

**Learning lessons from the 2007 floods
An independent review by Sir Michael Pitt
Interim Report**

RESPONSE FROM THE WILDLIFE TRUSTS

27 March 2008



The Wildlife Trusts

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There are 47 local Wildlife Trusts across the whole of the UK, the Isle of Man and Alderney. We are working for an environment rich in wildlife for everyone. With 720,000 members, we are the largest UK voluntary organisation dedicated to conserving the full range of the UK's habitats and species whether they be in the countryside, in cities or at sea. We manage 2,200 nature reserves covering more than 86,000 hectares; we stand up for wildlife; we inspire people about the natural world and we foster sustainable living.

The Wildlife Trusts are involved in water policy issues at national, regional and local levels, and are key players in wetland habitat management, restoration and enhancement on the ground. We are represented on the Defra WFD Stakeholder Group and the Defra Flood Risk Management Stakeholder Group, and represent the environmental NGO sector on a number of River Basin District Liaison Panels and Regional Flood Defence Committees.

The Wildlife Trusts believe that land use planning and flood management policies all have the potential to contribute significantly to habitat restoration and enhancement. This provides a mechanism for adaptation to climate change and landscape scale conservation, as well as contributing to ecosystem services.

We would be pleased to provide further information in relation to this submission.

Introduction

- The Wildlife Trusts warmly welcome the publication of the interim report into the summer 2007 flooding and support the emphasis on both the Urgent Recommendations and Interim Conclusions. We are pleased that the broad range of key issues concerning flooding - prevention, adaptation and mitigation and response - have been considered in a single document as it is critical that solutions and lessons learnt are shared by the wide ranging audience that these issues will concern.
- We feel that the interim report has provided a measured, rational response to the severe events of summer 2007. We welcome this approach and feel assured that this will continue through to the publication of the final report in June 2008.

Recommendation 1

We strongly advocate the adoption of sustainable flood management as the most appropriate way forward in dealing with flood risk management into the future. Flood defence structures should be used where necessary to protect people and property from flooding, but complementary natural solutions must be properly considered and delivered on the ground through the creation of washlands and wetlands for flood storage, and the restoration of natural processes throughout the catchment. Strict planning controls on floodplain development and the widespread use of Sustainable Drainage Systems in urban and rural areas, flood warning systems and flood resilience measures must also form part of the sustainable flood management solution.

- We welcome the acknowledgement by the review that adapting to flood risk must include implementation of a range of measures, rather than continuing to rely on individual flood

defences. Foresight concluded that the most sustainable responses to reducing flood risk are:

- Catchment-wide storage
 - Land use planning
 - Coastal defence realignment
- Foresight also concluded that taking an integrated approach would reduce the need for investment of up to £30 billion when compared to using engineering approaches alone. This itself demonstrates the economic benefits of moving away from reliance on flood defences. The Wildlife Trusts believe this independent review provides an opportunity that simply cannot be missed to truly promote a whole-scale change in the approach to managing flooding, from updating stifling legislation to provision of adequate funding and research on the ground at the local farm scale to deliver what is needed.
 - Having already submitted evidence to the Review, our comments in this submission will concentrate on a selection of Interim Conclusions that are of most relevance to The Wildlife Trusts. Detailed comments follow a summary of recommendations, and we also give evidence in Annex 1 of how a portfolio of sustainable flood management schemes, including washlands and wetlands and Sustainable Drainage Systems is reducing the risk of flooding in the Rotherham/Sheffield area. Annex 2 illustrates how natural processes can be used to reduce flood risk, and bring multiple benefits to biodiversity.

Summary of recommendations

1. We strongly advocate the adoption of sustainable flood management as the most appropriate way forward in dealing with flood risk management into the future. Flood defence structures should be used where necessary to protect people and property from flooding, but complementary natural solutions must be properly considered and delivered on the ground through the creation of washlands and wetlands for flood storage, and the restoration of natural processes throughout the catchment. Strict planning controls on floodplain development and the widespread use of Sustainable Drainage Systems in urban and rural areas, flood warning systems and flood resilience measures must also form part of the sustainable flood management solution.
2. (IC 29) We strongly recommend that a clear message is conveyed to local authorities concerning the role of channel maintenance in flood prevention and the duties towards wildlife in carrying out their functions.
3. (IC 31) We recommend that the framework to achieve greater working with natural processes should focus on sustainable flood management.
4. (IC 31) We recommend that Defra scrutinise its project appraisal process to ensure that the benefits of soft engineering solutions are objectively judged against traditional hard flood defences, including where a package of schemes using natural processes would be required to meet flood risk standards.
5. (IC 31) Defra should also ensure that the appraisal process is designed to promote approval of flood management schemes which integrate both hard and soft flood structures.
6. (IC 31) In order to deliver a programme for the use of natural processes in flood management, we recommend that a proportion of the Defra budget is ring-fenced to provide funding for the creation of washlands and wetlands for flood storage.
7. (IC 31) There is an urgent need to develop a funding mechanism to deliver sustainable flood management through the restoration of natural processes. Defra are currently considering the establishment of 'Catchment Restoration Funds'¹ to restore river channels and we recommend that this should be taken forward urgently, and extended to include provision for floodplain restoration.
8. (IC 32) We strongly recommend that further research is needed to fully understand the role which land management could play in reducing flood risk at the catchment scale.
9. (IC 33) To further promote the approach and incentivise those key players involved in flood risk management, we recommend that as part of a Flooding Act, a duty be placed on public authorities to promote sustainable flood management.

¹ DEFRA (2008) *Future Water: The Government's Water Strategy for England*. HMSO p.52

Detailed comments on Interim Conclusions

Maintenance of defences and watercourses

IC 29 – The Environment Agency should open dialogue with all those landowners who will be affected by either a withdrawal from or significant reduction in maintenance of rural watercourses.

- We support the analysis of the limited benefit of channel maintenance in alleviating flooding problems and consider the information presented in the Interim report to be scientifically sound. We suspect that there may be localised flooding problems caused by lack of in-channel maintenance, but given the scientific evidence, we stress that these should be dealt with at the local scale.
- The Wildlife Trusts believe that engaging landowners at the point of withdrawal or reduction in maintenance provides an opportunity to investigate the potential for land use change to achieve greater flood storage on floodplain land. This would also provide an opportunity to educate landowners of the benefits of restoring channels and floodplains to achieve more sustainable water management on their land.
- Experience of some local Wildlife Trusts has revealed some disturbing evidence that following the flooding in 2007, local authorities are using the Land Drainage Act 1991 to force riparian owners to remove vegetation, obstructions and silt from watercourses where there is an 'alleged drainage/flooding problem in [their] area' without proper survey work or regard to other environmental duties. In one example an order was placed upon a riparian owner to remove vegetation from a watercourse which is designated as a SSSI, and is part of the Chalk Streams Biodiversity Habitat Action Plan Priority Habitat as well as being within an AONB. Removal of pristine chalk streams gravel was only averted by an alert landowner who made contact with Natural England and Wildlife Trust staff.
- It is of great concern to The Wildlife Trusts that these notices are being served based on an alleged problem rather than being fully investigated, no wildlife survey work is being undertaken, and that local authorities are not aware of obligations for SSSI management.

Recommendation 2

We strongly recommend that a clear message is conveyed to local authorities concerning the role of channel maintenance in flood prevention and the duties towards wildlife in carrying out their functions.

Working with natural processes

IC 31 – Defra, the Environment Agency and Natural England should work with partners to establish a programme and framework to achieve greater working with natural processes, including the identification of appropriate sites and the development of more incentives for creating water storage, restoring the natural course of rivers and establishing green corridors.

- The Wildlife Trusts strongly support this interim conclusion. The Wildlife Trusts partnership, across the UK, is actively involved in implementing schemes on the ground which set out to restore natural processes in the catchment.

Recommendation 3

We recommend that the framework to achieve greater working with natural processes should focus on sustainable flood management.

- The Scottish Flooding Issues Advisory Committee defined sustainable flood management as:

"provid[ing] the maximum possible social and economic resilience against flooding, by protecting and working with the environment, in a way which is fair and affordable both now and in the future."

- Adopting an approach to flood risk management centred on protecting and working with the environment would encourage the use of natural processes to address flood risk. Previous flood management policies have worked against natural processes through embanking and straightening rivers; past agriculture and land management policy has promoted drainage and intensive land use, which coupled with floodplain development has changed the way catchments respond to high and intensive rainfall.
- Working with natural processes would start to reverse the impact of some of these policies, include channel realignment, reconnecting floodplains, improving land-use practice and restoring upland areas including peat bogs, all of which have been shown to contribute to the slowing down of water in the catchment and reduce flood risk downstream. The use of Sustainable Drainage Systems can reduce flooding impacts in local communities as well as providing vital green corridors in urban areas, which benefit both wildlife and people.

Water storage

- Working with natural processes is an integral part of achieving sustainable flood management. It also offers the opportunity to deliver other objectives, including biodiversity targets, improvements to water quality, improved water supply (through storing flood waters for irrigation), recreation and health benefits. Potteric Carr Nature Reserve managed by Yorkshire Wildlife Trust saved up to 10 000 homes from flooding in south Doncaster by storing 200 000 cubic metres of floodwater during summer 2007. When not acting as a flood storage area, it is a popular nature reserve, providing recreation and access opportunities for the local community and a home to large numbers of bird, butterfly and dragonfly and plant species. Water is filtered through the reserve and as a result provides a cleaner raw water source for homes in the Doncaster area.
- The current Defra project appraisal system penalises natural flood management options because of the difficulties of demonstrating biodiversity benefits and engineers favouring the 'traditional' approach because they feel more comfortable with designing these types of schemes. The current appraisal process undervalues the environmental benefits of natural flood management schemes, and often focuses on minimising environmental loss, rather than maximising environmental benefit. English Nature Research Report 406 provides a series of case studies which illustrate that environmental benefits are frequently not fully appraised.² We hope that the new Outcome Measures will help to address this issue by including BAP habitat creation targets as an outcome measure.
- However, there is still a risk that this will not be a sufficient incentive for greater uptake of the use of soft engineering measures. We feel that unless natural flood management schemes are actively promoted, they may still lose out to traditional flood defence schemes. Working with natural processes will often involve a combination of schemes, which whilst individually may not be able to offer a standard '1 in 100' year protection would collectively offer this required level of protection. It is much easier to assess protection levels for a traditional flood defence wall, and Defra should ensure that the project appraisal system does not penalise the use of natural processes in this way.

² English Nature Research Report Number 406. *Sustainable Flood Defence: The case for washlands*. 2001

- The project appraisal process must ensure that it is flexible enough to deal with projects that go beyond the typical 'one hit' solutions and that where sites or schemes can make a partial, or even substantial contribution to reducing flood risk as part of a combination of measures, that they can still gain approval for central funding.
- We accept that in some locations, the use of natural processes such as washlands will not be appropriate, due to constraints on availability of land. However, where catchment appraisal demonstrates their use can be shown to make a contribution, we believe that this should be promoted, to eventually become a normal part of dealing with flood risk.
- Through adopting a catchment approach to dealing with flood risk and promoting the use of controlled washlands, hard flood defences can be targeted to deal with local flooding issues.

Recommendation 4

We recommend that Defra scrutinise its project appraisal process to ensure that the benefits of soft engineering solutions are objectively judged against traditional hard flood defences, including where a package of schemes using natural processes would be required to meet flood risk standards.

Recommendation 5

Defra should also ensure that the appraisal process is designed to promote approval of flood management schemes which integrate both hard and soft flood structures.

- Examples such as Potteric Carr nature reserve in Doncaster, Whisby Nature Park in Lincoln and the Ouse Washes show that biodiversity can successfully be integrated into flood storage areas. As well as creating resilience for people and property against flooding, the creation of large wetland areas can offer significant benefits to biodiversity. Wildlife also needs to adapt to climate change, and large areas of habitat can allow wildlife to move out of danger during flooding. Recognising the primary purpose of washland creation for flood storage is the protection of people and property from flooding, Outcome Measure BAP targets mean that proposals for washland creation should also consider any biodiversity opportunities which can be taken as part of the scheme.
- **Annex 1** describes how sustainable flood management is being implemented in the Rotherham/Sheffield area, through the use of washlands and wetlands in the catchment, and the development of Sustainable Drainage Systems in Sheffield to reduce the effect of flooding. In Rotherham, regeneration of the urban waterside has been secured through creating provision for a nature reserve washland that, together with providing flood storage, also provides an attractive back-drop to the regeneration of Rotherham and can also be used for environmental education.
- **Annex 2** describes a number of washland and wetland creation schemes in Lincolnshire which provide a flood management function. These examples illustrate that when biodiversity is considered at the outset of project design, valuable wetland habitat can be created, delivering multiple benefits whilst maintaining the primary flood management function.

Recommendation 6

In order to deliver a programme for the use of natural processes in flood management, we recommend that a proportion of the Defra budget is ring-fenced to provide funding for the creation of washlands and wetlands for flood storage.

- Catchment Flood Management Plans are high-level strategic planning tools which do not provide enough detailed information to allow for targeted flood risk reduction. If wetland creation / restoration and catchment management are to be used as tools to reduce flood risk, then greater investment should be made to understand flood regimes on main rivers. Hydrological modeling needs to be carried out at catchment and sub-catchment scale, using criteria such as soil type, slope, and land-use to give a more detailed and integrated picture of how water is moving through the catchment. This would then show how land-use and wetland creation can be best used to reduce the impacts of flood events.

Incentives for the use of natural processes

- Integration of flood management into agriculture policy is essential for delivery of the use of natural processes to achieve sustainable flood management. Farmers acknowledge that they have a key role to play in reducing flood risk but in order to fulfil this role they must be offered appropriate incentives to manage their land in ways which can achieve this.
- Recognition of the ecosystem services which are provided by integrated catchment management is an essential part of achieving sustainable flood management. Water storage areas on farmland could provide summer irrigation; restoring a rivers' natural course can deliver improved soil protection (by reducing erosion) and reduce nutrient inputs as well as reducing discharge volumes downstream. These provide economic as well as environmental benefits.
- Currently, Environmental Stewardship offers small amounts of money to deliver limited options for land management for environmental enhancement including wetland creation. The targeted approach Natural England is currently developing for the Higher Level Stewardship scheme risks limiting funds available even further.
- Funding provision under agri-environment schemes is time-limited, and does not offer a long-term solution to the provision of land use change or improved land management to deliver a reduction in flood risk.

Recommendation 7

There is an urgent need to develop a funding mechanism to deliver sustainable flood management through the restoration of natural processes. Defra are currently considering the establishment of 'Catchment Restoration Funds'¹ to restore river channels and we recommend that this should be taken forward urgently, and extended to include provision for floodplain restoration.

- The most recent shift in agricultural policy has resulted in farmers being significantly financially rewarded for delivering environmental benefits through the creation of the Environmental Stewardship scheme. The forthcoming CAP reform should consider the wider benefits of land management for flooding.
- Experience of local Wildlife Trusts shows that there are examples of where a single landowner's reluctance to agree to a change in land use for the benefit of flood storage resulted in washland schemes being abandoned. In one example, in Brigg, North

Lincolnshire, an upstream washland scheme on the River Ancholme, incorporating biodiversity and recreational benefits had wide support. However, one land owner would not participate and because of this, the washland scheme did not go ahead. Hard flood defences have been constructed instead, which now require significant maintenance costs and still risk the probability of overtopping during extreme events. Landowners should expect to receive adequate compensation for land use change, but we recommend that where reticence is compromising a scheme which is in the best interests of the public, the use of compulsory land purchase should be considered.

- Farming Floodplains for the Future is a pilot scheme funding by the Defra Innovation Fund as part of Making Space for Water. This project has used catchment modelling to determine that while issues relating to urban development and drainage are important, run-off from rural tributaries in this catchment is a major factor in the cause of flooding in Stafford, particularly during sustained rainfall events. With no additional storage capacity in the floodplain, solutions are being sought upstream, targeted to those tributaries which are making the greatest flow contributions. Measures to address flood risk include creation of water storage areas, raising water levels in the ditch system, bunding of water to create temporary flood storage, wetland restoration, and opening up of the field drainage system and diverting water on potential wetland sites.
- Although only in its first year, the project has started to illustrate the ways in which farmers can work in conjunction with advisors to secure benefits for flood risk and for their own farm businesses. One to one site visits have secured commitment from farmers, who generally recognise that they have a part to play in the solutions to flood risk. Farmers have also been proactive in putting forward solutions, using their local knowledge. This has helped to secure farmers' buy-in to the project.
- Whilst there are a wide range of issues associated with flood risk management and farming, the project has found two which recur - farmers wanting adequate compensation for schemes and concern over lack of ongoing maintenance of rivers.

Programme of work

- Local Wildlife Trusts work closely with the Environment Agency, Natural England and local authorities to develop schemes which incorporate natural solutions to flood management. There are examples of washland and wetland schemes which are at the proposal stages which could be taken forward to form part of a programme for the use of natural processes in flood management, for example on the River Trent in Nottinghamshire and the River Alt in Lancashire. We look forward to working with Natural England and the Environment Agency to develop these and others into a comprehensive programme for investment.

Land Management

IC 32 – Environment Agency should provide an analysis of the effect that land management practices had or would have had on the impact of flooding during the summer 2007 floods.

- We strongly support this recommendation. We also draw attention to the recently published report 'The role of land use and land management in delivering flood risk management'³ which provides a comprehensive review of current research into the effect of land use and land management on flooding. We note the conclusion that these measures can have an impact at the local scale, but suggest that wider adoption of sustainable land management practices is needed to assess the contribution land management really makes to reducing flood risk. Logically, the greater uptake of

³ Environment Agency (2008) *The role of land use and land management in delivering flood risk management*. Delivery of Making Space for Water.

sustainable land management should lead to cumulative benefits which could be notable in reducing flood risk in a catchment.

Recommendation 8

We strongly recommend that further research is needed to fully understand the role which land management could play in reducing flood risk at the catchment scale.

- We believe that local scale improvements to flood risk are an essential element of the catchment approach and should be encouraged, particularly in upland areas where degradation of peat has caused increase rates of runoff and where intensive agricultural land use results in very low infiltration rates. Reducing runoff is one of the key hydrological challenges in reducing flood flows. Targeting the most sensitive areas would increase the amount of water held in the catchment, increasing the amount of time before it reaches downstream areas. This could provide more time for flood warning.
- The Environment Agency report demonstrates that there are significantly limited mechanisms available for delivery of land use management changes to reduce flood risk. This further supports the need to develop a new funding mechanism to deliver restoration of natural processes to contribute to reducing flood risk.

Updating legislation

IC 33 – Flooding legislation should be updated and streamlined under a single, unifying Act that among other outcomes addresses all sources of flooding, clarifies responsibilities and facilitates flood risk management.

- The Wildlife Trusts strongly agree with this interim conclusion, and see it as a timely opportunity to enshrine the concept of sustainable flood management in legislation, to firmly move away from the past emphasis on flood defence and drainage.
- Current flooding legislation is inhibiting the implementation of sustainable flood management. The Land Drainage Act 1991 promotes drainage to prevent flooding – the 2007 summer flooding has reminded us that faster drainage can actually contribute to increased flooding problems and relying on artificial pumping has its limitations in high flows. The Water Resources Act 1991 also constrains the management of flooding to ‘flood defence’.
- We believe that the recently launched consultation by Scottish Parliament on their proposed Flooding Bill provides a good framework for similar legislation in England. The proposed Bill covers all aspects of planning and preparing for floods:
 - Transposing the EC Directive on the Assessment and Management of Flood Risks (the Floods Directive);
 - Creating a framework for a sustainable, catchment focused approach to flood risk management;
 - Reforming the current legislation covering flood protection and prevention;
 - Simplifying the approach to developing and implementing measures to manage flood risk
- As we have promoted throughout this response, we believe that advocating a sustainable flood management approach could provide the umbrella term for the whole raft of measures discussed in the Pitt Review for reducing flood risk, from washland creation to improving the flood warning system. Enshrining this in legislation would provide the

strong steer needed to adopt the approach and could unblock some of the issues concerning delivery of policies advocated by Making Space for Water.

Recommendation 9

To further promote the approach and incentivise those key players involved in flood risk management, we recommend that as part of a Flooding Act, a duty be placed on all public authorities to promote sustainable flood management.

- We believe that this will provide an additional incentive to Defra, the Environment Agency, local authorities, IDBs, Highways Agency amongst others, to adopt a sustainable flood management approach.

Annex 1

Sustainable flood management in Sheffield and Rotherham

Potteric Carr Nature Reserve

The reserve lies within the Potteric Carr basin, an area of low lying land to the south of Doncaster. Formerly largely fen and bog, it was drained in the mid-18th century for agriculture. In the 1950s mining subsidence occurred under part of the Carr and within 20 years this area had returned to its former fen conditions.

The wide range of species supported by the site includes:

- Over 200 species of bird, of which around 90 have bred in the last 30 years. Around 70 species breed every year including kingfisher, long-eared owl, reed and sedge warblers, all three woodpeckers and woodcock.
- Marsh plants including great spearwort, lesser water-plantain, lesser reedmace, greater tussock sedge, purple small reed, great water dock, yellow-wort and traveller's joy.
- 28 species of butterfly such as comma, gatekeeper, whiter-letter hairstreak, purple hairstreak and brown argus.
- 19 species of dragonfly including black-tailed skimmer, banded demoiselle, hairy dragonfly, broad-bodied chaser and ruddy darter.

The wetland site stores floodwaters at times of high water and the reserve's wetland plants filter the water coming in so that when it flows out, the water quality is much improved. During summer 2007, flood waters spilled safely over the banks onto the reserve, which has a flood storage capacity of approximately 200 000 cubic metres. It is estimated to have saved thousands of homes from flooding. In addition, the wildlife was able to take refuge on the islands designed for it and did not suffer adversely from the extreme weather.

Flood alleviation scheme, Centenary Riverside, Rotherham

Rotherham is situated on the River Don immediately downstream of the Rother confluence and has a history of flooding. A pre-feasibility study promoted by the Rotherham Investment Development Office in 2001 showed that the standard of service is as low as 1 in 10 years (10%) in places, as no formal flood defences currently exist. 118 properties, 5 of which are residential, are at risk from flooding. Flood risk represents a major obstacle to regeneration of 14ha (33 acres) of urban centre land as this area is located within the 1 in 100 year (1%) floodplain, including proposals for 1,209 new homes.

A large area near to the River Don is gradually being redeveloped, placing the town's river at the heart of its renaissance and at the centre of a major social and economic regeneration programme. The regeneration zone where most of the new development will be located is at severe risk of flooding (and was inundated this summer) so there was a need to defend it and increase the flood storage capacity of the river channel. To enable this to happen, a £12 million flood alleviation scheme is being put in place along the river, by a partnership led by Rotherham Metropolitan Borough Council, the Environment Agency and the Wildlife Trust for Sheffield & Rotherham, with funding from South Yorkshire Objective 1 and Yorkshire Forward.

It is anticipated that the full flood alleviation programme will prevent future serious flood events such as those that hit South Yorkshire this summer, as well as enabling a wholesale shift in the town's approach to its river – making it a highly valued asset rather than an undervalued threat.

Central to this programme is the creation of a new four hectare urban wetland nature park in a loop in the river – on some of the land that had previously been earmarked for economic development - at Centenary Riverside, which will help to hold large flood events (protecting the surrounding area) and also improving the quality of the local environment for local businesses, providing recreational, educational, health and employment benefits to local people, and having a positive impact on wildlife. The new wetland at Centenary Riverside is being designed in partnership with the Wildlife Trust working in Rotherham, and will be managed and maintained by the Wildlife Trust for Sheffield & Rotherham once it is complete.

Sheffield SUDS

Manor Fields District Park is a 25 hectare park and Local Wildlife Site, owned and managed by Sheffield City Council, with a Sustainable Urban Drainage Scheme (Sheffield CC website, 2007). The scheme allows water to run off the road, into a system of swales, which feed into a large infiltration basin, which in turn feeds into a stream.

In 2005 the Park received an Eco-Quality Award for its SUDS, which manages the rainwater run-off from an adjacent new housing development, as an alternative to using a conventional piped sewerage system. A Sheffield SUDS Working Group has now been established to explore the practical encouragement of SUDS in all appropriate locations within the City.

In June 2007, the infiltration basin filled up with water and did not overtop. The water safely infiltrated into the ground over the next few weeks.

When the SUDS system is dry, the area is used as an events area for the local community. The construction costs were approximately £1 million cheaper than a traditional storm water sewer.

Woodhouse Washlands

This 66 hectare grassland site straddles the river Rother on the Sheffield/Rotherham boundary and features wet pasture, scrub, marsh and open water habitats. This controlled washland is part of the River Rother Flood Defence Scheme, owned by the EA and managed by Yorkshire Wildlife Trust. It is one of the sites along the regionally important bird migration route of the Rother Valley and is important for breeding birds such as snipe, lapwing, skylark and reed bunting. Mammals include stoat and water vole and there are several amphibian species, including smooth newt and great crested newt.

Sprotborough Flash Nature Reserve

Sprotborough Flash lies in the gorge of the river Don and was created by mining subsidence in 1924. The 28 hectare reserve, which comprises open water, woodland, and magnesium limestone grassland habitats, is managed by Yorkshire Wildlife Trust and designated as a SSSI. 112 bird species have been recorded, including great crested grebe, gadwall, reed warbler and green and great woodpecker; the site is also important for its plant and insect life. The site also has a flood control function, as a controlled washland. Water floods the fen habitats adjacent to the flash in if the river Don overflows and there is an overspill pipe for releasing the water when floods subside.

The site has a Water Level Management Plan to ensure that maintenance and operational activities do not detrimentally affect water levels in the important wetland areas (EA 'Overview of water quality in the River Don catchment', *date unknown*). In 1997 the EA carried out works at the site to allow the water levels to be more sensitively managed.

To some extent, subsidence areas like Sprotborough Flash have compensated for the loss of natural wetland adjacent to river channels, that were lost through land drainage work for agriculture at the beginning of the last century (EA 'Overview of water quality in the River Don catchment', *date unknown*). Birds such as snipe, redshank, golden plover and dunlin are common on these flashes.

Annex 2

Flood management washland and wetland sites in Lincolnshire

Crowland and Cowbit Wash and protection of Spalding

Crowland and Cowbit Washes cover some 700 hectares of land between the embanked River Welland and the New River, the confluence of which is at the southern end of Spalding. Prior to construction of the Coronation Channel, their functioning as washland was frequently essential for the protection of the town: they have not been put to use as often in recent years, the last occasion being in 1998. It remains a discrete block of low-lying land, and its value for flood risk management is likely to increase again as a result of climate change.

Because of its discrete boundary, both or either of Crowland or Cowbit Washes could be restored as semi-natural habitat without any effects on the hydrology of surrounding land. It provides a unique opportunity to replace lost wetland habitat.

Baston Fen Nature Reserve and protection for agricultural land

One of the few remaining regularly functioning washlands within the county is the Lincolnshire Wildlife Trust's Baston Fen Nature Reserve, managed in collaboration with the Welland and Deepings Drainage Board. This area continues to accommodate heavy rainfall and excess water during wet periods and did so in the summer of 2007. At less than 50 hectares however, this site is all that remains of the county's original 1,000 square kilometres of wet fenland. With a loss of over 99.9%, it is hardly surprising that the vast majority of Lincolnshire's wetland wildlife and heritage has also disappeared.

Baston Fen and its neighbouring reserve, Thurlby Fen, is the last stronghold of many rare aquatic plants and invertebrates, including greater water-parsnip, fen pondweed, bladderwort and the impressively large and nationally scarce fenland diving beetle, *Dytiscus dimidiatus*.

Saltfleetby – Theddlethorpe Nature Reserve

LWT acquired arable land inland from the Saltfleetby-Theddlethorpe dunes nature reserve, through which the Great Eau flows. In cooperation with the Environment Agency, the banks confining the river have been removed to allow water to spill out onto the re-created grazing marsh at times of high flow.

Long Eau Manby/Great Carlton and protection for agricultural land

In the 1990s, two schemes were implemented by the Environment Agency on the Long Eau between Manby and Great Carlton, east of Louth. Constraining, raised flood banks were removed to produce washlands. This work was coupled with creation of wetland habitats, with farmers receiving incentives through Countryside Stewardship grants. Because habitat creation was considered at the outset, the schemes have succeeded in bringing about multiple benefits. Otters use the area regularly.

Branston Island and protection for Lincoln and agricultural land

The River Witham has been straightened and embanked from Lincoln to Boston. Branston Island lies to the north east of the river, bounded by the channel of the Old River Witham. Covering approximately 100 ha it is ideally situated as washland, protecting both the city of

Lincoln and agricultural land from rising downstream water levels when high tide prevents discharge into Boston Haven.

The land was purchased by the Environment Agency's predecessor organisation and is leased back to the previous owner. When originally brought into public ownership, the land was managed as wet grassland and there was tremendous potential for further enhancing its value for wildlife, alongside its flood risk management function. Subsequently the grassland has been ploughed and the farmer takes arable crops when they are not damaged by flood water. Because of the nature of the agreement, additional sums would be necessary to gain biodiversity and other amenity benefits.