Poole Harbour
Catchment Initiative

Catchment Plan
Update – May 2014

www.pooleharbourcatchment.co.uk
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### Key abbreviations

- **Catchment Plan**: This document, containing information about the Poole Harbour Catchment Initiative, is due to be updated every five years or when required.
- **Action Plan**: Summary document containing the actions agreed by the Poole Harbour Catchment Initiative, is updated annually.
- **PHCI**: Poole Harbour Catchment Initiative
- **F&P**I: Frome and Piddle Catchment Initiative
- **WFD**: Water Framework Directive
- **RBMP**: River Basin Management Plan
- **CaBA**: Catchment Based Approach
- **EU**: European Union
- **EA**: Environment Agency
- **NE**: Natural England
- **Defra**: Department for Environment, Food and Rural Affairs
- **Ofwat**: The Water Services Regulation Authority
- **SSSI**: Site of Special Scientific Interest
- **SPA**: Special Protection Area
- **SAC**: Special Area of Conservation
- **AONB**: Area of Outstanding Natural Beauty
- **NVZ**: Nitrate Vulnerable Zone
- **CAP**: Common Agricultural Policy
- **FWAG SW**: Farming and Wildlife Advisory Group South West
- **FPWDFA**: Frome, Piddle and West Dorset Fisheries Association
- **GWCT**: Game and Wildlife Conservation Trust
- **NFU**: National Farmers Union
- **CLA**: Country Landowners and Business Association
- **DWT**: Dorset Wildlife Trust
- **FC**: Forestry Commission
- **DWR**: Dorset Wild Rivers
- **CSF**: Catchment Sensitive Farming
- **WW**: Wessex Water
- **RSPB**: Royal Society for the Protection of Birds
- **WRT**: Westcountry Rivers Trust
- **WDDC**: West Dorset District Council
- **DCC**: Dorset County Council
- **FBA**: Freshwater Biological Association
- **CEH**: Centre for Ecology and Hydrology
- **CSO**: Combined Sewer Overflow

Report updated on behalf of the Poole Harbour Catchment Initiative Partnership
Foreword

Protecting the Poole Harbour catchment and tackling specific issues that affect water quality, nature conservation value and the landscape are important to many individuals and local organisations in the Dorset area.

The catchment has a legacy of good partnership projects to build upon. However, to make a real difference there needs to be an integrated approach to sharing knowledge and delivering improvements that will protect it for the long term.

The catchment initiative involves local people and organisations in decision making by sharing evidence, listening to ideas, working out priorities and seeking to deliver integrated actions that address local issues in a cost effective way and protect local resources.

With the Poole Harbour catchment failing to meet Water Framework Directive (WFD) targets and the River Frome Site of Special Scientific Interest (SSSI) not being in favourable condition for a range of factors, including nutrient levels, there is much work to be done.

The catchment initiative is keen to work with all stakeholders within the catchment and it is encouraging that land owners and land managers are playing an integral role in the partnership. We continue to welcome full engagement and encourage participation in the sharing of data, decision making and implementation of future plans.

Through applying science and evidence-based approaches and using local and regional knowledge, we will continue to develop and deliver a plan which sets out potential solutions to benefit all stakeholders. By working together we can take the practical, sustainable and affordable steps to deliver improvements to protect and improve the Poole Harbour catchment.

Ruth Barden
Environment and catchment strategy manager, Wessex Water

www.pooleharbourcatchment.co.uk
Introduction

What is it?
The Poole Harbour Catchment Initiative (PHCI) was originally known as the Frome and Piddle Catchment Initiative. This name was changed in May 2013 by the steering group when the boundary of the catchment was extended to incorporate all rivers and streams that drain into Poole Harbour. The extension of the catchment boundary and the update of the Catchment Plan will ensure the PHCI aligns with other emerging strategies and plans for the area.

The PHCI is a local partnership that helps to improve communications, share information and coordinate actions at a local level to achieve multiple benefits for the water environment. The PHCI aims to carry on working with a wide range of stakeholders to align efforts and deliver more effective improvements for the local people, businesses, landscape and environment of the Poole Harbour catchment.

The Frome and Piddle Catchment Initiative was one of the 25 national pilots to trial the Catchment Based Approach. During 2012 each pilot adopted a local stakeholder engagement process with the aim of developing a collaboratively agreed Catchment Plan. The Catchment Based Approach was officially adopted by the government in June 2013. The government is now encouraging all stakeholders within the catchment to work together at a local scale to deliver improvements to rivers and the groundwater environment.

Why is it required?
We would like the rivers and groundwater in the catchment and Poole Harbour to be healthy for the benefit of wildlife, local residents, businesses, tourists and anglers. However, the catchment has its challenges which include:

- some of the groundwater and rivers within the catchment currently fail to achieve Water Framework Directive (WFD) standards. WFD is European legislation to protect and enhance the water environment. The Environment Agency is responsible for ensuring that all water bodies achieve ‘good’ ecological and chemical status by 2027
- some groundwater sources are at risk of failing Drinking Water Inspectorate (DWI) supply standards. Wessex Water is required to ensure compliance with these standards at all times for the health and safety of their customers
- the River Frome, from Dorchester to Wareham, and a section of the Bere Stream are designated as Sites of Special Scientific Interest (SSSI) and are subsequently protected due to their diverse and rare aquatic plants and animals. Both currently fail SSSI condition assessments by Natural England
- Poole Harbour is designated as a Special Protection Area (SPA) for its internationally valuable birdlife. The harbour is also designated as a transitional water (estuary) under the WFD but currently fails to achieve the requirements of both designations
- there has been huge variability in salmon stocks in recent years, as shown by egg deposition estimates, and the abundance of the European eel stock is at a historical minimum and continues to decline
- climate change is predicted to result in increased temperatures, drier summers, wetter winters and more intensive rainfall. Consequently more extreme flow events are expected and measures are required to provide flood mitigation to protect flows in dry conditions and to aid adaptation to these changes.
What is the aim?
The aim is to work collaboratively with local stakeholders to deliver an effective Catchment Plan that meets the needs of local people, businesses and wildlife as well as European legislation. The plan aims to protect and restore the groundwater, rivers and Poole Harbour for the benefit of all of those who live in, work in and enjoy the catchment.

To achieve this, the PHCI seeks to clearly identify the catchment issues, agree sustainable solutions and develop a practical Action Plan to deliver these solutions. The Catchment Plan will be reviewed on a five-year basis, or as required, to ensure the partnership is responding to the most relevant issues. The Catchment Plan is supplemented by an Action Plan which will be reviewed on an annual basis by the steering group. The Action Plan will identify the lead organisation for each action and potential funding sources.

Poole Harbour surface waterbodies WFD Status. Data provided by Environment Agency 2013
(Note: Please see Appendix 2 for WFD water body failing elements)

How will the PHCI influence future plans?
The European Water Framework Directive (WFD) came into force in December 2000 and became part of UK law in December 2003. The WFD provides an opportunity to plan and deliver a better water environment. The WFD introduced River Basin Management Plans (RBMP) which are published in six-year cycles to identify measures needed to achieve compliance with the standards set by the WFD. The PHCI Catchment Plan will help to inform and support the development of the RBMP for the South West. The Action Plan measures, which have been agreed by the partners, will inform the South West RBMP for 2015-2021; which is produced by the Environment Agency.

The Environment Agency has stated that it is committed to:
• incorporating new actions from this plan into River Basin Management Plans where it is clear that stakeholders have committed to the action
• participating in actions and projects that arise, and changing or adapting the activities it undertakes in the catchment.

The PHCI Catchment Plan is not a statutory document; however it plays an important role in reflecting the opinions and actions of all stakeholders at this local scale. As such it will influence decision making for the statutory River Basin Management Plan as well as the next review of water company investment plans and prices, due this year.
Who is involved?

A ‘Terms of Reference’ (www.pooleharbourcatchment.co.uk) has been agreed by the partners and the partnership structure is shown below:

A catchment coordinator is employed by Wessex Water on behalf of the partnership and their work programme is managed by the steering group.

**Steering group**

The steering group meet on a quarterly basis, or as required and represent a wide range of stakeholders and sectors including the following organisations:

Catchment Sensitive Farming; Dorset Area of Outstanding Natural Beauty; Dorset County Council; Dorset Wildlife Trust; Environment Agency; Farming and Wildlife Advisory Group South West; Forestry Commission; Frome, Piddle & West Dorset Fisheries Association; Game & Wildlife Conservation Trust; National Farmers Union; Natural England; Royal Society for the Protection of Birds; West Dorset District Council; Wessex Water and Westcountry Rivers Trust. Two members of the Agricultural & Land Management Group also attend the Steering Group meetings to ensure that there is a strong communication link between the core groups of the PHCI.

**Agriculture and land management group**

An agriculture and land management group formed in January 2014 after six months of consultation and wider stakeholder engagement. This group is farmer led and works with partner organisations as required, helping to identify solutions to the many agricultural related actions identified in the Catchment Plan. The group meets on a quarterly basis and encompasses existing groups such as the Catchment Sensitive Farming steering group and provides a single farmer led group in the catchment to tackle issues relating to the water environment.

**Governance group**

The governance group comprises staff from the regulatory and funding organisations that have the power to influence budgets and staff resources within their own organisations with respect to the PHCI. The group will provide a strategic overview and support the steps taken towards achieving the goals that have been agreed. The group will also feed back the outputs to their relevant boards and to the South West River Basin Liaison Panel.
Task groups

Task groups are set up to carry out work that needs more detailed or specialist attention. Each task group will be set up by the steering group and incorporate individuals or organisations with a particular interest, knowledge or influence in the subject of the group. At present, a monitoring task group has been established. For more information please go to Appendix I.

Partners’ shared vision

- **Sustainable** farming, development, water use and sewage treatment that supports healthy rivers and groundwater in the Poole Harbour catchment.
- **Recognition** of the ecosystem services that the catchment can provide and adequate payment to those that manage the land to provide these services.
- **Improvements** to biodiversity habitats both in the form of naturally functioning rivers, floodplains and wetlands and appropriately located woodland and low-input grassland.
- **Achievement** of national environmental standards for the benefit of wildlife and users of these waters and Poole Harbour.

This report:

(i) outlines the engagement and collaborative working process followed by the initiative
(ii) provides an introduction to the catchment, agreed issues, existing activity and its effectiveness
(iii) explains the decision making behind proposed solutions and highlights barriers to delivery
The Frome and Piddle pilot engagement process

A catchment co-ordinator was appointed in November 2011 and a variety of stakeholder engagement events and meetings were arranged during the pilot stage in 2012. Data and information was collated and analysed and reports were produced on behalf of the partners. An independent facilitator was used for many of the workshops.

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<th>Timeline</th>
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<tr>
<td>Inception workshop – stakeholders agree issues and set up steering group</td>
<td>November 2011</td>
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<td>There were 16 individuals from a variety of organisations who discussed and agreed issues, potential causes and effectiveness of existing activity. A steering group was established that met every two months to co-ordinate activity, appraise options, agree actions and decide content and format of the Catchment Plan.</td>
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<td>Stakeholder meeting – to provide opportunity to raise and further discuss issues</td>
<td>February 2012</td>
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<td>Around 100 people including representatives from farming and riparian interest groups, town and parish councils attended a launch event. Presentations and information stands on current issues, existing activity and how we are working collaboratively were provided along with a question and answer session and opportunities to raise further issues.</td>
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<td>Task group workshops – to research issues and activity, set targets and propose actions</td>
<td>May-June 2012</td>
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<td>Topic specific task groups were formed for information gathering and activity mapping. Stakeholders collated and presented evidence on the agreed issues and suggested targets and a potential long list of solutions. Available data was reviewed and local knowledge gathered.</td>
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<td>Landowner representative meetings – discuss issues, potential solutions and funding mechanisms</td>
<td>July-October 2012</td>
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<td>Meetings with the National Farmers Union (NFU) and Country Landowners &amp; Business Association (CLA) took place in Wareham and Dorchester to discuss issues, particularly nitrogen and potential solutions and funding.</td>
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<tr>
<td>Produce framework – evidence base and potential solutions proposed</td>
<td>August 2012</td>
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<td>The state of the catchment was reviewed and key concerns highlighted. Current activity was appraised. A potential solutions matrix was used to demonstrate how potential solutions may address several issues as well as climate change and ecosystems services. A draft Action Plan was drawn up following detailed discussions by task groups and revised by task group leads to produce the final Action Plan. Available at: <a href="http://www.pooleharbourcatchment.co.uk">www.pooleharbourcatchment.co.uk</a> under the downloads section</td>
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<tr>
<td>Cost benefit analysis and workshops to appraise solutions and agree actions</td>
<td>September-November 2012</td>
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<td>Task group leads had prioritised actions and a short list was produced. Options for nitrogen, phosphorus and sediment reduction underwent a scoring exercise options appraisal by the steering group to produce an optimal package of solutions. Cost benefit analysis of options to reduce nitrogen in Poole Harbour by rural policy analysts from the Draft Poole Harbour Nitrogen Reduction Strategy (2012) and options to reduce phosphorus in the Frome catchment by Cascade Consulting (2012), commissioned by Wessex Water, were also used as a guide in the selection of a short list and proposal of an optimal package of solutions.</td>
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<tr>
<td>Produce Catchment Plan and submit to Defra</td>
<td>December 2012</td>
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<td>Draft sent to steering group for comment and refinement</td>
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<td>Optimise existing delivery and implement recommended actions if supported</td>
<td>January 2013 onwards</td>
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<td>Publish and promote plan, co-ordinate further engagement, explore funding mechanisms, support development of catchment monitoring network</td>
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A report of the inception workshop, launch event, meeting minutes and notes are available on request by emailing: info@pooleharbourcatchment.co.uk
Stakeholder workshop.

Launch event.
Location and geology
The area covered by the PHCI comprises all rivers and streams that drain into Poole Harbour and covers a drainage area of approximately 820 km².

The Frome and Piddle river catchments are picturesque rural catchments in the county of Dorset with nationally recognised chalk rivers which are important for their salmon and trout fishing. Both the Frome and Piddle rivers rise in the Dorset Downs and flow through the chalk lands and across clay and gravel deposits to enter Poole Harbour. The geology is mainly chalk with vast unconfined aquifers providing drinking water for the catchment and the surrounding area and also providing the majority of flow for the Frome and Piddle rivers. Older clays and greensand occur mainly in the north west of the catchment with younger tertiary clays, gravel and sand overlaying the confined chalk in the lower catchment.

The Poole area is more heavily populated than the Frome and Piddle catchments and includes large expanses of urban areas to the north of the harbour. The geology to the north of Poole Harbour is underlain by Bagshot Beds, soft sandy strata of Ecocene (early Tertiary) age. These give rise to acid, sandy soils characterised by localised pockets of heath and woodland habitats. Within the layers of sand are beds of ball clay. Near Poole Harbour the chalk lies 100-200m below ground level.

The coastal town of Wareham is located to the west of the harbour, and the Isle of Purbeck area lies to the south west of the harbour. The geology to the south of the harbour is formed by layers that fold and form a high narrow ridge, the Purbeck Hills. Soils are well drained and calcareous grassland and woodland are the dominant features of the landscape. The southern edge of Purbeck drains to the coast and lies outside the Poole Harbour catchment boundary. Tourism is now a leading industry in Dorset, and one of the primary reasons tourists are drawn to Dorset is the attractiveness of the county’s coast and countryside.

Environmental and landscapes features
The area contains many sites of local, regional, national and international importance, with a range of habitats supporting a variety of species.

A substantial proportion of the area is within the Dorset Area of Outstanding Natural Beauty (AONB) which works in partnership to conserve and enhance the natural beauty of almost half of Dorset’s countryside (1128km²). A large part of the catchment is also within the Wild Purbeck Nature Improvement Area (NIA), which is being led by the AONB partnership. The NIA is trialling a partnership approach to deliver enhanced wildlife habitats and community engagement at a landscape scale. It covers the lower part of the catchment but will promote land management advice and habitat creation throughout the Poole Harbour catchment.
Poole Harbour is one of the largest and shallowest natural harbours in the world, with an area of approximately 38km². The harbour is of exceptional ecological value and is protected by a multitude of conservation designations. Central to the ecological value are the intertidal mudflats, sandflats and marshes (80% of area at low water) and the diversity of the shoreline ranging from reed and marsh to sand and shingle. The main freshwater inputs to the harbour are the rivers Frome, Piddle, Corfe and Sherford.

**Population**

There are approximately 200,000 people living in the Borough of Poole and 50,000 people (Dorset County Council, 2011) living in the more rural upper catchments and county town of Dorchester. It is anticipated that the local population within the catchment will rise by a further 25,000 by 2035 given that population is predicted to increase by 10% in this period. The effects of sewage from a rising local population need to be considered in decision making, with particular focus given to the effects this will have on Poole Harbour. Summer visitors can increase the population significantly, and are predicted to increase waste discharges by a further 13% in Dorchester and 80% in Wareham (using Wessex Water estimates for 2035).

**Farming and the environment**

More than 75% of the land within the catchment is used for agriculture which is almost equally divided between arable and pasture and on a par with the national average. Cereals are dominant over the chalklands with more dairy and beef farming in the west and in the lower floodplains. Farming now accounts for approximately 5% of Dorset’s economy with the annual gross output equating to £306 million and the GVA reaching £112 million (NFU, South West 2013). There are more than 5,974 people directly employed in agriculture in Dorset which equates to 9.8% of the South West’s farmworkers.
Poole Harbour

Poole Harbour is designated as a ‘Protected Area’ under the Water Framework Directive, because of its European nature conservation designation as a Special Protection Area for birds. The intertidal habitats and coastal waters of Poole Harbour are also of significant nature conservation value. The heathlands bordering large parts of the shoreline are designated as a ‘Special Areas of Conservation’ under the Habitats Directive.

Poole Harbour is classified as a transitional waterbody (under the WFD) and flows into the Dorset-Hampshire coastal waterbody. The harbour is highly eutrophic, classed as moderate for both dissolved inorganic nitrogen (DIN) and opportunistic macroalgae. There is a very clear ecological disturbance from the excess of nutrients in this system; and it is also failing for chemicals (tributyl-tin compounds). The Dorset-Hampshire coastal waterbody is also currently failing for nitrogen. It is felt that potential improvements made to upstream waterbodies (Poole Harbour) could result in an improvement to the nitrogen status of this larger coastal waterbody.

Poole Harbour is classified as a heavily modified transitional water body under the WFD because of its modification for coastal protection and navigational purposes. Objectives have been set to achieve ‘Good Ecological Potential’ and actions are being identified to mitigate for the damage caused by modifications, so the harbour’s ecological potential can be realised.

WFD Transitional and Coastal Waterbodies

Lytchett Bay, Poole Harbour.
The following designations and legislation are also applicable to Poole Harbour:

- Poole Harbour is designated under the Ramsar Convention as a wetland site of international importance. The habitats and species it supports are protected through the requirements of the Special Protected Areas and SSSI designations.

- Poole Harbour is also designated as a Special Protected Area (SPA) under the Birds Directive. This is to protect the internationally important wetland bird habitat.

- The heathland bordering large parts of the shoreline are also of European nature conservation importance as Special Areas of Conservation under the Habitats Directive.

- There are two designated bathing waters within Poole Harbour and outflows from the harbour influence the bathing water quality of nearby beaches. None of the bathing waters are currently considered to be at risk and are meeting the required standards of the revised Bathing Water Directive.

- The Environment Agency is responsible for implementing the Shellfish Waters Directive (2006) which protects and, where necessary, improves the quality of waters to ensure the provision of high quality edible shellfish products. There are three designated shellfish waters within Poole Harbour and the most westerly one is currently failing to meet the required standards, failing for faecal coliforms in shellfish flesh. The Poole Bay Shellfish Water Area (outside the harbour) is currently compliant.

- Poole Harbour was designated both a Sensitive Area (Eutrophic) under the Urban Waste Water Treatment Directive and a Polluted Water (Eutrophic) under the Nitrates Directive in 2002. As a consequence, nitrogen stripping was installed at Poole sewage treatment works in 2008 (with a discharge consent of 10mg/l).

Water supply and treatment

Wessex Water is the main public drinking water and sewage treatment provider in the catchment although there are also private water supplies and private sewage treatment (including septic tanks). Wessex Water holds 13 abstraction licences for drinking water and operates 21 sewage treatment works in the Poole Harbour catchment. Public water supply is sourced from the chalk aquifer. Waste water is returned through sewage treatment works and septic tanks to the aquifer, rivers and direct to Poole Harbour.

Ecosystem services provided by the catchment

Ecosystem services are the processes by which the environment produces the resources that we value, such as clean air, water, food and well-being. It includes carbon sequestration in soils and vegetation, reduced flood risk, biodiversity, aquifer recharge, water quality and recreation.

Where the ecosystem services can be identified and valued, alternative funding sources may be accessed and there are opportunities for landowners to be paid appropriately by beneficiaries to steward and enhance these services as well as provide food. Such schemes are known as payments for ecosystem services (PES). These often involve a broker such as an environmental or rivers trust.

A feasibility study was conducted by the RSPB in 2012 to examine the viability of a ‘nitrogen trading’ payments for ecosystem services (PES) scheme around Poole Harbour. There is potential for a nitrogen trading market in the Poole Harbour catchment, created by the legal imperative to protect Poole Harbour Special Protected Area (SPA) from further damage due to nitrogen enrichment. Any new sources of nitrogen from housing development, industry or consented agricultural activity in the catchment must be mitigated by reducing the load reaching the harbour from existing nitrogen sources.

This study investigated the feasibility of a PES scheme in which reductions in existing (and largely agricultural) nitrogen discharges were paid for by those seeking planning permission for new development that would inevitably increase nitrogen loading through the sewerage system. Although there are no technical barriers to a nitrogen mitigation PES, and elements of such a system are now appearing in the catchment, this study found barriers to a scheme paying farmers for establishing long-term land management changes.
Agreed key issues

The pilot engagement process identified five key issues and pressures for the Frome and Piddle catchment. A number of issues were clear, particularly those involving non-compliance with statutory standards. However, we were keen to ensure that issues relevant to all stakeholders living and working within the catchment were identified and not just those specified by the regulators. In particular the steering group identified the five key issues below.

During 2013 the steering group reviewed the five issues and consulted with various stakeholder groups to understand if these issues were also relevant in the extended Poole Harbour area of the catchment. Consultative workshops and meetings confirmed that the key issues also apply to the areas surrounding Poole.

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<tr>
<th>Agreed key issues</th>
<th>Reported cause</th>
<th>Type</th>
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<tr>
<td>Nitrogen*</td>
<td>Sewage (treatment works, CSOs, septic tanks)</td>
<td>Current</td>
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<td></td>
<td>Agriculture (land use and management)</td>
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<tr>
<td>Phosphorus</td>
<td>Sewage (treatment works, CSOs, septic tanks)</td>
<td>Current</td>
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<td></td>
<td>Agriculture (land use and management)</td>
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<tr>
<td>Sediment</td>
<td>Agriculture (land use and management)</td>
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<td></td>
<td>Highways (also acting as ‘pathway’)</td>
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<td>Water quantity</td>
<td>Abstraction (water companies and agriculture)</td>
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<td>High flow</td>
<td>Agriculture (land use and management)</td>
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<td>Low flow</td>
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<td>Channel and habitat alterations</td>
<td>Flood defence</td>
<td>Historical</td>
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<td>Water level management</td>
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<td>Land drainage</td>
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*also viewed as historical/legacy.

Key to steering group opinion of where we are in terms of resolving issue.

- Nowhere near
- Making ground
- Getting there
- Almost sorted
- All fine

Existing literature was reviewed and current data analysed and presented to develop our understanding of these issues. Other issues raised included water temperature (climate change), chemicals including metals, pesticides, herbicides, oestrogen, bacteria (shellfish failure), groundwater flooding, invasive species, access, swan grazing and lack of habitat continuity.

Agreed desired outcomes

In addressing these issues particular desired outcomes were:
- catchment surface water bodies reach WFD good ecological status by 2027
- River Frome and Bere Stream SSSI reach favourable condition by 2020
- catchment groundwater bodies and Poole Harbour to reach good status and favourable condition as soon as feasibly possible
- no drinking water supplies regularly at risk of failing DWI standards
Aligning the Poole Harbour Catchment Initiative in Dorset

There are many existing plans, strategies and groups already being implemented in Dorset. This is partly due to the catchment being heavily designated and protected. To enable us to effectively restore and protect the catchment there needs to be better coordination and shared solutions to achieve the challenging targets set by EU legislation.

What is the role of the Poole Harbour Catchment Initiative?

• **COORDINATION** - One benefit of the PHCI is to help coordinate existing actions to ensure we are all working in the most effective way to benefit the water environment. We need to work together in a strategic approach, with complementary delivery to meet the targets set within our catchment.

• **COMMUNICATION** - The PHCI provides a forum to improve communications between stakeholders. It also acts as a conduit for translating national guidance and improves external communications to help us learn best practice from national and international projects.

• **FACILITATION** - The PHCI is an advocate for the catchment, aiming to secure funding where possible from both local, national and European sources. Adopting a partnership approach strengthens the outcomes and long term viability of projects.

• **PARTICIPATION** - The PHCI engages with stakeholders who have not been involved before. The Initiative recognises that everybody needs to take ownership and buy into the efforts of the PHCI if we are to succeed in protecting the environment, supporting local people and businesses and securing a catchment that will provide for future generations.

• **INNOVATION** - The PHCI brings together stakeholders to identify more innovative and effective ways to deliver improvements in the future for the Local Enterprise Partnership. Solutions need to be both environmentally sustainable and economically viable for the local businesses and people of Dorset.

The PHCI builds on the extensive activity already underway in the catchment. The list below highlights some of the plans that the PHCI is working to align with:

- Strategy for Managing Nitrogen in Poole Harbour to 2035, EA/NE led document
- Biodiversity 2020 – national strategy for halting biodiversity decline
- Local Plans – local development strategies
- Poole & Wareham Coastal Erosion Strategy
- Wild Purbeck Nature Improvement Area (NIA)
- Poole Harbour Commissioners – Poole Harbour Aquatic Plan
- Dorset Area of Outstanding National Beauty (AONB) Partnership
- Dorset Wild Rivers
- Dorset Wetland Group
- Dorset Biodiversity Partnership
- Dorset Local Enterprise Partnership
- Dorset Local Nature Partnership
- Watercress Growers Association
- Local fishing clubs

Key Partnerships and Groups that the PHCI is working with or keen to be more involved with:

Dorset farmland, Upper Frome.
### Some of the existing actions within the catchment

<table>
<thead>
<tr>
<th>Lead partner(s)</th>
<th>Key issue</th>
<th>Existing actions within the catchment</th>
</tr>
</thead>
</table>
| **Catchment Sensitive Farming (CSF)**  
**Natural England** | Land use and management | CSF provides specialist free advice and training to farmers to help them address the risks and issues associated with diffuse pollution on their holdings. The range of advice on offer includes:  
- Infrastructure – relating to clean and dirty water separation around farm yards and buildings, slurry and manure handling and storage  
- Soil Husbandry – assessing soil structure and overcoming problems relating to their soils; compaction and related runoff and erosion from both arable and grassland  
- Nutrient and manure management – helping to plan applications of organic and inorganic fertilisers at the appropriate times and rates to ensure optimum take up for their crops as well as minimising potential for any losses.  
CSF also helps farmers ensure they are compliant with regulation in particular nitrate vulnerable zones and cross compliance. There is an annual CSF capital grant scheme which farmers can apply for. The project, which has been running since 2006, is a voluntary approach and is currently funded until 2014 although it is likely to be extended beyond this time but the format is not yet known. |
| **Catchment management approach/source protection**  
**Wessex Water** | Land use and management | The Wessex Water catchment management team provides free best-practice advice, local soils and water quality data and agronomic assistance to farmers near some of their groundwater sources, including Empool, Eagle Lodge, Winterbourne Abbas and Hooke sources (source protection). Assistance is provided on optimal fertiliser application, point source issues, agricultural management plans and targeting relevant funding sources.  
The aim is to reduce nitrate levels at public water supply sources which are at risk of failing drinking water standards. It builds on knowledge gained from the previous initiative: Water Resources Management in Cooperation with Agriculture (WAgriCo) and is funded until 2020. |
| **Diffuse pollution work**  
**Environment Agency**  
*(helping to deliver the Strategy for Managing Nitrogen in Poole Harbour catchment, to 2035)* | Land use and management | The EA and Natural England have undertaken a strategic review of the Poole Harbour catchment. Analysis of current diffuse activity has helped to come up with options for delivering required reductions in nitrogen within the Poole Harbour catchment. The strategy will be delivered via two implementation plans, one that will focus on diffuse pollution and one that will address point source pollution. Many stakeholders are involved and they are currently discussing how this strategy can be delivered largely through voluntary approaches.  
Diffuse water pollution plans for the River Frome and Bere Stream SSSIs are also being developed.  
The EA are funding specific work within the catchment to pilot approaches and identify the best ways that we can meet the diffuse standards within the strategy. |
| **Environmental Stewardship Schemes/New Environmental Land Management Schemes**  
**Natural England** | Land use and management | Environmental stewardship (ES) payments have been available for a range of measures including options for livestock reductions for low input permanent grassland, wetland creation and grants for cover crops. Natural England advisers are working with CSF and the Farming and Wildlife Advisory Group South West (FWAGSW) to promote and encourage greater uptake of ES in the Poole Harbour catchment and Wild Purbeck NIA. |
<table>
<thead>
<tr>
<th>Lead partner(s)</th>
<th>Key issue</th>
<th>Existing actions within the catchment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wild Purbeck NIA (Nature Improvement Area)</strong> Partnership</td>
<td>Land use and management</td>
<td>The NIA plans to restore 120 hectares of heathland by removal of conifer plantation and tree invasion in the lower part of the catchment and adjoining catchments in Purbeck. The loss of woodland cover will be compensated by the creation of new woodland in more suitable locations elsewhere in the catchment with a target of 15 hectares of planting over the next three years. A further 30 hectares of shrub and tree planting has been identified as compensatory habitat due to sea level rise as part of the Poole and Wareham Coastal Erosion Strategy. The EA tree and shrub planting strategy for the Frome uses opportunity mapping to guide the location of new woodland including riparian and bankside trees.</td>
</tr>
<tr>
<td><strong>Wessex Water projects</strong></td>
<td>Wastewater investigations</td>
<td>Investigations into the impact of Wessex Water sewage treatment works on Poole Harbour and the River Frome and Bere Stream SSSI have been completed. The outcomes have been incorporated into the Wessex Water business plan for 2015.</td>
</tr>
<tr>
<td><strong>Environment Agency projects</strong></td>
<td>River restoration</td>
<td>The River Frome Rehabilitation Plan is an Environment Agency led project that delivers rehabilitation works to the river channel throughout the Frome SSSI. It involves a technical advisory group of appropriate stakeholders and is funded until 2018.</td>
</tr>
<tr>
<td><strong>Dorset Wild Rivers Partnership</strong></td>
<td>River restoration</td>
<td>Dorset Wild Rivers is a partnership project led by Dorset Wildlife Trust (DWT) to deliver improvements to rivers and their associated wetland habitats across the chalk rivers of Dorset and particularly tributaries in the Frome and Piddle catchment. It is currently funded until 2015.</td>
</tr>
<tr>
<td><strong>Fish related projects on the River Frome, Piddle and Sherford</strong> EA, WRT, GWCT, FP&amp;B DFA and landowners</td>
<td>Fish pass, habitat improvement and fish passage improvements</td>
<td>Close working between the: Environment Agency, riparian owners, fishing clubs, the Association of Rivers Trusts, Westcountry Rivers Trust (WRT), Game &amp; Wildlife Conservation Trust (GWCT), the Frome Piddle and West Dorset Fisheries Association and the Salmon and Trout Research Centre collectively deliver habitat improvement works and implement the removal or by-passing of barriers to fish migration. The GWCT continues long–term collection of the high quality data needed to allow efficient management of salmon stocks.</td>
</tr>
<tr>
<td><strong>Catchment Abstraction Management Strategy (CAMS)</strong> EA</td>
<td>Water quantity</td>
<td>The Catchment Abstraction Management Strategy (CAMS) ensures sufficient water is available for all users. Investigations into the impact of abstraction on the lower Piddle, Bere Stream, Devils Brook and Hooke are being completed and outstanding questions will be investigated by Wessex Water from 2015.</td>
</tr>
<tr>
<td><strong>Catchment Flood Management Plan (CFMP)</strong> EA</td>
<td>Water quantity</td>
<td>The CFMP sets out actions to manage flood risk and includes policies on mitigation options for different areas of the catchment.</td>
</tr>
<tr>
<td><strong>River Frome SSSI Water Level Management Plan</strong> EA</td>
<td>Water quantity</td>
<td>The River Frome SSSI Water Level Management Plan includes flow apportionment for multiple channels and involved stakeholders in decision making to ensure sufficient water is available for all interest groups.</td>
</tr>
<tr>
<td><strong>Catchment Information Pack (CIP)</strong> EA</td>
<td>General</td>
<td>A review produced by the Environment Agency for the Poole Harbour catchment outlines the work that will be required to achieve good ecological status under the WFD.</td>
</tr>
</tbody>
</table>
Nitrogen

Nitrogen was agreed to be a key issue by the steering group. The evidence, agreed targets and existing activity around this subject is outlined in this section.

What is it?

Nitrogen (N) is a chemical element that constitutes 78% of the earth’s atmosphere. It is a nutrient that is essential for plant growth taken up in the form of nitrate (NO$_3^-$) which is an ion that forms inorganic salts that are soluble and therefore invisible in water. Please note that the terminology used in this report refers to both nitrogen and nitrate.

What is the problem?

Nitrogen levels have shown an increasing trend in rivers and groundwater.

The concentration of nitrate in the River Frome currently averages around 6.5mg/l and historically was only around 2mg/l in 1965. (Note: multiplying concentration by flow allows loads to be calculated).

- High nitrate levels have led to the growth of dense algal mats in the Poole Harbour Special Protection Area. The mats can smother natural vegetation and invertebrates that protected birds feed on. Nitrates are a cause of the failure to meet favourable condition status and WFD standards.

- High nitrate levels have also caused deterioration in SSSI wetland habitats due to excessive growth of rank vegetation such as nettles. The effect in rivers is uncertain and there may be an impact on water crowfoot (Ranunculus) and river bed algae (diatoms/phytobenthos).

- Nitrate levels in the Upper Dorset Frome Chalk (groundwater) and Lower Frome and Piddle (groundwater) fail to meet ‘good’ status according to the WFD standards and have a ‘rising status’. This trend is likely to be reflected in the increasing nitrate concentrations in rivers as they receive their baseflow from the groundwater. Rivers contribute the largest nitrate loading with 73% of nitrates in the harbour being derived from surface waters, 19% from the English Channel and 8% from direct discharges.

- There are 13 public water supply sources in the Poole Harbour catchment, six of these sites have previously exceeded the Drinking Water Standards of 50mg/l as NO$_3^-$ or 11.3mg/l as N. Six sites are currently at risk of exceeding this standard, three sites have elevated nitrate levels but are stable and four sites pose no threat. Nitrates are so high at the Langdon public water supply source that it is no longer used. The Milborne St Andrew source is not used in winter when the nitrate level in the water is at its highest.

- Wessex Water has previously worked with the Drinking Water Inspectorate (DWI) to ensure that all water supply sources comply with the drinking water standard. Many of these have been identified as Safeguard Zones where measures to reverse rising nitrate trends need to be implemented. At these water supply sites within the catchment the DWI has supported Wessex Water implementing the catchment management approach (P14) instead of installing treatment. The catchment management
approach will be implemented at more sites within the catchment during the next water company business plan (2015-2020) subject to approval from Ofwat; these sites include Alton Pancras (Upper Piddle), Forston (Lower Cerne) and Milborne St Andrew (Bere Stream).

Where does it come from?
An estimated 80% of nitrogen in Poole Harbour is from agriculture and 15% is from sewage treatment works.

Nitrogen from fertiliser and manure leaches into chalk groundwater but can also enter rivers directly as run-off over land or via drains and other routes during storm events. Leaching is the main source with a time lag of up to 30 years in some cases on the higher land of the chalk downs where the water table is low and there is much chalk strata for the water to percolate through.

What are the future trends?
Nitrogen loads entering the harbour are forecast to rise further as a consequence of historical farming practices from 30 years ago. These loads are expected to peak between 2020 and 2030 and stabilise at around 2,300 tonnes N/yr. There is also future pressure from a predicted population increase of around 25,000 people in the Poole Harbour catchment by 2035. This is estimated to result in 21 tonnes of additional nitrogen per year via sewage treatment works.

Nitrogen targets
A number of targets have been set through the Strategy for Managing Nitrogen in Poole Harbour catchment to 2035
• the greatest nitrate reductions in the catchment are required from diffuse agricultural sources. The Strategy recommends; a target to reach 1,730 tonnes of nitrogen per year.
• all new development (residential and commercial) should not result in any net increase in nitrogen – requiring a 21 tonnes/year nitrogen reduction based on population estimates for human waste water affecting Poole Harbour by 2035.
In addition Wessex Water and the Environment Agency have a target to manage nitrate levels in water sources so that treatment plants to remove the nitrate are not required.


![Algal growth in Poole Harbour 2010. Natural England.](image)
**Existing activity**

Nitrogen removal already takes place at Poole sewage treatment works that discharges to Holes Bay, which results in a reduction in the order of 240 tonnes per year. This plant was very expensive to build (£12m) and has high operating costs and high greenhouse gas emissions. As the catchment is designated as a nitrate vulnerable zone, this has helped to contribute to reducing the total nitrogen load. However, modelling indicates that the current action programme will only deliver a small percentage of the target reduction.

Reductions in nitrogen are likely to have occurred due to the provision of agri-environment advice and grants in the target areas. Reduction has also been observed in most groundwater sources where the Wessex Water catchment management team has engaged with farmers and worked with Catchment Sensitive Farming to minimise nutrient inputs on a voluntary basis. But this only applies to a relatively small area of the Poole Harbour catchment and the targets require reductions beyond the drinking water standard.

**Steering group views**

The steering group consensus was that we were ‘nowhere near’ reaching these targets and as such nitrate is the most pressing issue facing the catchment. Existing activity will be insufficient to solve the problem and a significant change in approach is required to deliver long-term solutions.
Eagle Lodge nitrates – a case study

Eagle Lodge is a groundwater source that supplies the Dorchester area. The raw water from the boreholes failed the Drinking Water Inspectorate nitrate standard at times in 1999 and in 2001.

In 2004 a nitrate removal plant was planned and designed for Eagle Lodge. However, the high construction and running costs of a nitrate plant, and the need for additional land to build the plant, led Wessex Water to look at a catchment management option for the source. This started in 2005 following a series of dry winters when nitrate peaks regionally had been lower than in previous years. The objective was to optimise nitrate inputs in the catchment to the extent that under high groundwater situations nitrate peaks remained well below the nitrate standard.

The catchment adviser made contact with the farmers explaining the nitrate problem to them, obtained farm records, identified specific issues and developed a good working relationship with them. This allowed the adviser to suggest changes in farming practice that included improved nutrient and manure management, calibration of fertiliser spreaders, altered drilling dates of autumn sown crops, use of winter cover crops and the adoption of resource protection measures under environmental stewardship. Many farmers took up these options, assisted between 2005 and 2008 by a European jointly funded partnership, the Water Resources Management in Cooperation with Agriculture (WAgrico), that included the National Farmers Union.

Since 2006, with a return of some wetter winters, there have been some nitrate peaks, but well below the drinking water standard limit and the levels seen before catchment management started.

Working with farmers, Wessex Water.
Phosphorus

Phosphorus was agreed to be a key issue by the steering group. The evidence, agreed targets and existing activity around this subject is outlined within this section.

What is it?
Phosphorus (P) is a highly reactive chemical element and a nutrient that is essential to plant growth. It is measured in a number of forms:
• ortho-phosphate is phosphorus in a solution form available to be taken up by aquatic plants and algae;
• total phosphorus includes soluble phosphorus and insoluble phosphorus adsorbed to or within sediment and organic matter in the water;
• soluble reactive phosphate is similar to orthophosphate being the form most easily used by plants and used to set targets.

Targets for the WFD and SSSI levels of phosphorus are under national review. River phosphate targets are changing in accordance with revised national standards for all rivers, SACs and SSSIs.

What is the problem?
Ortho-phosphate concentrations peaked in the River Frome in the early 1990s but have decreased over the past 20 years, mainly due to phosphorus removal using chemical treatment (iron dosing) at Dorchester and Wool sewage treatment works. Some decline has probably also occurred, such as the decline in the use of phosphorus in fertilisers and better manure management practices.

While levels are now close to the annual average target there remains a number of key issues.
• High summer ortho-phosphate levels within the river, especially when combined with low flow velocity, can lead to excessive algal growth. This can potentially reduce oxygen concentrations in the water which can affect the growth of plants and the ecology of the entire ecosystem.
• Ortho-phosphate is not consistently at sufficiently low concentrations to meet favourable condition standards that are required on the River Frome and Bere Stream SSSIs particularly during the summer growth season and periods of wet weather.
• The Lower Frome and Lower Piddle WFD (2013) class is ‘Poor’ for diatoms (river bed algae) and ‘Moderate’ for macrophytes (aquatic plants). The Environment Agency is investigating why plants and diatoms are not meeting good ecological status within the rivers Frome and Piddle. It should be noted that the diatom assessment method is currently being updated; therefore the results and status classes may change in the future.
• The River Sherford and Corfe Streams are at WFD ‘Moderate’ class for ortho-phosphate in 2013. The River Sherford’s current failings have been confirmed as point source with suspected diffuse inputs from other sources such as private domestic sewage and agricultural runoff. The Corfe River is currently failing due to a more even distribution of point source and diffuse sources. Source apportionment analysis shows that 67% of phosphorus within this sub catchment comes from diffuse sources.

Ortho-phosphate concentrations at East Stoke 1965-2014.- Data provided by CEH. Copyright NERC, CEH & FBA

Red line indicates the maximum annual and growing season (March-September) average concentration required along the River Frome SSSI for favourable condition of the chalk river habitat and species of special interests. It approximates high class under the WFD.

Green represents the rolling average.
Where does it come from?

Previous investigations and studies have shown the main sources of phosphorus in the River Frome and Piddle are:

**Diffuse sources** including agricultural land (manure, fertiliser, soil and sediment) and septic tanks. It can be washed into rivers along critical flow pathways during heavy rainfall events and dissolved phosphorus can also leach into rivers along sub-surface flow pathways. This is estimated to account for around 64% and 77% of phosphorus load to the Rivers Frome and Piddle respectively. Once in the river bed, phosphorus can be released from the sediment into the water.

**Point sources**, primarily sewage treatment works. These come from human and trade waste and include detergents. This has been estimated to account for around 36% and 23% of the total phosphorus load to the Rivers Frome and Piddle respectively. Other point source discharges within this catchment include fish farms and watercress farms.

For the River Frome the total point source inputs have been estimated at 8 tonnes per year and the total diffuse inputs at 15 tonnes per year. The ortho-phosphate concentrations during the aquatic plant prime growing period (March-September) are of most concern. Concentrations have historically been highest in the summer during low flow periods when sewage treatment works effluent makes up a higher proportion of the flow. There are still relatively large peaks of high concentrations and loads that occur sporadically within the catchment, particularly during rainfall events.

There are fish farms on the River Hooke, River Cerne, Tadnoll Brook and Sydling Water and several watercress farms on the Lower Frome, Tadnoll Brook, Sydling Water and Bere Stream. Although the total load delivered by these may be low they may be responsible for intermittent high concentrations particularly during low flow periods.

It is estimated that there are more than 3,500 unsewered properties in the catchment that may have septic tanks discharging to ground or to the river. The majority of those discharging to ground have phosphorus bound up by the chalk.

Those discharging to watercourses are estimated to contribute a very low total load but may be responsible for high concentrations in small watercourses in upper sections of the rivers during low flow periods.

Unexplained high concentrations of mainly biologically available ortho-phosphate, unrelated to rainfall, have also been identified during the summer of 2011 and 2012. This has been done using Wessex Water continuous monitoring equipment on the River Frome at East Stoke and suggests un-permitted discharges that the Environment Agency is investigating.
Phosphorus targets

- River Frome SSSI (Dorchester to Wareham) and Bere Stream SSSI shall meet SSSI targets by 2020; ortho-phosphate is no more than 50 ug/l P as a growing season average (March-September) and no more than 50 ug/l P as an annual average.
- All rivers in the catchment to reach WFD Good Status for ortho-phosphate by 2021, or by 2027 at the latest.


The UK Technical Advisory Group (TAG) has recently published new target guidelines for phosphorus in freshwater bodies. It is believed that if these chemical standards are achieved in water bodies then the relevant biology to achieve good status would be supported. The current standard for ortho-phosphate to achieve good status is 120ug/l, the new standard proposed is site specific.

Below are the new specific ortho-phosphate boundary values for annual means for the main rivers in the catchment to achieve 'good ecological status'.

<table>
<thead>
<tr>
<th>River/Tributaries</th>
<th>Current WFD Good class target ug/l P</th>
<th>Proposed WFD Good Class boundaries (Calculations based on revised UK TAG recommendations) ug/l P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frome and main tributaries</td>
<td>120</td>
<td>69-91</td>
</tr>
<tr>
<td>Piddle and main tributaries</td>
<td>120</td>
<td>74-93</td>
</tr>
<tr>
<td>Sherford</td>
<td>120</td>
<td>84-86</td>
</tr>
<tr>
<td>Corfe</td>
<td>120</td>
<td>85</td>
</tr>
</tbody>
</table>

Proposed change in WFD ortho-phosphate standards (Good moderate class boundaries)

Explanation of natural variation in phosphorus levels along rivers in the catchment

Phosphorus is at higher concentrations in the upper sections of rivers in the Frome and Piddle catchments. Reasons include:

1. Groundwater arises from greensand aquifers in the upper catchment. Phosphate concentrations in greensand vary considerably and require further investigation as there is some debate as to the proportion derived naturally from ‘phosphatic’ bands (fossilised bone); the proportion derived from human activity such as farming; and the influence of dilution from low phosphorus groundwater in the overlying chalk geology. Research is ongoing but the influence of greensand suggests that proposed new national standards may be unachievable on some headwaters in the Frome catchment.

2. Phosphorus is at low concentrations in groundwater from chalk aquifers because the ortho-phosphate in solution readily binds to chalk as the water percolates through the aquifer. The relative contribution of groundwater to river flow increases with distance downstream and this provides a diluting effect. There may also be some binding of phosphorus to iron rich deposits within the clay and gravel deposits in the lower river channel.

3. The higher slopes and clay soil types in the upper sections of both catchments mean these areas are more vulnerable to soil erosion with associated particulate phosphorus and leaching of dissolved soil phosphorus.

Existing activity

To reduce diffuse phosphorus levels Catchment Sensitive Farming (CSF) along with FWAGSW has assisted many farmers in developing soil and manure management plans.

Over the last two years the Piddle catchment has been the focus of a lot of work through CSF looking at mitigation measures on farm tracks (to remove pollutant pathways) which should help to reduce diffuse phosphorus.

The improvements at Dorchester and Wool sewage treatment works have been achieved using conventional iron dosing to reduce total phosphorus to below a 1mg/l annual average final effluent concentration that is discharged to the river. This has reduced total phosphorus input to the River Frome by over 28 tonnes/year. The current estimate of phosphorus being discharged is 8 tonnes/year.

Steering group view

The steering group consensus was that we are ‘getting there’ for phosphorus but further reductions are required from diffuse sources throughout the catchment. Some of the smaller settlements, hamlets and farms are not connected to the main sewerage system. This can increase ortho-phosphate concentrations where treated wastewater is discharged directly into streams and needs to be considered in future improvements within the catchment. The steering group also needs to be aware of the potential contribution of phosphorus from local urban development.

Phosphorus is still just above target levels for the River Frome SSSI so options are being appraised for phosphorus removal at sewage treatment works in the Frome catchment and more sustainable approaches such as reed beds/constructed wetlands and catchment management are favoured if technically feasible. It is the intention to install phosphorus treatment in the next Wessex Water asset management plan period (2015-2020) at Maiden Newton, subject to the approval of Ofwat.
In 2010 Wessex Water set up a trial at Somerton sewage treatment works looking at sustainable phosphorus removal.

National and European legislation may require phosphorus removal at hundreds of sewage treatment works across the UK and this trial hopes to provide a sustainable solution that may be applied in many areas, including the Poole harbour catchment.

Traditional methods of phosphorus removal at sewage treatment works involve chemical precipitation (iron dosing) which requires high start up costs, resource implications, and continuing running costs that include frequent transport of chemicals and transport of the sludge produced, resulting in a high carbon footprint.

The trial at Somerton consisted of six reedbeds, each containing a different media, being constructed and planted with reed mace *Typha latifolia*. Each bed then received secondary treated effluent from the sewage treatment works. The trial began in 2010 and the results using steel slag media (a by-product of the steel industry), which adsorbs the phosphorus, are promising.

Phosphorus levels in the final effluent during the summer months were less than 2mg/l of ortho-phosphate when using steel slag media in the reed bed.

Initial results suggest the media requires replacing every 4-5 years and finding a use for the media once the phosphorus removal properties have been exhausted is being explored.

The reedbeds need a relatively large land area and the use of seasonal consents requires consideration. More sustainable alternatives to concrete for lining the reed beds also needs to be reviewed.

The trial has been funded by Wessex Water with support from the Environment Agency and Natural England which are both keen to see more sustainable ways to reduce phosphorus levels in the environment. Findings suggest that this is a relatively cheap and sustainable option for phosphorus removal at a small scale which is very accessible to different organisations and individuals and can provide widespread environmental benefits.
Sediment was an agreed key issue by the steering group. The evidence, existing activity and agreed recommendations are outlined in this section. The River Frome SSSI fails to meet favourable condition assessment for suspended solids and siltation is cited as a reason for failure of the Bere Stream SSSI. Siltation of gravel has also been considered a significant cause of poor trout and salmon numbers.

**What is it?**

Sediment refers to any substance that does not readily dissolve in water. It arises from erosion within the channel and also soil and organic run off from the land. It can be measured directly in water samples as suspended solids and turbidity, or as deposited particles on, or in, the stream bed. Its movement through rivers is important for ecosystem successional processes. It is trapped by plants and debris and settles out in areas of low velocity.

While sediment describes a wide range of particle size and geological or organic make up, in the Poole Harbour catchment, fine sediment (silt) has been identified and agreed as the key issue. Fine sediments can affect the biota through:

- physical smothering when it settles
- damage to fish and invertebrates when in suspension (eg, gill damage)
- reduction in light penetration and alteration to macrophyte communities (when both settled and in suspension)
- transport of associated chemicals and nutrients (eg, phosphorus)
- oxygen depletion can occur when increased breakdown of organic silt by micro-organisms takes place.

However, fine sediments can also form an important habitat for biota and the growth of aquatic plants, as well as juvenile lamprey which is an SAC species.

**What is the problem?**

The quantity and distribution of fine sediment is determined by the total input, plus the turbulence and velocity of the water, both of which are affected by many factors. These include, the river discharge or flow, channel morphology, gradient, and channel bed roughness (including plant growth). Fine sediments also carry other pollutants such as harmful chemicals and phosphorus, which can lead to algal blooms in the rivers.

Fine sediment distribution will vary throughout the year as discharge and vegetation vary. Importantly, the ecological consequences of fine sediment will depend on the coincidence of siltation with the lifecycle of the aquatic species that depend upon the river habitat. For example, when salmon lay their eggs upstream in small gravel beds (redds), the deposition of fine sediments can reduce their spawning success.

Fine sediments that are not retained by river dynamics or deposited in the floodplain during flood events will ultimately end up in Poole Harbour where its deposition in the navigation channels necessitates dredging. Sediments can also carry bacteria (including faecal indicator organisms) and may account for failures of shellfish waters in Poole Harbour.

There are periods when sediment concentration and the load of sediment in rivers within the catchment is much higher than normal, generally during high rainfall events. There is a reasonably strong seasonal pattern with the highest concentrations in rivers within the catchment generally seen in winter in response to rainfall. Low concentrations of fewer than 5 mg/l are usually recorded during late summer/low flows but heavy summer rainfall, can also lead to high sediment concentrations.

**Where does it come from?**

The catchment has been well researched for sediment following the lowland catchment research programme (LOCAR) and England Catchment Sensitive Farming Delivery Initiative (ECSFDI) monitoring programmes. These have installed sediment collection chambers or made use of event monitors that are triggered to take a sample at times of high flow and undertaken sediment fingerprinting to determine the source of the sediment.

Sediment movement is a natural feature of river geomorphology. However, excessive river sediment can be derived from surface soil supporting cultivation, pasture with high stocking levels, erosion of road verges, river channel banks eroded by livestock, and from subsurface sources via artificial drainage. Roads and farm tracks also act as pathways to transfer sediment to rivers.

The Hooke, Cerne, Tadnoll and Win sub-catchments all showed similar relative contributions. On the River Win around 10% of sediment was from roads, which was likely to originate in fields. Erosion from land and channel banks is a natural process and a rise in suspended solids in rivers, associated with higher rainfall, is expected with the annual load dependent on annual rainfall.


The results indicate that much of farmers’ top soil is ending up in the rivers and ultimately Poole Harbour. The aggregates industry has also been reported as a source on the River Frome and Tadnoll Brook.

It should be noted that the Bere Stream sub-catchment of the River Piddle does not appear to have the same input from agriculture with around a third of the sediment originating from damaged road verges and nearly two fifths from within the channel. Cultivated and pasture land contributed less than 5% each. This may reflect the lake at the top of the catchment acting as a silt trap.

The Bere Stream is regarded as one of the few remaining examples of a natural chalk stream in its lower section. It has much riparian wetland and woodland in this section, which may also act as natural mitigation to intercept run-off from agricultural land but may also lead to the retention of sediment amongst woody debris within the braided channel.


Can we predict the potential for sediment loss?

There are a number of models that can calculate the potential run-off from land use, topography, soil and rainfall parameters. These models can estimate the catchment sediment yield and are very useful for predicting the effects of agricultural measures. They provide useful tools for prioritising areas of the catchment for engagement and application of measures, especially for estimating multiple benefits. However, they tend to estimate agricultural sources of sediment and do not predict the more local impacts of silt, whether in suspension or settled, or its direct effect on the ecology. The PHCI Agriculture & land management group and Monitoring task group are keen to understand more about how these models can be used by the PHCI in future planning and decision making within the Poole Harbour catchment.

Maize cultivation, intensive dairy and ploughing on steep slopes in the upper catchment have been reported to produce very silty run-off during high rainfall events. Salad cropping in the lower catchment can have a similar effect.
Sediment targets
During 2013 a Monitoring task group was formed which encapsulates partner organisations and local expertise from the PHCI. The group agreed that the success of measures to reduce loss of sediment from: land; through septic tanks; through highways and; through point sources (like sewerage) will be best demonstrated by a ‘weight of evidence approach’. This will allow both local and catchment wide effects to be detected over the medium and long term. Therefore, the revised target for the Poole Harbour catchment is to:

• achieve a sustained reduction in sediment in rivers within the catchment.

A monitoring plan will be developed which incorporates the existing strategic and project level monitoring within the catchment and seeks to fill the gaps in data by partner cooperation. A citizens science programme which engages landowners, farmers and fishermen will be explored to monitor both local projects and measures the success of the Catchment Plan.

Existing activity
Catchment Sensitive Farming (CSF) has been successful at reducing sediment from diffuse sources within the catchment through mitigation measures including soil and manure management plans, changes in cultivation practices, encouragement of minimum tillage, siting of high risk crops, establishment of buffer strips, localised stream fencing and re-siting of gates and pathways.

The Piddle Tracks Project is most notable in having undertaken significant remedial works to a number of tracks totalling some 13.5 km down the Piddle valley. This initiative has been a collaborative approach between farmers, local authorities, anglers, CSF and the Environment Agency. Removal of the potential for sediment run-off via these pathways to the watercourse will undoubtedly provide huge benefits to sediment reduction within the Piddle catchment.

CSF has also been working closely with the salad growers in the lower Frome catchment to mitigate the impacts of sediment run-off from their intensive seasonal harvesting period.

Installation of settlement ponds that reduce run-off and remove sediment (and therefore phosphorus) on heathland tank ranges by the Ministry of Defence at Bovington has been successful at reducing sediment input to tributaries of the River Frome but this is very localised. More widespread use of interceptor ponds could link well with best practice advice and woodland creation (where field drains need to be intercepted before entering the watercourse, otherwise the planting will not work).

Steering group view
The steering group consensus was that we are making ground with the issue although some believed we are nowhere near solving it. Further land use change or land management mitigation measures are required, particularly targeting critical flow pathways in high risk areas. Some of the measures proposed for nitrogen and phosphorus reduction will also deliver substantial sediment reductions.
The Win catchment – a case study

The Win catchment has some very large intensive arable and dairy farms on steep land in its upper catchment, on impeded drainage clays. Since 2007 mitigation measures including minimum tillage, buffer strips, and contour ploughing were put in place supported through Higher Level Stewardship (HLS) funding and CSF. This has resulted in a significant reduction in the contribution of sediment input into the catchment from cultivated top-soils from 80% to 4%; from pasture top-soils from 11% to 5%; and from roads from 8% to 1%. In contrast, the relative contribution from channel banks increased from 1% to 90%. These changes in the relative importance of different sediment sources were associated with a 60% reduction in sediment on the river bed.

Source: England Catchment Sensitive Farming Delivery Initiative Phase 2.
River channel and habitat alteration was considered a key issue by the steering group. The evidence, agreed targets and existing activity around this subject is outlined within this section.

What is its importance?
River channels and their associated bankside, riparian and floodplain wetland habitat are important for wildlife and act as corridors for migratory species. They also have inherent aesthetic value and are important from a landscape and recreation perspective, particularly with regard to angling.

What are the problems?
• River channels, bankside, riparian and floodplain wetland habitat have deteriorated in condition. River channels have been over widened, straightened, deepened and embanked with a loss of connectivity with the floodplain. Additional channels have been created, which reduce flow in the main channel.
• Weirs and hatches that have been installed have created barriers to fish and eel migration. These also disconnect river habitat and make reaches more vulnerable to pollution incidents and to the effects of climate change.
• Wetlands have been drained to improve productivity of the land for improved grassland and arable production and there is a general lack of habitat continuity.
• Bank and riparian vegetation has been removed or overgrazed with some tree and woodland removal.
• Invasive non-native species have become established at locations throughout the catchment. This has led to poor habitat quality for fish, mammals, birds, invertebrates and plants including many protected UK and Dorset BAP species such as salmon, otter, water vole and rare chalk stream invertebrate species.
• Poor channel and bankside habitat and/or migration barriers are having negative impacts for fish on parts of the Cerne, Frome headwaters, Lower Frome and Piddle rivers.
• Historic bankside tree removal has reduced shade and is likely to result in higher summer water temperatures that may encourage increased algal production and may be a contributory factor to the WFD ‘poor’ status for diatoms (river bed algae) on the Lower Frome and Piddle. There is also an associated loss of woody debris in the system, which is, an important direct and indirect habitat component.
• The River Frome SSSI fails to meet favourable condition due to channel, bankside and riparian condition. High summer water temperature may also contribute.

What are the causes?
Over the past few hundred years river channels have been modified and altered for a variety of reasons. These include:
• flood defence
• land drainage for agricultural production
• water level management of water meadows using sluices and impoundments
• current land management including high livestock numbers causing overgrazing of vegetation and poaching of banks
• high swan numbers particularly unpaired juveniles that eat in-stream vegetation and locally degrade some sections.

Artificial deep drainage in the valleys and floodplain limits possibilities of river restoration, reduces wetland habitat, reduces aquifer recharge in the upper catchment and acts as a conduit for diffuse pollution. Raised river embankments disconnect the river and floodplain limiting wetland potential and flood attenuation, and reducing the potential for silt deposition on the floodplain.

What are the opportunities?
River and wetland restoration aims to restore the natural state and function of rivers in support of biodiversity, recreation, flood safety and landscape development. It can generate economic benefits from tourism, recreation, flood control and many other services provided by healthy river ecosystems. It can also make significant contributions to flood risk reduction by increasing the natural retention capacity of rivers and their floodplain. Excess water can be absorbed by restoring wetlands and floodplains, former meanders and other natural storage areas. If it occurs at a large enough scale it can improve nutrient reduction, reduce downstream flood risk and potentially increase base flows by improving aquifer recharge.
What are the targets?
Improvements to river channels to achieve:

- good ecological status under WFD for all surface water bodies within the catchment by 2027
- favourable condition for channel morphology and associated wetland habitat on the River Frome SSSI by 2020.

The maps above show habitat quality and habitat modification for sections of the River Frome SSSI. The two measures are combined in assessing river SSSIs for river quality. Conservation requirements are for a high element of pristine/unmodified or, where there is fair or greater modification, the river habitat is high or better quality. The map reveals the patchy nature of degradation and that almost two thirds of the river is of good to excellent quality from a conservation perspective. In the assessment carried out in 2010 a total of 40 sections were favourable and 25 sections unfavourable. The sections that are most modified and have a low habitat quality are those that require addressing and this approach should be applied throughout the catchment.
Existing activity

The River Frome Rehabilitation Plan is an Environment Agency led project within the Frome SSSI, which is supported by Natural England. It works to enhance the river channel morphological structure and improve its ability to function naturally, supporting both in channel and riparian habitat work. A technical advisory group of stakeholders has been established to provide guidance and help to deliver work that enables the river to adapt and be resilient to climate change. The project is constantly looking to build upon and develop the existing techniques used to deliver the works. Some small monitoring such as electro-fishing and fixed point photography has been undertaken to measure and determine the success of the project. The short-term success of the project also relies on anecdotal evidence, but further targeted monitoring would be required to determine the success in the long term.

The River Frome project is currently working with the Forestry Commissions English Woodland Grant Scheme to deliver more than 15 hectares of wetland and woodland habitat creation as part of the Lower Woodsford project.

The Environment Agency has been working in partnership along the River Sherford and recently installed a fish migration easement on a bypass channel. There has also been work carried out to introduce woody debris structures to increase the areas of gravel for spawning sites.

Dorset Wild Rivers (DWR) is a partnership that delivers river habitat improvements across Dorset, led by Dorset Wildlife Trust. FWAGSW is leading on farming and diffuse pollution issues and working with landowners to improve wetland habitats. In the first four years of the project (2010-2013) more than 11 km of the Frome and Piddle and their tributaries have been worked on. This includes 2.5km of the South Winterbourne which was restored, including moving the river back to its natural course and reconnecting it to its floodplain. Eighteen debris dams have been installed on the upper tributaries to create natural channel features and to increase re-wetting of the riparian woodland during peak flood events and to slow down water movement in the catchment.

DWR has carried out numerous projects including a habitat enhancement scheme on Dorchester’s Mill Stream.

Works to enhance the River Frome, Lower Piddle, Sydling Water and River Cerne have included: narrowing sections of rivers; installing mid-channel islands and large woody debris to allow scouring of the gravels on the river bed; creation of pools and riffles, and addressing areas of dense shade and planting up trees in other areas.

Forest Research has produced a Tree and Shrub Planting Strategy for the Environment Agency, based on opportunity mapping which will aid riparian planting and future management within the Frome catchment. DWR project has planted nearly 7ha of wet woodland on the upper Frome tributaries and 85 hectares of new woodland planted or planned within the catchment.

The Environment Agency has produced Salmon Action Plans for the Frome and Piddle and has worked on many fish pass and habitat improvement projects throughout the catchment. Previous partnership working with the Frome, Piddle and West Dorset Fisheries Association (FPWDFA) enabled gravel cleaning to restore and maintain salmon spawning areas. The success of this project was monitored annually through redd counting surveys. Similarly, close working relationships with fishing clubs in these catchments have resulted in targeted fisheries habitat improvements over the years. In addition the Environment Agency has promoted the value of long-term data collection by the Game & Wildlife Conservation Trusts (GWCT) Salmon & Trout Research Centre at East Stoke, recognising the high quality data needed to allow efficient management of the salmon stock.

The FPWDFA works closely with the Environment Agency, riparian owners, the Association of Rivers Trusts, Westcountry Rivers Trust (WRT) and the GWCT to deliver habitat improvement works and remove or by-pass barriers to fish migration.
A very successful and high profile project to aid migration of all fish species within the catchment has been completed at Louds Mill, Dorchester, and was officially opened in 2009. The next aim will be to install an eel pass at Louds Mill in the future. Bovington tilting weir is also scheduled for removal with associated restoration upstream and downstream by the Environment Agency. The weir is yet to be appraised, however a feasibility study has been included within the strategy and design work will follow if the feasibility study confirms the project is viable.

Steering group view

The steering group agreed that we were ‘getting there’ for river restoration. The Dorset Wild Rivers partnership would benefit from additional resources to increase its coverage and further attention on the Frome headwaters, River Cerne and Lower Piddle is required. A river cannot be given a land unit number and is not defined as agricultural land and therefore cannot receive payment for management through agri-environment schemes. As such, there is no financial incentive for farmers to manage large woody debris, for example, in rivers. The Return of the Natives project has had some local success at controlling invasive non-native species and has increased awareness by landowners and gardeners of the need to control Himalayan balsam. However by their very nature these species require constant management and considerably more action is required to provide effective control on a catchment-wide basis.

The knowledge and experience gained by the River Frome Rehabilitation Plan technical advisory group could be used throughout the catchment. Further quantitative spatial mapping of habitat distribution and use would aid the river corridor restoration programme so that areas can be restored to deliver recreation, sanctuary areas, and amenity access. Some barriers to fish migration still remain and the Environment Agency have prioritised the list of barriers in the south west region.

There is much greater scope for wetland creation/restoration although any schemes on riparian land need to take further account of the needs of fishermen and riparian and floodplain farmers. Payments through government funded schemes can be difficult for landowners to access and may still not adequately reward farmers. Those farmers who choose to have pasture land flooded could be compensated for additional livestock feed costs but could also receive financial recognition of the ecosystem service that flooding on their land is providing (including reduced downstream flood risk and improved carbon storage). This could be in the form of an annual payment, or a payment based on the number of weeks (April-September) that land is inundated. Potential funding sources such as the Environment Agency flood and coastal risk management budget should be explored.
Water quantity

Water quantity was agreed to be a key issue by the steering group in relation to both high and low flow. The evidence and existing activity around this subject is outlined in this section.

The extremes of the hydrological range (flooding and drought) can cause major disruption and significant environmental damage. Following the very dry winter of 2011 the flooding of agricultural land has been a major concern for farmers throughout 2012, 2013 and 2014 and resulted in loss of income and a reduction in natural capital such as top soil and weed free swards. The unprecedented summer flows can be seen on the graph below.

What is the low flow problem?
Concerns have been expressed that reduced summer river flows are occurring, leading to impacts on river ecology. Low flow can result in reduced surface run off, nutrient dilution, reduced habitat quantity and quality, and increased fine sediment deposition. Climate change particularly (drier summers), abstraction for public water supply and agricultural irrigation at times of low flow have all been implicated. The effects of low flows are exacerbated in channels that have been altered and modified (generally widened and deepened) for historical flood defence purposes, especially where encroachment of marginal vegetation is prevented due to high bank angle, grazing or bankside clearance. Sluice operation for flow allocation to multiple channels during periods of low flow compounds the problem.

What is the high flow problem?
Concerns have been expressed that increased run-off is occurring in the catchment leading to increased flood risk to properties and farmland downstream, greater phosphorus and sediment transfer to rivers and Poole Harbour and associated impacts on ecology.

Climate change (more intensive rainfall), intensification of agriculture (reduction in un-improved grassland), compaction of land (mechanised agriculture and increased livestock densities), bare soils in winter (lack of cover crops) and salad cropping in summer (lower catchment) have all been implicated. Woodland cover has been quite stable for some time but the location of woods has changed, as some have been removed and others planted on new land. Decreasing cover is not a problem but the location and design of new planting potentially is.

Highways also act as pathways for run-off during storm events particularly where drains lack maintenance or are absent. The effects of high flows can also be exacerbated by channel alterations for historical flood defence purposes (straightening, widening and deepening). This includes artificial deep drainage, as the water is not encouraged to enter the floodplain (in suitable upstream areas where there is no flood risk to property) to attenuate peak flow.
What are the targets?
Appropriate abstraction, flow allocation and flood management such that:

- all surface water bodies within the catchment reach WFD ‘good’ ecological status by 2027
- the River Frome and Bere Stream SSSI achieve favourable condition by 2020.

At average and above average flows (<Qn50) there should not be more than 15% deviation from the natural flow due to abstractions or discharges. At below average flows (Qn 50-95) there should be no more than 10% deviation and at low flows (>Qn95) there should be no more than 5-10% deviation along channels in the River Frome and Bere Stream SSIs by 2020.
**Existing activity**

**Low flow**

To understand and control abstraction the EA has developed Catchment Abstraction Management Strategies (CAMS) for each catchment (or group of catchments). The principal aim of CAMS is to provide a framework to carry out resource availability assessments; balancing the ‘in-river ecological requirements’ and the need of abstractors.

The output from CAMS is a licensing strategy which aids the sustainable management of water resources on a catchment scale. This process can identify river reaches where levels of abstraction exceed the amount of available water. In such cases this can lead to investigations via the Restoring Sustainable Abstraction (RSA) programme. Several public water supplies (PWS) sourced within the Poole Harbour catchment have been subject to RSA driven investigations. These investigations have led to some licence changes. For example, at Alton Pancras source, the annual quantity for public water supplies was reduced and stream support was provided to maintain acceptable summer river flows along the Upper Piddle.

The CAMS process can also identify flow impact which may cause potential WFD compliance issues. If ‘good status’ is not being achieved and reduced flow, due to abstraction, may be a contributing factor then the EA will investigate a WFD driven investigation into the abstraction impact on river flows. The EA investigated two river reaches (Devils Brook and Lower Piddle) in 2012 and the Devils Brook will require further investigation by Wessex Water from 2015 onwards.

Water efficiency programmes have been effective at reducing peak and average demand for public water supply and 66.4% of properties in the catchment are metered – well above the Wessex Water average of 51%. Wessex Water has also reduced its leakage rate by more than 50% since 1995 and wants to promote metering further, subject to Ofwat consent from 2015.

The River Frome Water Level Management Plan led by the Environment Agency involved key stakeholders in defining how water is managed through sluices and hatches to maintain the conditions required for the Frome SSSI below Dorchester.

**High flow**

The Catchment Flood Management Plan (CFMP) divides the Poole Harbour catchment into nine sub-areas which have similar physical characteristics, sources of flooding and level of risk. Each sub-area has been assigned to one of six generic flood risk management policies that provide the most appropriate approach to managing flood risk in that sub area.

The majority of the Poole Harbour catchment is covered by Policy 6, which states that the EA will:

> “Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental (and socio-economic) benefits.”

Dorchester, Wareham and Poole are covered by Policy 4:

> “Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change”

The water bodies of Purbeck are in Policy 1 which deals with:

> “Areas of little or no flood risk where we will continue to monitor and advise”

All actions within the PHCI Action Plan will aim to complement the policies set out in the CFMP. Specifically, any woodland, wetland or rough grassland creation and land management diffuse pollution mitigation measures will help to secure multi-benefits for the PHCI and this CFMP policy.

The Environment Agency is currently going through a review of their flood risk policies. At present there is no active pursuance of proposed actions. If these happen via non-Environment Agency (funded) routes eg, changing land use and operational farm practice, which reduce run-off and hence river peak flow) then the Environment Agency will encourage and support this. Dorset County Council also proposes no large schemes although ongoing work to improve flood resistant/resilience of individual properties affected by surface/groundwater flooding will continue.

The EA are currently in the process of moving from CFMPs to Flood Risk Management Plans (FRMPs) which will be better aligned to the objectives of the River Basin Management Plan. The FRMPs will identify the potential to jointly deliver flood and environmental benefits eg, Sustainable urban drainage systems, woodland planting and agri-environment schemes.

![River Frome flooding around Holme Bridge in winter 2012. Wessex Water.](image)
Case study – abstraction impact modelling

Abstraction impacts have been modelled using the calibrated Wessex Basin Model that uses groundwater levels and river flow under current public water supply abstraction levels to predict whether the full abstraction licence was used. This is presented below for the River Frome at East Stoke and River Piddle at Baggs Mill.

Modelled River Frome flow and abstraction impacts at East Stoke.

Modelled River Piddle flow and abstraction impacts at Baggs Mill.

Steering group view

The steering group believed that further work is required to understand the potential impacts of high flows with regards to flood risk since peak flows are inherently difficult to attenuate. The opinion for low flows was almost sorted but the scope of the works for water level management requires broadening to include the multiple channels on the River Frome upstream of Dorchester up to Maiden Newton and on the River Piddle from Wareham up to Druce. A clear decision making process on flow apportionment is required by the Environment Agency and the River Frome Rehabilitation Project technical advisory group. It is felt that landowners and fisheries organisations should also be engaged in furthering this process. New actions to reduce abstraction, provide stream support and/or channel improvements would be required if any ecological impacts of abstraction are identified by current Environment Agency investigations. The steering group also believes that all actions need to consider the potential problems arising from a change in flow variability due to the changing climate. In particular, it will be important to ensure that measures that are implemented to mitigate damaging effects of high flows should not inadvertently accentuate the problem of low flows.
A key concern for many stakeholders is the impact of climate change on the catchment and increasing the resilience of the catchment to changes in weather and climate is an essential requirement.

UK climate projections suggest that by 2050 average annual temperature will increase by more than 2°C, summer rainfall is projected to decrease by 20% and winter rainfall to increase by 17% (under a medium emissions scenario).

Modelled changes for the south west river basin in the 2050s at a 50% probability level. Source: UK Climate Projections
Future flows have high uncertainty but modelling for the 2050s by the Centre for Ecology and Hydrology suggests around a 20% reduction in summer flows and a 20% increase in winter flows.

The Catchment Flood Management Plan predicts a 20% increase in peak flow in all watercourses which will increase the probability of large-scale flood events and a total sea level rise of 500mm by the year 2100 that will increase the risk of flooding in Wareham.

Using river models it is estimated that by 2100, around 2,500 people and 1,500 properties across the catchment may be at risk from a 1% annual probability flood. Sensitivity testing showed that river flooding is not sensitive to changes in urban development but future land use management could be used to bring benefits for flood risk management.

It is important that any recommended actions can cope with projected changes in climate and will remain viable over the long term. Although some climate change impacts may not be strongly felt for years to come, it is important that decisions and investments made now take future changes in climate into account, and help to reduce the severity of these changes by reducing emissions of greenhouse gases. It is also important that options for catchment management consider climate impacts over the project’s lifetime, and are able to either create other benefits through actions to increase resilience to climate change, or remain unaffected by these impacts or remain flexible and able to accommodate these changes.

**Loss of habitat**

Sea level rise will result in a loss of designated wetland and freshwater habitat bordering Poole Harbour, if existing flood defences cannot be assured. To maintain the biodiversity of designated sites in the catchment there will be a need to restore and recreate these features elsewhere. This will include areas of grazing marsh and 30 hectares of compensatory shrub and woodland creation identified in the Poole and Wareham Coastal Erosion Strategy.

**Planning policy**

Hydropower has been raised as a potential future issue as schemes are a potential risk to fish species, particularly migratory salmonids through: (i) restricting migration, (ii) causing direct fatalities. Further research into impacts, such as that carried out by GWCT at Bindon, is supported and it is recommended that planning policy takes account of findings when considering any future applications.

Green energy production for bio-digesters within the catchment can act to encourage intensive agricultural biomass production rather than the use of more environmentally friendly waste products/wood fuel. This requires consideration when encouraging such development in the catchment. Use of agricultural land for installation of solar photo-voltaic electricity generation is becoming more popular due to feed-in-tariff payments provided to the landowner in support of renewable energy targets. This will provide multiple environmental benefits including reduced nutrient inputs and is supported in locations that do not affect visual amenity and landscape character.

**Local foods and fibre**

There are opportunities to encourage further sustainable farming through support of local foods and also developing wood fuel markets. This has been supported to date by the Wild Purbeck NIA and is aided by the government’s renewable heat incentive, which is currently available for commercial biomass systems and it is the government’s intention to introduce domestic biomass systems in 2014.

**CAP reform**

The Common Agricultural Policy (CAP) is in the process of reforming but lengthy negotiations with respect to the EU budget for the period 2014-2020 have delayed the reform. As such, Defra and the Rural Payments Agency are unable to implement the new CAP from January 2014 as planned, and it is now recognised that 2014 will be a transitional year.

While the CAP reform proposals are still subject to debate and compromise by member states, original proposals included:

- greening, to be achieved through maintenance of the ratio of permanent pasture to arable land, crop diversification and sustaining a minimum percentage of ecological focus areas, in addition to permanent pasture, on farm
- continuation of the link between Direct Payments and obligations under cross-compliance, although requirements could be simplified and the Water Framework Directive and Sustainable Use of Pesticides Directive may be incorporated into the rules
- capping of support received by any individual farm
- a small farmers scheme to simplify payments and compliance obligations for very small holdings.
Identifying the high risk areas in the catchment

Historically the Environment Agency (EA) and various other organisations have monitored and collected a wide range of data and information within the catchment. The data enables us to observe the change in nitrate, phosphate and sediment levels within the catchment over time. More recently the data has been used in models to create maps that help us to predict the conditions/problems in areas where we have less information. These predictions can be shown as maps of nitrate, phosphate or sediment.

The map below shows where the higher concentrations of nitrate are likely to be present in groundwater within the catchment.

Map of the modelled diffuse nitrate load within the Poole Harbour catchment (NEAP-N 2010)

It is becoming increasingly important to ensure that catchment partnerships understand how to use the data and information that is available to find solutions to multiple issues. During the pilot stage of the initiative, a risk map was developed by Wessex Water using information from nationally developed models with outputs specific to the issues arising in the Poole Harbour catchment.

This risk map has recently been improved and provides us with a map of areas that, due to their topography, soil, location, geology and land use are at a greater risk of causing nutrient enrichment and delivering high sediment loads to the river system. It does not define areas which are currently experiencing problems, only areas which have the potential to do so.

The risk map combines data from two key national models (PSYCHIC and NEAP-N) to identify areas that pose a risk to water quality so that agronomists and land advisers can target the highest risk areas for visits. The empirical data used in the model will be verified locally before interventions are agreed. This map will enable the strategic targeting of resources in areas of greater potential risk to water quality.

How can the risk map be used?

This tool will help to ensure a more coordinated approach from the projects and partnerships working within the catchment. It is vital that farmers, agronomists and farm advisers can access this information freely.

There are a number of additional maps and data which will complement this work and help to provide a wider evidence base on which to base decisions.
Data on carbon storage, biodiversity, vulnerability to climate change and critical flow pathways will be used to assist in the targeting of measures to achieve multiple benefits, such as improved habitat resilience, in addition to the core targets of the Catchment Plan. This will ensure that the money we secure for environmental projects is spent in the best possible places to address the target problem while delivering additional benefits.

**What are the next steps?**

- The tool will continue to be developed and trialed. We are currently working with local agricultural and farming stakeholders to ground truth the outputs of the map and verify how accurate this approach is.

- We need to make sure that we are using up to date information in the model. Updated and improved data will be incorporated as and when it becomes available to ensure that the tool remains relevant and current.

- There are many additional data sets that could be included in the model. As the model develops we aim to incorporate relevant data relating to biodiversity and climate change, to highlight opportunities and compliment the many approaches and efforts within the catchment.

Many other catchments and organisations within the UK are also using similar mapping tools to aid decision making and help everyone work together to address the challenges faced by the water environment.

Water quality data is collected using the Wessex Water monitoring trailer.
Solutions

In the previous section, five key issues were identified for improvement in the catchment. This section seeks to identify solutions to those issues. During the pilot stage of the catchment initiative, the steering group identified solutions that are sustainable and take a holistic view of the issues.

The steering group identified a long list of options to achieve improvements, and reviewed them against the suite of issues in order to develop an optimal set of measures to include in the Action Plan. In doing so the steering group broadly followed the approach adopted by water companies’ water resources management planning process.

The process involved:

- Considering all potential options including their ecosystem services (the long list)
- Identifying some of those options that should be eliminated for clear reasons (to give the short list)
- Undertaking a semi-quantitative assessment to produce the Action Plan.

The overall process is shown diagrammatically below:

Potential actions for the long list of solutions to catchment issues were collated from a variety of sources including:

- suggestions from stakeholder task group workshops
- suggestions from meetings with the National Farmers’ Union and the Country Land and Business Association
- Literature review including:
  - An Inventory of Methods to Control Diffuse Water Pollution from Agriculture (DWPA) Diffuse Water Pollution Assessment (2006) by (IGER) the Agricultural Development Advisory Service (ADAS)
  - Phosphorus options appraisal by Cascade Consulting for Wessex Water (2012).

The long list of solutions is shown opposite.

Development of the long list

Sewage treatment works.
Long list of options

Sewage treatment

- **New nitrogen removal at Dorchester sewage treatment works** Installation of a nitrogen removal plant at Dorchester sewage treatment works which could remove approximately 75-90 tonnes per year (14-16% of the target reduction of 550 tonnes) but with high construction and operating costs and high greenhouse gas emissions.

- **Improved nitrogen removal at Poole sewage treatment works.** Additional seasonal nitrogen removal using existing plant at Poole sewage treatment works. By targeting a lower nitrogen discharge concentration of 5mg/l-N, 29 tonnes of nitrogen could be removed per year (6% of target). This option also has high operating costs and high greenhouse gas emissions.

- **Phosphorus reductions in the Frome catchment – first time sewerage.** Connection of unsewered properties (that are currently on septic tanks) to the sewerage network. The sewerage would then be treated at sewage works and could remove 6.7-30.5 kg of total phosphorus per year.

- **Phosphorus reductions in the Frome catchment at Maiden Newton sewage treatment works and/or Cerne Abbas sewage treatment works** Using reed beds or conventional treatment this could remove up to 500kg of phosphorus per year.

Land management

- **New regulation under Environmental Permitting Regulations to control the use of nitrogen** This would involve mandatory reductions in the application of nitrogen fertiliser to land with fines imposed on farmers if evidence was found that they were using nitrogen above the imposed limits.

- **Best practice advice catchment wide (by funded independent agronomists)** Provision of free advice to farmers in locations not covered by Catchment Sensitive Farming target areas or current Wessex Water catchment management source protection zones. This could reduce nitrogen by up to 206 tonnes (37% of target), total phosphorus by around 4 tonnes per year and sediment by around 380 tonnes per year.

- **Cover crops catchment wide** This assumes catchment wide adoption of cover crops after harvesting of winter wheat. It is based on 3,555 hectares and assuming full uptake, it could reduce nitrogen by an estimated 321 tonnes (58% of target), phosphorus by around 1775kg and sediment by around 890 tonnes per year.

- **Catchment wide reduction in livestock densities** This could reduce nitrogen by 550 tonnes (100% of target) with substantial phosphorus and sediment reductions but would be a high cost option if farmers are to be compensated for reduced dairy and beef production.

River channel and habitat improvements

- **Channel habitat improvements and fish barrier assessment** This is in addition to current activity for habitat improvements and includes waterbodies failing WFD standards. Provision for assessment and prioritisation of all remaining barriers to migratory fish by relevant stakeholders is included.

Land use

- **Large scale woodland creation.** Large scale land purchase and consequently high costs. A figure of 15,583 hectares was proposed as this could reduce nitrogen by around 550 tonnes (100% of target), phosphorus by around 4 tonnes and sediment by around 1,400 tonnes per year.

- **Strategic small scale woodland creation.** woodland creation by private landowners receiving English woodlands Grant scheme payments and additional contribution from the Forestry Commission would be relatively small scale. A best case estimate of 900 hectares could reduce nitrogen by around 32 tonnes (6% of target), phosphorus by around 450kg and sediment by around 80 tonnes per year.

Water quantity

High flows

- No direct delivery actions are proposed at present but the land use and management options listed above would be beneficial.

Low flows

- No direct delivery actions proposed at present but land use and management options listed above would be beneficial. Investigations are proposed at two public water supply abstractions from 2015 which may lead to future actions.
Development of the short list of options

The development of the short list involved reviewing in more detail each of the long list options. From this review certain options were eliminated. The reason for their elimination is presented below.

**New regulation under Environmental Permitting Regulations (EPR) to control use of nitrogen** was removed as there was no consensus among stakeholders due to potential lack of yields and profitability for farming that may result. There would also be difficulties in resourcing the regulation required. Note: This may have to be re-evaluated by 2020 if there is no success with the current plan.

**Catchment wide reduction in livestock densities** was removed as it was not supported by farmers, would be costly and difficult to regulate. Note: This is still supported as a smaller scale option under environmental stewardship but was not deemed suitable on a catchment wide scale.

Development of the recommended actions

The remaining nine key actions were reduced further to form the list of recommended actions following a semi-quantitative process of the short list. This involved a scoring exercise undertaken by the steering group, against a series of criteria and a cost benefit assessment using information from appropriate literature. However, three options were not subjected to the full process.

- Channel habitat improvements and fish barrier assessment was viewed as the only option for solving the associated issue so did not require appraisal. It is estimated to cost a minimum of £300,000 in total for the channel habitat improvements work in the Upper Frome and River Piddle. It will cost around £1m for the remaining work on the Frome SSSI. Any fish barrier proposal will require project specific costing.
- For the two options for phosphorus reductions in the Frome catchment (removal at existing sewage treatment works and first-time sewerage) both were subjected to cost-benefit analysis as part of an appraisal by Cascade Consulting but were not subjected to the scoring exercise.

**Scoring exercise**

Six of the nine options were subjected to the scoring exercise by the steering group. The potential solutions were awarded a qualitative score (-5 to +5) for impact/benefits they could provide for each agreed issue within the catchment and other key considerations.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nitrate in groundwater</td>
</tr>
<tr>
<td></td>
<td>Nitrate in rivers and impact on associated riparian and floodplain wetland habitats</td>
</tr>
<tr>
<td></td>
<td>Nitrate in Poole Harbour</td>
</tr>
<tr>
<td>2</td>
<td>Phosphorus in rivers and Poole Harbour</td>
</tr>
<tr>
<td>3</td>
<td>Sediment in rivers and Poole Harbour</td>
</tr>
<tr>
<td>4</td>
<td>River channel and riparian habitat structure</td>
</tr>
<tr>
<td>5</td>
<td>Low flow (aquifer recharge)</td>
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<tr>
<td></td>
<td>High flow (flood risk)</td>
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<tr>
<td></td>
<td>Other key considerations</td>
</tr>
<tr>
<td></td>
<td>Carbon/greenhouse gases, atmospheric (climate change mitigation)</td>
</tr>
<tr>
<td></td>
<td>Terrestrial species and habitats (climate change adaptation)</td>
</tr>
<tr>
<td></td>
<td>Food and fibre production</td>
</tr>
<tr>
<td></td>
<td>Societal, amenity and recreation</td>
</tr>
</tbody>
</table>

The options were also scored (-5 to +5) for effectiveness and practicability and factors of these scores were multiplied by the sum of the benefit scores, the percentage of the most pressing nitrate issue they resolved and immediacy of results. This value was divided by cost based on those calculated by rural policy analysts and used in the Strategy for Managing Nitrogen in Poole Harbour Catchment by 2035, where applicable.
This exercise was completed from literature values to help with the overall assessment.

Indicative annual cost (over 50 years), estimated annual reduction and indicative value for potential solutions to agreed catchment issues.

Note: The costs and particularly the estimated reductions due to catchment approaches are indicative for comparison purposes and not definitive. Large uncertainties exist and stated assumptions have been made. Costs and reductions have been derived from the Strategy for Managing Nitrogen in Poole Harbour catchment by 2035 and Cascade Consulting phosphorus appraisal. Reductions in sediment and phosphorus from diffuse sources based on DWPA manual and expert judgment. Nitrogen removal at Dorchester sewage treatment works does not include construction costs.
Results of steering group semi-quantitative scoring exercise

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit score for all issues</th>
<th>Effectiveness certainty of method</th>
<th>Practicability certainty of uptake</th>
<th>Immediacy of results</th>
<th>Benefit : cost ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 New nitrogen removal at Dorchester STW (consented)</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.9</td>
</tr>
<tr>
<td>2 Improved nitrogen removal at Poole STW (best endeavours)</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>1.3</td>
</tr>
<tr>
<td>3 Woodland creation (using EWGS payments)</td>
<td>14</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2.4</td>
</tr>
<tr>
<td>4 Woodland creation (using land purchase)</td>
<td>30</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>5 Best practice advice by independent agronomists – two for area of catchment not currently covered assumed.</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>11.6</td>
</tr>
<tr>
<td>6 Grants for cover crops (assumed entire catchment eligible with maximum potential annual uptake)</td>
<td>17</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4.5</td>
</tr>
</tbody>
</table>

All of the diffuse solutions (options 3-6) scored highest but there are uncertainties with the effectiveness of the methods and level of uptake. There would also be a time delay of up to 30 years before results for nitrate are realised on the high chalk downs where there is a low water table. Water percolates through the chalk at around 1 m per year. Although results could be immediate where appropriate mitigation was applied to grasslands on clay or maize on sands.

For example, reductions in nitrate have occurred relatively quickly (around five years) in catchments in floodplains/river valleys with a high water table, such as Eagle Lodge, where Wessex Water has engaged in delivering best practice advice. There may also be a time delay of up to 10 years for substantial improvements to phosphorus due to soils continuing to leach phosphorus as a legacy of previous fertiliser and manure application, although sediment reductions should be more immediate and help reduce the particulate phosphorus levels.

The results were used to aid decision making and the following options were eliminated for the reasons provided below.

**Nitrogen removal at Dorchester sewage treatment works** – although this would effectively have immediate, guaranteed results from when the plant became operational it would only remove around 15% of the target. It was eliminated because it was the lowest scoring option with relatively high construction and operating costs and high greenhouse gas emissions.

**Woodland creation using land purchase** – this would provide the maximum benefit but was the least cost-effective of the catchment based approaches. It was also unrealistic given the opposition from many farmers and landowners so was not included.

**First time sewerage** – was removed as it would provide very little benefit for phosphorus reduction or other issues and was the least cost-effective method for reducing phosphorus.
The following options were selected as recommended actions for the reasons provided below.

**Improved nitrogen removal at Poole sewage treatment works** – although this would only solve a low percentage of the overall nitrate problem and has quite high costs, it discharges directly into Holes Bay and would provide substantial benefit at this location. Therefore it was decided to recommend this option as it would only require additional operation of the existing nitrogen removal plant and could be used as a localised trial to monitor whether the nitrogen reduction is successful at reducing algae.

**Strategic woodland creation on a small scale** – making use of the existing English Woodland Grant Scheme scored higher and was included but would only solve a small percentage of the nitrate issue. There may be issues of uptake and planting may not necessarily occur in the most high risk locations. However, the Forestry Commission would take this into account when assessing applications and the PHCI would produce risk maps to aid locating new woodland on critical flow pathways. Initial discussions with farmers suggest they would consider small areas of woodland creation if the case can be clearly made for where it should be located.

**Best practice advice (by independent agronomists)** – this was the option with the highest benefit: cost ratio and could potentially deliver reductions of more than a half of the proposed nitrate target, more than a quarter of diffuse phosphorus inputs and substantial sediment reductions. It is also favoured by farmers and landowners. This option was sub-divided into CSF target areas, areas around water supply source protection zones not currently receiving catchment management and the wider Poole Harbour catchment.

**Grants for cover crops** – This scored relatively highly but there were concerns regarding its effectiveness and practicability. However, it was agreed that if complemented with the correct management agreements and advice provision from agronomists it can be very effective at reducing diffuse nitrogen, phosphorus and sediment. Additional funding provision could be incorporated into the budget for best practice advice so as not to conflict with current provision for grants for cover crops under agri-environment schemes but grants may need to be higher to increase uptake. The recent Defra consultation on suggested changes to Nitrate Vulnerable Zone rules resulted in six suggested changes including making the use of cover crops on land that would be bare over winter mandatory.

**Additional phosphorus reductions in the Frome catchment** – it would be preferential to use reed beds at Cerne Abbas and/or Maiden Newton sewage treatment works or potentially a combination of both. It was agreed that this option should be taken forward with method(s) and location(s) dependent on a feasibility study results.

These options, along with fish barrier assessment and channel habitat improvements were carried forward and added to existing actions in order to develop an optimal package for all issues, while considering climate change mitigation and adaptation. Supportive actions were also included.

In March 2014, the Action Plan measures were also included in the EA’s cost benefit analysis for the Poole Harbour catchment (part of the draft River Basin Management Plan for the south west) which ensures that proposals for the WFD are cost beneficial.

### Development of the Action Plan

A summary of the key actions in the Action Plan can be found in section 9. The Action Plan is made up of the three sections shown above. Existing actions, recommended actions, and actions to support this work such as monitoring.
As outlined in the previous section, there is much effective work already underway in the catchment. This needs recognition and the delivery elements are included in the Action Plan, where the steering group believed it continued to be of value.

The table below shows the agreed existing actions to improve the agreed catchment issues, along with barriers to progress and opportunities for success.

<table>
<thead>
<tr>
<th>Existing on the ground actions</th>
<th>Barriers</th>
<th>Opportunities</th>
<th>Funding and timescale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment Sensitive Farming to continue to work in target areas to assist farmers in adopting mitigation measures to reduce sediment, phosphorus and nitrogen leaching and run-off.</td>
<td>Only applies to CSF target areas.</td>
<td>Well respected by farmers and landowners. Trust is already established.</td>
<td>Funded by Defra as part of transitional period until 2015. Funding is expected to continue post 2015.</td>
</tr>
<tr>
<td>Wessex Water to continue to work in existing source protection zones to assist farmers in reducing nitrogen leaching.</td>
<td>Only applies to some areas.</td>
<td>Well respected by farmers and landowners. Trust is already established.</td>
<td>Wessex Water until 2020.</td>
</tr>
<tr>
<td>FWAGSW to continue to provide land management advice for Wild Purbeck NIA to assist farmers in adopting mitigation measures to reduce sediment, phosphorus and nitrogen leaching and run-off.</td>
<td>Limited resource and small area.</td>
<td>Well respected by farmers and landowners. Trust is already established.</td>
<td>Defra until 2015.</td>
</tr>
<tr>
<td>Woodland creation – 120ha (inc 15ha of new wet woodland). Target priority sites (from risk and opportunity mapping) for maximum water quality and additional benefits. To include riparian planting.</td>
<td>Much will only replace woodland cleared for heathland restoration.</td>
<td>Could be targeted for maximum benefit.</td>
<td>NIA, EA, DWT</td>
</tr>
<tr>
<td>Environmental Stewardship including options of low input grassland and wetland creation and grants for cover crops. (Note this scheme will cease in 2014 and be replaced by the new Environmental Land Management Scheme from 2015).</td>
<td>Can be difficult to access, relatively small scale.</td>
<td>Could be targeted for maximum benefit.</td>
<td>The new land management scheme will open in 2015 with new agreements starting from Jan 2016.</td>
</tr>
<tr>
<td>Eel pass installation.</td>
<td>Limited funding and resources from EA for eel pass work post 2014.</td>
<td>Can combine resources with other works. Scope for delivery through partner organisations.</td>
<td>EA, potential funding opportunities via the Sustainable Eel Group.</td>
</tr>
<tr>
<td>Direct wetland restoration work and 15ha wet meadow creation at suitable sites throughout catchment through Wild Purbeck NIA.</td>
<td>Relatively small scale.</td>
<td>Could be targeted for maximum benefit.</td>
<td>Defra until 2015.</td>
</tr>
</tbody>
</table>
Recommended actions

The high level recommended actions are:

- best practice agronomist advice
- additional incentives including for cover crops
- additional nitrogen removal at Poole sewage treatment works
- additional phosphorous reductions in the Frome catchment
- small scale woodland creation
- river channel habitat improvement and fish barrier assessment and/or removal.

These are described in further detail below, and in the Action Plan we have drawn out what is required to make them happen.

**Best practice advice and additional incentives including cover crops**

Work to spread best practice by Catchment Sensitive Farming (CSF), Wessex Water and others has already produced excellent results and, if expanded, could contribute to a wider range of environmental issues as well as to trying to reduce the nitrate levels in groundwater and phosphorus and sediment in rivers. This work could be taken forward by Wessex Water, in particular in the source protection zones but also more widely across the catchment to help reduce nitrogen levels to offset discharges from Dorchester sewage treatment works beyond legislative requirements. CSF is a key element of this work and it is essential that it continues to be funded to provide advice and grants for target areas post 2014 with a greater focus on nitrogen.

Whether they are provided by Wessex Water, CSF or any other delivery mechanism, additional agronomists should be funded to work throughout the rest of the Poole Harbour catchment 2015-2020 to provide free independent advice and possibly grants to farmers to achieve target nitrate reductions and also phosphorus and sediment reductions where possible.

In targeting this work, the objective would be to ensure compliance with environmental and drinking water standards. The Environment Agency is trialling and developing a nitrate leaching tool that allows estimation of current leaching levels designed to assist farmers in selecting suitable mitigation measures to achieve overall nitrate reductions.

Again, ideally all farmers and landowners across the Poole Harbour catchment would determine mitigation measures to suit their business needs while achieving target reductions in nitrogen leaching. Wessex Water’s existing catchment management (source protection) is expected to continue until at least 2020, and they are looking to expand the work into the catchments of Alton Pancras source (Upper Piddle), Forston source (Cerne) and Milborne St Andrew source (Bere Stream).

It is recommended that Natural England assists in prioritising stewardship applications for measures that will achieve nitrogen reductions across the Poole Harbour catchment from 2013 onwards. In developing options for Environmental Stewardship more attention could be given to nitrogen leaching and their inclusion in future applications such as grant provision for cover crops above and beyond (or incorporated into) current payments to make this option more attractive to farmers compared with over-winter stubble.

It has been proposed in the Wessex Water business plan (2015-2020) to offset additional nitrogen removal at Dorchester sewage treatment works by expanding the catchment management/source protection work that Wessex Water delivers within the catchment. This approach has been supported by Natural England and the Environment Agency and will potentially provide greater, more cost effective reductions by funding agronomists and potentially offering grants, subject to Ofwat approval.

Cover crops are already a key part of the advice given by the current catchment agronomists and have been shown to be an economic means of reducing nitrate leaching. It is recommended that farmers continue to be so advised, with grants where appropriate – ideally from agri-environment schemes. Support for this type of land management for resource protection should be a key issue for CAP reform.

**Additional nitrogen removal at Poole sewage treatment works**

During the initiative there has been much discussion as to whether Wessex Water should seek to operate its Poole sewage treatment works at a lower nitrogen limit than currently specified. In general it is not the type of action that the initiative has sought to promote, particularly as it is costly and very energy intensive. On the other hand the capital costs of the plant are sunk, the plant appears to operate at a lower nitrate level than required by the standard, it would be an improvement that could be delivered quickly and does recognise the particular eutrophication issue of Holes Bay while contributing to a reduction in the total nitrate load to Poole Harbour. Therefore, overall the steering group believe Wessex Water should attempt to run Poole sewage treatment works to a lower total nitrogen level under a management permit (rather than a tightened numerical consent).
Additional phosphorus removal in the Frome catchment

In the short timescale the steering group was unable to come to a final decision as to what was the right balance between further reductions in the phosphorus discharges from sewage treatment works and how much we should target phosphorus reductions from increased catchment management work. It is therefore recommended that further investigations are done, particularly around assessing the effectiveness of best practice advice/catchment management for phosphorus reduction. Removal of phosphorus from sewage treatment works may still be required. In anticipation of this, it is recommended that Wessex Water continues with its work to identify means of sustainably reducing phosphorus levels.

Small-scale strategic woodland creation

Woodland creation by private landowners makes use of the existing English Woodland Grant Scheme funding and additional contribution available for the catchment to recognise ecosystem services that the woodland creation can provide. It is recommended that the annual payment for landowners continues to be available post 2013.

River channel habitat improvement and fish barrier assessment

The recommended river habitat improvement work includes extending it to WFD failing rivers and non-SSSI rivers and wetlands and EA special project funding could be used. The process undertaken by the EA for assessing and prioritising all river structures has already been carried out on a strategic regional basis for the south west region. The EA’s decision making process relates to prioritising funding over a larger geographic area than just the PHCI catchment and at present the EA do not know how fish pass funding will be allocated in future so additional sources will be sought.

Supportive actions

The initiative has also identified the need for ‘supportive actions’ covering ongoing engagement, monitoring, trials and research. Key actions are:

- the adoption of a voluntary nitrate leaching target by farmers and land managers. This will require considerable further engagement and clear communications if it is to be successful with adequate time for trialling and refinement of a nitrate leaching tool developed by the Environment Agency. The success of these targets is vital if WFD requirements are to be met
- further opportunity for spatial mapping is required to assist with prioritisation of land use change, land management mitigation and river restoration
- suitable operating procedures need to be agreed by stakeholders and followed at sluice structures to avoid some braided reaches being deprived of an adequate flow regime while minimising the flood risk for affected land and properties. A clear decision making process for hatch operation protocols on the rivers within the catchment is required.
- further investigations into the source of phosphorus at a sub-catchment level are required including the variability in greensand springs
- development and implementation of a comprehensive monitoring plan for rivers and groundwater is necessary to fill in gaps in regulatory monitoring, in particular with continuous monitoring.

These supportive actions are included in the Action Plan. Partners have volunteered to lead and support with the funding required for recommended on the ground actions.
Review and monitoring

The PHCI will review the progress and success of the Action Plan on an annual basis. It is important to recognise that the steering group will be keen to measure environmental improvements and not just report on what action there has been.

The PHCI is working with other partnerships, such as the Wild Purbeck NIA, to ensure that there is effective communication between the partnerships. This will help to cut down on any overlap and duplication of partners' time when they have to report back and review the progress that is being made on actions that are delivering benefits for multiple partnerships.

The Monitoring Task Group draws together the local knowledge and expertise of more than 12 organisations and charities. The Group has agreed to support the implementation of a monitoring work plan for the catchment. This will initially focus on reviewing the data that is collectively held within the catchment and develop an accurate and up to date evidence base to inform decision making. Ten actions have been identified for 2014, which include collating a joint monitoring programme, identification of gaps in our evidence base; and focusing efforts on progressing the mapping and modelling work that is required to support the effective implementation of mitigation measures at a farm level. It also seeks to increase the use of citizen science to improve the data collection and engage the local stakeholders in the health of their rivers.

The PHCI recognises that the actions being delivered need to be assessed. Without investigating and/or monitoring the effects of our actions we will not fully understand if the action has had a positive impact on the environment.

Cost benefit analysis

Ongoing cost benefit analysis (CBA) work will be required to assess the economic viability of delivering the PHCI Action Plan and future actions. The monitoring data will improve the evidence base for the assessment of benefits. There is a general agreement that we all need to support viable measures, completing the CBA work will help to keep the PHCI focused on supporting practical solutions and produce a list of actions that have been vigorously tested.

The PHCI will continue to feedback and work with the South West River Basin Management Plan Liaison Panel. Where feasible the PHCI aims to align actions with the RBMP and ensure that the Poole Harbour catchment maximises every opportunity to draw down funding from the European budget to help deliver the work that is required at the catchment scale.

Conclusions

The recommended actions, in combination with existing activity and accompanied by the supportive actions should be sufficient in meeting legislative requirements but success is highly dependent on the continued collaborative working between all stakeholders. The recommended actions require further quality assurance against statutory and national policy considerations and to be future proofed with regard to climate change mitigation and adaptation. The Action Plan will be reviewed annually and can be refined according to further engagement with stakeholders.

The programme of work for the PHCI will focus on the immediate five to 10 years but full improvement will require permanent funding; the long-term solution to nitrogen pollution is unlikely to be resolved until the next century. Many of the current grants could fund interim measures but institutional change may be required to sustain long-term solutions that require annual payments.

A catchment fund, supported annually by government and/or private contributions and administered by an independent broker such as an environmental or rivers trust may be required.

The steering group will work with the agricultural and land management group to find sustainable and viable solutions to the catchment issues that are currently posing a threat to the environment, local people and businesses. The PHCI will assist in the co-ordination of events, task group meetings and aim to undertake further cost benefit analysis, ‘future proofing’ of actions, and exploring new funding mechanisms. The monitoring task group will also support the further development of modelling and an improved catchment monitoring network to assist in the targeted delivery of environmental improvements. Relevant actions have been forwarded into the draft SW River Basin Management Plan (RBMP) for 2015-2021 and the draft Wessex Water business plan for 2015-2020.
The PHCI Action Plan is available as a supplementary document [www.pooleharbourcatchment.co.uk](http://www.pooleharbourcatchment.co.uk). The table below summarises the key actions that have been agreed in 2014. The Action Plan will continue to be updated annually.

<table>
<thead>
<tr>
<th>Category</th>
<th>Action ref</th>
<th>Type of action</th>
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<tbody>
<tr>
<td><strong>Diffuse: delivery mechanisms</strong></td>
<td>1A</td>
<td>Existing</td>
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<td>1B</td>
<td>Existing</td>
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<td><strong>Point source: delivery</strong></td>
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<td>Supportive</td>
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<tr>
<td><strong>River and wetland: delivery</strong></td>
<td>3A</td>
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</table>
## Action

<table>
<thead>
<tr>
<th>Development and trialling of nitrate leaching tool</th>
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</thead>
<tbody>
<tr>
<td>Agree a direction of travel for diffuse pollution measures within the catchment (Strategy for Managing Nitrogen in Poole Harbour Catchment to 2035)</td>
</tr>
<tr>
<td>Coordinate advisory efforts in Wild Purbeck NIA and the wider catchment</td>
</tr>
<tr>
<td>Development of catchment specific best practice guidelines for use by all agronomists</td>
</tr>
<tr>
<td>Further develop spatial mapping for habitat creation making use of local knowledge</td>
</tr>
<tr>
<td>Help to determine reductions in nitrate leaching, phosphorus and sediment run off</td>
</tr>
<tr>
<td>Develop a coordinated voluntary programme to support catchment monitoring plan and encourage community engagement</td>
</tr>
<tr>
<td>Investigate farm economic considerations in achieving environmental targets</td>
</tr>
<tr>
<td>Develop recommendations to improve effectiveness of NVZ Action Programme for Defra and assist farmers</td>
</tr>
<tr>
<td>Continue delivering Catchment Sensitive Farming (2014)</td>
</tr>
<tr>
<td>Wessex Water – (Source Protection Zone) agronomist advice (catchment management/source protection)</td>
</tr>
<tr>
<td>Encourage uptake of Environmental Stewardship Schemes</td>
</tr>
<tr>
<td>Increase woodland creation</td>
</tr>
<tr>
<td>Provide land management advice to farmers in Wild Purbeck NIA</td>
</tr>
<tr>
<td>CSF continues post 2014</td>
</tr>
<tr>
<td>Wessex Water continue with catchment management approach (2015-2020)</td>
</tr>
<tr>
<td>Wessex Water work in new source protection zones (2015-2020)</td>
</tr>
<tr>
<td>Increase private woodland creation</td>
</tr>
<tr>
<td>Understand diffuse phosphorus contribution at sub catchment level</td>
</tr>
<tr>
<td>Determine the source of phosphorus from greensand springs</td>
</tr>
<tr>
<td>Improve understanding about the sources and contribution of dissolved organic nitrogen to the total nitrogen load on Poole Harbour</td>
</tr>
<tr>
<td>Assess in combination the scale of nitrogen deposition from commercial pig and poultry units and other manure storage units in and around catchment</td>
</tr>
<tr>
<td>Advocate for use of phosphate free detergents</td>
</tr>
<tr>
<td>Awareness raising – Septic tank registration, impact and maintenance</td>
</tr>
<tr>
<td>Further identify inputs from water cress farms, fish farms and aggregates industry</td>
</tr>
<tr>
<td>Additional nitrogen removal at Poole sewage treatment works</td>
</tr>
<tr>
<td>Additional P removal in Frome catchment</td>
</tr>
<tr>
<td>Trial steel slag and chalk soakaways with British Standard septic tanks in Hooke catchment</td>
</tr>
<tr>
<td>Continue River Frome Rehabilitation Project</td>
</tr>
<tr>
<td>Increase number of eel pass installations</td>
</tr>
<tr>
<td>Continue river and wetland habitat improvement</td>
</tr>
<tr>
<td>Increase direct wetland restoration work</td>
</tr>
<tr>
<td>Scoping study/walkover of Corfe Stream</td>
</tr>
<tr>
<td>Continue wild rivers and wetland restoration (2015-2020)</td>
</tr>
<tr>
<td>Assessment and prioritisation of structure removal/fish passage</td>
</tr>
<tr>
<td>River walks and ecology demonstrations for farmers, landowners and members of local community throughout catchment</td>
</tr>
<tr>
<td>Further understand key drivers of salmon population in the River Frome</td>
</tr>
<tr>
<td>Encourage water saving in the home to reduce water supply demand</td>
</tr>
<tr>
<td>Further investigate effects of abstraction impact on Devil’s Brook.</td>
</tr>
<tr>
<td>Develop key indicators of river health for the initiative which can be measured by community and existing projects</td>
</tr>
<tr>
<td>Upper Frome and River Piddle flow apportionment plan</td>
</tr>
<tr>
<td>Form one agricultural group - invite farmers to have a voice and influence the future delivery within the catchment</td>
</tr>
<tr>
<td>Develop a monitoring work plan at a catchment scale</td>
</tr>
<tr>
<td>Identify appropriate measures/actions for Poole, Purbeck and Sherford areas of the catchment</td>
</tr>
<tr>
<td>Coordinate responses and lobby on all issues affecting the catchment</td>
</tr>
</tbody>
</table>

## Key

- **Existing action** – blue
- **Recommended action** – orange
- **Supportive actions** – green
Frequently asked questions

Does the PHCI have any money that I can apply for?
- The PHCI is a partnership led initiative that encourages and facilitates co-working, collaboration and synergies between the organisations and partners who have been brought together under this initiative.
- When funding is required to help deliver actions that have been agreed within the PHCI Action Plan, the catchment coordinator will help partners collaboratively identify and apply for appropriate funding.
- The PHCI does not have the capacity or budget to fund the direct delivery of the outlined actions. However, the PHCI can provide resources, skills and knowledge through the partner organisations, steering group, task groups and the catchment coordinator to help secure funding for shared actions identified as a priority within the PHCI Action Plan.

Is the PHCI Catchment Plan a statutory document?
- No, the PHCI Catchment Plan is not a statutory document. However it will help to support the development of the River Basin Management Plan for the south west, which is a statutory document. Both the Catchment Plan and RBMP will support the actions required at the river catchment scale to meet the Water Framework Directive requirements.
- The European WFD came into force in December 2000 and became part of UK law in December 2003. The WFD provides an opportunity to plan and deliver a better water environment, focusing on ecology. The Environment Agency is the competent authority for the WFD.
- The WFD introduced a formal series of six-year RBMP cycles. RBMPs identify the objectives required to deliver the WFD. The first RBMP cycle will end in 2015 and the RBMP will then be updated and reissued. A South West River Basin Liaison Panel has been established to help manage the south west RBMP process and delivery.

How can the PHCI help me deliver my project to benefit the water environment?
The PHCI can help you:
- utilise the local expertise of task groups. For example: steering group, agricultural and land management group, monitoring task group
- build up ideas and deliver projects through a partnership approach
- utilise the shared tools, maps and data of the PHCI to inform your work
- by providing a wide network of stakeholders, including local businesses, landowners and the Dorset Local Enterprise Partnership and Local Nature Partnerships
- by providing good communications links with other projects- to avoid duplication of conflicting activities.

How does the PHCI align with the Strategy for Managing Nitrogen in Poole Harbour to 2035?
The Strategy for Managing Nitrogen outlines what the nitrogen targets are for meeting EU legislation within Poole Harbour SPA. The PHCI is keen to work with the EA to find voluntary solutions to meeting these targets. The PHCI Agricultural and land management group is farmer led and will help to provide guidance and support in this collaborative working.
- The PHCI and the Agriculture and land management group is keen to find more holistic measures that deliver wider benefits while meeting the nitrogen targets.

How do I/my organisation get involved?
- There are various ways of getting involved:
  - contact the catchment coordinator via web page – www.pooleharbourcatchment.co.uk
  - sign up to receive the PHCI newsletter – info@pooleharbourcatchment.co.uk
  - get involved with a task group
  - get involved with the existing community focussed projects and/or volunteer your time.
Acknowledgements

We would like to thank the following groups and individuals for their time and support with updating the Catchment Plan and for their continued support with the development and delivery of the Action Plan.

Steering group members contributing their time include: Fiona Bowles, WW; Clare Buckerfield FWAGSW; Olivia Durkin WRT; Charles Dutton, FP&WDFA; Stephen Gregory, GWCT; Hilary Jordan, WDDC; Douglas Kite, NE; Ben Rayner, EA; Ian Rees, DAONB, Jack Rhodes, RSPB; Brian Richards, DCC; Alison Turnock, Wild Purbeck NIA; Sarah Williams, DWT; Matthew Uren, NFU; Charlotte Woodford CSF, Neil Punchard, WW, Zoe Pittaway, WW.

Agriculture and land management group members who have contributed their time include: Wakely Cox, Kevin Wallbridge, Alaster Dallas, Andy Baggs, Andy Foot, James Franklin, Bernard Cox, Brian Chandler, Richard Miller, Charles Norman, David Cotterell, Edward Gallia, James Selby-Bennett, Mike Watkins, Shirley Preston, Will Bond, Charlotte Sealy.

Monitoring task group members who have contributed their time include: Robert Aqualina; Patrick Armitage, FBA; Graham Brown, EA; Giles Bryan, EA; Nicole Caetano, EA; Adrian Collins, Rothamsted Research; Ian Colley, Hyder; Phil Connelly, EA; John Davy-Bowker, FBA; Hugh Dawson, CEH; Jeremy Graham, WW; Andy House, WW; Dave Jones, WW; Iwan Jones, QMUL; Alasdair Maxwell, EA; Adrian Moore, WW; John Murphy, QMUL; John Phillips, EA; Jane Youdan, WW, Alex Martin, WW
### Appendix 1- Progress update for 2013

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New catchment coordinator recruited</strong>&lt;br&gt;From March to April 2013 there was no catchment coordinator in position; a new full time coordinator was recruited in April to support the PHCI. The position is currently hosted by Wessex Water with the support of the Environment Agency.</td>
<td>April 2013</td>
</tr>
<tr>
<td><strong>Steering group meetings continue</strong>&lt;br&gt;The steering group now meet on a quarterly basis. During the initial year (2012) they met every 2 months. Members of the steering group are also putting their time into task groups such as the Agriculture and land management group and monitoring task group.</td>
<td>May, July &amp; November 2013</td>
</tr>
<tr>
<td><strong>Catchment boundary extends and Catchment Plan updated in spring 2014</strong>&lt;br&gt;To align with the Environment Agency’s (EA) Operational catchment and the River Basin Management Plan review in 2014, the boundary has been extended to cover the whole of the Poole Harbour Catchment. All rivers and streams that drain into Poole Harbour are now covered by the PHCI partnership. The Catchment Plan will be updated to incorporate these changes.</td>
<td>July 2013</td>
</tr>
<tr>
<td><strong>Governance group</strong>&lt;br&gt;The governance group meet on average every year to review the progress of the PHCI and respond to arising issues. The governance group membership consists of senior staff from the EA, NE and Wessex Water.</td>
<td>July 2013</td>
</tr>
<tr>
<td><strong>Partner updates circulated regularly</strong>&lt;br&gt;To help keep the wider stakeholders up to date with the progress of the PHCI a newsletter bulletin is circulated to the wider partnership and is also available to download from the web page: <a href="http://www.pooleharbourcatchment.co.uk">www.pooleharbourcatchment.co.uk</a></td>
<td>May, July, September 2013, Feb 2014</td>
</tr>
<tr>
<td><strong>Monitoring task group develop a coordinated work plan for the whole catchment</strong>&lt;br&gt;Over 20 organisations have identified the key actions required to coordinate monitoring efforts within the catchment. Ten key actions have been agreed and different partners will lead on each action. Alignment of landscape mapping- previously lots of mapping work carried out within the catchment.</td>
<td>August, September 2013</td>
</tr>
<tr>
<td><strong>Documents available to download from the website</strong>&lt;br&gt;The Action Plan has been updated and is available on the web page. Steering group members will be invited to update on progress of individual actions at each quarterly meeting with a complete review of the Action Plan on an annual basis. The draft terms of reference have also been reviewed by the steering group and are available to download.</td>
<td>August 2013</td>
</tr>
<tr>
<td><strong>Agricultural and land management group forms</strong>&lt;br&gt;It has been recognised that there had been limited engagement with local farmers during the initial stakeholder engagement process. Therefore to encourage farmers to become actively involved with delivering improvements for the water environment, a farmer led group has formed to identify the best ways to solve the challenges facing land managers. The group officially met for the first time in January 2014.</td>
<td>September 2013</td>
</tr>
<tr>
<td><strong>Stakeholder workshop- joint event with EA to consult on RBMP review</strong>&lt;br&gt;The PHCI joined up with the EA to deliver a workshop in October, stakeholders were invited to discuss the issues and solutions in the extended catchment area, and review the progress of the PHCI after the first year. The EA will carry out cost benefit analysis based on the feedback that the stakeholders provide at the workshop- national assessment to quantify the most viable solutions will be undertaken to identify solutions to be included in the next RBMP.</td>
<td>October 2013</td>
</tr>
<tr>
<td><strong>PHCI strengthened links with Poole Harbour stakeholders/partnerships</strong>&lt;br&gt;The PHCI catchment coordinator attends the Poole Harbour Commissioners steering group to improve communications between the upper and lower areas of the catchment.&lt;br&gt;The catchment coordinator also attends the Wild Purbeck NIA steering group, looking to join up delivery of actions between the partnerships.</td>
<td>November 2013</td>
</tr>
<tr>
<td><strong>Strategic approach to fundraising within Dorset</strong>&lt;br&gt;Look to improve communications between the LNP, LEP, AONB, DWT and Wild Purbeck NIA to cut down on duplication, look to align fundraising project ideas and bids.</td>
<td>October 2013</td>
</tr>
</tbody>
</table>

Please note all actions are reported in the Action Plan, which is available at www.pooleharbourcatchment.co.uk
Appendix 2 - WFD water body failing elements, Environment Agency 2013

The current WFD classification of water bodies listed in the PHCI Catchment Plan is based on the latest information the EA had at the time the plan was produced. This should be regarded as a snapshot of the situation at the time of publication as new information is gathered the status of water bodies may change. In the first River Basin Management Plan (2009) many water bodies were classified based on Expert Judgement. Expert Judgement is used when there is a lack of data on a water body. Since 2009 the EA have gathered more information on our rivers which has led to changes in WFD status based on the availability of more data rather than actual changes in water quality or ecology.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>WRAXALL Brook</td>
<td>Poor</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Frome Dorset (Headwaters)</td>
<td>Poor</td>
<td>Moderate</td>
<td>Moderate - Fish (Uncertain)</td>
</tr>
<tr>
<td>BERE STREAM</td>
<td>Good</td>
<td>Moderate</td>
<td>Moderate - Fish (Uncertain)</td>
</tr>
<tr>
<td>Frome Trib (Luckford Lake) *</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Frome Dorset Trib (River Win) *</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Tadmooll Brook (including Empool Bottom)</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Frome Dorset Trib (Compton Valence Stream)*</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Frome Dorset (Lower) &amp; Furzebrook Stream</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor - Phytobenthos (Very Certain)</td>
</tr>
<tr>
<td>SYDLING WATER</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>CERNE</td>
<td>Poor</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Frome Dorset (Upper)</td>
<td>Good</td>
<td>Good</td>
<td></td>
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<tr>
<td>HOORE</td>
<td>Good</td>
<td>Good</td>
<td></td>
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<tr>
<td>Trib of Poole Harbour (Greenland Stream) *</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Trib of Poole Harbour (Brenscome Stream - Wych) *</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>CORFE RIVER*</td>
<td>Moderate</td>
<td>Poor</td>
<td>Poor - Phytobenthos (Very Certain)</td>
</tr>
<tr>
<td>Trib of Poole Harbour (Luscombe Valley Stream) *</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate - Phosphate (Uncertain)</td>
</tr>
<tr>
<td>Wareham Forest Stream*</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate - Expert Judgement (Hydromorphological results only)</td>
</tr>
<tr>
<td>SOUTH WINTERBOURNE*</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Trib of Poole Harbour (Upton Heath Stream) *</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate - Expert Judgment (Hydromorphological results only)</td>
</tr>
<tr>
<td>PIDDLE (Lower)</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor - Phytobenthos (Very Certain)</td>
</tr>
<tr>
<td>Trib of Poole Harbour (Hatch Pond Stream) *</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate - Expert Judgement (Hydromorphological results only)</td>
</tr>
<tr>
<td>Sherford River</td>
<td>Moderate</td>
<td>Poor</td>
<td>Poor - Fish (Very Certain)</td>
</tr>
<tr>
<td>PIDDLE (Upper) *</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>DEVILS BROOK*</td>
<td>Moderate</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Trib of Poole Harbour (Burnbake Stream)*</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate - Expert Judgement (Hydromorphological results only)</td>
</tr>
</tbody>
</table>

*not assessed for fish, fish assessment does not normally include data upstream of the perennial head in a winterbourne