

EA-NORTH EAST BOX 6

managing flood risk

An aerial photograph of a flooded landscape, showing a vast expanse of water reflecting the sky. The water is a deep blue, and the surrounding land is a lighter, hazy blue. The perspective is from a high angle, looking down on the water.

Yorkshire Derwent
Catchment Flood Management Plan

March 2007



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Agency



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Preface

Our goal is to reduce the risk of flooding from rivers and the sea to people, homes, businesses, infrastructure and the natural environment.

Flooding is a natural process – we can never stop it happening altogether. So tackling flooding is more than just defending against floods. It means understanding the complex causes of flooding and taking action together to reduce flood risk.

To reduce flood risk we need to work in partnership with local planning authorities, landowners, local communities, emergency services and other interested groups in order to:

- understand current and future flood risk;
- plan for the likely impacts of climate change;
- prevent inappropriate development in flood risk areas;
- reduce flood risk through sustainable projects, for example, creating washlands and storage areas;
- explore the wider opportunities to reduce the sources of flood risk, including changes in land use and land management practices;
- deliver an effective flood forecasting, flood warning and emergency response service;
- encourage people at risk of flooding to be aware and be prepared.

A Catchment Flood Management Plan (CFMP) allows us to consider our approach to reduce flood risk over a long time period. Working with other individuals and organisations we can develop the ideas and approaches from this plan into projects that will reduce flood risk within the catchment for future generations.

Options have been identified that apply to both individual communities and the wider Derwent catchment. We have used information on land use and climate change as the main inputs to the CFMP as these are thought to be the main causes of increased flood risk in the catchment in future years.

The Yorkshire Derwent catchment is a predominantly rural catchment located in the north east of England. The catchment extends south from the North Yorkshire Moors and flows into the River Ouse at Barmby on the Marsh south of Selby.

The largest towns within the catchment are the market towns of Malton and Norton, with small villages and hamlets distributed across the catchment. The towns and villages that border the River Derwent and its tributaries have a long history of flooding.

A lot of work has been undertaken on the Derwent catchment since the 1999 floods. This flood triggered work to reduce flood risk across the area. We have successfully completed new flood alleviation schemes at Malton, Norton, Old Malton and Stamford Bridge. Flood warnings have been improved. More locations are now on the flood warning service and the accuracy of the warnings has been improved. Our telemetry network has increased to providing a better understanding of rainfall and river conditions and we have also improved our flood maps that cover the area.

The Derwent catchment is now in a stronger position with regard to managing flood risk but further work is needed to deal with flood risk to take account of the effects of climate change and land use change. This Derwent Catchment Flood Management Plan identifies the ideas that will help us to manage flood risk in the future.

There are separate Technical Annexes that provide the supporting evidence and data upon which the conclusions are based.

ENVIRONMENT AGENCY



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1 Introduction

The overall aim of the Derwent Catchment Flood Management Plan (CFMP) is to identify the best way to manage flood risk in the area and to improve our natural and built environment. It will help us prepare ourselves for the potential effects of climate and land use change over the next 50 to 100 years.

1.1 Environment Agency approach to flood risk management

We are the lead authority for all flood risk management activities in England and Wales.

Our overall aims of reducing flood risk in England and Wales are to:

- discourage inappropriate development in areas at risk from flooding;
- encourage the provision of adequate and effective flood warning systems;
- to encourage the provision of flood alleviation measures.

1.2 Role of catchment flood management plans

A CFMP is a forward planning document. By working with other major decision-makers within a river catchment we can identify and agree policies for future flood risk management. The CFMP will contribute towards the European Water Framework Directive, river basin management plans and will guide investment in flood risk management activities.

1.3 Derwent CFMP

This CFMP covers the whole of the Yorkshire Derwent catchment. The Derwent CFMP has assessed issues that could have an effect on the flood risk across the whole catchment.

These include:

- land management – afforestation/intensification of agriculture;
- water management – flood storage;
- effects of climate change.

1.4 What the CFMP does not do

The Derwent CFMP will not provide detailed flood risk management solutions for individual flooding issues. It provides broad scale ideas that will guide and enable solutions to be developed that make sense in the context of the whole catchment over a 50-100 year time period. This CFMP document will be reviewed every six years to monitor its performance and to take account of new information that may influence the area.

1.5 This CFMP can be used by you

It is anticipated that this CFMP can be used by many organisations, landowners and land managers to enable them to consider flood risk within their everyday work and future practices.

We hope to demonstrate to you through this document the work we have done to draw together a vision for future flood risk management in the catchment. We need to work together to deliver this vision for the Derwent catchment.

This CFMP can be used by the following organisations who need to consider flood risk as part of their plans:

- Local Authorities and development planners who will use it to influence land use planning and policy.
- Internal Drainage Boards and water companies to support planning of their activities in the wider context of the catchment.
- Defra for planning future funding and demonstrating policy implementation.
- Emergency Services with a response role to flooding.
- National Park, Natural England, Forestry Commission, Farming and Wildlife Advisory Group to promote and enhance biodiversity.
- National Farmers Union, Country Land and Business Association to promote agricultural diversification to interested groups.

In 2001 external organisations and individuals were consulted, their comments were returned and have been incorporated into the Derwent CFMP.



Derwent Bridge, Bubwith

2 Catchment overview

2.1 Definition and extent of catchment

The Derwent catchment lies mainly within the county of North Yorkshire.

The boundaries are: to the North, the North Yorkshire Moors and Howardian Hills; to the west, the Vale of York; to the east, the Yorkshire Wolds and the North Sea coast, and to the south, the Humber Estuary.

2.2 Physical characteristics

2.2.1 *Climate*

The annual rainfall across the catchment ranges from 1100 millimetres on the Upper Derwent across the North York Moors to 600 millimetres where the Derwent flows into the River Ouse at Barmby-on-the-Marsh. The higher rainfall on the upper catchment can influence smaller more localised catchments, for example, Pickering Beck.



2.2.2 Principal catchment features

This CFMP covers an area of 2048 square kilometres and has a population of 100,000 (2001 census). It is highly diverse in terms of topography, landscape, historic environment, settlement pattern and economic and social well being.

The watercourses in the upper catchment, flowing from the North Yorkshire Moors, respond quickly to heavy rainfall. Through the Vale of Pickering and along the Lower Derwent Valley to the River Ouse at Barnby-on-the Marsh, the river and surrounding land have gentler slopes. Here river levels are generally slow to respond to rainfall but river levels can remain high for many days.

2.2.3 Hydrology

There are gauging stations throughout the catchment that measure river flows. On the Derwent at Buttercrambe data has been collected since September 1973. The average flow here is 16.648 cubic metres per second. It was over 10 times this in November 2000 at 172.08 cubic metres per second.



2.3 Wildlife

There are a large number of designated sites within the catchment including more than 60 Sites of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protection Areas (SPA).

The lower sections of the Derwent flow through the Lower Derwent Valley SAC/SPA/Ramsar. These include many of the flood meadows and washlands already designated as SSSIs which regularly flood during the winter months. The Lower Derwent Valley is designated for its lowland hay meadows, alluvial forest, otter and internationally important numbers of breeding and overwintering birds and waterfowl.

The River Derwent SAC is in unfavourable condition due to nutrients, siltation, channel structure and lack of access for migratory fish.



2.4 Recreation and tourism

Recreation and tourism on the Derwent is essentially linked with the landscape and cultural interests. Places of interest and activities include:

- North Yorkshire Moors – walkers, campers, horse riding, field sports including hunting and shooting.
- Dalby Forest, a forestry commission site – walkers, horse riding, picnics, cycling, rallying and music concerts.
- Lower Derwent Valley area – bird watchers, walkers, cycle routes and long distance footpaths namely, Centenary Way, Minster Way, and the Trans Pennine Trail.
- Stamford Bridge, Malton, Pickering – sightseeing, history shopping.
- Castle Howard, North York Moors Railway, Flamingoland, Eden Camp – tourist attractions.
- The River Derwent and Pocklington Canal – fishing, boating and canoeing.

2.5 Landscape and land use

The upper reaches lie within the North York Moors National Park and stretches of the Rivers Rye and Derwent lie within the Howardian Hills, an Area of Outstanding Natural Beauty (AONB).

The area is predominantly rural. The upper Derwent catchment is largely covered with heather and grass moorland, which is used for rough grazing grouse and managed forest. In the lower catchment arable farming is more prominent.



Higher quality agricultural land is found lower in the catchment in the river valleys, the Vale of Pickering and the Lower Derwent Valley. Agricultural production in low-lying areas is aided by the land drainage work undertaken by the Internal Drainage Boards (Appendix 12).

Many of the towns and villages within the study area have a high quality built environment and a number are protected by Conservation Areas including parts of Malton and Pickering. This ensures strict controls over development, such as building design, tree works and the demolition of buildings or structures. Additionally, there are areas of open space, which are considered visually important in maintaining the character of the areas.

Scarborough and York are located outside the Derwent CFMP study area, however they are the main urban settlements serving the area. The catchment is mostly rural in character with many small villages and hamlets. The principal market towns in the catchment are Malton, Norton, Pocklington, Stamford Bridge and Pickering.

3 Current flood risks and management

3.1 History of flooding

The Derwent catchment has a long history of flooding with evidence dating back to 1892. Prior to the flooding in 1999, the previously highest recorded flood was in 1947. The catchment has been particularly badly affected by flooding in 1927, 1930, 1931, 1932, 1960 and in more recent times, during March 1999, summer and autumn 2000, August 2002 and June 2005.



Flooded market place in Pickering, c 1930

The autumn 2000 flood event was the worst flood recorded. It was estimated to have been an event with a two per cent chance of happening in any year. The impacts of this flood were severe on communities and many properties within the catchment suffered significant flooding. The locations of the affected properties and details of other assets flooded during an event can be seen in Appendix 13. The extent and levels of the flooding shown is from historic data that was collected. Some other historic floods have occurred where data has not been collected. Smaller, more frequent events can still cause significant damage to those affected.

As a result of the autumn 2000 event, over 200 properties in the Derwent catchment were affected by flooding. Pickering, Stamford Bridge, Old Malton, Malton and Norton, Sinnington, Elvington and Thorganby were subject to significant flooding.



Flooding in Malton, Autumn 2000

3.2 Flood regime

There are two reasons for river flooding across the Derwent catchment. Firstly, flooding caused by prolonged and heavy rainfall across the North York Moors, often combined with snow melt, causes flooding across the whole of the catchment. Secondly flooding can be the result of intense local rainfall events that are common during summer months. Flooding in the villages to the north of the catchment is usually quite rapid, for example at Kirkby Mills and Pickering where the catchment is steep. The lower Derwent, from Elvington to Barmby on the Marsh is at risk from both river and tidal flooding.

3.3 Existing flood risk management within the catchment

3.3.1 Floodplain and floodbanks

Floodplains or areas around the river, act as natural flood alleviation by allowing floodwater from the river to flow onto them. This lowers depth of the floodwater downstream. Many of the floodbanks in the Derwent catchment protect agricultural land during the more frequent smaller floods, but overtop during the larger events.

3.3.2 Maintenance

Maintenance regimes across the Derwent include a yearly programme of grass cutting, vermin control on flood banks, weed control of watercourse channels to maintain water flow in the smaller watercourses and visual inspection of all defences to ensure the flood alleviation schemes are in good condition. This work is planned on an annual basis.

The Internal Drainage Boards within the Derwent catchment also undertake similar maintenance works on drainage channels to improve land drainage.

3.3.3 Flood alleviation schemes

Flood alleviation schemes completed within the last four years to protect the built environment include:



Old Malton



Malton/Norton Scheme



Stamford Bridge

3.4 Flow control structures

There are a number of flow control structures on the Derwent.

These were installed to maintain water levels during low flow conditions to maintain navigation and to protect historic bridges and buildings. Weir Head sluice, was designed as a pollution prevention structure to protect the sink holes along the River Derwent in Forge Valley from being polluted by sheep dip. Barmby Barrage prevents salt water entering the River Derwent on high tides allowing abstraction for water supply purposes.



Weir Head sluice



Stamford Bridge sluice



Elvington sluice



Kirkham sluice



Barmby Barrage

3.5 Flood warning

We provide flood warnings across the Derwent catchment to the following communities at risk from flooding:

Bubwith	Mowthorpe	Sinnington
Butterwick Bridge	Newby	Stamford Bridge
Elvington	Norton	Thorganby
Kexby Bridge	Old Malton	Wressle and Brackenholme
Malton	Pickering	
Menthorpe and Breighton	Scalby	

The nature of the catchment means it is possible to give our target warning time of at least two hours to most people at risk across the Derwent catchment. However, there are locations on the upper catchment where this could be improved or is not currently possible due to the quick response of the watercourses. At present 40 per cent of properties at risk in the Derwent catchment have been invited to be included on the flood warning system, from this 51 per cent have signed up to the warning system.

Flood warnings on the Derwent based on 2004 at risk register:

Total at risk in Derwent catchment	2680
Total number of people offered a flood warning service	1073
Total signed up to receive a flood warning	550



Old Malton,
Autumn 2000



Stamford Bridge,
Autumn 2000

3.6 Flood risk areas within the catchment

In addition to the flood risk areas covered by our flood warning service, there are other locations in the Derwent catchment that have experienced flooding in the past and are considered to be prone to flooding, these include:

Burniston	Keldholme	Ryton
Cloughton	Kexby	Scalby
East Cottingwith	Kirkby Mills	Settrington
Gilling East	Marton	Thorganby
Hayton	Normanby	Thornton-le-Dale
Helmsley	Nunnington	Wilberfoss
Hovingham	Pocklington	

3.7 Infrastructure affected by flooding

If severe flooding occurs to the degree that is suggested by the extreme flood outline extent, which is a 0.1 per cent chance in any one years, it is likely that utility services to homes and businesses will be temporarily affected. Services such as gas, electricity and telephones may be cut off. Also floodwater can overwhelm sewer systems causing the flood water to become contaminated.

The road and rail infrastructure network affected by flooding can disrupt the lives of people within the catchment and also those who travel across it. The infrastructure that can potentially be affected from flooding is illustrated in the following table.



From Sutton-on-Derwent/Elvington to Barmby-on-the-Marsh, the River Derwent is navigable. Between East Cottingwith and Melbourne in the south of the Derwent Catchment, the Pocklington Canal is also navigable. If these watercourses flood they can become dangerous to navigate. Locks have the potential to become submerged beneath the floodwater and bridges become impassable due to the reduction in height clearance due to high water levels.



Malton,
County Bridge,
Autumn 2000



Malton Railway
Station, Autumn
2000

Infrastructure	Potentially affected routes
Rail	York to Scarborough/Filey
	North York Moors Railway (Pickering to Grosmont)
	Selby to Howden (Leeds to Hull route)
Roads	No motorways within catchment
A roads	A64, A1039, A163, A169, A170, A166, A63, A1079, A165
B roads	B1228, B1246, B1247, B1248, B1257, B1258, B1363, B1415

4 Possible future changes to the catchment

Considerable physical changes may occur within the catchment over the next 50 to 100 years. This section identifies possible future scenarios that have been modelled to develop CFMP policies to manage long term flood risk. Combinations of urban development, changes in land use and climate change have been considered.

4.1 Urban development

Regional and Sub-regional Planning Guidance promotes the role of market towns as important local service centres, the importance of Malton and Norton is highlighted and other important market towns should be identified through development plans. Within the CFMP study area the Ryedale Local Plan also identifies Pickering and Kirkbymoorside, alongside Malton and Norton, as market towns. In the East Riding of Yorkshire the current local plan recognises the role of Pocklington as an urban centre.

Overall, the four towns in the study area will be the focus for development in the future to support their local service centre role. However, major growth to 2016 will be directed to locations outside the study area. A range of smaller settlements in the study area could accommodate limited housing, industrial and transport related development. This will be of a relatively small scale to primarily meet local needs and to protect the character of the settlement.

4.1.1 Development beyond 2016

In the period just beyond 2016 it remains difficult to envisage major growth in the study area. Market towns are likely to continue to expand to fulfil their roles as local service centres.

4.1.2 Development summary

From the investigation of development plans future trends in urbanisation within the Derwent catchment are not considered to be significant, and therefore have not been subjected to modelling for this CFMP.

4.2 Land management

The Derwent catchment is a predominantly rural area. We have therefore focussed on land management change scenarios to assess what impact they have on flood risk.

Land management change scenarios modelled for this CFMP include:

- Scenario one – blocking land drains, reducing flood peak levels by 10 per cent.
- Scenario two – using buffer strips adjacent to watercourses, delaying the flood peak by two hours.
- Scenario three – widescale afforestation, a combination of scenario one and two.
- Scenario four – increasing land drainage, speeding up the flood peak by two hours.
- Scenario five – floodplain storage.
- Scenario six – increase channel conveyance (flow).
- Scenario seven – climate change.

These have all been applied to an event with a one per cent chance of happening any year.

The results from the scenario tests suggest that capitalising on land use could reduce flows and levels associated with the flood event with a one per cent chance of happening any year to broadly equivalent to the flood event with a two per cent chance of happening in any year. Possible changes to present day land use could include:

- modifying land drains to slow the flow from reaching watercourses;
- encouraging afforestation where appropriate;
- improving channel conveyance (flow), and identifying opportunities for restoration of meanders where appropriate and to increase water storage within the river channel;
- identifying suitable flood storage locations.



Castle Howard

The opportunity to store some water should be investigated further as there can be multiple benefits from reducing flood risk to enhancing the environment. Land management initiatives will also help restore the River Derwent SSSI to favourable condition and meet Public Service Agreement targets for SSSI's by 2010.

4.3 Climate change

The United Kingdom Climate Impacts Programme 2002 (UKCIP02) suggests that by the 2050s the predicted impacts on the Derwent catchment area could include:

- an increase in annual average daily temperature between 1.0 degree celsius and 2.3 degrees celsius;
- wetter winters and drier summers;
- a reduction in average annual rainfall of up to 10 per cent;
- summer rainfall to decrease between 13 per cent and 32 per cent;
- winter rainfall to increase between 8 per cent and 20 per cent;
- summer storms with high intensity rainfall may become more frequent and intense.

Over the next 50 years the patterns of flooding are likely to change. Increased winter rainfall volumes and more intense summer storms may have the effect of increasing frequency of flooding therefore increasing the need to plan for the effects of this across the catchment.



The results from the climate change scenario for the Derwent catchment show that this has the most significant impact on increasing flood risk across the area. Assuming Defra's climate change guidelines are a good prediction, action is needed within the Derwent Catchment to manage the effects of climate change this could include:

- protecting the floodplain from inappropriate development;
- identifying areas that could be allowed to flood to take account of the increase in flood flow;
- reviewing current drainage systems (both urban and rural drainage);
- improving flood warning to those who may be at risk from flooding in the future;
- reviewing the current flood alleviation schemes to determine whether they will operate effectively with climate change or whether they will need to be modified;
- monitoring wildlife to establish whether any habitats or species are at risk and if so look to re-establish them elsewhere;
- monitoring fish levels and species distribution to identify any changes.

Further work is on going to look at the impacts of climate change. If there are any changes to the present guidelines the Derwent CFMP will look at these when it is reviewed in future.

The causes of climate change also need to be addressed. This is outside the scope of this CFMP. We support actions to reduce the causes of climate change through our corporate environmental targets and supporting the work of those in the field of climate change research (United Kingdom Climate Impacts Programme). We all have a part to play in reducing the causes of climate change.

4.4 Sources of uncertainty within the CFMP

The significance of uncertainty needs to be fully assessed and integrated into the development of flood risk management policies. Sources of uncertainty are:

- climate change;
- land use change;
- planning and development;
- flood modelling.

These will be reconsidered when the CFMP is reviewed in six years time.



River Dove, Farndale



River Derwent from Howsham Bridge

5 Derwent preferred plan

The CFMP policies determine whether flood risk should increase, decrease or remain the same. There are two types of policy for the catchment; those that apply to the whole catchment and those that apply to smaller areas of the catchment.

The catchment has been divided by council ward boundaries. These have been tested by a range of scenarios, for example, climate change and changes in land management. The council wards that showed similar results have been grouped together to form policy units.

We aim to make the outputs from the Derwent CFMP sustainable in the long term. This means identifying how best to manage the flood risk across the catchment by considering its effect on people, the environment (both wildlife and heritage), and on the economy to the local area and to the UK.

The Derwent CFMP policies have been tested against our CFMP objectives to assess the sustainability of the policies.

A timescale has been applied to the flood management actions for the Derwent CFMP. Actions can commence sooner than the timescale proposed.

Short timescale 0 – 5 years

Medium timescale 5 – 25 years

Long timescale 25 – 100 years

The Derwent CFMP objectives are to:

- 1) Reduce the risks of flooding to people, property and the environment;
- 2) Improve the quality of life in terms of amenity, recreation and access;
- 3) Protect and enhance landscape, biodiversity and cultural heritage of the Derwent catchment;
- 4) Balance the needs of water users and improve water use management;
- 5) Limit and adapt to the effects of climate change;
- 6) Promote a sustainable and vibrant local economy.

(NB. The objectives are referred to in the policy plan in brackets).

Derwent catchment

Policy:

- improve catchment information – rainfall, runoff, river level/flow and flood risk;
- prevent inappropriate development in the floodplain;
- make space for water – improve land management practice, restore natural use of floodplain;
- improve communication – professional partners, landowners, those directly at risk from flooding;
- promote sustainable urban drainage systems;
- climate change – monitor the effects of climate change to - Derwent catchment policy.

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Improve hydrological data on the catchment	<ul style="list-style-type: none"> • Increased rainfall, river flow and level monitoring equipment (1) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local planning authorities 	<ul style="list-style-type: none"> • Short/Medium
Prevent inappropriate development in the floodplain	<ul style="list-style-type: none"> • No inappropriate development within the floodplain (1, 5 and 6) 	<ul style="list-style-type: none"> • Local Planning Authorities 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Short
	<ul style="list-style-type: none"> • Accurate measure of flood risk across the catchment (1) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local planning authorities 	<ul style="list-style-type: none"> • Short
Promote Environmental Stewardship Schemes	<ul style="list-style-type: none"> • Increased take up of environmental stewardship schemes (3, 4 and 6) 	<ul style="list-style-type: none"> • Natural England 	<ul style="list-style-type: none"> • National Farmers Union • Environment Agency • Country and Land Business Association • Land owners 	<ul style="list-style-type: none"> • Short
	<ul style="list-style-type: none"> • Long term stability of environmental stewardship schemes (3, 4, 5 and 6) 			<ul style="list-style-type: none"> • Medium

Action	Measure of success to support Derwent CFMP objectives
Improve flood warning service	<ul style="list-style-type: none"> • Increased take up of flood warning service (1) • Improved flood warning coverage (1) • People at risk from flooding take effective action (1 and 2)
Improve communication between organisations and landowners	<ul style="list-style-type: none"> • Multi-Agency forum to collect and disseminate information to all is established (1,2,3,4,5 and 6)
Change land management practice to reduce flooding	<ul style="list-style-type: none"> • Reduced sedimentation levels (4) • Improved water quality (4) • Increased take up of environmental stewardship (6) • Increased length and usage of buffer strips (1, 3, 4 and 5)
Improve emergency response to flooding	<ul style="list-style-type: none"> • Seamless and integrated response to flooding incidents (1)

Lead organisation	Supporting organisations	Timescale for results
<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Defra People at risk from flooding Local authorities Media organisations Emergency services 	<ul style="list-style-type: none"> Short
<ul style="list-style-type: none"> Yorkshire and Humber Assembly 	<ul style="list-style-type: none"> All professional organisations 	<ul style="list-style-type: none"> Medium
<ul style="list-style-type: none"> Defra 	<ul style="list-style-type: none"> Environment Agency Natural England Country and Land Business Association Land owners National Farmers Union 	<ul style="list-style-type: none"> Medium/Long
<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Local authorities Emergency services Utility companies Parish/Town councils Property owners 	<ul style="list-style-type: none"> Short

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Promote sustainable urban drainage	<ul style="list-style-type: none"> Increased usage of sustainable urban drainage on new developments and re-developments (1, 4, 5 and 6) Sustainable urban drainage systems are maintained as per their original design (1, 2, 4, 5 and 6) 	<ul style="list-style-type: none"> Local planning authority 	<ul style="list-style-type: none"> Environment Agency Developers Property owners Highway Authority 	<ul style="list-style-type: none"> Short Medium/Long
Reduce greenhouse gas emissions	<ul style="list-style-type: none"> Reduction in emissions of all greenhouse gases (1, 3 and 5) Reduction in energy use (3 and 5) Increase recycling (3 and 6) Reduction in car usage (2, 3 and 5) 	<ul style="list-style-type: none"> HM Government 	<ul style="list-style-type: none"> Environment Agency Local authorities Industry Individuals 	<ul style="list-style-type: none"> Medium/Long



Kirkham Abbey



Stamford Bridge

Policy unit one geographic area: Swainby, Broughton and Greenhow, Flylingdales, Dales

Policy:

- more sustainable land management will reduce flood risk downstream.

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Promote sustainable farming practice	<ul style="list-style-type: none"> • Increased number and area of wetland sites (1, 2, 3 and 6) • Reduction in water level downstream (1 and 5) • Enhanced biodiversity and landscape (3) • Review stocking levels (6) • Review sowing of crops (3) • Enhanced biodiversity (3) • Improved recreational usage of the site where appropriate (2 and 6) 	<ul style="list-style-type: none"> • National Park • Land owner 	<ul style="list-style-type: none"> • Natural England • Environment Agency • Landowners • RSPB 	<ul style="list-style-type: none"> • Medium

Policy unit two geographic area: Birdsall (Derwent District), Stockton and Bossall (Ryedale South West), Ampleforth, Rillington

Policy:

- reduce existing flood risk management actions.

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Introduce buffer strips adjacent to watercourses	<ul style="list-style-type: none"> • Reduced sedimentation levels within the river channel (3 and 4) • Increased width and usage of buffer strips (1, 2, 3, 4 and 5) 	<ul style="list-style-type: none"> • Landowners 	<ul style="list-style-type: none"> • Environment Agency • Natural England • National Farmers Union • Country and Land Business Association 	<ul style="list-style-type: none"> • Medium
Identify and abandon floodbanks that do not provide a reduction in flood risk to property	<ul style="list-style-type: none"> • Redundant floodbanks removed from asset register (3, 4 and 5) • Restoration of natural floodplain (1, 2, 3, 4 and 5) • Improved river corridor habitat (3) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Landowners • Natural England • National Farmers Union • Country and Land Business Association 	<ul style="list-style-type: none"> • Short/Medium
Increase meanders to the River Derwent within Rillington Ward	<ul style="list-style-type: none"> • Increased lengths of river restoration (3) • Reduced flood levels downstream (1) • Increased biodiversity and amenity usage of the stretch of river post restoration (2 and 3) 	<ul style="list-style-type: none"> • River Restoration Centre 	<ul style="list-style-type: none"> • Landowners • Natural England • Environment Agency 	<ul style="list-style-type: none"> • Medium/Long

Policy unit three geographic area: Sherburn, Amotherby, Thornton Dale, Wolds Weighon, Lindhead, Scalby, Derwent (Derwent Valley), Ayton (Derwent Valley)

Policy:

- continue with existing (or alternative) actions to manage flood risk (accepting the affects of climate change).

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Set floodbanks away from watercourse within Sherburn Ward	<ul style="list-style-type: none"> • Reduction in flood risk downstream (1) • Reduced sedimentation levels within the river channel (3 and 4) • Increased lengths of floodbanks set back from the watercourse (1, 3, 4, 5 and 6) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Landowners • Natural England • Local Planning Authority 	<ul style="list-style-type: none"> • Medium
Increase forestation within Thornton Ward	<ul style="list-style-type: none"> • Increased recreational use within the forested area (2) • Area of forest is increased (1,2, 5 and 6) • Improved water quality (chemical and biological) (4) • Reduced flood risk downstream (1) 	<ul style="list-style-type: none"> • Forestry Commission 	<ul style="list-style-type: none"> • Landowner • Local Planning Authority • Environment Agency 	<ul style="list-style-type: none"> • Long
Assess flood risk at: East and West Ayton Scalby, Mowthorpe, Burniston and Cloughton	<ul style="list-style-type: none"> • Flood risk mapping study completed (1) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local Authority • Local community 	<ul style="list-style-type: none"> • Short

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Flood storage in Amotherby Ward	<ul style="list-style-type: none"> Increased flood storage area within Amotherby ward (5) 	<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Landowners Local planning authorities 	<ul style="list-style-type: none"> Medium
Introduce buffer strips adjacent to watercourses	<ul style="list-style-type: none"> Reduced sedimentation levels within the river channel (3 and 4) Increased length and usage of buffer strips (1, 2, 3, 4 and 5) 	<ul style="list-style-type: none"> Landowners 	<ul style="list-style-type: none"> Environment Agency Natural England National Farmers Union Country and Land Business Association 	<ul style="list-style-type: none"> Medium
Identify and abandon floodbanks that do not provide a reduction in flood risk to property	<ul style="list-style-type: none"> Redundant floodbanks removed from asset register (3, 4 and 5) Restoration of natural floodplain (1, 2, 3, 4 and 5) Improved river corridor habitat (3) 	<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Landowners Natural England National Farmers Union Country and Land Business Association 	<ul style="list-style-type: none"> Short/Medium
Maintain existing flood defences that provide reduced flood risk to property	<ul style="list-style-type: none"> Assets are in serviceable condition (1, 6) 	<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Landowners 	<ul style="list-style-type: none"> Short
Slow rate of land erosion by increasing take up of environmental stewardship	<ul style="list-style-type: none"> Sedimentation levels reduced (4) Improved water quality (3 and 4) Increased take up of environmental stewardship (6) 	<ul style="list-style-type: none"> Defra 	<ul style="list-style-type: none"> Environment Agency Natural England Landowners 	<ul style="list-style-type: none"> Medium/Long

Policy unit four geographic area: Hovingham, Kirkbymoorside, Kirby Misperton (Cropton and Sinnington), Wheldrake, North Duffield, Pocklington, Howdenshire, Howden

Policy:

- take action to sustain the current level of flood risk into the future (managing effects of climate change).

To manage flood risk we recommend:

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations (managing effects of climate change)	Timescale for results
Increase forestation in upland areas	<ul style="list-style-type: none"> • Increased recreational use within the forested area (2) • Area of forest is increased (1,2, 5 and 6) • Improved water quality (chemical and biological) (4) • Reduced flood risk downstream (1) 	<ul style="list-style-type: none"> • Forestry Commission 	<ul style="list-style-type: none"> • Landowner • Local planning authority • Environment Agency 	<ul style="list-style-type: none"> • Long
Assess flood risk at : <ul style="list-style-type: none"> • Sinnington • Kirkby Mills • Keldholme • Harome • Hovingham • Kirkbymoorside • Kirby Misperton 	<ul style="list-style-type: none"> • Flood risk mapping study completed (1) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local planning authorities 	<ul style="list-style-type: none"> • Short

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations (managing effects of climate change)	Timescale for results
Maintain existing flood defences that reduce flood risk to property	<ul style="list-style-type: none"> Assets are in serviceable condition (1, 6) 	<ul style="list-style-type: none"> Environment Agency 	<ul style="list-style-type: none"> Landowners 	<ul style="list-style-type: none"> Short
Slow rate of land erosion by increasing take up of environmental stewardship	<ul style="list-style-type: none"> Sedimentation levels reduced (4) Improved water quality (3 and 4) Increased take up of environmental stewardship (6) 	<ul style="list-style-type: none"> Defra 	<ul style="list-style-type: none"> Environment Agency Natural England Landowners 	<ul style="list-style-type: none"> Medium/Long



Hovingham Beck, Hovingham



Pocklington Beck, Pocklington

Policy unit five geographic area: East and West Norton, Malton, Helmsley, East and West Pickering

Policy:

- take further action to reduce flood risk (reduce effects of climate change).

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Assess flood risk at Helmsley	<ul style="list-style-type: none"> • Flood risk mapping study completed (1) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local planning authority • People at risk from flooding 	<ul style="list-style-type: none"> • Short
Review flood risk in Malton and Norton	<ul style="list-style-type: none"> • Capital investment strategy is reviewed 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Defra 	<ul style="list-style-type: none"> • Short
Maintain existing flood defences that reduce flood risk to property	<ul style="list-style-type: none"> • Assets are in serviceable condition (91, 6) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Landowners 	<ul style="list-style-type: none"> • Short
Reduce flood risk at Pickering	<ul style="list-style-type: none"> • Flood risk reduced (1, 6) 	<ul style="list-style-type: none"> • Environment Agency 	<ul style="list-style-type: none"> • Local planning authority • People at risk from flooding 	<ul style="list-style-type: none"> • Medium

Policy unit six geographic area: Hemingbrough, Sheriff Hutton, Seamer, Hertford, Cayton, Derwent (Dunnington)

Policy:

- take action to increase the frequency of flooding to deliver benefits locally or elsewhere.

Action	Measure of success to support Derwent CFMP objectives	Lead organisation	Supporting organisations	Timescale for results
Create wetland sites	<ul style="list-style-type: none"> • Increased number and area of wetland sites (1, 2, 3 and 6) • Reduction in water level downstream (1 and 5) • Enhanced biodiversity and landscape (3) • Improved recreational usage of the site where appropriate (2 and 6) 	<ul style="list-style-type: none"> • National Park 	<ul style="list-style-type: none"> • Natural England • Environment Agency • Landowners • RSPB 	<ul style="list-style-type: none"> • Medium
Slow rate of land erosion by increasing take up of environmental stewardship	<ul style="list-style-type: none"> • Sedimentation levels reduced (4) • Improved water quality (3 and 4) • Increased take up of environmental stewardship (6) 	<ul style="list-style-type: none"> • Defra 	<ul style="list-style-type: none"> • Environment Agency • Natural England • Landowners 	<ul style="list-style-type: none"> • Medium/Long

5.1 Conclusion

The Yorkshire Derwent Catchment Flood Management Plan identifies the preferred flood management approach for the area to reduce the risk of flooding over a significant time period.

Formal review of the Derwent CFMP will take place every six years to reflect significant changes in flood risk in the catchment or policy changes such as the Water Framework Directive River Basin Management Plans.

During a review, the CFMP policies will be evaluated to monitor progress in delivering the actions. The actions will also be reviewed to take account of any new information. Information will be updated and expanded to incorporate the most up to date knowledge. Consideration will be given to:

- the availability of new planning and modelling tools;
- the effects of recent significant flood events;
- urban development;
- advanced understanding of climate change;
- changes in national policy guidance.

These factors may lead to changes in the CFMP policies for flood risk management.

Detailed information used to formulate this document is available on request.

For more information please contact: Environment Agency (Yorkshire Derwent CFMP)
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Howsham Bridge

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Derwent CFMP Broadscale modelled scenarios & modelling methodology

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Step 2 – Derwent CFMP measures past first screening

Step 3 – Proposed measures to be modelled

Step 4 – Derwent options appraisal matrix

Measures review with consultee comments

Step 5 – Modelled scenarios/modelling options

Economics basecase and scenario

Economics for climate change

Ward boundaries

GIS Layer – Policy Unit 1 - 6 Policy unit and scenario analysis

CFMP objectives and generic flood risk methods assessment matrix

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