

## Report of the Strategic Director of Place to the meeting of Regeneration and Environment Overview and Scrutiny Committee to be held on 18<sup>th</sup> October 2022

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### Subject:

Water Management and Resilience in the Bradford District

### Summary statement:

The Environment and Waste Management Overview Scrutiny Committee undertook a wider scrutiny review into water management across the District following the devastating winter 2015 floods. The Water Management Scrutiny Review was endorsed by the Environment and Waste Management Overview Scrutiny Committee at their meeting on 4<sup>th</sup> July 2017 where it was recommended to be considered by the Corporate Overview and Scrutiny Committee in their meeting on the 26<sup>th</sup> October 2017 where it was subsequently endorsed.

Following its adoption, The Water Management Scrutiny Review included twenty-six recommendations and a report has been brought to the committee on an annual basis to highlight progress made against each recommendation. The majority of the recommendations raised in the original Water Management Scrutiny Review Report are now deemed satisfied.

Within the October 2021 meeting it was resolved by the Regeneration and Environment Overview Committee that a report which provides an update on all the Council's water management and resilience initiatives and also includes information on flood alleviation equipment available to communities be presented to the Committee in 12 months.

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### Overview & Scrutiny Area:

Regeneration and Environment

## **EQUALITY & DIVERSITY:**

The public sector equality duty in s149 of the Equalities Act applies to the Council in the exercise of its functions. Those functions will include most, if not all, of the proposals and other measures referred to in this report. The duty is to “have due regard to the need to (a) eliminate discrimination, harassment, victimisation and any other conduct that is prohibited under [the 2010 Act], (b) advance equality of opportunity between persons who share relevant protected characteristics and persons who do not share it.”. In summary, this includes the need to remove or minimise disadvantages suffered by persons that are connected to that relevant protected characteristic and taking steps to meet the needs of persons who do not share it and encouraging persons who share a relevant protected characteristic to take account of disabled person’s disabilities and makes it clear that compliance with the duties ‘may involve treating some persons more favourably than others’. It is evidence that all of the schemes and proposals referred to in this report have the potential to impact on persons who share one of more of the relevant protected characteristics.

## 1. SUMMARY

The Environment and Waste Management Overview Scrutiny Committee undertook a wider scrutiny review into water management across the District following the devastating winter 2015 floods. The Water Management Scrutiny Review was endorsed by the Environment and Waste Management Overview Scrutiny Committee at their meeting on 4<sup>th</sup> July 2017 where it was recommended to be considered by the Corporate Overview and Scrutiny Committee in their meeting on the 26<sup>th</sup> October 2017 where it was subsequently endorsed.

Following its adoption, The Water Management Scrutiny Review included twenty-six recommendations and The report has been brought to the committee on an annual basis to highlight progress made against each recommendation. The majority of the recommendations raised in the original Water Management Scrutiny Review Report are now deemed satisfied or are dealt with as day to day activities by a host of council services. In this respect, the original report has achieved its objectives.

Within the October 2021 meeting it was resolved by the Regeneration and Environment Overview Committee that **a report which provides an update on all the Council's water management and resilience initiatives and also includes information on flood alleviation equipment available to communities be presented to the Committee in 12 months.**

## 2. BACKGROUND

The floods of December 2015 inundated over 1,000 homes and businesses across a wide swathe of Bradford District and turned the lives of many hundreds of local people upside down. The cost of the damage to residential and commercial property is estimated to have been around £34 million. The broader social, environmental and economic impacts were even greater in scope as residents struggled to cope with the upheaval to their everyday lives through the months that followed.

Water management in Bradford was again unfortunately put to the test in 2020 by the wettest February on record when Storm Ciara and Storm Dennis caused widespread incidents across the district. Approximately 300mm of rainfall fell in a four-week period. To put this in context the average annual rainfall for Bradford is circa 950mm. This caused a reported 71 residential properties and approximately 60 businesses to succumb to internal flooding. This also caused four schools to flood and be forced to close plus large lengths of the highway network becoming impassable. In total over 900 flooding incidents were reported through the contact centre during the period. This was a stark reminder of the importance of flood risk and water management within the district.

In January and February of 2021, several storms caused widespread disruption and incidents across the district. These events again highlighted where existing processes in the response to flood risk had improved but also where further work was required.

Storm Franklin brought around 90mm of rainfall in a 24 hour period during February 2022. The Rainfall landing on an already saturated catchment causing local drainage infrastructure to stress and at times be overwhelmed. To put this level of rainfall in context,

the average monthly amount of rainfall for the whole of February is 75mm, since records began.

The larger main rivers the River Aire, River Worth and River Wharfe peaked at high levels but no reports of property flooding from these river systems were raised. There were a large number incidents recorded from non-main river and surface water flooding, (including a landslip on Westlea Avenue, Riddlesden and surface water flooding in Low Moor and in East Morton). In total the Council received 60 incidents to investigate surface water flooding of properties. Fifteen properties were recorded to succumb to internal flooding.

Articulate road closures were put in place due to surface water flooding of the highway network and many minor roads and rights of ways were also unpassable. Power cuts affecting more than 1000 properties in the district. The Thackley Railway Tunnel (Airedale Line) flooded (water seeping through roof and walls) – which resulted in the Leeds / Bradford / Ilkley / Shipley lines being closed temporarily.

The flood events over the last 8 years have highlighted that Water Management is still a key challenge and how the Council engages and approaches this challenge over the coming years will be critical to providing a prosperous and sustainable district that allows individuals, households and businesses to adapt, change and innovate to address the tests presented by climate change. High quality water management requires a multitude of organisations and stakeholders to collaborate effectively.

### **3. REPORT ISSUES**

#### **Bradford Council's Capital Flood Risk Programme**

Since the major floods in 2015 the Council have recognised the need for a long term strategic approach to managing flood risk across our district. The Council have worked with the Environment Agency and Yorkshire Water to scope and develop a Bradford Flood Programme Board ('the Board'). The Board objectives alongside ongoing scheme development, is a priority to focus on identifying and delivering cost-beneficial solutions for communities at risk of flooding within the district. The Board was established in January 2017 and have progressed and supported the emergence of a capital flood risk programme of works for the District. The work conducted by the Council in recent years has provided the tools and knowledge to develop a healthy and progressive capital flood risk management programme. Not only have projects advanced within areas initially impacted by Storm Eva in 2015, but largely due to the many partnerships and relationships formed in creating the programme, this has provided a springboard towards unearthing a multitude of multi organisation flood risk management schemes in the district.

The Board was established in January 2017 and have progressed and supported the emergence of a capital flood risk programme of works for the District. Presented in Appendix 1 is a copy of the latest Bradford Council Capital Flood Risk Programme. This programme details the capital works schemes to better protect properties from flood risk in the district.

The programme illustrates the spread of projects between the Aire and Wharfe Catchment. The programme shows the forecasted delivery of projects and where currently

funding gaps exist based on their eligibility to attract Flood Defence Grant in Aid from the Department for Environment, Flood and Rural Affairs (DEFRA), this being the main source of government funding to fund projects to reduce flood risk. Further to the establishment of the Board the first project within the programme was delivered and ready for service in February 2021. The Esholt Surface Water Flood Alleviation Project provides a high standard of protection to 20 properties within Esholt that have suffered repeated flooding in the past. The next scheme in the programme to be progressed was a surface water flood reduction scheme in the village of Goose Eye in Keighley. Funding for the scheme was granted in November 2021 and the scheme was ready for service in April 2022. The project provides a high standard of protection to 32 properties within Goose Eye that have suffered repeated flooding in the past. Further information on these two schemes can be found in Appendix 2.

It is essential that the schemes in the Councils programme continue to be progressed collaboratively to ensure our high risk communities are resilient to future climate changes and an increased risk of flooding.

### **Flood Resilience**

Members of the Silsden Emergency Planning Group, together with Members of Wharfedale Mens Shed, have combined to put together a proposal for an easily installed and removed barrier to replace the sand bags which are currently deployed to the east side of the ford in St John's Street when there is a flood risk. Sand bags are not considered to be effective barriers against flooding (with the exception of diverting flow) and deploying the sand bags involves several members of the SEPG and the use of motor vehicles to move the bags from the storage area at the rear of Silsden Methodist Church to the ford site. They are heavy, particularly when wet, and have become a playground for children causing a nuisance for neighbours at the storage area. The sand bags typically weigh 20Kg and around 40 have to be moved to create an effective barrier a total weight of 800Kg over  $\frac{3}{4}$  ton.

The Council are supportive of this community effort but appreciate that a Flood Risk activity permit needs to be sought from the Environment Agency. Emergency Planning have agreed to cover the cost of the permit application and the Land Drainage & Flood Risk Management team are reviewing the evidence provided by the group before the application is submitted.

### **Community Engagement**

There is a need for Bradford Council to play a part in helping to develop the ability of communities to look after themselves to a greater degree than they currently do. Bradford Council's Emergency Planning Team have developed local Flood and Emergency plans with Parish and Town Councils within Bradford District. Bradford Council have provided Flood Packs for properties at risk and have secured funding for river stewardship works in collaboration with partners and community groups through the Bradford Flood Programme Board Flood Resilience Group. Bradford Council will continue to identify, work with partners and deliver cost-beneficial solutions for communities at risk of flooding whilst enhancing local knowledge of contributory issues.

The River Aire and its tributaries in Bradford are extensive and flood risk is widespread.

There is a need to engage with multiple communities within Bradford District in regard to the risk they face and their role in mitigating that risk and being more resilient. The Council recognise that this a considerable undertaking and something that the Council do not have the resources to do on what we would consider to be an effective level. This is however what we need our communities to be. River Aire Care provides a mechanism to support residents and businesses to deliver direct improvements to their communities. This in turn provides a sense of wellbeing, pride and ownership of their immediate environment. The Council recognise the value of this work and consider that Local Levy can be used to ensure that resilience building within communities continue its current momentum.

River Aire Care is a programme of raising community resilience to flooding throughout the River Aire catchment through awareness raising, community clean ups, volunteer opportunities, group support and an apprenticeship for a young people/person. This programme builds on existing work and ensures its continuity as future funding plans are developed.

A staff member from the Aire Rivers Trust will support local volunteer groups to raise flood awareness, care for their rivers and improve local biodiversity. These include supporting existing groups (i.e. River Worth Friends) and helping newer ones grow (i.e. Friends of Silsden Beck). This project will grow capacity for environmental conservation and river stewardship within the catchment and within the Trust, through a Countryside Worker apprenticeship.

The staff member will also support the delivery of an apprenticeship as part of the wider programme.

The project will provide outreach work and awareness raising with targeted communities, such those in the vicinity of the Keighley and Stockbridge Scheme, to improve flood resilience. This will include the updating of a flood awareness pack for the Bradford district.

### **Climate Change and Adaption**

According to the 2018 UK Climate Change Projections average sea level could increase by over a metre by the end of the century (Met Office, 2019) and at 2C global warming without adaptation between 10% and 125% more people could be affected by river flooding worldwide. Limiting global warming to 1.5C approximately halves the increase in flooding impact (Met Office 2018) underlining the importance of acting now to adapt to flooding and coastal change. According to the World Health Organisation climate change is one of the greatest threats to global health in the 21st century (WHO, 2015). The climate emergency is the defining issue for local government over the next ten to twenty years and The City of Bradford Metropolitan District Council declared a Climate Emergency in 2019 and joined the Leeds City Region Climate Coalition which is aiming for a net zero carbon region by 2038.

A climate resilient district will not be effectively delivered by Bradford Council working on their own. We all need to take action now so that we are ready for what the future will bring. We need all Risk Management Authority's (RMA's), individuals, communities, the third sector, businesses, farmers, land managers and infrastructure providers to contribute

to planning and adapting to future flooding in the authority area so that Bradford District is a flood resilient district. The government's Environment Bill (Parliament 2020a) and Agriculture Bill (Parliament UK, 2020b) recognise that we need to make nature's power part of our solution and support farmers and land managers to take a more integrated approach to flood risk and water resource management. Our work to date has enabled us to develop good working partnerships and it is our intention to grow those partnerships further to enable us to deliver the flood alleviation projects and resilience measures that the district needs. The consultation on the emerging [National Resilience Strategy](#) (December 2021) reports that the majority of respondents believe that more can be done to assess (82%, 268 respondents) and communicate (80%, 261) risk, whilst 76% (246) consider that everyone has a part to play in improving the UK's resilience.

The Council are currently updating its Strategic Flood Risk Assessment (SFRA) in line with new guidance released this year. Within the update maps of predicted flood risk will be published from detailed computer flood mapping. This will inform the flood risk aspects and policies of the site allocations process. The latest climate change allowances will be considered to identify flood risk extents from all sources of flooding. The mapping outputs will assess the effects of climate change on all sources of flooding and identify areas where it is expected climate change to increase flood risk. The maps will also determine where the effects of climate change will make existing development unsustainable. This process will help identify any development that may need to be relocated to sustainable locations.

The National Planning Policy Framework (NPPF) sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. Making allowances for climate change in flood risk assessments is a way of achieving this. NPPF and supporting planning practice guidance on flood risk and coastal change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development's lifetime taking climate change into account. Local planning authorities refer to the published guidelines when preparing local plans and considering planning applications.

Advice on climate change was previously set at a national level however research suggested that future guidelines for changes to peak river flows as a result of climate change might be more appropriate if considered on a regional scale. New allowances were produced by the EA in April 2016 (Flood Risk Assessments: Climate Change Allowances) and there are different allowances for different periods of time over the next century. Bradford District lies within the Humber river basin district and allowances for changes to peak river flows range from 10 to 50%. Peak rainfall intensity is set nationally at a range of 5 to 40%.

It is imperative that the effects of more extreme flooding in Bradford District are mitigated against and plans and schemes are developed to better manage and adapt to any increased risk of local flooding as a result of climate change. This affects the functions of all RMA's and all Council departments.

## **Whole Catchment Approach**

The whole catchment approach is central to any scheme being successful and funding bids are increasingly being submitted on a catchment-wide basis encompassing multiple projects through a number of local authority administrative areas.

For the River Aire in Bradford, Local Levy Investment was used to develop a study to help identify a short list of the most viable options to reduce flood risk for communities including Bingley, Baildon, Shipley and Apperley Bridge. Using the latest available hydraulic model of the River Aire, produced as part of the Leeds FAS scheme, the study tested both direct interventions and more catchment wide solutions for flood alleviation. The Bradford Aire Catchment Flood Alleviation Study considered a whole catchment solution for flood risk on the River Aire which was a priority for the Board. The study investigated the use of upstream storage solutions within Craven and the western parts of the district. The early results show levels can be reduced however the cost of implementing these measures are proportionally high and therefore current funding arrangements sourced through DEFRA do not fully fund any of the measures. Further catchment wide discussions are now taking place with the Environment Agency and wider partners already engaged in the project such as the Aires Rivers Trust to see where multi benefit schemes across the catchment could help fill the funding gaps.

The Wharfe Flood Partnership meets quarterly to review FRM and related matters on the Wharfe catchment. It is attended by the EA, North Yorkshire County Council, Bradford Council, Leeds City Council, Yorkshire Water and the Yorkshire Dales Rivers Trust (YDRT). The Wharfe Flood Partnership secured Local Levy funding to progress projects throughout the catchment and following on from the Addingham 4 Becks project, YDRT have secured funding to undertake NFM farm plans with landowners. Due to resource constraints this funding is being reprofiled to the 23/24 financial year.

## **Working with Natural Processes (WwNP) in Bradford**

Working with Natural Processes (WwNP) or Natural Flood Management (NFM) is a type of flood risk management used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood and coastal erosion risk.

WwNP has the potential to provide environmentally sensitive approaches to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences. WwNP and NFM are used interchangeably in the UK though the term WwNP is now used by Defra. Bradford Council work with RMA's and other partners to deliver WwNP projects across the Bradford district.

Bradford Council have contributed to the evidence base for WwNP by undertaking pilot projects in Bradford District on both the Aire and Wharfe Catchments on Harden Moor and Ilkley Moor. Further detail so these projects are included in Appendix 2. Whilst the primary objective is flood risk reduction, the nature of WwNP means that it is multidisciplinary and requires input from multiple fields to ensure that measures enhance the existing environment rather than irrevocably changing it to the detriment of other environmental, social or economic objectives. For these reasons, WwNP projects are very much partnership efforts, from the landowners, to the communities, to organisations already working in the area and to the organisations delivering the projects. For Bradford Council,



WwNP projects as a landowner requires the Land Drainage team to work with Countryside and Rights of Way and Parks and Green Spaces Team.

Bradford Council is a partner in the Natural Environment Research Council funded Yorkshire Integrated Catchment Solutions Programme (iCASP) which is funded until 2026. The aim is to use research to make a difference to the environment, economy and society and to promote Yorkshire as a global leader in implementing resilient catchment management. Bradford Council has been involved in a number of iCASP projects involving modelling of WwNP and takes part in the Community of Practice, a group set up by iCASP to bring together people working on different natural flood management projects across Yorkshire. Bradford regularly attends the iCASP Community of Practice (CoP). The meetings provide a forum for networking, learning and disseminating best practice: they are designed to build regional capacity amongst WwNP practitioners through sharing knowledge and discussing challenges and opportunities. The meetings enable participants to undertake informal continuing professional development (CPD). Many of the meetings take place on sites where WwNP interventions have been installed to allow a tour guided by those who have designed and installed the WwNP measures.

Bradford Council is also part of the [White Rose Forest](#) Partnership. The White Rose Forest is the community forest for North and West Yorkshire, working in partnership with local authorities, landowners, businesses and communities to increase woodland across the region and improve our natural environment. Through the partnership millions of trees are being planted in urban centres and countryside that will help manage flood risk, mitigate the impact of climate change, create jobs and provide happier and healthier places for us all to live, work in and enjoy. The vision of White Rose Forest is 'to create a genuinely sustainable and well wooded landscape in North and West Yorkshire which will benefit local people, the economy and wildlife'.

A series of best practice manual in regards to Natural Flood Management has been put together by the Yorkshire Dales Rivers Trust and this is regular used by the Council in pursuing WwNP opportunities. A link to the guide is below;

[Natural Flood Management - Yorkshire Dales Rivers Trust \(ydrtr.org.uk\)](http://ydrtr.org.uk)

This year CIRIA have also published the Natural Flood Management Manual (C802F) which is available to download on their website [www.ciria.org](http://www.ciria.org)

The approaches that have been implemented in these projects are all replicable on other catchments within the district and Bradford Council as LLFA and a landowner will continue to work with partners to realise more WwNP projects across Bradford district.

### **Local Flood Risk Management Strategy**

The Flood and Water Management Act 2010 places a statutory duty on the City of Bradford Metropolitan District Council, as Lead Local Flood Authority for Bradford District, to develop a Local Flood Risk Management Strategy. This Strategy must detail the Risk Management Authorities and the functions that they can exercise within the authority area, assess flood risk, the objectives for managing that risk and the measures undertaken to implement those objectives.

This Strategy is currently being updated and will outline the City of Bradford Metropolitan District Council's approach to managing flood risk from all sources throughout the district and is been developed to align with current legislation and guidance. It builds on work undertaken since the publication of the first Strategy in 2016 and aims to continue the forward momentum to better manage the risks and consequences of flooding from ordinary watercourses, surface water, groundwater, rivers, sewers, reservoirs and canals. Objectives within the Local Flood Risk Management Strategy are applicable to the whole of Bradford District and work is ongoing on both the Aire and Wharfe catchments.

The updated document is being prepared by the Land Drainage and Flood Risk Management service within the Council and is due to be out to consultation during the winter months of 2022.

### **Strategic Council Polices relating to water management**

The Council have developed a 'Housing Design Guide' and are developing a 'Street Design Guide' that will emphasise the importance and specify the use of Blue Green Infrastructure and Green Street Initiatives within developments. The Street Design Guide is currently out for consultation and the Housing Design Guide was adopted as a Supplementary Planning Documents in 2020. A link to the document is below.

[Homes and Neighbourhoods Design Guide \(low-res version\) \(bradford.gov.uk\)](https://www.bradford.gov.uk/Document/central/13564/Homes%20and%20Neighbourhoods%20Design%20Guide%20(low-res%20version).pdf)

Furthermore, Policy SC6 of the Councils Core Strategy, includes provisions to provide clearer direction to new development in contributing towards linking areas and corridors of Green Infrastructure. The policy also now provides for further strategic information on Green Infrastructure as it provides a common thread that links other important issues in the Core Strategy including: local resilience to climate change (in relation to the provision of flood water storage, sustainable drainage and urban cooling), sustainable transport and housing, leisure and tourism, health and well-being and making space for water.

Also within Policy SC6 the River Corridors of the Aire and Wharfe and the South Pennine Moors are identified as strategic Green Infrastructure assets due to the opportunities offered to enhance the living landscape as a resource for people and wildlife and to address future needs for flood alleviation, water management, carbon capture and recreation.

Policy EN7 of the Councils Core Strategy, includes provisions to 'Safeguard areas which have the potential to increase flood storage provision and improve defences within the Rivers Aire and Wharfe corridors' and 'The Council will not permit development in areas within the functional floodplain (Flood Zone 3b) as defined in the most up-to-date SFRA with the exception of water compatible uses and essential infrastructure'.

### **Partnership Working**

The Council are working with the Leeds Flood Alleviation Scheme Phase 2 (Leeds FAS2) project team, in partnership with the Environment Agency, to develop a catchment wide approach to reducing flood risk. This includes Natural Flood Management (NFM) measures on the upper and mid stretches of the River Aire as an integral part of phase 2

of the scheme. The scheme is identifying with landowners, which land is suitable for NFM measures. Also as part of the scheme, potential areas have been identified and shared with partners and the Leeds FAS2 project team. A substantial land bank is required to deliver the Leeds FAS NFM programme, and requires a significant amount of buy in from numerous landowners. The Leeds FAS2 project team are very keen to continue to work with large landowners throughout the River Aire Catchment and have continuously engaged with the Council on the potential to implement NFM measures within the district.

West Yorkshire has launched an innovative programme to make the region more resilient to flooding and climate change. The five Lead Local Flood Authorities (LLFA's), Environment Agency and West Yorkshire Combined Authority are partners and they have support from local stakeholders including academic partners, community based groups, Third Sector organisations and Yorkshire Water. The Programme will work at catchment level and across administrative boundaries.

The WY FLIP will focus on innovation, exploring new ways of working including bringing together people who do not normally work together such as representatives from the private sector, community groups, charities and volunteers with a keen interest in flood resilience. Collaboration is key and representatives outside of the flood risk and environment sectors will be involved including the finance and insurance sector, transport, education, technology and health to ensure a holistic approach and other benefits for our communities. Learning from the programme will be shared across organisations to help others deliver similar projects successfully across the region, nationally and internationally.

WY FLIP has been kick-started with 2 years of funding from the Yorkshire Regional Flood and Coastal Committee to develop core activities, establish a governance structure and attract more funding to deploy projects and sustain the Programme into the future.

### **Property Level Flood Resilience**

Property Flood Resilience, also widely known as Property Level Protection (PLP), provides property owners and professional partners with practical and cost-effective steps to help lower flood risk, through the use of affordable bespoke products.

These offer an innovative and effective response which 'plugs the gap' that previously existed between engineered flood protection schemes, and either sandbags or the 'do nothing' option. The approach aims to identify products and measures that are appropriate for the person, flood and property together, helping to reduce flood damage and increase peace of mind.

Following the floods in February 2020 this year, The Department of Environment and Rural Affairs (DEFRA) issued guidance for Local Authorities to facilitate the delivery of the Property Flood Resilience Recovery Support Scheme 2020 (PFR 2020) in October 2020 (dealy due to impact of COVID19 Pandemic).

Bradford Council were eligible for the PFR 2020 grant funding from the government because it was impacted by Storm Ciara and/or Dennis and 25 or more properties were severely affected.

The purpose of the scheme was to assist flood impacted property owners to improve the flood resilience of their individual properties when they repair them after a flood. The outcome from the funding was that if flooding were to reoccur, damage levels would be considerably lower and householders and businesses could return to their properties much more quickly. The scheme ran from October 2020 and closed in July 2022.

The Council facilitated the delivery of the Property Flood Resilience Recovery Support Scheme [2020]. This included the management of all aspects of the grant to ensure eligible properties had suitable mitigations measures installed to assist owners to improve the flood resilience of their individual properties when they repaired them after a Storms Ciara and Dennis. The objective of the funding was that if flooding were to reoccur, damage levels would be considerably lower and householders and businesses could return to their properties much more quickly.

The scheme involved a range of work activities including,

- Promotion of the scheme including preparation of documents to be uploaded on communication platforms
- Making contact with property owners including providing information and advice to help them understand the benefits of making their properties more resilient.
- Procurement and commission of Independent Surveyors
- Arranging flood and building surveys of impacted properties
- Procuring a list of suitable local contractors/ installers
- Working with insurers, loss-adjusters or builders to integrate resilient repair into the recovery process
- Working with other Council departments and external organisations
- Quality Assurance – developing a robust process to administer the scheme and to carry out risk-based inspections to check the quality of the installation and to assist property owners to follow-up cases of poor workmanship
- Supporting property owners to understand the concepts and future management of the installations.
- Administrating payments and reporting

The Land Drainage and Flood Risk Management service managed the grant scheme including the procurement and commissioning of independent surveyors to undertake survey's and appraisals of the installed mitigation measures. In total there were 135 application forms issued to both residential and business properties. From this, 60 applications were submitted for consideration and 54 were deemed eligible. Recently installed property flood resilience measures to these 54 properties will ensure the impacts of any future flood events will be greatly reduced, assisting with the costs and mental distress caused by a flood event within the newly protected communities.

### **Sustainable Drainage Systems (SuDS) in Bradford**

A key component of climate change mitigation for Bradford will be flood resilience, and much the schmes that are promoted and developed need to explores innovative solutions for Sustainable Drainage Systems (SuDS) and Nature Based Solutions (NBS). Retrofitting sustainable drainage systems into our urban landscapes is now seen as a priority and is the strategy used on redevelopment projects in the district.

The West Yorkshire Transport Fund Programme currently includes highway improvements works in recently delivered at the New Line Junction and Hard Ings, Keighley. The programme and Bradford to Shipley Corridor. The design and implementation of the drainage solutions that serve these scheme are all being delivered, in-house, by the Land Drainage service. As a result, all these highway schemes incorporate measures to reduce quantities of surface water and improve the quality if runoff from the new carriageway areas through the use of SuDS.

Bradford Council has secured funding to carry out highway improvements and sustainable landscaping works to an area of the City Village locally known as the 'Top of Town', focused on North Parade, Rawson Square and Northgate. A network of 'rain gardens' will be established as part of a drainage system designed to help mitigate local flooding risks for the project. Rain gardens are areas of planting designed to temporarily hold, filter and soak away any rain water that runs off buildings and paved areas in a more sustainable manner rather than straight into sewers not preventing overloading the sewers. Whilst planting semi-mature trees will contribute to the physical landscape, it will also create new habitats and increase biodiversity. Providing wildlife corridors and connections between green spaces. Providing options for wildlife to travel is extremely important to urban biodiversity.

The Council are applying SuDS to a number of Council schemes, including an ongoing [Life CRITICAL](#) project at Horton Park, part of the EU Life Programme supporting environmental, nature conservation and climate action, for which community engagement is a vital part of the project innovation. The award winning [Interreg North Sea Region BEGIN - Blue Green Infrastructures through Social Innovation](#), looked at how together with the community we can build more resilient and liveable cities.

### **Water Quality Improvements**

Although not falling under the same regulations in terms of flood risk management there can be considerable overlap between water quality and flood risk. Members of Bradford Council earlier in the year approved a motion "Respecting Our Rivers",:

By reducing surface water runoff into local sewerage networks, schemes will help reduce the discharge from Yorkshire Waters Combined Sewer Overflows that connect to the river networks within the district, improving the water quality of natural environment. Preliminary discussions have begun between the Council and Yorkshire Water at identifying areas where the implementation of nature based drainage solutions will reduce flood risk, improve urban water body quality and reduce combined sewer overflow discharges.

### **Land Drainage Investigations**

Bradford Councils Land Drainage Team regularly investigate reports of blocked or collapsed watercourses within the Bradford Beck Catchment. Blockages can lead to an increased risk of flooding, risk of environmental pollution incidents and impacts on the amenity quality of an area.

Land drainage law is complex and is covered within the Land Drainage Act 1991. The Council is able to offer advice about problems associated with land drainage, including

ditches, streams, rivers and other watercourses. Essentially, a landowner is responsible for the drainage of their land. If a watercourse passes through land, under the Land Drainage Act 1991, the landowner is classified as a 'Riparian Owner' and is responsible for maintaining the flow within the watercourse and to ensure an impediment to that flow does not exist.

The Council only has a responsibility for watercourse when the Council is the landowner. Other than that, the Council do have powers to act in certain circumstances, to mitigate against the effects of flooding generated from land drainage matters.

If a landowner fails to carry out necessary maintenance on a watercourse, the Council can serve notice and carry out works if ditches have become blocked resulting in a flood risk or health hazard. These powers are contained in the Land Drainage Acts 1991 and Sections of the Public Health Act 1936, but are not instantaneous - the process between first notification of a problem and serving a notice can take years, and further stages are required if the landowner defaults on the notice.

Occasionally investigations reveal blockages on land that is unregistered or where emergency works are necessary. In these instances, the Council conduct a review to understand the risk posed by any defects and if quick interventions will reduce the risk and avoid on-going issues that can take up large amounts of resource. Recent investigations have led to a collaborative project to stabilise the culvert under the Bradford Live project where major civil engineering works were necessary to the total of £1.3m. This scheme had been project managed by the Councils Land Drainage and Flood Risk Management Team.

## **Data and Technology**

The collection, review and reuse of data is becoming increasingly important and a necessary tool to analysing water management, responding to flood events and providing evidence to prioritise resources and initiatives. The Council has worked within a wide range of projects that support better water managements through the use of data and technology

Flow monitoring (funded through the EU Smart Cities and Open Data Reuse project (SCORE)) was put in place to establish baseline flow rates on Backstone Beck and this monitoring has remained beyond the completion of physical works to determine the efficacy of the natural flood management project. This has been published as open data and has been used to inform studies by iCASP and Yorkshire Water. Fixed point photography posts are also in place on the moorland allowing visitors to submit photos of the landscape in order to monitor changes. The images captured are enabling us to see the change in the landscape where interventions are in place. Dales Land Net have a series of soil moisture content monitors installed in the upper catchment and Moors For The Future have installed three cameras and three water pressure loggers behind dams in each of the three main tributary channels to Backstone Beck to determine how the dams respond to high water flows – pairing time-lapse with pressure files. In addition, dipwells were installed near the Dales Land Net equipment plus cameras with views of Ilkley. These will remain in place until the end of this year. The flow monitors will be in place for a further 18 months to enable us to undertake post-intervention assessment.

Money granted through the Yorkshire Regional Flood and Coastal Committee, the Council have purchased a flood forecasting application called Meniscus MAP Rain. The application enables the Council to look at patterns of historical rainfall events in the district where we know that we have experienced historical flooding issues and forecast the progression of rainfall events in the future providing user defined forecast rainfall alerts. The product will assist the Council to identify where localised events are most likely to occur and therefore where to prioritise and target activities such as gully and trash screen clearance prior to a forecasted event and where Council resources may need to be focussed during an event. The tool will also be used to alert Parish and Town Councils or groups that hold Community Emergency and Flood Plans, and residents in known hotspot areas of surface water flood risk therefore continuing to build on and support community resilience to flooding.

The Council have recently commissioned a specialist consultant to create a new build computer model of Bradford Beck and its tributaries. The completed model will be ready early next year and will provide computer generated flood outlines and depths in the Bradford Beck Catchment. The model will be used as the evidence base for the emerging Level 1 and Level 2 Strategic Flood Risk Assessment updates for this catchment and the Council will also use the new model for evaluating flood risk management options in future capital works schemes. As part of the project the Council will be undertaking a full structural and geometric survey of the culverted sections Bradford Beck. This will be achieved by using remote laser scanning technology that will provide a full three dimensional computer model of the culvert structure allowing this data to be used for a multitude of projects. This 3D model can be incorporated into the Virtual Bradford 3D city model helping visualise flood risk scenarios and engage with elected members and the public.

iCASP have undertaken a project to assess the effectiveness of the recently implemented NFM measures on Ilkley Moor. An open-source rain-on-grid catchment and river model has been built that takes into account rainfall and river flow monitoring data collected over the last three years. The work has built on previous iCASP NFM projects such as Hardcastle Crags in Calderdale, but with the advantage of access to a significant quantity of monitoring data at the site. Backstone Beck has provided an ideal NFM test case for integrating multiple stakeholder issues in one model and draws together separate pieces of iCASP NFM project work and staff experience in one project.

There are many flood risk management authorities, asset owners and local authorities invested in the outcomes of the modelling, but none have responsibility for the whole catchment. The aim is to provide partners with a better holistic understanding of how changes will impact on the surface water in the catchment. Partners will be encouraged to co-develop and co-fund a mutually beneficial open model that transcends individual interests. It will help assess what proposed changes to drainage arrangements within the catchment might mean for the Beck, for example, helping to explore a potential diversion of Ilkley Tarn outflows from the combined sewer. Work such as this is valuable to wider water management issues such as water quality and the Wharfe at Cromwheel Bathing Water Designation. Bradford Council are working with Yorkshire Water and the Environment Agency to better understand all pressures on the river at the Bathing Water designation point and other LLFA's for the wider Wharfe catchment.

The Council offers an electronic stay connected email bulletin service to residents. The Stay connected is one of the Council's corporate communication channels. One service that can be signed up to is the delivery of up to date weather warning and flooding alerts and information about preparing for flooding before, during and after an event.

This service can be signed up to at the following link,

[Stay Connected - sign up for email alerts | Bradford Council](#)

To ensure the districts residents can prepare themselves for flood events and to improve their resilience, the Council offer advice on their website about property flood resilience measures and plans. This advice can be viewed at the following link

[Flooding information and support | Bradford Council](#)

### **Maintenance funding for water management assets**

The Land Drainage & Flood Risk Management service do not receive capital funding to undertake maintenance works on Council owned drainage infrastructure. The responsibility of drainage infrastructure will depend on which department or service manages the function of each individual asset. The Land Drainage & Flood Risk Management service work with the Environment Agency, Yorkshire Water and other organisations to identify and progress flood risk schemes within their capital works programme to address property flooding, and is actively looking for match funding to reduce the pressure on existing drainage systems.

The Highways Service manages a range of existing drainage infrastructure including assets such as the carrier drains that serve the highways, road gullies, road side ditches, drainage outfalls, and culverted watercourses that pass under the highway. Budgets used to maintain these assets are limited and base revenue budgets have decreased over recent years due to the spending constraints the Council is facing. Some sections are reported to use revenue budgets to undertake emergency maintenance projects however no capital budgets are available to implement a periodic asset maintenance programme.

With a reduction in base budgets for maintenance, the Highways Service have applied for other 'ad hoc' funding streams managed by the Department for Transport (DfT) to maintain assets.

The Council maintain 25 trash screens that protect downstream culvert systems from becoming blocked. The Trash Screens therefore provide protection to many key highway networks works plus approximately 250 residential properties. The maintenance works to keep the trash screens cleared are currently funded through Council staff revenue budgets.

Another flood risk management asset that is maintained using staff revenue budgets is Bradford Beck Overflow tunnel. The overflow tunnel was built in in the early 1990's and provides a standard of protection to 77 residential properties plus 158 businesses located within Bradford City Centre. Its operation and maintenance are vital to the City Centres viability.



As the Council promotes and delivers more flood risk management projects through its Capital Flood Risk Management Programme to meet the needs of a changing climate, there will be additional funding stresses in maintaining these assets. For example, recently built schemes in Esholt and Goose Eye do not have capital budgets available to implement a periodic asset maintenance programme. The Government do not provide revenue funding to local authorities for the maintenance of flood risk management schemes. All authorities will be facing this increasing challenge after the impact of years of austerity and budgetary pressures meaning more innovative ways to manage assets will need to be explored.

#### **4. FINANCIAL & RESOURCE APPRAISAL**

The measures being undertaken by the Council and its partners through these funding streams are being delivered through a range of specific capital grants and revenue budgets. Over the last year the service managed to deliver a programme of works of circa £3.5m across its portfolio of programmes.

With the progression of the flood risk capital programmes the service has had to procure additional support for delivery of its programmes to supplement its own internal resources. As the intensity of delivery for these programmes ramps up over the next couple of years this is likely to be a maintaining trend.

The Government do not provide revenue funding to local authorities for the maintenance of flood risk management schemes. All authorities will be facing this increasing challenge after the impact of years of austerity and budgetary pressures meaning more innovative ways to manage assets will need to be explored.

#### **5. RISK MANAGEMENT AND GOVERNANCE ISSUES**

The programmes of schemes and proposals described in this report are subject to robust risk management and governance arrangements to ensure their delivery is effectively managed at both Environment Agency and Council levels. Individual programme boards, comprising representatives of the Council and their EA counterparts meet on a monthly basis to review progress of individual schemes. A rigorous risk management process is applied to these projects and programmes with comprehensive risk registers being developed and maintained at both project and programme levels.

#### **6. LEGAL APPRAISAL**

The Flood and Water Management Act 2010 places a duty on Local Authorities to prepare The Council is the Lead Local Flood Authority under the Flood and Water Management Act 2010. Under section 9 of the 2010 Act the Council has a duty to and put in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas, and to monitor the application of a local flood risk management strategy in its area. The programmes of schemes and proposals in this report forms part of the work required to develop an effective flood risk strategy and to discharge the consequential duties arising under Section 9.

## **7. OTHER IMPLICATIONS**

### **7.1 SUSTAINABILITY IMPLICATIONS**

The requirements of these policies have been adopted as far as possible across all schemes which are at an advance stage of delivery (Outline Business Case or later) within the delivery programmes and are fully adopted in schemes which are in the early stages of development.

### **7.2 GREENHOUSE GAS EMISSIONS IMPACTS**

In the context of the Climate Emergency declared by the Council in January 2019, reducing greenhouse gas emissions is a priority for the district. The projects described in the programme of works in this report are required to report and value their carbon impact.

The Environment Agency uses a net carbon benefit approach to capture the carbon costs, carbon emissions avoided and any carbon sequestration of flood risk management schemes. This uses the [Green Book](#) approach to carbon costing combined with specific research on the carbon emissions avoided and carbon sequestration that flood risk managements can provide.

Flood risk management schemes provide carbon avoided benefits as their implementation, offsets the carbon spent in emergency and repair works in recovery after a flood event. This carbon avoided is calculated over the lifetime of the flood risk management intervention.

### **7.3 COMMUNITY SAFETY IMPLICATIONS**

None

### **7.4 HUMAN RIGHTS ACT**

Any Human Rights implications arising from schemes described in this report are taken into account in the development of that scheme.

### **7.5 TRADE UNION**

There are no trade union implications associated with this report.

### **7.6 WARD IMPLICATIONS**

All wards in the district are impacted by flood risk and water management. The wards in which the measures described in this report are implemented will generally benefit from the improvements. Appropriate consultation has, and will continue, to take place with Ward Members and local communities during the development of individual projects.

### **7.7 AREA COMMITTEE ACTION PLAN IMPLICATIONS (for reports to Area Committees only)**

Not applicable

## **7.8 IMPLICATIONS FOR CHILDREN AND YOUNG PEOPLE**

There are no implications arising as a consequence of this report.

## **7.9 ISSUES ARISING FROM PRIVACY IMPACT ASSESMENT**

Not applicable

## **8. NOT FOR PUBLICATION DOCUMENTS**

None

## **9. OPTIONS**

Members are asked to consider the report and provide views and comments.

## **10. RECOMMENDATIONS**

**That Bradford Council's Regeneration and Environment Overview and Scrutiny Committee considers this report and provides comments, and receives a report back before the end of October 2023 which provides an update to the Councils progress of all Water Management and Resilience initiatives within the district.**

## **11. APPENDICES**

Appendix 1 Bradford Councils Capital Flood Risk Programme

Appendix 2 Flood Risk Management Projects Highlights

## **12. BACKGROUND DOCUMENTS**

Water Management Scrutiny Review Report 2017

[Env2MayDocAMAppendixDraft Report - Water Management Scrutiny Review KW.pdf \(modern.gov.co.uk\)](#)

Bradford Councils Strategic Flood Risk Assessment

[Evidence Base | Bradford Council](#)

Bradford Councils Local Flood Risk Management Strategy 2016

[bradford-lfrms-final.pdf](#)



# Appendix 1 Bradford Councils Capital Flood Risk Programme

Bradford Councils Capital Flood Risk Programme: September 2022 funding and delivery summary

Scheme	Funding Summary £k						Total Funding £k	Scheme Cost £k	Funding Gap £k	Ready for Service	Homes Better Protected	Non-homes Protected
	FDGiA Eligibility	Defra Booster	CBMDC	ESIF	Other	Local Levy						
<b>COMPLETED SCHEMES</b>												
Bradford Resilience Group						155	155	155	0	Jan-18	80	50
Harden Moor NFM (Leeds FAS2)			10		167		177	177	0	Oct-19		
Esholt Village Surface Water FAS	225		10			50	285	285	0	Feb-21	20	1
Backstone Beck NFM		225	30				255	255	0	Aug-21		
Goose Eye Surface Water FAS	380		15			25	453	453	0	Apr-22	27	1
Property Level Flood Grants 2020		250	10				260	250	0	Jul-22	50	3
<b>TOTAL</b>	<b>605</b>	<b>475</b>	<b>75</b>		<b>167</b>	<b>230</b>	<b>1,565</b>	<b>1,565</b>	<b>0</b>	<b>Total</b>	<b>177</b>	<b>55</b>
<b>FORCASTED SCHEMES</b>												
Redcar Lane Flood Alleviation	50		25				72	75	0	Dec-22	3	0
Skipton Road, Keighley	453		10				463	463	0	Jun-23	35	1
Bingley and Shipley PLP	77						77	600	523	Jul-23	42	
Apperley Bridge SW FAS	200		10			60	270	480	210	Oct-23	22	1
Haworth FAS	186		5				186	560	374	Apr-25	12	14
Bradford Beck FAS	1,741		5			55	1,801	3,650	1,849	Jul-25	77	158
Cottingley, Gill Wood FAS	249						249	350	101	Jan-27	17	
Menston Dicks Garth Road	261						261	450	189	Jan-27	24	
Oakworth Beck FAS	200						200	346	146	Jan-27	47	2
Silsden Beck Flood Alleviation	400		5			50	455	3,067	2,612	Mar-27	56	20
Addingham	134						134	410	276	Mar-27	82	
Bradford District Culvert Refurb Programme	1,610		5			60	1,675	2,000	325	Jul-27	322	0
Baildon Drainage Study	120		5			30	155	275	120	Jul-27	55	5
Keighley and Stockbridge Flood Alleviation Scheme	4,891		10			328	5,244	14,818	9,574	Jul-28	497	280
Burley in Wharfedale SW Study	142		5			30	177	410	233	Mar-28	82	4
Ilkley Denton Road FAS	1,921						1,921	4,825	2,904	Jul-30	51	
Ilkley Backstone Beck Culvert	19						19	200	182	Jul-31	4	
Bradford Aire Catchment FAS	1,036		10			157	1,203	15,781	14,578	Jul-33	80	46
<b>TOTAL</b>	<b>13,690</b>	<b>0</b>	<b>85</b>	<b>0</b>	<b>0</b>	<b>710</b>	<b>14,552</b>	<b>48,760</b>	<b>34,196</b>	<b>Total</b>	<b>1685</b>	<b>586</b>

Figures in **GREEN** shade indicate schemes led by the Environment Agency

**Appendix 2 Flood Risk Management Projects Highlights**

## Esholt Surface Water Flood Alleviation Scheme

Recognising the need for a long term strategic approach to managing flood risk across our district, Bradford Council worked with the Environment Agency and Yorkshire Water to scope and develop a Bradford Flood Programme Board. The Board agreed that alongside ongoing scheme development, it is a priority to focus on identifying and



Boxing Day 2015 Flooding

delivering cost-beneficial solutions for communities at risk of flooding within the district. Further to the establishment of the Board the first project to make it to construction within the Bradford Capital Flood Risk Programme was the Esholt Surface Water Flood Alleviation Scheme. The project was first established using £50k of local levy money drawn down from the Yorkshire Region Flood and Coastal Committee. This allowed the project team to develop a business case for £225k of Flood Defence Grant in Aid funding from DEFRA to construct the

scheme.



Installation of flood relief pipework

Work started at Esholt in October 2020. The main bulk of the works is the installation of approximately 150 metres of flood relief pipework to reduce the risk of surface water flooding within the village. Our contractor Peter Duffys Ltd have been progressing the scheme during the Covid-19 pandemic and have

adapted how we work in line with government guidance to ensure we continue to focus on critical activities.

Esholt Village is a small confined Yorkshire settlement with tight working room within the historic streets. This has made the logistics of the scheme challenging, especially keeping a local livestock haulage business running during the works, and having a materials compound half a mile from the main works. The combination of these factors has made progress steady but early engagement by the project team with all local residents and stakeholders has ensured the works have not disrupted the day to day flow and operation of the village.



Restricted working room casued logistical challenges

The scheme is now complete and was ready for service in March 2021. The scheme provides a high standard of protection to 20 properties within Esholt Village that have suffered repeated flooding in the past.



## Goose Eye Water Flood Alleviation Scheme

Further to the establishment of the Board one project to make it to construction within the Bradford Capital Flood Risk Programme was the Goose Eye Surface Water Flood Alleviation Scheme. The project was first established using £25k local levy investment from the YRFCC. This allowed the project team to develop a business case for a fully funded Flood Defence Grant in Aid scheme to the value of £450k



Flood Water destroys arch window in 2015 event.

Goose Eye is a small village located outside Keighley attracting the local residence to the scenic village. The village had flooded in recent times during the 2015 and 2020 flood events. The first stage of the project was the installation of flood relief pipework which needed to be complete promptly. Flood relief pipes were installed across the Turkey Inn car park and this had meant that parking had been reduced therefore this would have impacted the business. To reduce any impact on the business the contractor had closed half of the car park leaving some parking bays for the customer to use.



Resurfaced Turkey Inn Car Park

The second phase of works was undertaken on Lund Lane where a new drainage system has been installed. The drainage system role was to collect all of the surface water and springs. This reduces flooding as the surface water is diverted in to Todley Clough, the local watercourse. Lund Lane was resurfaced as part of the scheme providing a much improved road surface to this unadopted highway.



Lund Lane Resurfaced with flood channel installed

This scheme has now been completed within the budget at a high standard and protects 32 houses within the Goose Eye Village that have been exposed to flooding in the past.

# Backstone Beck Natural Flood Management Project

Backstone Beck was a WwNP project that was part of the Defra funded National WwNP program. The aim of the project was to slow the flow from the circa. 170 hectares (ha) upper catchment and thus mitigate against flooding in the lower reaches near the confluence with the River Wharfe where properties, businesses and roads in Ilkley have been historically impacted and are at risk. The project is complete but Bradford Council are undertaking further flow monitoring and gathering images from the public using the fixed point photography posts.



Leaky Dam Structure

The majority of funding was allocated to peatland restoration works; slowing the flow and re-wetting the moor through grip blocking and sphagnum planting. Footpath works were also undertaken to divert flows back onto the moorland to mitigate against erosion and disrupt flow paths.

Works started in 2021 but were postponed due to the COVID 19 pandemic and were complete in April 2022. Grips on the moor have been modified to hold water during heavy rainfall events. One method was using igneous rock to create leaky dams to reduce the flow into

Backstone Beck and to improve the moor biodiversity by creating new habitats.

Other works included the installation of wooden dam structures to create mini storage and wetland areas. Sphagnum moss was also planted to persevere biodiversity and also holds a purpose to absorb any surface water. This scheme has now been completed at a high standard which reduces the flow of the Backstone Beck. Bradford Council are observing the beck by flow monitoring and images from the public.



Timber Dams

The approaches that have been implemented in these projects are all replicable on other catchments within the district and Bradford Council as LLFA and a landowner will continue to work with partners to realise more WwNP projects across Bradford district.

## Harden Moor NFM Project

Leeds City Council and the EA, in partnership with Bradford Council undertook a WwNP project on Harden Moor as part of the Leeds Flood Alleviation Scheme phase 2.

Harden Moor contains active blanket bog which is permanently wet due to high levels of rainfall. This helps peat to form, which absorbs carbon and stores it more effectively than trees.



Horse power was used to transport NFM measures

High levels of rainfall have increased due to global warming, which can cause flooding in the valleys. Keeping our moors wet and encouraging blanket bog assists with flood reduction and will also make these sites more resilient to wildfire, which is also an increasing threat.

Harden Moor was identified as one of five pilot NFM projects being implemented throughout the River Aire catchment, funded by Leeds City Council. The design was developed by Bradford Council through the White Rose Forest and includes interventions aimed at 'slowing the flow' of water into Harden Beck, which

is a major tributary to the River Aire. The natural methods undertaken were:

- blocking drainage features and leaky dams to reduce water run-off and re-wet land
- woodland creation and sphagnum planting to increase water absorption
- land management to maximise woodland cover through natural regeneration and re-wetting of heathland where feasible, so that the runoff is reduced, and the landscape can hold more water in times of flood

Existing habitats were kept, and minor amendments made to reduce surface water runoff and erosion and improve water absorption in the area.

This scheme has now been completed with the logistical challenges now overcome with the NFM measures working in full effect.

