment (Diffuse Pollution) Scotland Regulations 2008.

[17] The WEWs Act requires Scottish Water to deliver SuDs as part of its investment programme.

[18] Priority Substances and Specific Pollutants. There are no new sediment standards proposed for the WFD.

trigger migration, improvements to downstream water temperature and dissolved oxygen levels). These provide environmental benefits for lotic (flowing waters) aquatic ecosystems. Measures such as managing the rate and range of artificial drawdown and managing water levels in impoundments will improve the biodiversity, flora & fauna of lentic (still waters) aquatic ecosystems. CAR 2005 incentives to improve the efficiency of water use by irrigation sector should further reinforce these biodiversity benefits.

Draft RBMP morphological measures to improve modified habitat will also have a number of additional benefits on the Biodiversity, flora & fauna SEA topic, although the links between morphological improvements and biodiversity are complex as mentioned previously. These measures could have a number of cross-cutting positive effects such as reducing flood risk and improving the riparian zone. Measures that remove barriers or create fish passes will enable fish migration to previously inaccessible water bodies and hence provide a significant positive biodiversity and fauna benefit. Regional partnerships to help control invasive non-native species are also expected to provide biodiversity, flora & fauna benefits through creating space for native species, while the Fish Health Directive and regulations to control non-native fish in aquaculture will help enforce against illegal activity.

There are a number of draft RBMP non-regulatory measures that are expected to reinforce the positive environmental effects of measures on biodiversity, flora & fauna. These include co-ordinating and targeting compliance work and funding at WFD priorities, campaign awareness raising and promotion of best practice, and identifying opportunities for morphological improvements. It is anticipated that these measures will provide biodiversity, flora & fauna benefits, but as the direct environmental effects of these measures is unknown, these have been categorised as having uncertain effects.

There are a number of draft RBMP measures that have both positive *and* negative effects on biodiversity, flora & fauna. These are measures that benefit the water body they are targeted at, but could have negative effects (these effects have been described in Section 5.3.1 under the Biodiversity, flora & fauna SEA topic and are not repeated here) on other water bodies. They include the IPPC/CAR measures to transfer all or part of a discharge, the use of alternative sources or relocating abstraction points, controls on licensed hydropower schemes, the remediation of water and sediment, and controlling invasive non-native species by eradicating *in situ* and capture and removal.

Population & human health

The effects of the draft RBMP measures on population & human health are predominantly positive. Measures such as IPPC/CAR that apply new standards to control point source pollution will result in water quality improvements that have additional positive benefits for human health and the recreational use of water, while abstraction and flow regulation measures designed to provide more water for aquatic ecosystems will help with dilution (especially during critical dry periods) and in so doing protect designated water bodies.

There are, however, a number of measures that have both positive *and* negative effects on the Population and human health SEA topic. For example, the IPPC/CAR measure to transfer all or part of a discharge may simply shift the locus of the problem to a new area/water body, while

the measure to use an alternative source or relocate an abstraction point may have a similar effect (i.e. provide additional water for dilution in the targeted water body and increase pollutant concentrations in the water body from whence the new abstraction is located). Similar effects may occur where there are measures to control invasive non-native species. The negative effects of both of these measures can be largely mitigated by finding an appropriate local/regional solution that considers the entire water cycle such as a Water Cycle Strategy.

Water

The effects of the draft RBMP measures on the Water SEA topic, and the additional benefits/negative effects are very similar to those described for the Biodiversity, flora & fauna SEA topic and are not repeated here.

Climate factors

The effects of the draft RBMP measures are both positive *and* negative on the Climate factors SEA topic. It is anticipated that the new CAR/GBR/IPPC standards will provide additional water environment benefits, and will contribute to addressing the impacts of climate change on biodiversity and the human use of water, but could result in greater energy consumption, further GHG emissions and produce a greater volume of waste (with potentially more contaminants). Consequently, most diffuse and point source pollution measures have been categorised as having both a positive *and* negative effect on the Climate factors SEA topic. The CAR measure to use an alternative water supply source or relocate the abstraction may have a similar positive *and* negative effect, in that it will benefit the water environment from whence it is relocated, but may require new infrastructure, increased energy consumption and increase GHG emissions at the water body where it is relocated. Two measures designed to tackle diffuse and point source pollution: retrofitting or improving existing SuDs and Habitats Directive review of consents are expected to have a positive effect on the Climate factors SEA topic. The retrofitting of SuDs is likely to contribute to sustainable flood management and contribute to the mitigation of floods and droughts, while the Habitats Directive will contribute to addressing the impacts of climate change on biodiversity.

The effects of the abstraction and flow regulation and changes to morphology measures are mostly positive for the Climate factors SEA topic. This is because the measures to improve modified habitat contribute to promoting sustainable flood management, the mitigation of floods and droughts, and help mitigate the effects of climate change on both biodiversity and the human use of water. Further, these measures will contribute to improving ecosystem resilience, thereby creating a more robust environment which is better able to adapt to climate change. Although these measures may increase energy consumption and increase GHG emissions, they are not judged to be significant, and hence the overall effect of these measures is considered to be positive. However, it is instructive to note that the removal of engineering structures may increase flood risk; this will need to be assessed on a case by case basis.

Cultural heritage

The majority of the draft RBMP measures are expected to have no significant effect on the Cultural heritage SEA topic. There are, however, two exceptions. The measures to remove

barriers/engineering structures to enable fish migration may result in the loss of historic water-related features such as weirs, mills, fish traps, artificial ponds, dams and canals, or even potential wetland archaeological sites. The loss of engineering structures may also negatively impact existing water supply infrastructure, and in some cases increase flood risk. Where the structures provide amenity benefits through creating recreational opportunities for boating or angling, the effects of removing these barriers may be negative for some sectors of the local economy.

Landscape

Most of the draft RBMP measures are expected to have no significant effect on the Landscape SEA topic. However, the measures to provide first time sewerage may have a significant negative effect if the design of the works is not sympathetic to the aesthetics of the landscape. The measures to improve modified habitat may have both positive *and* negative effects on landscape, positive in that they may improve the character and diversity of the landscape from an ecological perspective, but negative if the removal of barriers/engineering structures and the provision of fish barriers degrades landscape character.

Material assets

A number of draft RBMP measures are expected to have a significant positive effect on the Material assets SEA topic. These are measures aimed at increasing water efficiency savings and reducing leakage. These measures will not only contribute to more efficient use of water management infrastructure, but could also delay the need for new water supply infrastructure. Measures that require the retrofitting and use of SuDs will have a similar positive effect for the same reasons, but have the additional cross-cutting benefit of reducing diffuse pollution and flood risk. The measure to change the sediment management maintenance regime may also have a significant positive effect by reducing the amount of sediment in water supply assets, improving their operation and performance.

A number of negative effects can also be identified. For example, CAR controls on abstraction that require the release of water downstream of reservoirs for ecological purposes, CAR measures that manage the rate and change of artificial drawdown and water levels in reservoirs, and SEPA controls on licensed hydropower schemes may reduce the deployable output of reservoirs, and the amount of renewable energy delivered from the hydropower. Similar negative effects are possible under CAMS and SAP. These effects may be mitigated if an optimal solution can be found between security of supply and environmental flows.

Soil

The draft RBMP measures to reduce diffuse pollution are expected to have a positive effect on soils for the reasons mentioned earlier. Two new measures designed to tackle morphological pressures are likely to have additional significant positive effects on the Soils SEA topic. These are measures to improve the morphological condition of channel banks and shorelines, riparian zones and wetland habitats. These will help to improve infiltration rates, reduce runoff and hence contribute to reducing erosion hazard. Controlling invasive non-native species infestation should also improve the riparian zone, and help to reduce erosion hazard. The measure to

change sediment management maintenance regime may have a negative effect on soils if the disposal of contaminated sediment is not according to best practice.

Consultation question 4 – Do you think SEPA/Environment Agency have identified the potential significant environmental effects likely to arise from implementing the Solway Tweed draft River Basin Management Plan?

5.3.3. Continued Improvement

Biodiversity, flora & fauna

Continued Improvement measures to reduce point source pollution such as the requirement for low Phosphorus detergents are likely to lead to further water quality improvements with concomitant biodiversity, flora & fauna benefits. The additional investment in catchment-related activities and CMPs over successive planning cycles should lead to additional benefits. It should be noted, however, that ecosystem responses are unlikely to be linear. A restoration policy framework that provides funding to remove abandoned structures such as old embankments will also contribute to biodiversity, flora & fauna improvements, although the links between morphological improvements and biodiversity are complex and non-linear (as mentioned earlier). The restoration policy framework will include habitat improvement in the riparian zone, managed re-alignment of rivers and coastal margins, and gravel placement for spawning. Possible policy mechanisms to control the spread of invasive non-native species could have positive effects for biodiversity, but have been categorised as uncertain for the reasons mentioned earlier. MPAs will provide longer-term biodiversity benefits for the marine and estuarine environment.

Measures to identify opportunities to improve morphology may also provide biodiversity, flora & fauna benefits, but as the direct biodiversity, flora & fauna effects of these measures is unknown, these have been categorised as having uncertain effects.

Population & human health

The effects of the Continued Improvement measures on population & human health are both positive *and* negative. Measures to minimise pollution loadings from rural land use will result in water quality improvements that have significant benefits for human health.

Water

The effects of the Continued Improvement measures on the Water SEA topic are very similar to those described for the biodiversity, flora & fauna SEA topic and are not repeated here. Measures to identify opportunities to improve morphology may also provide water environment benefits, but as the direct environmental effects of these measures is unknown, these have been categorised as having an uncertain effect.

Climate factors

The effects of the Continued Improvement measures are both positive *and* negative on the Climate factors SEA topic. The source control of Phosphorus from domestic sources could mean that that less chemical dosing will be required to meet current consents, potentially benefiting the Climate factors SEA topic. Further, although the additional investment in catchment-related activities and CMPs over successive planning cycles will provide longer-term environmental benefits, the measures applied may require increased energy consumption and potentially contribute to further GHG emissions. The effects of the measures to identify opportunities to improve morphology are uncertain, and have been classified as such.

Cultural heritage

The effects of the Continued Improvement measures on the Cultural heritage SEA topic are predominantly not significant.

Landscape

The effects of the Continued Improvement measures on the Landscape SEA topic are predominantly not significant.

Material assets

The effects of the Continued Improvement measures on the Material assets SEA topic are predominantly not significant.

Soil

The effects of the Continued Improvement measures on the Soil SEA topic are predominantly not significant.

Consultation question 5 – Do you think SEPA/Environment Agency have identified the potential significant environmental effects likely to arise from implementing the potential additional measures identified under the Scottish Government consultation 'Continued Improvement'?

5.4. Cumulative effects

The cumulative effects of the PPS and alternatives have been assessed for two cases:

- firstly, for the interaction of the draft RBMP and the Reference/Baseline measures; and
- secondly, for the interaction of the Continued Improvement alternative with the measures in both the draft RBMP and the Reference/Baseline case.

The combined effects of different measures are discussed by SEA topic. It is important to note that the combined effects are not always additive, especially where the effects are positive for SEA topics like Biodiversity, flora & fauna, Water, Landscape and Soil SEA topics. Here, the measures contribute to long-term improvements in water quality and aquatic ecosystem

condition. These can be monitored to assess trajectories of change. The cumulative effects may, however, be additive for SEA topics such as Climate factors where energy consumption and GHG emissions accumulate. Similarly, cumulative effects on Cultural heritage or Material assets SEA topics could be additive if numerous historic environmental features are removed or water management infrastructure is made redundant.

5.4.1. Cumulative effects of draft RBMP

Biodiversity, flora & fauna

The combined effect of the Reference/Baseline and draft RBMP measures to tackle diffuse pollution and point source pollution will be improved biodiversity, flora & fauna as a result of improvements in water quality. For diffuse pollution, positive cumulative effects will result both from the existing Reference/Baseline measures and from the draft RBMP CAR and GBR measures which will enforce new (WFD) standards. While measures to deal with point source pollution that transfer of all or part of a discharge will have positive environmental effects at the site from which the discharge has been transferred, they will produce potentially negative effects on the receiving water body.

The measures in the Reference/Baseline and the draft RBMP that address abstraction and flow regulation pressures will have a cumulative positive effect on biodiversity, flora & fauna through improvements in environmental flows and, for example, by reductions in leakage. While these measures will improve the water environment in the water bodies they are targeted at, they could create potential environmental problems elsewhere if new water supply sources need to be found, or if additional demand is placed on other existing sources, or if there is a potential reduction in energy production from hydropower. The measures may also potentially impact on the SDB and reduce the deployable output from existing sources of supply.

The combined effect of the Reference/Baseline and draft RBMP measures to tackle morphological pressures will result in improved habitat for aquatic ecosystems and improvements in biodiversity, flora & fauna. However, the cumulative impact of these measures on some other SEA topics may be negative as noted elsewhere.

Where the removal of engineering structures and barriers to fish migration result in the loss of important historical sites or increased flood risk, the cumulative negative effects may be significant.

The cumulative effect of Reference/Baseline and draft RBMP measures will be fewer invasive non-native species *in situ* in the Solway Tweed RBD, and better controls on their future introduction and dispersal leading to improvements in biodiversity, flora & fauna.

Population & human health

The separate effects of the Reference/Baseline measures and the draft RBMP measures on population & human health are mainly positive and the cumulative effect of these measures should be in the same direction. For example, measures in either the Reference/Baseline or the draft RBMP that reduce diffuse pollution across sectors are likely to benefit human health by

reducing pollutant loads to protected waters that have beneficial uses such as drinking water abstraction, bathing or shell fisheries. These improvements may in turn increase amenity value to the benefit of tourism and designated National Parks.

Water

The combined effect of the Reference/Baseline and draft RBMP measures to tackle diffuse pollution and point source pollution will be to improve water quality due the interactions of these measures described above for biodiversity, flora & fauna. Those measures that result in increased environmental flows by targeting abstraction and flow regulation may also improve water quality by providing increased dilution for discharges, as well as contributing directly to the improvements in biodiversity, flora & fauna noted above.

Climate factors

The measures in the Reference/Baseline case and the draft RBMP that reduce the impact of point discharges by providing additional treatment or moving the point of discharge have the potential to increase energy demand and GHG emissions during both construction and operation. The effects from different measures will be additive and so there may be a negative cumulative effect on climate factors through increased GHG emissions. Where measures to deal with diffuse pollution or abstraction and flow regulation, such as implementing first time sewerage or changes in flow regime that reduce hydropower yields involve increased energy use (or reduced production from hydropower schemes) they will have a negative cumulative effect on climate through increased GHG emissions.

Cultural heritage

As the Reference/Baseline measures are expected to have no significant effect on cultural heritage, there is cumulative effect with the draft RBMP measures. However, where the removal of engineering structures and barriers to fish migration result in the loss of important historical sites or increased flood risk, the cumulative negative effects may be significant.

Landscape

Most of the measures in the Reference/Baseline case and the draft RBMP are expected to have no significant effect on the Landscape SEA topic. However, the measures to provide first time sewerage may have a significant negative effect if the design of works is not sympathetic to the aesthetics of the landscape. Further, the measures to improve modified habitat may have both positive *and* negative effects on landscape, positive in that they may improve the character and diversity of the landscape from an ecological perspective, but negative if the removal of barriers/engineering structures and the provision of fish barriers degrades landscape character. Because the extent of landscape impacts may be increased in terms of numbers of sites affected and area by the combined application of Reference/Baseline and draft RBMP measures, these may have a cumulative negative impact.

Material assets

The considerations for material assets are similar to those for Climate factors in that measures in the Reference/Baseline case and the draft RBMP that reduce the impact of point discharges by providing additional treatment or moving the point of discharge have the potential to increase waste production both during construction and operation. The effects from different measures will be additive and so there may be a negative cumulative effect on material assets through increased waste production. Similarly, where measures to deal with diffuse pollution or abstraction and flow regulation involve increased waste production they will have a negative cumulative effect on material assets.

Soil

The combined effect of the Reference/Baseline and draft RBMP measures to tackle diffuse pollution will be to improve the condition of soil in the District.

5.4.2. Cumulative effects of Continued Improvement

The alternative to the draft RBMP for the Solway Tweed RBD is to include the additional Continued Improvement measures in combination with the measures in the Reference/Baseline case and the draft RBMP. To avoid repetition, the following subsections simply describe the additional cumulative effect of the Continued Improvement measures over and above the cumulative effects of the Reference/Baseline and draft RBMP described in Section 5.4.1.

The Continued Improvement measures will, in general, reinforce and/or extend the cumulative effects of the draft RBMP apart from where:

- a measure in Continued Improvement mitigates a cumulative negative effect likely to arise from the other measures; or
- a measure in Continued Improvement interacts with the other measures in such a way as to create a new significant environmental effect.

Considering the measures included in the Continued Improvement option, their cumulative effects on the SEA topics other than Climate factors and Material assets are assessed as being the same as for the Reference/Baseline and the draft RBMP. An assessment of the cumulative effects of Continued Improvement are assessed for the Climate factors and Material assets SEA topics below.

Climate factors

The Continued Improvement measure to introduce controls on the level of Phosphorus products in domestic detergents may have a positive beneficial effect on climate factors if it allows measures to reduce phosphate by additional wastewater treatment to be less widely applied or introduces efficiencies in current operating systems. Hence, the effect of this measure may be to reduce the cumulative climate factor impacts of other phosphorus control measures in the Reference/Baseline and draft RBMP by reducing the incidence of these measures.

Material assets

The Continued Improvement measure for reducing phosphate content in products may reduce the amount of waste generated by the phosphorus control measures in the Reference/Baseline and draft RBMP by reducing the incidence of these measures.

5.5. Inter-plan effects

The RBMP will be being implemented at the same time as a large number of other plans, policies and strategies as noted in Section 3 and Appendix C. The interaction of the RBMP with these other plans will only be significant where a RBMP option interacts with another plan to create a new significant impact from that plan or where other plans can effectively mitigate effects from the RBMP.

The five main SEA topics under which the RBMP options have been assessed as having a significant adverse impact are:

- Material assets – through increased waste production;
- Climate factors – through increased energy consumption and GHG emissions;
- Population & human health – through possible changes in water supply output; and
- Biodiversity, flora & fauna – through transfer of impacts from one location to another;
- Water - through transfer of impacts from one location to another.

Hence the potential for inter-plan effects is greatest with those other plans, policies and strategies that interact with these SEA topics. For example, the UK Climate Change Programme, Changing our ways: Scotland's climate change programme and the Scottish Water sewage sludge strategy.

Consultation question 6 – Do you think SEPA/Environment Agency have identified all the potential cumulative effects arising from implementing the draft RBMP and Continued Improvement measures?

6. FINALISING THE PLAN AND IMPLEMENTATION

Four potentially significant negative environmental effects were identified during the assessment process. Their effects, and suggestions for their mitigation, are summarised in this chapter. The opportunities for enhancement of the draft RBMP are also considered.

The chapter also makes proposals for the monitoring programme to determine whether the environmental effects identified during the assessment actually occur.

6.1. Introduction

This section of the report focuses on the outcomes of the environmental assessment process. Consideration of mitigation of negative effects, enhancement of positive effects, and monitoring of the Plan and its effects are requirements under the Environment Assessment of Plans and Programmes Regulations (2004). Where a Plan has been identified as having potentially negative environmental effects there is a requirement to examine ways in which these effects can be prevented, reduced or (less preferably) offset. Mitigation can include a number of actions including changes to the Plan; referral to lower or higher tier plans; and, in some cases, compensation measures. Mitigation measures can also include enhancement of positive effects identified, and consideration should be given to this in the SEA process.

There is also a requirement to develop a monitoring strategy for the Plan. This is intended to monitor environmental effects of the Plan, and to inform on the extent to which these have been identified during the SEA. The monitoring plan can provide information on whether mitigation measures have been successful, and also on whether any unexpected environmental effects result from the adoption of the Plan[19].

6.2. Mitigation of significant environmental effects

Four potentially negative effects of the Plan and the alternative were identified in Section 5. These were:

- increased waste production;
- increased energy consumption and associated increased emissions of GHG;
- change in the deployable output from existing water supply sources; and
- transferral of environmental problems from one water body to another.

[19] While this Environmental Report contains suggestions for monitoring, consultees are asked to consider any alternative or additional monitoring measures which may be useful.

Mitigation for increased waste

Increases in waste production were identified as potential effects from a number of measures. Increased production of waste could occur from increased levels of wastewater treatment, the removal of non-native invasive species; sediment removed during bed remediation; and the removal of historic engineering structures.

The effects of increased waste production are varied but can include contamination of land where wastes are disposed; threats of leachate from waste storage; transmission of non-native invasive species; reduction of landfill capacity; increased use of non-renewable resources; and increased transportation and treatment energy costs.

Many of the potential negative effects attributable to increased waste will be effectively managed through best practice and existing legislative and regulatory regimes. These include those on sludge disposal, incineration, waste management licensing, and landfill regulations.

The negative effects of increased disposal to landfill, and transportation and treatment energy costs are harder to mitigate. There is no strategic level approach to managing this effect; however mitigation could be achieved through assessment of waste impacts at a local level. In order to address this, the Plan should ensure that consideration of waste generation, and its disposal, is given due emphasis during planning. It should also ensure that best practice associated with measures includes the application of the waste hierarchy[20] whereby preferred options of reuse and recycling of materials are utilised over disposal to landfill.

Mitigation of increased energy use and GHG emissions

Increases in energy usage are largely associated with those measures which require additional treatment (of water or sediment) or additional storage and pumping (for example, first time sewerage measures). A lesser, although still potentially significant, effect is noted where measures require new infrastructure (e.g. treatment works or pipe network).

Mitigation of these effects will largely come through consideration of individual applications of measures. There is little that the Plan can do directly to reduce these impacts. However, promotion of renewable sources of energy, and of energy-efficient infrastructure should be encouraged. Measures should also be implemented with consideration of national strategies on climate change.

Mitigation for reduction of deployable output

A number of measures could have a negative effect on the deployable output from impoundments. Associated with the potential reduction in deployable output could be:

- reduced power generating capacity ;
- releases from reservoirs can lead to lower levels of dissolved oxygen downstream; and

[20] For more information on the waste hierarchy please refer to DEFRA at http://www.defra.gov.uk/ENVIRONMENT/waste/

- reduced capacity for abstractions downstream.

These could occur where releases of water from reservoirs are managed to naturalise downstream flow regimes. In some cases, water may need to be sourced elsewhere.

Mitigation of such effects is likely to be particular to individual measures and their implementation. The Plan should encourage the consideration of these effects at local and regional level (through for example a Water Cycle Strategy) and should ensure that decisions are made on measures with due consideration of other national plans, specifically those relating to climate change (renewables) and agriculture.

Mitigation for relocation of environmental pressures

While it is expected that there is potential for significant environmental effects to be experienced by other water bodies (e.g. where an effluent discharge is relocated or abstraction point moved), it is expected that this evaluation will be made at a project level and the implementation of unfavourable measures will not be permitted.

6.3. Opportunities for enhancement

A wide range of positive effects resulting from the Plan were identified during the assessment process; these are detailed in Section 5 of this report. The identification of opportunities for enhancement of these effects are complicated in this case. The Plan is specifically targeted at tackling a range of environmental issues faced by the water environment; as such the opportunities for improvement of these environmental issues have already been optimised for those measures contained in the Plan. However, the Plan itself is only the first step in addressing these issues in the longer term.

The assessment process, which compared the Plan with the Continued Improvement alternative, identified that Continued Improvement offered additional environmental benefits over and above those offered by the plan itself. One method of enhancing the Plan would be to develop a wider range of measures, incorporating those contained in Continued Improvement. It is also expected that further cycles of the RBMP process will offer new measures to further improve the environmental quality of water bodies which may not be included in this cycle due to expense or prioritisation.

The assessment process focused primarily on sets of measures, and to a lesser extent on the underlying principles of the Plan. Many of the opportunities for additional benefits for the wider environment will be a result of decisions made regarding implementation of measures at a more local level. It is important, then, that the Plan as a whole encourages consideration of measures within the wider set of social and environmental issues faced in the RBD.

Table 9 presents a summary of opportunities for enhancement of environmental benefits for the draft Solway Tweed RBMP.

Table 9 Opportunities for enhancement of environmental benefits within the draft RBMP

SEA Topic	Comments on enhancement
Biodiversity, flora & fauna	Aquatic ecosystem biodiversity is a key aspect underlying the Plan. The measures contained within the Plan are optimised to provide benefits within the constraints of the current Plan cycle. Opportunities for enhancement of the positive effects of the Plan are offered through the inclusion of additional measures. Additional measures include those contained in Continued Improvement as well as measures which will be identified in future Plan development cycles. Improvements in the water environment are likely to lead to improvements in the wider environment.
Population & human health	The Plan is assessed as having a number of positive impacts on population & human health as a by-product of improving the environmental condition of water bodies. There are minor opportunities for enhancement of these effects by incorporating Continued Improvement measures. There may also be benefits which are produced by future RBMP cycles. Enhancement of these effects could be achieved in future cycles by ensuring consideration of population & human health during the Plan making process.
Water	As mentioned in relation to biodiversity, flora & fauna, opportunities for enhancement of the Plan are largely through increasing the range of measures included within the Plan. The measures contained within the Plan have already been optimised for improvements to the water environment. Enhancement could be achieved through incorporating the Continued Improvement measures.
Climate factors	The Plan is assessed as producing positive impacts in relation to aspects of climate factors. While there is limited scope within the current Plan to further enhance these effects, the Plan should ensure that future RBMP cycles further develop ways in which benefits can be achieved in terms of climate change adaptation (e.g. restoration policy framework may contribute to healthier more resilient ecosystems).
Cultural heritage	The assessment process identified that the Plan is unlikely to have strategically significant effects on cultural heritage and as such opportunities for enhancement have not been identified.

SEA Topic	Comments on enhancement
Landscape	The assessment process identified that the Plan is unlikely to have strategically significant effects on landscape, although there may be benefits at a local level. As such opportunities for enhancement are limited.
Material assets	Potential positive effects on material assets related primarily to increased efficiency in water use. These effects could be further enhanced through the use of Water Cycle Strategies.
Soil	Effects on soil include improved quality and reduced erosion hazard. Many of the measures will contribute to these effects, primarily in respect to agriculture and forestry. Opportunities for enhancing these effects are limited in this RBMP cycle although additional measures in further cycles may lead to improvement.

Consultation question 7 – Do you think SEPA/Environment Agency have identified appropriate mitigation and enhancement measures?

6.4. Monitoring

Monitoring of the Plan, in its broadest sense, is intended to provide ongoing information on the following:

- what the overall environmental outcomes of the Plan are;
- whether the identified significant environmental effects are arising as expected;
- where the suggestions for mitigation of significant environmental effects are effective; and
- whether the plan is being appropriately implemented.

Monitoring of environmental outcomes

SEPA and the EA have monitoring programmes that will continually report on the state of the water environment in the District. These monitoring programmes are a requirement under the WFD and are designed to fulfil a number of roles within the river basin planning cycle:

- classify waterbodies according to their ecological and chemical status;
- increased understanding of possible threats to the environment;
- drive programmes of measures to identify why a waterbody is failing, and what action is required; and
- at a strategic level, determine whether the RBMP is achieving the set objectives.

The role of the Solway Tweed RBD monitoring strategy is to ensure that sufficient environmental information is gathered to assess progress towards attainment of the WFD objectives. The Solway Tweed monitoring network was designed within the framework of the WFD using guidance from an EU group on monitoring to meet this objective.

The WFD requires that all water features in a category (i.e. rivers, lakes, transitional waters, coastal waters and groundwater) above a certain size threshold be reported as water bodies. Surface water bodies are grouped into different sub-categories according to their physical and chemical characteristics.

The WFD specifies three categories of monitoring which have different but complementary purposes – surveillance, operational and investigative. Monitoring is based on a set of parameters matched to different water body types (e.g. fish and macrophytes in lochs and rivers, algae in coastal waters, chemicals in groundwater). The surveillance network is widespread measuring all relevant parameters listed in the WFD. The operational network focuses on a sub-set of water bodies which are identified as being at risk of failing to meet the requirements of the WFD. The investigative network is intended to respond to unplanned events and emerging risks to water bodies where the source of the risk is not necessary understood. Further details of the WFD monitoring programme can be found on the SEPA[21] and EA[22] websites.

In respect of the water environment in the District, it is anticipated that the WFD monitoring programme will be sufficient to monitor the significant effects of the Plan.

Monitoring of significant environmental effects

The significant negative environmental effects identified in this assessment were:

- increased waste production;
- increased energy consumption and associated increased emissions of GHG;
- change in the deployable output from existing water supply sources; and
- transferral of environmental problems from one water body to another.

A table of suggested monitoring indicators is given below. Consultees are requested to suggest any additional data or indicators which may be useful for monitoring the identified effects.

Table 10 Suggested monitoring indicators for the RBMP

Potential negative effect	Suggested indicator	Responsibility for collection
Increased waste production	Sewage sludge arisings	Scottish Water / United Utilities / Northumbrian Water
Increased energy consumption / GHG emissions	Energy usage at waste water treatment plants	Scottish Water / United Utilities / Northumbrian Water
Change in water supply output	Registered and licensed abstraction volumes	SEPA / EA
Transferral of environmental problems	No method for monitoring this effect has been identified.	

[21] http://www.sepa.org.uk/wfd/monitoring/index.htm

[22] http://www.environment-agency.gov.uk/subjects/waterquality/955573/1001324/958407/1793326/

Monitoring implementation of the Plan

While not strictly the role of the SEA process, consideration should be given to monitoring the extent to which the Plan is being implemented within the District.

Many of the measures across the Plan options involve changes in legislation which will necessarily result in changes to behaviour (e.g. GBRs). However, there are a number of measures which are, to some extent, discretionary (e.g. SRDP, other economic incentives, voluntary management agreements). It is suggested that a monitoring programme is designed and implemented to allow for assessing the uptake of these measures. Much of the key data for these should be available from the overarching authority responsible for the particular measure. For example, the SG will collate information on the uptake of SRDP and those which relate to WFD pressures directly.

Consultation question 8 – Do you think SEPA/Environment Agency have identified appropriate processes and indicators to monitor environmental effects?

Acronyms

AA	Appropriate Assessment
AAG	Area Advisory Group
AGF	Advisory Group Forum
AMD	Acid Mine Drainage
AONB	Area of Outstanding Natural Beauty
CAR	Controlled Activities Regulations
CMP	Catchment Management Plan
CSF	Catchment Sensitive Farming
Defra	Department for Environment, Food and Rural Affairs
dRBMP	Draft River Basin Management Plan
DWPA	Drinking Water Protected Area
EA	Environment Agency (England and Wales)
EIA	Environmental Impact Assessment
GEP	Good Ecological Potential
GBR	General Binding Rules
GHG	Greenhouse Gases
GCMs	Global Climate Models
IA	Impact Assessment
INNS	Invasive Non-Native Species
IPPC	Integrated Pollution Prevention and Control
LCA	Landscape character assessment
NAG	National Advisory Group
NNR	National Nature Reserve
NVZ	Nitrate Vulnerable Zone
NSA	National Scenic Area
PPC	Pollution Prevention and Control
PPS	Plans, Programmes and Strategies
RBC	River Basin Characterisation
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SG	Scottish Government
SPA	Special Protected Area
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SRDP	Scotland Rural Development Programme
SSAFO	Silage Slurry and Fuel Oil (Regulations)
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SUDS	Sustainable Urban Drainage Systems
SWMI	Significant Water Management Issues
TBT	Tributyl tin
UKCIP	United Kingdom Climate Impacts Programme
UKWIR	UK Water Industry Research

WEWS	Water Environment and Water Services
WFD	Water Framework Directive
WwTW	Waste water Treatment Works

.

APPENDICES

APPENDIX A LIST OF NATIONAL AND REGIONAL MEASURES ASSESSED AS PART OF THE SOLWAY TWEED RBMP

APPENDIX B ENVIRONMENTAL BASELINE REPORT

APPENDIX C OTHER RELEVANT PLANS AND PROGRAMMES AND ENVIRONMENTAL OBJECTIVES

APPENDIX D NATIONAL AND REGIONAL ASSESSMENT TABLES

APPENDIX E SCREENING FOR APPROPRIATE ASSESSMENT

APPENDIX F SIGNIFICANT ENVIRONMENTAL EFFECTS BY PRESSURE AND SECTOR