



# Flood Risk Management Strategy

## Solway



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## Foreword

Flooding can affect us all. The risk of flooding and its impacts can't be removed entirely from our lives but it can be managed. This strategy takes our knowledge and understanding of flooding and turns it into a set of actions that are planned, prioritised and co-ordinated to tackle flooding in the areas where it affects us the most.

Approximately 3,900 residential and 900 non-residential properties are at risk of flooding in the Solway Local Plan District. Dumfries (including Lincluden), Moffat and Stranraer are just some of the areas where the greatest impacts of flooding can be found. The annual damages across the region are estimated to be £14 million, largely from river flooding. Across Scotland we now estimate 108,000 properties to be at risk, with the expected annual flood damage being in the region of £252 million.

We can expect these numbers to increase. Changes to the climate, how we live and how we use the land bring more and more people and property into flood risk.

Although the risk of flooding will never be removed entirely, this strategy describes the ambition for managing flooding and the priorities for action. A Local Flood Risk Management Plan co-ordinated by Dumfries and Galloway Council provides additional detail on the responsibility for delivery, funding and coordination of actions across the Local Plan District. Taken together, these documents describe the commitment of public bodies to address flooding.

This Flood Risk Management Strategy is published by SEPA and has been approved by Scottish Ministers. It has been produced with the support and collaboration of Dumfries and Galloway Council, Scottish Borders Council, Scottish Water and others with an interest in flood management. SEPA took account of the views received through two public consultations carried out during the development of the strategy and its supporting information.

How we plan for and manage our flood risk has far reaching consequences for Scotland's communities. As well as targeting action and resources in the areas where they can achieve most, the strategies also help to increase awareness of flood risk and improve understanding of how it can affect us.



Terry A'Hearn

Chief Executive Officer  
SEPA



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## 1 Flood risk management in Scotland

### 1.1 What is a Flood Risk Management Strategy?

Flood Risk Management Strategies have been developed to reduce the devastating and costly impact of flooding in Scotland. They coordinate the efforts of all organisations that tackle flooding, be it in our cities or rural areas and be it from rivers, the sea or from surface water. The strategies concentrate the work of these organisations to where the risk of flooding and benefits of investment are greatest.

By publishing these strategies, we are giving individuals, communities and businesses the information to better manage their own responsibilities. Everyone can take action with the confidence of knowing what others are doing and when they are doing it.

Flood Risk Management Strategies set out the short to long term ambition for flood risk management in Scotland. The strategies state the objectives, as agreed by responsible authorities, for tackling floods in high risk areas. Actions that will then deliver these objectives are described and prioritised in six-year planning cycles. The decisions are based on the best evidence available on the causes and consequences of flooding. Through this risk-based and plan-led approach, flood management will improve for individuals, communities and businesses at risk in Scotland.

Each strategy should be read alongside its Local Flood Risk Management Plan. The Local Flood Risk Management Plans have been developed by local authorities and provide additional local detail on the funding and delivery timetable for actions between 2016 and 2021. The publication date of the Local Flood Risk Management Plans is June 2016. Both the Flood Risk Management Strategy and Local Flood Risk Management Plan will be updated every six years.

These Flood Risk Management Strategies are approved by Scottish Ministers and published by SEPA, Scotland's strategic flood risk management authority. They have been prepared in collaboration with all 32 local authorities, Scottish Water and other organisations with a responsibility or interest in managing flooding. They are required under the Flood Risk Management (Scotland) Act 2009 and the European Commission's Floods Directive. The actions proposed to manage flood risk in high risk areas have been developed using the best available information at the time. The number of actions that are actually delivered over the six years set out in the strategy will depend on a number of factors including funding availability, and community engagement issues such as potential objections to a particular flood protection scheme.

### 1.2 How to read this Strategy

Each Flood Risk Management Strategy has three sections:

Section 1 contains background information on the approach taken in Scotland to manage flooding. It explains the duties and aims of organisations involved in tackling flooding, including how they work together and how flood risk management planning is linked to other government policies and initiatives.

Section 2 is the most important section for those individuals and communities seeking to understand their flood risk and its management. For priority areas (called Potentially Vulnerable Areas) there is a short description of the causes and consequences of flooding. The agreed objectives are clearly set out. And, most importantly, the actions that will deliver these objectives are prioritised and described. Section 3 includes supporting information on the sources of flooding in wider river catchments and coastal areas. A glossary is also provided.

### 1.3 Managing flooding in Scotland

Flood risk management in Scotland aims to manage flooding in a sustainable way. Sustainable flood risk management considers where floods are likely to occur in the future and takes action to reduce their impact without moving the problem elsewhere. It considers all sources of flooding, whether from rivers, the sea or from surface water. It delivers actions that will meet the needs of present and future generations whilst also protecting and enhancing the environment.

The sustainable approach to managing flood risk works on a six year planning cycle, progressing through the key stages outlined below.

#### Identifying priority areas at significant flood risk

The first step to delivering a risk-based, sustainable and plan-led approach to flood risk management was SEPA's **National Flood Risk Assessment**, which was published in 2011. The assessment considered the likelihood of flooding from rivers, groundwater and the sea, as well as flooding caused when heavy rainfall is unable to enter drainage systems or the river network. The likelihood of flooding was examined alongside the estimated impact on people, the economy, cultural heritage and the environment. It significantly improved our understanding of the causes and consequences of flooding, and identified areas most vulnerable to floods.

Based on the National Flood Risk Assessment, SEPA identified areas where flooding was considered to be nationally significant. These areas are based on catchment units as it is within the context of the wider catchment that flooding can be best understood and managed. These nationally significant catchments are referred to as **Potentially Vulnerable Areas**. In Scotland, 243 Potentially Vulnerable Areas were identified. They are estimated to contain 92% of the total number of properties at risk.

A small number of Candidate Potentially Vulnerable Areas were identified after the National Flood Risk Assessment in light of new information that warranted further assessment and appraisal. They are included in the flood risk management planning process. The National Flood Risk Assessment will be updated to inform each subsequent planning cycle.

#### Improving the understanding of flooding

SEPA developed **flood hazard and flood risk maps** between 2012 and 2014. These maps improved our understanding of flooding and helped inform the subsequent selection of actions to manage flood risk in Potentially Vulnerable Areas. The flood hazard maps show information such as the extent of flooding, water level, as well as depth and velocity where appropriate. The flood risk maps provide detail on the impacts on people, the economy, cultural heritage and the environment.

In 2012 SEPA also developed an **assessment of the potential for natural flood management**. The assessment produced the first national source of information on where natural flood management actions would be most effective within Scotland.

Flood hazard and flood risk maps and the assessment of the potential for natural flood management can be viewed on the SEPA website [www.sepa.org.uk](http://www.sepa.org.uk).

## Identifying objectives and selecting actions

The objectives and actions to manage flooding will provide the long-term vision and practical steps for delivering flood risk management in Scotland. Working collaboratively with local partnerships, SEPA has agreed the objectives for addressing the main flooding impacts. Actions that could deliver these agreed objectives have been appraised for their costs and benefits to ensure the right combinations are identified and prioritised. The actions considered in the development of this strategy include structural actions (such as building floodwalls, restoring flood plains, or clearance and repair works to rivers) and non-structural actions (such as flood warning, land use planning or improving our emergency response). Structural and non-structural actions should be used together to manage flood risk effectively.

An assessment of the potential for natural flood management was used to help identify opportunities for using the land and coast to slow down and store water. Natural flood management actions were recommended in areas where they could contribute to the management of flood risk. In such instances these actions were put forward as part of flood protection or natural flood management studies.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) report predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall events. The predicted increase in rainfall is expected to variably increase the potential for river and surface water flooding, and similarly, there is expected to be a rise in sea levels that will vary around the coastline.

The predicted increases in flood risk described in Section 3 are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Flood Risk Management Strategies and Local Flood Risk Management Plans

For flood risk management purposes, Scotland has been divided into 14 **Local Plan Districts**. Each Local Plan District will have a set of complementary plans: Flood Risk Management Strategies produced by SEPA, and Local Flood Risk Management Plans produced by a lead local authority. Flood Risk Management Strategies and Local Flood Risk Management Plans aim to make a strong and lasting contribution to sustainable flood risk management, and will be at the heart of efforts to tackle flooding in Scotland. They will help to target and maximise the benefit of public investment.

### 1.4 How the Flood Risk Management Strategy was developed

#### Partnership working

Many organisations and individuals are involved in helping to improve flood management in Scotland. A piecemeal approach to tackle flooding does not work. Flooding is too complex, and the causes and impacts too complicated for any single

organisation to address alone. Flooding disregards local authority boundaries and cuts across the responsibilities of organisations such as SEPA, Scottish Water and emergency responders. To be successful, flood management requires coordination among organisations as set out in this strategy. A willingness to collaborate by those responsible for flood management is essential.

This strategy has been developed in partnership by:

- Dumfries and Galloway Council (lead local authority), East Ayrshire Council and Scottish Borders Council. There are also cross border arrangements with Cumbria County Council and Carlisle City Council;
- Scottish Water; and,
- SEPA.

These organisations are working more closely together than ever before. In local partnerships, here and throughout Scotland, SEPA has provided the technical analysis and ensured a consistent national approach is taken. It has provided the evidence upon which to make sensible, informed decisions. Local authorities and Scottish Water have made sure that local knowledge and expertise has informed the decision-making.

### **Consultation, engagement and advice**

SEPA has been keen to hear from the people and communities that live under the threat of flooding to ensure that our technical analysis of the risks is accurate and that efforts to manage flooding are targeted to where most can be achieved. SEPA held two public consultations during the development of the Flood Risk Management Strategies. The first was on the general approach to flood risk management planning and the identification of priority areas (2011); the second, held jointly with local authorities, was on the understanding of flooding in these priority areas and on the objectives and actions to manage flooding (2015).

Further advice has been sought from relevant organisations at key stages. The strategies have benefited from Local Advisory Groups, providing important community and area-based knowledge on both the causes and consequences of flooding and on the appropriate actions for future management. Local Advisory Groups have been especially helpful in considering flood risk management planning in the context of wider plans and initiatives. The Solway Local Advisory Group includes representatives from a range of sectors, including government agencies, local authorities, non-government organisations, utility companies and land and asset managers.

A Cross Border Advisory Group is also in place in the Solway Local Plan District to advise the Environment Agency, SEPA and local authorities on flooding issues that straddle the border. The group consider how the relevant authorities should coordinate their work in order to ensure that they understand how the impact of flood risk on one side of the border is affected by actions or inactions on the other side of the border.

In producing the Flood Risk Management Strategy, SEPA has also taken advice from a National Flood Management Advisory Group. Over 50 member organisations, reflecting the national importance and impact of flooding on our communities, economy, environment and cultural heritage, have been invited at key stages to provide comment and input.

Some of the work carried out by SEPA has been complex and technical in nature for which we have sought professional advice. Through membership of the Scottish

Advisory and Implementation Forum for Flooding (SAIFF), we have received assistance from local authorities, Scottish Water, Forestry Commission Scotland, the National Park Authorities and other key interested organisations. We have also developed some of our methods by working with other organisations with similar responsibilities within the UK and Europe. We have specifically worked with the Environment Agency and English local authorities in the cross border areas.

SEPA's chief statutory function in flood risk management planning is to prioritise future actions across Scotland. To do this, SEPA made a technical, risk-based assessment of the costs and impacts of actions. This independent assessment was used alongside information from partner organisations to jointly agree priorities and identify indicative delivery dates for actions. A National Prioritisation Advisory Group, with representatives from the Scottish Government, COSLA, Scottish Water and local authorities, was established to provide guidance to SEPA on the priority of flood risk management actions, having considered both the technical ranking prepared by SEPA and issues of local priority.

### **Strategic Environmental Assessment and Habitats Regulation Appraisal**

SEPA undertook a strategic environmental assessment to assess the significant environmental effects of the Flood Risk Management Strategies. Our assessment was published in an environmental report, and we consulted the public on our findings. We have published a post-adoption statement, which describes how we have taken account of the environmental assessment and the consultation responses, and how we will monitor any significant environmental effects of the Flood Risk Management Strategies.

We also undertook a Habitats Regulations Appraisal to ensure that the Flood Risk Management Strategies will not adversely affect the integrity of Special Areas of Conservation and Special Protection Areas. We consulted Scottish Natural Heritage and Natural England on our appraisal method and took their views into account. We have applied mitigation measures where required.

## **1.5 Roles and responsibilities for flood risk management planning**

Individuals have a personal responsibility to protect themselves and their property from flooding. However, public bodies have responsibilities too and are working together to reduce the impacts of flooding in Scotland. Responsibility for flood risk management planning falls primarily to SEPA, local authorities and Scottish Water. Some of the key roles are outlined below and more information is available from the SEPA website.

### **Your responsibilities**

Organisations and individuals have responsibilities to protect themselves from flooding. Being prepared by knowing what to do and who to contact if flooding happens can help you reduce the damage and disruption flooding can have on your life.

The first step to being prepared is signing up to Floodline so you can receive messages to let you know where and when flooding is likely to happen. Other useful tools and advice on how to be prepared are available on the Floodline website, including a quick guide to who to contact in the event of a flood. For more information visit: [www.floodlinescotland.org.uk](http://www.floodlinescotland.org.uk). You can also check how your area could be affected by flooding by looking at SEPA's flood maps.

## **SEPA**

SEPA is Scotland's national flood forecasting, flood warning and strategic flood risk management authority. We have a statutory duty to produce Scotland's Flood Risk Management Strategies. As described above, we work closely with other organisations responsible for managing flood risk through a network of partnerships and stakeholder groups to ensure that a nationally consistent approach to flood risk management is adopted.

SEPA also has a responsibility to identify where in Scotland there is the potential for natural flood management techniques to be introduced. Natural flood management uses the natural features of the land to store and slow down the flow of water.

In running Floodline, we provide direct warnings, live flooding information and advice on how to prepare for or cope with the impacts of flooding 24 hours a day, seven days a week. To help us forecast for flooding we work in partnership with the Met Office through the Scottish Flood Forecasting Service. SEPA has piloted surface water flood forecasting to help urban areas improve their resilience to and preparedness for flooding. The development and wider roll-out of this service is being considered alongside the technical, resource and communication challenges with providing surface water flooding guidance.

To raise awareness of flooding at a national level SEPA runs education initiatives, community engagement programmes and an annual campaign to promote the useful advice and information available through Floodline. We work in partnership with local authorities, Neighbourhood Watch Scotland, Ready Scotland and others to share our resources and help to promote preparedness and understanding of how flood risk is managed.

### **Local authorities and lead local authorities**

Local authorities work together for flood risk management planning purposes through a lead local authority. The lead local authority must perform several important functions over and above the general flood-related duties and powers given to local authorities. Most significantly, the lead local authority, having contributed with other local authorities to the production of the Flood Risk Management Strategy, must prepare a Local Flood Risk Management Plan. Although the lead local authority is responsible for the production of the plan, its content will be drawn from and agreed by all relevant local authorities, other responsible authorities and SEPA. Local authorities have been working collaboratively in the manner described above to develop these Local Flood Risk Management Plans.

It is the responsibility of your local authority to implement its flood protection actions agreed within the Flood Risk Management Strategy, including new schemes or engineering works and their statutory requirements to monitor, clear and maintain watercourses. You can help your local authority to manage flooding by letting them know if debris is blocking watercourses or if flood defences have been tampered with. During severe flooding, local authorities will work with the emergency services and coordinate shelter for people evacuated from their homes.

### **Scottish Water**

Scottish Water is a responsible authority for flood risk management and is working closely with SEPA, local authorities and others to coordinate plans to manage flood risk.

Scottish Water has the public drainage duty and is responsible for foul drainage and the drainage of rainwater run-off from roofs and any paved ground surface from the boundary of properties. Additionally, Scottish Water helps to protect homes from flooding caused by sewers either overflowing or becoming blocked. Scottish Water is not responsible for private pipework or guttering within the property boundary.

## National parks

The two National Park Authorities, Loch Lomond and Trossachs National Park and Cairngorms National Park, were designated as responsible authorities for flood risk management purposes in 2012. Both have worked with SEPA, local authorities and Scottish Water to help develop Flood Risk Management Strategies and Local Flood Risk Management Plans. They also fulfil an important role in land use planning, carrying out or granting permission for activities that can play a key role in managing and reducing flood risk.

## Other organisations

- The **Scottish Government** oversees the implementation of the Flood Risk Management (Scotland) Act 2009, which requires the production of Flood Risk Management Strategies and Local Flood Risk Management Plans. Scottish Ministers are responsible for setting the policy framework for how organisations collectively manage flooding in Scotland. Scottish Ministers have also approved this Flood Risk Management Strategy.
- **Scottish Natural Heritage** has provided general and local advice in the development of this Flood Risk Management Strategy. Flooding is seen as natural process that can maintain the features of interest at many designated environmental sites, so Scottish Natural Heritage helps to ensure that any changes to patterns of flooding do not adversely affect the natural environment. Scottish Natural Heritage also provides advice on the impacts of Flood Protection Schemes and other land use development on designated sites and species.
- **Forestry Commission Scotland** was designated in 2012 as a responsible authority for flood risk management planning purposes and has engaged in the development of the Flood Risk Management Strategies through national and Local Advisory Groups. This reflects the widely held view that forestry can play a significant role in managing flooding.
- During the preparation of the flood risk management plans **Network Rail** and **Transport Scotland** have undertaken works to address flooding at a number of frequently flooded sites. Further engagement is planned with SEPA and local authorities to identify areas of future work. There is the opportunity for further works to be undertaken during the first flood risk management planning cycle although locations for these works are yet to be confirmed.
- **Utility companies** have undertaken site specific flood risk studies for their primary assets and have management plans in place to mitigate the effects of flooding to their assets and also minimise the impacts on customers.
- The **Met Office** provides a wide range of scientific support, forecasts and weather warnings. SEPA and the Met Office work together through our partnership the Scottish Flood Forecasting Service.
- The **emergency services** provide emergency support when flooding occurs and can coordinate evacuations. You should call the emergency services on 999 if

you are concerned about your safety or the safety of others and act immediately on any advice provided.

- **Historic Environment Scotland** considers flooding as part of its regular assessments of historic sites. As such, flooding is considered as one of the many factors which inform the development and delivery of its management and maintenance programmes.

## 1.6 Links with other plans and policies

### River basin management planning

River basin management aims to protect and improve the condition of our rivers, lochs, estuaries and coastal waters. Taking action to reduce flood risk in Scotland provides an opportunity to connect with plans to improve the quality of Scotland's water environment at the same time. For example, coordination between river basin management and flood risk management can reduce flood risk, whilst improving water quality and biodiversity.

SEPA is leading the delivery of River Basin Management Plans and Flood Risk Management Strategies and has worked to ensure that there is integration and coordination between them. This coordination, particularly in regard to consultation and engagement, will be important for stakeholders many of whom have an interest in the objectives of both plans.

### Land use and spatial planning

Land use planning decisions are one of the most powerful tools available to manage flood risk. The alignment of flood risk management and land use planning policy is pivotal to achieving sustainable flood risk management. Decisions relating to flood risk management can have significant implications for the location of development and, likewise, decisions relating to the location of development can impact on flood risk. Land use planning has the potential to contribute to sustainable flood risk management through the location, use and design of new development and the redevelopment of existing areas. Actions that deliver national level land use planning policies are summarised in Annex 2.

SEPA is a statutory consultee providing advice on planning applications with regards to flood risk. Guidance aims to minimise flood risk to development and ensure no adverse effects occur elsewhere. Land use planning objectives and actions have been agreed with responsible authorities, which will ensure that flood risk is adequately taken into account throughout the planning process.

### Emergency planning and response

Emergency plans are prepared under the Civil Contingencies Act 2004. They are in place across Scotland and are prepared by Category 1 and 2 Responders, such as Police Scotland and the Scottish Ambulance Service. Emergency plans ensure the effective management of response to emergencies. Emergency plans can either be generic and deal with all emergencies or specific to deal with, for example, flooding. The information contained in the Flood Risk Management Strategies can be used to inform wider emergency response plans for flooding.

Many organisations have specific roles and responsibilities during an emergency response to a flood for example, local authorities, the Scottish Fire and Rescue Services, Police Scotland and SEPA. In many cases, this response is augmented by

the work of voluntary organisations, communities and individuals. During an emergency, the response by these agencies will be co-ordinated through regional and local resilience partnerships.

## Scottish Water investment plans

There is a close relationship between Flood Risk Management Strategies and Scottish Water's investment plans. Sewer flooding is not considered in detail in this strategy although it remains a high priority for Scottish Water and its customers. Scottish Water's close involvement in flood risk management planning aims to ensure that there is strong coordination between the management of sewer and surface water flooding and the actions to be taken forward by local authorities.

## 1.7 Supporting information

### Sources of flooding described in this strategy

The Flood Risk Management Strategy addresses the risk of flooding from rivers, the coast and surface water. The risk of flooding from rivers is usually due to rainfall causing a river to rise above bank level spreading out and inundating adjacent areas. Coastal flooding is where the risk is from the sea. Sea levels can change in response to tidal cycles or atmospheric conditions. Over the longer term sea levels and coastal flood risk may change due to climate change. Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. There can be interactions between these sources of flooding, but for the purposes of this strategy they are dealt with independently.

The following aspects of flooding have not been incorporated into this strategy:

- **Groundwater** is generally a contributing factor to flooding rather than the primary source. It is caused by water rising up from underlying rocks or flowing from springs.
- **Reservoir breaches** have been assessed under separate legislation (Reservoirs (Scotland) Act 2011). Further information and maps can be found on SEPA's website.
- The Flood Risk Management (Scotland) Act 2009 does not require SEPA or responsible authorities to assess or manage **coastal erosion**. However, SEPA has included consideration of erosion in the Flood Risk Management Strategies by identifying areas that are likely to be susceptible to erosion and where erosion can exacerbate flood risk. As part of considering where actions might deliver multiple benefits, we have looked to see where the focus of coastal flood risk management studies coincides with areas of high susceptibility to coastal erosion. Subsequent detailed studies and scheme design will need to consider coastal erosion in these areas.
- **Coastal flood modelling.** The information on coastal flooding used to set objectives and identify actions is based on SEPA modelling using simplified coastal processes and flooding mechanisms at work during a storm. Wave overtopping cannot be accurately modelled at a national scale due to the importance of local factors such as prevailing wind conditions, the depth and profile of the near-shore sea bed or the influence of any existing defences or management structures. As a result, coastal flood risk may be underestimated in some areas. Conversely, in locations with wide and flat floodplains, the modelling

may overestimate flood risk. To address this, in a number of locations where more detailed local models were available they have been incorporated into the development of the Flood Risk Management Strategies. Where wave overtopping has been specifically identified as a concern – but where no further detailed modelling is available – particular compensation has been made in the selecting actions to address coastal flood risk.

### Commonly used terms

Below are explanatory notes for commonly used terms in this strategy. A glossary of terms is also available.

- Reference to flood risk.** During the development of this strategy flood risk has been assessed over a range of likelihoods. For consistency in reporting information within the strategies, unless otherwise stated, all references to properties or other receptors being ‘at risk of flooding’ refer to a medium likelihood flood (up to a 1 in 200 chance of flooding in any given year). By exception, references will be made to high or low risk flooding, which should be taken to mean a 1 in 10 chance/likelihood or 1 in 1000 chance/likelihood of flooding in any given year respectively.

Chance / likelihood of flooding	
High	1 in 10 year
Medium	1 in 200 year
Low	1 in 1000 year

- Annual Average Damages** have been used to assess the potential economic impact of flooding within an area. Depending on its size or severity each flood will cause a different amount of damage to a given area. Annual Average Damages are the theoretical average economic damages caused by flooding when considered over a very long period of time. It does not mean that damage will occur every year: in many years there will be no damages, in some years minor damages and in a few years major damages may occur. High likelihood events, which occur more regularly, contribute proportionally more to Annual Average Damages than rarer events. Within the Flood Risk Management Strategies Annual Average Damages incorporate economic damages to the following receptors: residential properties, non-residential properties, vehicles, emergency services, agriculture and roads. They have been calculated based on the principles set out in the Flood Hazard Research Centre Multi-Coloured Handbook (2010).
- History of flooding.** The history of flooding sections of this document report floods that have occurred up to July 2015.

## 1.8 Next steps and monitoring progress

Flood risk management planning has progressed significantly in recent years. Scotland now has the most advanced nationally consistent and locally informed understanding of the causes and consequences of flooding that it has ever had. SEPA is committed to improving this knowledge and understanding during subsequent planning cycles, accepting that these first Flood Risk Management Strategies are based on the best available current knowledge and data.

SEPA has prioritised actions based on funding assumptions provided by Scottish Government and the capacity of local authorities to deliver within the next six years. Lead local authorities will provide an interim report on the progress of delivering all

actions in the Local Flood Risk Management Plan not earlier than two years and not later than three years from its publication. A final report will also be prepared at the end of the first planning cycle.

A second set of Flood Risk Management Strategies and Local Flood Risk Management Plans will be published in December 2021 and June 2022 respectively.

### **Licensing acknowledgements**

Full data licensing acknowledgements can be found in Annex 3 of this strategy.

# Flood Risk Management Strategy

## Solway Local Plan District

This section is the most relevant for individuals, communities and businesses seeking to understand their local flood risk and its management. There is an overview of the Local Plan District, as well as further detail for every Potentially Vulnerable Area. For each Potentially Vulnerable Area, there is a short description of the causes and consequences of flooding. The agreed objectives are clearly set out and, most importantly, the actions that will deliver these objectives are prioritised and described.

## Section 2: Understanding and managing flooding

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• Springholm (14/10).....	123
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• Spittal (14/16).....	188
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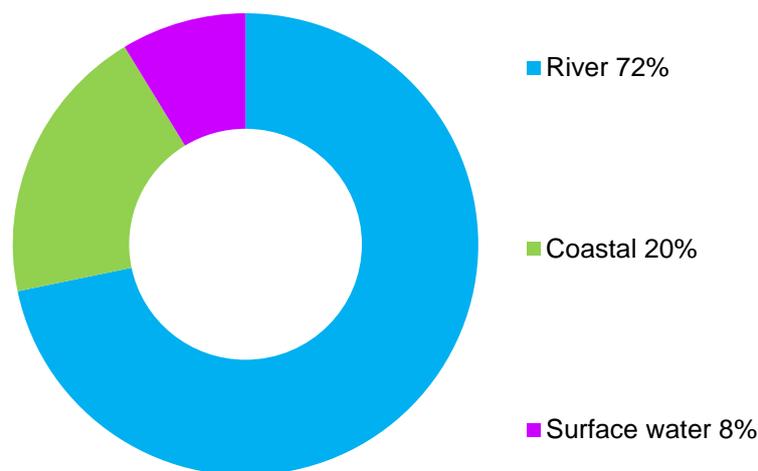
## 2.1 Summary of flooding in the Solway Local Plan District

The Solway Local Plan District extends from Drummole and Portpatrick in the west, to beyond Langholm and Newcastleton in the east (see Figure 2). The Local Plan District has a total area of approximately 7,000km<sup>2</sup>. There are 24 Potentially Vulnerable Areas and two candidate Potentially Vulnerable Areas within this Local Plan District. The location of these areas is shown in Figure 2.

### Flood risk in the Solway

There are approximately 3,900 residential properties and 900 non-residential properties at risk of flooding within the Local Plan District. This equates to approximately 4% of all properties at risk of flooding nationally. Within the Local Plan District, approximately 5% of residential properties and almost 13% of non-residential properties are at risk and it is estimated that 74% of these properties are located within Potentially Vulnerable Areas. A further 10% of properties at risk are identified within two candidate Potentially Vulnerable Areas. The Annual Average Damages from flooding (see glossary) are approximately £14 million.

River flooding is the main source of flooding in the Local Plan District, closely followed by surface water flooding (Figure 1). The Annual Average Damages caused by river flooding are £9.8 million, those caused by coastal flooding are £2.7 million and those caused by surface water flooding are £1.2 million.



**Figure 1:** Annual Average Damages by flood source

Table 1 and Figure 3 show the main areas, number of properties at risk and the Annual Average Damages caused by flooding in the main towns and cities within the Local Plan District. This includes damages to residential properties, non-residential properties, transport and agriculture. Please note that economic damages to airports and rail infrastructure were not assessed as strategic information on damages at this scale is not available.

	Residential and non-residential properties at risk of flooding	Annual Average Damages
Dumfries (including Lincluden)	840	£3.7 million
Moffat	350	£630,000
Stranraer	350	£430,000
Dalbeattie	290	£510,000
New Cumnock (including Mansfield)	240	£490,000
Newton Stewart / Minnigaff	210	£490,000
Langholm	190	£270,000
Annan	180	£530,000
Castle Douglas	170	£440,000
Newcastleton	140	£160,000

**Table 1:** Main areas at risk of flooding

### Background information on the Solway Local Plan District

The extent of the Solway Local Plan District and the location of the Potentially Vulnerable Areas are shown in Figure 2. The main urban areas are Dumfries, Stranraer and Annan and it has a population of approximately 160,000 people.

The area is predominantly within Dumfries and Galloway Council. However, there are parts of four further local authorities and cross-border arrangements with Cumbria County Council and Carlisle City Council.

The largest river catchment is the River Nith. Other watercourses include the River Annan, River Cree, River Esk and River Dee. The area is predominantly rural with large areas of agricultural grazing and woodland. Coniferous woodland is mainly found on the gentle side slopes of the upper catchment areas of the district, while broadleaved woodlands are scattered at lower elevations on edges of coniferous forests and along the valley floors and coastline.

The Solway Local Plan District includes 625km of coastline, mainly along the Solway Firth.

Further details of flood risk from distinct sources can be found in the river, coastal and surface water sections of this report.





## Objectives and actions in the Solway Local Plan District

The objectives are the shared aims for managing flooding. Actions describe where and how flood risk will be managed. Objectives and actions have been set by SEPA and agreed by flood risk management responsible authorities following consultation.

Some flood risk management objectives and actions apply to all areas, whether designated as a Potentially Vulnerable Area or not. For example, flood risk can be managed through national planning policy or as part of ongoing statutory duties for local authorities. The focus of this Flood Risk Management Strategy is to manage flood risk in Potentially Vulnerable Areas where specific actions apply in addition to the generic actions listed below. Further detail on specific actions can be found in the relevant Potentially Vulnerable Area chapter. Local authorities may have further information on how they manage flooding across their area.

Target area	Objective(s)	ID	Indicators
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 3,900 residential properties</li> <li>• 900 non-residential properties</li> <li>• 8600 people</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 3,900 residential properties</li> <li>• 900 non-residential properties</li> <li>• 8600 people</li> </ul>

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	-		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and the Resilient Communities Initiative, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. Local authorities will be undertaking additional awareness raising activities, further details will be set out in the Local FRM Plans.		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	Local authority, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. The local authorities produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

<b>Action (ID):</b>	<b>EMERGENCY PLANS / RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	<b>Avoid an overall increase in flood risk. (14033)</b> <b>Reduce overall flood risk. (14040)</b>		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## 2.2 Potentially Vulnerable Areas

The table below summarises the actions to manage flood risk in the Potentially Vulnerable Areas of this Local Plan District. Further detail is provided in each Potentially Vulnerable Area.

PVA	Flood protection scheme/ works	Natural flood management works	New flood warning	Flood protection study	Natural flood management study	Surface water plan/study	Strategic mapping and modelling	Maintain flood protection scheme*	Maintain flood warning*	Flood forecasting	Property level protection scheme	Community flood action groups	Self help	Awareness raising	Maintenance	Site protection plans	Emergency plans/ response	Planning policies
14/01			✓	✓			✓	✓	N/A	✓			✓	✓	✓		✓	✓
14/02			✓	✓			✓	✓	N/A	✓		✓	✓	✓	✓		✓	✓
14/03				✓		✓	✓	N/A	✓	✓		✓	✓	✓	✓		✓	✓
14/04	✓		✓				✓	N/A	N/A	✓			✓	✓	✓		✓	✓
14/05	✓		✓			✓	✓	N/A	✓	✓			✓	✓	✓		✓	✓
14/06						✓	✓	N/A	N/A	✓			✓	✓	✓		✓	✓
14/07			✓				✓	N/A	N/A	✓			✓	✓	✓		✓	✓
14/08			✓	✓	✓	✓	✓	N/A	✓	✓			✓	✓	✓		✓	✓
14/09							✓	N/A	✓	✓			✓	✓	✓		✓	✓
14/10								✓	N/A	✓			✓	✓	✓		✓	✓
14/11					✓		✓	N/A	N/A	✓			✓	✓	✓		✓	✓
14/12	✓		✓				✓	N/A	N/A	✓		✓	✓	✓	✓		✓	✓
14/13								✓	N/A	✓			✓	✓	✓		✓	✓
14/14							✓	✓	✓	✓			✓	✓	✓		✓	✓
14/15	✓			✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
14/16								N/A	N/A	✓			✓	✓	✓		✓	✓
14/17				✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
14/18							✓	N/A	✓	✓			✓	✓	✓		✓	✓
14/19			✓	✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
14/20							✓	✓	✓	✓			✓	✓	✓		✓	✓
14/21				✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
14/22				✓	✓		✓	N/A	✓	✓			✓	✓	✓		✓	✓
14/23								N/A	✓	✓			✓	✓	✓		✓	✓
14/24				✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
14/25c				✓				✓	N/A	✓			✓	✓	✓		✓	✓
14/26c	✓						✓	N/A	✓	✓	✓	✓	✓	✓	✓		✓	✓

\*Note: N/A is used where there is no formal Flood Protection Scheme or flood warning scheme present.

## Kirkconnel (Potentially Vulnerable Area 14/01)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Nith

### Summary of flooding impacts



#### At risk of flooding

- 90 residential properties
- <10 non-residential properties
- £150,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

Actions

## Kirkconnel (Potentially Vulnerable Area 14/01)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Nith

### Background

This Potentially Vulnerable Area is located in the north of the Solway Local Plan District and is almost 10km<sup>2</sup>. It includes the town of Kirkconnel (shown opposite).

The area is at risk of river flooding, primarily from the River Nith. Ground water has also been known to affect properties and the road network within the area. There is a small risk of surface water flooding to areas surrounding Kirkconnel.

There are approximately 90 residential properties at risk of flooding. The Annual Average Damages are approximately £150,000 caused by river flooding.



### Summary of flooding impacts

River flooding is from the River Nith and three tributaries. The Grain Burn and Polbower Burn flow into the Nith from the north and the Kello Water has its confluence with the Nith to the south east of Kirkconnel. The Nith is one of the larger rivers in the Solway Local Plan District and has a shallow gradient as it flows through the area. The catchments of the Polbower Burn, Grain Burn and Kello Water are considerably smaller and have a steeper gradient.

The strategic assessment in this area shows that it is only subject to river flooding; however, historical records identify that groundwater flooding has also been experienced following the cessation of mining activity. The contribution of groundwater flooding has not been assessed in this report.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Residential properties within Kirkconnel are at risk of flooding from the River Nith, notably at St. Conal's Square and Riverside Terrace. The main road link at risk of flooding is the A76 to the north of Kelloholm.

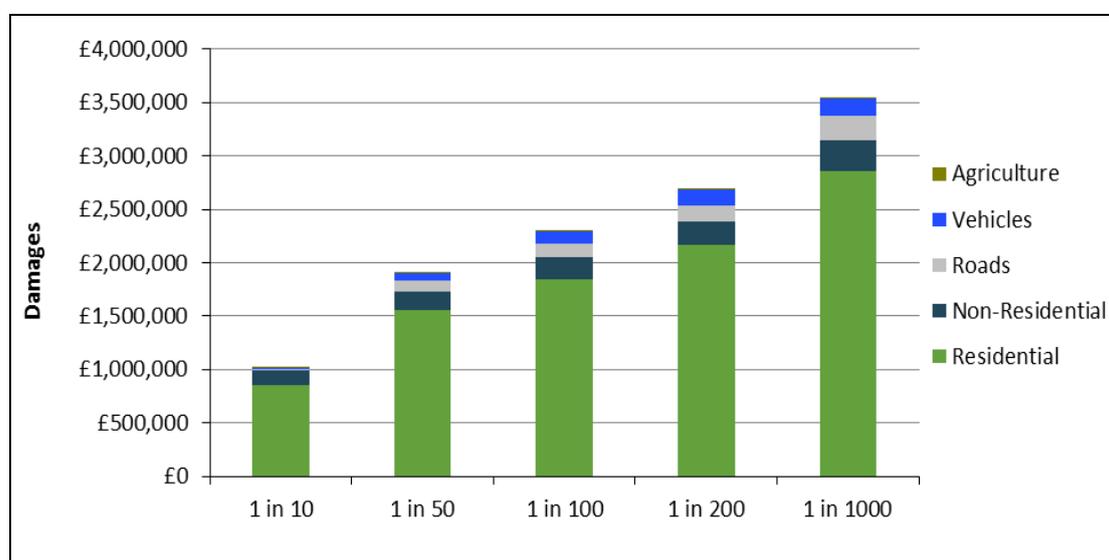
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 90 to 110.

The damages associated with floods of different likelihood are shown in Figure 1. For this Potentially Vulnerable Area the highest damages are to residential properties.

The location of the impacts of flooding is shown in Figure 2.

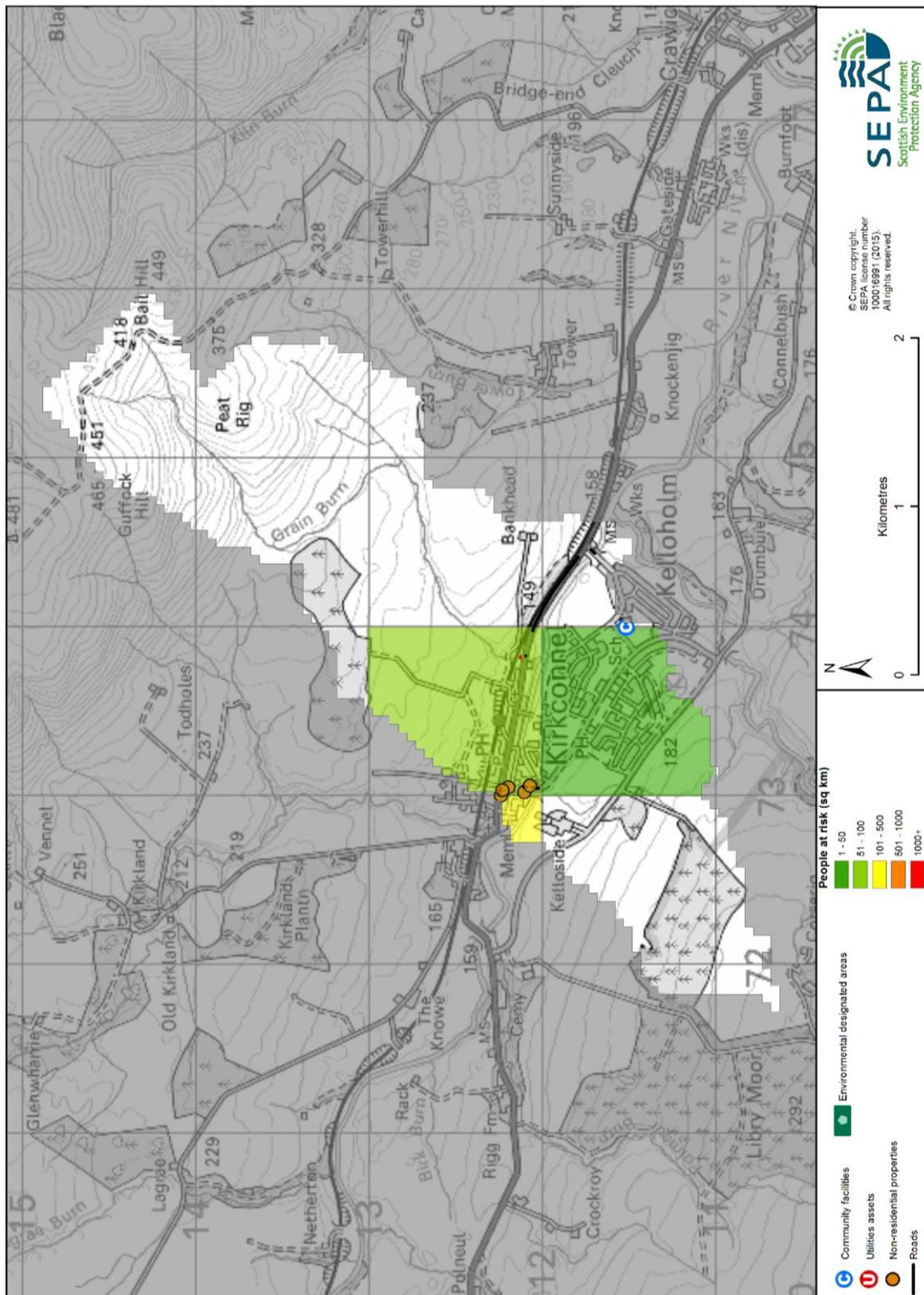
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 710)	40	90	100
Non-residential properties (total 60)	<10	<10	<10
People	80	190	220
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities assets	0	0	0
Transport links - roads (km)	<0.1	0.6 (of which <0.1 is A road)	0.8 (of which <0.7 is A road)
Transport links - rail (km)	0	0	<0.1
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	0.1	0.2	0.2

**Table 1:** Summary of flooding impacts<sup>1</sup>



**Figure 1:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



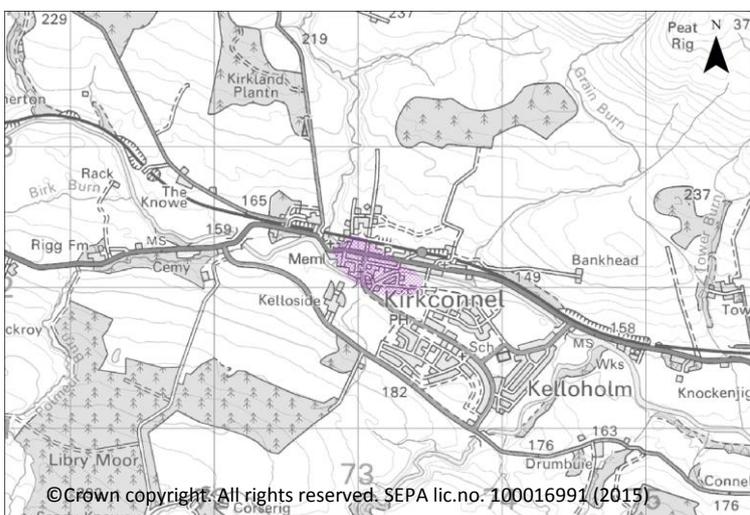
**Figure 2: Impacts of flooding**

### History of flooding

On 30 December 2013, prolonged heavy rain across Dumfries and Galloway caused the River Nith to burst its banks at Kirkcubbin, resulting in more than 40 homes being evacuated and a local community facility on the north side of the Nith being flooded.

## Objectives to manage flooding in Potentially Vulnerable Area 14/01

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Kirkconnel Potentially Vulnerable Area.

Reduce the risk of river flooding to properties in Kirkconnel	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>90 residential properties</li> <li>&lt;10 non-residential properties</li> <li>£170,000 Annual Average Damages</li> </ul>	 <p style="font-size: small; text-align: center;">© Crown copyright. All rights reserved. SEPA lic.no. 100016991 (2015)</p>
Objective ID: 14001	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>90 residential properties</li> <li>£150,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>90 residential properties</li> <li>£150,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/01

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Kirkconnel Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140010010)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Kirkconnel (14001)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding from the Upper River Nith (from Kirkconnel downstream). Forecasting capability is currently under development in this area.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140010005)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Kirkconnel (14001)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>72 of 168</b>	<b>7 of 10</b>	
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been completed by Dumfries and Galloway Council, to assess flood risk within Kirkconnel and the feasibility of flood protection actions to mitigate the risk. The study also looked at the potential for natural flood management actions to reduce the impact of flooding, taking into account the proposed work from the New Cumnock pilot catchment study. The study also considered a localised property level protection		

	<p>schemes giving consideration of the achievable flood warning times for the upper River Nith.</p> <p>It is recommended that this study is reviewed to determine the current risk in the town and the potential future risk with climate change. This will determine if or when further work is required to investigate how to reduce the flood risk.</p>
<b>Potential impacts</b>	
<b>Economic:</b>	The flood protection study should consider how to reduce flood risk to 91 residential properties and 5 non-residential properties in this location, with potential damages avoided of up to £4.8 million.
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection study area. There may be changes in visual amenity and land use as a result of this action.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. This study is proposed for a number of rivers. The physical condition of part of the River Nith (water body ID 10611) is identified by SEPA to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There are no international or national level environmental designations that are likely to be impacted by this action. Working in and around the channel may alter the river morphology and may increase erosion downstream of the action. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Upper River Nith area to improve understanding of flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140010017)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Kirkconnel (14001)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Kirkconnel Flood Protection Scheme was constructed in 1984 on the Polbower Burn and consisted of the installation of a concrete channel, culvert and reinforcing gabions. The standard of protection is not known. Maintenance of this scheme should be continued. A flood protection study has been carried out by Dumfries and Galloway Council to look at further actions to reduce risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

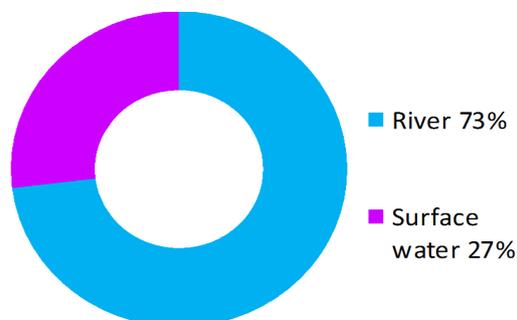
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Moffat (Potentially Vulnerable Area 14/02)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

### Summary of flooding impacts



#### At risk of flooding

- 370 residential properties
- 50 non-residential properties
- £680,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

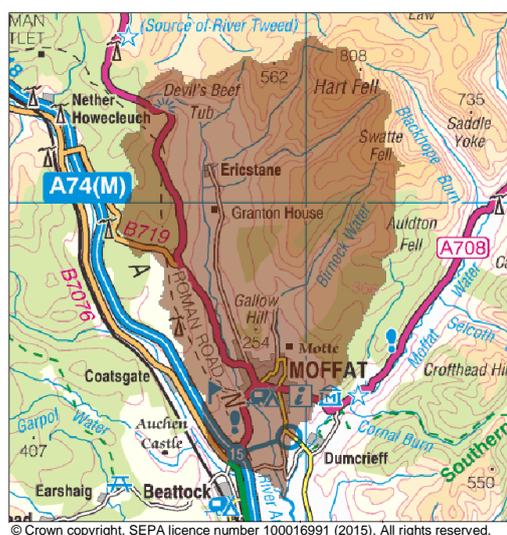
Actions

## Moffat (Potentially Vulnerable Area 14/02)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

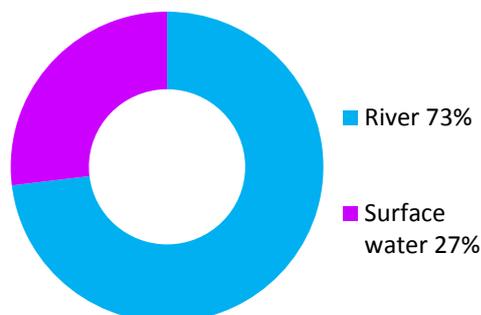
### Background

This Potentially Vulnerable Area is located in the north east of the Solway Local Plan District. It is approximately 20km<sup>2</sup> (shown below).



This is a steep, largely rural area covering the Birnock Water and part of the River Annan catchment.

There are approximately 370 residential properties and 50 non-residential properties at risk of flooding. The Annual Average Damages are approximately £680,000 with the majority caused by river flooding.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The primary source of river flooding within the area is the River Annan and the Birnock Water. A study undertaken in 2006 indicated that water overtopping the banks of the Birnock Water, would flow away from the river and pond in low-lying areas. The confluence of these two watercourses is to the south of Moffat with extensive flooding shown as the two rivers converge. This area of the town is where the majority of the flood damage to residential and non-residential properties is predicted to occur.

Almost all of the surface water risk within Moffat originates as runoff from the Gallow Hill area of the town. This steep hill has caused flooding problems in areas of Moffat to both the east and west of Gallow Hill. There are properties on the hillside that have been previously affected by surface water runoff which is made worse by a lack of storage capacity within existing culverts which may also become blocked.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. There are approximately 50 residential properties at risk from surface water flooding and the main transport route, the A74 (M), is also at risk. Nine designated cultural heritage sites are at risk of flooding.

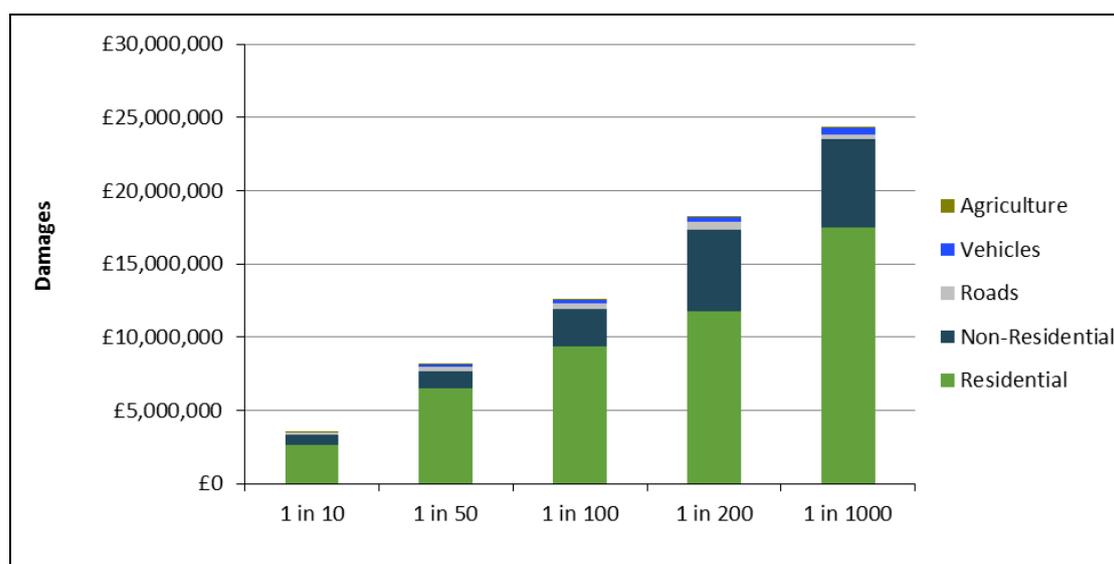
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 370 to 450 and the number of non-residential properties from approximately 50 to 60.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
<b>Residential properties (total 1,400)</b>	80	370	510
<b>Non-residential properties (total 150)</b>	30	50	60
<b>People</b>	190	820	1,100
<b>Community facilities</b>	<10 Emergency service	<10 Includes: emergency services and educational buildings	10 Includes: emergency services and educational buildings
<b>Utilities assets</b>	<10	10	10
<b>Transport links - roads (km)</b>	1.4 (of which 0.1 is motorway)	3.3 (of which 0.2 is motorway)	4.1 (of which 0.2 is motorway)
<b>Environmental designated areas (km<sup>2</sup>)</b>	0	0	0
<b>Designated cultural heritage sites</b>	7	9	10
<b>Agricultural land (km<sup>2</sup>)</b>	1.7	2.5	2.8

**Table 1: Summary of flooding impacts<sup>1</sup>**



**Figure 2: Damages by flood likelihood**

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

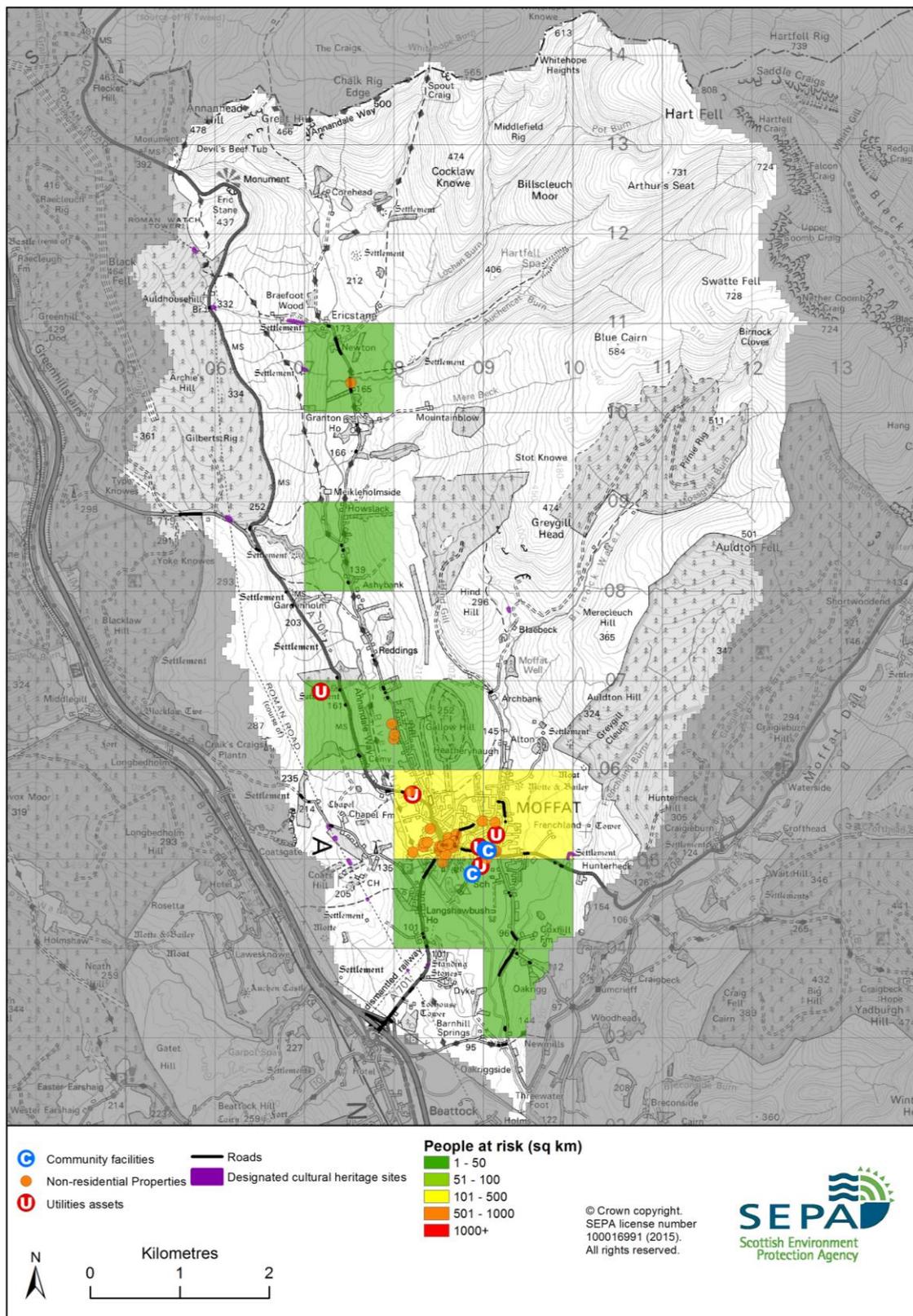


Figure 3: Impacts of flooding

## History of flooding

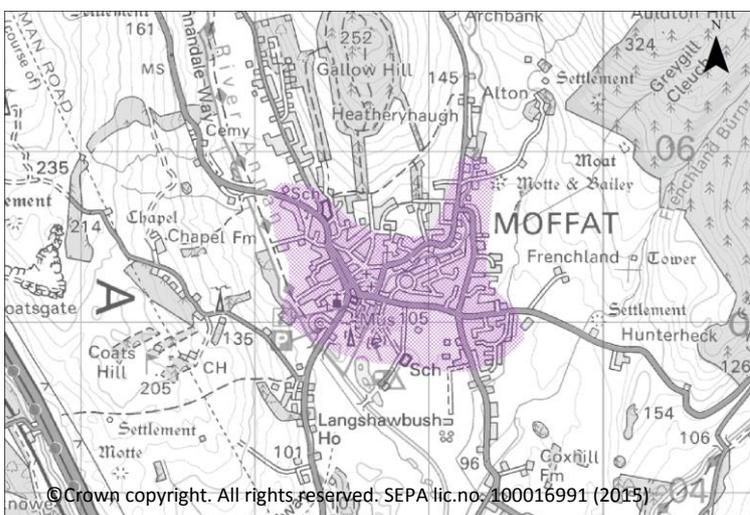
The earliest recorded flood in Moffat occurred in 1852. Since then, flooding from the River Annan and surface water flooding have been periodically reported.

River flooding was reported in August 1999, November 2003 and January 2009 and affected roads, including the A701, and public streets.

Drainage issues caused flooding in Moffat in 2003, 2006, 2008 and 2009, and impacted on the road network, including the A701, residential properties and garages. In December 2013, flooding affected a community sports facility as well as residential properties near the A701.

## Objectives to manage flooding in Potentially Vulnerable Area 14/02

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Moffat Potentially Vulnerable Area.

Reduce the risk of river flooding to properties in Moffat	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>310 residential properties</li> <li>30 non-residential properties</li> <li>£460,000 Annual Average Damages</li> </ul>	
Objective ID: 14002	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>370 residential properties</li> <li>£680,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>370 residential properties</li> <li>£680,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/02

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Moffat Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>post 2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding from the River Annan. Full scoping will be required before a flood warning service can be developed and implemented in this area and further assessment will help to determine appropriate timescales for delivery.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140020005)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Moffat (14002)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>25 of 168</b>	<b>2 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Moffat Flood Study which was completed in 2006, identified potential works within Moffat including improvements to culverts and construction of flood defences. Since this study further information has been gathered which has increased the confidence in the modelling. The new modelling should be used to identify potential actions to manage flooding in the area.		

	The study should also investigate the potential for natural flood management actions to reduce runoff locally and the wider Birnock Water catchment. Other actions may also be considered to select the most sustainable combination of actions.
Potential impacts	
<b>Economic:</b>	The flood protection study should consider how to reduce flood risk to 306 residential properties and 41 non-residential properties in this location, with potential damages avoided of up to £11 million.
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection study area. There may be changes in visual amenity and land use as a result of this action.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Moffat Hills Special Area of Conservation. There is likely to be a loss of natural and semi-natural habitat in the direct footprint and vicinity of the defences. Increasing conveyance in these watercourses may increase erosion downstream of the action. Modification of the existing culverts is unlikely to damage habitats and ecosystems in this generally urban environment. There are listed buildings on Well Road and a listed bridge (New Bridge) that have the potential to be negatively impacted by direct defences.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140020017)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Moffat (14002)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	A Flood Protection Scheme was constructed on Well Road, Moffat in 1989 which consisted of replacing an old mill piped scheme on the banks of the Birnock Water. The standard of protection is 5 years. The flood study should investigate the potential enhancement of these defences. Maintenance of this scheme should be continued.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (140020012)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Moffat (14002)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The local community set up the Moffat Flood Action group, to raise awareness of flood risk in the area. An informal flood warning scheme run by the group is currently in place.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p> <p>Scheduled works of clearance and repair are carried out on existing culverted watercourses and drains. Two hydro-logic water level gauges are in place on small culverted watercourses at key locations (eg screens). DGFirst, who are responsible for areas such as maintenance of roads, facilities management and community safety, receive an SMS warning when the water level reaches a certain height, indicating that screen clearance may be urgently required.</p>		

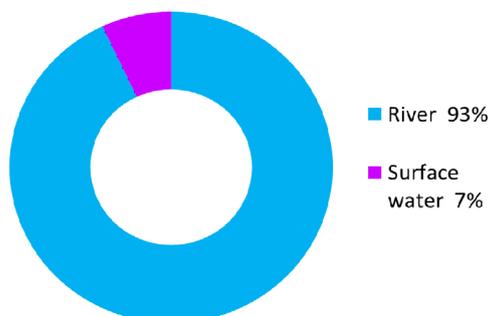
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Newcastleton (Potentially Vulnerable Area 14/03)

Local Plan District	Local authority	Main catchment
Solway	Scottish Borders Council	River Esk (Solway)

### Summary of flooding impacts



#### At risk of flooding

- 140 residential properties
- 10 non-residential properties
- £160,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<b>Maintain flood warning</b>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

Actions

## Newcastleton (Potentially Vulnerable Area 14/03)

Local Plan District	Local authority	Main catchment
Solway	Scottish Borders Council	River Esk (Solway)

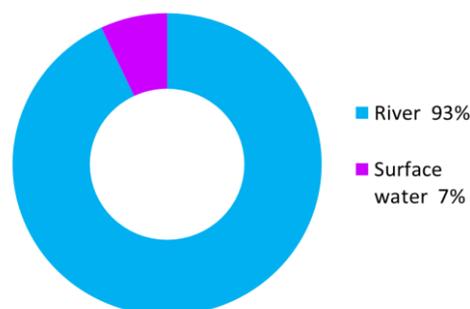
### Background

This Potentially Vulnerable Area is located in the east of the Solway Local Plan District. It is almost 10km<sup>2</sup> and incorporates the town of Newcastleton (shown below).



There are approximately 140 residential properties and 10 non-residential properties at risk of flooding.

The Annual Average Damages are £160,000 with the majority caused by river flooding.



**Figure 1:** Annual Average Damages by flood source

### Summary of flood impacts

River flooding within this Potentially Vulnerable Area is primarily caused by the Liddel Water with the main impacts in the centre of Newcastleton. At this location both residential and non-residential properties are at risk of flooding. River flooding to the north and south of the village could directly impact upon the B6357 and areas of agricultural land.

There are approximately 10 residential properties at risk of surface water flooding. However, previous flooding in the area has shown a greater flood risk because surface water and river flooding could combine. The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

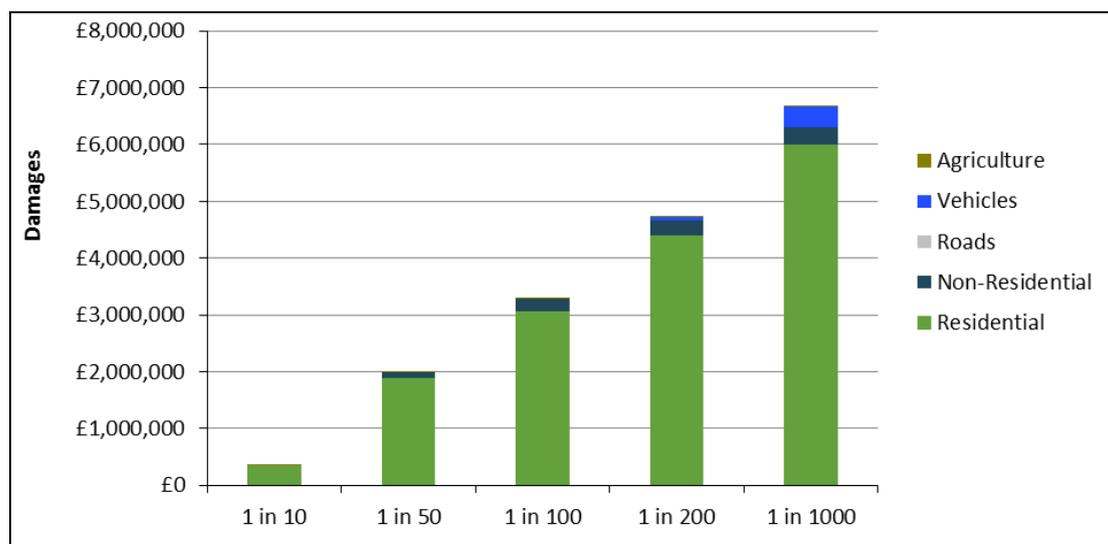
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding lie within Newcastleton and include people, non-residential properties and roads.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 140 to 370 and the number of non-residential properties from approximately 10 to 40.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties. The location of the impacts of flooding is shown in Figure 3.

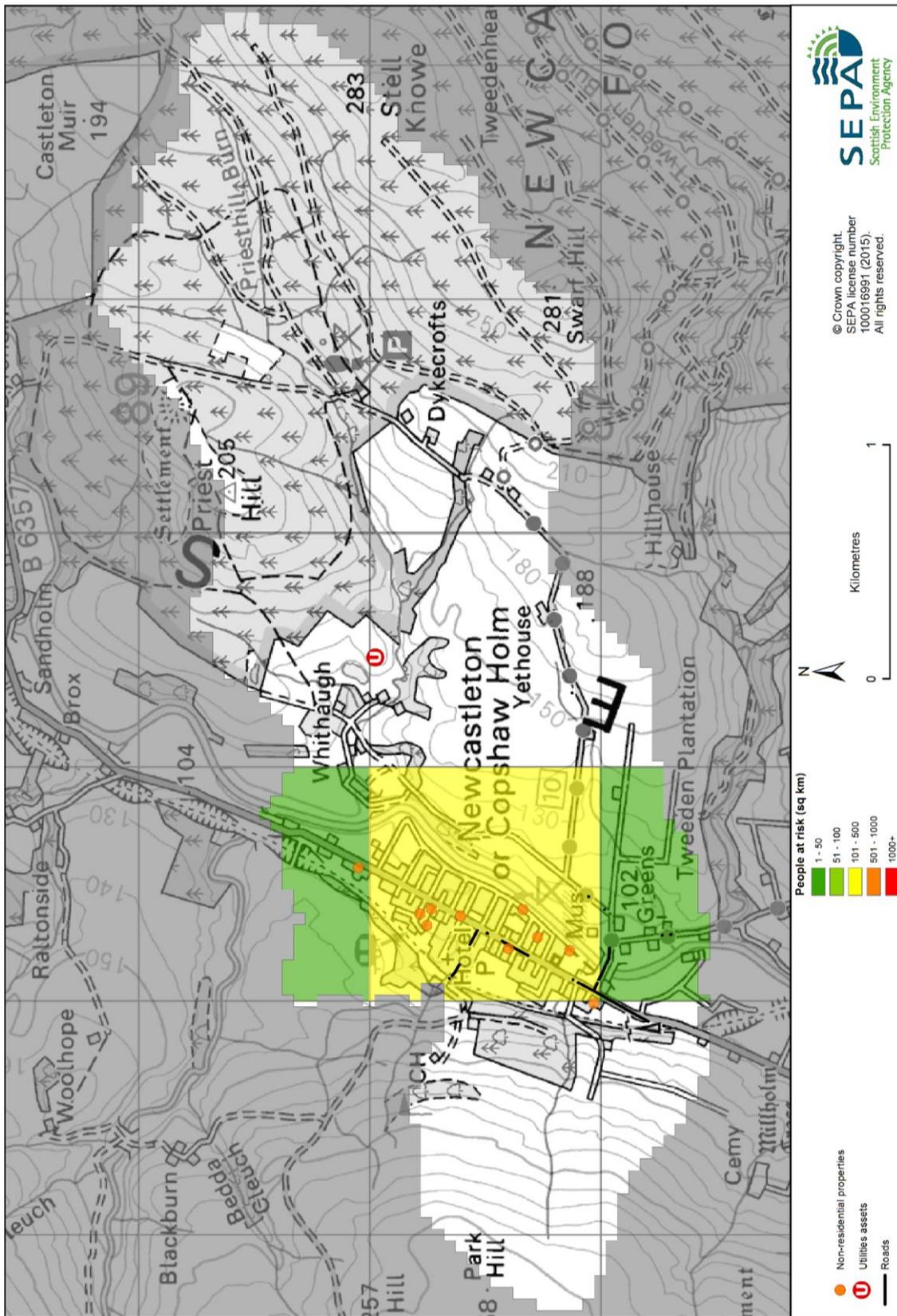
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 440)	20	140	260
Non-residential properties (total 40)	<10	10	20
People	40	300	560
Community facilities	0	0	0
Utilities assets	0	0	<10
Transport links – roads (km)	0.2	0.8	1.1
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	0.2	0.3	0.3

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

A record of flooding in Liddesdale dates from the mid-1800s. Scottish Borders Council has records of significant flooding of the Liddel Water in the Newcastleton area on 1 January 1991.

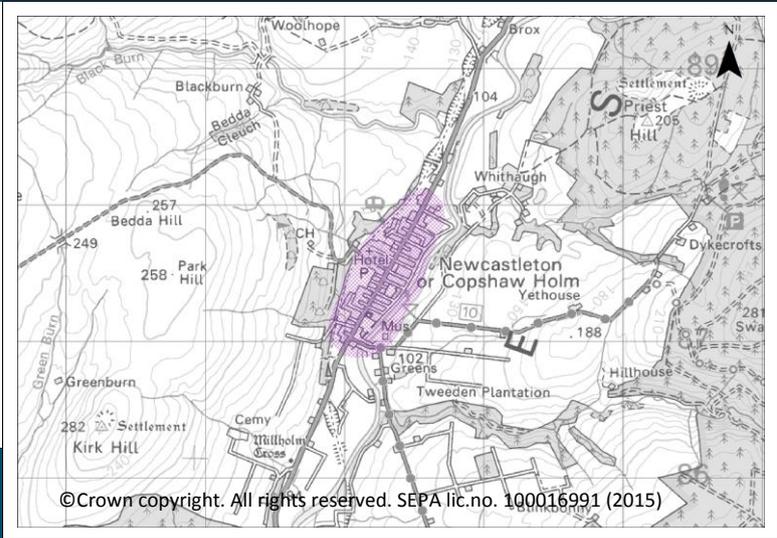
Newcastleton has suffered from three major floods in recent years, in February 1997, January 2001 and October 2005. The 2005 flood was reported by local residents as the worst in living memory and caused damage to 30 houses, equal to approximately 10% of residential properties.

**Objectives to manage flooding in Potentially Vulnerable Area 14/03**

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Newcastleton Potentially Vulnerable Area.

**Reduce risk to residential properties from river flooding within Newcastleton**  
Indicators: Target area:

- 130 residential properties
- <10 non-residential properties
- £150,000 Annual Average Damages



Objective ID: 14003

Target area	Objective	ID	Indicators within PVA
Newcastleton	Reduce the economic damages and risk to people from surface water flooding in Newcastleton	14037	* See note below
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 140 residential properties</li> <li>• £160,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 140 residential properties</li> <li>• £160,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 14/03 there are <10 residential properties at risk and Annual Average Damages of £12,000.

## Actions to manage flooding in Potentially Vulnerable Area 14/03

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Newcastleton Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140030005)</b>		
<b>Objective (ID):</b>	Reduce risk to residential properties from river flooding within Newcastleton (14003)		
<b>Delivery lead:</b>	Scottish Borders Council		
<b>Priority:</b>	National:		Within local authority:
	<b>98 of 168</b>		<b>5 of 6</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A study is recommended to develop upon previous studies, incorporating the most up to date information. The study will further investigate the feasibility of a flood protection scheme in Newcastleton, focusing on the benefit of direct flood defences on the Liddel Water and further property level protection scheme. This study should also consider natural flood management action to reduce runoff into the town. Other actions may also be considered to select the most sustainable combination of actions.		
<b>Potential impacts</b>			
<b>Economic:</b>	The flood protection study should consider how to reduce flood risk to 128 residential properties and 5 non-residential properties in this location, with potential damages avoided of up to £3.6 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be changes in visual amenity and land use as a result of this action.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. To be in accord with the flood risk management strategy, the responsible authority		

<b>Environmental:</b>	should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Langholm - Newcastleton Hills Special Protection Area. There is the potential for impacts on the Langholm - Newcastleton Hills Site of Special Scientific Interest. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences. There is the potential for the direct defences to have a negative impact on the settings of the Newcastleton Heritage Conservation Area and the few listed buildings in the area.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (140370018)</b>		
<b>Objective (ID):</b>	Reduce the economic damages and risk to people from surface water flooding in Newcastleton (14037)		
<b>Delivery lead:</b>	Scottish Borders Council		
<b>Status:</b>	<b>Not started</b>	<b>Indicative delivery:</b>	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	<b>Indicative delivery:</b>	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	<b>Indicative delivery:</b>	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Newcastleton Village flood warning area which is part of the Newcastleton river flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (140030012)</b>		
<b>Objective (ID):</b>	Reduce risk to residential properties from river flooding within Newcastleton (14003)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Borders Council is currently in discussion with Newcastleton and District Community Council with a view to forming a Resilient Communities Group which would take action in the event of a flood.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Scottish Borders Council currently operates a Flood Product Subsidy, it is recommended that this should be continued. Flood protection products are offered at discounted prices to Scottish Borders households and businesses whose property is at risk from flooding.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with communities through the Scottish Borders Council Resilient Communities initiative</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Borders Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

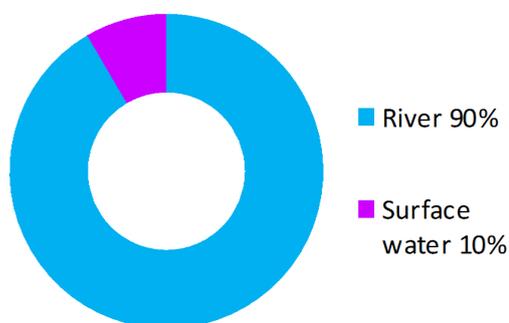
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Langholm (Potentially Vulnerable Area 14/04)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Esk (Solway)

### Summary of flooding impacts



#### At risk of flooding

- 180 residential properties
- 20 non-residential properties
- £300,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

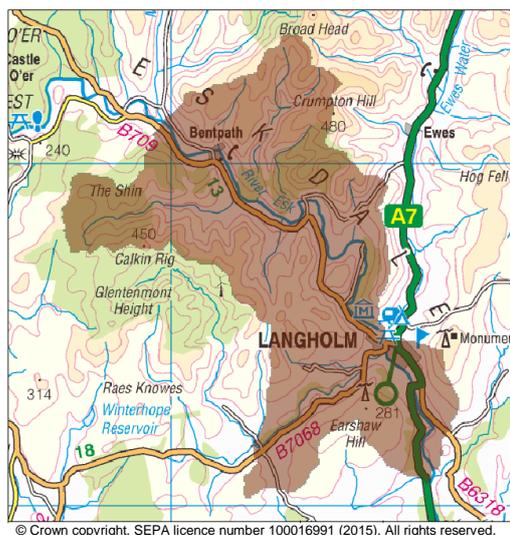
Actions

## Langholm (Potentially Vulnerable Area 14/04)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Esk (Solway)

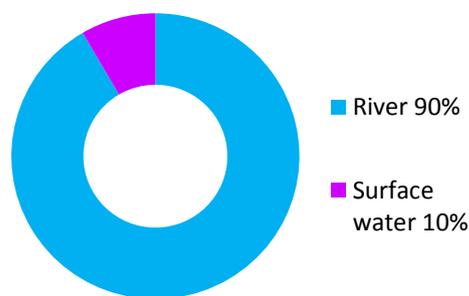
### Background

This Potentially Vulnerable Area is located in the east of the Solway Local Plan District. It has almost 70km<sup>2</sup> and incorporates the town of Langholm (shown below).



There are approximately 180 residential properties and 20 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £300,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The main catchment is the River Esk (Solway) which flows from the north west to the south east. The Ewes Water flows into Langholm from the north east and joins the Esk in the town centre. The Wauchope Water flows into Langholm from the south-west, joining the Esk downstream of the Ewes Water confluence.

River flooding is primarily from the River Esk and the Ewes Water which may impact residential and non-residential properties in several areas of Langholm. Small sections of the A7 road are also at risk from river and surface water flooding. Field runoff bypassing culvert entrances can contribute to flooding.

Surface water flooding is largely caused by runoff from the steep hillsides above Langholm. Studies indicate capacity issues in the culvert draining the hillside above Holmwood Drive. Flooding can be exacerbated by field runoff to gardens potentially causing internal property damage.

On the east side of the town, drainage from the golf course and fields flows to the River Esk via three culverts. These have become blocked in the past and caused flooding.

The risk of flooding to people and property, as well as to community facilities, utilities,

the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding are within Langholm.

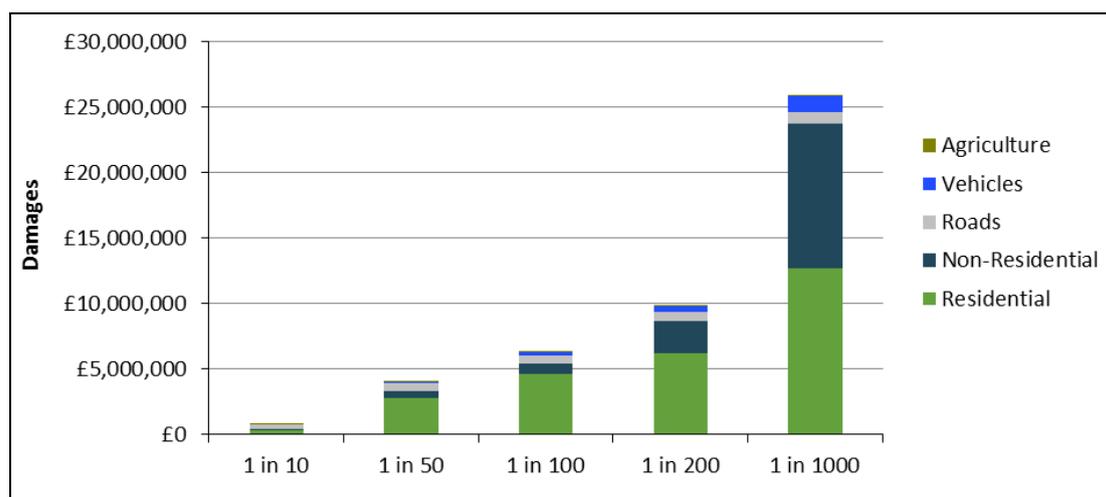
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 180 to 320 and the number of non-residential properties from approximately 20 to 30.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works, and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

The damages associated with floods of different likelihood are shown in Figure 2. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
<b>Residential properties (total 1,400)</b>	10	180	340
<b>Non-residential properties (total 130)</b>	<10	20	30
<b>People</b>	20	390	740
<b>Community facilities</b>	<10 Educational buildings	<10 Educational buildings	<10 Educational buildings
<b>Utilities assets</b>	0	<10	<10
<b>Transport links – roads (km)</b>	2.7 (of which <0.1 is A road)	4.2 (of which 0.1 is A road)	5.1 (of which 0.2 A road)
<b>Environmental designated areas (km<sup>2</sup>)</b>	0	0	0
<b>Designated cultural heritage sites</b>	8	9	9
<b>Agricultural land (km<sup>2</sup>)</b>	1.1	2.0	2.4

**Table 1:** Summary of flood impacts<sup>1</sup>



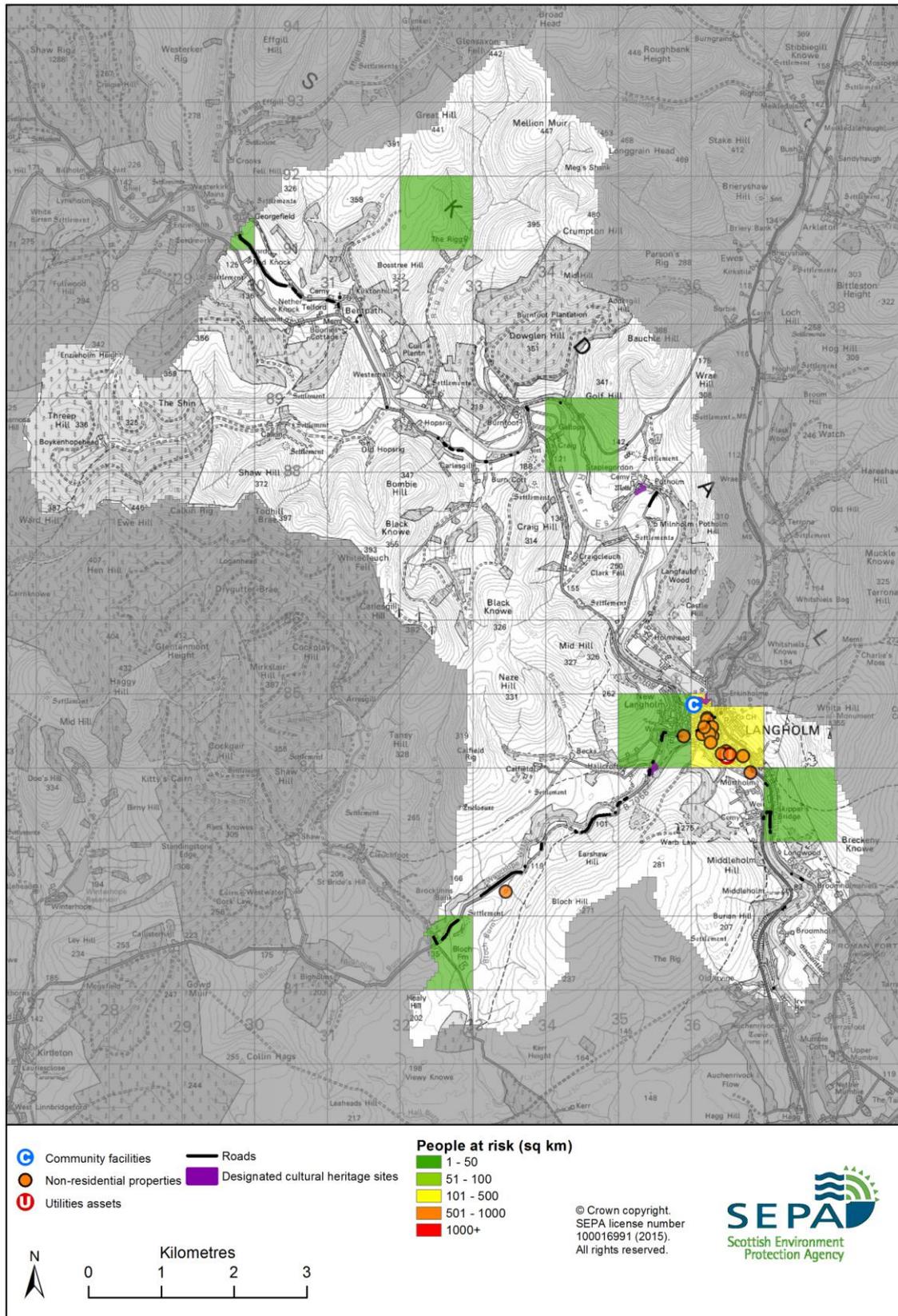
**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

## History of flooding

River flooding has been regularly reported since 24 January 1794. While the flooding has on occasion resulted in significant impacts to people, the vast majority of impacts have been to agricultural land and roads, especially along the A7. River flooding in 1906 and 1990 resulted in the A7 road, local businesses and properties being flooded.

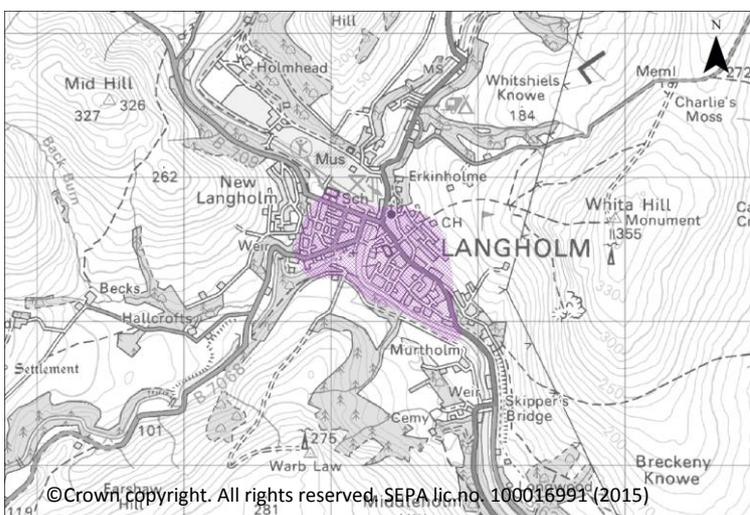
Surface water flooding has contributed to disruption along the A7 in Langholm in August 1994, with drainage issues affecting roads and properties in 2004, 2005, 2006 and 2007. A number of small culverted watercourses in Langholm flooded in 2012 affecting private properties and the A7 Trunk Road.



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/04

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Langholm Potentially Vulnerable Area.

Reduce the risk of river flooding to properties in Langholm	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>170 residential properties</li> <li>20 non-residential properties</li> <li>£240,000 Annual Average Damages</li> </ul>	 <p style="font-size: small; text-align: center;">© Crown copyright. All rights reserved. SEPA lic. no. 100016991 (2015)</p>
Objective ID: 14004	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>180 residential properties</li> <li>£300,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>180 residential properties</li> <li>£300,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/04

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Langholm Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (140040006)</b>				
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Langholm (14004)				
<b>Delivery lead:</b>	Dumfries and Galloway Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>24 of 42</b>		<b>3 of 4</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	<p>It is recommended that the council progress work on the proposed flood protection scheme in Langholm. The Langholm Flood Risk Assessment has been completed which identified potential works within Langholm, including construction of flood defences along the River Esk and Wauchope Water.</p> <p>Further work should be carried out to identify the most sustainable combination of actions and further investigation made into the impact of surface water runoff. Design options should take account of the new flood warning scheme and potential use of property level protection.</p>				
<b>Potential impacts</b>					
<b>Economic:</b>	The proposed scheme may benefit 38 residential properties and 29 non-residential properties at risk of flooding in this location, damages avoided are estimated to be £4.1 million. The flood protection scheme has an estimated benefit cost ratio of 2.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.				
<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. There are no international or national level				

<b>Environmental:</b>	environmental designations that are likely to be impacted by this action. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences. There is the potential for the works to have a negative impact on settings of the Langholm Heritage Conservation Area, Langholm Castle Scheduled Monument and the numerous listed buildings in the area.
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<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140040010)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Langholm (14004)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Continue with the development and implementation of flood warnings on the River Esk at Langholm.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with communities through the Scottish Borders Council Resilient Communities initiative</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

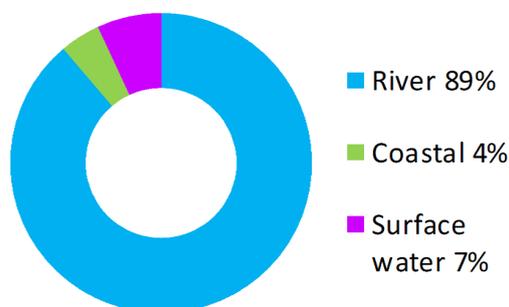
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Dumfries Nith (Potentially Vulnerable Area 14/05)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Dumfries Whitesands to Blackshaw coastal

### Summary of flooding impacts



### At risk of flooding

- 600 residential properties
- 240 non-residential properties
- £2.3 million Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

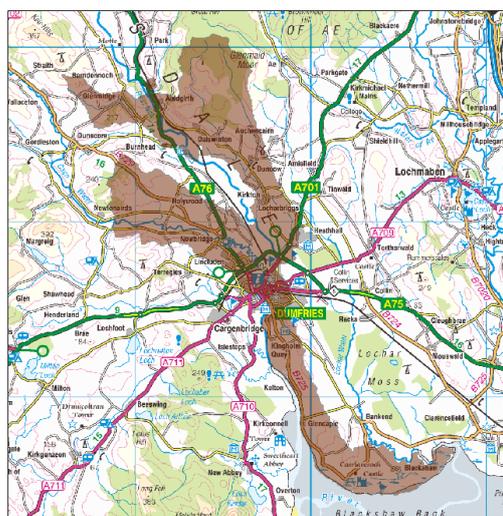
Actions

## Dumfries Nith (Potentially Vulnerable Area 14/05)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Dumfries Whitesands to Blackshaw coastal

### Background

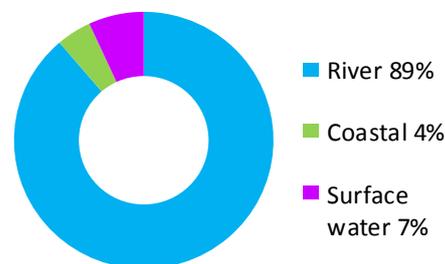
This Potentially Vulnerable Area is located towards the east of the Solway Local Plan District and extends to the north and south of Dumfries (shown below). It is almost 120km<sup>2</sup> and incorporates part of the town of Dumfries.



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There are approximately 600 residential properties and 240 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £2.3 million.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The primary sources of river flooding within the area are the Cluden water and the River Nith which flows in from the north and discharges into the Solway Firth. These two watercourses converge north of the centre of Dumfries, where residential and non-residential properties are predicted to flood. Downstream, the Whitesands area of town is another notable area of flood risk, and a number of residential properties are also affected by river flooding in Kirkton and Newbridge.

The south of this Potentially Vulnerable Area has a coastline with frontage onto the Solway Firth, where coastal flooding is predicted around Blackshaw. At Kingholm and Glencaple there is potential for coastal flooding to combine with river flooding, which was evident in January 2014.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. There are approximately 210 residential properties at risk of surface water flooding, as well as impacts to non-residential properties and roads, notably the A710, A75 and A76. There are 29 designated cultural heritage sites at risk, including several scheduled monuments and listed buildings. Small areas of designated environmental sites are shown to be at risk within this area.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 600 to 950 and the number of non-residential properties from approximately 240 to 340.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to non-residential properties (45%) followed by damages to residential properties (40%). The location of the impacts of flooding is shown in Figures 3.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works, and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

## **History of flooding**

There has been regular flooding in this area for a number of years. River flooding from the River Nith accounts for the majority of these records; the Nith can also be subject to tidal surge from the Solway. Nithsdale and Duncow have been particularly affected over the years with records dating back to 1795. River floods occurred in Dumfries on 2 December 1848 and 11 March 1881. More recently, on 31 October 1977, river flooding in Dumfries resulted in residents being rescued by boats from Brewery Street. The impacts included flooding of properties and considerable financial losses to the local business community. Flooding has been reported in the area at least once every year from 2003, with flooding of the A781, Whitesands Car Park and numerous properties.

Surface water flooding has been reported throughout the area. These events have impacted various locations including Auldirth in 2006; Nithsdale B729 road at Cluden Lodge; Duncow and Dumfries town centre and the B725 road in Glencaple December 2008.

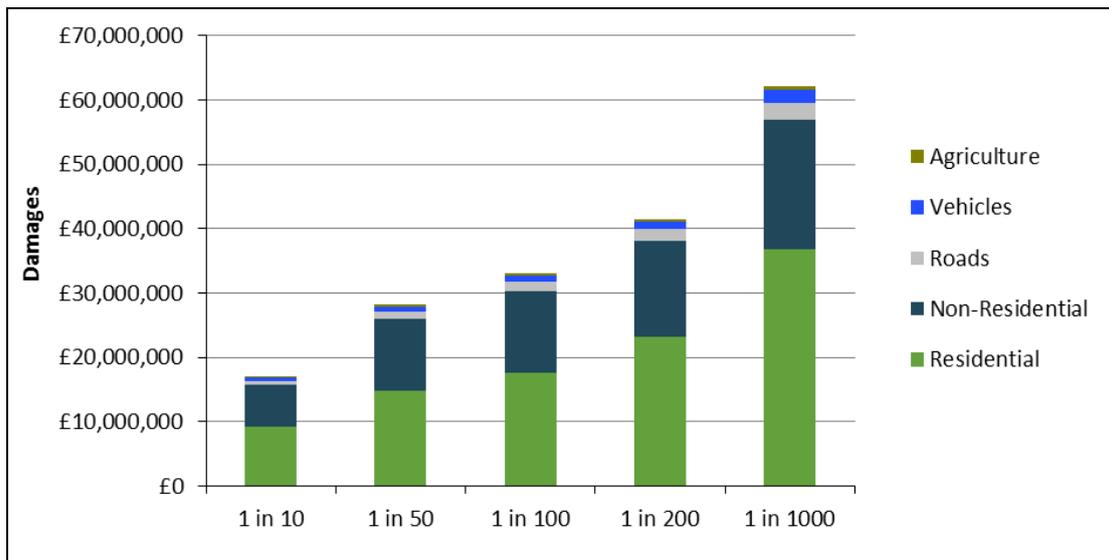
Coastal flooding has been recorded in the Nithside area and further south of the town centre at Kingholm Quay, Glencaple. This occurred most recently in 2014 when car parks, roads and properties were damaged.

Significant flooding occurred in the Nith catchment on November 2009 which resulted in flooding to properties in Dumfries and the surrounding areas.

On the 3 January 2014 coastal flooding occurred in Glencaple, Kelton and the road to the north, affecting approximately 10 properties.

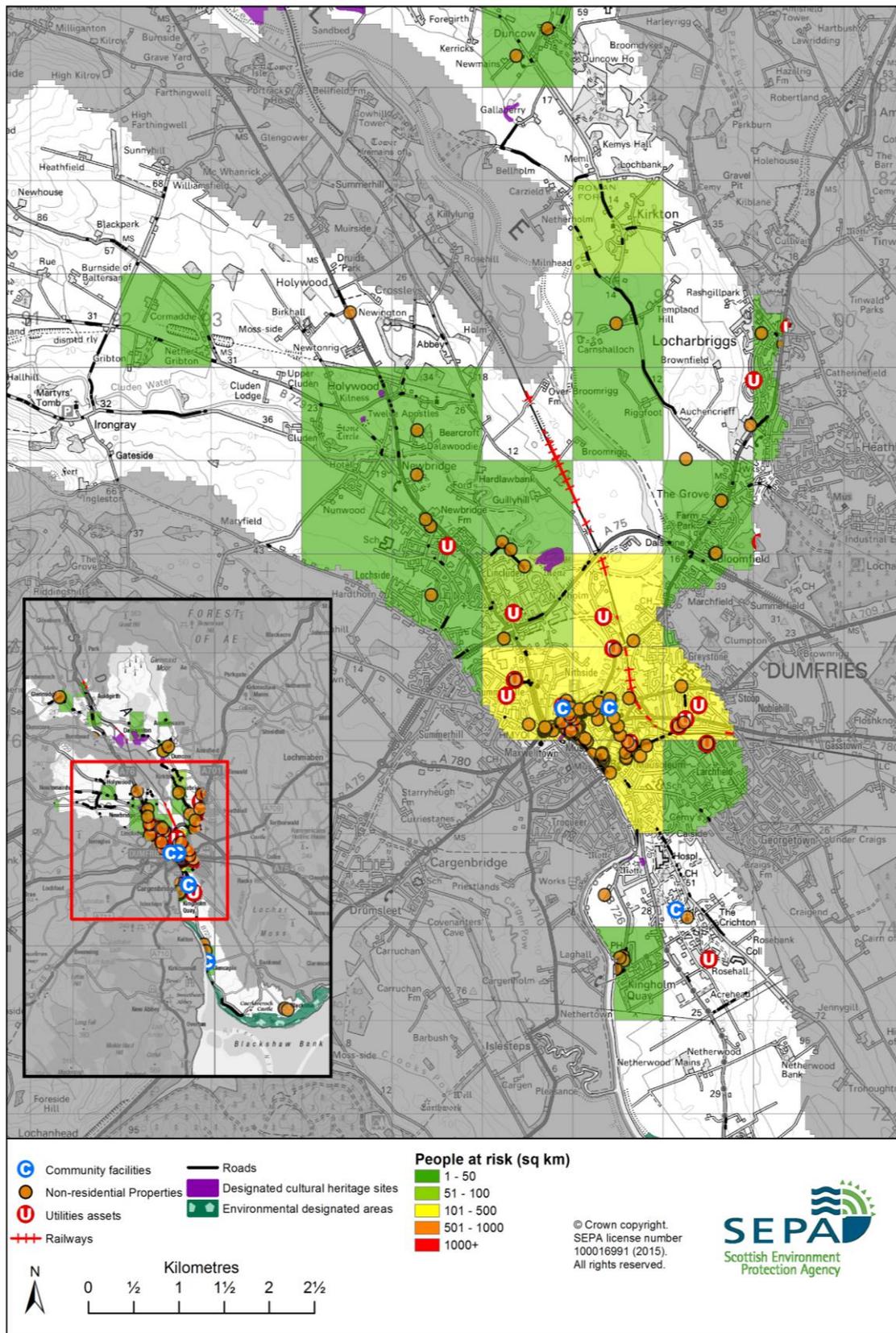
	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 12,500)	230	600	960
Non-residential properties (total 1,400)	90	240	370
People	500	1,300	2,100
Community facilities	<10 Includes: educational buildings and emergency services	<10 Includes: educational buildings, emergency services and healthcare facilities	<10 Includes: educational buildings, emergency services and healthcare facilities
Utilities assets	10	20	20
Transport links – roads (km)	3.2 (of which 0.2 is A road)	11.3 (of which 0.8 is A road)	19.9 (of which 1.9 is A road)
Transport links – rail (km)	0.9	2.4	4.9
Environmental designated areas (km <sup>2</sup> )	25.0	30.0	30.5
Designated cultural heritage sites	17	29	34
Agricultural land (km <sup>2</sup> )	12.7	15.7	16.1

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/05

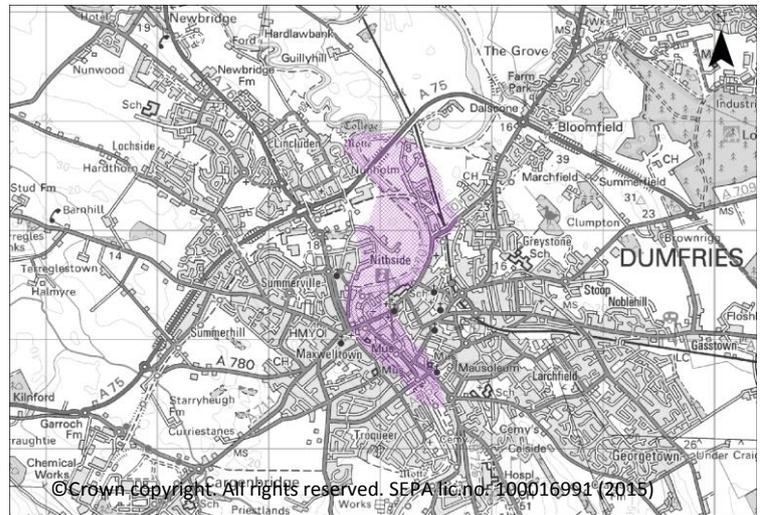
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Dumfries Nith Potentially Vulnerable Area.

### Reduce the risk of river flooding to properties in Dumfries

Indicators:

Target area:

- 310 residential properties
- 120 non-residential properties
- £1.6 million Annual Average Damages



Objective ID: 14006

Target area	Objective	ID	Indicators within PVA
Dumfries	Reduce the economic damages and risk to people from surface water flooding in Dumfries	14035	* See note below
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 600 residential properties</li> <li>• £2.3 million Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 600 residential properties</li> <li>• £2.3 million Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 14/05 there are 210 residential properties at risk and Annual Average Damages of £150,000.

## Actions to manage flooding in Potentially Vulnerable Area 14/05

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Dumfries Nith Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (140060006)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Dumfries (14006)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:		Within local authority:
	<b>18 of 42</b>		<b>1 of 4</b>
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	It is recommended that the council progress work on the proposed flood protection scheme in Whitesands, Dumfries. Over a number of years Dumfries and Galloway council have commissioned a number of studies to examine and understand the flooding issues along with potential mitigation options. The Whitesands Project (Flood Protection Scheme and Public Realm) identified potential works within Dumfries. Further work on the design of the scheme is still being carried out. The identified design should look to promote the most sustainable combination of actions, enhance the local amenity value of the river while taking account of the local concerns including construction of flood defences along the River Nith in Dumfries.		
<b>Potential impacts</b>			
<b>Economic:</b>	The proposed scheme may benefit 59 residential properties and 107 non-residential properties at risk of flooding in this location, damages avoided are estimated to be £79 million. The flood protection scheme has an estimated benefit cost ratio of 2.7.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		

<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. This flood protection scheme is proposed for part of the River Nith (water body IDs 10603 and 200316). The physical condition of this river and estuary is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river and estuary or degrade them. Opportunities to improve the condition of the river and estuary should be considered by coordinating with river basin management planning. There are no international or national level environmental designations that are likely to be impacted by this action. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences; however, this can be replanted and re-establish. There is the potential for the direct defences to have negative impacts on settings of the Dumfries Heritage Conservation Area, the Dumfries Old Bridge Scheduled Monument and the numerous listed buildings and structures in the area.
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<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding from the Upper River Nith (from Kirkconnel downstream). Forecasting capability is currently under development in this area.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (140350018)</b>		
<b>Objective (ID):</b>	Reduce the economic damages and risk to people from surface water flooding in Dumfries (14035)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>SEPA will seek to develop flood mapping in the Middle and Lower River Nith area to improve understanding of flood risk. SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.</p> <p>SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km<sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.</p>		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.</p>		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Continue to maintain the Whitesands flood warning area which is part of the Nith river flood warning scheme. Continue to maintain the Upper Solway Firth and Nith Tidal flood warning areas which are part of the Solway coastal flood warning scheme.</p>		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Upper Solway Firth and Nith Tidal coastal flood warning areas. This will be achieved through enhanced direct mailings for flood warning areas and education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

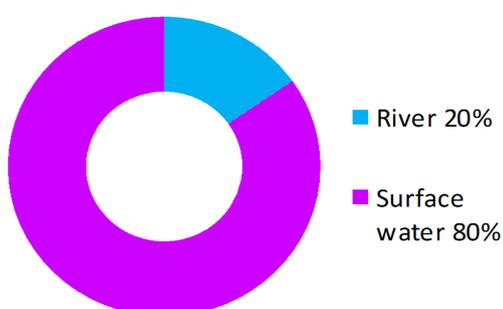
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Dumfries east (Potentially Vulnerable Area 14/06)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Lochar Water

### Summary of flooding impacts



#### At risk of flooding

- 110 residential properties
- <10 non-residential properties
- £240,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

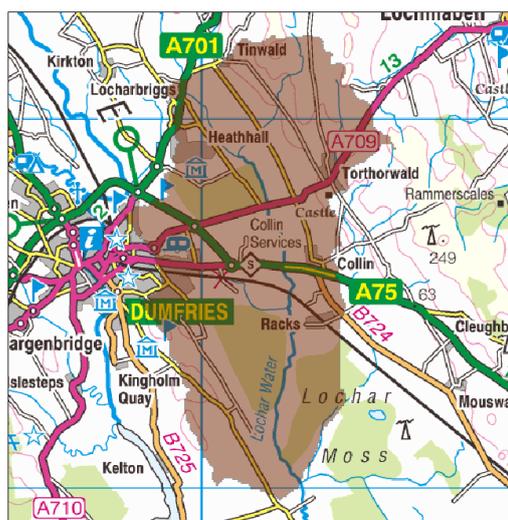
Actions

## Dumfries east (Potentially Vulnerable Area 14/06)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Lochar Water

### Background

This Potentially Vulnerable Area is located to the east of Dumfries, is over 50km<sup>2</sup> and incorporates part of the town of Dumfries (shown below).



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There are approximately 110 residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £240,000.

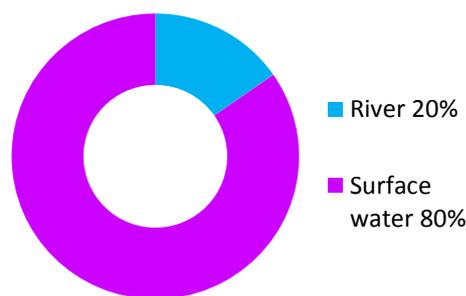


Figure 1: Annual Average Damages by flood source

### Summary of flood impacts

Surface water is shown to have the greatest impact in the area with approximately 100 residential properties at risk. Surface water flooding is predominately located along minor watercourses and may result from the interaction of surface water and river flooding. River flooding in the area is primarily attributed to the Lochar Water, which flows from north to south through the area.

The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

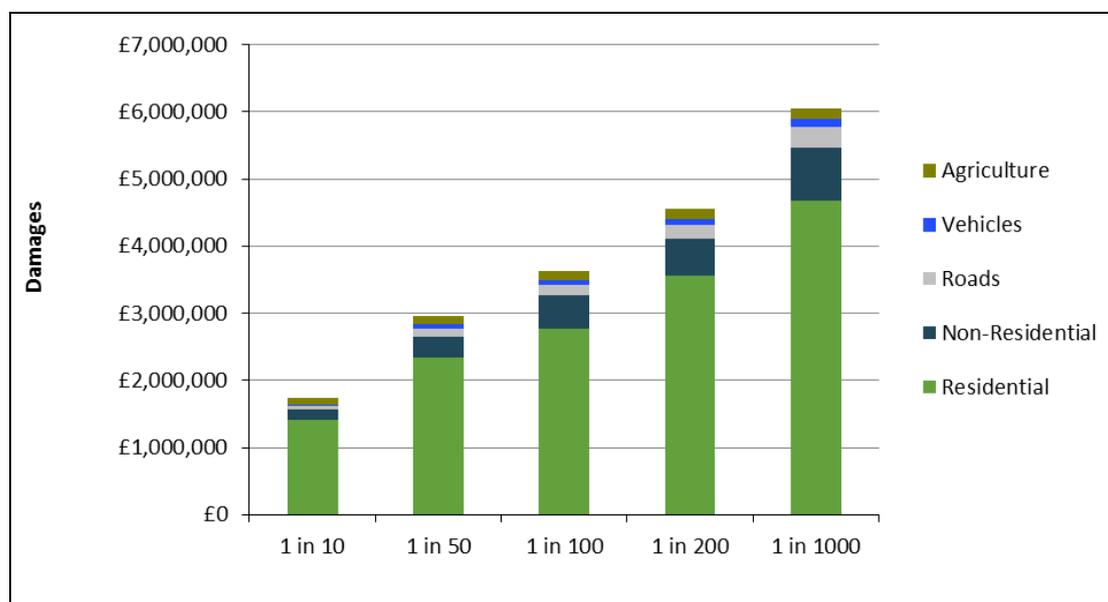
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. There is a risk of river flooding to residential and non-residential properties in the Heathhall area of Dumfries and Torthorwald. Land adjacent to the Lochar Water and the Dow Lochar (Lochar Water tributary) and small sections of the A709 and A75 are also at risk of flooding. One designated cultural heritage site is also at risk of flooding.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 110 to 130.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by surface water flooding experience the highest economic impact at approximately 70% of the damages. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 4,400)	40	110	130
Non-residential properties (total 170)	<10	<10	10
People	90	230	290
Community facilities	<10 Educational buildings	<10 Educational buildings	<10 Educational buildings
Utilities assets	<10	<10	10
Transport links - roads (km)	0.7 (of which <0.1 is A road)	2.2 (of which 0.1 is A road)	2.8 (of which 0.2 is A road)
Transport links - rail (km)	0.5	1.3	1.4
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	1	1
Agricultural land (km <sup>2</sup> )	3.9	5.2	5.8

**Table 1:** Summary of flood impacts<sup>1</sup>

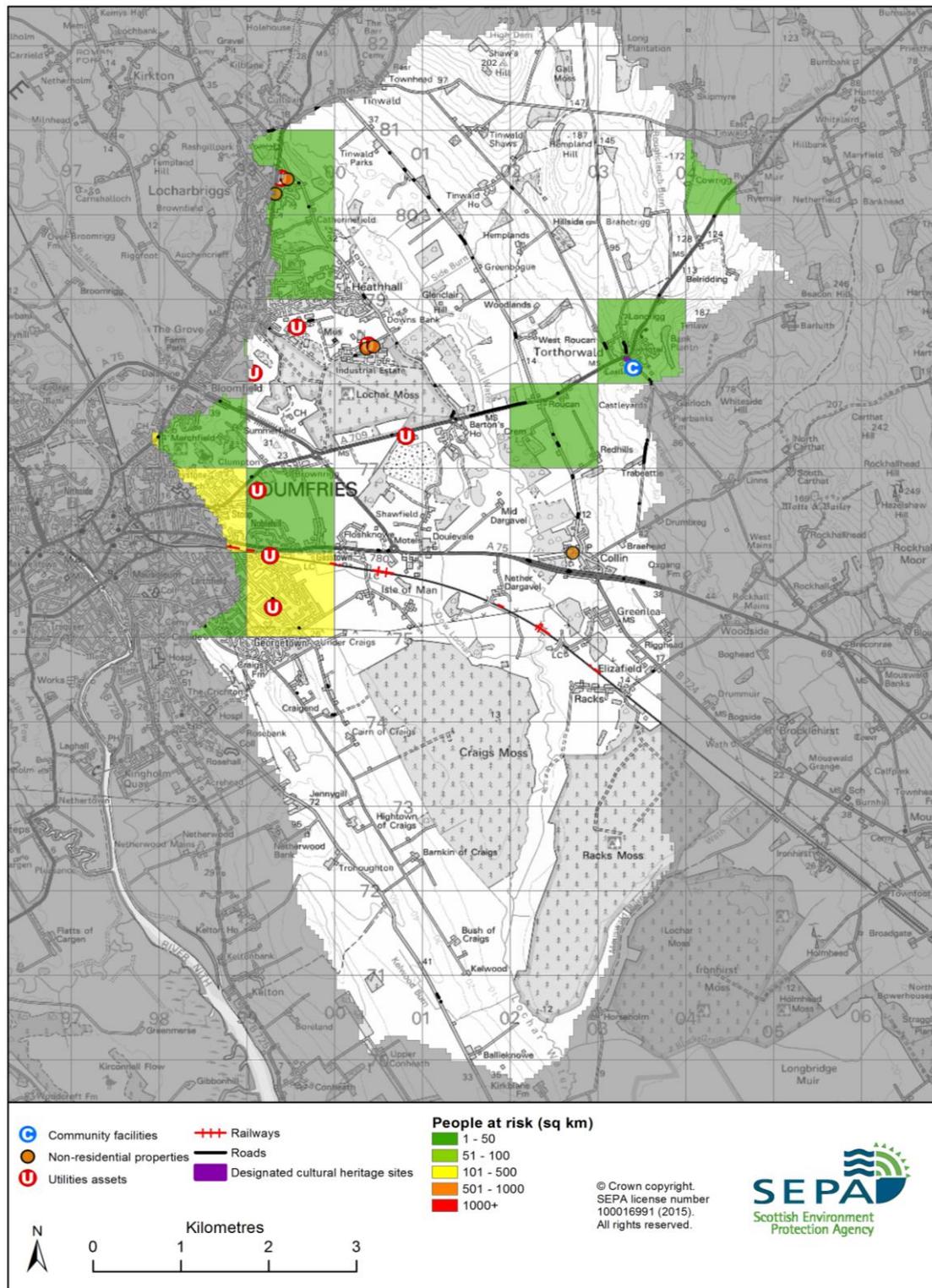


**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

## History of flooding

Records of flooding within the area confirm that the main risk is the potential for combined minor watercourse and surface water flooding. Records between 2004 and 2007 show the areas affected are Georgetown, Noblehill, Heathhall and Collin. Local roads and residential properties are affected.



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/06

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Dumfries east Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Dumfries	Reduce the economic damages and risk to people from surface water flooding in Dumfries	14035	* See note below
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 110 residential properties</li> <li>• £240,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 110 residential properties</li> <li>• £240,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 14/06 there are 100 residential properties at risk and Annual Average Damages of £200,000.

## Actions to manage flooding in Potentially Vulnerable Area 14/06

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Dumfries east Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (140351018)</b>		
<b>Objective (ID):</b>	Reduce the economic damages and risk to people from surface water flooding in Dumfries (14035)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline. This will be achieved through SEPA-led education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p> <p>The Lochar Water is heavily modified, and it is reported that the Lochar Water Improvement Committee remove vegetation and improve flows.</p>		

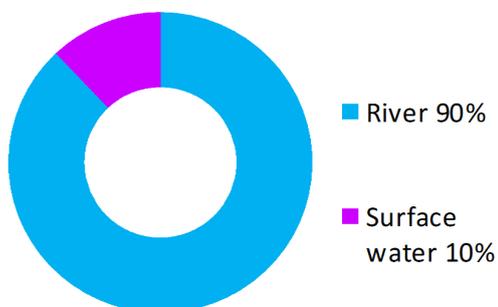
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Lochmaben - Lockerbie (Potentially Vulnerable Area 14/07)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

### Summary of flooding impacts



#### At risk of flooding

- 50 residential properties
- 20 non-residential properties
- £300,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

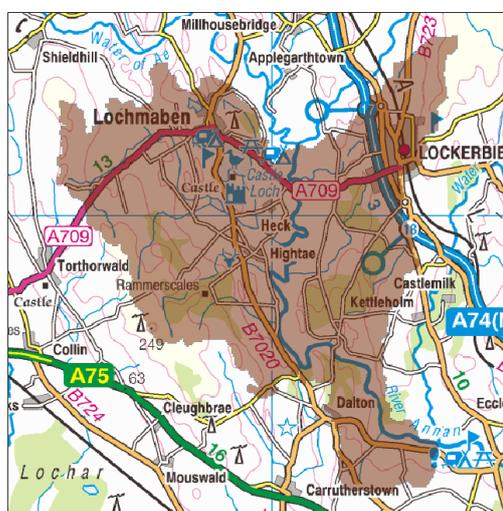
Actions

## Lochmaben - Lockerbie (Potentially Vulnerable Area 14/07)

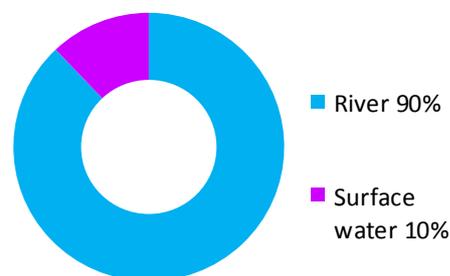
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

### Background

This Potentially Vulnerable Area is located to the east of Dumfries, is almost 80km<sup>2</sup> and incorporates the towns of Lockerbie and Lochmaben (shown below).



There are approximately 50 residential properties and 20 non-residential properties at risk of flooding. The Annual Average Damages are approximately £300,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The Kinnel Water converges with the River Annan to the north of this Potentially Vulnerable Area; it then flows from north to south east. The Dryfe Water flows from north east, passing under the A74, and joins the Annan to the east of Lochmaben.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. There are approximately 10 residential properties and small sections of the road and rail network at risk of surface water flooding. Within Lockerbie, residential and non-residential properties, and sections of road, notably the A74, are predicted to be at risk of river flooding. Flooding is also expected to affect areas of agricultural land east of Lockerbie. Residential properties to the south east of Lochmaben, Dalton and the villages of Heck and Hightae are also at risk.

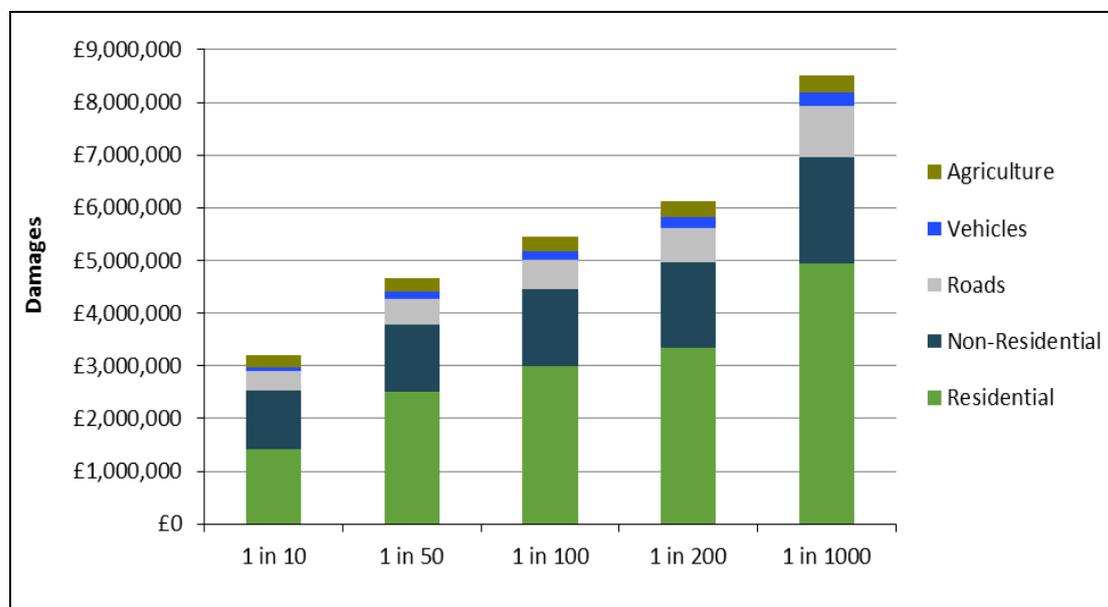
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 50 to 80.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties experience the highest economic impact at approximately 45% of the damages followed by non-residential properties at around 30%.

The location of the impacts of flooding is shown in Figure 3.

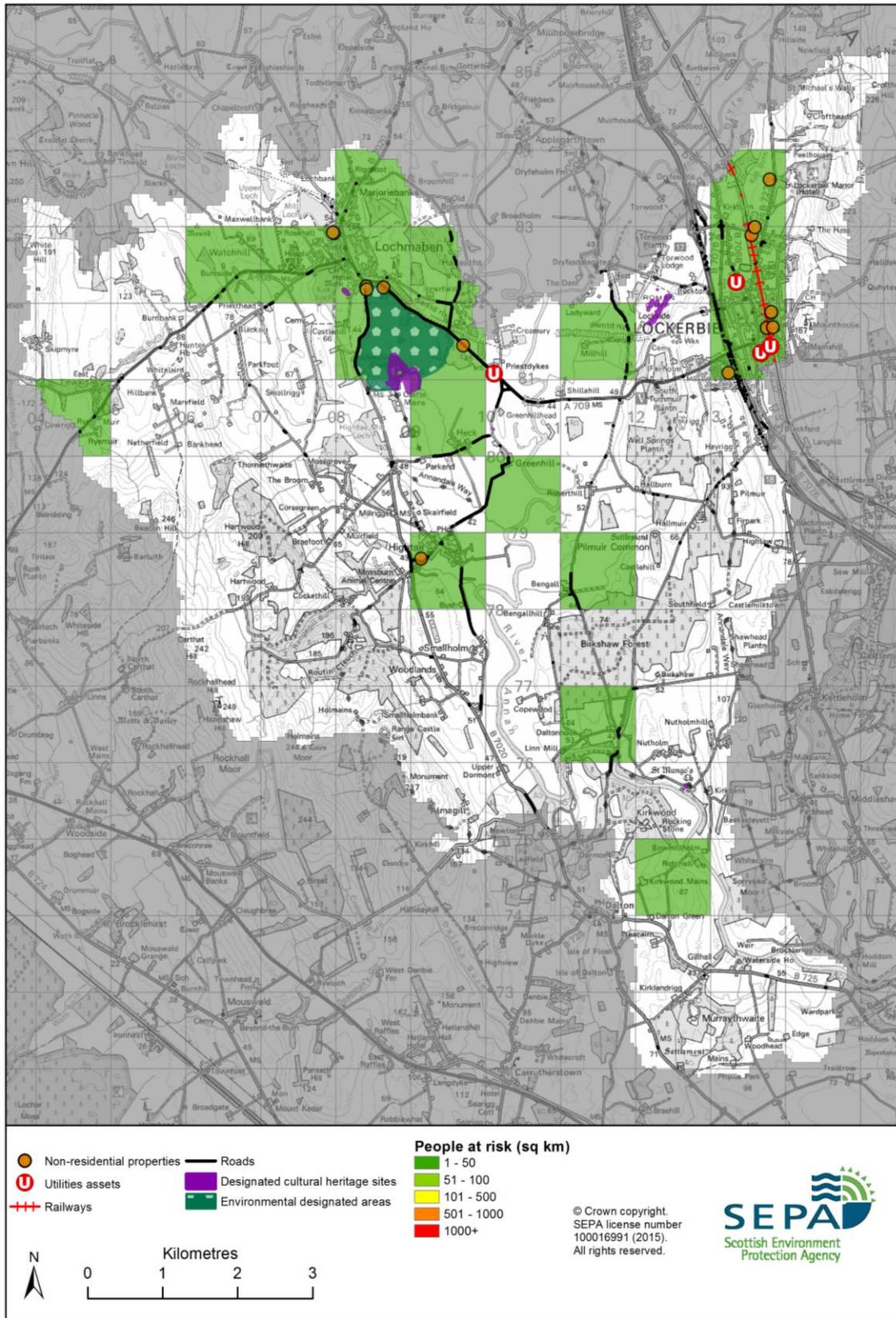
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,400)	30	50	80
Non-residential properties (total 330)	<10	20	20
People	60	120	180
Community facilities	0	0	0
Utilities assets	0	<10	<10
Transport links – roads (km)	7.7 (of which 0.2 is motorway)	13.3 (of which 0.5 is motorway)	15.9 (of which 0.7 is motorway)
Transport links – rail (km)	1.4	1.8	1.9
Environmental designated areas (km <sup>2</sup> )	2.1	2.1	2.1
Designated cultural heritage sites	8	10	10
Agricultural land (km <sup>2</sup> )	8.7	9.9	10.6

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

The River Annan in the west of Lockerbie has flooded many times with records dating back to 1767 and most recently in December 2013. River flooding has been reported numerous times since 2002. In 2009 many properties in Heck, Hightae and Greenhills were cut off by flooding from the river Annan. In March 1950, hundreds of acres of agricultural land were submerged by flood water. The highest damages caused by river flooding to properties were in Lochmaben in February 1767 and September 1830.

Surface water flooding has also affected the area of Lockerbie in 2002 and 2005, flooding roads and properties.

## Objectives to manage flooding in Potentially Vulnerable Area 14/07

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Lochmaben - Lockerbie Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 50 residential properties</li> <li>• £300,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 50 residential properties</li> <li>• £300,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/07

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Lochmaben - Lockerbie Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>post 2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding from the River Annan. Full scoping will be required before a flood warning service can be developed and implemented in this area and further assessment will help to determine appropriate timescales for delivery.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

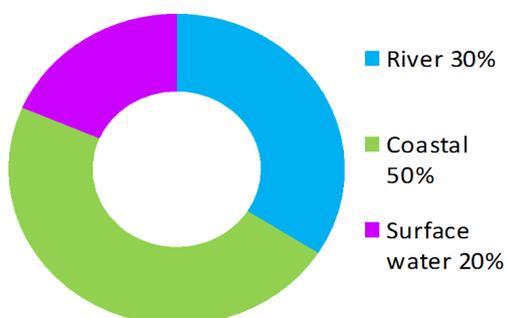
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Ecclefechan - Annan (Potentially Vulnerable Area 14/08)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

### Summary of flooding impacts



### At risk of flooding

- 240 residential properties
- 70 non-residential properties
- £590,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<b>Natural flood management study</b>	<b>Maintain flood warning</b>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

Actions

## Ecclefechan - Annan (Potentially Vulnerable Area 14/08)

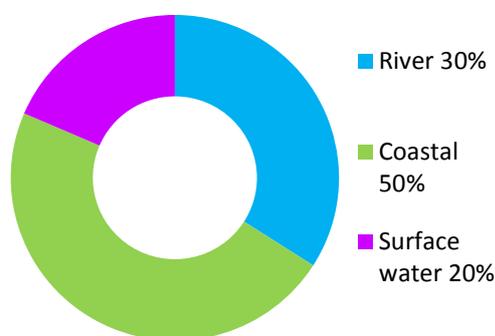
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Annan

### Background

This Potentially Vulnerable Area is located in the east of the Solway Local Plan District, on the south coast of Dumfries and Galloway (shown below). It over 90km<sup>2</sup> and incorporates Annan in the south and Grange Fell in the north.



There are approximately 240 residential properties and 70 non-residential properties at risk of flooding. The Annual Average Damages are approximately £590,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

River flooding is mainly associated with the River Annan and its tributaries, and affects the towns of Ecclefechan, Brydekirk and Annan. In Ecclefechan, the Mein Water, a tributary of the Annan, and the Ecclefechan Burn provide the main flood risk. In Brydekirk, river flooding from the River Annan may affect a number of residential properties. Flooding has also previously occurred from the Jennymill Burn in the southern part of the village.

There is a risk of coastal flooding to the south of Annan. Within Annan town centre, problems of overflowing storm drains and culverts have been recorded. There is also a combined river and tidal risk in the lower reaches of the River Annan, which contributes to flood risk. Therefore, the combination of river, surface water and coastal flooding within this Potentially Vulnerable Area is a key issue.

There are no existing formal flood defence schemes within this area. However, there are a number of privately owned coastal defences at Battlehill and Newbie, including concrete seawalls, sleeper walls, rock armour and a dumped clay embankment. Dumfries and Galloway Council also maintain coastal erosion defences to the west of Barnkirk Point. This is by means of an old concrete wall that is fronted by a revetment of heavy rock armour. This heavyweight rock armour continues

westwards, protecting the eastern part of the Newbie. The western end of Newbie is then protected by a mixture of rock armour stone, concrete and sheet steel.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. In Ecclefechan, a number of residential properties, short sections of railway line and the B7075 and A74 roads and agricultural land is at risk. To the south of Annan, residential and non-residential properties are at risk of flooding. There are also areas of agricultural land, sections of road near Newbie and designated environmental areas at risk from elevated tidal levels in the Solway estuary.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by coastal flooding experience the highest economic impact at approximately 30% of the damages. Non-residential properties also provide a notable contribution at approximately 12% of the damages.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 240 to 350 and the number of non-residential properties from approximately 70 to 100.

The location of the impacts of flooding is shown in Figure 3. Most of the receptors at risk of flooding lie within Annan and include people, non-residential properties, utilities, roads and railways.

## History of flooding

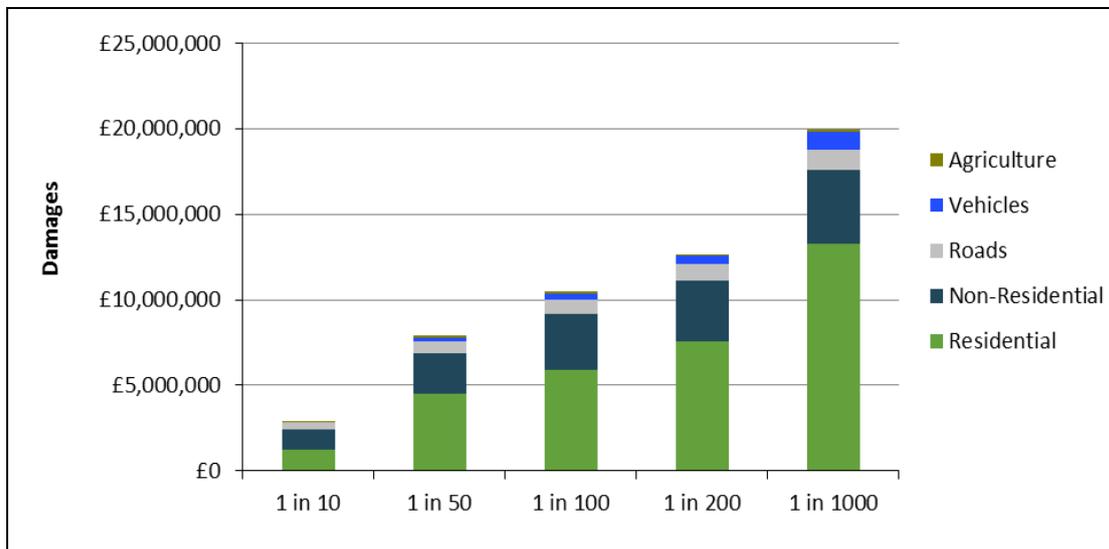
Records show that the towns of Annan and Brydekirk have been mainly affected by river flooding. The most recent river flood took place in October 2005 and resulted in flooding to properties, gardens and roads. The most damaging river flood to properties and people in the area was recorded in October 1896, in the Lower Annandale area of Annan.

Surface water floods have been recorded in Annan and Dunbeck in 2006. Recent surface water floods have also been reported in Annan during the summer of 2013 at Standalane and Newington Park, where water flowed out of a drain and into gardens at Newington Park. The flooding was followed by mitigation works after joint investigations between Scottish Water and Dumfries and Galloway Council.

Coastal flooding has also affected the town of Annan. The coastal floods with the highest damages caused to properties and people occurred in 1896 and 1902. Less damaging coastal floods have also been recorded in 1930, 1942, 1947, 1996 and 2002. The 2002 event had high flows in the River Annan and caused joint river and coastal impacts. The most recent coastal flood event occurred on the 3 January 2014 and impacted roads, properties and agricultural land.

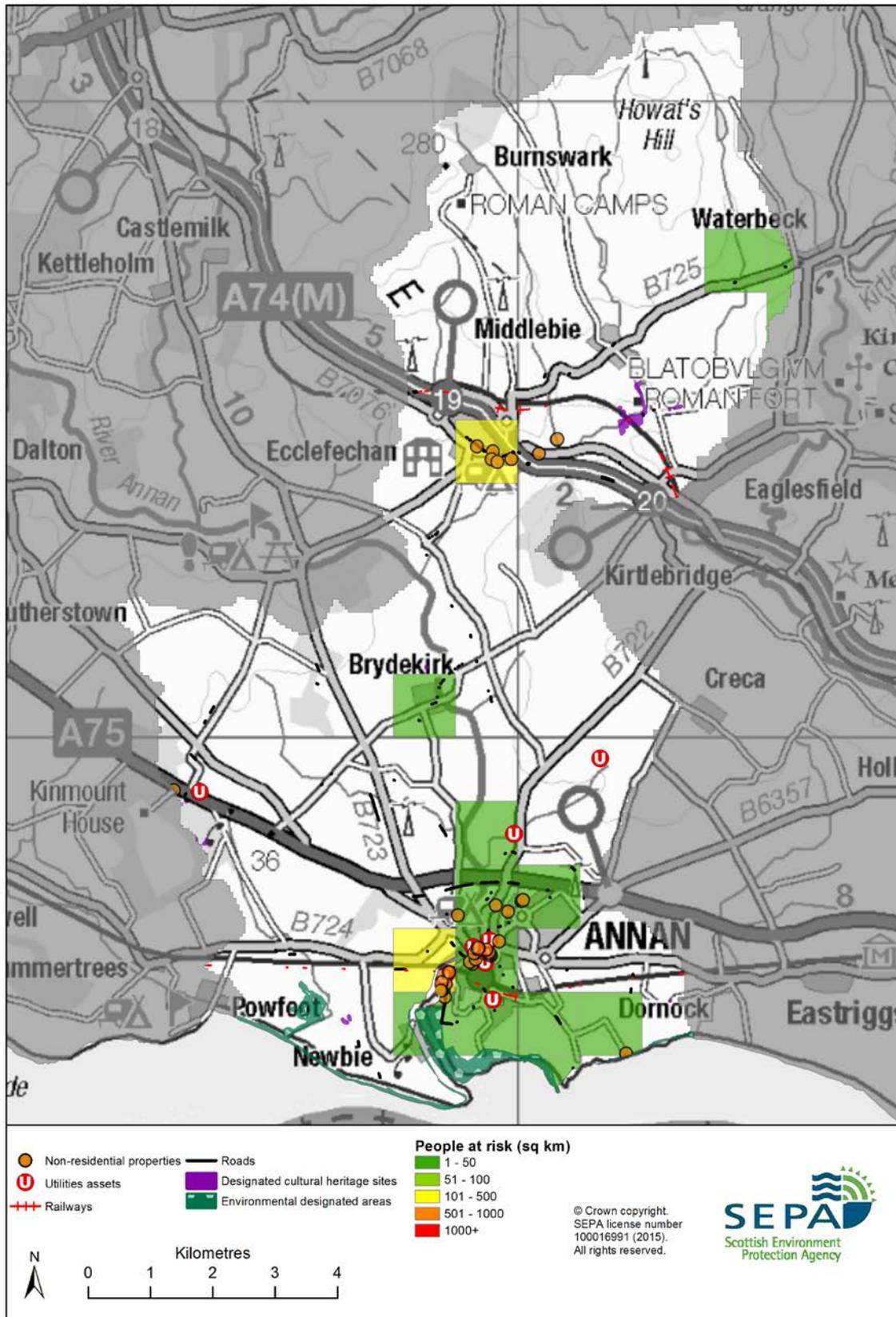
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 5,300)	40	240	410
Non-residential properties (total 470)	30	70	100
People	90	520	900
Community facilities	0	0	0
Utilities assets	<10	10	10
Transport links – roads (km)	1.7 (of which 0.4 is motorway and 0.1 is A road)	4.1 (of which 0.5 is motorway and 0.7 is A road)	5.7 (of which 0.5 is motorway and 2.5 is A road)
Transport links – rail (km)	1.5	1.8	2.1
Environmental designated areas (km <sup>2</sup> )	2.8	3.0	3.1
Designated cultural heritage sites	11	13	16
Agricultural land (km <sup>2</sup> )	2.5	4.1	5.3

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/08

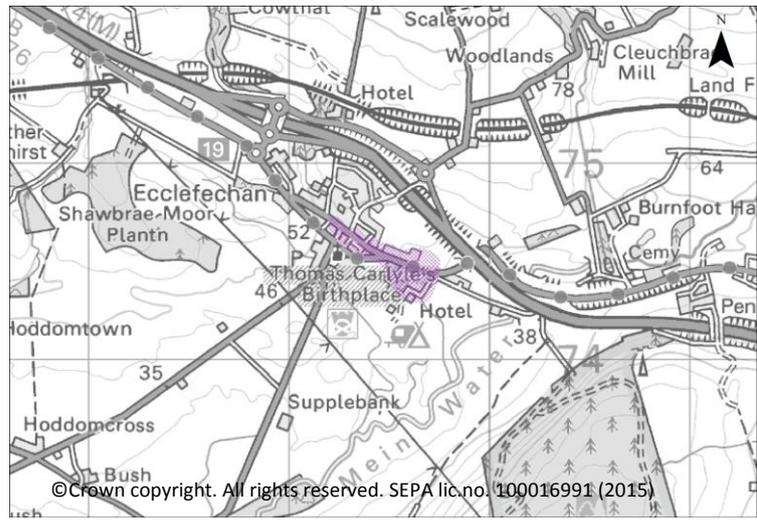
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Ecclefechan - Annan Potentially Vulnerable Area.

### Reduce the risk of river flooding to residential and non-residential properties in Ecclefechan

Indicators:

- 50 residential properties
- <10 non-residential properties
- £74,000 Annual Average Damages

Target area:



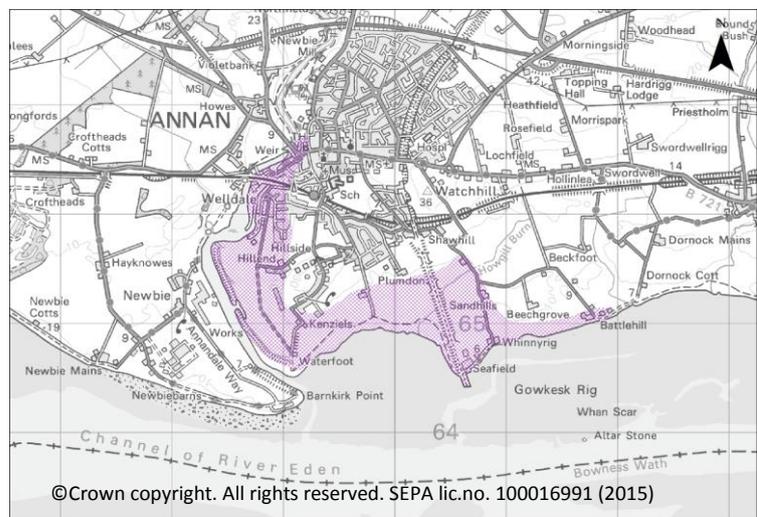
Objective ID: 14009

### Reduce the risk of coastal flooding to residential and non residential properties in Annan

Indicators:

- 110 residential properties
- 30 non-residential properties
- £270,000 Annual Average Damages

Target area:



Objective ID: 14011

Target area	Objective	ID	Indicators within PVA
Annan	Reduce the economic damages and risk to people from surface water flooding in Annan	14034	* See note below
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 240 residential properties</li> <li>• £590,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 240 residential properties</li> <li>• £590,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 14/08 there are 30 residential properties at risk and Annual Average Damages of £85,000.

## Actions to manage flooding in Potentially Vulnerable Area 14/08

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Ecclefechan - Annan Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>post 2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding from the River Annan. Full scoping will be required before a flood warning service can be developed and implemented in this area and further assessment will help to determine appropriate timescales for delivery.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential and non residential properties in Annan (14011)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>1 of 168</b>	<b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to		

	<p>other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>
Potential impacts	
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140110005)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential and non residential properties in Annan (14011)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>61 of 168</b>	<b>5 of 10</b>	
<b>Status:</b>		Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	A flood protection study should be carried out to investigate further the construction of direct flood defences along the River Annan in Annan. This study may also consider property level protection actions and other complementary actions. The Solway coastal study (ID 141220020) will help to identify the requirements of this work. Therefore this study is not planned until the second cycle.		
Potential impacts			
<b>Economic:</b>	There are 96 residential properties and 25 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.1 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection study area. In addition there are two utilities which have been identified as potentially benefitting from this action.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

<b>Environmental:</b>	environment. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Solway Firth Special Area of Conservation, and Upper Solway Flats and Marshes Special Protection Area. Construction of direct defences on the River Annan has the potential for downstream impacts on the Upper Solway Flats and Marshes Site of Special Scientific Interest and Ramsar site. There is likely to be a loss of natural and semi-natural habitat in the footprint and vicinity of the defences. There is the potential for the direct defences to have negative impacts on the setting of several listed buildings on Port Street in Annan.
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<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (140090003)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to residential and non-residential properties in Ecclefechan (14009)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	A natural flood management study is recommended to further assess the potential to reduce runoff to Ecclefechan.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impacts have not been defined at this stage.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. There are no international or national level environmental designations that are likely to be impacted by this action. There is the potential for the existing ecosystems in the area to be impacted through a change of land use if woodland planting is undertaken; however, this would improve biodiversity as the existing land is arable and grazing. There are likely to be improvements in water quality through reduced agricultural chemical and sediment runoff, which will have positive impacts on the terrestrial and freshwater habitats and species in the area. Implementation of this action would benefit listed buildings off Hall Road and High Street during high frequency flood floods.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (140340018)</b>		
<b>Objective (ID):</b>	Reduce the economic damages and risk to people from surface water flooding in Annan (14034)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		

<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed. SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Upper Solway Firth flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Upper Solway Firth coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

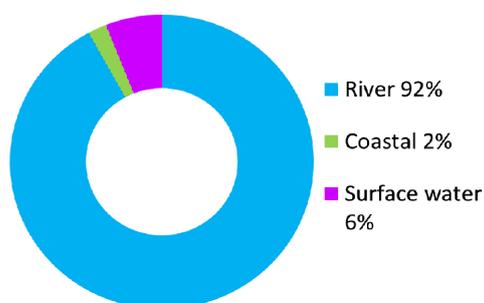
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Kirtle Water catchment (Potentially Vulnerable Area 14/09)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirtle Water

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- <10 non-residential properties
- £140,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

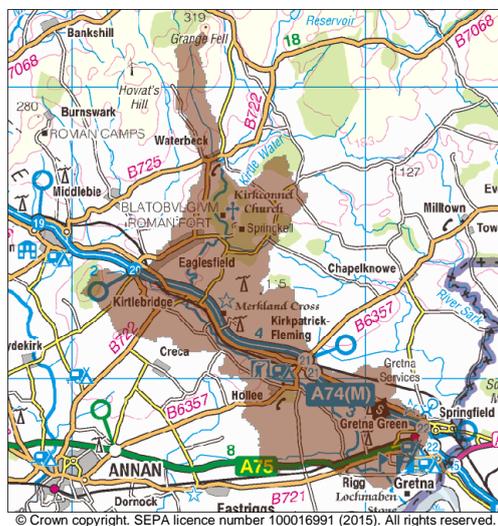
Actions

# Kirtle Water catchment (Potentially Vulnerable Area 14/09)

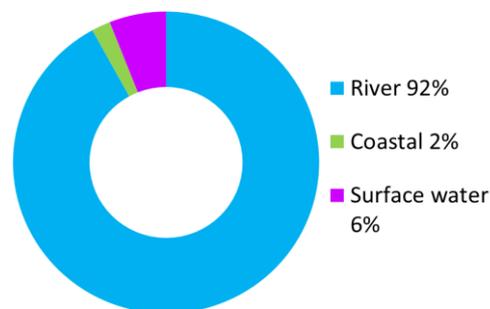
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirtle Water

## Background

This Potentially Vulnerable Area is located in the south east of the Solway Local Plan District (shown below). It incorporates the area to the north west of Gretna including the village of Kirtlebridge and is almost 60km<sup>2</sup>.



There are approximately 20 residential properties and fewer than 10 non-residential properties at risk of flooding. The total Annual Average Damages are approximately £140,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

River flooding in the area is primarily associated with the Kirtle Water which flows from north to south and is predicted to cause flooding to residential and non-residential properties in Waterbeck, Kirtlebridge, Kirkpatrick-Fleming and Gretna Green. Surface water flooding is concentrated around the Kirtle Water and its tributaries, impacting the area of Eaglesfield.

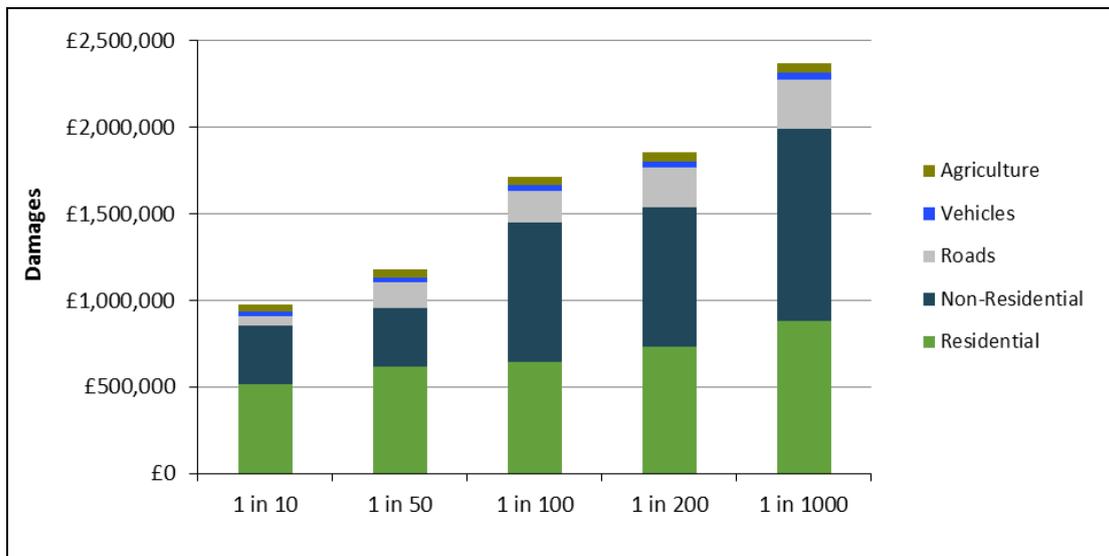
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding lie within Kirkpatrick-Fleming and Kirtlebridge and include people, non-residential properties, roads and railways. There are sections of the road and rail network predicted to be affected by flooding, including the A74(M) and A75.

The damages associated with floods of different likelihoods are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are from river flooding to residential properties (35%), followed by damages to non-residential properties (25%).

The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,100)	10	20	20
Non-residential properties (total 140)	<10	<10	<10
People	20	40	40
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	2.4 (of which 0.3 is motorway and <0.1 is A road)	3.8 of which 0.4 is motorway and <0.1 is A road)	4.2 of which 0.4 is motorway and <0.1 is A road)
Transport links - rail (km)	0.9	0.9	0.9
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	1
Agricultural land (km <sup>2</sup> )	1.3	1.8	2.0

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

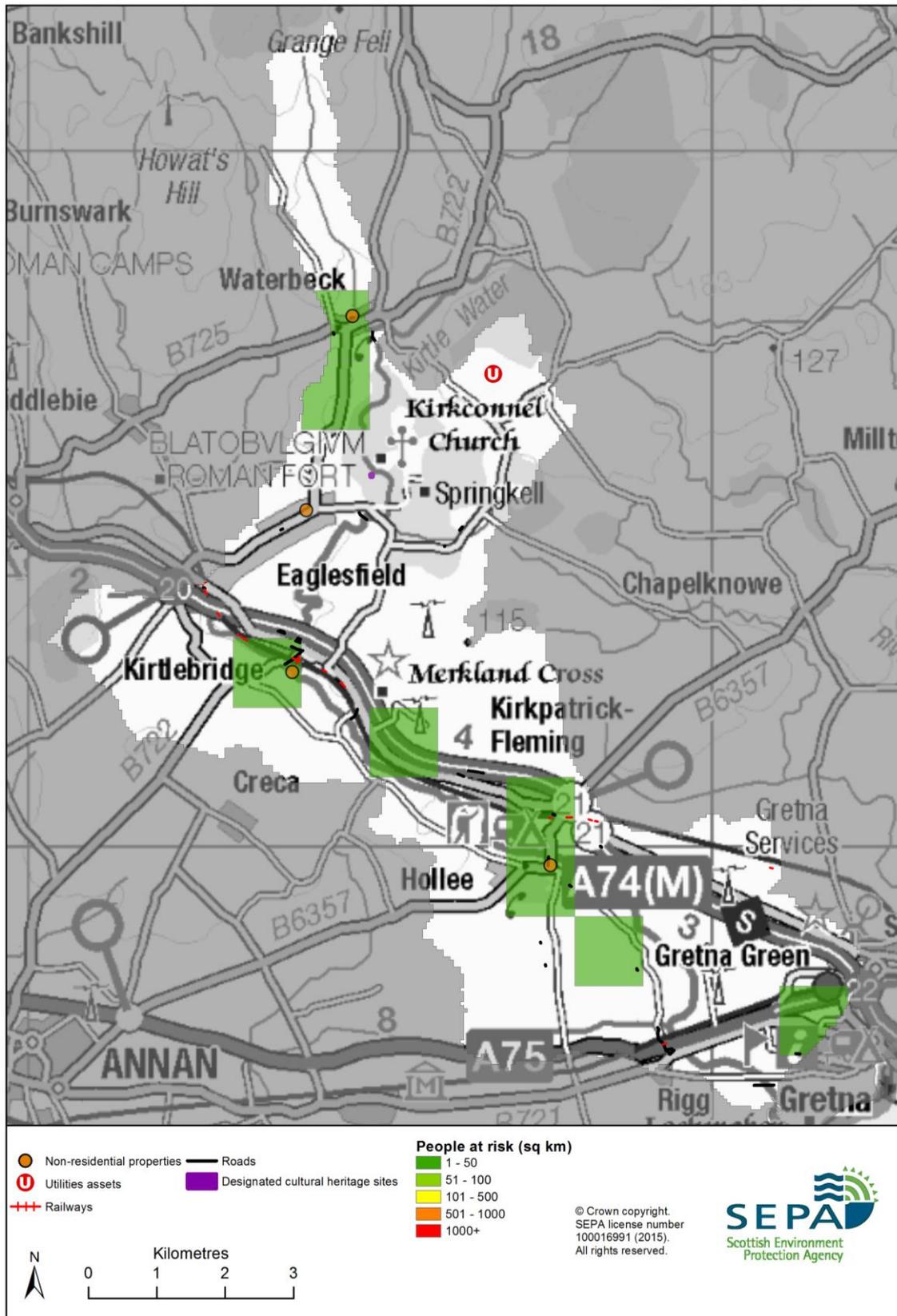


Figure 3: Impacts of flooding

## History of flooding

Records show the causes of flooding in the area are variable, but most are due to heavy local rainfall. There have been two notable floods. The first was on 1 June 2007, where the Eaglesfield Burn flooded properties in Burnside, Eaglesfield as a result of insufficient drainage during heavy rainfall. The second flood was on the 29 June 2007 where a property flooded in Croftlands, Eaglesfield. Culvert replacement works were carried out at Cornhill Farm in Eaglesfield to reduce the risk of flooding to nearby properties.

River flooding was reported in and around Gretna in 1924 and 1942 with large areas of agricultural land inundated and stock losses.

Coastal flooding was reported in October 1997, which was due to a tidal surge that affected utilities at Old Graitney.

## Objectives to manage flooding in Potentially Vulnerable Area 14/09

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Kirtle Water catchment Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £140,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £140,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/09

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Kirtle Water catchment Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Upper Solway Firth flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p> <p>Property owners in Rigg have carried out works to divert field drainage to a nearby watercourse. This was part funded by Dumfries and Galloway Council using the Flood Product Subsidy Scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

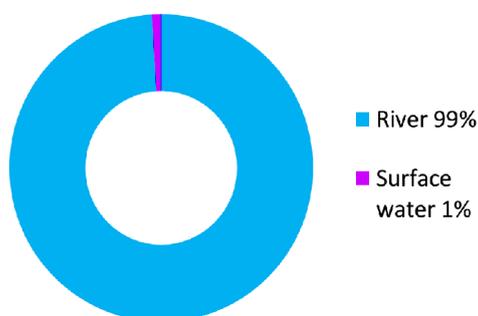
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Springholm (Potentially Vulnerable Area 14/10)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Urr Water

### Summary of flooding impacts



#### At risk of flooding

- 30 residential properties
- <10 non-residential properties
- £100,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

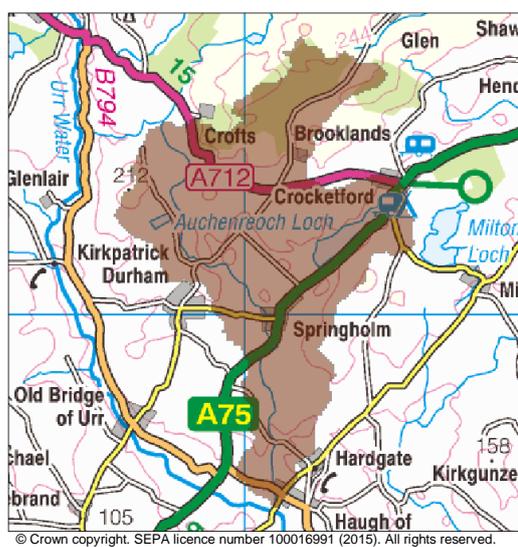
Actions

## Springholm (Potentially Vulnerable Area 14/10)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Urr Water

### Background

This Potentially Vulnerable Area is located in the centre of the Solway Local Plan District. It is approximately 30km<sup>2</sup> and incorporates the village of Springholm and Haugh of Urr (shown below).



There are approximately 30 residential properties and fewer than 10 non-residential properties at risk of flooding. The Annual Average Damages are approximately £100,000.

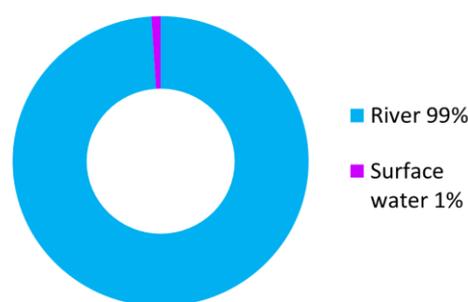


Figure 1: Annual Average Damages by flood source

### Summary of flooding impacts

This Potentially Vulnerable Area is in the Urr Water catchment, which is located in the west of the area and flows from north to south. Within this catchment, there is the potential of flooding from a number of burns including the Brooklands, Burnlands, Minnydow, Culshan, and Spottes. Auchenreoch Loch is also within this Potentially Vulnerable Area and is located adjacent to the A75 to the south west of Crocketford.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. The majority of river flood risk to residential and non-residential properties is in the vicinity of Springholm and Haugh of Urr at the southern tip of the area. There is also a risk to the road network, notably the A75, and agricultural land.

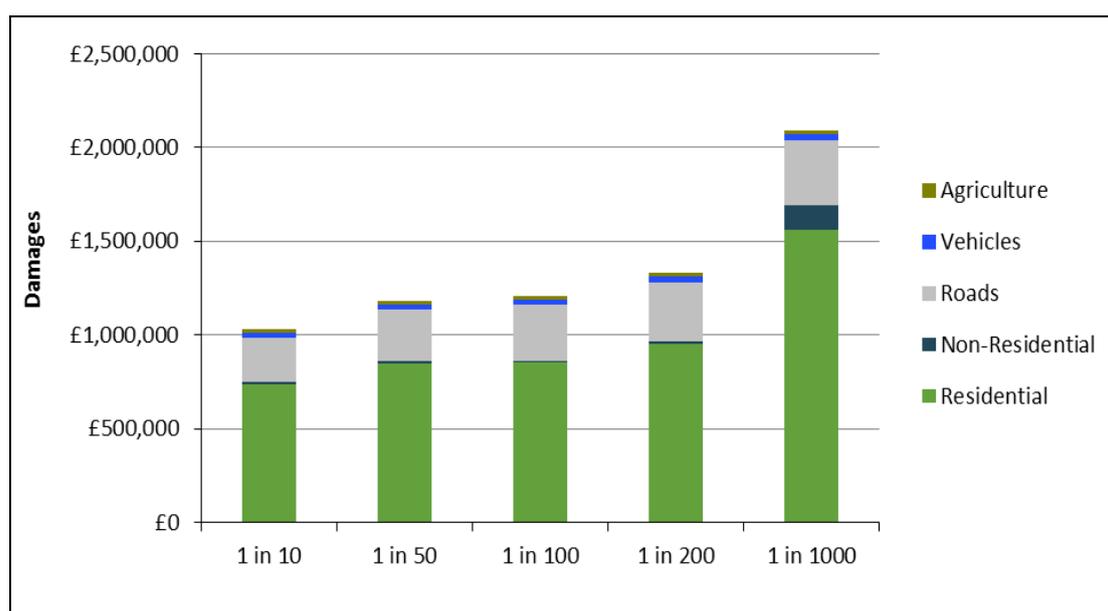
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 30 to 50.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 75% of the damages followed by flooding of roads.

The location of the impacts of flooding is shown in Figure 3.

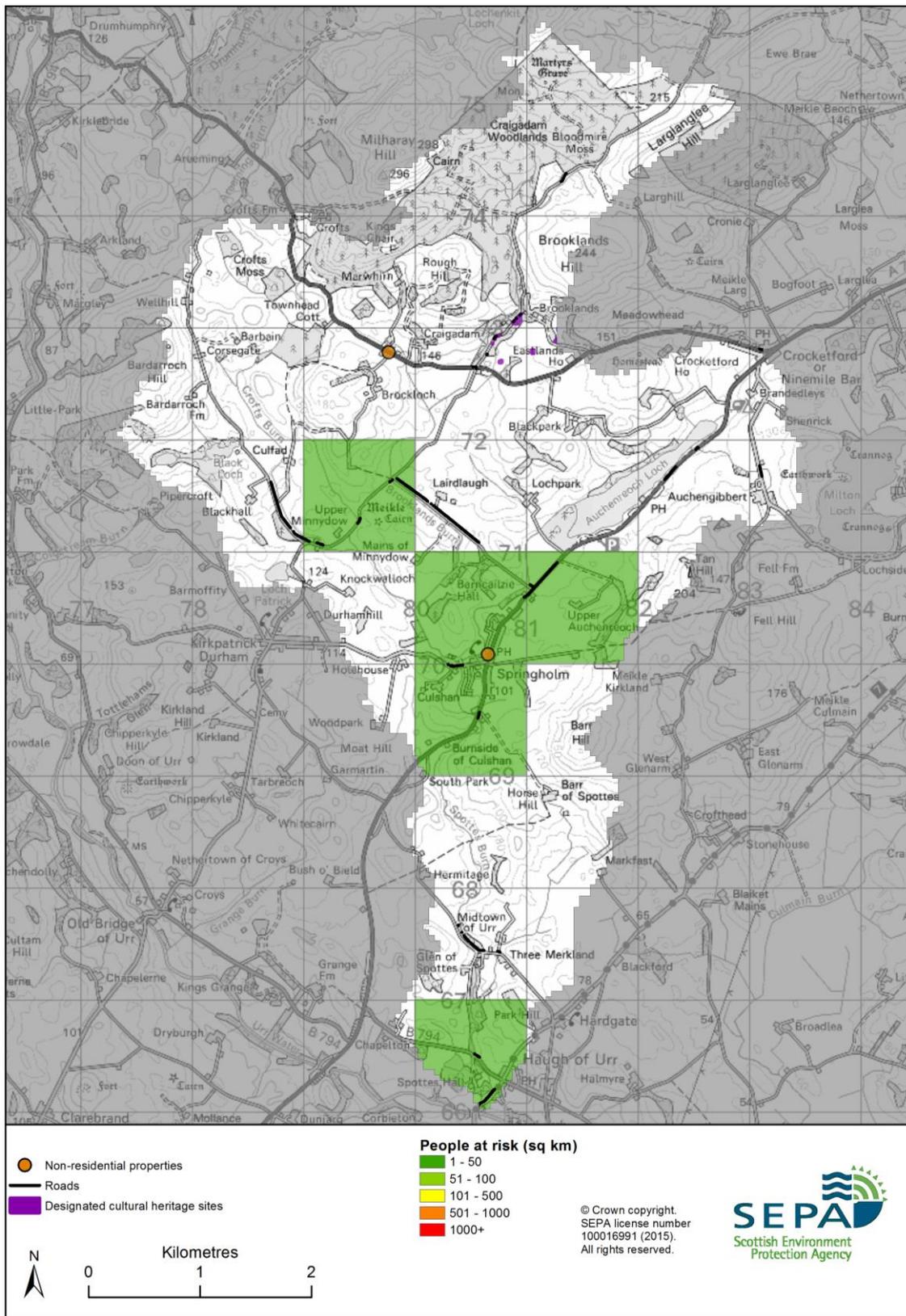
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 300)	20	30	50
Non-residential properties (total 20)	<10	<10	<10
People	50	60	100
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	2.3 (of which 0.5 is A road)	2.9 (of which 0.6 is A road)	3.2 (of which 0.6 is A road)
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	1	1	2
Agricultural land (km <sup>2</sup> )	0.8	0.9	1.0

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

All reported river flooding in this area has been due to burns bursting their banks. These floods were reported between February 2002 and November 2003 in the vicinity of Springholm and Crocketford. Nearby roads were flooded and waters were close to properties. There have been reported incidents of surface water flooding when heavy rainfall has combined with high levels in Auchenreoch Loch, which may affect the A75.

## Objectives to manage flooding in Potentially Vulnerable Area 14/10

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Springholm Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 30 residential properties</li> <li>• £100,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 30 residential properties</li> <li>• £100,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/10

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Springholm Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140400017)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Springholm flood defences. The Springholm Flood Protection Scheme was completed in 1990 and consisted of the installation of a water gate, channel improvements and replacement culverts on the Culsharn Burn.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline. This will be achieved through education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

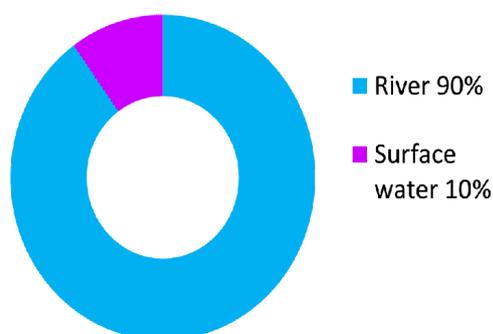
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Castle Douglas (Potentially Vulnerable Area 14/11)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Dee (Solway)

### Summary of flooding impacts



#### At risk of flooding

- 180 residential properties
- 30 non-residential properties
- £430,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

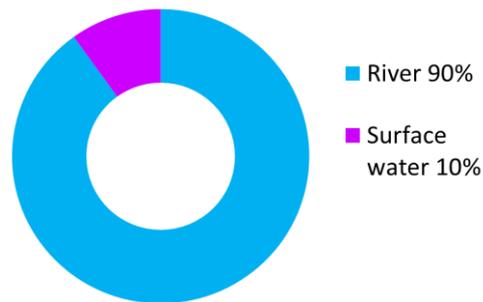
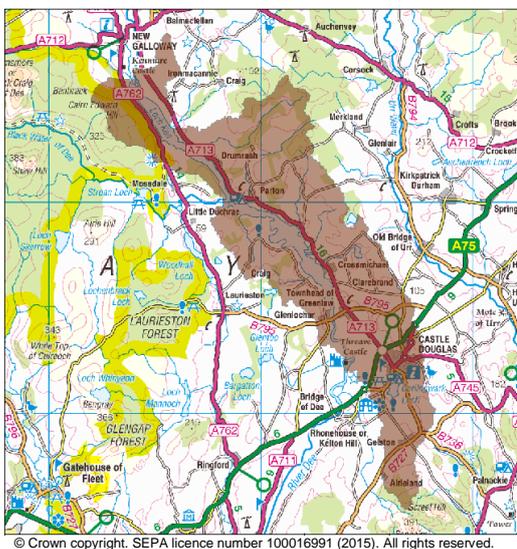
# Castle Douglas (Potentially Vulnerable Area 14/11)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Dee (Solway)

## Background

This Potentially Vulnerable Area is located in the middle of the Solway Local Plan District. It incorporates the settlements of Gelston, Castle Douglas and New Galloway, and has an area of 100km<sup>2</sup> (shown below).

There are approximately 180 residential properties and 30 non-residential properties at risk of flooding. The Annual Average Damages are approximately £430,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

River flooding in this area is primarily attributed to the River Dee which enters Loch Ken at Little Duchrae in the north east and flows in a southerly direction. The Water of Ken also flows into the Loch from the north. The water levels in Loch Ken are controlled by the Glenlocharran Barrage, as part of a hydro-electric scheme. There have been reports of flooding at Loch Ken Caravan Park, situated at the River Dee and Loch Ken confluence.

In the south of the area, flooding to Castle Douglas is influenced by Carlingwark Loch and Blackpark pumping station on Carlingwark Lane. A flood risk assessment carried out by Dumfries and Galloway Council shows that the national flood mapping does not accurately represent flood risk in this area. The flood risk assessment shows there is limited flooding from Carlingwark Loch into Castle Douglas, with only a localised affect in low lying areas. Therefore the flood risk is overestimated in this area.

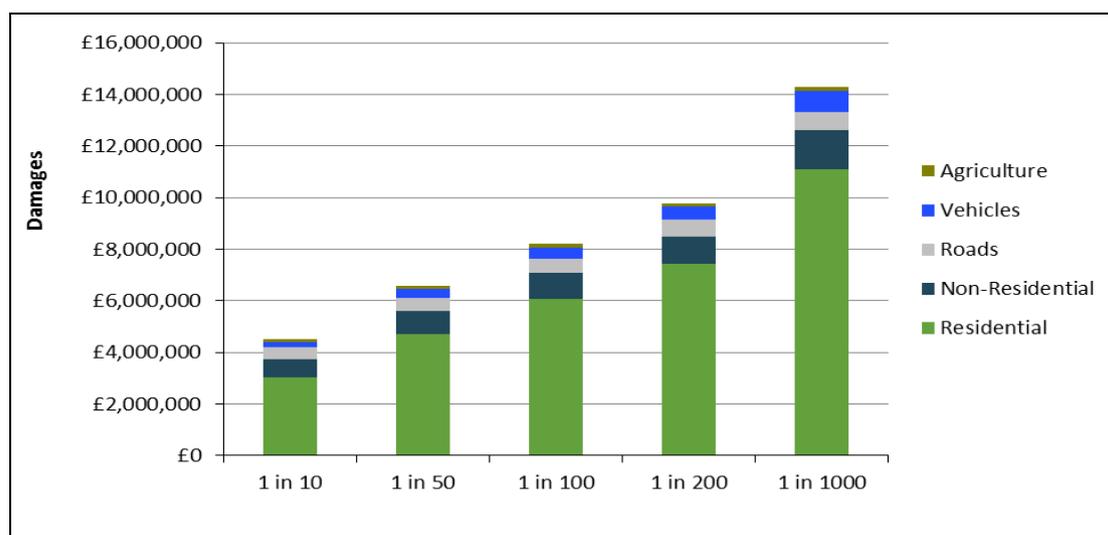
Isolated pockets of surface water flooding are predicted to occur in areas within Castle Douglas with the highest flood depths in the south of the town.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding lie within Castle Douglas. Sections of the A75 road are at risk from surface water flooding.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 70% of the damages. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 2,600)	20	180	250
Non-residential properties (total 340)	<10	30	40
People	40	380	550
Community facilities	<10 Emergency services	<10 Includes: emergency services and healthcare facilities	<10 Includes: emergency services and healthcare facilities
Utilities assets	<10	<10	<10
Transport links - roads (km)	6.7 (of which 0.1 is primary road)	10.3 (of which 0.3 is primary road)	12.0 (of which 0.3 is primary road)
Environmental designated areas (km <sup>2</sup> )	12.1	12.8	13.0
Designated cultural heritage sites	8	9	9
Agricultural land (km <sup>2</sup> )	5.3	6.6	7.4

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

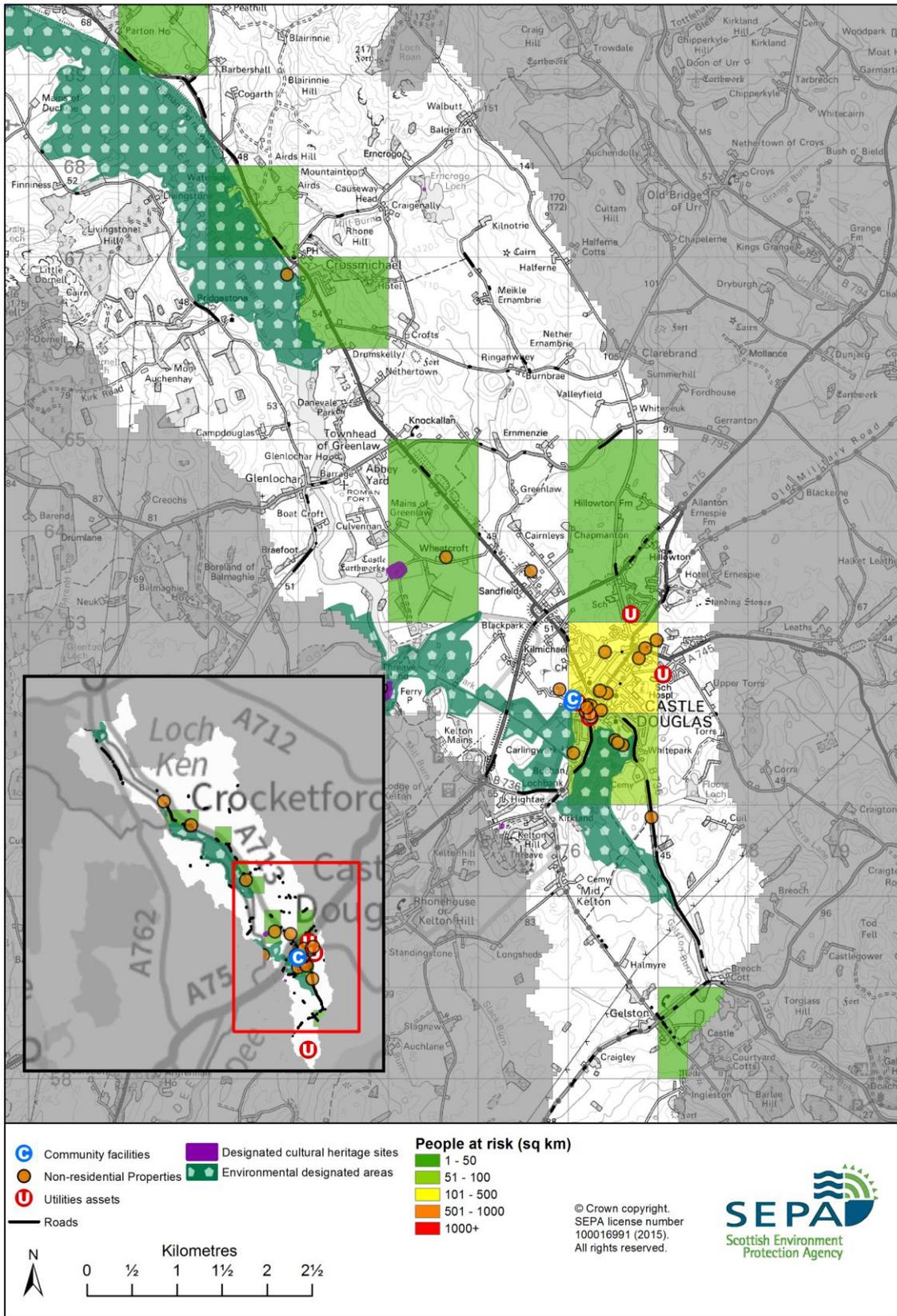


Figure 3: Impacts of flooding

## History of flooding

River flooding has been the main source of floods in the Gelston, Hillowton, Greenlaw and Castle Douglas areas. Floods were recorded between October 2002 and December 2008 and impacted major trunk roads such as the A713 and A745. It should be noted that due to a recently upgraded culvert, flood risk in Gelston has been reduced significantly.

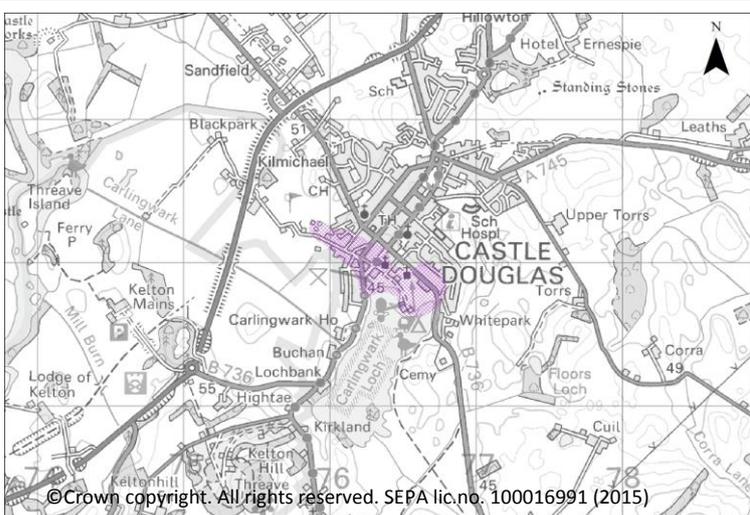
River floods with the highest damages to properties and people occurred in Parton in March 1881 and in Castle Douglas in December 1872. In the mid-1930s, the Scottish Power hydro scheme was commissioned and as a result of the scheme, the level of risk was alleviated making these events less likely in the future.

Surface water flooding impacted the Castle Douglas area in 2002, 2003 and from September to December 2008. These floods also affected major trunk roads.

## Objectives to manage flooding in Potentially Vulnerable Area 14/11

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for the Castle Douglas Potentially Vulnerable Area.

### Reduce the risk of river and surface water flooding to properties in Castle Douglas

Indicators:	Target area:
<ul style="list-style-type: none"> <li>110 residential properties</li> <li>£320,000 Annual Average Damages</li> </ul>	 <p style="font-size: small; text-align: center;">© Crown copyright. All rights reserved. SEPA lic.no. 100016991 (2015)</p>
Objective ID: 14015	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>180 residential properties</li> <li>£430,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>180 residential properties</li> <li>£430,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/11

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for the Castle Douglas Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	<i>Maintain flood warning</i>	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (140400003)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	As part of the wider Galloway Glens Landscape Partnership Scheme, Dumfries and Galloway Council propose to investigate whether Natural Flood Management measures can be utilised on the small tributaries of the Dee to reduce flood risk to settlements in the Dee catchment and provide other ecological and habitat benefits.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Loch Ken and River Dee Marshes Special Protection Area. Sites of Special Scientific Interest are also present in the study area and could be positively or negatively impacted.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140150016)</b>		
<b>Objective (ID):</b>	Reduce the risk of river and surface water flooding to properties in Castle Douglas (14015)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will review existing modelling and data for this area, to determine if any improvements can be made to the flood maps. SEPA will support the local authority if further detailed study beyond a strategic scale is required.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

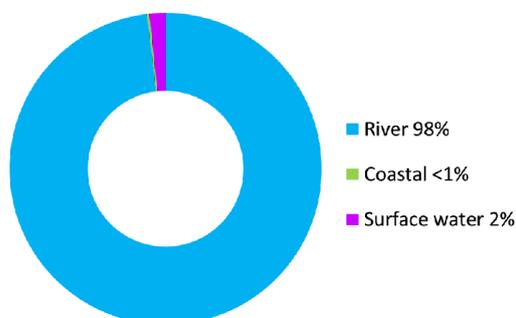
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Newton Stewart (Potentially Vulnerable Area 14/12)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Cree

### Summary of flooding impacts



#### At risk of flooding

- 210 residential properties
- 70 non-residential properties
- £540,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

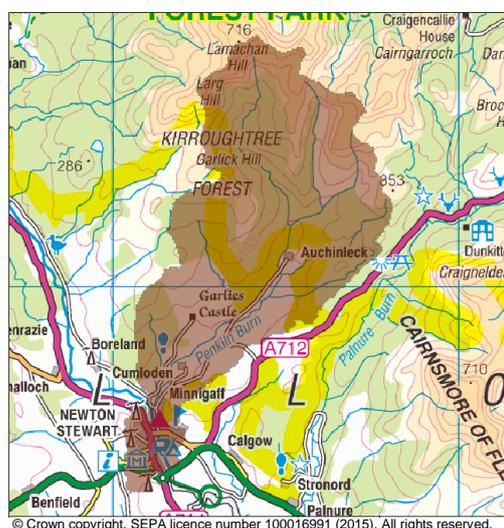
Actions

## Newton Stewart (Potentially Vulnerable Area 14/12)

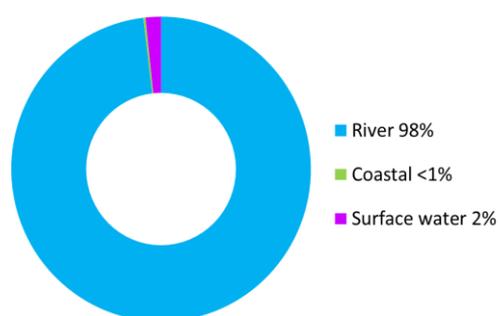
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Cree

### Background

This Potentially Vulnerable Area is located to the west of the Solway Local Plan District. It incorporates the settlements of Newton Stewart, Minnigaff and Auchinleck (shown below). It is approximately 50km<sup>2</sup>.



There are approximately 210 residential properties and 70 non-residential properties at risk of flooding. The Annual Average Damages are approximately £540,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The River Cree originates in the north of Solway Local Plan District and flows south through the centre of Newton Stewart; this is the main source of risk in the area. The Penkiln Burn originates in the north and flows south west towards Minnigaff where it joins the River Cree. The upper reaches of Penkiln Burn are within Kirroughtree Forest above Auchinleck.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the properties at risk of flooding lie within Newton Stewart and Minnigaff.

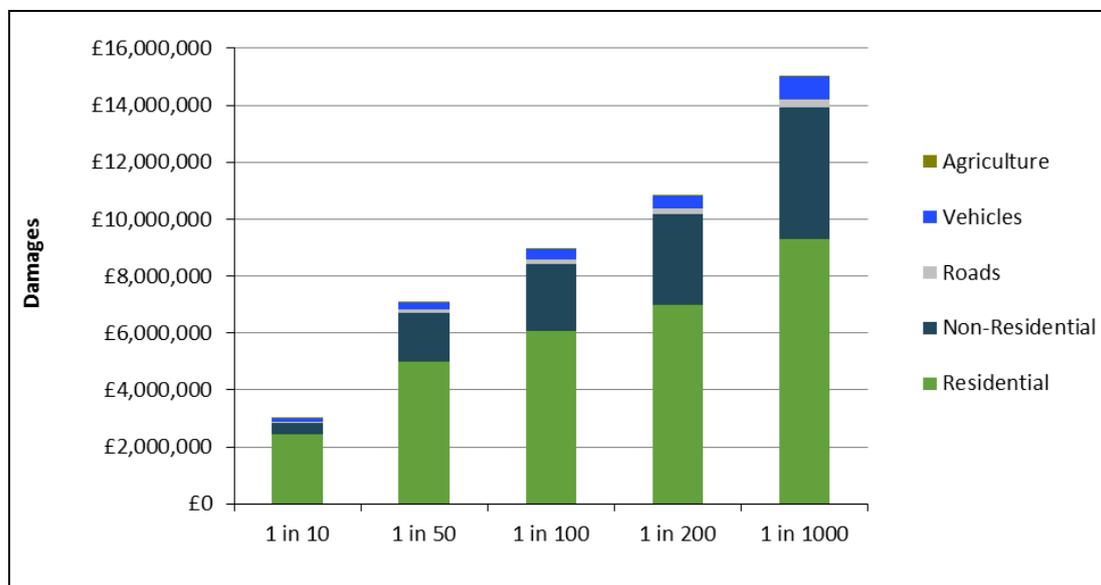
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 210 to 290 and the number of non-residential properties from approximately 70 to 90.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 75% of the damages. Non-residential properties also contribute a notable portion of the damages.

The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,800)	100	210	240
Non-residential properties (total 220)	20	70	90
People	200	450	540
Community facilities	<10 Educational buildings	<10 Includes: educational buildings and emergency services	<10 Includes: educational buildings and emergency services
Utilities assets	<10	<10	<10
Transport links - roads (km)	0.2 (of which <0.1 is A road)	0.7 (of which <0.1 is A road)	1.0 (of which <0.1 is A road)
Environmental designated areas (km <sup>2</sup> )	<0.1	<0.1	<0.1
Designated cultural heritage sites	2	2	3
Agricultural land (km <sup>2</sup> )	0.1	0.2	0.9

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

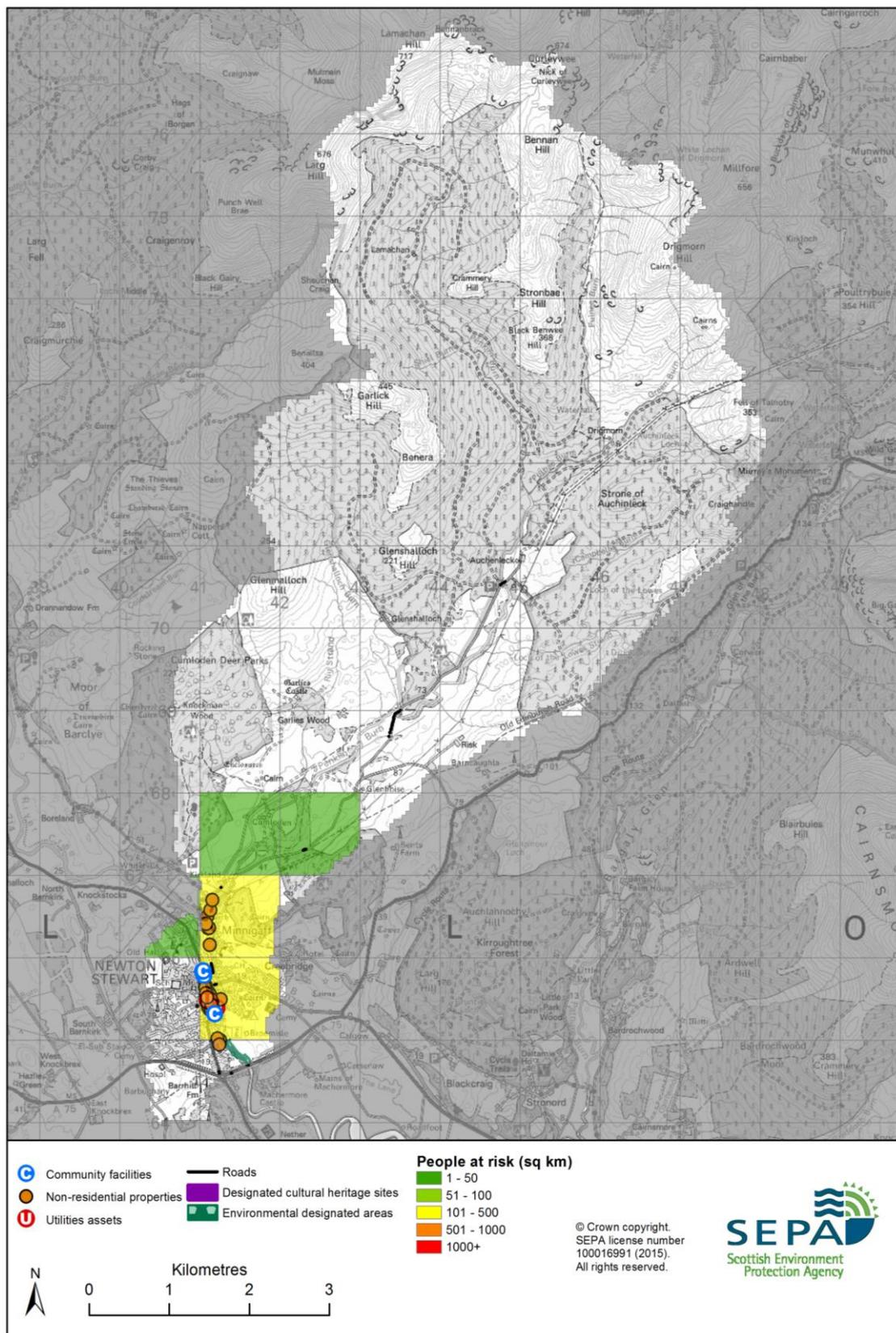


Figure 3: Impacts of flooding

## History of flooding

All recorded flooding to properties has occurred in the vicinity of Newton Stewart and Minnigaff. Flooding was recorded on 30 December 2013 and on 19 November 2012 the highest observed water level in the River Cree occurred when it is thought that around 50 properties were affected. The return period has been identified as between 1 in 50 to 1 in 85 years. Two further notable floods in Newton Stewart occurred in October 1988 and August 1960. The former impacted agricultural land, roads and a community facility, while agricultural properties were washed away along with a road bridge in the 1960 flood.

The most recent reported surface water flood was in 2002, which resulted in flooding of the A714 north and B7079 Kirroughtree. Floods in 1950 and 1878 resulted in businesses, residential properties and roads being flooded.

There has been one coastal flood recorded, which occurred in 1854 and resulted in the flooding of agricultural land.

## Objectives to manage flooding in Potentially Vulnerable Area 14/12

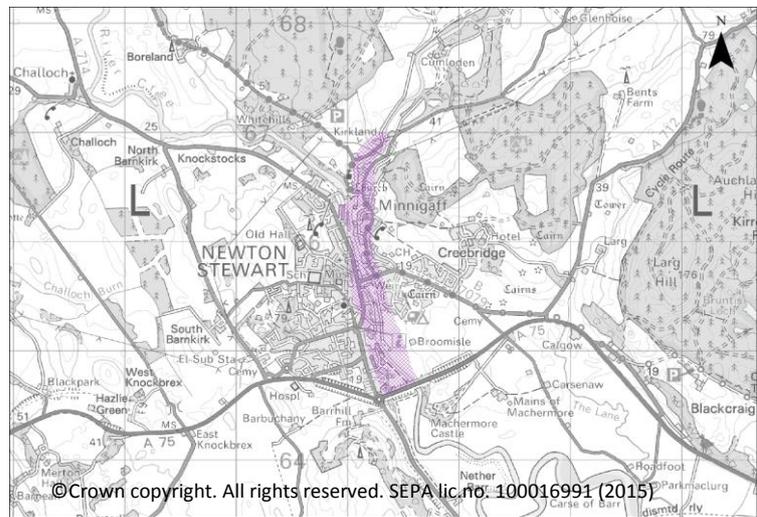
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Newton Stewart Potentially Vulnerable Area.

### Reduce the risk of river flooding to properties in Newton Stewart

Indicators:

Target area:

- 200 residential properties
- 70 non-residential properties
- £520,000 Annual Average Damages



Objective ID: 14016

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 210 residential properties</li> <li>• £540,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 210 residential properties</li> <li>• £540,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/12

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Newton Stewart Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (140160006)</b>				
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Newton Stewart (14016)				
<b>Delivery lead:</b>	Dumfries and Galloway Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>25 of 42</b>		<b>4 of 4</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	It is recommended that the council progress work on the proposed flood protection scheme in Newton Stewart. The Newton Stewart Flood Study identified potential works, including construction of direct defences along the River Cree and Penkiln Burn. The study is being further refined to consider actions that increase the level of protection offered. This includes raising of a footbridge over the River Cree in combination with increased direct defences. Other actions may also be considered to select the most sustainable combination of actions.				
<b>Potential impacts</b>					
<b>Economic:</b>	The proposed scheme may benefit 62 residential properties and 63 non-residential properties at risk of flooding in this location, damages avoided are estimated to be £12 million. The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. In this location, it has been estimated that 25 residential and non-residential properties could potentially benefit from natural flood management actions. The flood protection scheme has an estimated benefit cost ratio of 1.6.				

<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection scheme area. In addition there are two utilities which have been identified as potentially benefitting from this action. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism. There may be changes in visual amenity and land use as a result of this action.
<b>Environmental:</b>	Flood protection works can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. There is potential for impacts on habitats and changes to channel morphology. Opportunities to mitigate any environmental impacts should be identified as part of the study through the design and timing of works.

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Continue with the development and implementation of the Newton Stewart flood warning area on the River Cree.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (140160012)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to properties in Newton Stewart (14016)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The local community set up the Newton Stewart Flood Action group, to raise awareness of flood risk in the area.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

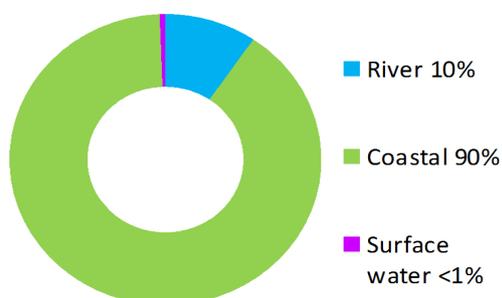
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Kirkcolm (Potentially Vulnerable Area 14/13)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	North Rhins

### Summary of flooding impacts



#### At risk of flooding

- <10 residential properties
- £59,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

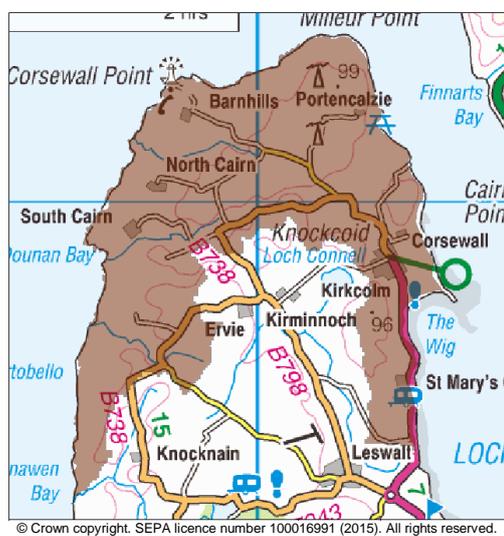
Actions

## Kirkcolm (Potentially Vulnerable Area 14/13)

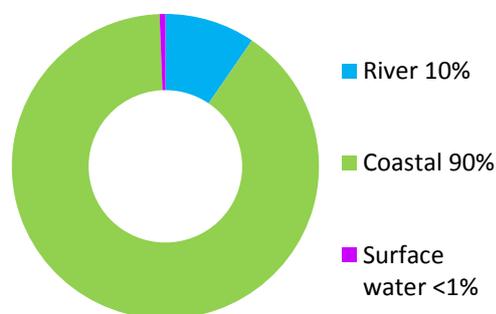
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	North Rhins

### Background

This Potentially Vulnerable Area is located to the western extent of the Solway Local Plan District. It incorporates the village of Kirkcolm and is approximately 40km<sup>2</sup> (shown below).



There are fewer than 10 residential properties estimated to be at risk of flooding. However, the historical records indicate that this number potentially underestimates the risk. The Annual Average Damages are approximately £59,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

Coastal flooding provides the greatest risk to the area of Kirkcolm with the main impact affecting transport routes, notably a 2km stretch of the A718 to the south of Kirkcolm. This assessment of coastal flood risk does not include the impacts of wave overtopping, therefore it is possible that impacts in this area have been underestimated.

River flooding is shown to have a small impact on properties and transport links. Historically, river flooding has caused flooding to properties and people in Kirkcolm. One reported flood also destroyed a bridge, which has since been replaced to a higher level of design.

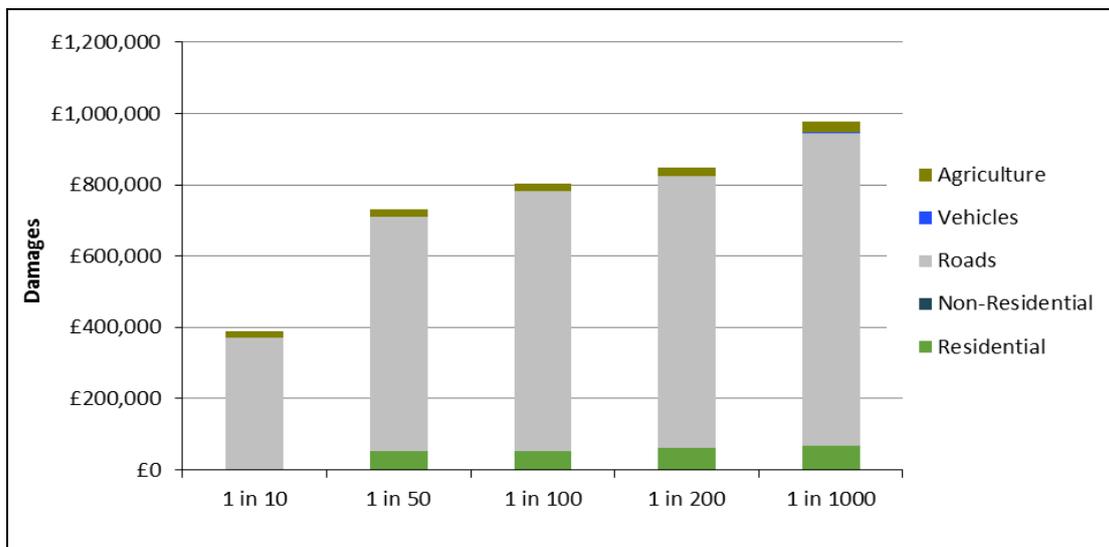
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. Roads infrastructure affected by coastal flooding experience the highest economic impact with approximately 85% of the damages.

The location of the impacts of flooding is shown in Figure 3.

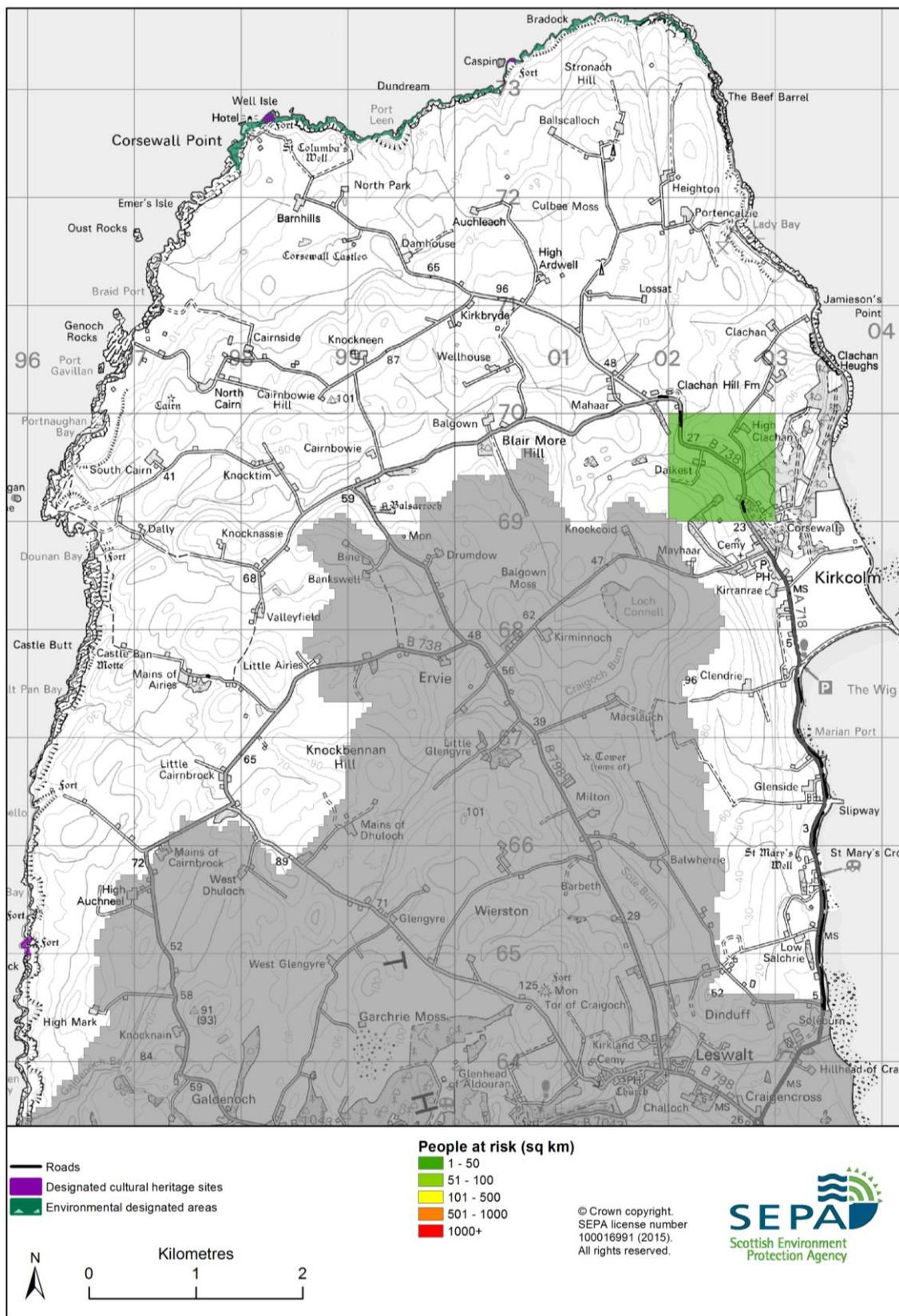
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 230)	<10	<10	<10
Non-residential properties (total 30)	<10	<10	<10
People	<10	<10	<10
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	1.2	2.4	2.7
Environmental designated areas (km <sup>2</sup> )	<0.1	0.1	0.1
Designated cultural heritage sites	0	0	3
Agricultural land (km <sup>2</sup> )	0.3	0.3	0.4

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

All recorded floods are located in the vicinity of Kirkcolm. The flood which caused the highest damages to properties and people occurred in Kirkcolm on 11 September 1950. Its impacts included the Stranraer-Kirkcolm road at Corsewall Mill to be blocked where the burn burst its banks and also destruction of a bridge, causing major disruption to transport.

The area of Corsewall was subject to tidal inundation on 21 December 1894, which resulted in two fatalities when a steamer became stranded. Roadways were also damaged, the south pier was blocked with stones and debris, and houses were flooded.

## Objectives to manage flooding in Potentially Vulnerable Area 14/13

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Kirkcolm Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £59,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £59,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/13

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Kirkcolm Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140400017)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Kirkcolm flood defences. The Kirkcolm Flood Protection Scheme was constructed on behalf of Dumfries and Galloway Council in 1981 and involved channel improvements and culvert up-grades. Installation of a new headwall and trash screen occurred in 2012 along with the installation of a water level gauging station at the site of the 1981 Flood Protection Scheme. Dumfries and Galloway Council also have sections of coastal erosion defences including seawalls at Kirkcolm.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

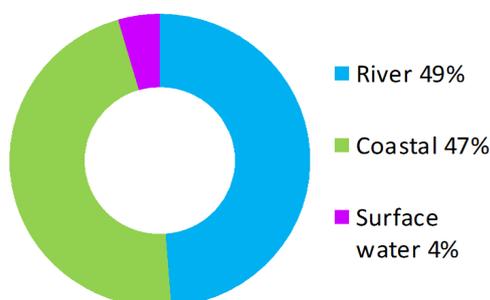
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Portpatrick (Potentially Vulnerable Area 14/14)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Portpatrick coastal

### Summary of flooding impacts



#### At risk of flooding

- 10 residential properties
- <10 non-residential properties
- £54,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

## Portpatrick (Potentially Vulnerable Area 14/14)

Local Plan District	Local authorities	Main catchment
Solway	Dumfries and Galloway Council	Portpatrick coastal

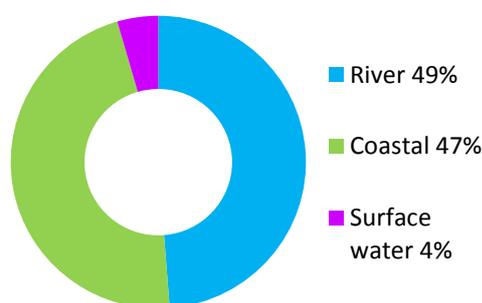
### Background

This Potentially Vulnerable Area is located at the western edge of the Solway Local Plan District and incorporates the village of Portpatrick (shown below). It is approximately 30km<sup>2</sup>.



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There are approximately 10 residential properties and fewer than 10 non-residential properties at risk of flooding. The Annual Average Damages are approximately £54,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

Coastal flooding from the North Channel is limited to a small number of locations along the western coastline, primarily around Portpatrick. Residential and non-residential properties are predicted to be at risk, along with stretches of the A77 road.

River flooding within this Potentially Vulnerable Area is primarily attributed to the Dinvin Burn which is partially culverted through Portpatrick. The Knock and Maize Burns to the north also present a small risk of river flooding, mainly to the A738 in the area of Portslogan Bridge. Interaction between river and coastal flooding is limited to the downstream extents of the Dinvin, Knock and Maize Burns, particularly in the areas of Portpatrick harbour, Knock Bay, Port Mora and Port Kale.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 10 to 20.

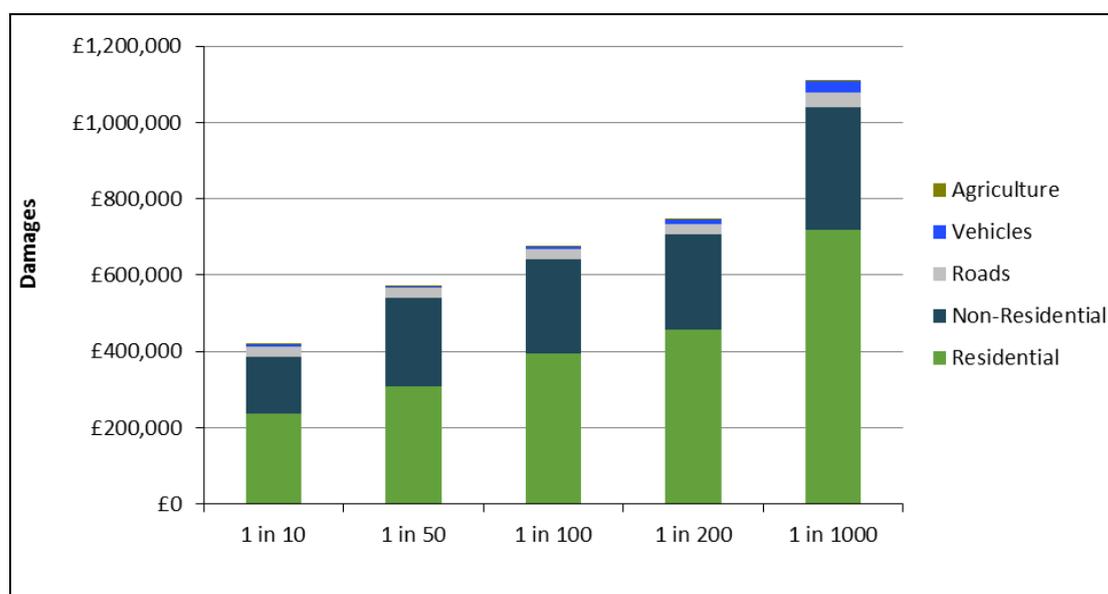
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding lie within Portpatrick.

The damages associated with floods of different likelihood are shown in Figure 2.

Residential properties affected by river flooding experience the highest economic impact with approximately 55% of the damages. The location of the impacts of flooding is shown in Figure 3.

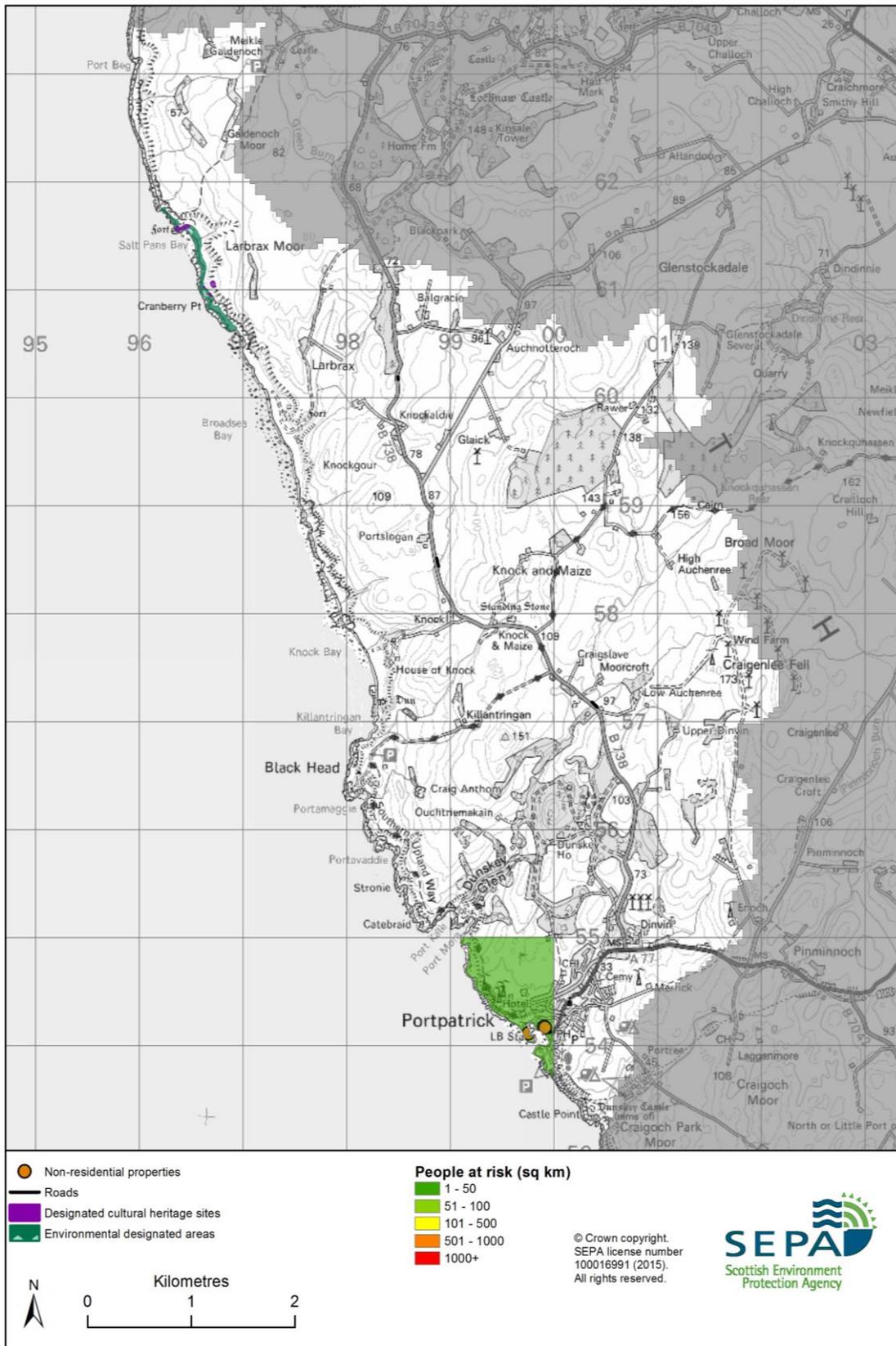
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 430)	<10	<10	20
Non-residential properties (total 50)	<10	<10	<10
People	10	20	40
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	0.2	0.2	0.3
Environmental designated areas (km <sup>2</sup> )	<0.1	<0.1	<0.1
Designated cultural heritage sites	2	3	3
Agricultural land (km <sup>2</sup> )	<0.1	<0.1	<0.1

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

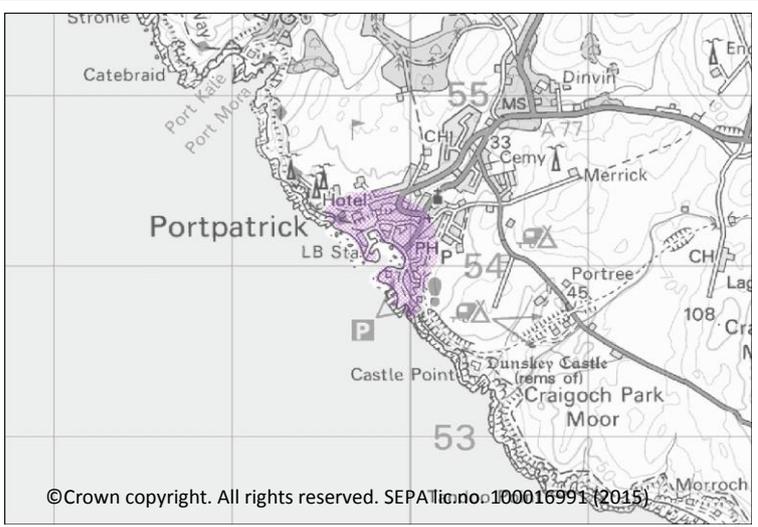
Flooding in January 2014 caused damage to coastal defence structures in Portpatrick. The area of Portpatrick was also affected by coastal floods in the late 19th and early 20th Century.

The most recent major river flood in Portpatrick occurred in October 2000, when the burn overtopped its banks, flooding the Main Street and causing extensive damage to shops, hotels and houses. This flood ultimately led to the construction of the Portpatrick Flood Protection Scheme in 2004.

## Objectives to manage flooding in Potentially Vulnerable Area 14/14

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Portpatrick Potentially Vulnerable Area.

### Accept the current standard of protection offered by the Portpatrick Flood Protection Scheme

Indicators:	Target area:
<p>Scheme provides protection to:</p> <ul style="list-style-type: none"> <li>80 residential properties</li> <li>20 non-residential properties</li> </ul>	
Objective ID: 14018	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>10 residential properties</li> <li>£54,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>10 residential properties</li> <li>£54,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/14

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Portpatrick Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Greta to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140180017)</b>		
<b>Objective (ID):</b>	Accept the current standard of protection offered by the Portpatrick Flood Protection Scheme (14018)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Portpatrick flood defences. The Portpatrick Flood Protection Scheme was constructed in 2004 on behalf of Dumfries and Galloway Council and consisted of upstream attenuation areas, channel improvements, bridge raising, a storm bypass pipe and walls.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the South West Rhins flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the South West Rhins coastal flood warning area . This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p> <p>Dumfries and Galloway Council also have sections of coastal defences including a concrete seawall at Portpatrick. There are also privately owned retaining wall defences at Portpatrick.</p> <p>Dumfries and Galloway Council has recently undertaken works in Hill Street, Portpatrick, to manage surface water flows into an upgraded culvert network with discharge to the sea.</p>		

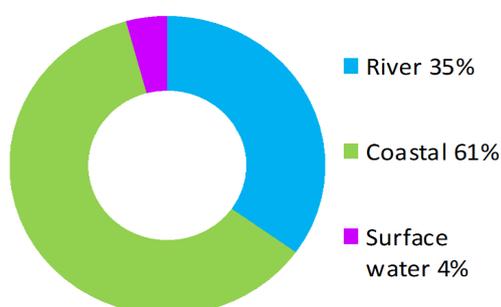
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Stranraer (Potentially Vulnerable Area 14/15)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Stranraer coastal

### Summary of flooding impacts



#### At risk of flooding

- 290 residential properties
- 60 non-residential properties
- £360,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

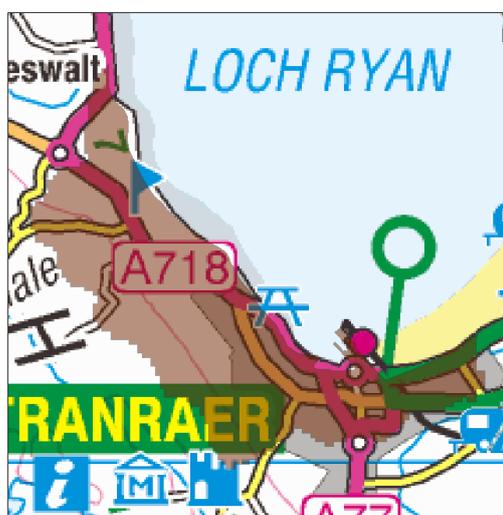
Actions

## Stranraer (Potentially Vulnerable Area 14/15)

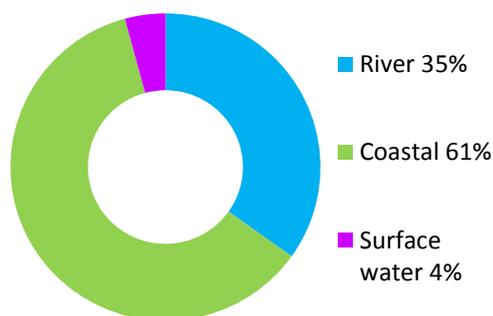
Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Stranraer coastal

### Background

This Potentially Vulnerable Area is located to the western extent of the Solway Local Plan District and incorporates the town of Stranraer (shown below). It is approximately 10km<sup>2</sup>.



There are approximately 290 residential properties and 60 non-residential properties at risk of flooding. The Annual Average Damages are approximately £360,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

Whilst this report only covers part of Stranraer, the whole town is being assessed for future actions to mitigate flood risk. There is potential for coastal flooding to occur within the area, particularly in the harbour area and former ferry terminal, which lies on the shores of Loch Ryan. Coastal floods are also likely to impact on local transport links which run along the shoreline, including the A718 and the A77. A number of nearby residential properties, community facilities and utilities are also at risk.

River flooding originates from three main sources, the Black Stank Burn, the Town Burn and the Sheuchan Burn. The Black Stank Burn drains agricultural land to the south east of Stranraer. It flows along the south east boundary of the Potentially Vulnerable Area and then in an easterly direction, where it becomes the Bishop Burn and discharges to Loch Ryan. The Black Stank has a very flat gradient and is known to overflow into the Town Burn just outside the area. The Town Burn flows north west through Stranraer, where it is extensively culverted until its outfall at the harbour.

The interaction between the Black Stank and the Town Burn creates flooding to the town centre. The Town Burn is heavily culverted and has flooding issues from Gallowhill into culvert entrances.

The Sheuchan Burn is known to cause flooding problems at Nursery Avenue, Leafield, Liddesdale Road, Springbank Road, Brookfield and Mayfield Avenue. Risk has been substantially reduced by recent works carried out, at Sheuchan Bridge and the outfall of the Sheuchan Burn.

There are areas within the Potentially Vulnerable Area where interactions between river and coastal flooding may increase the identified risk. These include Stranraer harbour at the Town Burn outfall, the A77 Cairnryan Road at the mouth of the Bishop Burn, and where the Sole Burn discharges to Loch Ryan. There are known surface water interactions around Station Street/Edinburgh Road and with the Black Stank. Surface water flooding may also affect open land and properties in the Moorefield area and Galloway community hospital.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk of flooding lie within Stranraer along the burns within the town and include people, non-residential properties, community facilities, utilities, roads and railways. Further impacts to roads along the coast can also be seen with the potential for disruption.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 290 to 420 and the number of non-residential properties from approximately 60 to 70.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by coastal and river flooding experience the highest economic impact at approximately 70% of the damages. Non-residential properties and roads infrastructure also provide a notable portion of the damages.

The location of the impacts of flooding is shown in Figure 3.

## History of flooding

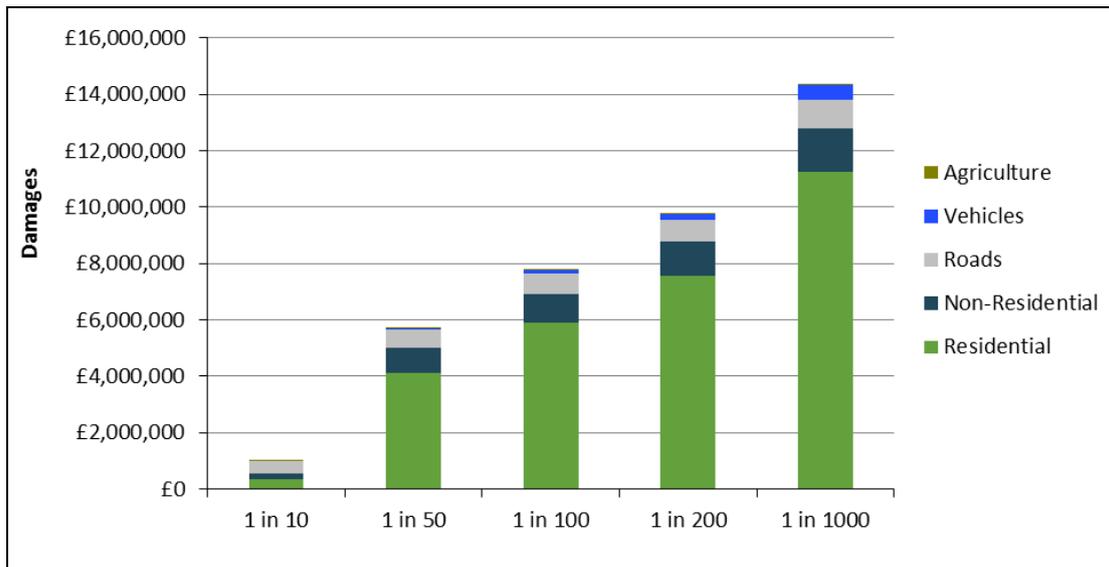
The majority of recorded floods relate to the Stranraer area. Records show that river flooding is the main source of flooding in the area, primarily in Mayfield. In 1970-1971 the ferry terminal marshalling yard was inundated due to overtopping of the Black Stank / Bishop Burn, which led to water passing along the railway from south to north. Other notable river floods took place in October 1926, August 1999 and September-October 2002.

Surface water flooding occurred in Stranraer in January 1942, which resulted in the evacuation of residential and non-residential properties; further flooding occurred in 2007, 2012 and 2013.

Coastal flooding has mainly affected the Harbour of Stranraer from tidal surges in Loch Ryan, the most recent flooding being in January 2014. The highest tidal levels in Stranraer occurred in 1894 and led to significant coastal flooding. Further notable coastal flooding occurred in January 1928, when peak tides and a northerly storm led to flooding on North Strand Street, and in 1938-1939 when the north end of King Street became inundated with water. In 1852 coastal flooding also caused destruction to roads and properties.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,700)	10	290	400
Non-residential properties (total 380)	<10	60	70
People	30	640	880
Community facilities	<10 Emergency services	<10 Emergency services	<10 Emergency services
Utilities assets	<10	<10	10
Transport links - roads (km)	1.3 (of which <0.1 is A road)	2.7 (of which 0.3 is A road)	3.5 (of which 0.6 is A road)
Transport links - rail (km)	0.7	1.4	1.9
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	<0.1	<0.1	<0.1

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



## Objectives to manage flooding in Potentially Vulnerable Area 14/15

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Stranraer Potentially Vulnerable Area.

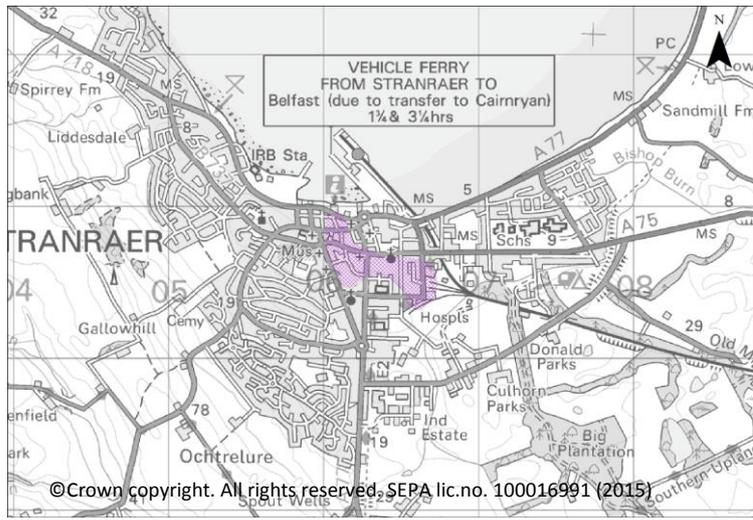
### Reduce the risk of river and surface water flooding to residential and non-residential properties in Stranraer

Indicators:

- 160 residential properties
- 30 non-residential properties
- £130,000 Annual Average Damages

Objective ID: 14019

Target area:



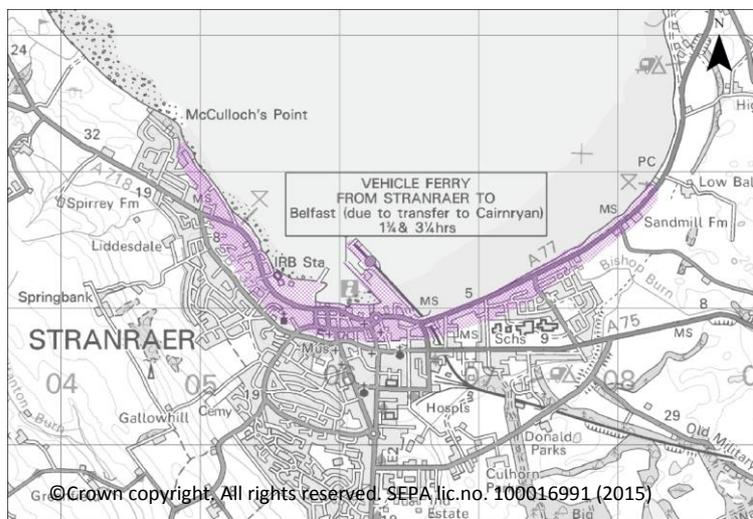
### Reduce the risk of coastal flooding to residential and non residential properties in Stranraer

Indicators:

- 140 residential properties
- 30 non-residential properties
- £180,000 Annual Average Damages

Objective ID: 14020

Target area:



Target area	Objective	ID	Indicators within PVA
Stranraer	Reduce the physical or disruption risk related to the transport network for rail.	14300	<ul style="list-style-type: none"> <li>• 40m of rail track at 3 locations</li> </ul>
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 290 residential properties</li> <li>• £360,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 290 residential properties</li> <li>• £360,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/15

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Stranraer Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (140190006)</b>				
<b>Objective (ID):</b>	Reduce the risk of river and surface water flooding to residential and non-residential properties in Stranraer (14019)				
<b>Delivery lead:</b>	Dumfries and Galloway Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>21 of 42</b>		<b>2 of 4</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	It is recommended that the council progress work on the proposed flood protection scheme in Stranraer. Assessment of the flood risk within Stranraer identified a number of works to reduce flooding to people and properties. The Stranraer Flood Protection Works is split into different items. The two outstanding items of work. The first will help to alleviate flooding to properties in the Ochrelure area, by increasing hydraulic capacity issues at the head of the system. The favoured option includes diversion of flows. The second item of work is concerned with flooding on the Town Burn mainly downstream of the railway culvert. The preferred option for the Station Road area is to regulate flow passing through the railway culvert and therefore alleviate flood risk in this area.				
<b>Potential impacts</b>					
<b>Economic:</b>	The proposed scheme may benefit 160 residential properties and 31 non-residential properties at risk of flooding in this location, damages avoided are estimated to be £960,000. The flood protection scheme has an estimated benefit cost ratio of 2.6.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection scheme area. There may be				

<b>Social:</b>	changes in visual amenity and land use as a result of this action.
<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. This flood protection scheme is proposed for the Black Stank (water body ID 10483). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There are no international or national level environmental designations that are likely to be impacted by this action. Creation of a culvert to discharge to the Black Stank may increase erosion and sedimentation downstream of the action. There will be a loss of habitat in the footprint of the works, which should re-establish over time. There is likely to be a loss of natural and semi-natural habitats in the footprint of the storage area.

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (14300021)</b>		
<b>Objective (ID):</b>	Reduce the physical or disruption risk related to the transport network for rail. (14300)		
<b>Delivery lead:</b>	Network Rail		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Network Rail will carry out civil engineering work which will reduce flood risk to identified sections of the rail network within this Potentially Vulnerable Area.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential and non residential properties in Stranraer (14020)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National: <b>1 of 168</b>	Within local authority: <b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the completed Flood Risk Assessment for the Stranraer Harbour area and the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>		
<b>Potential impacts</b>			

<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140190017)</b>		
<b>Objective (ID):</b>	Reduce the risk of river and surface water flooding to residential and non-residential properties in Stranraer (14019)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Stranraer Flood Protection Works is split into work items which are currently at different stages of completion. Works to date include upgrading of culverts, installation of trash screens, silt traps and automatic air bricks to properties. The standard of protection of these works is generally 200 years. The works should all be maintained once completed. Levels of flood risk are likely to increase over time as a consequence of climate change.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Loch Ryan flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Loch Ryan coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p> <p>Dumfries and Galloway Council own a number of coastal defences in Stranraer including concrete walls, sheet pile walls, gabions and rock armour. There are also a number of privately owned seawalls.</p>		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Spittal (Potentially Vulnerable Area 14/16)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	River Bladnoch

### Summary of flooding impacts



#### At risk of flooding

- <10 residential properties
- £26,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

Actions

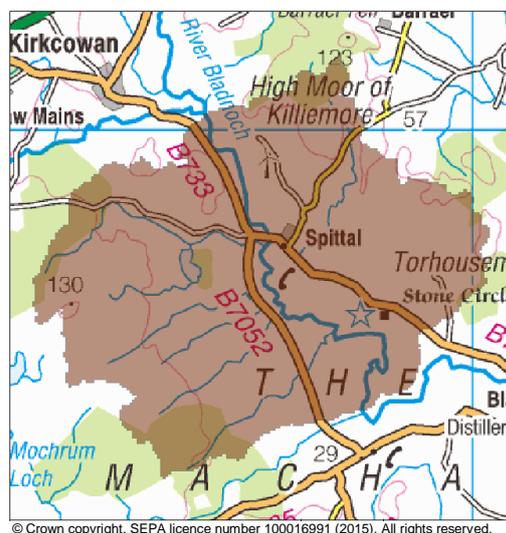
## Spittal (Potentially Vulnerable Area 14/16)

Local Plan District	Local authorities	Main catchment
Solway	Dumfries and Galloway Council	River Bladnoch

### Background

This Potentially Vulnerable Area is located in the west of the Solway Local Plan District and incorporates the village of Spittal (shown right). It is approximately 40km<sup>2</sup>.

There are fewer than 10 residential properties at risk of river flooding in the area. The Annual Average Damages are approximately £26,000. All damages in this Potentially Vulnerable Area are caused by river flooding.



### Summary of flooding impacts

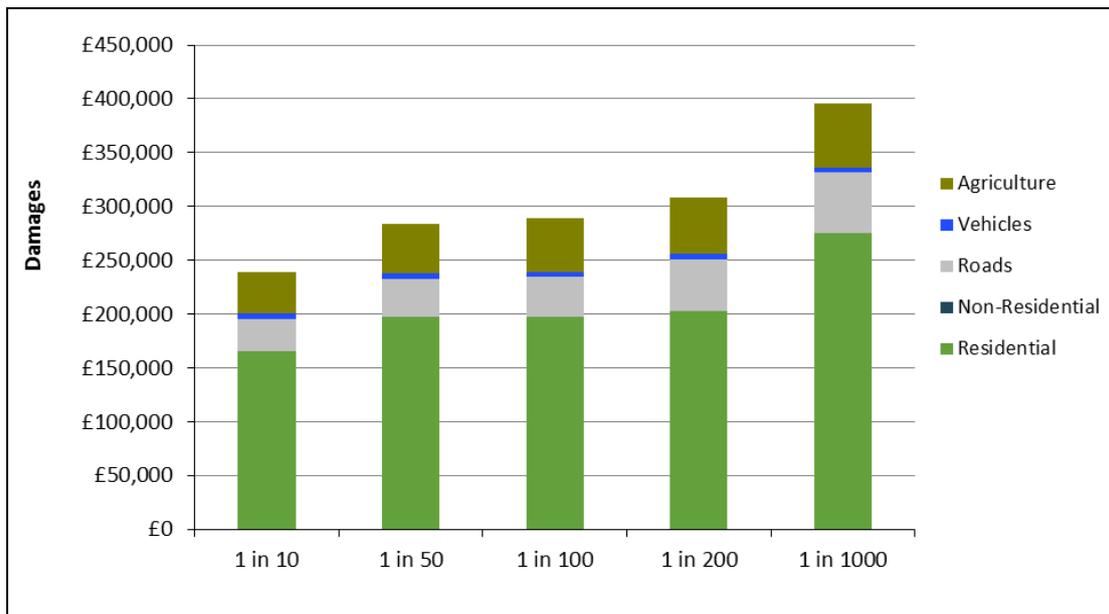
The main catchment that overlaps the Potentially Vulnerable Area is the River Bladnoch, which is comprised largely of upland grazing, grassland and agricultural land, forestry and a large number of lochs. The River Bladnoch flows through the centre of the area in a south easterly direction. The Bladnoch and its tributaries flood mainly onto agricultural land and limited flooding to properties is predicted, primarily in Spittal.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. There are limited impacts predicted in this area with sections of road at risk of flooding and some impacts to properties.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties affected by river flooding (60%) followed by damages to roads infrastructure and agricultural land. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 60)	<10	<10	<10
Non-residential properties (total 10)	<10	<10	<10
People	<10	<10	<10
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	0.8	1.1	1.3
Environmental designated areas (km <sup>2</sup> )	0.3	0.4	0.4
Designated cultural heritage sites	2	2	2
Agricultural land (km <sup>2</sup> )	1.9	2.6	2.9

**Table 1:** Summary of flood impacts<sup>1</sup>

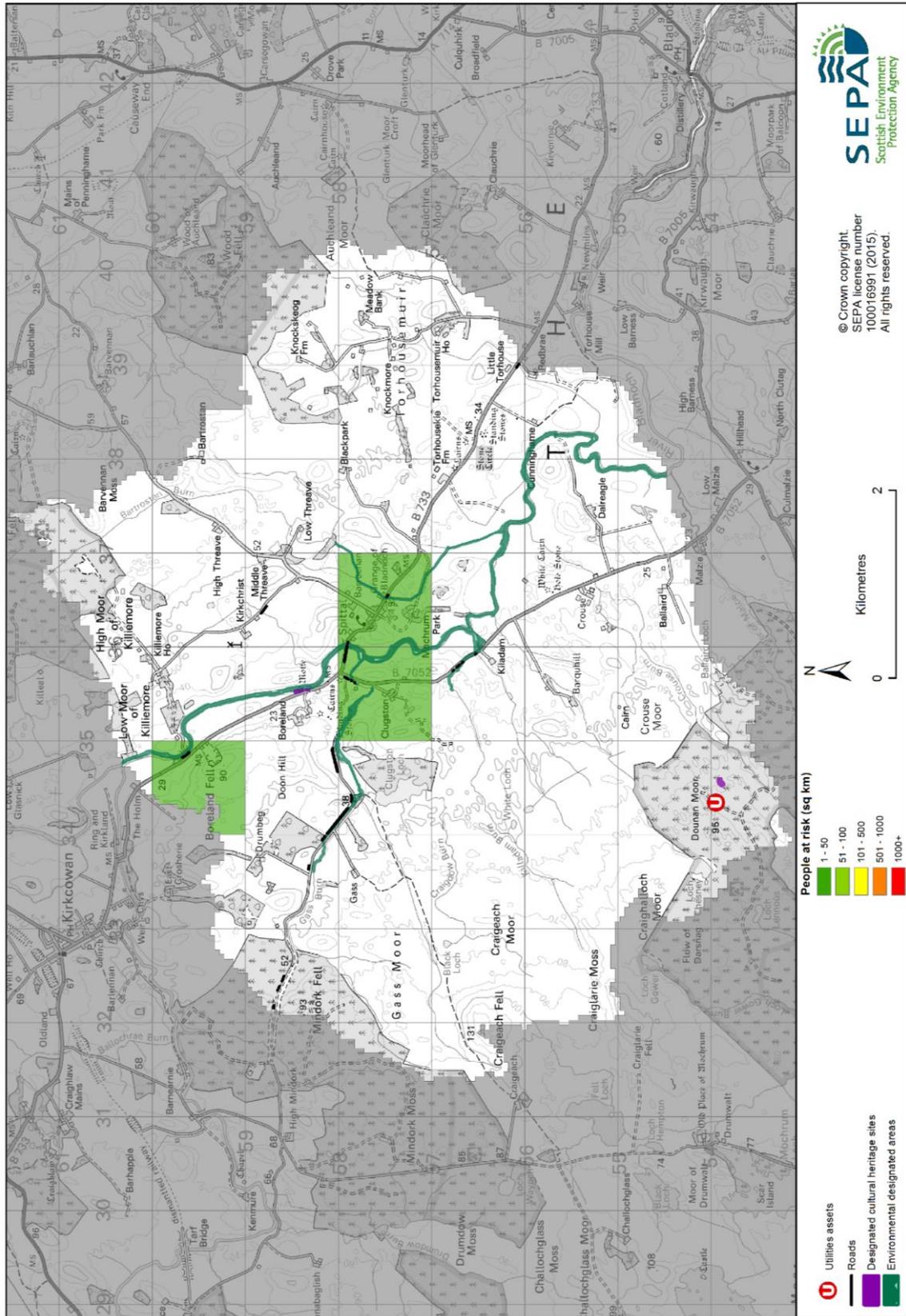


**Figure 2:** Damages by flood likelihood

## History of flooding

River flooding was reported in August 2002 and 2004, without major impact to properties. Surface water floods were reported in 2006 and December 2008, this flooding was located along the B733 without significant impacts.

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/16

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Spittal Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £26,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £26,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/16

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Spittal Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<i>Strategic mapping and modelling</i>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with communities and promote Floodline using most the appropriate mix of methods for the area. These could include direct mailings, education activities, participation in local events and relevant flooding messages in the media.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

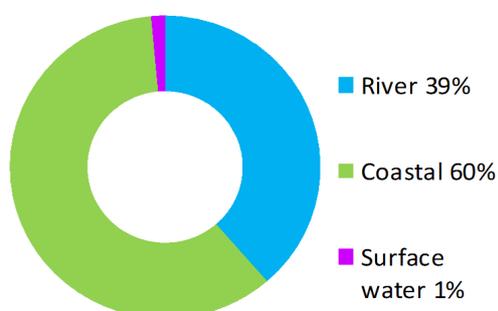
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Creetown (Potentially Vulnerable Area 14/17)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Moneypool Burn

### Summary of flooding impacts



#### At risk of flooding

- 90 residential properties
- 20 non-residential properties
- £340,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

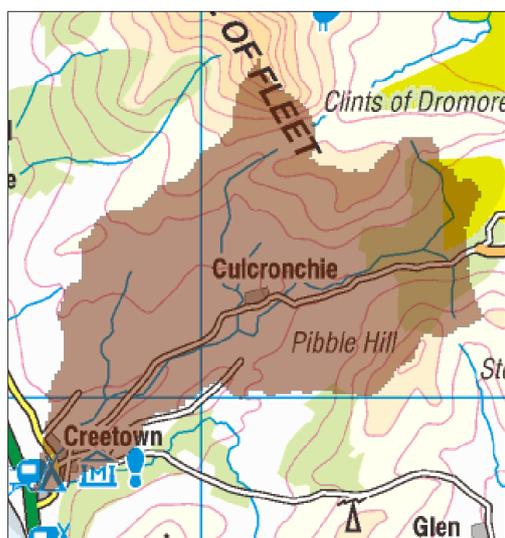
Actions

## Creetown (Potentially Vulnerable Area 14/17)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Moneypool Burn

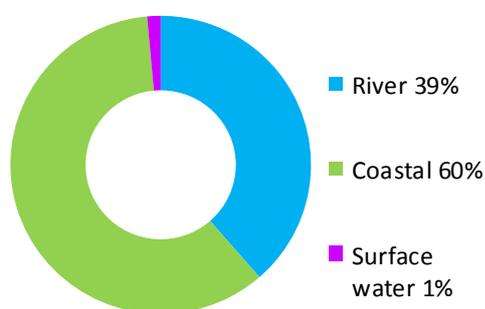
### Background

This Potentially Vulnerable Area is located in the west of the Solway Local Plan District and incorporates the town of Creetown (shown below). It is approximately 30km<sup>2</sup>.



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There are approximately 90 residential properties and 20 non-residential properties at risk of flooding. The Annual Average Damages are approximately £340,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

There is a risk of coastal flooding in the south west of the area where the Balloch Burn and the Moneypool Burn converge to form the Ferry Burn in Creetown. The Ferry Burn subsequently discharges to the River Cree, which is tidal at this location. Coastal flooding is predicted to affect a number of residential and non-residential in the vicinity of Mill Street, Harbour Street, Norris Street and Silver Street.

River flooding is mostly attributed to the Moneypool Burn and the Balloch Burn. In rural reaches of these watercourses flooding is restricted to a relatively narrow corridor of mainly agricultural land or woodland and a 1km stretch of Chain Road. Within the lower reaches in the urban area of Creetown, a number of residential and non-residential properties are at risk of river flooding.

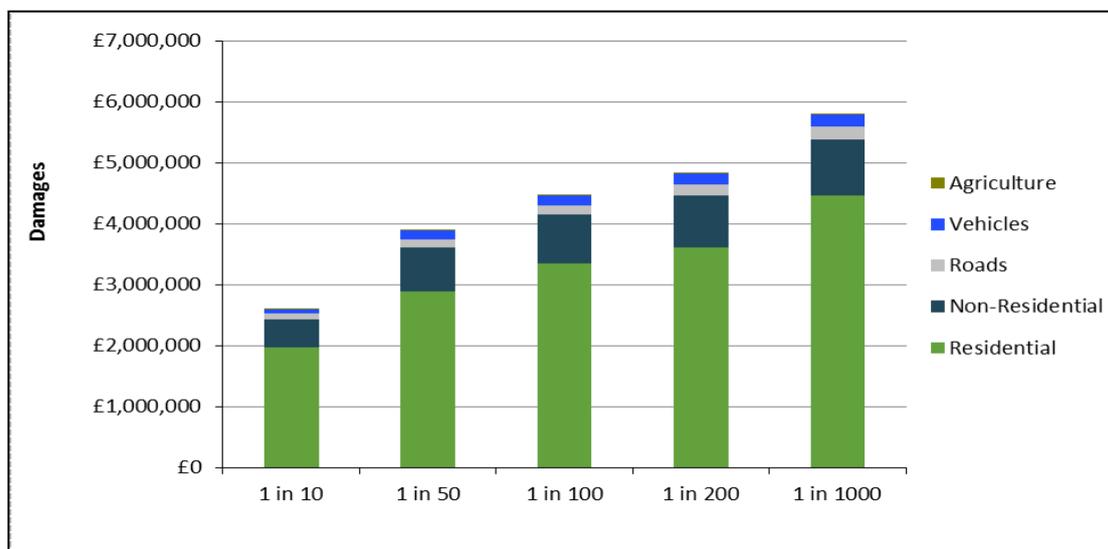
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 90 to 130 and the number of non-residential properties from approximately 20 to 30.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. The figure shows almost all impacts are predicted in Creetown. People, non-residential properties and roads are shown to be at risk.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by coastal and river flooding experience the highest economic impact at approximately 80% of the damages. Non-residential properties also provide a notable portion of the damages. The location of the impacts of flooding is shown in Figure 3.

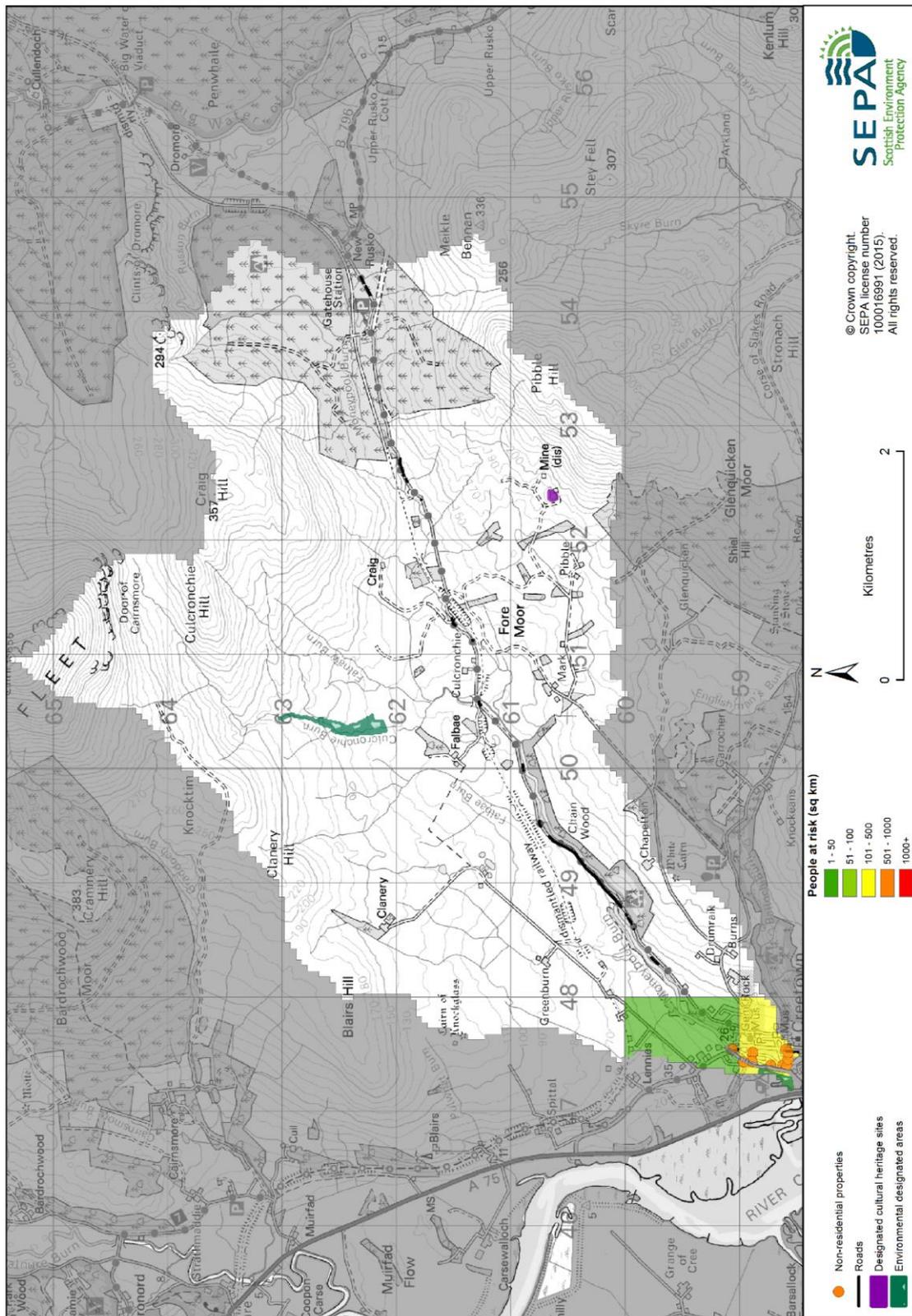
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 300)	50	90	120
Non-residential properties (total 30)	<10	20	20
People	120	200	250
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	0.9	1.2	1.3
Environmental designated areas (km <sup>2</sup> )	<0.1	<0.1	<0.1
Designated cultural heritage sites	1	1	1
Agricultural land (km <sup>2</sup> )	0.3	0.4	0.4

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

### History of flooding

There has been little flooding reported within this area. However, coastal flooding did occur on 3 January 2014 and affected five properties. Flash flooding in Creetown occurred on July 2015 impacting properties.

## Objectives to manage flooding in Potentially Vulnerable Area 14/17

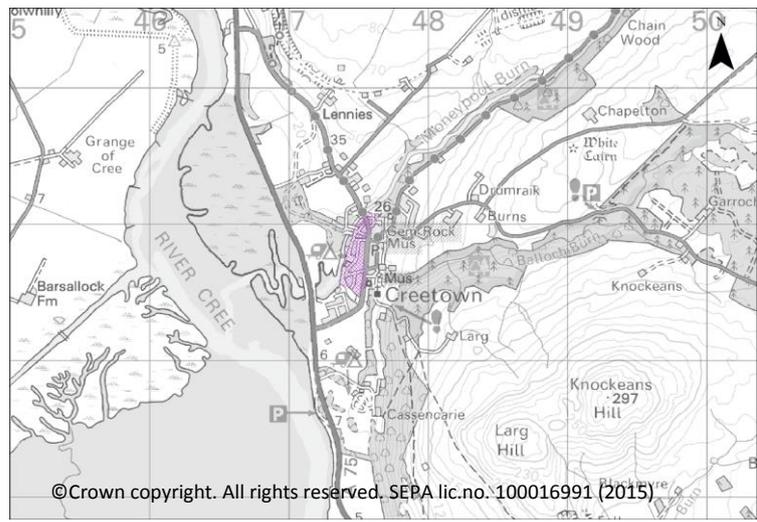
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Creetown Potentially Vulnerable Area.

### Reduce the risk of river and coastal flooding to residential properties in Creetown

Indicators:

- 90 residential properties
- £270,000 Annual Average Damages

Target area:



Objective ID: 14023

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 90 residential properties</li> <li>• £340,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 90 residential properties</li> <li>• £340,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/17

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Creetown Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of river and coastal flooding to residential properties in Creetown (14023)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:		Within local authority:
	<b>1 of 168</b>		<b>1 of 10</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.
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<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140230005)</b>		
<b>Objective (ID):</b>	Reduce the risk of river and coastal flooding to residential properties in Creetown (14023)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National: <b>96 of 168</b>	Within local authority: <b>8 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further investigate the feasibility of a flood protection scheme in Creetown. The study will focus on the benefit of flood defences on the Moneypool and Balloch Burns and the role of natural flood management actions for reducing runoff flow into the rivers. This study should take account of the interaction of the Moneypool and Balloch Burns with the tidal River Cree. Other actions may also be considered to select the most sustainable combination of actions.</p> <p>The Solway coastal study may also provide information which will feed into this study.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	The flood protection study should consider how to reduce flood risk to 82 residential properties and 15 non-residential properties in this location, with potential damages avoided of up to £3.4 million. The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. In this location, it has been estimated that 29 residential and non-residential properties could potentially benefit from natural flood management actions.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. There are no international or national level environmental designations that are likely to be impacted by this action. Direct defences can, however, cause some or all of the floodplain to be disconnected from the river, which can lead to a reduction in water quality and a loss of carbon storage. There is the potential for local negative impacts on		

**Environmental:** morphology and sediment dynamics which in turn may impact fish through increased sediment load.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Inner Wigtown Bay flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

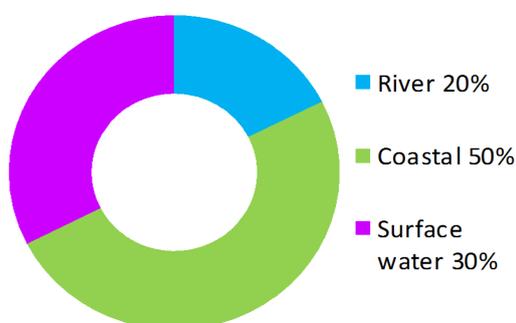
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Gatehouse of Fleet (Potentially Vulnerable Area 14/18)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Water of Fleet

### Summary of flooding impacts



#### At risk of flooding

- <10 residential properties
- <10 non-residential properties
- £19,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

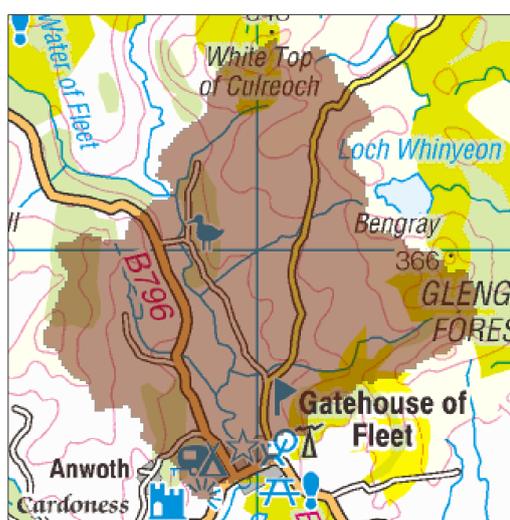
Actions

## Gatehouse of Fleet (Potentially Vulnerable Area 14/18)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Water of Fleet

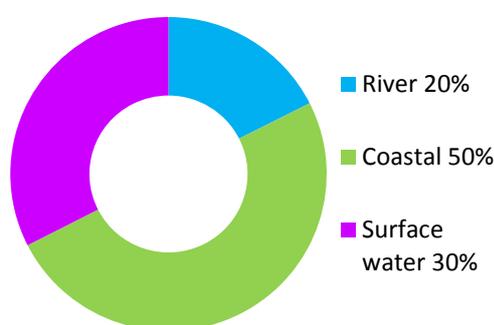
### Background

This Potentially Vulnerable Area is located in the west of the Solway Local Plan District and incorporates the town of Gatehouse of Fleet (shown below). It is approximately 30km<sup>2</sup>.



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There are fewer than 10 residential properties and non-residential properties at risk of flooding. The Annual Average Damages are approximately £19,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

This area is within the Water of Fleet catchment. The Big Water of Fleet and the Little Water of Fleet converge to become the Water of Fleet, which then flows south and discharges at Wigtown Bay. The majority of the catchment is rural and consists of rough grazing, moorland and forestry.

River flooding is primarily attributed to the Water of Fleet, although the impact of this is mostly on short sections of roads and small areas of agricultural land. The Water of Fleet has a tidal effect in the area which is predicted to cause flooding in Gatehouse of Fleet to residential and non-residential properties. There are known issues of surface water and river flooding interaction at the Mill Pond and Mill Lade to the east of the town.

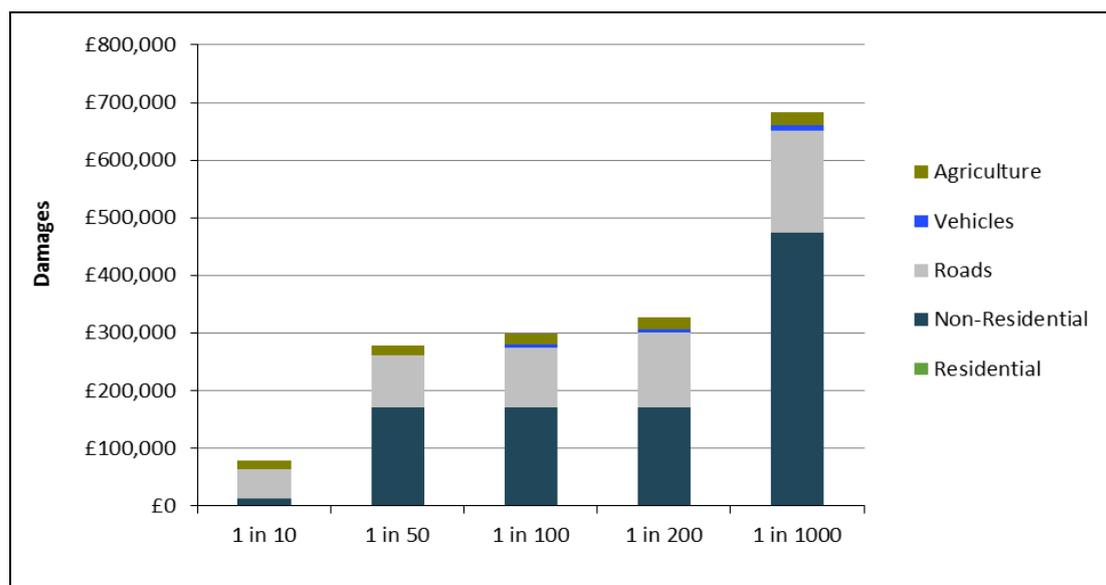
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. Non-residential properties affected by coastal flooding experience the highest economic impact at approximately 45% of the damages. Flooding of road

infrastructure also provides a notable portion of the economic damages. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 490)	<10	<10	<10
Non-residential properties (total 60)	<10	<10	10
People	<10	<10	<10
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	0.6	1.0	1.3
Transport links - rail (km)	0	0	0
Environmental designated areas (km <sup>2</sup> )	<0.1	<0.1	<0.1
Designated cultural heritage sites	2	2	3
Agricultural land (km <sup>2</sup> )	0.7	1.0	1.1

**Table 1:** Summary of flood impacts<sup>1</sup>

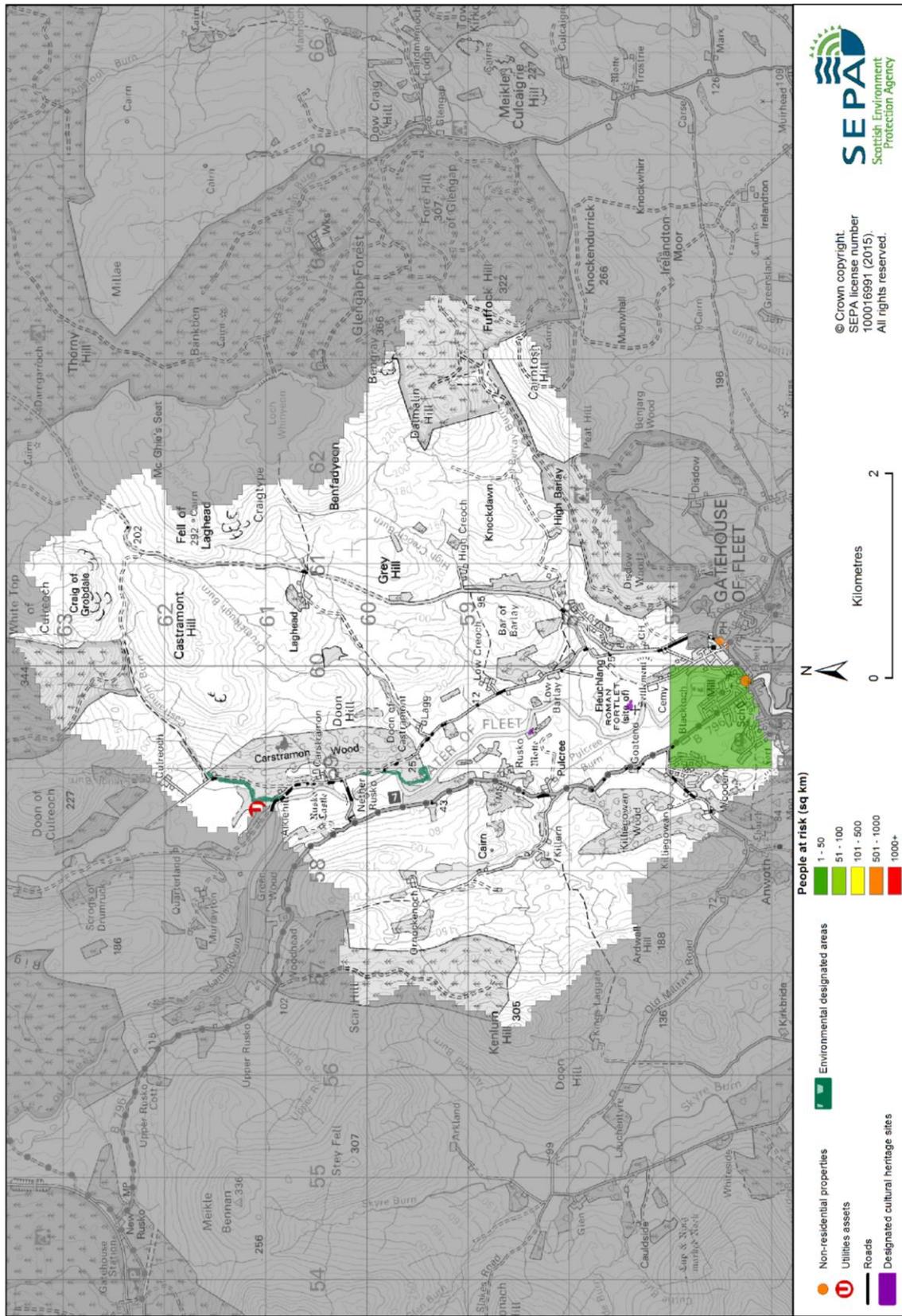


**Figure 2:** Damages by flood likelihood

## History of flooding

The majority of floods recorded in this area are due to river flooding. Localised flooding in the town of Gatehouse of Fleet was reported in 2002, 2003 and 2008 although there were limited impacts on the surrounding area. There are records of flooding associated with the Mill Pond and Mill Lade.

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/18

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Gatehouse of Fleet Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £19,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £19,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/18

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Gatehouse of Fleet Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Fleet Bay flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Fleet Bay coastal flood warning area This will be achieved through direct mailing for flood warning areas and education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

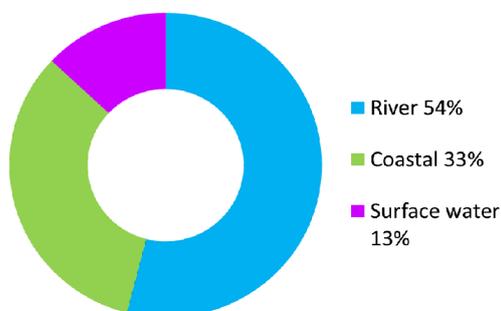
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Dalbeattie (Potentially Vulnerable Area 14/19)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirkgunzeon Lane catchment, Dalbeattie to Needles Eye

### Summary of flooding impacts



### At risk of flooding

- 280 residential properties
- 80 non-residential properties
- £570,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<b>Maintain flood warning</b>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

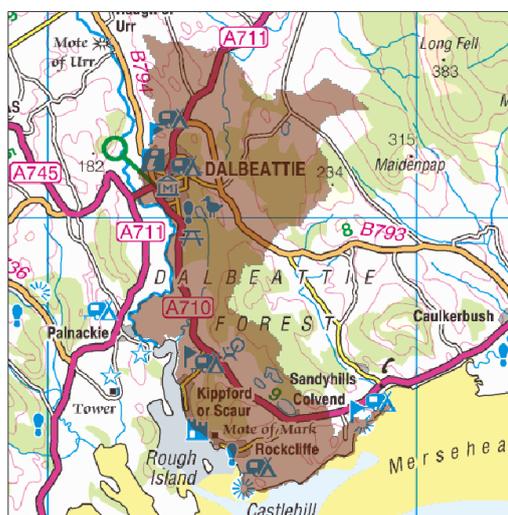
Actions

## Dalbeattie (Potentially Vulnerable Area 14/19)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirkgunzeon Lane catchment, Dalbeattie to Needles Eye

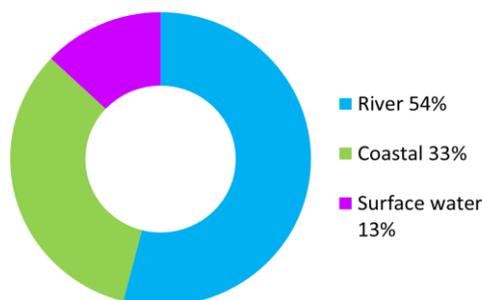
### Background

This Potentially Vulnerable Area is located on the south coast of the Solway Local Plan District and incorporates the town of Dalbeattie (shown below). It is approximately 40km<sup>2</sup>.



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There are approximately 280 residential properties and 80 non-residential properties at risk of flooding. The Annual Average Damages are approximately £570,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

River flooding in this area is primarily attributed to the Kirkgunzeon Lane, which flows to Maidenholm where it turns west towards Dalbeattie. This river may cause flooding to residential properties, non-residential properties, roads (notably sections of the A710 and A711), utilities and agricultural land around Maidenholm. These predicted impacts are supported by historical flood reports from Dalbeattie. Areas of notable flood risk in Dalbeattie include High Street, the port area, and along the Mill Burn and Little Burn. The national flood mapping for Dalbeattie does not fully represent the flood defences in the area.

The main coastal risk within this Potentially Vulnerable Area is from the Urr Water, which flows along the western boundary of the Potentially Vulnerable Area from Dalbeattie to the Solway Firth, and is tidal over this entire reach. There is also potential for interaction with river flooding in this location. Coastal flooding is predicted to affect a number of properties and a short section of the road network in Dalbeattie and Kippford.

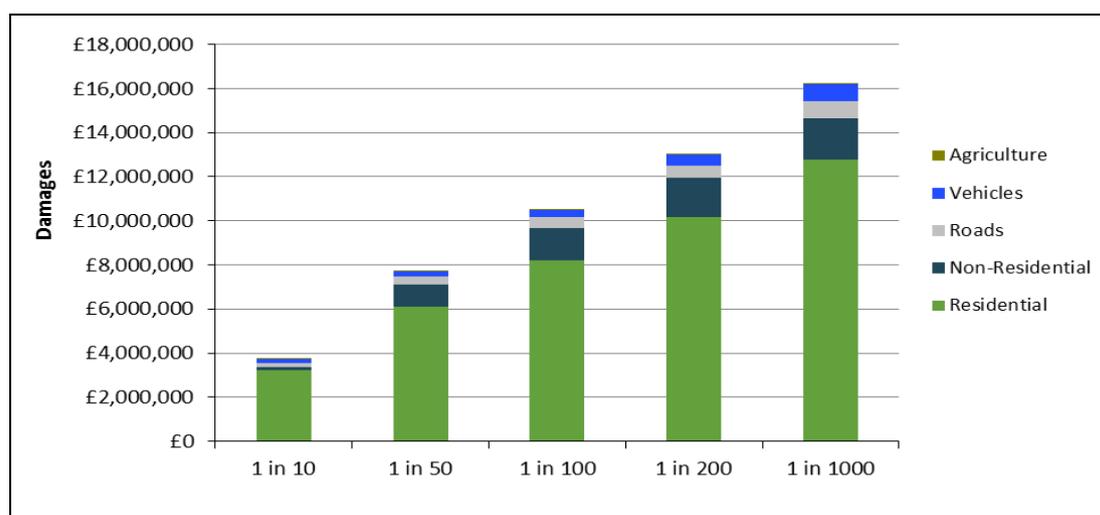
Surface water flooding is more prevalent in the northern half of the area. However, there are small pockets of surface water flooding within Dalbeattie which may impact on properties, utilities and roads.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 290 to 420 and the number of non-residential properties from approximately 80 to 90.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Impacts are primarily within Dalbeattie, with a concentration of residential and non-residential properties at risk, although properties and roads may be impacted in some other locations. The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 60% of the damages followed by non-residential properties. The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 2,600)	200	280	320
Non-residential properties (total 240)	50	80	50
People	440	640	710
Community facilities	0	0	0
Utilities assets	<10	10	10
Transport links - roads (km)	1.8	3.5	4.0
Transport links - rail (km)	0	0	0
Environmental designated areas (km <sup>2</sup> )	0	0	<0.1
Designated cultural heritage sites	2	2	2
Agricultural land (km <sup>2</sup> )	2.0	2.5	2.6

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

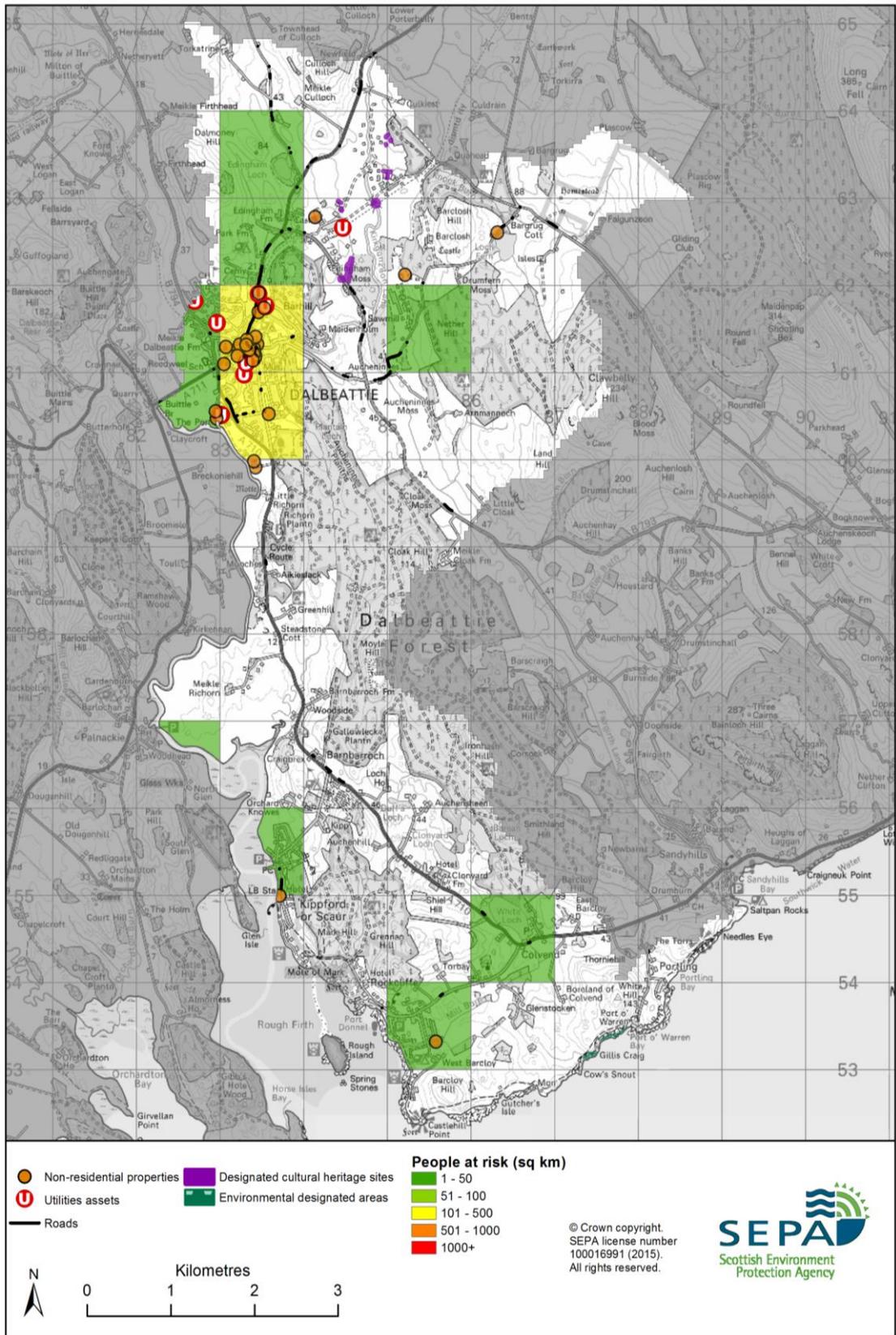


Figure 3: Impacts of flooding

## History of flooding

Areas that affected by flooding in this area include Kippford and Dalbeattie, with flooding from different sources reported every year since 2002. The most significant floods in the area occurred in Dalbeattie. Flooding on 31 October 1977 caused major disruption to gas supplies for two days and significant damage to a footbridge. Flooding in 1982 saw the Urr Water reach its highest levels since records began in 1964. River flooding and surface water flooding was record in Dalbeattie in 2002, 2003, 2004, 2005 and 2008. These floods affected roads and properties.

Parts of the seafront have been affected by tidal surges from the Solway Firth, specifically Airieland, Rockcliffe Village and Foreshore Road. Kippford has also suffered damage from coastal surges, the most recent occurring in January 2014.

## Objectives to manage flooding in Potentially Vulnerable Area 14/19

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Dalbeattie Potentially Vulnerable Area.

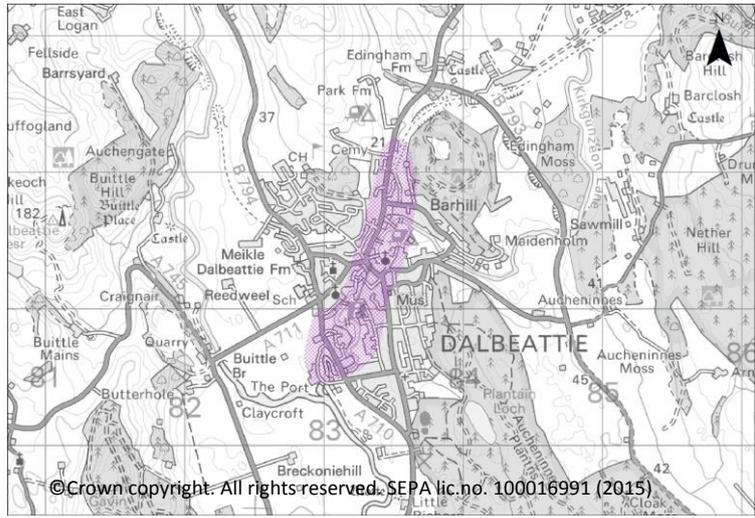
### Reduce the risk of river flooding to residential and non-residential properties in Dalbeattie

Indicators:

- 220 residential properties
- 60 non-residential properties
- £600,000 Annual Average Damages

Objective ID: 14025

Target area:



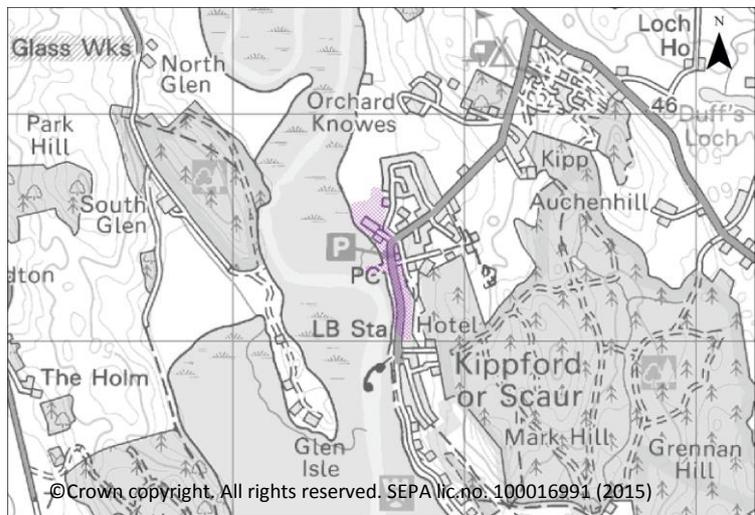
### Reduce the risk of coastal flooding to residential properties between Dalbeattie and Kippford

Indicators:

- <10 residential properties
- £12,000 Annual Average Damages

Objective ID: 14026

Target area:



Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 280 residential properties</li> <li>• £570,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 280 residential properties</li> <li>• £570,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/19

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Dalbeattie Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (140400010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>post 2021</b>
<b>Description:</b>	The area under consideration includes properties in Dalbeattie affected by flooding from Kirkgunzeon Lane/Barr Burn. Further feasibility assessment will be required to assess the potential for delivery and subsequent to that appropriate timescales for delivery can be determined.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential properties between Dalbeattie and Kippford (14026)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>1 of 168</b>	<b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to		

	<p>other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>
Potential impacts	
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140250005)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to residential and non-residential properties in Dalbeattie (14025)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>25 of 168</b>	<b>2 of 10</b>	
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further investigate the standard of protection of the current defences in Dalbeattie along with the current and future level of risk in the town. If a review of the risk identifies future work is required now or in the future, the study should examine the feasibility of a enhancing the flood protection scheme, focusing on improvement to the conveyance of the Kirkgunzeon Lane watercourse, and the improvement of direct flood defences on the Kirkgunzeon Lane.</p> <p>This study should also consider the role natural flood management actions can have to reduce runoff and slow water within the river. Other actions may also be considered to select the most sustainable combination of actions.</p>		
Potential impacts			
<b>Economic:</b>	The flood protection study should consider how to reduce flood risk to 146 residential properties and 49 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £14 million.		

<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection study area. In addition there are three utilities which have been identified as potentially benefitting from this action. There may be changes in visual amenity and land use as a result of this action.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. This study is proposed for the river Kirkgunzeon Lane (water body ID 10589). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There are no international or national level environmental designations that are likely to be impacted by this action. Downstream of these works there may be slight negative impacts on water quality through increased erosion and sedimentation on the Kirkgunzeon Burn and the Rough Estuary. There is likely to be a temporary loss of habitat and displacement of species where constrictions are removed.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140260005)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential properties between Dalbeattie and Kippford (14026)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>146 of 168</b>	<b>9 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	Initial assessment to refine knowledge of coastal flooding issues is to be made within the Solway coastal study. Depending on the outcomes from this study further work may be required to mitigate flooding impacts to roads and properties in the area.		
<b>Potential impacts</b>			
<b>Economic:</b>	There are four residential properties at risk of flooding in this location, with potential damages avoided of up to £640,000.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.</p> <p>SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km<sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.</p>		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.</p>		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140250017)</b>		
<b>Objective (ID):</b>	Reduce the risk of river flooding to residential and non-residential properties in Dalbeattie (14025)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Dalbeattie Flood Protection Scheme was completed in 1981 and consisted of flood banks, flood walls, and channel improvements to Kirkgunzeon Lane, Dalbeattie Burn and Drumjohn Burn. Maintenance should be continued. The level of protection provided by these defences may decrease due to the impact of climate change.</p>		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Rough Firth and Southernness Point flood warning areas which are part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Rough Firth and Southerness Point coastal flood warning areas. This will be achieved through direct mailing for new flood warning areas and education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

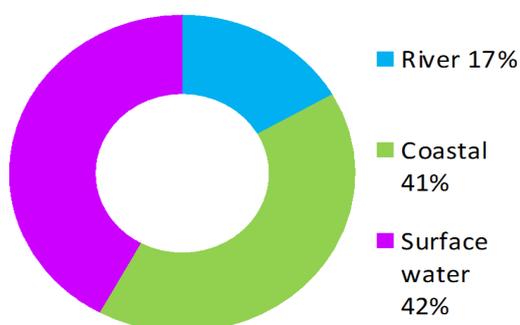
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Palnackie (Potentially Vulnerable Area 14/20)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Palnackie coastal

### Summary of flooding impacts



#### At risk of flooding

- <10 residential properties
- £3,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

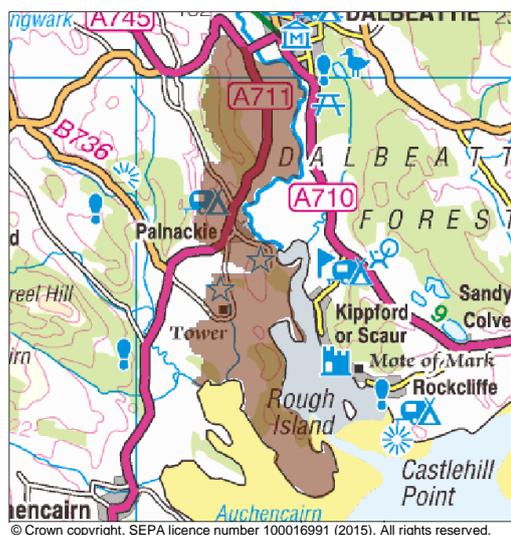
Actions

## Palnackie (Potentially Vulnerable Area 14/20)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Palnackie coastal

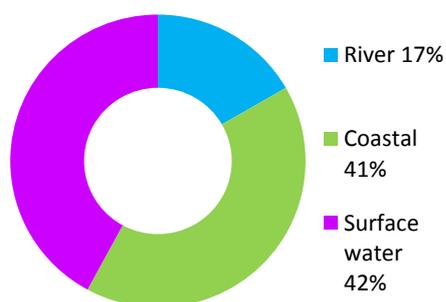
### Background

This Potentially Vulnerable Area is located on the south coast of the Solway Local Plan District and incorporates the village of Palnackie (shown below). It is approximately 10km<sup>2</sup>.



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There are fewer than 10 residential properties at risk of flooding. The Annual Average Damages are approximately £3,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

This Potentially Vulnerable Area was originally designated due to frequent reports of flooding, however, actions were taken in 2005 to mitigate these issues and there are now fewer than 10 residential properties at risk of flooding.

The village of Palnackie is the only settlement within this Potentially Vulnerable Area. The village is at the centre of this narrow area and is mainly surrounded by areas of agriculture and forestry, with some areas of rough grazing. The Urr Water runs along the eastern boundary. Potterland Lane discharges to Orchardton Bay to the south west of the area. The Orchardton Burn flows within the southern half and discharges to the Orchardton Bay.

In Palnackie in 2004 and 2005 a stone lade was replaced along an alternate route within the road boundary, with a new culvert and new outlet. A new surface water pipe was installed in 2005 in Port Road as the existing culverted watercourse lacked capacity and proved problematic with regard to maintenance.

The area has an extensive frontage onto the Solway Firth, while the eastern boundary runs along the line of the Urr Water, which is tidal over this entire reach. Coastal and river flooding is predicted to affect agricultural land along the eastern boundary and to the north of Orchardton Bay.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Small areas of designated environmental sites of approximately 1km<sup>2</sup> are at risk of flooding.

The damages associated with floods of different likelihood are shown in Figure 2. Surface water damages may be under-represented in Figure 2 due to limitations in the available modelling output. Almost all of the damages in the area come from damage to agricultural land.

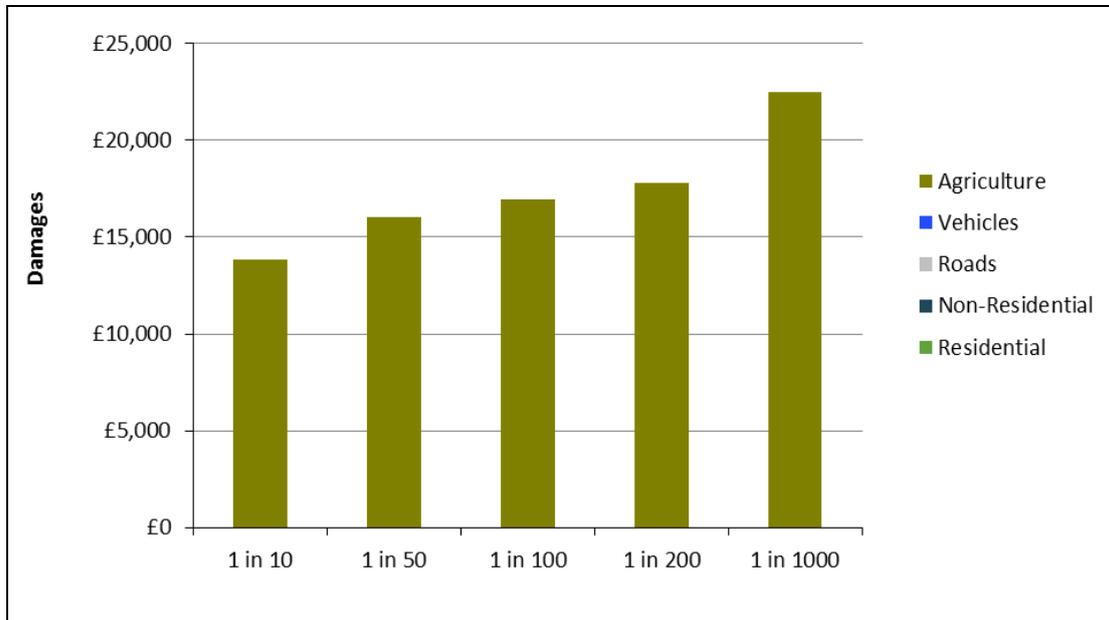
The location of the impacts of flooding is shown in Figure 3.

### **History of flooding**

The majority of records relate to river flooding in the Palnackie area between 2004 and 2005, affecting residential properties. Since the installation of the culvert replacement in 2005, there has been one report of flooding, in 2008.

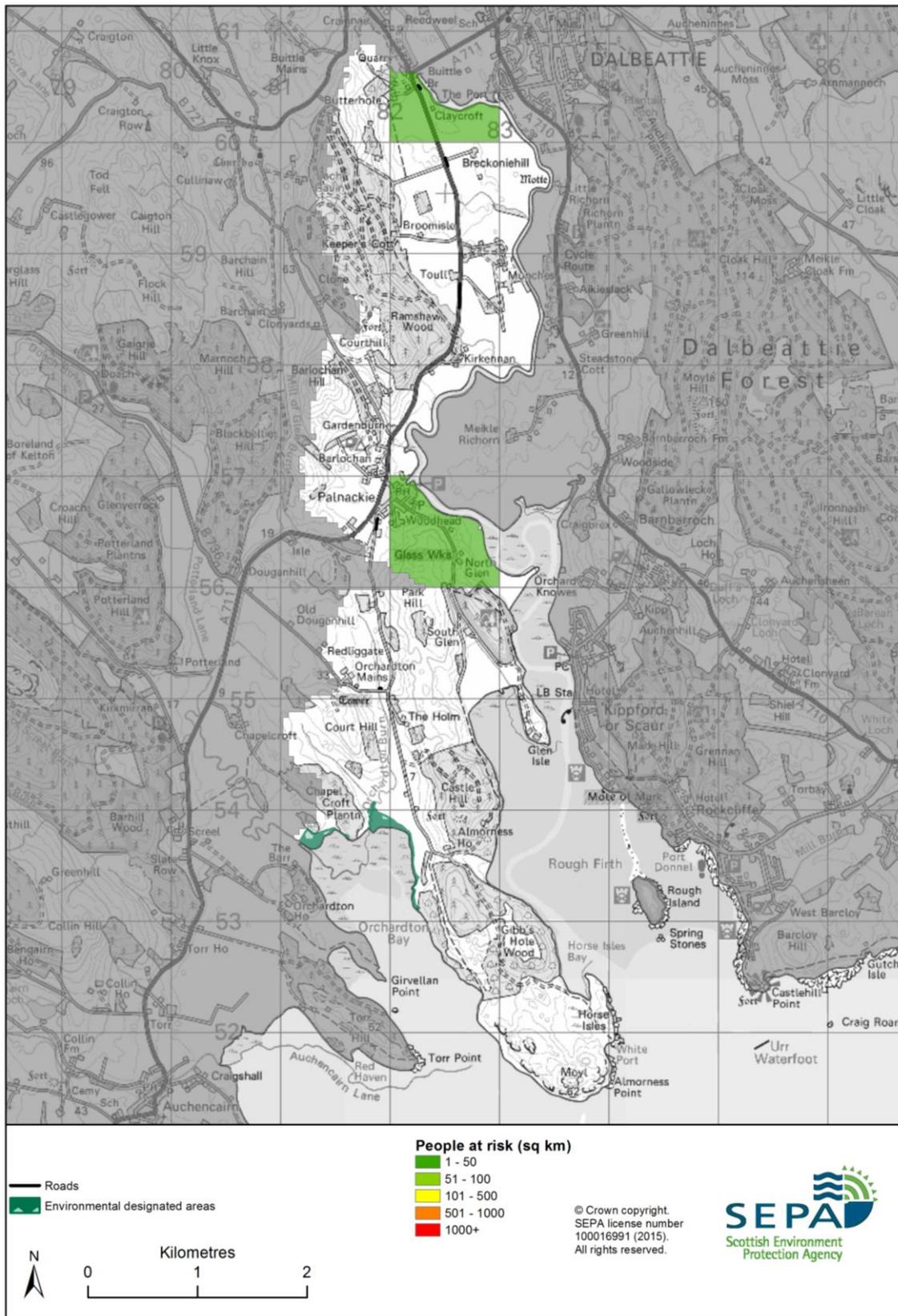
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 120)	<10	<10	<10
Non-residential properties (total 20)	<10	<10	<10
People	<10	<10	<10
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	0.3	0.4	0.5
Transport links - rail (km)	0	0	0
Environmental designated areas (km <sup>2</sup> )	1.0	1.0	<0.1
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	0.9	1.2	1.0

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## Objectives to manage flooding in Potentially Vulnerable Area 14/20

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Palnackie Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £3,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £3,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/20

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Palnackie Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.</p> <p>SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km<sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.</p>		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140400017)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Palnackie flood defences. The Palnackie flood protection works were constructed on behalf of Dumfries and Galloway Council in 2004 and involved replacing a stone lade with a culvert and new outlet.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Rough Firth flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

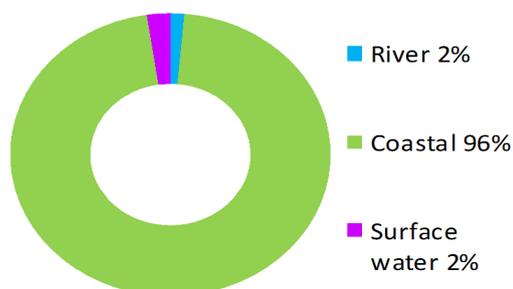
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Southernness and Carsethorn (Potentially Vulnerable Area 14/21)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Southernness coastal

### Summary of flooding impacts



### At risk of flooding

- 50 residential properties
- <10 non-residential properties
- £210,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

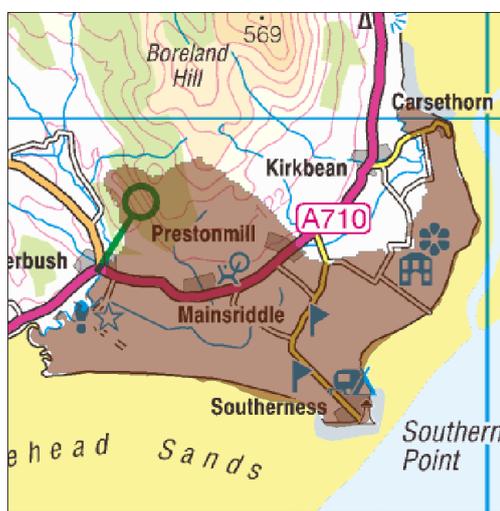
Actions

## Southernness and Carsethorn (Potentially Vulnerable Area 14/21)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Southernness coastal

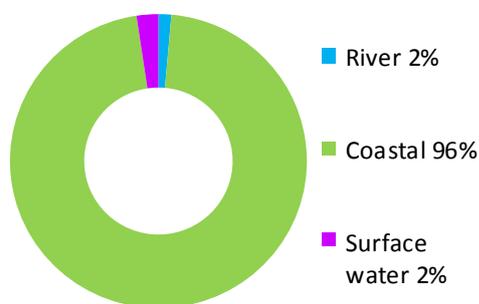
### Background

This Potentially Vulnerable Area is located on the south coast of the Solway Local Plan District and incorporates the village of Southernness (shown below). It is approximately 20km<sup>2</sup>.



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There are approximately 50 residential properties at risk of flooding. The Annual Average Damages are approximately £210,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

There are a number of small settlements including Carsethorn, Southernness and Mainsriddle within this Potentially Vulnerable Area. The Southwick Burn flows south along the western edge of the area and discharges to the Solway Firth at Mersehead, while the Prestonmill Burn flows east to the north of the area and discharges to the Solway Firth at Carsethorn. The lower reaches of the Southwick Burn and Prestonmill Burn are tidal.

Coastal flooding may inundate a large area in the west, bound on two sides by the Southwick Burn and the Solway Firth. Residential properties will be affected in Southernness and Carsethorn; this is supported by historical reports of wave overtopping in Southernness and tidal/drainage issues in Carsethorn.

River flooding within this Potentially Vulnerable Area is concentrated in the west and is primarily attributed to the Southwick Burn. Flooding affects a large area of mainly agricultural land and a network of existing drainage channels, which drain into the Southwick Burn, may exacerbate the extent of flooding.

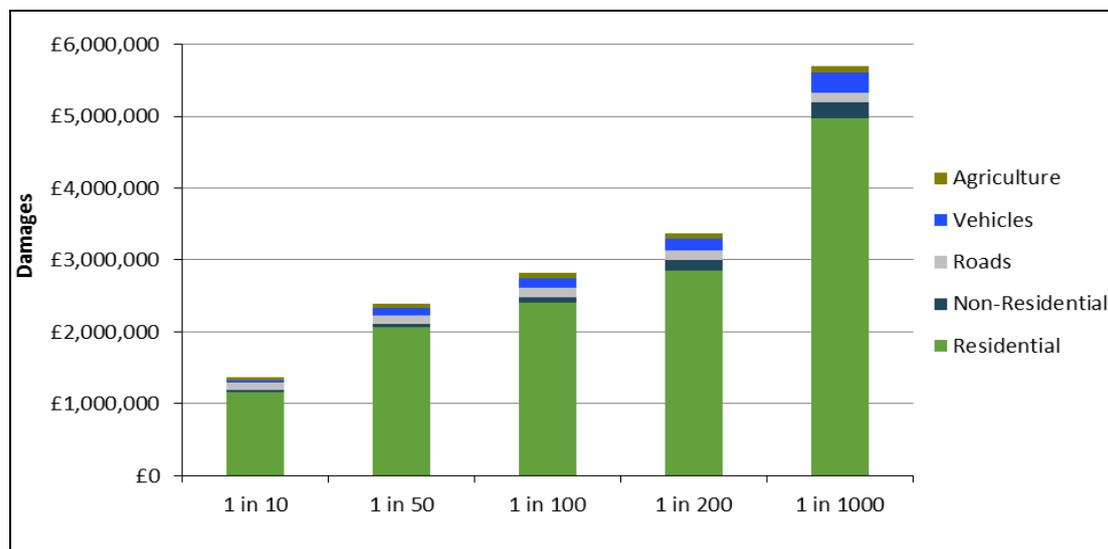
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 50 to 80.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Three designated cultural heritage sites are at risk of flooding, and small areas of environmental importance 4.2km<sup>2</sup> are also at risk.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by coastal flooding experience the greatest economic impact at approximately 85% of the damages. The location of the impacts of flooding is shown in Figure 3. It shows that there is some flooding to properties in the Southerness, Carsethorn and Mersehead.

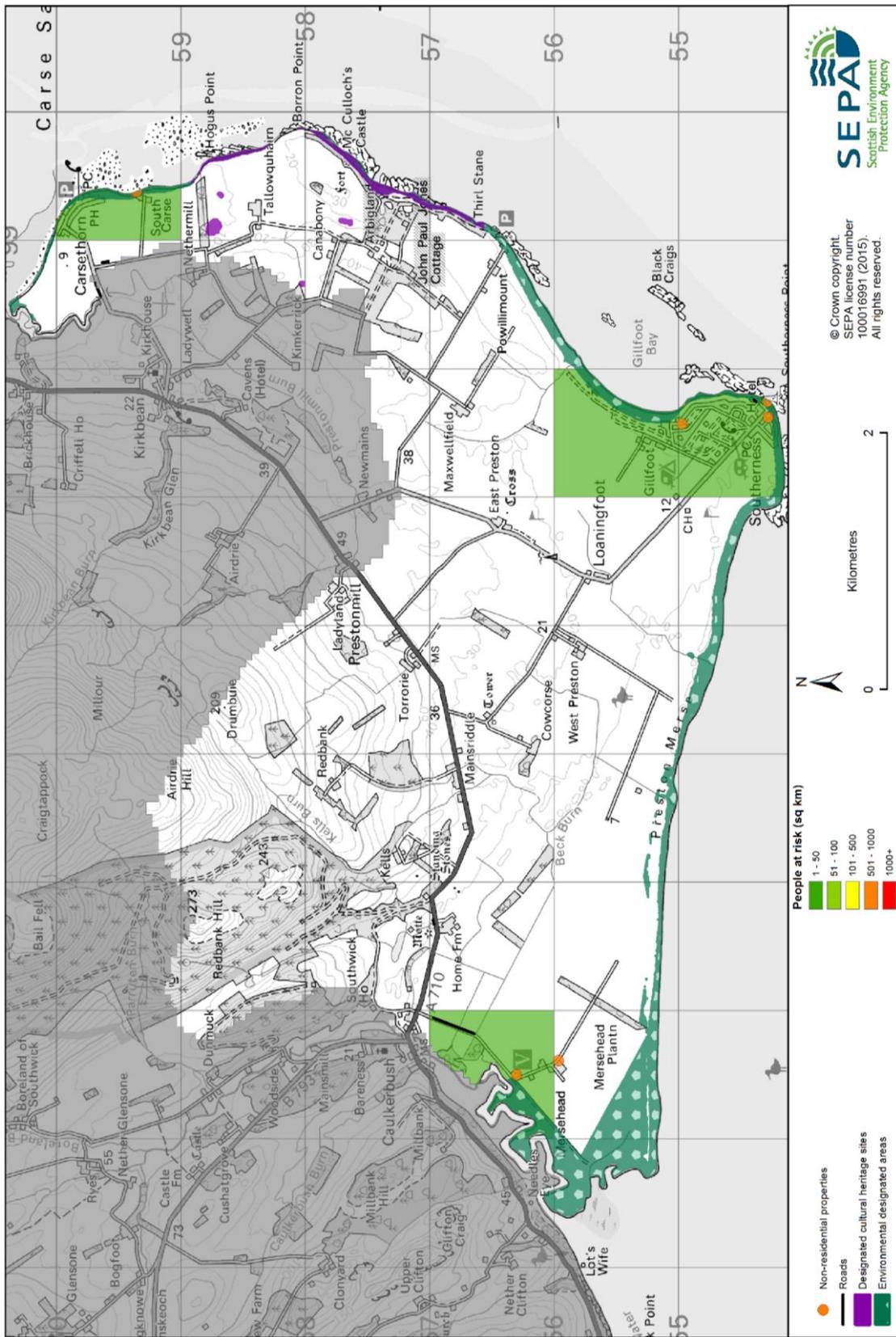
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 260)	20	50	80
Non-residential properties (total 30)	<10	<10	<10
People	40	100	180
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links - roads (km)	0.8	1.0	1.1
Transport links - rail (km)	0	0	0
Environmental designated areas (km <sup>2</sup> )	3.3	4.2	4.6
Designated cultural heritage sites	3	3	3
Agricultural land (km <sup>2</sup> )	2.07	3.8	4.2

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

## History of flooding

The majority of flooding records report a limited impact on people and properties in terms of the numbers affected.

Surface water flooding was reported in 2006 and 2008 along the A710 near Mainsriddle, causing minor flooding of the road and nearby properties.

Tidal surges from the Solway Firth caused flooding of roads, properties and agricultural land at Carsethorn and Southernness in 1886, 1900, 1902, 1967, 1979 and 2014. Approximately 10 residential properties were reported flooded in Southernness on 03 January 2014.

## Objectives to manage flooding in Potentially Vulnerable Area 14/21

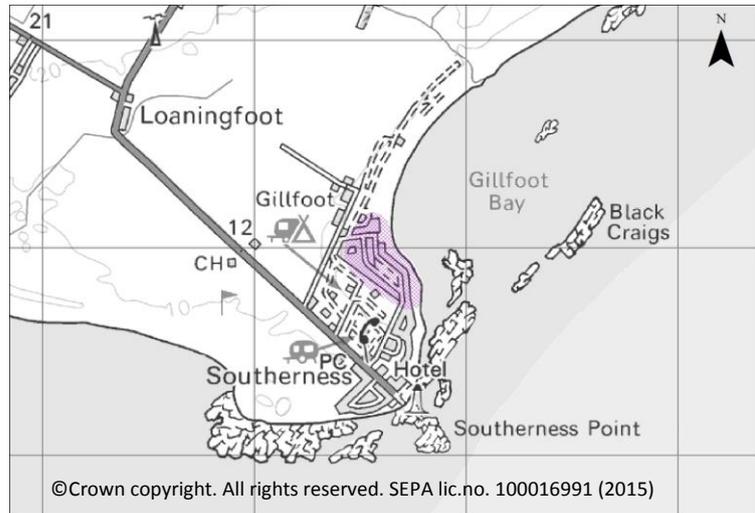
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Southerness and Carsethorn Potentially Vulnerable Area.

### Reduce the risk of coastal flooding to residential properties in Southerness

Indicators:

- 30 residential properties
- £120,000 Annual Average Damages

Target area:



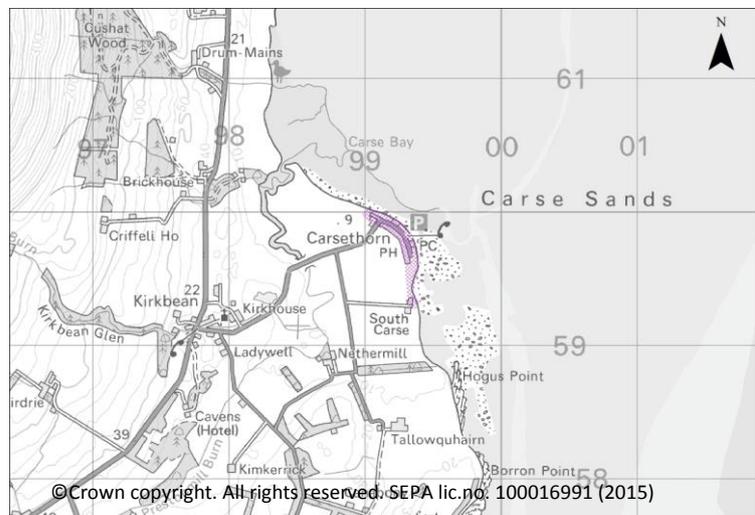
Objective ID: 14028

### Reduce the risk of coastal flooding to residential properties in Carsethorn

Indicators:

- £58,000 Annual Average Damages

Target area:



Objective ID: 14120

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 50 residential properties</li> <li>• £210,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 50 residential properties</li> <li>• £210,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/21

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Southernness and Carsethorn Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential properties in Carsethorn (14120) Reduce the risk of coastal flooding to residential properties in Southernness (14028)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>1 of 168</b>	<b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create		

<b>Social:</b>	opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140280017)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to residential properties in Southernness (14028)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Southernness Flood Protection Scheme was completed in 1983 and consisted of a diversion pipe and field drainage system (pluvial flooding). The standard of protection is not known. Maintenance should be continued. Dumfries and Galloway Council also owns erosion defences of rock armour protecting roads in Carsthorn. There are also privately owned coastal defences in Carsethorn and Southernness including rock armour and stone walls.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Southerness Point flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Southernness Point coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

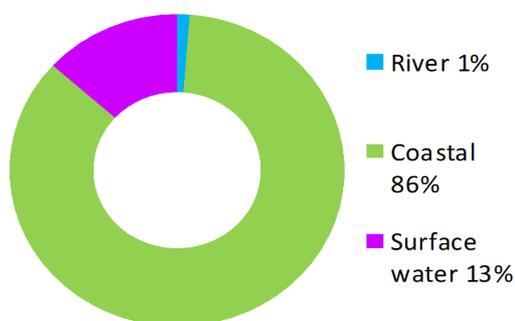
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Kirkcudbright (Potentially Vulnerable Area 14/22)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirkcudbright coastal

### Summary of flooding impacts



### At risk of flooding

- 90 residential properties
- 40 non-residential properties
- £240,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

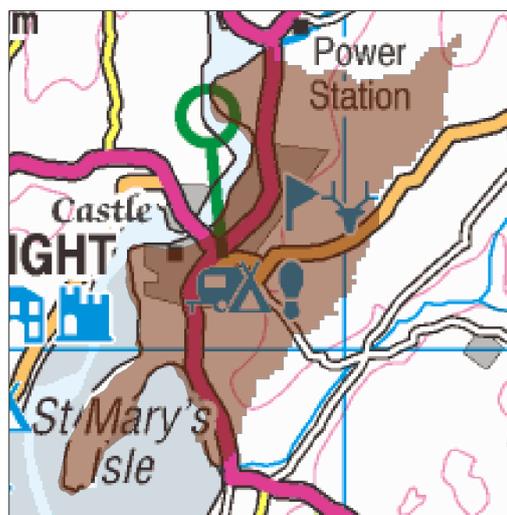
Actions

## Kirkcudbright (Potentially Vulnerable Area 14/22)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Kirkcudbright coastal

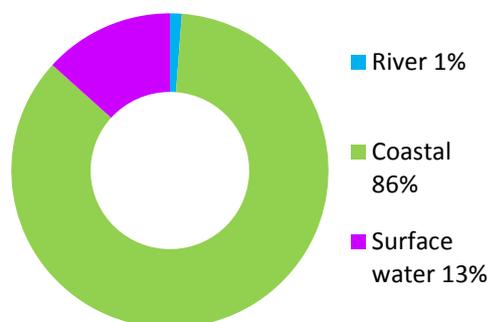
### Background

This Potentially Vulnerable Area is located on the south coast of the Solway Local Plan District and includes the town of Kirkcudbright (shown below). It is approximately 10km<sup>2</sup>.



There are approximately 90 residential properties and 40 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £240,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The main settlement in this Potentially Vulnerable Area is Kirkcudbright, which is situated on the banks of the River Dee. The River Dee is tidal in this area and flows along the western boundary and discharges to Kirkcudbright Bay in the Solway Firth. Coastal flooding is predicted to affect residential properties along the River Dee, transport routes, notably the A711 and A755, and agricultural land to the north of Mutehill. The Buckland Burn/Gribdae Burn flows outwith the Potentially Vulnerable Area in a south westerly direction and discharges into Kirkcudbright Bay at Mutehill, on the southern boundary. There are privately owned coastal defences of rock armour in Doon Bay/Mill Hall.

River flooding within the area is identified along the western boundary and is attributed to the River Dee. The Dee is a managed watercourse and flows may be affected by the storage and release of water by Scottish Power in their operation of the Galloway Hydro Scheme; this is likely to have a positive contribution to managing flood risk within the area. The Mill Burn is known to have previously overflowed onto Millburn Street and onto school grounds.

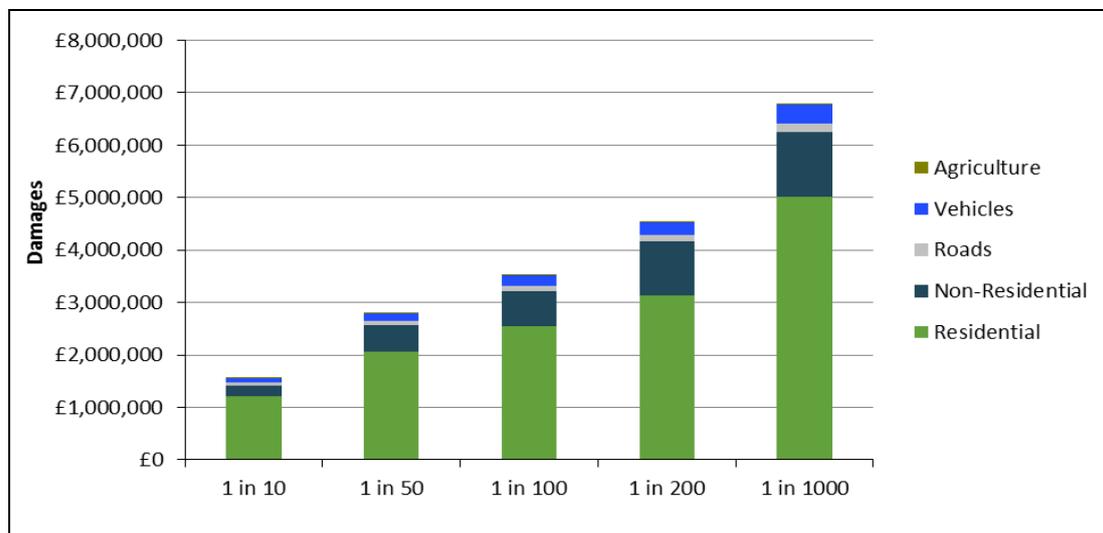
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. Most of the receptors at risk lie within Kirkcudbright and include properties, utilities and roads; one designated cultural heritage site is also at risk.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 90 to 200 and the number of non-residential properties from approximately 40 to 50.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties experience the highest economic impact (75%) of the damages followed by non-residential properties. The location of the impacts of flooding is shown in Figure 3.

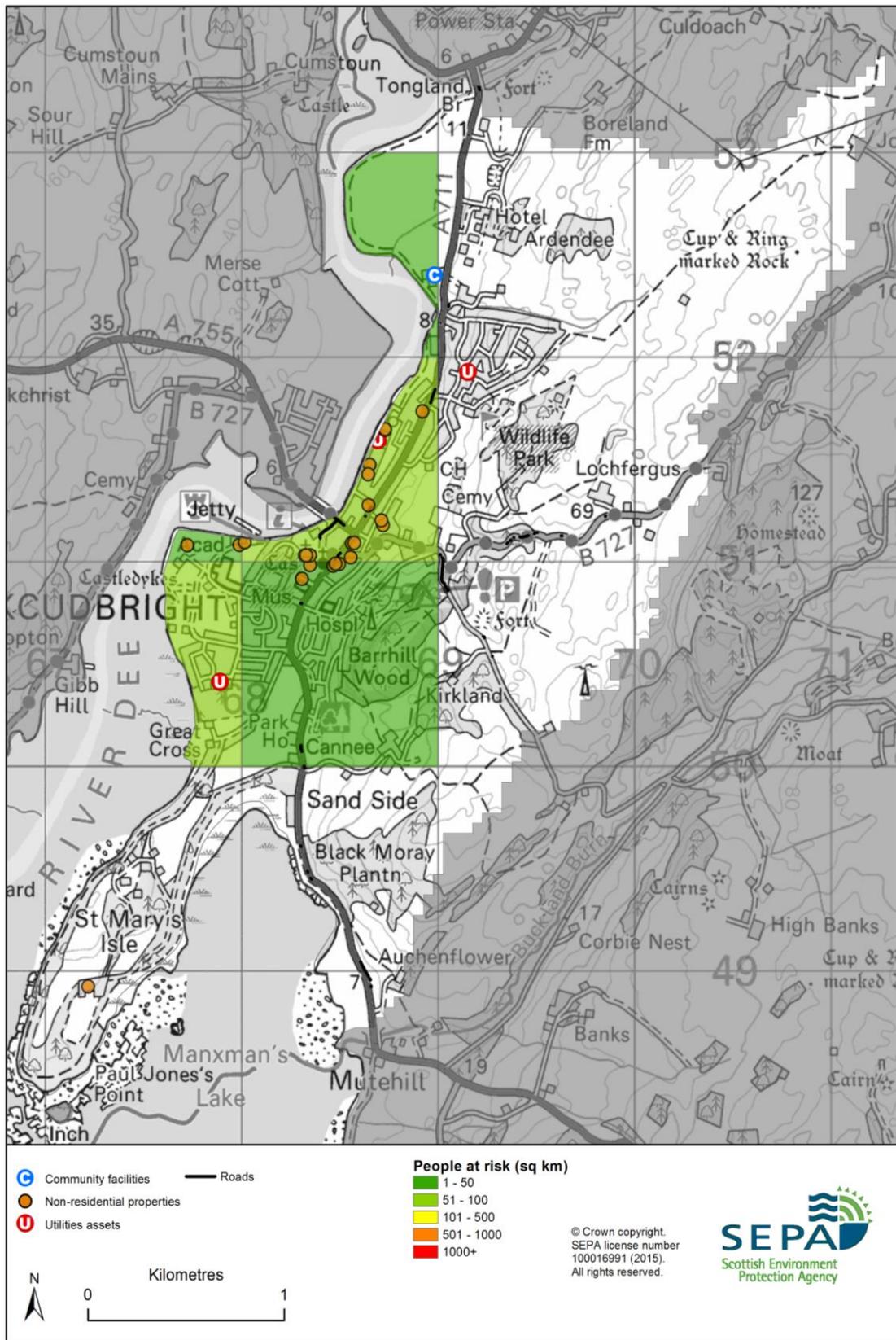
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,600)	40	90	140
Non-residential properties (total 180)	20	40	50
People	100	200	310
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities assets	<10	<10	10
Transport links - roads (km)	0.4	0.8	0.9
Designated cultural heritage sites	1	1	1
Agricultural land (km <sup>2</sup> )	0.3	0.5	0.6

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

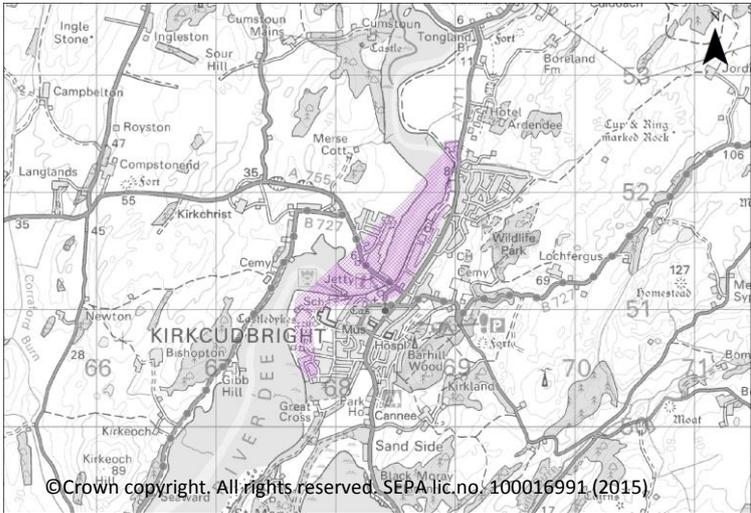
## History of flooding

The majority of reported floods within this area are thought to have occurred due to the drainage system being overwhelmed during some storms. This has caused the A711 trunk road and numerous properties to flood. There have been occasional reports of river and coastal flooding throughout this area.

Coastal flooding was recorded at Janefield on 3 January 2014 when an embankment/bund was overtopped during a storm surge. This also caused flooding in and around the harbour area. The Harbour area regularly floods due to high tides and storm surges but the infrastructure is designed to accommodate these impacts.

## Objectives to manage flooding in Potentially Vulnerable Area 14/22

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Kirkcudbright Potentially Vulnerable Area.

Reduce the risk of coastal flooding to properties in Kirkcudbright	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>90 residential properties</li> <li>20 non-residential properties</li> <li>£200,000 Annual Average Damages</li> </ul>	
Objective ID: 14029	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>90 residential properties</li> <li>£240,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>90 residential properties</li> <li>£240,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/22

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Kirkcudbright Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to properties in Kirkcudbright (14029)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>1 of 168</b>	<b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.
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<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140290005)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to properties in Kirkcudbright (14029)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National: <b>61 of 168</b>	Within local authority: <b>5 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	Initial assessment of coastal flooding and erosion issues will be made within the Solway coastal study ID(141220020). Depending on the identified levels of risk from the Shoreline Management study a further detailed studies may be required to investigate actions which would help to reduce the risk in Kirkcudbright. The study should take into account the interaction of the River Dee with coastal levels downstream, and the Scottish Water hydro scheme upstream. This study should consider how natural flood management actions could help reduce the impact of coastal flooding along with property level protection on its own and in combination with other actions.		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 85 residential properties and 19 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.4 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there are two utilities which have been identified as potentially benefitting from this action.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. There are no international or national level environmental designations that are likely to be impacted by this action, provided the defences are set back from the estuary. There is likely to be a loss of natural mudflat habitat in the footprint and vicinity of the defences, unless they are set back from the estuary. This action has the potential for negative impacts on the setting of numerous heritage buildings, Kirkcudbright Castle Scheduled Monument, Maclellens Castle property in state care and Scheduled Monument, Broughton House garden and designed landscape and Kirkcudbright Heritage Conservation Area.		

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (140400003)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	As part of the wider Galloway Glens Landscape Partnership Scheme, Dumfries and Galloway Council propose to investigate whether Natural Flood Management measures can be utilised on the small tributaries of the Dee to reduce flood risk to settlements in the Dee catchment and provide other ecological and habitat benefits.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Loch Ken and River Dee Marshes Special Protection Area. Sites of Special Scientific Interest are also present in the study area and could be positively or negatively impacted.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Kirkcudbright Bay flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Kirkcudbright Bay coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

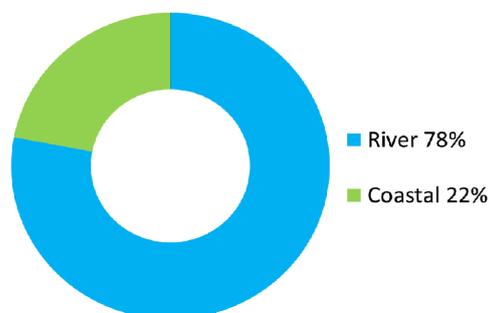
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Braehead and Whauphill (Potentially Vulnerable Area 14/23)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Milldriggan coastal

### Summary of flooding impacts



#### At risk of flooding

- <10 residential properties
- <10 non-residential properties
- £200,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	<i>Strategic mapping and modelling</i>	Flood forecasting	Self help	Maintenance	Planning policies

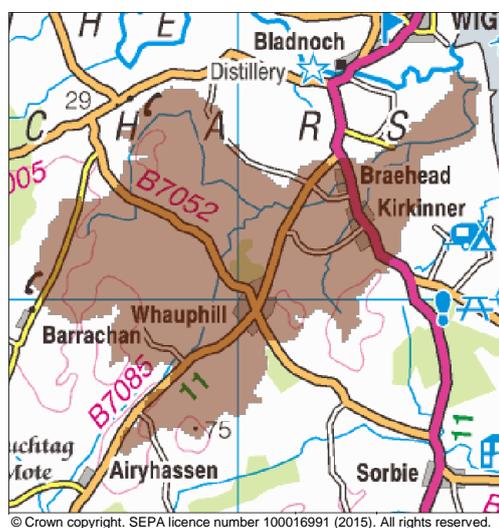
Actions

## Braehead and Whauphill (Potentially Vulnerable Area 14/23)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Milldriggan coastal

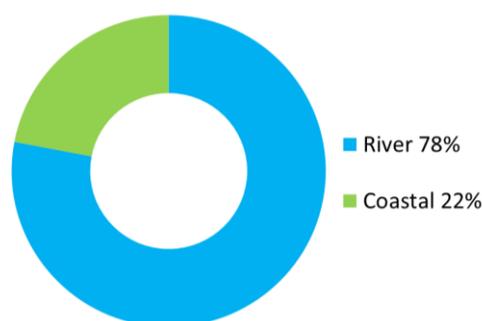
### Background

This Potentially Vulnerable Area is located in the south west of the Solway Local Plan District and incorporates the villages of Kirkinner and Whauphill (shown below). It has is approximately 25km<sup>2</sup>.



There are fewer than 10 residential and non-residential properties at risk of flooding.

The Annual Average Damages are approximately £200,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The area has no direct coastal frontage onto Wigtown Bay however the north east of the area is within 500m of the coastline. Coastal flooding is predicted to affect non-residential properties and agricultural land.

River flooding within this area is primarily attributed to the River Bladnoch, Maltkiln Burn and the canal. The Maltkiln Burn flows in a north westerly direction and discharges to the River Baldnoch; the River Baldnoch then discharges to Wigtown Bay. River flooding is seen at Capenoch Croft where the Maltkiln Burn is culverted under the B7052. The main transport route with a risk of flooding is the A746. Flooding from the canal also poses a risk to agricultural land and sections of road at Baryerrock.

Utilities and sections of the road network are predicted to be affected by surface water flooding where the B7052 crosses the Maltkiln Burn at Capenoch Croft and where it crosses The Canal at Baryerrock.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table

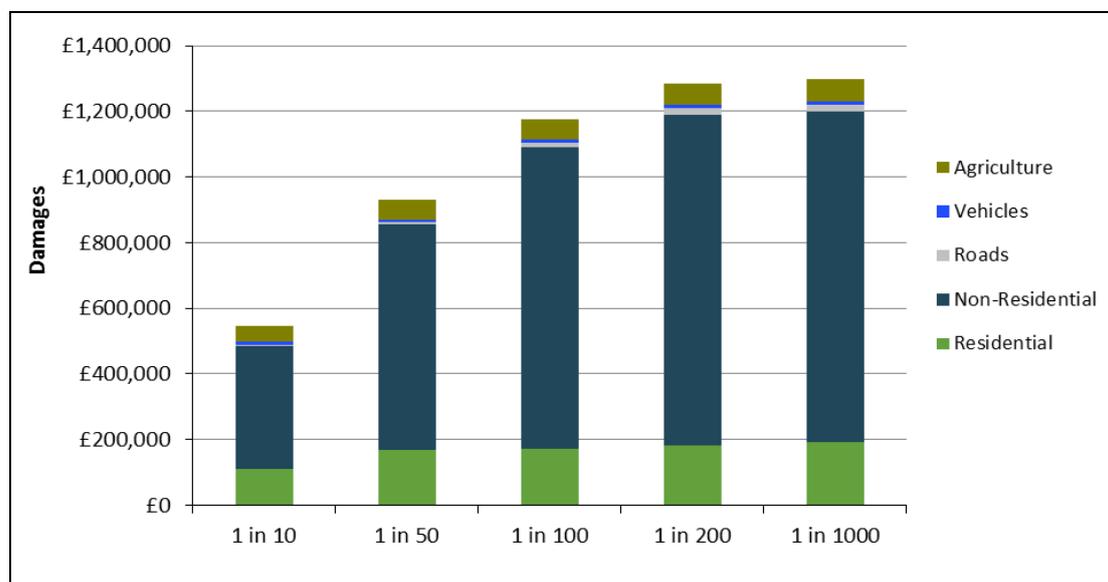
1. It shows that there are limited impacts people, non-residential properties, utilities and roads within the area.

The damages associated with floods of different likelihood are shown in Figure 2. Non-residential properties experience the highest economic impact at approximately 40% of the damages followed by roads and residential properties.

The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 220)	<10	<10	<10
Non-residential properties (total 20)	<10	<10	<10
People	<10	<10	<10
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	2.7	3.6	3.8
Environmental designated areas (km <sup>2</sup> )	<0.1	<0.1	<0.1
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	4.5	6.0	3.1

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

## History of flooding

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

Reported incidents of flooding within this area are all due to periods of heavy rainfall exceeding the design standard of drainage systems mainly in Kirkinner and Whauphill.

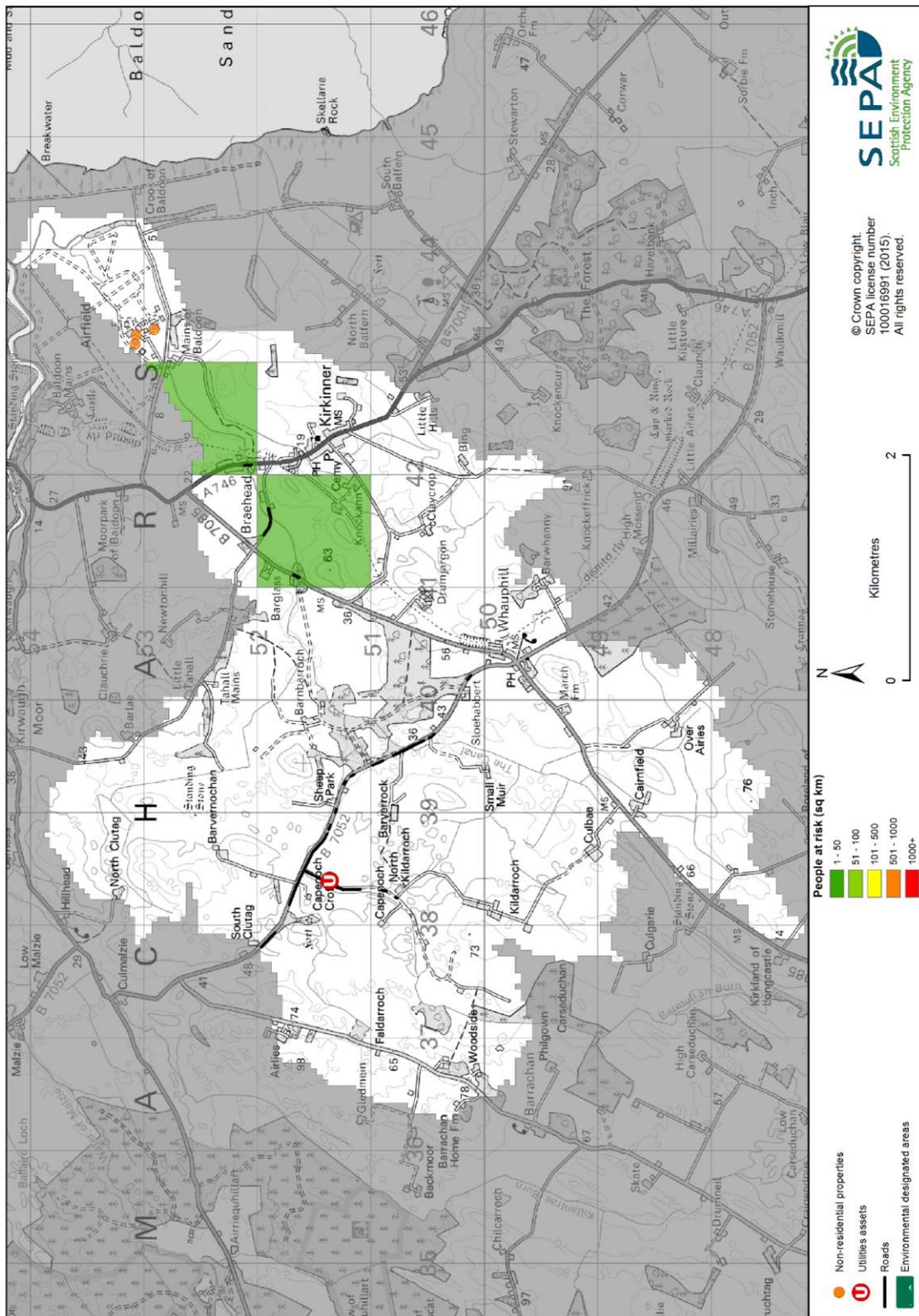


Figure 3: Impacts of flooding

## Objectives to manage flooding in Potentially Vulnerable Area 14/23

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Braehead and Whauphill Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £200,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• &lt;10 residential properties</li> <li>• £200,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/23

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Braehead and Whauphill Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	<i>Strategic mapping and modelling</i>	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Inner Wigtown Bay flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Inner Wigtown Bay coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

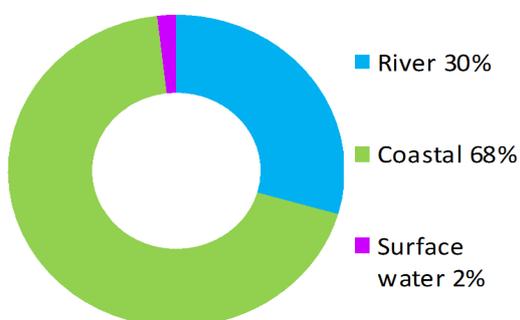
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Isle of Whithorn and Garlieston (Potentially Vulnerable Area 14/24)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Isle of Whithorn to Garlieston coastal

### Summary of flooding impacts



#### At risk of flooding

- 90 residential properties
- 30 non-residential properties
- £470,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

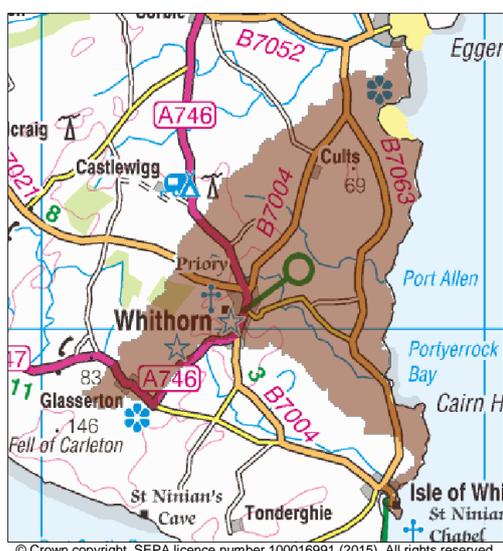
Actions

## Isle of Whithorn and Garlieston (Potentially Vulnerable Area 14/24)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Isle of Whithorn to Garlieston coastal

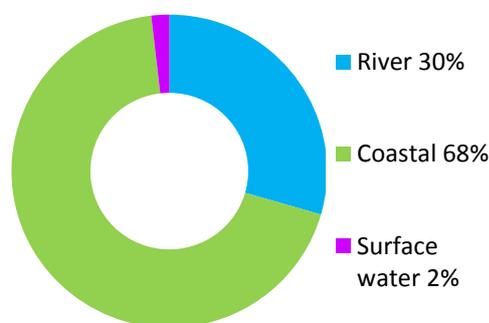
### Background

This Potentially Vulnerable Area is located towards the south west of the Solway Local Plan District and incorporates the towns of Whithorn, Garlieston and Isle of Whithorn (shown below). It is approximately 30km<sup>2</sup>.



There are approximately 90 residential properties and 30 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £470,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

This Potentially Vulnerable Area has extensive frontage onto Wigtown Bay. The area includes only part of Garlieston and Isle of Whithorn and figures for the whole towns are not presented in this report, however the full area of both towns are included in further assessment carried out by Dumfries and Galloway Council.

River flooding is primarily attributed to the Ket Burn. This poses a risk to residential and non-residential properties in Whithorn and the Whithorn Priory. Flooding from the Kevan and Broughton Burns is predicted to affect sections of road network, notably the A746, and agricultural land. There is also a potential risk of flooding from the Drummullin Burn in the Isle of Whithorn, and the Pouton and Inch Burns in Garlieston.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 90 to 100.

The risk of flooding to people and property, as well as to community facilities, utilities,

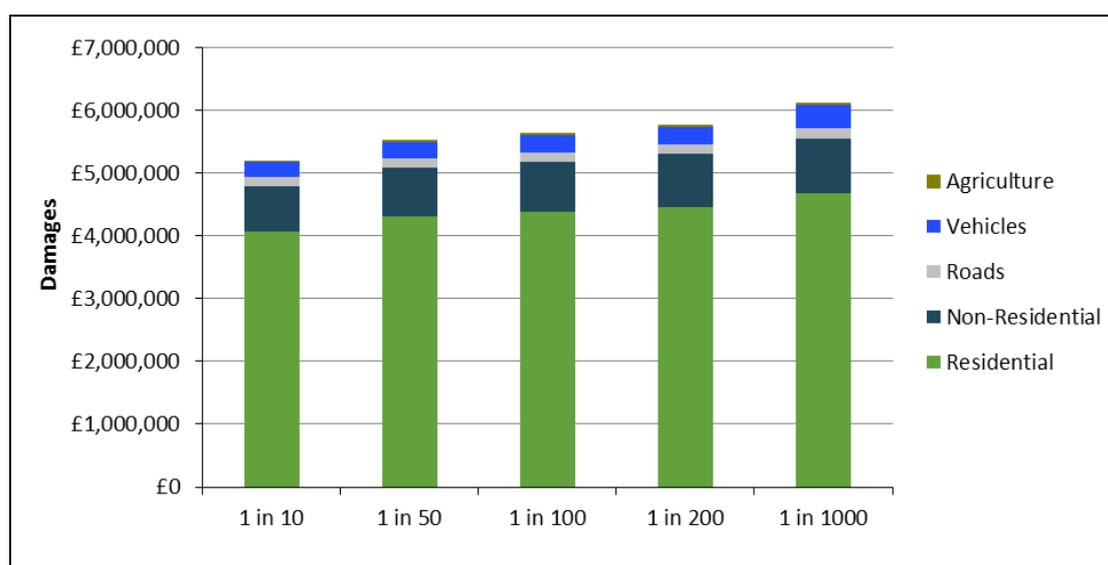
the transport network, designated sites and agricultural land is summarised in Table 1. Nine designated cultural heritage sites are at risk of flooding.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by coastal flooding experience the highest economic impact at approximately 55% of the damages.

The location of the impacts of flooding is shown in Figure 3. There are further impacts immediately outside the Potentially Vulnerable Area that have been taken into consideration when looking at further actions.

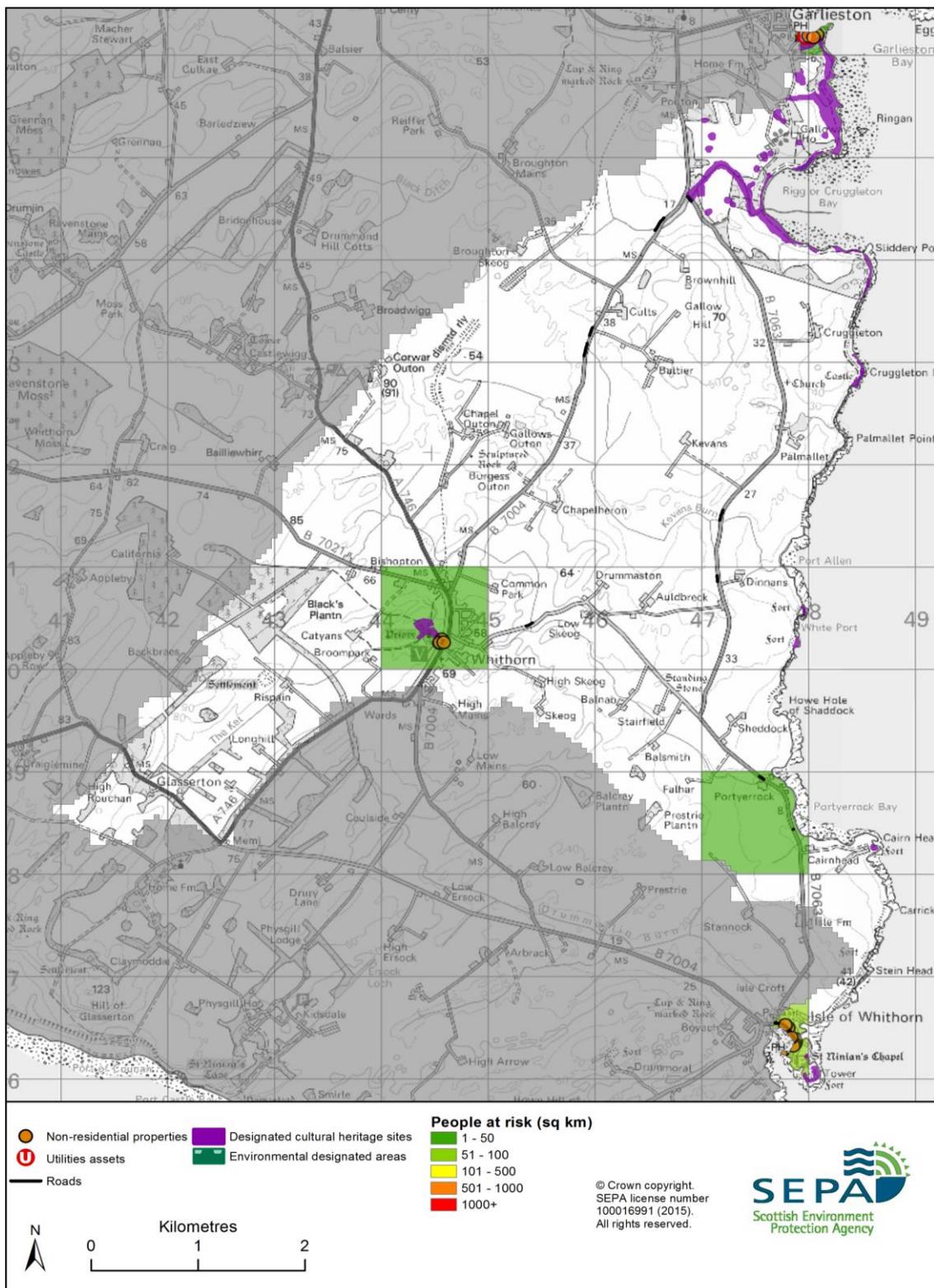
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 520)	80	90	90
Non-residential properties (total 90)	30	30	30
People	180	190	200
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	0.8	1.1	1.1
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	8	9	11
Agricultural land (km <sup>2</sup> )	0.9	1.0	1.0

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damages by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources



**Figure 3: Impacts of flooding**

### History of flooding

River flooding occurred in Whithorn in 2005 which affected the A746 major trunk road. The Isle of Whithorn suffered flooding due to a tidal surge on the 3 January 2014, affecting approximately 40 properties. On the 1 February 2014 coastal flooding in the Isle of Whithorn resulted in fire and rescue crews pumping water from properties on Harbour Row and Main Street.

## Objectives to manage flooding in Potentially Vulnerable Area 14/24

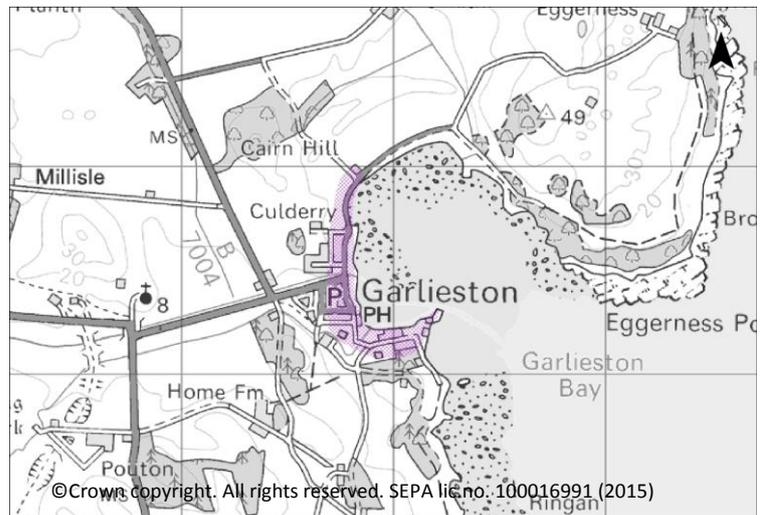
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Isle of Whithorn and Garlieston Potentially Vulnerable Area.

### Reduce the risk of coastal flooding to properties in Garlieston

Indicators:

- 80 residential properties
- 20 non-residential properties
- £390,000 Annual Average Damages

Target area:



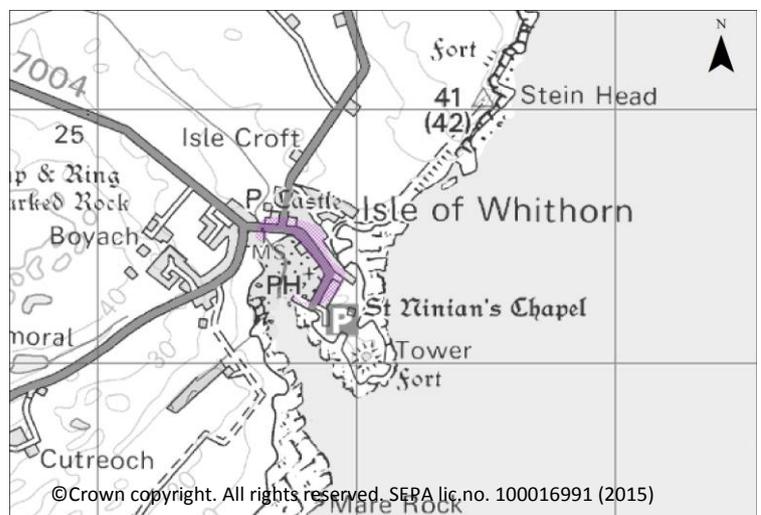
Objective ID: 14032

### Reduce the risk of coastal flooding to properties in Isle of Whithorn

Indicators:

- <10 non-residential properties
- £230,000 Annual Average Damages

Target area:



Objective ID: 14121

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>• 90 residential properties</li> <li>• £470,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>• 90 residential properties</li> <li>• £470,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/24

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Isle of Whithorn and Garlieston Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (141220020)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to properties in Isle of Whithorn (14121) Reduce the risk of coastal flooding to properties in Garlieston (14032)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National: <b>1 of 168</b>	Within local authority: <b>1 of 10</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A study is recommended to further develop the understanding of coastal flooding along the Solway coastline. This study should build on from the previous shoreline management plan to investigate flooding and coastal erosion, wave overtopping and the current coastal protection offered. The study may focus in detail on Potentially Vulnerable Areas however it could also look at the risk to other areas.</p> <p>The study will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 259 residential properties and 64 non-residential properties at risk of flooding over the extent of this study. The potential damages avoided over this area are estimated to be up to £26.1 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create		

<b>Social:</b>	opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. To be in accord with the flood risk management strategy, the responsible authority should seek to ensure as part of the study that the Solway coastal study will not have an adverse effect on the integrity of the Loch of Inch and Torrs Warren Special Protection Area, Upper Solway Flats and Marshes Special Protection Area, Luce Bay and Sands Special Area of Conservation, and Solway Firth Special Area of Conservation. There is the potential for impacts on several coastal Sites of Special Scientific Interest.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140320005)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to properties in Isle of Whithorn (14121) Reduce the risk of coastal flooding to properties in Garlieston (14032)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:		Within local authority:
	<b>25 of 168</b>		<b>2 of 10</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	Initial assessment of coastal flooding and erosion issues will be made within the Solway coastal study ID (141220020). Depending on the identified levels of risk from the coastal study, further detailed assessment may be required to investigate actions which would help to reduce the risk at Isle of Whithorn and Garlieston. This study should consider how natural flood management actions could help reduce the impact of coastal flooding along with the potential of property level protection on its own and in combination with other actions.		
<b>Potential impacts</b>			
<b>Economic:</b>	There are 74 residential properties and 20 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £14 million.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there is one utility which has been identified as potentially benefitting from this action.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. There are no international or national level environmental designations that are likely to be impacted by this action, provided the defences are set back from the coastline. There is likely to be a loss of natural mudflat and beach habitat in the footprint and vicinity of the defences, unless they are set back from the coastline. This action has the potential for negative impacts on the setting of numerous heritage buildings along North and South Crescent and the harbour, and Galloway House garden and designed landscape, although the action may offer protection to Galloway House.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Gretna to Portpatrick area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (141210017)</b>		
<b>Objective (ID):</b>	Reduce the risk of coastal flooding to properties in Isle of Whithorn (14121)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Whithorn Flood Protection Scheme was completed in 1991 and consisted of channel improvements to the Ket Burn and sewer relaying. The standard of protection is not known. Maintenance should be continued. Dumfries and Galloway Council has a number of coastal defences within this area including harbour walls and masonry/concrete walls at the Isle of Whithorn and Portyerrock. There are also privately owned seawalls in Isle of Whithorn and Rigg Bay		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140400030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Outer Wigtown Bay flood warning area which is part of the Solway coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline in the Outer Wigtown Bay coastal flood warning area. This will be achieved through direct mailing for flood warning areas and education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

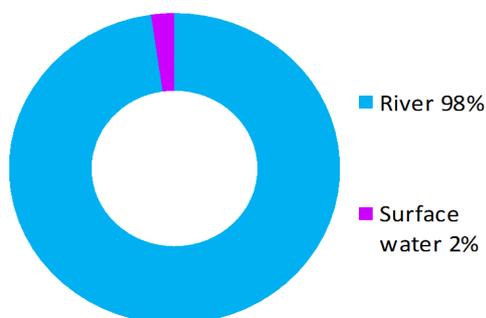
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Moniaive (Candidate Potentially Vulnerable Area 14/25c)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Dalwhat Water

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- <10 non-residential properties
- £55,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

## Moniaive (Candidate Potentially Vulnerable Area 14/25c)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council	Dalwhat Water

### Background

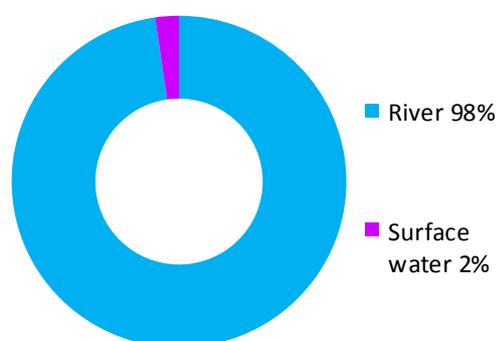
This candidate Potentially Vulnerable Area includes the town of Moniaive which is located in the centre of the Solway Local Plan District (shown below). The Craigdarroch Water and the Dalwhat Water flow through the area. It is approximately 55km<sup>2</sup>.



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There are approximately 20 residential properties at risk of flooding.

The Annual Average Damages are approximately £55,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

This area was not originally identified as a Potentially Vulnerable Area in 2011. However, updated information on flood risk identified that this area should be regarded as a candidate Potentially Vulnerable Area due to the risk to people and properties.

Flood risk in the area is mostly attributed to river flooding from the Craigdarroch Water and the Dalwhat Water. The Dalwhat Water flows from the north east of the area, with the Craigdarroch Water flowing from the west. The confluence of the two watercourses is in Moniaive where there is a risk of flooding to residential properties.

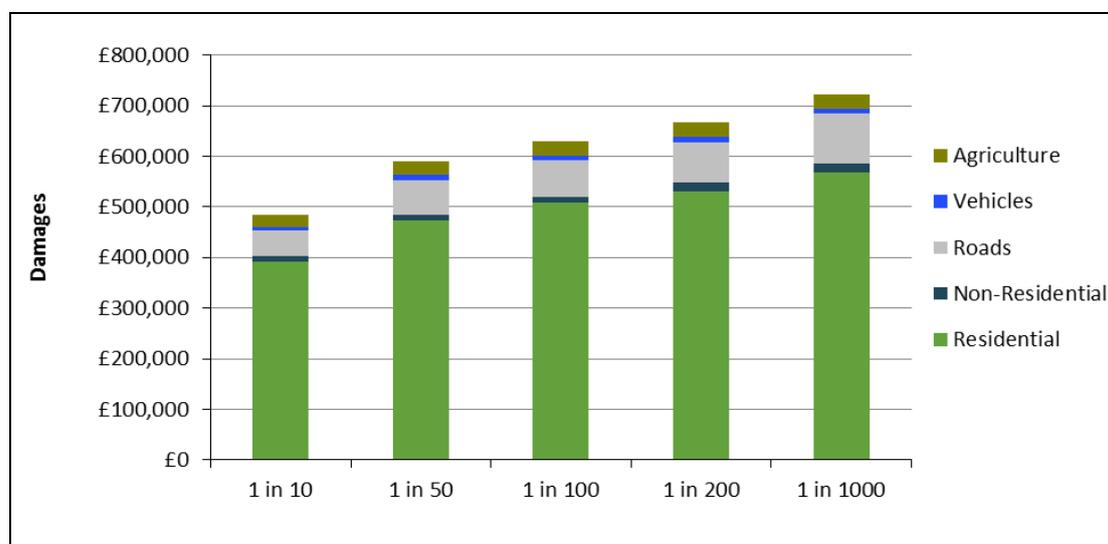
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the greatest economic impact at approximately 80% of the damages.

The location of the impacts of flooding is shown in Figure 3. It shows that there are limited impacts within the area.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 310)	10	20	20
Non-residential properties (total 30)	<10	<10	<10
People	30	40	40
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links - roads (km)	0.3 of A road	0.5 (of which 0.4 is A road)	0.6 (of which 0.5 is A road)
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	1.2	1.4	1.4

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damage by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

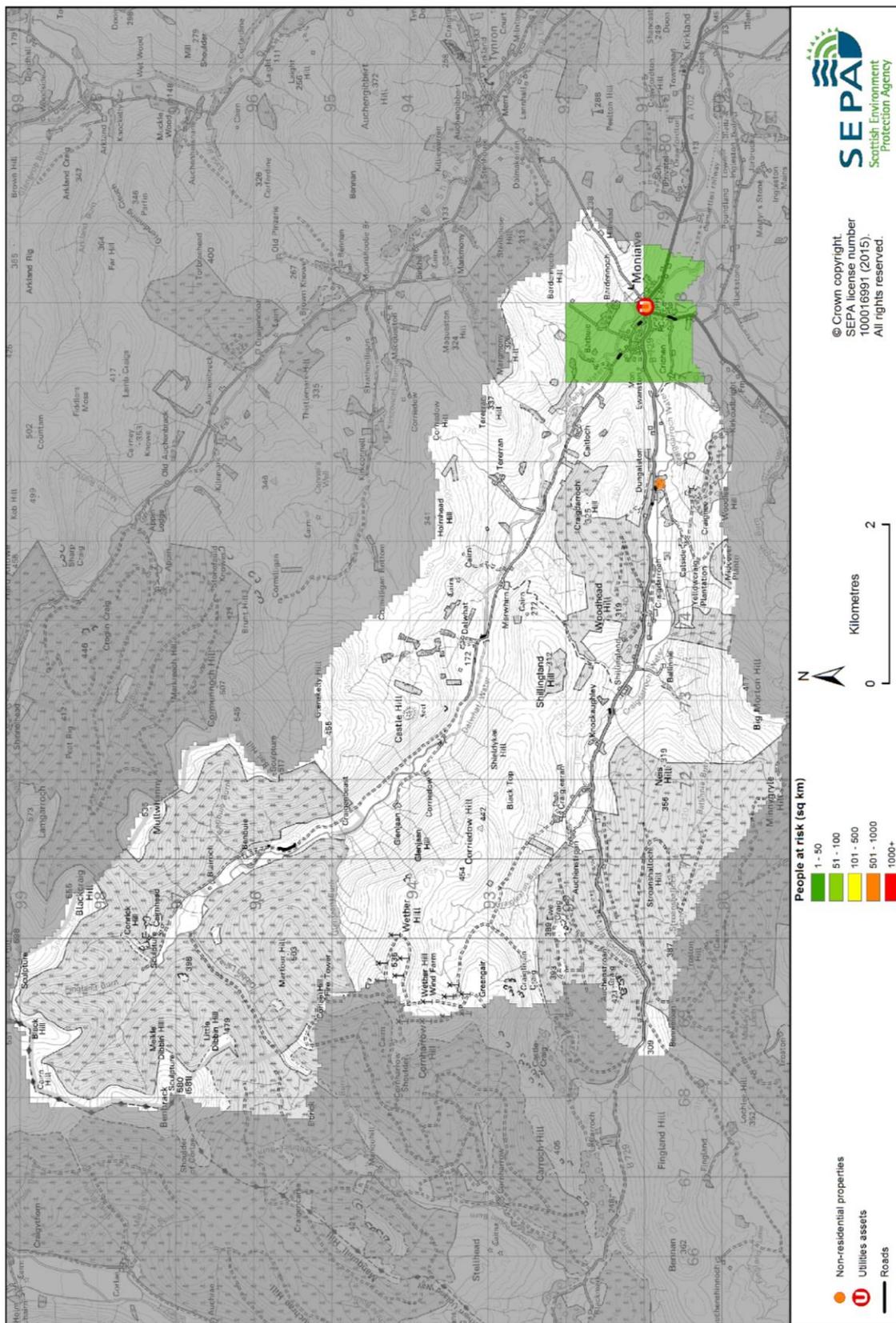


Figure 4: Impacts of flooding

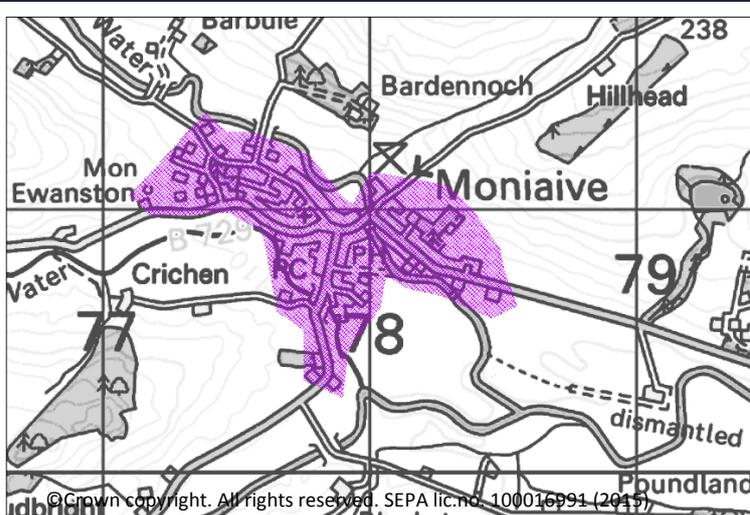
## History of flooding

The Dalwhat Water flooded in December 2013 and affected residential properties, roads and public spaces in Moniaive. In November 2006, further reported incidents of flooding from the Dalwhat Water affected Nithside, Moniaive and Woodside and resulted in gardens being flooded as well as the A702 and B729 roads.

There are records of flooding from surface water runoff in December 2013 which resulted in flooding of residential properties. Recorded flooding in November 2002 impacted Nithsdale and Moniaive. In October 2004 drainage flooding in Moniaive caused flooding to non-residential properties and the A702 road.

## Objectives to manage flooding in Potentially Vulnerable Area 14/25c

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Moniaive Candidate Potentially Vulnerable Area.

Reduce the risk of flooding in Moniaive	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>18 residential properties</li> <li>&lt;10 non-residential properties</li> <li>£44,000 Annual Average Damages</li> </ul>	
Objective ID: 14038	© Crown copyright. All rights reserved. SEPA lic.no. 100016991 (2015)

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>20 residential properties</li> <li>£55,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>20 residential properties</li> <li>£55,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/25c

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Moniaive Candidate Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (140380005)</b>		
<b>Objective (ID):</b>	Reduce the risk of flooding in Moniaive (14038)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Priority:</b>	National:		Within local authority:
	<b>168 of 168</b>		<b>10 of 10</b>
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection scheme has previously been built in Moniaive to address flooding experienced within the town. As the scheme was built more than 50 years ago it is recommended that a study is undertaken to assess the current flood risk within Moniaive and if further work is required to reduce the level of risk in the area now or in the future, due to climate change.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impacts have not been defined at this stage.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (140380017)</b>		
<b>Objective (ID):</b>	Reduce the risk of flooding in Moniaive (14038)		
<b>Delivery lead:</b>	Dumfries and Galloway Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	A flood protection scheme was built in Moniaive to address flooding experienced within the town. The level of protection offered by the scheme is not currently known. A flood protection study is being carried out by Dumfries and Galloway Council to establish the level of protection offered by the current scheme and potential further work to reduce flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Dumfries and Galloway Council has a Pilot Flood Product Subsidy Scheme in place, it is recommended that this should be continued. Residential or business properties that are identified as being at risk of flooding are eligible for the scheme. There are various products to reduce the impact of flooding to properties which can be purchased as part of the scheme.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with communities and promote Floodline using most the appropriate mix of methods for the area. These could include direct mailings, education activities, participation in local events and relevant flooding messages in the media.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Dumfries and Galloway Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

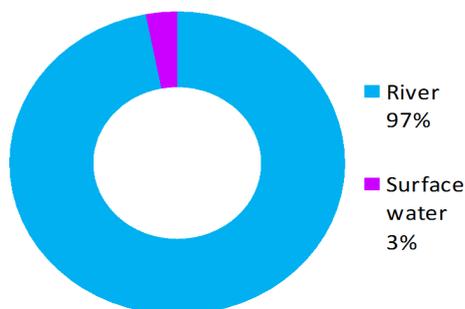
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Dumfries and Galloway Council along with the Scottish Fire and Rescue Service, SEPA and the Scottish Flood Forum have procured a Flood Pod. The Pod can be deployed to an area at risk of a flood emergency and is filled with flood protection equipment which is issued to the public.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## New Cumnock (Candidate Potentially Vulnerable Area 14/26c)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council, East Ayrshire Council	River Nith

### Summary of flooding impacts



#### At risk of flooding

- 240 residential properties
- 60 non-residential properties
- £520,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	Property level protection scheme	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

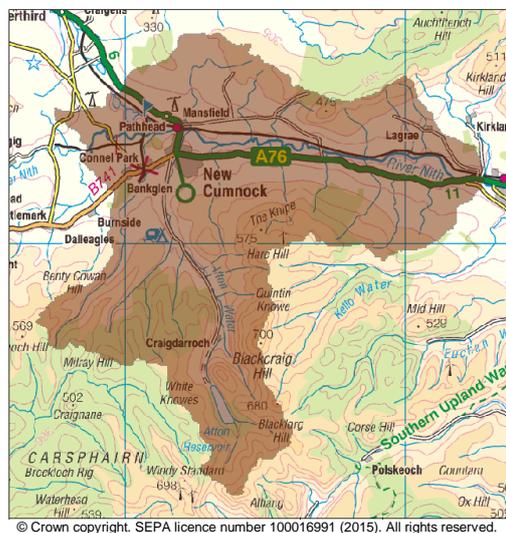
Actions

## New Cumnock (Candidate Potentially Vulnerable Area 14/26c)

Local Plan District	Local authority	Main catchment
Solway	Dumfries and Galloway Council, East Ayrshire Council	River Nith

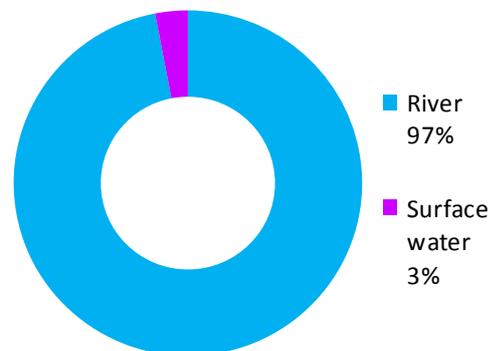
### Background

This candidate Potentially Vulnerable Area covers an area in the River Nith catchment. It is approximately 120km<sup>2</sup> and includes the town of New Cumnock (shown below).



There are approximately 240 residential properties and 60 non-residential properties at risk of flooding.

The Annual Average Damages are £520,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

This area was not originally identified as a Potentially Vulnerable Area in 2011. However, updated information on flood risk from the new hazard maps identified that this area should be regarded as a candidate Potentially Vulnerable Area due to the risk to people and properties.

River flooding presents the greatest risk to residential properties in New Cumnock as well as to transport links, notably the A76 and B741. The River Nith flows from the west of the area through New Cumnock before flowing east toward Kirconnel. The Afton Water and Connel Burn both flow from the south of the area toward New Cumnock where they join the River Nith. These are generally steep catchments which flatten out close to New Cumnock where there is a risk of flooding to residential properties.

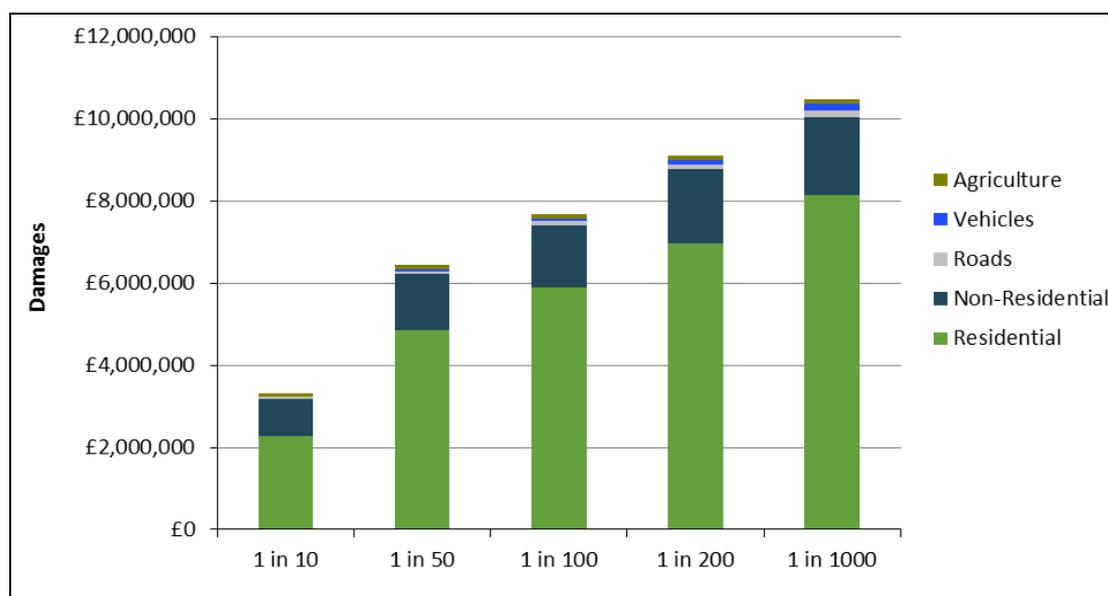
Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 240 to 290 and the number of non-residential properties from approximately 60 to 70.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 85% of the damages.

The location of the impacts of flooding is shown in Figure 3. Most of the receptors at risk of flooding lie within New Cumnock.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 1,800)	80	240	270
Non-residential properties (total 230)	20	60	70
People	180	530	600
Community facilities	<10 Healthcare facilities	<10 Healthcare facilities	<10 Healthcare facilities
Utilities assets	0	<10	<10
Transport links - roads (km)	0.7 (of which 0.3 is A road)	1.3 (of which 0.8 is A road)	1.6 (of which 1.0 is A road)
Transport links - rail (km)	2.0	2.6	3.1
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	0
Agricultural land (km <sup>2</sup> )	4.7	5.5	5.7

**Table 1:** Summary of flood impacts<sup>1</sup>



**Figure 2:** Damage by flood likelihood

<sup>1</sup> Some receptors are counted more than once if flooded from multiple sources

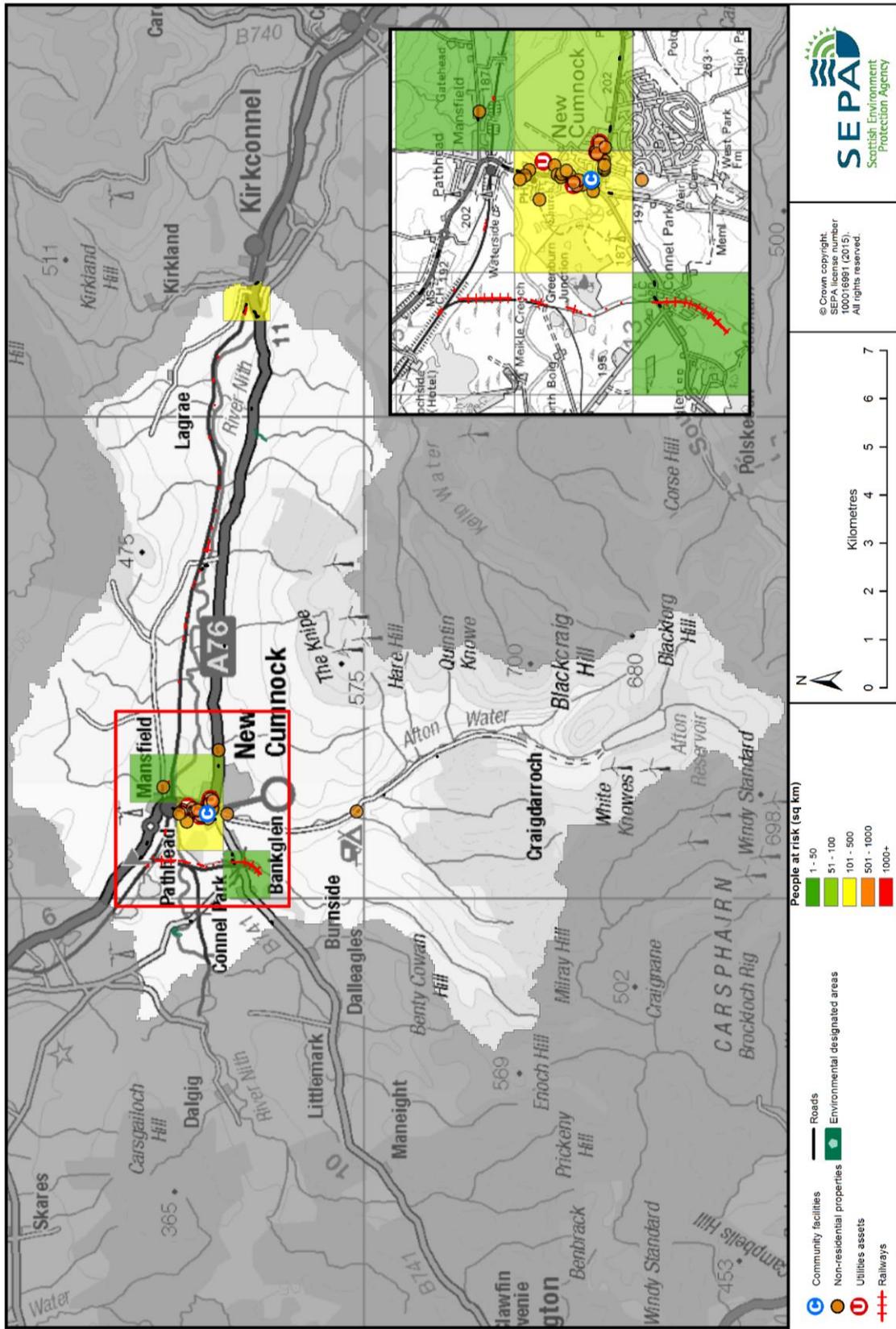


Figure 3: Impacts of flooding

## History of flooding

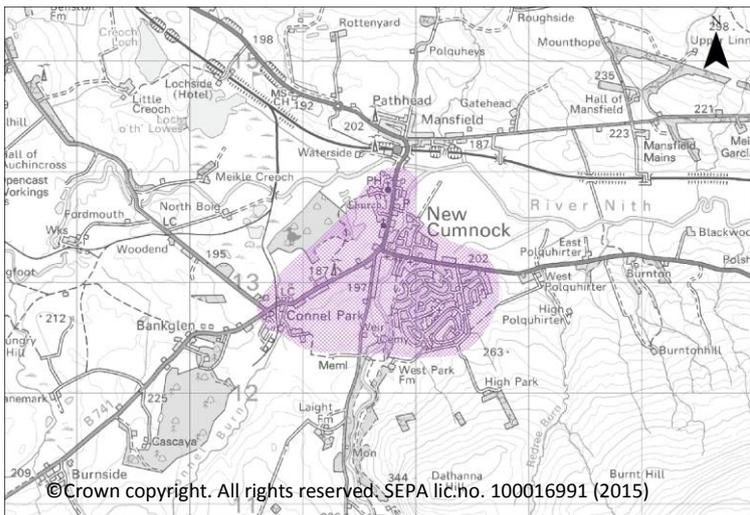
There are several incidents of flooding reported in the area and the majority of these are from river flooding.

The most notable floods were in December 2013 and January 2014 when the River Nith caused flooding to land around the football grounds within New Cumnock and the A76. The Afton Water caused flooding in December 2013 where it overtopped its banks at Afton Bridge, inundating residential and non-residential properties, flowing down the A76 and ponding at Dalhanna Drive. The same flood also affected community facilities. The Connel Burn flooded in December 2013 when waters overtopped both banks onto the adjacent disused railway line and flowed onto Knock Shinnock Road. This effectively cut off New Cumnock.

Flooding from the Connel Burn in January 2010 resulted in residential properties and gardens being inundated and the B741 was closed. New Cumnock was flooded in December 1994 from the River Nith due to a blocked culvert.

## Objectives to manage flooding in Potentially Vulnerable Area 14/26c

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for New Cumnock Candidate Potentially Vulnerable Area.

Reduce risk of river flooding to residential properties and non-residential properties in New Cumnock	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>240 residential properties</li> <li>60 non-residential properties</li> <li>£460,000 Annual Average Damages</li> </ul>	
Objective ID: 14039	

Target area	Objective	ID	Indicators within PVA
Applies across Solway Local Plan District	Avoid an overall increase in flood risk	14033	<ul style="list-style-type: none"> <li>240 residential properties</li> <li>£520,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Reduce overall flood risk	14040	<ul style="list-style-type: none"> <li>240 residential properties</li> <li>£520,000 Annual Average Damages</li> </ul>
Applies across Solway Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 14/26c

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for New Cumnock Candidate Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	Property level protection scheme	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (140390006)</b>		
<b>Objective (ID):</b>	Reduce risk of river flooding to residential properties and non-residential properties in New Cumnock (14039)		
<b>Delivery lead:</b>	East Ayrshire Council		
<b>Priority:</b>	National:		Within local authority:
	<b>27 of 42</b>		<b>1 of 1</b>
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	It is recommended that the council progress work on the proposed flood protection scheme in New Cumnock. Previous flooding and the New Cumnock Flood Study have shown a risk of flooding in the area and identified actions that would help mitigate the risk, including construction of flood defences along the Afton Water and Connel Burn and sediment management along the Afton Water.		
<b>Potential impacts</b>			
<b>Economic:</b>	The proposed scheme may benefit 95 residential and non-residential properties at risk of flooding in this location, damages avoided are estimated to be £4 million. The flood protection scheme has an estimated benefit cost ratio of 1.2.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there are three utilities which have been identified as potentially benefitting from this action. There may be changes in visual amenity and land use as a result of this action.		
<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. There are no international or national level environmental designations that are likely to be directly impacted by		

<b>Environmental:</b>	<p>this action. There is likely to be a loss of natural and semi-natural habitat in the footprint and vicinity of the direct defences. Downstream of the areas where conveyance is modified there may be slight negative impacts on water quality through increased erosion and sedimentation on the Afton Water and River Nith. There will be a loss of habitat and displacement of species where engineering works are undertaken; however, these habitats may re-establish and species return following works.</p>
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<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (140400016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	<b>Indicative delivery:</b>	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Upper River Nith to improve understanding of flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (140390020)</b>		
<b>Objective (ID):</b>	Reduce risk of river flooding to residential properties and non-residential properties in New Cumnock (14039)		
<b>Delivery lead:</b>	East Ayrshire Council		
<b>Status:</b>	<b>Existing</b>	<b>Indicative delivery:</b>	<b>Ongoing</b>
<b>Description:</b>	East Ayrshire Council have a flood warning system for New Cumnock which monitors levels on the River Nith, Afton water and Connel Burn.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (140400009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	<b>Indicative delivery:</b>	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>PROPERTY LEVEL PROTECTION SCHEME (140390008)</b>		
<b>Objective (ID):</b>	Reduce risk of river flooding to residential properties and non-residential properties in New Cumnock (14039)		
<b>Delivery lead:</b>	East Ayrshire Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	East Ayrshire Council have implemented a property level protection scheme in New Cumnock. The council have provided the property level protection (including the installation of fixed elements) and have provided training on the use of this equipment in conjunction with the flood warning levels and appropriate actions. A flood warning system has been installed by East Ayrshire Council to support this action.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (140390012)</b>		
<b>Objective (ID):</b>	Reduce risk of river flooding to residential properties and non-residential properties in New Cumnock (14039)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The community has formed the New Cumnock Flood Working Party, to help raise awareness of flood risk in the area.		

<b>Action (ID):</b>	<b>SELF HELP (140400011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (140400013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (140400007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	East Ayrshire Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (140400014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (140330001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (14033) Reduce overall flood risk (14040)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		



# Flood Risk Management Strategy

## Solway Local Plan District

This section provides supplementary information on the characteristics and impacts of river, coastal and surface water flooding. Future impacts due to climate change, the potential for natural flood management and links to river basin management are also described within these chapters.

Detailed information about the objectives and actions to manage flooding are provided in Section 2.

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## 3.1 Introduction

In the Solway Local Plan District, river flooding is reported across five distinct river catchments. Coastal flooding and surface water flooding are reported across the whole Local Plan District.

A summary of the number of properties and Annual Average Damages from river, coastal and surface water flooding is outlined in Table 1.

	Total number of properties at risk <sup>1</sup>	Annual Average Damages	Local authority
<b>River catchments</b>			
Esk (Dumfriesshire) catchment group	400	£870,000	Carlisle City Council Cumbria Council Dumfries and Galloway Council Scottish Borders Council
Annan catchment group	600	£1.5 million	Dumfries and Galloway Council Scottish Borders Council South Ayrshire Council South Lanarkshire Council
Nith catchment group	1,100	£4.3 million	Dumfries and Galloway Council, East Ayrshire council South Lanarkshire Council
Dee (Galloway) catchment group	630	£1.4 million	Dumfries and Galloway Council East Ayrshire council
Cree catchment group	740	£1.7 million	Dumfries and Galloway Council South Ayrshire Council
<b>Coastal flooding</b>			
Solway coastal area	840	£2.7 million	Dumfries and Galloway Council South Ayrshire Council
<b>Surface water flooding</b>			
Solway Local Plan District	830	£1.2 million	Dumfries and Galloway Council East Ayrshire council Scottish Borders Council South Ayrshire Council South Lanarkshire Council

**Table 1:** Summary of flood risk from various sources within the Solway Local Plan District

<sup>1</sup> Total number of residential and non-residential properties at risk of flooding.

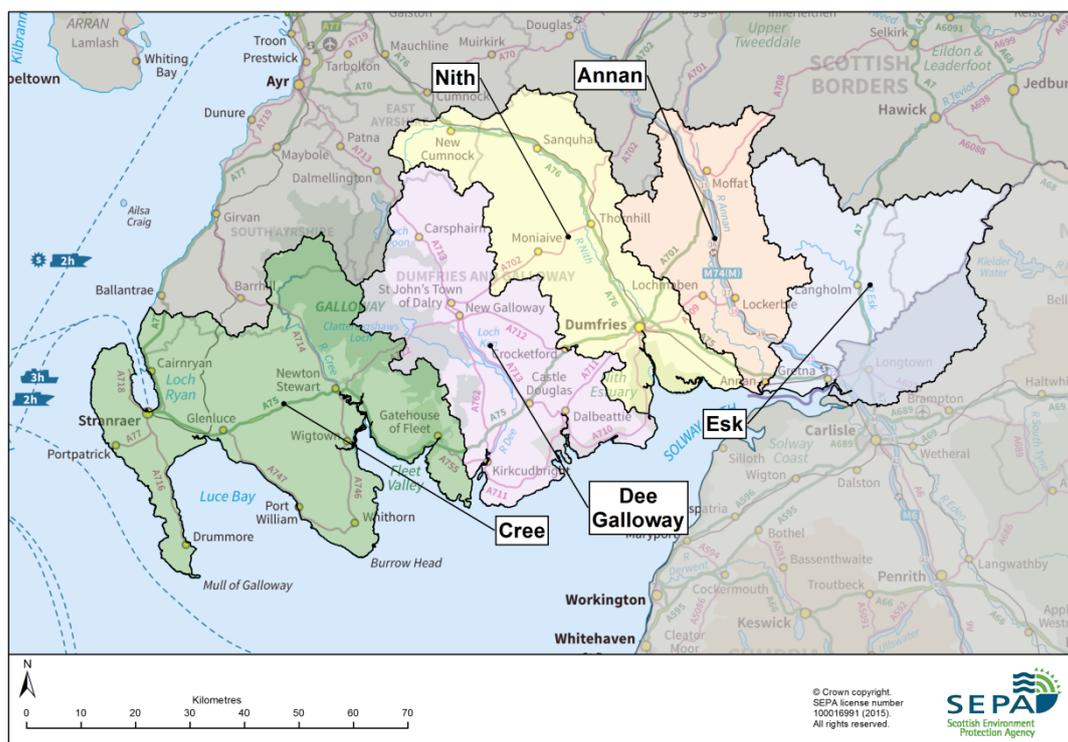
## 3.2 RIVER FLOODING

### Solway Local Plan District

This section provides supplementary information on river flooding at the catchment level. It provides an overview of the catchment's natural characteristics, flood risk and the existing actions to manage flooding. It outlines the likely impact of climate change and the potential for natural flood management.

Detailed information about the objectives and actions to manage flooding are provided in Section 2.

In the Solway Local Plan District, river flooding is reported across five distinct river catchments, shown below in Figure 1.



**Figure 1:** River catchments within the Solway Local Plan District

## River flooding Esk (Dumfriesshire) catchment group

### Catchment overview

The Esk catchment group is located within the Solway Local Plan District covering an area of over 1,360km<sup>2</sup>. The catchment group is over 99% rural with less than 1% urban and a population of approximately 16,000. This area includes parts of two local authorities; Dumfries and Galloway Council and Scottish Borders Council.

The River Esk is the main river within the Esk catchment group and originates in the hills to the east of Moffat. Its main tributaries are the Black Esk and the White Esk, which merge south of Castle O'er Forest. Langholm has an approximate elevation of 100m and is surrounded by steep hills on all sides with elevations of around 300m. It is located at the confluence of three rivers, the River Esk, Wauchope Water and Ewes Water.

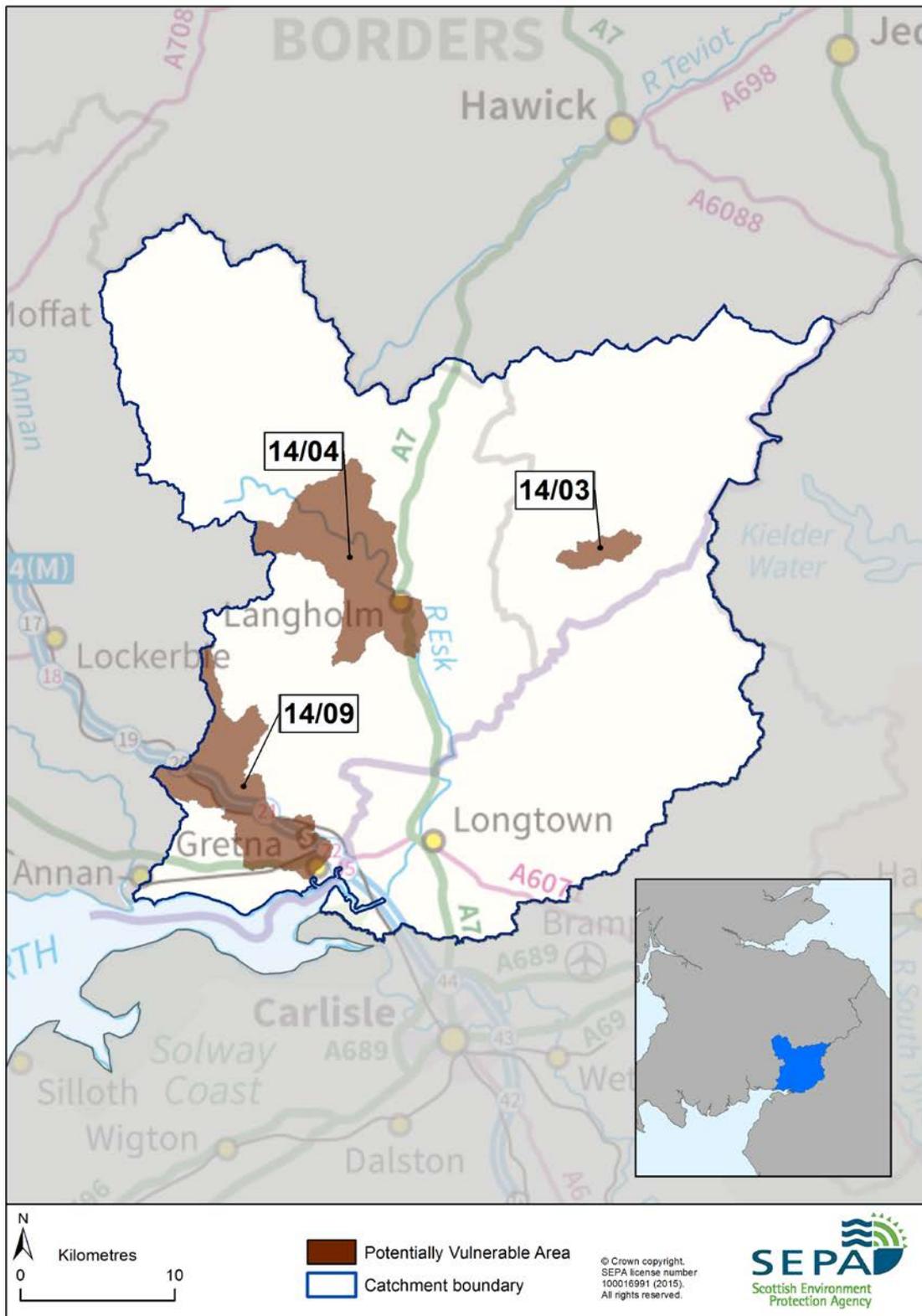
The Liddel Water flows from the north east of the catchment group, passing through Newcastleton after the confluence with the Hermitage Water. The Liddel Water forms the boundary between Scotland and England, before joining the River Esk between Canonbie and Longtown. The River Esk continues southwest and enters the Solway Firth to the east of Gretna.

The annual average rainfall is 1,366mm, which is broadly typical for Scotland. The annual average rainfall ranges between 1,298mm and 1,532mm in the upper parts of the catchment and 1,297mm and 1,427mm in the lower parts.

### Flood risk in the catchment

Approximately 360 residential properties are at risk of river flooding, 88% of which are located within Potentially Vulnerable Areas. There are approximately 40 non-residential properties predicted to be at risk of river flooding, 72% of which are located within Potentially Vulnerable Areas. There are three Potentially Vulnerable Areas within this catchment group as shown in Figure 1:

- Newcastleton (14/03)
- Langholm (14/04)
- Kirtle Water (14/09).



**Figure 1:** River catchment for the Esk (Dumfriesshire) catchment group

## Main areas at risk

The main areas with a risk of river flooding can be seen in Table 1 which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture. Langholm and Newcastleton are the main areas at risk of river flooding.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Langholm	190	£270,000
Newcastleton	130	£150,000
Waterbeck	<10	£40,000
Dornock	<10	£20,000
Davington	<10	£20,000

**Table 1:** Main areas at risk of river flooding

### Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Esk (Dumfriesshire) group catchment are approximately £870,000 which accounts for approximately 9% of the estimated Annual Average Damages from river flooding within the Solway Local Plan District. This consists of:

- 57% residential properties (£500,000)
- 19% non-residential properties (£160,000)
- 10% roads (£87,000)
- 7% emergency services (£60,000)
- 4% agriculture (£38,000)
- 3% vehicles (£23,000).

Figure 2 shows the distribution of Annual Average Damages throughout the area. The greatest concentration of damages is in Langholm, Newcastleton and Kirtlebridge.

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
Community facilities	<10	Includes: educational buildings and emergency services.
Utility assets	<10	Includes: electricity substations.
Roads (km)	5.5	Notably: M6 south east of Gretna A74(M) at Kirtlebridge A7 (Langholme to Longtown) There are also a number of locally important B roads at risk
Railway routes (km)	0.5	Railway between Kirtlebridge, Gretna, Carlisle, Annan and Longtown.
Agricultural land (km <sup>2</sup> )	21	

**Table 2:** Infrastructure and agricultural land at risk of river flooding

### Designated environmental and cultural heritage sites at risk

Within the catchment it is estimated that 28 designated cultural heritage sites are at risk of river flooding. These sites include; scheduled monuments and listed buildings.

Approximately 1.5 km<sup>2</sup> of environmental designated area is at risk of river flooding. This includes Special Areas of Conservation, Special Protection Areas and Sites of Special Scientific Interest.

### History of flooding

There has been a long history of flooding within the area, with a number of these floods impacting properties. The most significant flooding was experienced in Newcastleton with flooding in February 1997, January 2001 and October 2005. The flood on 12 October 2005 was reported by local residents as the 'worst in living memory', causing damage to around 30 houses.

The most recent flood occurred in 2012 which resulted in community facilities flooding in Eskdalemuir. Other recent reports of river flooding include Langholm by the River Esk which rose to street level in January 2009.

The earliest recorded flooding in the area occurred in 1846 with flooding from the Liddel Water, River Esk and Whitrope Burn, with two further regional flood events before 1900.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.

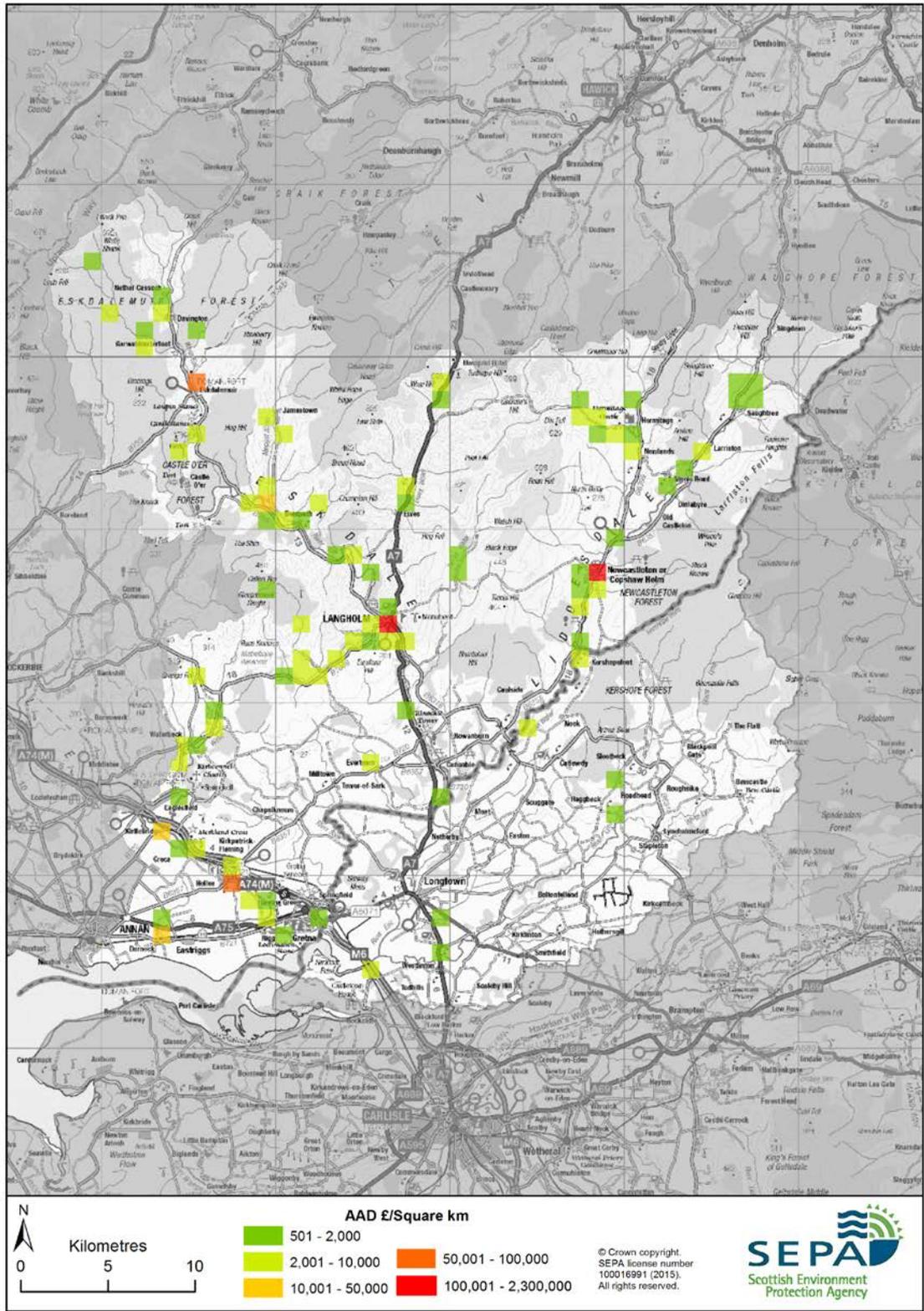


Figure 2: Annual Average Damages from river flooding

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document

### River flood warning schemes

SEPA operates a flood warning scheme for Newcastleton in the Scottish Borders. Flood Warnings are issued when river flooding is forecast for the flood warning areas. There is one river flood warning area in this catchment as shown in Figure 3 and Table 3. Table 3 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Properties within FWA	% of properties registered May 2014
Newcastleton Village	Liddel Water	230	49%

**Table 3:** Flood warning areas

Work has started on a Flood Early Warning System (FEWS) system for Langholm, which aims to be operational for 2016.



Figure 3: Flood warning area

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Esk (Dumfriesshire) catchment group may increase by 44%<sup>1</sup>. This would potentially increase in the number of residential properties at risk of river flooding from approximately 360 to 750, and the number of non-residential properties from approximately 40 to 80.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

### Runoff reduction

The assessment shows that many parts of the River Esk and Liddel Water catchments have the potential for runoff reduction.

### Floodplain storage

The River Esk between Georgefield and Craigcleuch, as well as the Ewes Water between Arkleton and Terrona, are also shown to have potential for floodplain storage.

Further areas are identified as having medium potential for floodplain storage are identified along the Hermitage Water and Liddel Water, upstream of Newcastleton.

### Sediment management

The River Esk has lengths of high erosion and deposition. Implementing natural flood management measures in these areas may have the potential of attenuating flows in the watercourses which contribute to flood risk in areas such as Langholm. Dumfries & Galloway Council is currently investigating the benefits of gravel removal through Langholm on the Esk.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## River flooding Annan catchment group

### Catchment overview

The Annan catchment group is located within the Solway Local Plan District, covering an area of over 960km<sup>2</sup>. The region is over 98% rural, with less than 2% of the area identified as urban and an approximate population of 25,000. This area includes parts of three local authorities; Dumfries and Galloway Council, Scottish Borders Council and South Lanarkshire Council.

The River Annan is the main river catchment in this area. It originates from Annanhead Hill in the north and flows south through steep hills past Moffat. Downstream of Moffat, the catchment is relatively flat, with the River Annan flowing parallel to the A74. The river has three main tributaries, the Kinnel Water, the Dryfe Water and the Water of Milk. The River Annan flows into the Solway Firth at Annan.

The rainfall for the catchment group is broadly typical for Scotland, ranging between 1,349mm in the lower parts of the area and 1,575mm in the upper parts.

### Flood risk in the catchment

There are approximately 540 residential properties at risk of river flooding, 81% of which are located within a Potentially Vulnerable Area. There are approximately 60 non-residential properties at risk of river flooding, 62% of which are located within a Potentially Vulnerable Area. There are three Potentially Vulnerable Areas situated within this catchment group as shown in Figure 1:

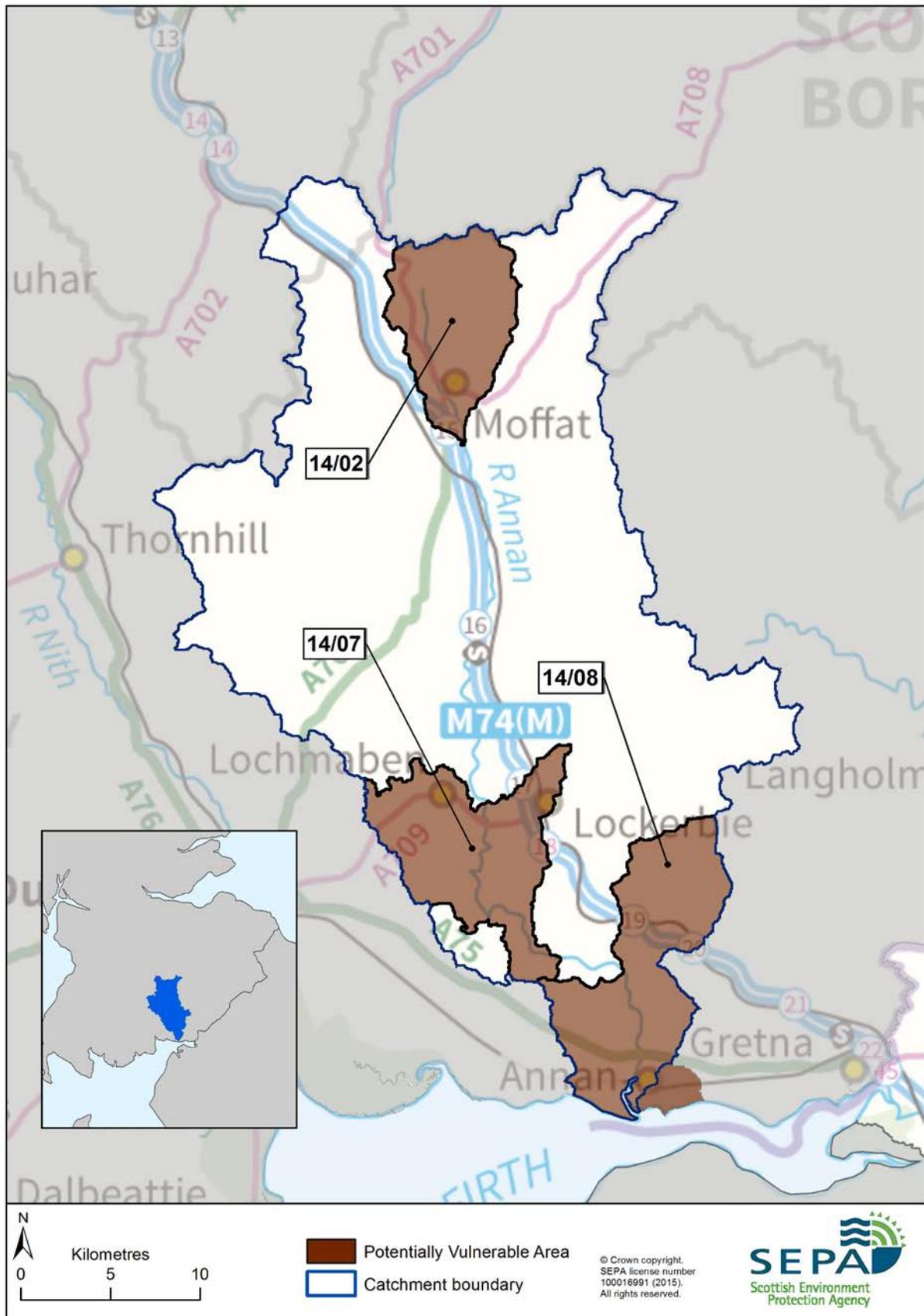
- Moffat (14/02)
- Lochmaben to Locherbie (14/07)
- Ecclefechan – Annan (14/08).

### Main areas at risk

The main areas at risk of river flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture. Moffat is the main town at risk of river flooding.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Moffat	340	£470,000
Annan	50	£110,000
Ecclefechan	50	£87,000
Lochmaben	10	£45,000
Hightae	10	£31,000
Ae	10	£19,000

**Table 1:** Main areas at risk of river flooding



**Figure 1:** River catchment for the Annan catchment group

## Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Annan catchment group are approximately £1.5 million, which accounts for almost 15% of the estimated Annual Average Damages from river flooding within the Solway Local Plan District. The damages are distributed as follows:

- 64% residential properties (£920,000)
- 11% roads (£160,000)
- 9% non-residential properties (£140,000)
- 7% agriculture (£100,000)
- 7% emergency services (£100,000)
- 2% vehicles (£36,000).

Figure 2 shows the distribution of Annual Average Damages throughout the catchment. The figure shows that the highest concentration of damages is in Moffat, with Ecclefechan, Lochmaben and Annan also having high damages

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational building and emergency services
<b>Utility assets</b>	10	Includes: electricity substations, Scottish Water assets and telecommunications sites
<b>Roads (km)</b>	10.2km	Notably: A74(M) at Kirtlebridge A701 Moffat to Dumfries (particularly the area known as 'Hidden Corner' A708 east of Moffat A709 Lockerbie to Lochmaben (particularly at Castle loch)
<b>Railway routes</b>	3.4km	Railway between Kirkton and Newton.
<b>Agricultural land (km<sup>2</sup>)</b>	47	Notably: adjacent to the Moffat Water and land along the course of the River Annan between Lockerbie and Lochmaben

**Table 2:** Infrastructure and agricultural land at risk of flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment group it is estimated that approximately 32 designated cultural heritage sites are at risk of river flooding. These sites include; scheduled monuments, designed gardens and landscapes and listed buildings.

Approximately 3km<sup>2</sup> of environmental designated area are is risk of river flooding. This includes Special Areas of Conservation, Special Protection Areas and Sites of Special Scientific Interest.

## History of flooding

There is a long history of flooding in this catchment group with most of the flooding impacting fields and roads. The most recent river flooding occurred in Moffat in December 2013, with regular flooding recorded in the town, over the last 15 years linked to both surface water and rivers. Other areas in the region have also suffered recent flooding including Applegarthtown, Nethermill, Heck and Kettleholm, which were impacted on 21 August 2009, mainly affecting roads. In 2005 a culvert upstream of Wamphray became blocked during a high flow event, leading to flooding of a number of properties, and damage to roads infrastructure. In December 2008 the Kinnel Water burst its banks and impacted the area of Millhousebridge.

One of the most significant floods in the area occurred in 1977. This caused damage to properties, railway lines and fields, with Newton Whampray, Annan and Brydekirk flooded by the River Annan and Moffat from both the River Annan and Birnock Water.

The earliest reported flooding in the area was in 1767 with flooding on the River Annan in part due to snow melt. It is reported that the flooding caused a large amount of damage in Lochmaben and destroyed housing and crops.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

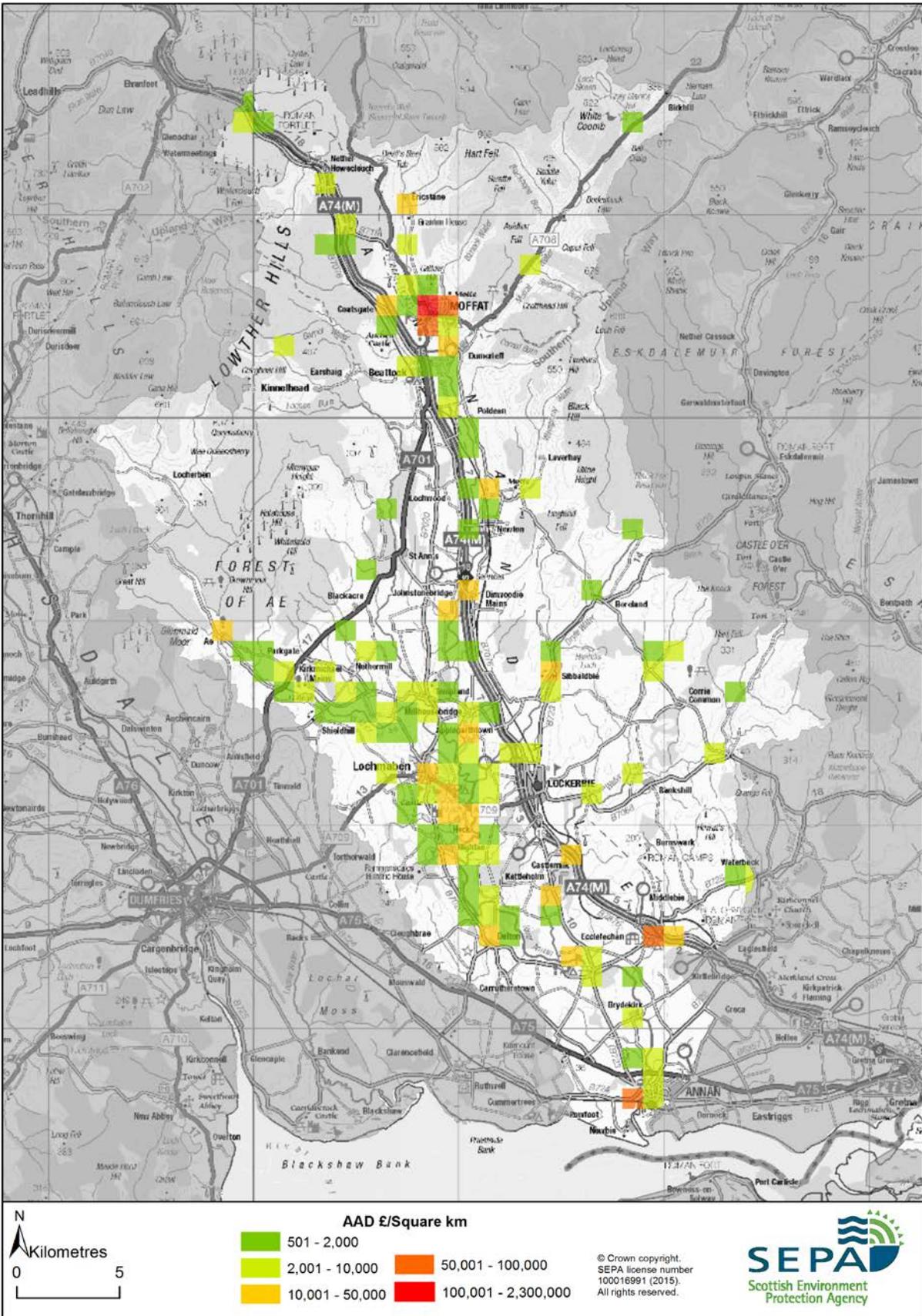
This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document.

### Flood protection schemes

A flood protection scheme was constructed in 1989 on the Well Road in Moffat. The scheme included channel improvements and the construction of culverts on an unnamed tributary of the Birnock Water.

### Awareness raising campaigns and community groups

The Moffat Flood Action Group is known to be active in this catchment group and covers the watercourses in Moffat and the upper River Annan. Since it was established in 2010 the group has promoted a flood product subsidy scheme and reports on issues associated with road drainage, culverts and watercourse condition.



**Figure 2:** Annual Average Damages from river flooding

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Annan catchment group may increase by 44%<sup>1</sup>. This would potentially increase in the number of residential properties at risk of river flooding from approximately 540 to 690 and the number of non-residential properties from approximately 60 to 90

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

### Runoff reduction

The assessment identifies an area with medium potential for runoff reduction in the Birnock Water catchment, which contributes to flooding in Moffat, and further areas in proximity to the Water of Ae, which converges with the River Annan. Some areas with high potential for runoff reduction are also identified to the south east near Waterbeck, within the catchment of the Mein Water, which contributes to flooding in Ecclefechan further downstream.

### Floodplain storage

The assessment shows that tributaries to the north of the Water of Ae, such as the Garrel Water, Kinnel Water and the Kirkland Burn, have the potential for floodplain storage. If large storage areas were available there may be potential to reduce flooding in areas at risk further downstream, such as Lochmaben. There may be potential for floodplain storage areas in Lochwood and Johnstonebridge, which may also help to reduce flooding in Johnstonebridge, as well as Lochmaben, Heck and Dalton further downstream.

### Sediment management

Lengths along the River Annan and the Water of Ae alternate between high erosion and high deposition in proximity to areas which are known to flood such as Heck and Hightae. Incorporating sediment management measures in these rivers may potentially reduce flood risk downstream.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## River flooding Nith catchment group

### Catchment overview

The Nith catchment group is located within the Solway Local Plan District and covers an area of over 1,480 km<sup>2</sup>. The catchment group is over 98% rural, with less than 2% urban, and an approximate population of 64,000. This area includes part of three local authorities; Dumfries and Galloway Council, East Ayrshire council and South Lanarkshire Council.

The main river catchment within this area is the River Nith. The River Nith catchment originates in the Carsphairn Hills of East Ayrshire. It initially flows in an easterly direction through New Cumnock and Kirkconnel before turning south and continuing to Dumfries, where it flows into the Solway Firth. The Nith is generally contained within steep valley sides as far south as Thornhill, where the landscape begins to flatten. The majority of tributaries of the River Nith are upstream of Thornhill and drain the hills of the southern uplands. The largest of these tributaries is the Cluden Water.

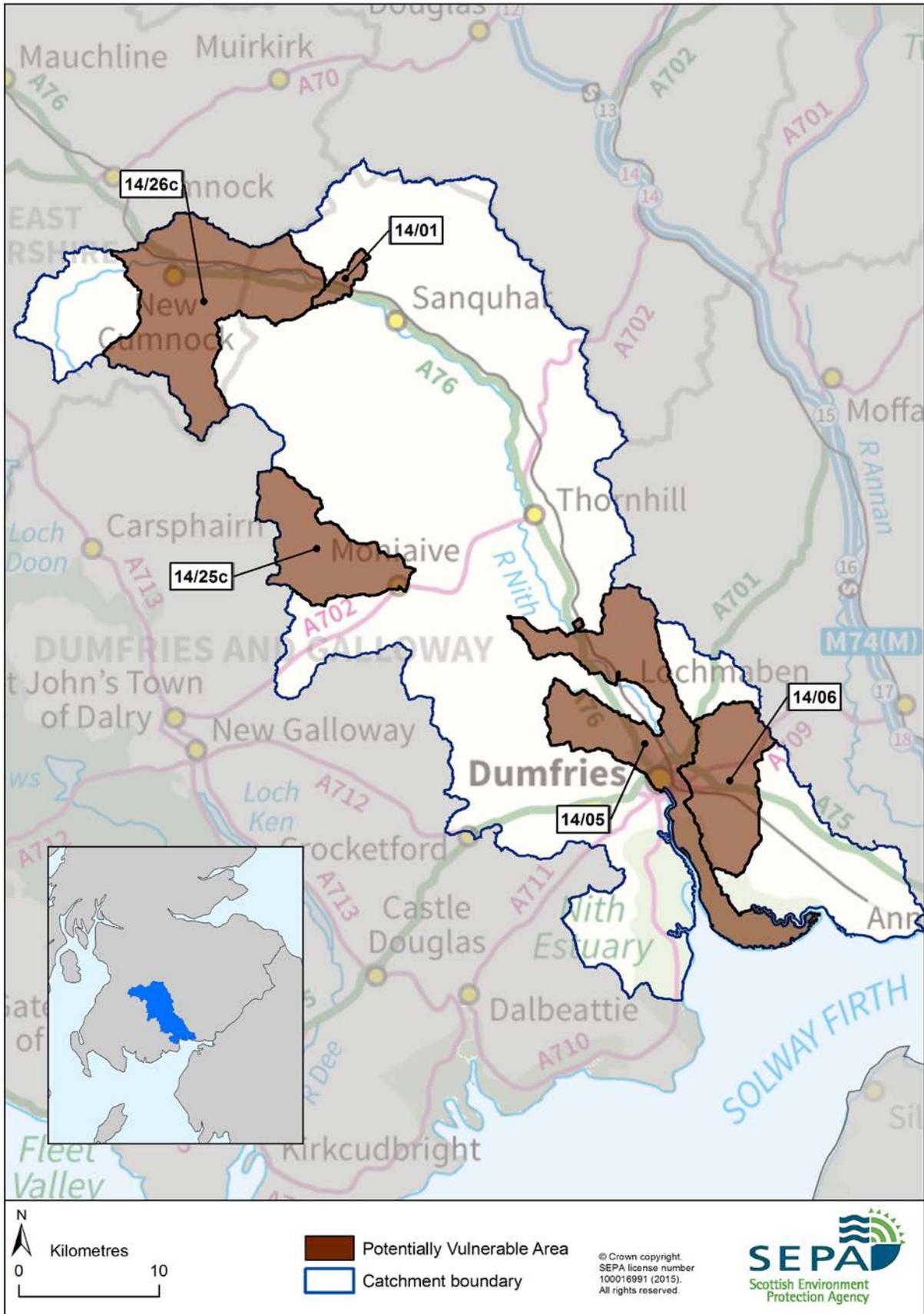
The Lochar Water is the second river catchment within the area and is significantly smaller than the Nith. Located in the south east, it flows approximately parallel to the River Nith and discharges to the Solway Firth.

The annual average rainfall for the Nith catchment group is broadly typical for Scotland, ranging between 1,438mm in the lower parts of the catchment to 1,527mm in the upper parts.

### Flood risk in the catchment

There are approximately 850 residential properties at risk of river flooding, 54% of which are located within Potentially Vulnerable Areas, with an additional 30% located within candidate Potentially Vulnerable Areas. There are also an estimated 220 non-residential properties at risk of river flooding, 65% of which are located within Potentially Vulnerable Areas and an additional 28% within candidate Potentially Vulnerable Areas. There are three Potentially Vulnerable Areas situated within this catchment group and there are also two candidate Potentially Vulnerable Areas (Figure 1):

- Kirkconnel (14/01)
- Dumfries Nith (14/05)
- Dumfries east (14/06)
- Moniaive (14/25c)
- New Cumnock (14/26c).



**Figure 1:** River catchment for the Nith catchment group

## Main areas at risk

The main areas at risk of river flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture. Dumfries and New Cumnock are the main areas at risk of river flooding.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Dumfries	390	£2.6 million
New Cumnock (including Mansfield)	290	£490,000
Kirkconnel	100	£170,000
Kirkton	20	£100,000
Moniaive	20	£50,000
Lincluden	10	£10,000

**Table 1:** Main areas at risk of river flooding

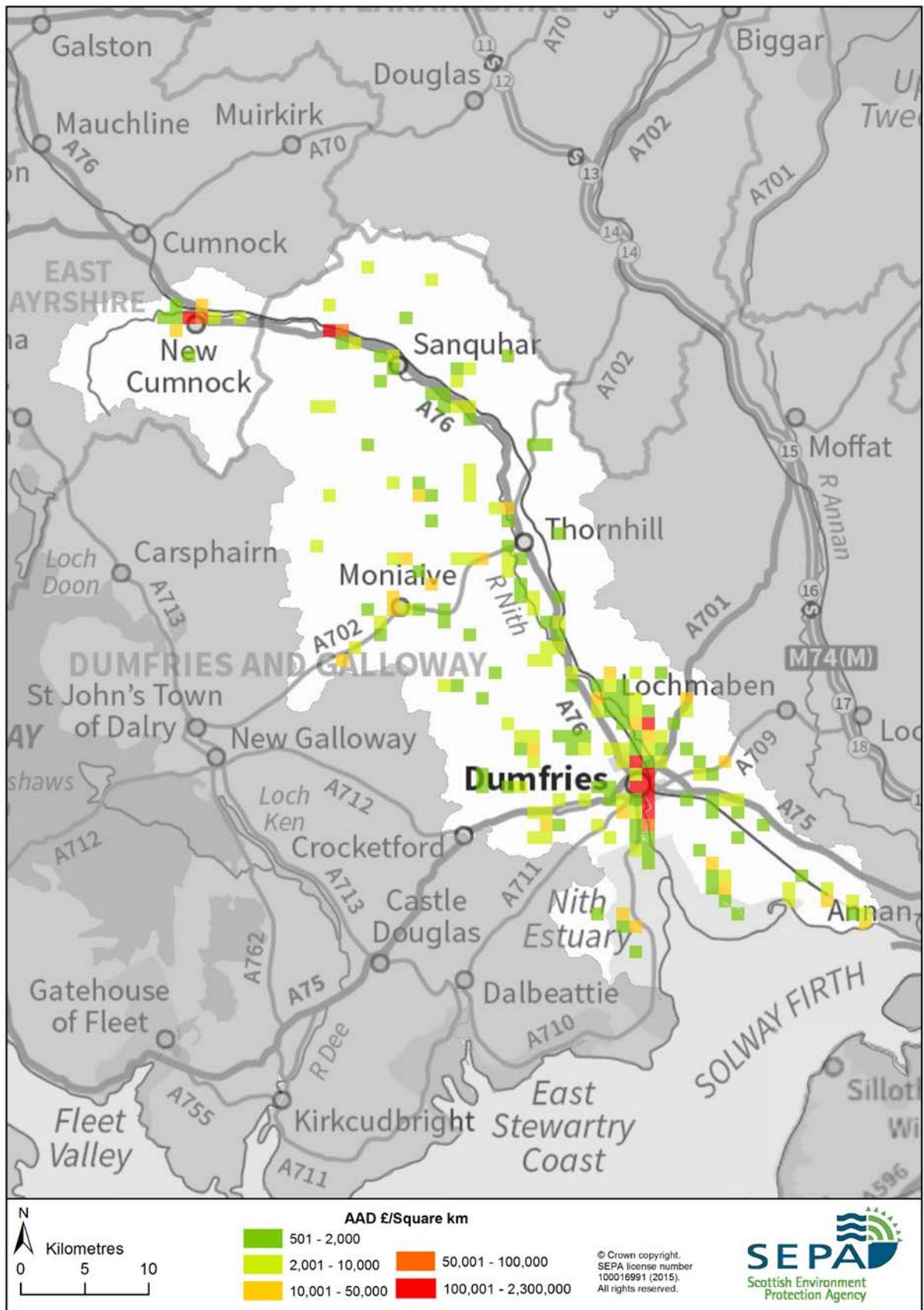
## Economic activity and infrastructure at risk

The total Annual Average Damages caused by river flooding in the Nith catchment group are approximately £4.3 million, which accounts for almost 44% of the estimated Annual Average Damages from river flooding within the Solway Local Plan District. The damages are distributed as follows:

- 44% residential properties (£1.9 million)
- 40% non-residential properties (£1.7 million)
- 7% emergency services (£250,000)
- 4% roads (£190,000)
- 3% agriculture (£140,000)
- 2% vehicles (£98,000).

Figure 2 shows the distribution of Annual Average Damages throughout the catchment group. It shows that the highest concentration of damages are in Dumfries and New Cumnock.

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available.



**Figure 2:** Annual Average Damages from river flooding

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational buildings.
<b>Utility assets</b>	30	Includes: electricity substations, Scottish Water assets and telecommunication sites.
<b>Roads (km)</b>	8.8	Notably: A76 New Cumnock to Dumfries A701 at Tinwald A75 Dumfries
<b>Railway routes (km)</b>	4.4	Railway between New Cumnock and Dumfries
<b>Agricultural land (km<sup>2</sup>)</b>	67	The most extensive areas of land are located to the north of Dumfries and extend north along the River Nith to Thornhill, Sanquhar and west of New Cumnock.

**Table 2:** Infrastructure and agricultural land at risk of river flooding

### Designated environmental and cultural heritage sites at risk

Within the catchment it is estimated that 28 designated cultural heritage sites are at risk of river flooding. These sites include; scheduled monuments, designed gardens and landscapes and listed buildings.

Approximately 12 km<sup>2</sup> of environmental designated area is at risk of river flooding. This includes Special Areas of Conservation (3km<sup>2</sup>), Special Protection Areas (5km<sup>2</sup>), and Sites of Special Scientific Interest (4km<sup>2</sup>).

### History of river flooding

There has been a long history of flooding within the catchment with a number of recent flood events.

Flooding occurred on 11 December 1994 near Auldgirth, north of Dumfries, which resulted in one fatality. On the same date there was flooding in Dumfries causing serious disruption to transport and damaged residential and commercial properties in Whitesands, Brewery Street and Friars Vennel.

Dumfries is known to be affected by floods from the River Nith almost every year since 1891 with the earliest flooding reported in 1785.

Flooding occurred on 31 December 2013 which affected properties and businesses in New Cumnock, Kirkconnel, Sanquhar and Moniaive. The areas worst affected were in New Cumnock, St. Conal's Square and Riverside Terrace in Kirkconnel, as well as parts of Sanquhar.

Significant flooding occurred in the Nith catchment on November 2009 which resulted in flooding to properties in Dumfries and the surrounding areas.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document.

### Flood protection schemes

Dumfries and Galloway Council constructed a flood protection scheme in Kirkconnel in 1984. This consisted of re-grading 330m of the Glenwharrie Burn (Polbower Burn), construction of concrete retaining walls and reinforcing gabions to the rear of Kirkconnel Activity and Resource Centre. It also included 120m of culvert and two surface water interceptor cattle grids at Fauldhead Farm.

### River flood warning schemes

SEPA operates a flood warning scheme in the Nith catchment group. Flood Warnings are issued when river flooding is forecast for the flood warning areas. There is one river flood warning area within the catchment, at Whitesands in Dumfries, as shown in Figure 3 and Table 3. Table 3 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Properties within FWA	% of properties registered May 2014
Whitesands (Dumfries)	Nith	349	36%

**Table 3:** Flood warning areas



Figure 3: Flood warning area

## Climate Change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Nith catchment group may increase by 44%<sup>1</sup>. This would potentially increase in the number of residential properties at risk of river flooding from approximately 850 to 1,200 and the number of non-residential properties from approximately 220 to 300.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA online maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicates the potential for runoff reduction, floodplain storage and sediment management. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to help identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

SEPA is currently carrying out a natural flood management pilot study in the Upper Nith catchment, which also looks at way to improve the ecological status of water bodies in the catchment and may help to reduce local flooding.

### Runoff reduction

The assessment shows that a large area in the north of the catchment group has the potential for runoff reduction. This area is situated within the River Nith catchment, upstream of New Cumnock, Kirconnel and Sanquhar.

### Floodplain storage

Downstream on the River Nith there are several areas with the potential for flood storage both upstream of Dumfries town centre.

### Sediment management

Moderate erosion occurs upstream of Kirconnel along lengths of the River Nith and the Glenwharrie Burn.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## River flooding Dee (Galloway) catchment group

### Catchment overview

The Dee catchment group is located within the Solway Local Plan District and covers an area of over 1,530km<sup>2</sup>. The catchment is over 98% rural and almost 2% urban with a population of approximately 24,000. This area includes part of two local authorities; Dumfries and Galloway Council and East Ayrshire Council.

The area comprises two main catchments, the River Dee and the Urr Water. The River Dee catchment has two main river stems: the Water of Ken, which flows in a southerly direction from the north of the catchment group, and the River Dee, which flows in an easterly direction before the two join at Loch Ken when the River Dee flows south discharging to the Solway Firth at Castle Douglas. The Urr Water is the significantly smaller catchment. It flows mostly southwards from Loch Urr then runs parallel to the B794 to the west of Dalbeattie, eventually discharging to the Solway Firth.

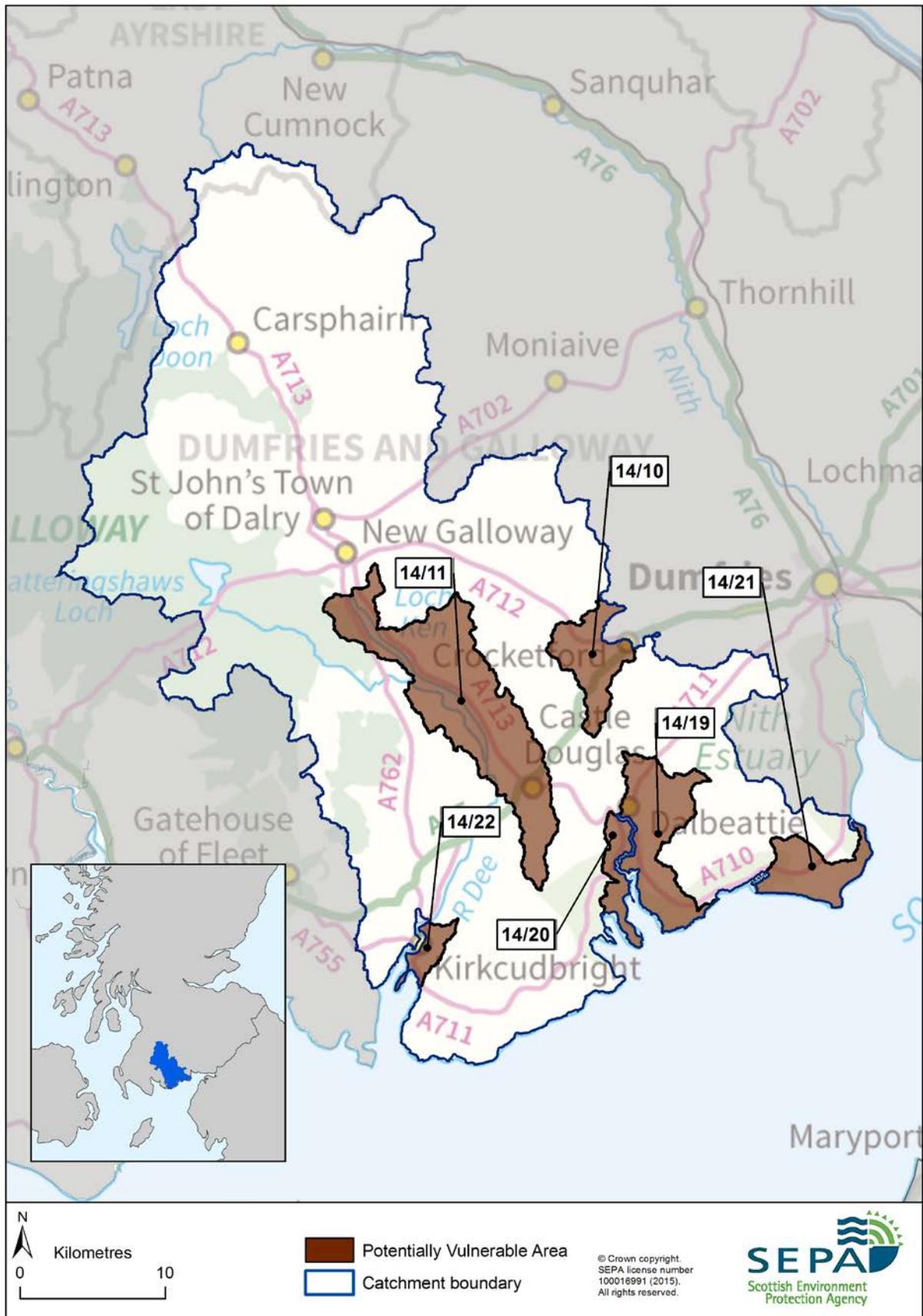
The catchment experiences higher than average rainfall ranging between 1,709mm in the lower part of the catchment and 1,821mm in the upper part.

The area is heavily modified by the Galloway hydro scheme, completed in the 1930s, which incorporates 1,344km<sup>2</sup> of catchment. Whilst the scheme's reservoirs provide some flood storage, they were not built as flood defence structures. Scottish Power is licensed to use water for power generation under regulations which include conditions to ensure flooding is not exacerbated by its operation. This includes restrictions on water release for electricity generation during flood conditions to avoid sending more water downstream. However, the reservoirs release excess flow when the water level rises above the appropriate levels.

### Flood risk in the catchment

There are approximately 530 residential properties predicted to be at risk of river flooding, 46% of which are located within Potentially Vulnerable Areas. Approximately 110 non-residential properties are predicted to be at risk of river flooding, 85% of which are located within Potentially Vulnerable Areas. There are five Potentially Vulnerable Areas at risk of river flooding situated within this catchment group as shown in Figure 1:

- Springholm (14/10)
- Castle Douglas (14/11)
- Dalbeattie (14/19)
- Palnackie (14/20)
- Southernness and Carsethorn (14/21).



**Figure 1:** River catchment for the Dee (Galloway) catchment group

## Main areas at risk

The main areas at risk of river flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture. The property count for Carsphairn comes from a local authority study, while all other values are from a SEPA study.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Dalbeattie	270	£260,000
Castle Douglas	120	£280,000
Carsphairn	30	£18,000
Springholm	20	£70,000
New Galloway	20	£47,000
Bridge of Dee	20	£36,000

**Table 1:** Main areas at risk of river flooding

## Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Dee (Galloway) catchment group are approximately £1.4 million which accounts for almost 14% of the estimated Annual Average Damages from river flooding within the Solway Local Plan District. The damages are distributed as follows:

- 68% residential properties (£1.0 million)
- 9% roads (£130,000)
- 8% emergency services (£95,000)
- 6% non-residential properties (£80,000)
- 6% agriculture (£80,000)
- 3% vehicles (£50,000).

Figure 2 shows the distribution of Annual Average Damages throughout the catchment group. Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational buildings and healthcare facilities
<b>Utility assets</b>	20	Includes: electricity substations and Scottish Water assets
<b>Roads (km)</b>	14.7	Notably: A713 between Carsphairn and Knocknalling A711 between Dalbeattie and Dumfries A75 between Springholm and Crocketford A762 at Glenlee north-west of New Galloway
<b>Agricultural land (km<sup>2</sup>)</b>	46	Generally located along the main watercourses but flood plains are more extensive to the west of Castle Douglas and north of New Galloway

**Table 2:** Infrastructure and agricultural land at risk of river flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment it is estimated that approximately 29 designated cultural heritage sites are at risk of river flooding. These sites include; scheduled monuments, designed gardens and landscapes and listed buildings.

Approximately 22 km<sup>2</sup> of environmental designated areas are at risk of river flooding. This includes Special Areas of Conservation (<1km<sup>2</sup>), Special Protection Areas (8km<sup>2</sup>) and Sites of Special Scientific Interest (14km<sup>2</sup>).

## History of flooding

Recent major river flooding was experienced in December 2013, Carsphairn, Ken Bridge, New Galloway, with local residents identifying the flooding as the worst they have experienced in 40 years. A number of properties were affected along with sections of the A713.

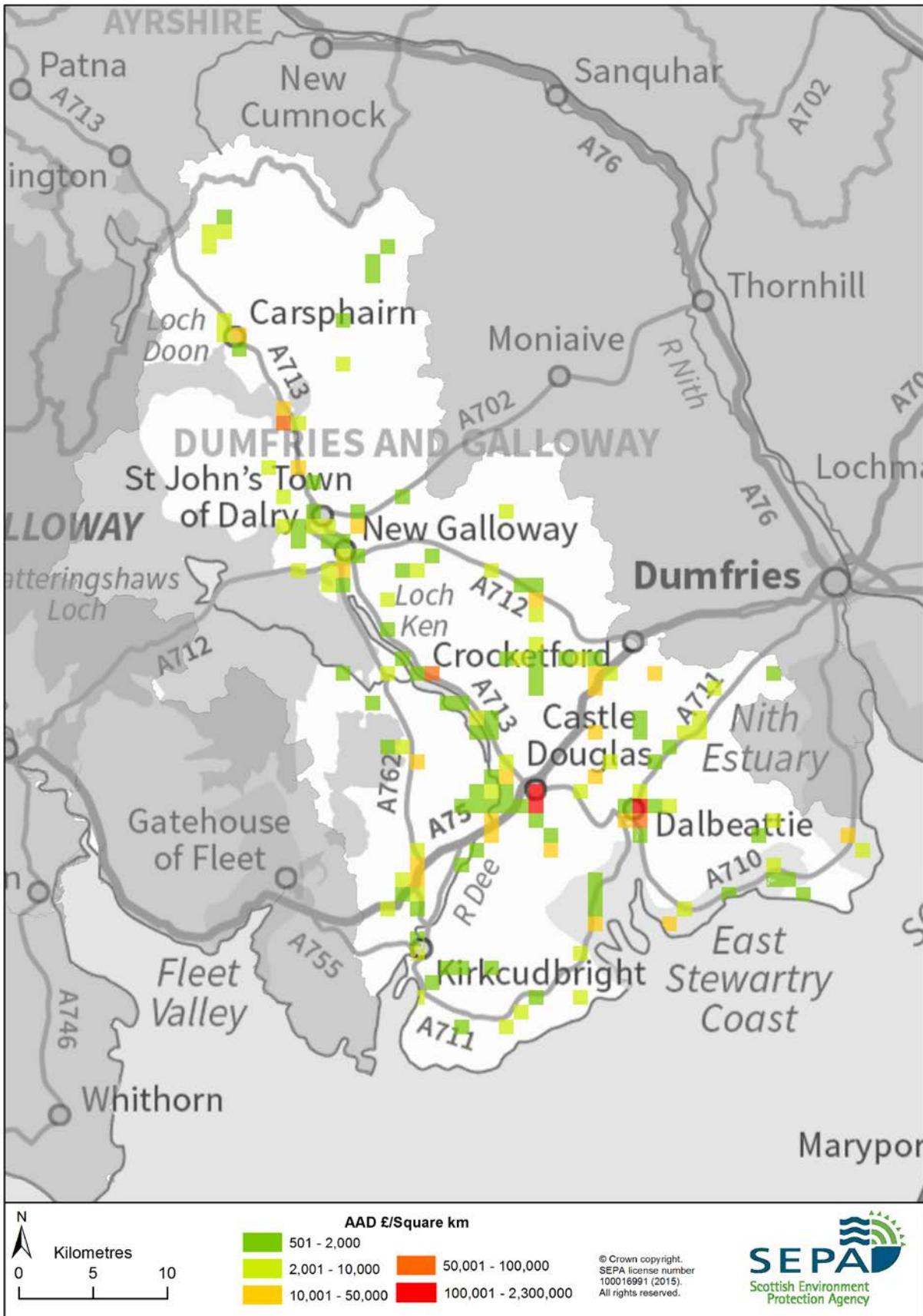
In late 2008 river flooding occurred in the areas of Beeswing, Dalbeattie, Kirkcudbright, Crossmichael and Parton mainly affecting roads and properties.

In December 2006 the Water of Ken flooded causing substantial damage to the A762 and road surface. On the same date flood water overspilled the banks of Loch Ken and flooded through fields onto the A713 road in Parton Village.

In January 2005 the Mill Burn flooded roads and school playground. On the same day the Palnackie Burn and Greenlaw Burn flooded and endangered nearby properties.

Wider impacts due to flooding, occurred on 31 October 1977 in Dalbeattie, when the gas supply was cut off for two days, during the flood a nearby footbridge was washed away.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.



**Figure 2:** Annual Average Damages from river flooding

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document.

### Flood protection schemes

Dumfries and Galloway Council has a number of flood protection schemes throughout this catchment group including the following:

- Dalbeattie Flood Protection Scheme (1981). The scheme covered the Kirkgunzeon Lane, Dalbeattie Burn and Drumjohn Burn and involved channel improvements, construction of banks and walls and culvert replacements.
- Craigieknowe Burn Flood Protection Scheme (1980)
- The Springholm Flood Protection Scheme (1990) consisted of the installation of a water gate, channel improvements and replacement culverts on the Culsharn Burn.
- Grange Burn Flood Protection Scheme (1972) in Bridge of Urr.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Dee (Galloway) catchment group may increase by 44%<sup>1</sup>. This would potentially increase in the number of residential properties at risk of river flooding from approximately 530 to 830 and the number of non-residential properties from approximately 110 to 150.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

Dumfries and Galloway Council are to carry out further assessment of the potential for natural flood management to reduce flood risk in the Dee catchment.

### **Runoff reduction**

The Loch Ken catchment has large areas of high and medium potential for runoff reduction. These are situated in the east of the catchment group, mainly covering the area between the Water of Deugh and Shaw Hill. Incorporating runoff reduction measures in this area may reduce risk along Loch Ken and the River Dee further downstream. Another notable area exists to the north of the River Deugh, which contributes to significant flood risk in Carsphairn. Other sizable areas designated as having medium potential for runoff reduction are scattered through the catchment group, particularly along the east and in the south east of the area, upstream of Potentially Vulnerable Areas Springholm (14/10), Dalbeattie (14/19) and Southernness and Caresthorn (14/21).

### **Floodplain storage**

There are substantial areas of potential flood storage throughout the catchment group. There is scope for additional storage at several lochs, including but not limited to Loch Grannoch, Lock Skerrow, Clatteringshaws Loch, Stroan Loch and most notably Loch Ken. As Loch Ken is controlled to an extent by the barrage at Glenlochar, therefore any potential flood storage may be governed by the operational controls at this structure. Loch Ken also contributes to flood risk in some nearby areas, so additional storage in this area may not be suitable as it may exacerbate flood problems.

Floodplain storage in the catchment group has already been greatly influenced by Scottish Power's incorporation of water storage areas. There are 10 dams within the Galloway hydro scheme, which provide additional storage in reservoirs such as Loch Doon, Clatteringshaws and Lock Ken to supply the six power stations that form the Galloway hydro scheme. The flow of water to the turbines can be shut off by closing intake gates and valves, according to customer demand and available water, which will alter water levels downstream. There are restrictions on water release for electricity generation during flood conditions, which have been put in place to avoid increased flooding downstream.

Further information on the Galloway hydro scheme can be found on the Scottish Power website<sup>2</sup>.

### **Sediment management**

Watercourses contributing to Lock Ken, such as the Water of Ken and Black Water of Dee, have distinct lengths of erosion and deposition. The River Dee, south of Loch Ken, has alternating high levels of erosion and deposition upstream of Kircudbright, which experiences flooding from the river. Opportunities for balancing the river sediment movement also exist along watercourses in Potentially Vulnerable Areas 14/10 (Spottes Burn) and 14/19 (Kirkgunzeon Lane).

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<sup>2</sup> [http://www.scottishpower.com/pages/galloway\\_and\\_lanark\\_hydro\\_schemes.asp](http://www.scottishpower.com/pages/galloway_and_lanark_hydro_schemes.asp)

## River flooding Cree catchment group

### Catchment overview

The Cree catchment group is located within Solway Local Plan District and covers an area of over 2,000km<sup>2</sup>. The region is over 98% rural with less than 2% of the area identified as urban, with an approximate population of 34,000. This area includes part of two local authorities; Dumfries and Galloway Council and South Ayrshire Council.

There are three main river catchments which are the Water of Luce, the River Bladnoch and the River Cree. The River Cree originates in the South Ayrshire Hills. The main tributaries of the Cree are the Minnoch, Trool and Penkiln Burns. The Water of Luce originates from Milljoan Hill in South Ayrshire and flows south into New Luce, where it is joined by the Cross Water of Luce. It continues south towards Glenluce before flowing into the Solway Firth at Luce Bay. The River Bladnoch headwaters are in Loch Maberry in the north, it continues in a south-easterly direction until it passes Wigtown harbour and enters the sea at Wigtown Bay.

The annual average rainfall in the area is relatively high for Scotland, ranging between 1,366mm and 2,026mm in the upper parts of the catchments, to between 1,342mm and 1,756mm in the lower parts.

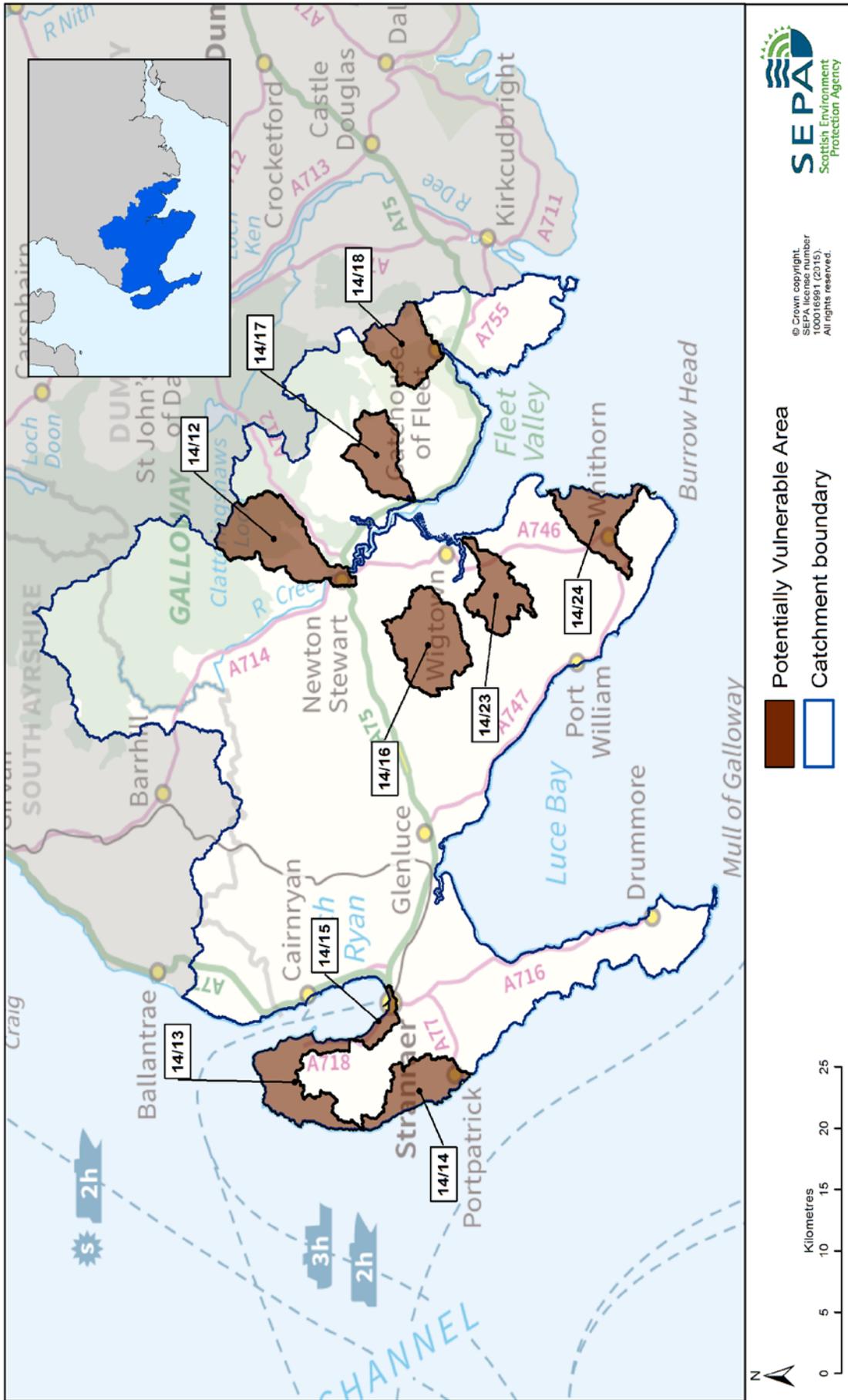
### Flood risk in the catchment

There are approximately 580 residential properties at risk of river flooding, 78% of which are located within Potentially Vulnerable Areas. There are also approximately 160 non-residential properties at risk of river flooding, 80% of which are located within Potentially Vulnerable Areas. There are nine Potentially Vulnerable Areas in this catchment group as shown in Figure 1:

- Newton Stewart (14/12)
- Kirkcolm (14/13)
- Portpatrick (14/14)
- Stranraer (14/15)
- Spittal (14/16)
- Creetown (14/17)
- Gatehouse of Fleet (14/18)
- Braehead and Whauphill (14/23)
- Isle of Whithorn and Garlieston (14/24).

### Main areas at risk

The main areas at risk of river flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture. Newton Stewart and Stranraer are the main areas at risk of flooding.



**Figure 1:** River catchment for the Cree catchment group

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Newton Stewart	270	£520,000
Stranraer	200	£160,000
Garlieston	80	£200,000
Creetown	60	£130,000
Isle of Whithorn	10	£35,000
Sorbie	10	£34,000
Port William	10	£30,000

**Table 1:** Main areas at risk of river flooding

### Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Cree catchment group are approximately £1.7 million, which accounts for almost 18% of the estimated Annual Average Damages from river flooding within the Solway Local Plan District. The damages are distributed as follows:

- 59% residential properties (£1.0 million)
- 18% non-residential properties (£300,000)
- 7% emergency services (£120,000)
- 7% roads (£110,000)
- 6% agriculture (£96,000)
- 3% vehicles (£47,000).

Figure 2 shows the distribution of Annual Average Damages throughout the catchment group. The figure shows that the highest concentration of damages is in Newton Stewart and Garlieston.

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational buildings and healthcare facilities
<b>Utility assets</b>	10	Includes: electricity substations and telecommunications sites
<b>Roads (km)</b>	10.2km	Notably: A77 along the shore of Loch Ryan heading north from Stranraer to Ballantrae A75 Stranraer to Newton Stewart and south of Gatehouse of Fleet A714 north of Newton Stewart
<b>Railway routes (km)</b>	1.4km	Stranraer
<b>Agricultural land (km<sup>2</sup>)</b>	50	Located mainly along the main watercourses

**Table 2:** Infrastructure and agricultural land at risk of flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment it is estimated that 48 designated cultural heritage sites are at risk of river flooding. These sites include; scheduled monuments, gardens and designed landscapes and listed buildings.

Approximately 11 km<sup>2</sup> of environmental designated area is at risk of river flooding. This includes Special Areas of Conservation (4km<sup>2</sup>), Special Protection Areas (1km<sup>2</sup>) and Sites of Special Scientific Interest (6km<sup>2</sup>).

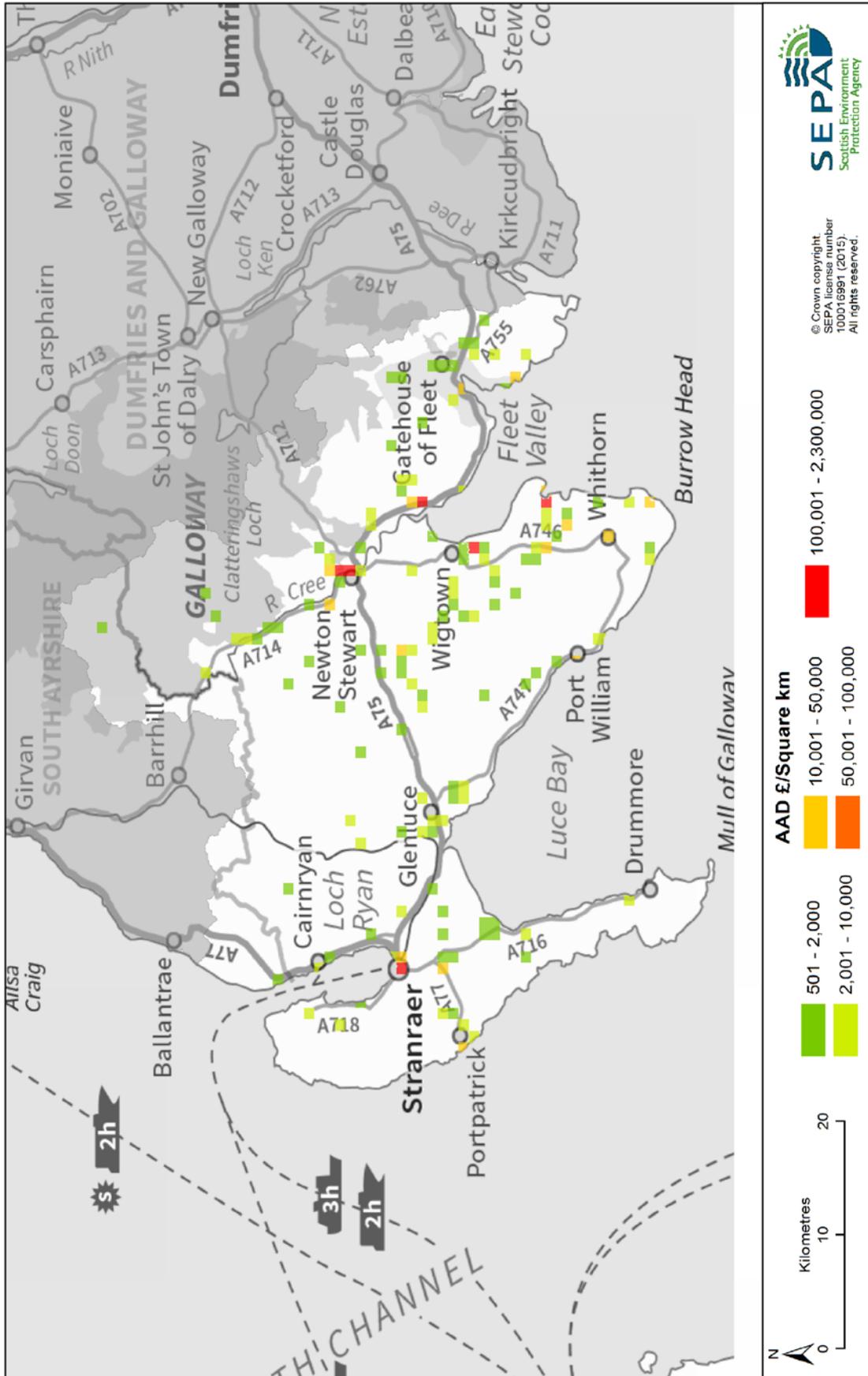
## History of flooding

There have been a number of floods in the area, which have impacted people and properties. The largest impacts have been along the River Cree and Penkiln Burn, where many river floods have affected Newton Stewart and Minnigaff. The first recorded flooding was in 1851, with the most recent flood occurring on 19 November 2012. Flooding in 2012 was the highest observed water level in the River Cree, which resulted in approximately 50 properties being flooded. The most recent flooding on the River Cree occurred on July 2015 when flash flooding caused flooding to properties Creetown.

A major river flood occurred in Portpatrick on October 2000 causing extensive damage to shops, hotels and houses. This flood ultimately led to the construction of the Portpatrick Flood Protection Scheme in 2004.

River floods have also impacted Mayfield. In 1970 and 1971 the ferry terminal marshalling yard flooded from Black Stank/Bishop Burn. The earliest recorded flood took place in October 1926 with a number of recent floods here in August 1999 and across September and October 2002.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.



**Figure 2:** Annual Average Damages from river flooding

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document.

### Flood protection schemes

Dumfries and Galloway Council has a number of flood protection schemes throughout this catchment group including:

- The Creetown Flood Protection Scheme that consists of embankments and a diversion channel.
- The Kirkcolm Flood Protection Scheme (1991) involved channel improvements and culvert up-grades.
- Kirkinner Flood Protection Scheme (1991) involved channel improvements and culvert replacements.
- Whithorn Flood Protection Scheme (1991) involved channel improvements and culvert replacement.
- Mochrum Flood Protection Scheme (1991) on the Druchtag Burn involved the burn being culverted through the village.
- Port Logan Flood Protection Scheme (1991) consisted of the culverting of an unnamed tributary through the Shore Road to mitigate flooding of properties along Laigh Row.
- The Portpatrick Flood Protection Scheme (2004) consisted of upstream attenuation areas, channel improvements, bridge raising, a storm bypass pipe and walls.
- Stranraer Flood Protection Scheme is partially completed. The scheme is being undertaken as a number of different work packages which includes: diversion of part of the Sheuchan Burn and trash screens, culverting, new culvert inlet and silt trap, culvert replacement, flow control, formalisation of storage within agricultural land and masonry wall re-build, as well as property level protection installations such as automatic air bricks. Dumfries and Galloway Council will maintain the works with periodic inspection.

### River flood warning schemes

There is no current river flood warning schemes within the Cree catchment group but it is proposed that a Flood Early Warning System (FEWS) for Newton Stewart will be put in place before the end of 2016.

## Awareness raising and community groups

The Cree Valley Flood Action Group covers the watercourses in Newton Stewart and a section of the River Cree. It was established in 2013 following flooding in November 2012.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Cree catchment group may increase by 44%<sup>1</sup>. This would potentially increase in the number of residential properties at risk of river flooding from approximately 580 to over 790 and the number of non-residential properties from approximately 160 to 190.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

## Runoff reduction and floodplain storage

The assessment indicates that a significant area of the catchment shows high and medium potential for runoff reduction. The main areas are in the north of the River Cree and Water of Minnoch catchments. There is also an area to the north of Newton Stewart with high potential for runoff reduction. This area is also shown to have high potential for additional floodplain storage with sections as far as Bargrennan.

## Sediment management

Watercourses within the catchment are generally balanced, with some shorter lengths alternating between high erosion and high deposition. Lengths of high erosion and high deposition occur upstream of Newton Stewart, with predominantly high deposition occurring downstream, therefore natural flood management actions in the upstream catchment may offer some potential to reduce flooding risk.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## 3.3 Coastal flooding

### Solway Local Plan District

This chapter provides supplementary information on flooding for coastal areas. It provides an overview of the natural characteristics of the coast, a summary of flood risk within the coastal area and a brief history of flooding. It also outlines the likely impact of climate change and the potential for natural flood management.

Information about the objectives and actions to manage flood risk are provided in in Section 2.

#### Coastal overview

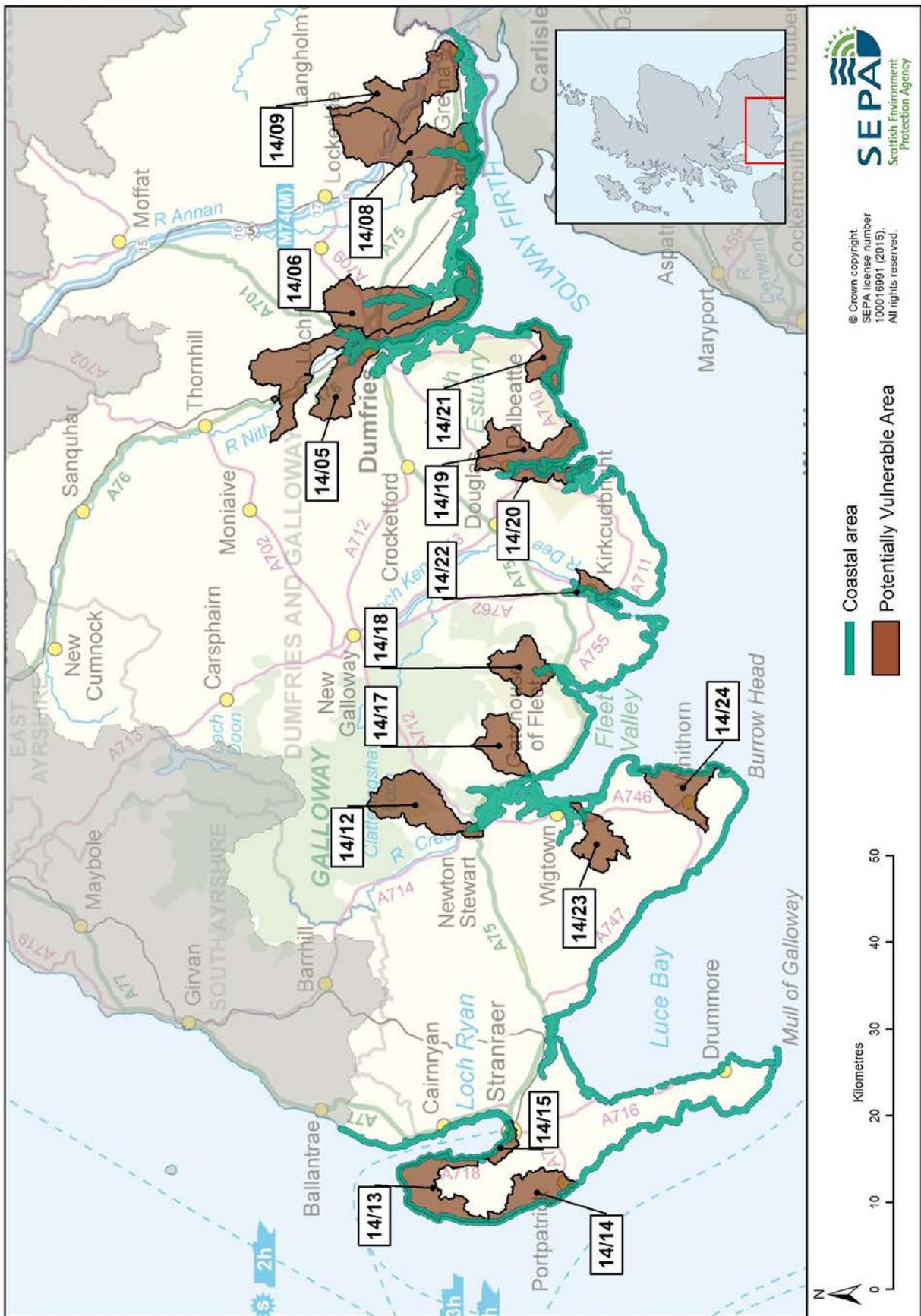
This coastal area of the Solway Local Plan District covers approximately 625km of coastline. There are several coastal communities in this coastal area including Stranraer, Annan, Creetown, Kirkcudbright and Portpatrick.

This area spans two local authorities; Dumfries and Galloway Council and South Ayrshire Council.

#### Flood risk

Within this area there are estimated to be approximately 670 residential properties and approximately 170 non-residential at risk of coastal flooding. This risk has been calculated from the inland projection of still water levels. Additionally there are potential impacts from locally generated wave mechanisms affecting the coastline. The Potentially Vulnerable Areas in this Local Plan District at risk of coastal flooding are listed below. Potentially Vulnerable Areas 14/06 and 14/12 are near the coast although have no damage from coastal flooding (Figure 1).

- Dumfries Nith (14/05)
- Ecclefechan-Annan (14/08)
- Kirtle Water catchment (14/09)
- Kirkcolm (14/13)
- Portpatrick (14/14)
- Stranraer (14/15)
- Creetown (14/17)
- Gatehouse of Fleet (14/18)
- Dalbeattie (14/19)
- Palnackie (14/20)
- Southernness and Carsethorn (14/21)
- Kirkcudbright (14/22)
- Braehead and Whauphill (14/23)
- Isle of Whithorn and Garlieston (14/24).



**Figure 1:** Local Plan District coastal area and Potentially Vulnerable Areas with a risk of coastal flooding

## Main areas at risk

The main areas at risk of coastal flooding can be seen in Table 1. This shows the number of properties at risk and the total Annual Average Damages caused by coastal flooding for each of these areas. This includes damages to residential and non-residential properties, transport and agriculture.

	Residential and non-residential properties at risk of coastal flooding	Annual Average Damages
Stranraer	150	£220,000
Annan	130	£240,000
Kirkcudbright	90	£200,000
Isle of Whithorn	50	£260,000
Powfoot	60	£230,000
Creetown	40	£200,000
Garlieston	40	£160,000
Dalbeattie	30	£180,000
Southernness	30	£120,000
Portpatrick	10	£30,000

**Table 1:** Main areas at risk of coastal flooding

## Economic activity and infrastructure at risk

The Annual Average Damages caused by coastal flooding within this coastal area are approximately £2.7 million. The damages are distributed as follows:

- 56% residential properties (£1.5 million)
- 15% non-residential properties (£410,000)
- 14% roads (£390,000)
- 6% Emergency services (£180,000)
- 4% vehicles (£120,000)
- 2% agriculture (£60,000).

There is potential for damages all along the Solway coastline, although the highest damages are predicted to occur around the main coastal areas, with potential impacts to properties, shops and services in these areas. Figure 2 shows the Annual Average Damages throughout the coastal area.

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available.

Table 2 shows further information about infrastructure and agricultural land at risk of coastal flooding.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes; emergency services and educational buildings
<b>Utility assets</b>	20	Includes; electricity substations and fuel extraction sites
<b>Roads (km)</b>	23.4	Notably: A77 and A75
<b>Railway routes (km)</b>	2.9	Section of Glasgow South Western line
<b>Agricultural land (km<sup>2</sup>)</b>	30.6	

**Table 2:** Infrastructure and agricultural land at risk of coastal flooding

### **Designated environmental and cultural heritage sites at risk**

Within the catchment it is estimated that approximately 42 designated cultural heritage sites are at risk of coastal flooding. These sites include; scheduled monuments, gardens and designed landscapes and listed buildings.

Approximately 32 environmental designated areas are at risk of coastal flooding. This includes four Special Areas of Conservation, four Special Protection Areas and 24 Sites of Special Scientific Interest. These include the Luce Bay and Sands, Isle of Whithorn Bay, Cree Estuary, Borgue coast, Upper Solway flats and marshes and Solway Firth.

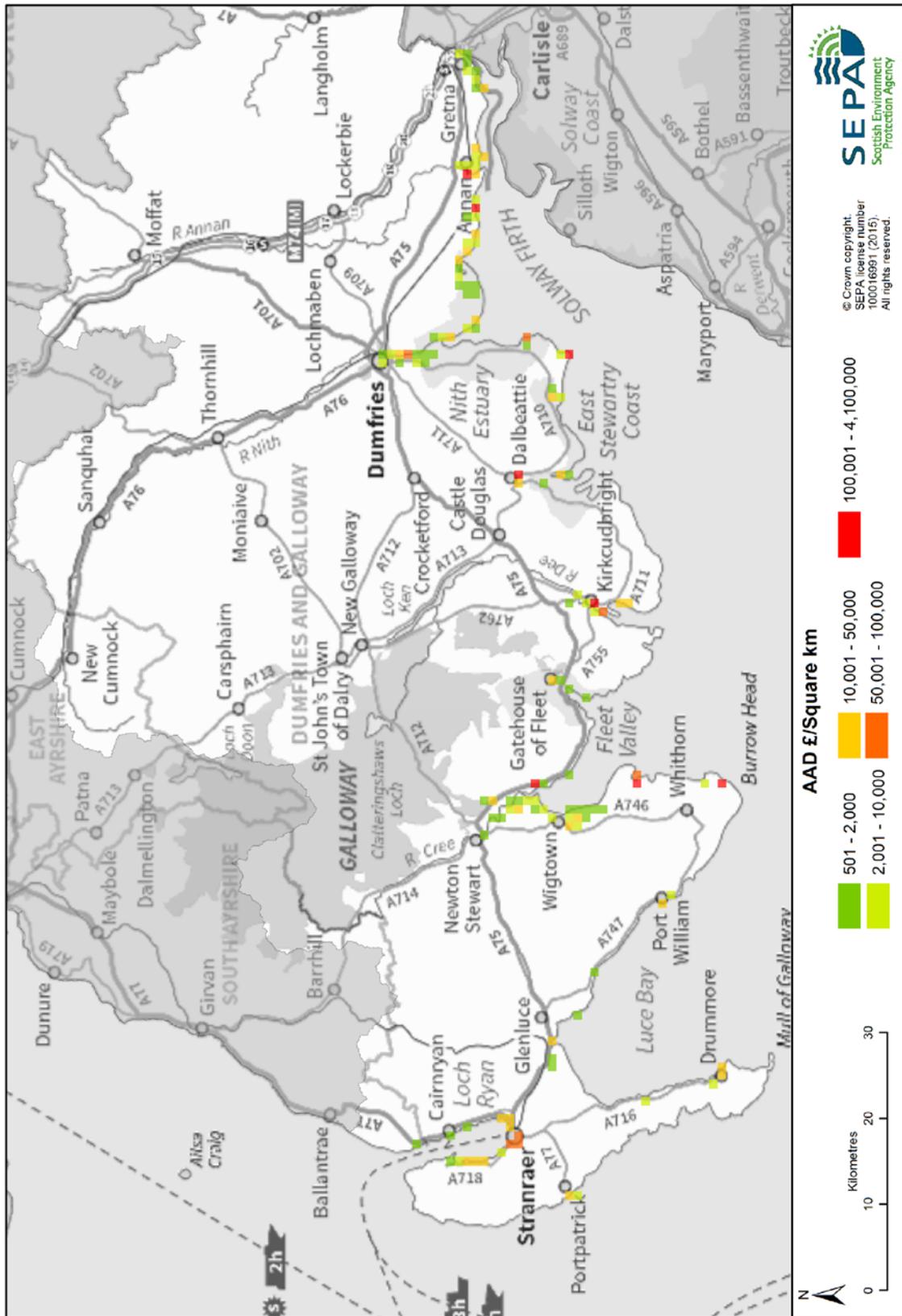


Figure 2: Annual Average Damages from coastal flooding

## History of flooding

The most recent and notable coastal flooding along the Solway coastline occurred in January 2014. The January 2014 flooding also affected several locations across the area including:

- Annan: approximately 30 properties were affected by flooding
- Creetown: more than 10 residential properties were affected.
- Dumfries: a few business properties were flooded.
- Glencaple and Kelton approximately 10 properties were affected and a road was closed due to flooding.
- Isle of Whithorn: approximately 40 residential properties and a few business properties flooded.
- Kirkcudbright: approximately 10 residential properties and business properties flooded.
- Port Logan fewer than 10 residential properties were flooded.
- Portpatrick there was damage to coastal defence structures
- Port William waves destroyed part of the sea wall and the A747 was damaged.
- Powfoot: roads and public space flooded and three families were evacuated from Queensberry Caravan Park.
- Southernness: approximately 10 residential properties flooded and there was damage to private coastal defence.

On the 1 February 2014 coastal flooding in the Isle of Whithorn resulted in fire and rescue crews pumping water from properties on Harbour Row and Main Street. Furthermore, on the 1 February 2014 huge waves overtopped the harbour wall in Port William which caused residential properties to flood and a coastal road to close at a number of locations.

The earliest recorded floods date back to the late 19 century. However, these had limited impacts to people and properties.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapter of this document.

## Flood protection schemes

There are coastal defence assets throughout this Local Plan District which are not formal flood protection schemes but do provide protection against both flooding and erosion.

Common types of shoreline defence along this coastline are:

- **Hard Shoreline Reinforcement:** Reinforcement structures use materials such as rock armour, man-made armour, revetments, retaining walls, gabion baskets, seawalls and sheet piling to protect vulnerable coastlines or harbours from erosion.
- **Flood Defence Embankment:** This is a length of flood embankment, such as an artificial bank of earth and stone created to prevent inundation of estuarine and coastal floodplains.

The location and type of existing coastal defences in this Local Plan District are shown in Figure 4.

## Coastal flood warning schemes

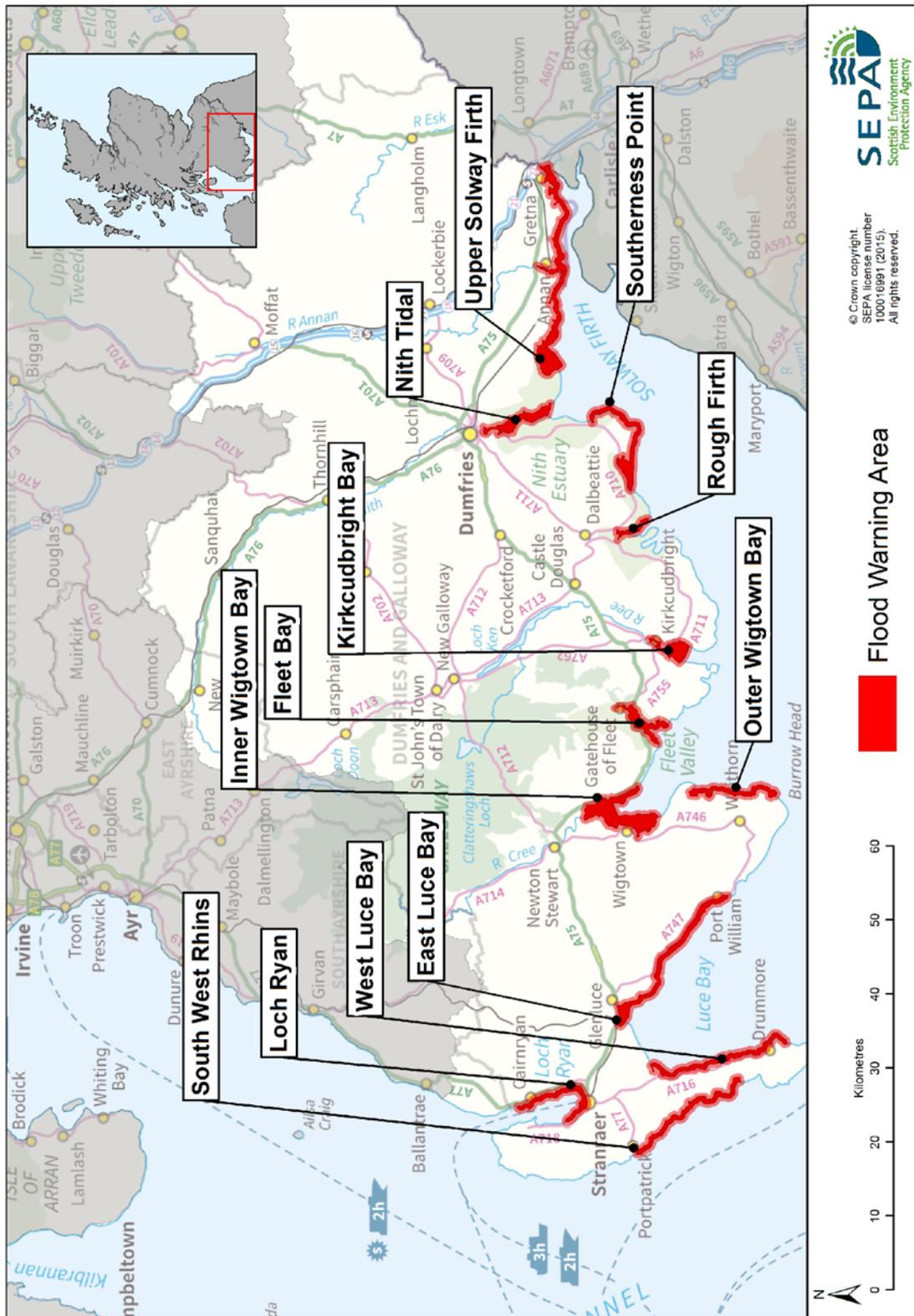
A flood warning scheme for the Solway Firth was launched in October 2015. The warning areas within this scheme are shown in Figure 3.

## Climate change and future flood risk

UK Climate Projections (UKCP09) predicts that climate change may increase sea levels. The magnitude of sea level rise varies around the coastline.

For the UKCP09 high emissions scenario, the predicted average sea level increase for the Solway Local Plan District is between 0.48m-0.50m by 2080. This may increase the number of residential properties at risk of coastal flooding from approximately 680 to 1,700 and the number of non-residential from approximately 170 to 230. Coastal flood modelling by SEPA has not taken into account the impacts of future climate change on wave overtopping or storminess, which could increase the number of people affected by coastal flooding.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.



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Figure 3: Flood warning areas

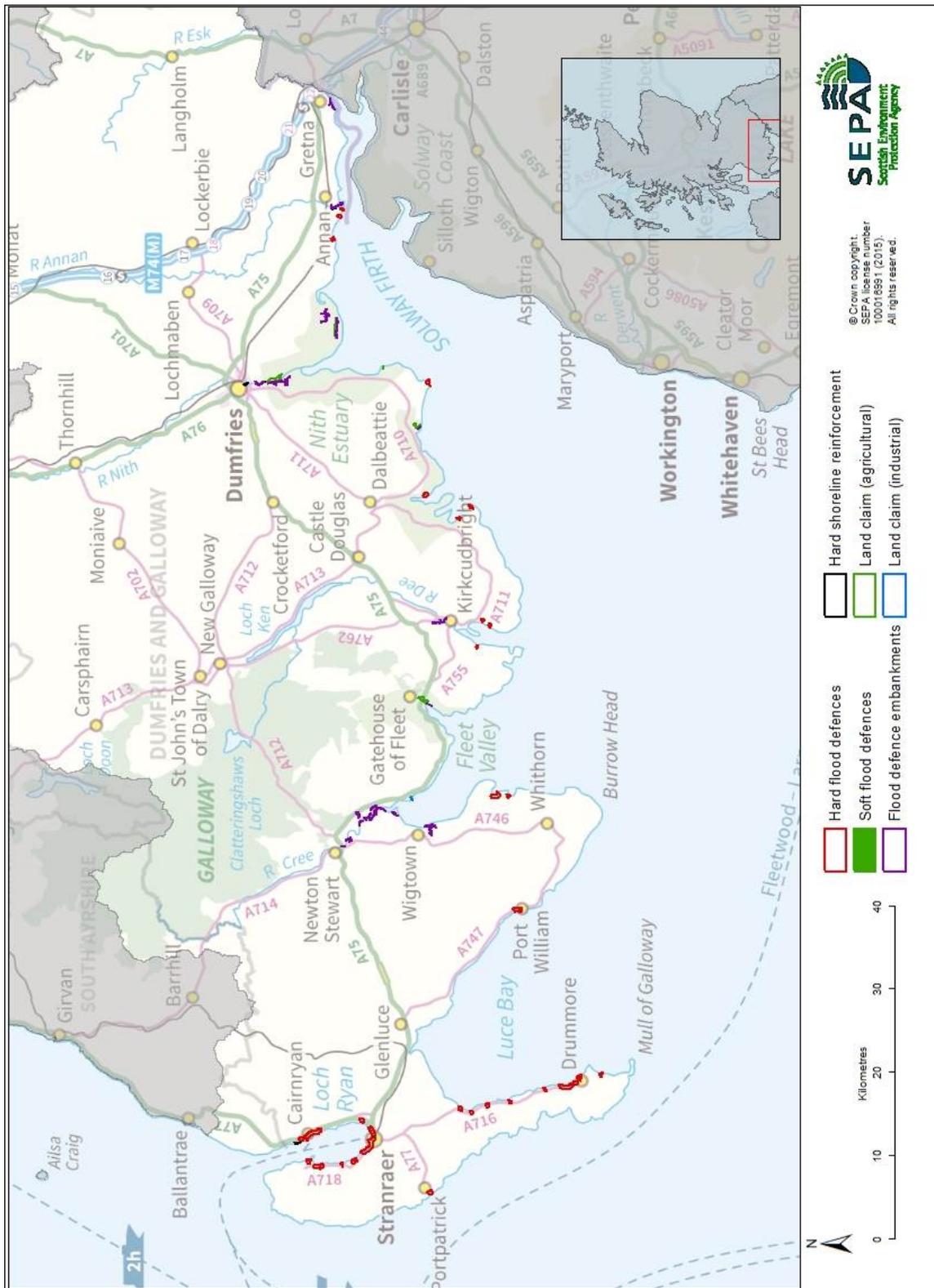


Figure 4: Coastal protection for coastal area

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

### Wave energy dissipation

There are a number of areas along the majority of the coastline that show potential for wave energy dissipation. Some of these areas are:

- Loch Ryan, between Leffnoll Point and Kirkcolm
- Broadsea Bay to Black Head
- Port of Spittal Bay
- Mull of Galloway to Burrow Head
- Innerwell Port and Ravenshall Point
- Southernness Point
- Kirkcudbright Bay
- Carsethorn.

### Estuarine surge

There are a number of areas showing high potential for estuarine surge attenuation. Most notable are:

- Auchencairn Bay
- Rough Firth
- along Mersehead Sands
- Blackshaw Bank
- Sarkfoot Point
- Wigtown Sands.

## 3.4 Surface water flooding

### Solway Local Plan District

This chapter provides supplementary information on surface water flooding across the Solway Local Plan District. It provides an overview of the main areas at risk and the history of surface water flooding. The predicted impacts on infrastructure are also identified. The impacts on environmental sites and agricultural land have not been assessed.

Information about the objectives and actions to manage flood risk are provided in Section 2.

#### Flood risk

Within Solway Local Plan District there are approximately 590 residential properties and 240 non-residential properties at risk of surface water flooding. It is estimated that 85% of these properties are located within Potentially Vulnerable Areas.

#### Main areas at risk

Table 1 provides a list of the areas with the greatest number of properties at risk. The damages include impacts to residential and non-residential properties, vehicles, emergency services and roads.

	Residential and non-residential properties at risk of surface water flooding	Annual Average Damages
Dumfries	380	£370,000
Moffat	70	£160,000
Annan	50	£75,000
Castle Douglas	40	£29,000
Lincluden	40	£25,000
Dalbeattie	30	£54,000
Heathall	20	£13,000

**Table 1:** Main areas at risk of surface water flooding

#### Economic activity and infrastructure at risk

The Annual Average Damages caused by surface water flooding within this catchment are approximately £1.2 million. The damages are distributed as follows:

- 53% residential properties (£630,000)
- 30% non-residential properties (£360,000)
- 11% roads (£130,000)
- 5% Emergency services (£60,000).
- 1% vehicles (£15,000)

Figure 1 shows the distribution of Annual Average Damages from surface water flooding across the Local Plan District. The greatest concentration of potential damages is in Dumfries. Annan, Moffat and Gatehouse of Fleet also have areas of high damages.

Please note that economic damages to rail were not assessed as information on damages at a strategic scale is not available. Table 2 shows the approximate numbers of further infrastructure assets which are at risk of flooding within this Local Plan District.

	Number at risk	Further detail
Community facilities	<10	Includes; educational buildings and emergency services.
Utility assets	70	Includes; electricity substations, electricity generation and fuel extraction sites.
Roads (km)	751	Includes; A710, A75 and A76
Railway routes (km)	6.5	Section of Glasgow South Western line

**Table 2:** Infrastructure at risk of surface water flooding

### Designated environmental and cultural heritage sites at risk

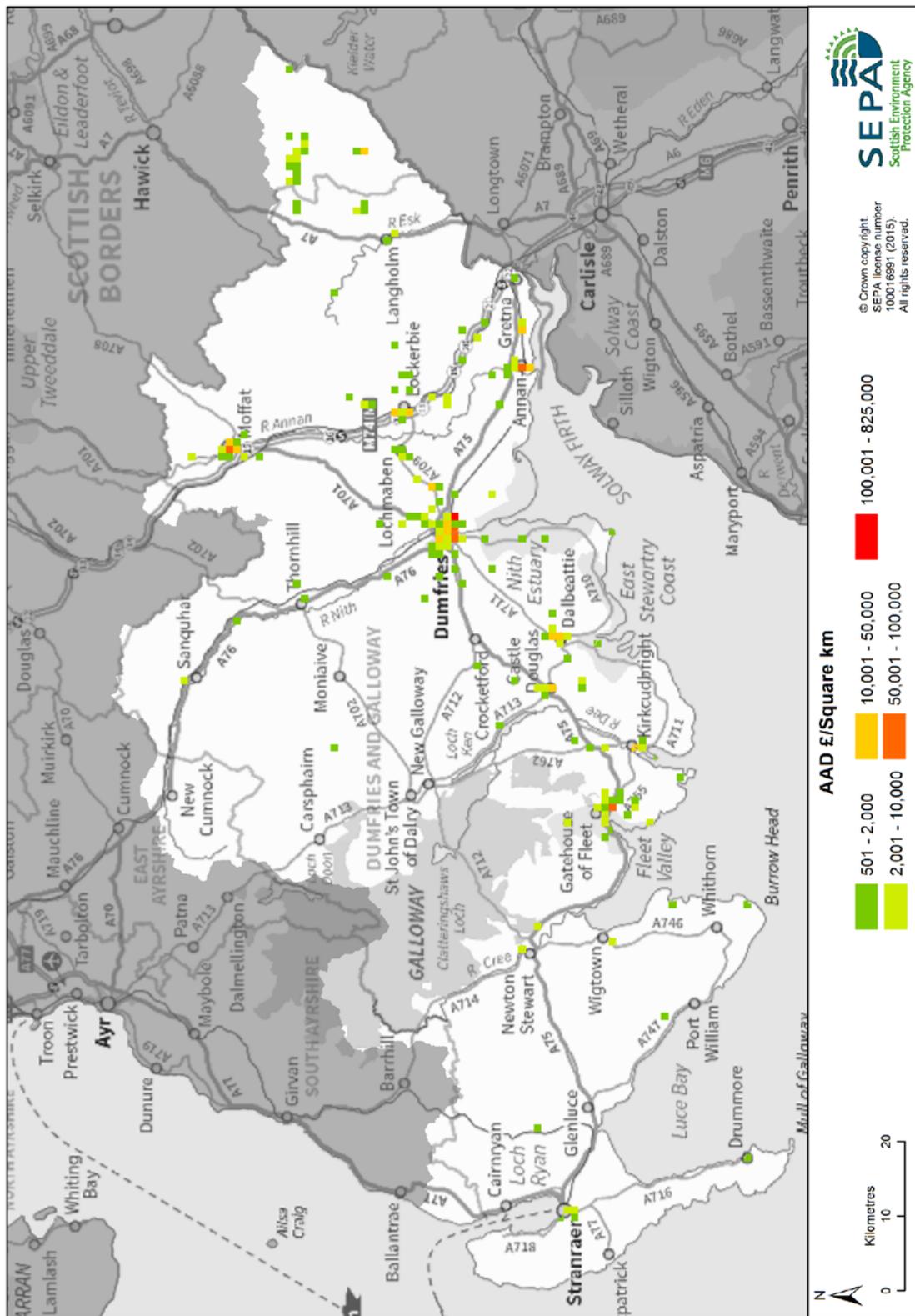
Within the Local Plan District it is estimated that 144 designated cultural heritage sites have a risk of surface water flooding. These sites include; scheduled monuments, gardens and designed landscapes and listed buildings.

The impact of surface water flooding on environmental sites has not been assessed and is assumed to be relatively low.

### History of surface water flooding

Since surface water flooding was first reported in Dumfries, Moffat and Newton Stewart during the 1870's, there have been few reports of surface water flooding to properties with most related to ponding on agricultural land. The most notable surface water flood occurred in January 1942 in the town of Stranraer, which caused flooding to a large number of residential and non-residential properties. Roads were also blocked, with an evacuation and rescue required.

More recently, minor flooding was reported to impact roads and properties in Nithsdale and Annandale and Eskdale in January and August 2009. There was also flooding between September and December 2008, which had minor impacts on many roads and properties throughout the district.



**Figure 1: Annual Average Damages from surface water flooding**

## Managing flood risk

### Surface water management priority areas

The areas at highest risk from surface water flooding have been prioritised. These priority areas were identified using SEPA flood models, supplemented with historical flood information and, where available, more detailed modelling from local authorities. These priority areas require the preparation of surface water management plans, the details of which can be found in Section 2.

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

### Flood protection schemes

There are two surface water flood protection schemes within Solway Local Plan District:

- The scheme at Southernness was completed in 1983 by Dumfries and Galloway Council and consists of two culverts and four manholes.
- A surface water drain was installed in 2009 in Newcastleton by the Scottish Borders Council.

## Climate Change and Future Flood Risk

UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The pluvial modelling undertaken considered climate change scenarios with a 20% increase in rainfall intensity.

Under these conditions it is estimated that the number of residential properties at risk of surface water flooding may increase from approximately 590 to 830 and the number of non-residential properties from approximately 240 to 300.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Annex 1: Glossary

Term	Definition
Accretion	Accumulation of sediment.
Actions	Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives has been based on a detailed assessment and comparison of economic, social and environmental criteria.
Annual Average Damages (AAD)	Depending on its size or severity each flood will cause a different amount of damage to a given area. Annual Average Damages are the theoretical average economic damages caused by flooding when considered over a very long period of time. It does not mean that damage will occur every year: in many years there will be no damages, in some years minor damages and in a few years major damages may occur. High likelihood events, which occur more regularly, contribute proportionally more to AADs than rarer events. Within the Flood Risk Management Strategies AADs incorporate economic damages to the following receptors: residential properties, non-residential properties, vehicles, emergency services, agriculture and roads. They have been calculated based on the principles set out in the Flood Hazard Research Centre Multi-Coloured Handbook (2010).
Appraisal	Appraisal is the process of defining objectives, examining options and weighing up the costs, benefits, risks and uncertainties before a decision is made. The FRM Strategy appraisal method is designed to set objectives and identify the most sustainable combination of actions to tackle flooding from rivers, sea and surface water.
Appraisal baseline	Defines the existing level of flood risk under the current flood risk management regime.
Awareness raising	Public awareness, participation and community support are essential components of sustainable flood risk management. SEPA and the responsible authorities have a duty to raise public awareness of flood risk. This is undertaken both individually and collaboratively by a range of organisations. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.
Bathing waters	Bathing waters are classed as protected areas under Annex IV of the Water Framework Directive (WFD). There are 84 designated bathing waters in Scotland. <sup>i</sup>
Benefit cost ratio (BCR)	A benefit cost ratio summarises the overall value for money of an action or project. It is expressed as the ratio of benefits to costs (both expressed as present value monetary values). A ratio of greater than 1:1 indicates that the economic benefits associated with an action are greater than the economic costs of implementation; therefore this is taken as the threshold of economic viability. It should be acknowledged that it is not always possible to accurately estimate economic values for all elements of benefit, and BCR is just one a number of techniques used in appraisal.
Blue infrastructure	Blue infrastructure is often complementary to 'green infrastructure' and includes sustainable drainage systems, swales (shallow, broad and vegetated channels designed to store and/or convey runoff and remove pollutants <sup>ii</sup> ), wetlands, rivers, canals (and their banks) and other watercourses <sup>iii</sup>
Candidate Potentially Vulnerable Area (PVAc)	Candidate PVAs are those areas identified after the National Flood Risk Assessment (2011), as a result of new information, where the impact of flooding is potentially sufficient to justify further assessment and appraisal. They will be considered for inclusion as new PVAs in the next flood risk management planning cycle.
Catchment	All the land drained by a river and its tributaries.

Term	Definition
Category 1 and 2 Responders (Cat 1 / 2)	Category 1 and 2 Responders are defined as part of the Civil Contingencies Act 2004 which seeks to minimise disruption in the event of an emergency. Category 1 Responders are 'core' responders: local authorities, police, fire and rescue services, ambulance service, NHS health boards, SEPA and the Maritime and Coastguard Agency. Category 2 Responders are key co-operating responders in support of Category 1 Responders. These include gas and electricity companies, rail and air transport operators, harbour authorities, telecommunications providers, Scottish Water, the Health and Safety Executive and NHS National Services Scotland <sup>iv</sup> .
Channel improvement	Where work has been carried out on a river channel allowing an increase in the volume of water it can carry.
Characterisation	Provides a description of the natural characteristics of catchments, coastlines and urban areas in terms of hydrology, geomorphology, topography and land use. It also includes the characterisation of existing levels of flood risk and existing flood risk management activity.
Coastal flooding	Flooding that results from high sea levels or a combination of high sea levels and stormy conditions. The term coastal flooding is used under the Flood Risk Management (Scotland) Act 2009, but in some areas it is also referred to as tidal flooding and covers areas such as estuaries and river channels that are influenced by tidal flows.
Combined sewer	Combined sewers transport sewage from homes and industry as well as carrying surface water runoff from gutters, drains and some highways. Heavy or prolonged rainfall can rapidly increase the flow in a combined sewer until the amount of water exceeds sewer capacity.
Combined sewer (overflow) (CSO)	Combined sewer overflows are purposely designed structures to ensure any excess water from sewerage systems is discharged in a controlled way and at a specific managed location.
Community facility	Within the FRM Strategies this term includes: Emergency Services (Police, Fire, Ambulance, Coastguard, Mountain Rescue) Educational Buildings (crèche, nursery, primary, secondary, further, higher and special education premises) Healthcare facilities: hospitals, health centres and residential care homes
Community flood action groups	Community flood action groups are community based resilience groups which, on behalf of local residents and business, help to prepare for and minimise the effects of flooding. They reflect the interests of their local communities and may differ in composition and remit. There are over 60 groups already established in Scotland. The Scottish Flood Forum provides support for both new and existing groups.
Confluence	Where two or more rivers meet.
Conveyance	Conveyance is a measure of the carrying capacity of a watercourse. Increasing conveyance enables flow to pass more rapidly and reducing conveyance slows flow down. Both actions can be effective in managing flood risk depending on local conditions.
Cultural heritage site	Historic Environment Scotland maintains lists of buildings of special architectural or historic interest; these buildings are referred to as 'listed buildings'. The highest level of designation is a World Heritage Site. Other designations included in this assessment are scheduled monuments, gardens and designed landscapes, and battlefields.
Culvert	A pipe, channel or tunnel used for the conveyance of a watercourse or surface drainage water under a road, railway, canal or other obstacle.
Damages	Flood damages are categorised as direct or indirect i.e. as a result of the flood water itself, or subsequent knock on effects. Damage to buildings and contents caused by flood water are an example of direct damages, whilst loss of industrial production, travel disruption or stress and anxiety are indirect. Some damages can be quantified in monetary terms, and others can only be described.

Term	Definition
	<p>The potential damages avoided by implementation of a flood risk management action are commonly referred to as the benefits of that action. When comparing the effectiveness of different actions, it is useful to consider estimated damages and damages avoided across the lifespan of the action. Within the FRM Strategies, a 100 year appraisal period has been used as standard. This allows costs, damages and benefits across this time frame to be compared in present value terms.</p> <p>See also 'Annual Average Damages'</p>
Demountable defences	<p>A temporary flood barrier is one that is only installed when the need arises, that is, when flooding is forecast. A demountable flood defence is a particular type of temporary defence that requires built-in parts and therefore can only be deployed in one specific location.<sup>v</sup></p>
Deposition	<p>A natural process leading to an accumulation of sediment on a river bed, floodplain or coastline.</p>
Economic impact	<p>An assessment of the economic value of the positive and negative effects of flooding and / or the actions taken to manage floods.</p>
Embankment	<p>Flood embankments are engineered earthfill structures designed to contain high river levels or protect against coastal flooding. They are commonly grass-covered, but may need additional protection against erosion by swiftly flowing water, waves or overtopping.</p>
Emergency plans / response	<p>Emergency response plans are applicable for all types of flooding. They set out the steps to be taken during flooding in order to maximise safety and minimise impacts where possible. Under the Civil Contingencies Act, Category 1 Responders have a duty to maintain emergency plans. Emergency plans may also be prepared by individuals, businesses, organisations or communities.</p>
Environmental impact	<p>A change in the environment as a result of an action or activity. Impacts can be positive or negative and may vary in significance, scale and duration.</p>
Environmental Impact Assessment (EIA)	<p>Environmental Impact Assessment (EIA) is a process which identifies the potential environmental impacts, both negative and positive, of a proposal.</p>
Environmental sites / environmental designated areas/ environmentally designated sites	<p>Areas formally designated for environmental importance, such as Sites of Special Scientific Interest (SSSI), Special Protection Area (SPA) or Special Areas of Conservation (SAC).</p>
Episodic erosion	<p>Erosion induced by a single event, such as a storm.</p>
Erosion	<p>A natural process leading to the removal of sediment from a river bed, bank or floodplain or coastline.</p>
Estuarine surge attenuation	<p>A reduction in the wave energy caused by storm surge. Breakwaters (barriers built out into the sea to protect a coast or harbour from the force of waves) or habitats such as saltmarsh can slow down and reduce the inland impact of storm surges (the rising of the sea due to wind and atmospheric pressure changes associated with storms), thereby reducing coastal flood risk.</p>
Estuary	<p>A coastal body of water usually found where a river meets the sea; the part of the river that is affected by tides.</p>
Fault (fault line)	<p>A break or fracture in the earth's crust as a result of the displacement of one side with respect to the other. In Scotland the Great Glen Fault is a major geological fault line cutting diagonally across the Highlands from Fort William to Inverness.</p>
Flash flood	<p>A flood that occurs a short period of time after high intensity rainfall or a sudden snow melt. A sudden increase in the level and velocity of the water body is often characteristic of these events, leaving a short time for warning or actions.</p>
Flashy watercourse	<p>A 'flashy' river or watercourse has a short lag time (the delay between peak rainfall intensity and peak river discharge), high peak discharge, and quickly returns to average flow. Rivers with these characteristics</p>

Term	Definition
	can be prone to flooding and leave a short time for warning or actions.
Flood	In the terms of the FRM Act, 'flood' means a temporary covering by water, from any source, of land not normally covered by water. This does not include a flood solely from a sewerage system, as a result of normal weather or infrastructure drainage. A flood can cause significant adverse impacts on people, property and the environment. drainage.
Flood bund	A constructed retaining wall, embankment or dyke designed to protect against flooding to a specified standard of protection.
Flood defence	Infrastructure, such as flood walls, embankments or flood storage intended to protect an area against flooding to a specified standard of protection.
Flood extent	The area that has been affected by flooding, or is at risk of flooding from one or more sources for a particular likelihood.
Flood forecasting	SEPA operates a network of over 250 rainfall, river and coastal monitoring stations throughout Scotland that generate data 24 hours a day. This hydrological information is combined with meteorological information from the Met Office. A team of experts then predict the likelihood and timing of river, coastal and surface water flooding. This joint initiative between SEPA and the Met Office forms the Scottish Flood Forecasting Service.
Flood frequency	The probability that a particular size/severity of flood will occur in a given year (see likelihood).
Flood gate	An adjustable, sometimes temporary, barrier used as a flood defence to control the flow of water within a water system or during a flood. Flood gates can also be part of operational flood defences or protect individual buildings or sites.
Flood guard	Flood guards cover a variety of types of door and window barriers that can be fitted to individual properties and operated by the owners / occupiers prior to a flood event. They act as a physical barrier to water entering the property and can provide protection against frequent and relatively shallow flooding.
Flood hazard	In terms of the FRM Act, hazard refers to the characteristics (extent, depth, velocity) of a flood.
Flood hazard map	Flood hazard maps are required by the FRM Act to show information that describes the nature of a flood in terms of the source, extent, water level or depth and, where appropriate, velocity of water. Flood hazard and risk maps are referred to collectively as flood maps and are available on the SEPA website.
Flood Prevention Scheme / Flood Protection Scheme (FPS)	A flood protection scheme, as defined by the FRM Act, is a scheme by a local authority for the management of flood risk within the authority area. This includes defence measures (flood prevention schemes) formerly promoted under the Flood Prevention (Scotland) Act 1961.
Flood protection study	Flood protection studies aim to refine understanding of the hazard and risk associated with flooding in a particular area, catchment or coastline. They will involve detailed assessment of flood hazard and / or risk and may develop options for managing flood risk.
Flood protection works	Flood protection works can include the same flood defence measures that would make up a formal Flood Protection Scheme but without the legal process, protections and requirements that would come by delivering the works as a scheme.
Flood risk	A measure of the combination of the likelihood of flooding occurring and the associated impacts on people, the economy and the environment.
Flood Risk Assessment (FRA)	Flood Risk Assessments are detailed studies of an area where flood risk may be present. These are often used to inform planning decisions, may help to develop flood schemes and have also contributed to the National Flood Risk Assessment.

Term	Definition
Flood Risk Management (Scotland) Act 2009 (FRM Act)	The flood risk management legislation for Scotland. It transposes the EC Floods Directive into Scots Law and aims to reduce the adverse consequences of flooding on communities, the environment, cultural heritage and economic activity.
Flood risk management cycle	Under the FRM Act flood risk management planning is undertaken in six year cycles. The first planning cycle is 2015 – 2021. The first delivery cycle is lagged by approximately 6 months and is from 2016 - 2022.
Flood Prevention (Scotland) Act 1961	The Flood Prevention (Scotland) Act 1961 gave local authorities discretionary powers to make and build flood prevention schemes. It was superseded by the Flood Risk Management (Scotland) Act 2009.
Flood Risk Management Local Advisory Groups	FRM Local Advisory Groups are stakeholder groups convened to advise SEPA and lead local authorities in the preparation of Flood Risk Management Plans. SEPA and lead local authorities must have regard to the advice they provide.
Flood Risk Management Plans (FRM Plans)	A term used in the FRM Act. FRM Plans set out the actions that will be taken to reduce flood risk in a Local Plan District. They comprise Flood Risk Management Strategies, developed by SEPA, and Local Flood Risk Management Plans produced by lead local authorities.
Flood Risk Management Strategy (FRM Strategy)	Sets out a long-term vision for the overall reduction of flood risk. They contain a summary of flood risk in each Local Plan District, together with information on catchment characteristics and a summary of objectives and actions for Potentially Vulnerable Areas.
Flood risk map	Complements the flood hazard maps published on the SEPA website providing detail on the impacts of flooding on people, the economy and the environment. Flood hazard and risk maps are referred to collectively as flood maps and are available on the SEPA website.
Flood wall	A flood defence feature used to defend an area from flood water to a specified standard of protection.
Flood Warning area (FWA)	A Flood Warning area is where SEPA operates a formal Flood Monitoring Scheme to issue targeted Flood Warning messages for properties located in the area. <sup>vi</sup>
Flood warning scheme	A flood warning scheme is the network of monitoring on a coastal stretch or river, which provides SEPA with the ability to issue Flood Warnings.
Floods Directive	European Directive 2007/60/EC on the Assessment and Management of Flood Risks builds on and is closely related to the Water Framework Directive (see river basin management planning). It was transposed into Scots Law by the Flood Risk Management (Scotland) Act 2009. The Directive requires Member States to assess if all watercourses and coastlines are at risk from flooding, to map the flood extent, assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk <sup>vii</sup> .
Floodplain	Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would naturally flow but for the presence of flood defences and other structures where they exist.
Floodplain storage	Floodplains naturally store water during high flows. Storage can be increased through natural or man-made features to increase flood depth or slow flows in order to reduce flooding elsewhere.
Gabion	A metal cage filled with rocks often used in river bank protection.
Green infrastructure	The European Commission defines green infrastructure as “the use of ecosystems, green spaces and water in strategic land use planning to deliver environmental and quality of life benefits. It includes parks, open spaces, playing fields, woodlands, wetlands, road verges, allotments and private gardens. Green infrastructure can contribute to climate change mitigation and adaptation, natural disaster risk mitigation, protection against flooding and erosion as well as biodiversity conservation.” See also ‘blue infrastructure’ <sup>viii</sup>

Term	Definition
Groundwater flooding	This type of flooding is caused by water rising up from underlying rocks or flowing from springs. In Scotland groundwater is generally a contributing factor to flooding rather than the primary source.
Integrated catchment study (ICS)	In urban areas, the causes of flooding are complex because of the interactions between rivers, surface water drainage and combined sewer systems and tidal waters. Scottish Water works with SEPA and local authorities to assess these interactions through detailed studies.
Land use planning (LUP)	The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups.
Lead local authority	A local authority responsible for leading the production, consultation, publication and review of a Local Flood Risk Management Plan.
Likelihood of flooding	The chance of flooding occurring. <b>High likelihood:</b> A flood is likely to occur in the defined area on average once in every ten years (1:10). Or a 10% chance of happening in any one year. <b>Medium likelihood:</b> A flood is likely to occur in the defined area on average once in every two hundred years (1:200). Or a 0.5% chance of happening in any one year. <b>Low likelihood:</b> A flood is likely to occur in the defined area on average once in every thousand years (1:1000). Or a 0.1% chance of happening in any one year.
Local Flood Risk Management Plans (Local FRM Plan)	Local Flood Risk Management Plans, produced by lead local authorities, will take forward the objectives and actions set out in Flood Risk Management Strategies. They will provide detail on the funding, timeline of delivery, arrangements and co-ordination of actions at the local level during each six year FRM planning cycle.
Local Nature Reserve (LNR)	A Local Nature Reserve is a protected area of land designated by a local authority because of its local special natural interest and / or educational value. Local authorities select and designate local nature reserves using their powers under the National Parks and Access to the Countryside Act 1949 <sup>ix</sup> .
Local Plan District	Geographical areas for the purposes of flood risk management planning. There are 14 Local Plan Districts in Scotland.
Local Plan District Partnerships	Each LPD has established a local partnership comprised of local authorities, SEPA, Scottish Water and others as appropriate. These partnerships are distinct from the FRM Local Advisory Groups and they retain clear responsibility for delivery of the FRM actions set out in the Local Flood Risk Management Plans. It is the local partnership that makes decisions and supports the delivery of these plans.
Maintenance	Sections 18 and 59 of the Flood Risk Management (Scotland) Act 2009 put duties of watercourse inspection, clearance and repair on local authorities. In addition, local authorities may also be responsible for maintenance of existing flood protection schemes or defences.
Montane habitat	This habitat encompasses a range of natural or near-natural vegetation occurring in the montane zone, lying above or beyond the natural tree-line.
National Flood Management Advisory Group (NFMAG)	The National Flood Management Advisory Group provides advice and support to SEPA and, where required, Scottish Water, local authorities and other responsible authorities on the production of FRM Strategies and Local FRM Plans.
National Flood Risk Assessment (NFRA)	A national analysis of flood risk from all sources of flooding which also considers climate change impacts. Completed in December 2011 this provides the information required to undertake a strategic approach to flood management that identifies areas at flood risk that require further appraisal. The NFRA will be reviewed and updated for the second cycle of FRM Planning by December 2018.

<b>Term</b>	<b>Definition</b>
Natural flood management (NFM)	A set of flood management techniques that aim to work with natural processes (or nature) to manage flood risk.
Non-residential properties	Properties that are not used for people to live in, such as shops or other public, commercial or industrial buildings.
Objectives	Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding.
One in 200 year flood	See 'likelihood of flooding' and 'return period'.
Planning policies	Current national planning policies, Scottish Planning Policy and accompanying Planning Advice notes restrict development within the floodplain and limit exposure of new receptors to flood risk. In addition to national policies, local planning policies may place further requirements within their area of operation to restrict inappropriate development and prevent unacceptable risk.
Potentially Vulnerable Areas (PVA)	Catchments identified as being at risk of flooding and where the impact of flooding is sufficient to justify further assessment and appraisal. There were 243 PVAs identified by SEPA in the National Flood Risk Assessment and these are the focus of the first FRM planning cycle.
Property level protection	Property level protection includes flood gates, sandbags and other temporary barriers that can be used to prevent water from entering individual properties during a flood.
Property level protection scheme	Some responsible authorities may have a formal scheme to provide, install and maintain property level protection for properties.
Ramsar sites	Ramsar sites are wetlands of international importance designated under the Ramsar Convention.
Receptor	Refers to the entity that may be impacted by flooding (a person, property, infrastructure or habitat). The vulnerability of a receptor can be reduced by increasing its resilience to flooding.
Residual risk	The risk that remains after risk management and mitigation. This may include risk due to very severe (above design standard) storms or risks from unforeseen hazards.
Resilience	The ability of an individual, community or system to recover from flooding.
Responsible authority	Designated under the FRM (Scotland) Act 2009 and associated legislation as local authorities, Scottish Water and, from 21 December 2013, the National Park Authorities and Forestry Commission Scotland. Responsible authorities, along with SEPA and Scottish Ministers, have specific duties in relation to their flood risk related functions.
Return period	A measure of the rarity of a flood event. It is the statistical average length of time separating flood events of a similar size. (see likelihood)
Revetment	Sloping structures placed on banks or at the foot of cliffs in such a way as to deflect the energy of incoming water.
Riparian	The riparian area is the interface between land and a river or stream. For the purposes of FRM this commonly refers to the riparian owner, which denotes ownership of the land area beside a river or stream.
River basin management planning (RBMP)	The Water Environment and Water Services (Scotland) Act 2003 transposed the European Water Framework Directive into Scots law. The Act created the River Basin Management Planning process to achieve environmental improvements to protect and improve our water environment. It also provided the framework for regulations to control the negative impacts of all activities likely to have an impact on the water environment.
Runoff reduction	Actions within a catchment or sub-catchment to reduce the amount of runoff during rainfall events. This can include intercepting rainfall,

Term	Definition
	storing water, diverting flows or encouraging infiltration.
Scottish Advisory and Implementation Forum for Flooding (SAIFF)	The stakeholder forum on flooding set up by the Scottish Government to ensure legislative and policy aims are met and to provide a platform for sharing expertise and developing common aspirations and approaches to reducing the impact of flooding on Scotland's communities, environment, cultural heritage and economy.
Sediment balance	Within a river where erosion and deposition processes are equal over the medium to long-term resulting in channel dimensions (width, depth, slope) that are relatively stable.
Sediment management	Sediment management covers a wide range of activities that includes anything from the small scale removal of dry gravels to the dredging of whole river channels and the reintroduction of removed sediment into the water environment. Historically, sediment management has been carried out for several reasons, including reducing flood risk, reducing bank erosion, for use as aggregate and to improve land drainage.
Self help	Self help actions can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources, frequency and scales of flooding. They focus on awareness raising and understanding of flood risk.
Sewer flooding (and other artificial drainage system flooding)	Flooding as a result of the sewer or other artificial drainage system (e.g. road drainage) capacity being exceeded by rainfall runoff or when the drainage system cannot discharge water at the outfall due to high water levels (river and sea levels) in receiving waters.
Site protection plans	Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.
Shoreline Management Plan (SMP)	A Shoreline Management Plan is a large scale assessment of the coastal flood and erosion risks to people and the developed, historic and natural environment. It sets out a long-term framework for the management of these risks in a sustainable manner.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest are protected by law under the Nature Conservation (Scotland) Act 2004 to conserve their plants, animals and habitats, rocks and landforms <sup>x</sup> .
Source of flooding	The type of flooding. This can be coastal, river, surface water or groundwater.
Special Area of Conservation (SAC)	Special Areas of Conservation are strictly protected sites designated under the European Habitats Directive. The Directive requires the establishment of a European network of protected areas which are internationally important for threatened habitats and species <sup>xi</sup> .
Special Protection Areas (SPA)	Special Protection Areas are strictly protected sites classified in accordance with the European Birds Directive. They are classified for rare and vulnerable birds (as listed in the Directive), and for regularly occurring migratory species <sup>xii</sup> .
Standard of protection (SoP)	All flood protection structures are designed to be effective up to a specified flood likelihood (Standard of Protection). For events beyond this standard, flooding will occur. The chosen Standard of Protection will determine the required defence height and / or capacity.
Storage area	A feature that can be used to store floodwater, this can be natural in the form of low lying land or manmade such as a reservoir or modified landform.
Strategic Environmental Assessment (SEA)	A process for the early identification and assessment of the likely significant environmental effects, positive and negative, of activities. Often considered before actions are approved or adopted.
Strategic Flood Risk Assessment (SFRA)	A Strategic Flood Risk Assessment is designed for the purposes of specifically informing the Development Plan Process. A SFRA involves the collection, analysis and presentation of all existing and readily available flood risk information (from any source) for the area of interest. It constitutes a strategic overview of flood risk.

Term	Definition
Strategic mapping and modelling	Strategic mapping and modelling actions have been identified in locations where SEPA is planning to undertake additional modelling or analysis of catchments and coastlines, working collaboratively with local authorities where appropriate, to improve the national understanding of flood risk.
Surcharge	Watercourses and culverts can carry a limited amount of water. When they can no longer cope, they overflow, or 'surcharge'.
Surface water flooding	Flooding that occurs when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead <sup>xiii</sup>
Surface water management plan (SWMP)	A plan that takes an integrated approach to drainage accounting for all aspects of urban drainage systems and produces long term and sustainable actions. The aim is to ensure that during a flood the flows created can be managed in a way that will cause minimum harm to people, buildings, the environment and business.
Surface water plan/study	The management of flooding from surface water sewers, drains, small watercourses and ditches that occurs, primarily in urban areas, during heavy rainfall. FRM Strategy actions in this category include: Surface Water Management Plans, Integrated Catchment Studies and assessment of flood risk from sewerage systems (FRM Act Section 16) by Scottish Water. These have been selected as appropriate for each Potentially Vulnerable Area.
Sustainable flood risk management	The sustainable flood risk management approach aims to meet human needs, whilst preserving the environment so that these needs can be met not only in the present, but also for future generations. The delivery of sustainable development is generally recognised to reconcile three pillars of sustainability – environmental, social and economic.
Sustainable drainage systems (SuDS)	A set of techniques designed to slow the flow of water. They can contribute to reducing flood risk by absorbing some of the initial rainfall and then releasing it gradually, thereby reducing the flood peak and helping to mitigate downstream problems. SuDS encourage us to take account of quality, quantity and amenity / biodiversity.
UK Climate Change Projections (UKCP09)	The leading source of climate change information for the UK. It can help users to assess their climate risks and plan how to adapt to a changing climate. The high emissions scenario refers to the SRES A1F1 emission scenario. See Annex 1 of the UKCP09 Climate change projections report for details. <sup>xiv</sup>
Utility assets	Within the FRM Strategies this refers to electricity sub stations, mineral and fuel extraction sites, telephone assets, television and radio assets.
Voe	A dialect term, common in place names and used to refer to a small bay or creek in Orkney or Shetland.
Vulnerability	A measure of how likely someone or something is to suffer long-term damage as a result of flooding. It is a combination of the likelihood of suffering harm or damage during a flood (susceptibility) and the ability to recover following a flood (resilience).
Wave energy dissipation	Process by which a wave loses its energy.
Wave overtopping	Wave overtopping occurs when water passes over a flood wall or other structure as a result of wave action. Wave overtopping may lead to flooding particularly in exposed coastal locations.

<sup>i</sup> <http://apps.sepa.org.uk/bathingwaters/> accessed 14/10/2015 last updated 2015

<sup>ii</sup> <http://www.susdrain.org/delivering-suds/using-suds/suds-components/swales-and-conveyance-channels/swales.html> accessed 12/10/2015 last updated 2012

<sup>iii</sup> <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

<sup>iv</sup> <http://www.legislation.gov.uk/ukpga/2004/36/schedule/1> accessed 12/10/2015 last updated 2004

<sup>v</sup> <http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter9.aspx?pagenum=10> accessed 12/10/2015 last update 07/03/2012

<sup>vii</sup> [http://ec.europa.eu/environment/water/flood\\_risk/](http://ec.europa.eu/environment/water/flood_risk/) accessed 12/10/2015 last updated 17/09/2015

<sup>viii</sup> <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

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- <sup>ix</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/local-designations/lmr/> accessed 12/10/2015 last updated 12/07/2015
- <sup>x</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/sssis/> accessed 12/10/2015 last updated 21/01/2015
- <sup>xi</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/sac/> accessed 12/10/2015 last updated 01/03/2013
- <sup>xii</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/spa/> accessed 12/10/2015 last updated 01/03/2013
- <sup>xiii</sup> <http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfs#wx=357683&y=355134&scale=2> accessed 12/10/2015 last updated 12/10/2015
- <sup>xiv</sup> <http://ukclimateprojections.metoffice.gov.uk> Document © Crown copyright 2009 accessed 01/12/15 last updated 30/04/2012

## Annex 2: Land use planning

Flood risk management actions from national planning policies
<p><b>AVOID DEVELOPMENT IN MEDIUM TO HIGH RISK AREAS</b></p> <ul style="list-style-type: none"> <li>a) <b>Planning authorities</b> work in partnership undertaking catchment-wide Strategic Flood Risk Assessments to inform their development plan allocations in line with SEPA's guidance and Land Use Vulnerability.</li> <li>b) <b>Planning authorities and SEPA</b> require the submission of flood risk assessments that accord with SEPA's <i>Technical Flood Risk Guidance for Stakeholders</i>, to support planning applications where there is a potential flood risk. The flood risk assessment should be used to demonstrate as far as possible that the development will be safe for its lifetime, without increasing flood risk elsewhere and, where possible, takes opportunities to reduce flood risk overall.</li> <li>c) <b>SEPA</b> ensures that its flood risk advice to planning authorities is clear and appropriate. SEPA, in consultation with planning authorities, undertakes an annual assessment of planning advice and its contribution to flood risk.</li> <li>d) <b>SEPA and planning authorities</b> engage at an early stage of the development plan process to agree appropriate forms of development to help inform the preparation and implementation of Strategic Flood Risk Assessments.</li> </ul>
<p><b>REDUCE IMPACTS TO EXISTING BUILDINGS</b></p> <ul style="list-style-type: none"> <li>a) <b>SEPA, planning authorities and local communities</b> are required to engage at an early stage of the development plan process to agree the best long term land uses for areas where relocation, abandonment and/or change of use have been identified to deliver sustainable flood risk management. Where possible, new land uses should aim to achieve multiple benefits for local communities such as the creation of blue / green infrastructure and increased resilience to climate change.</li> </ul>
<p><b>PROTECT AND ENHANCE NATURAL FEATURES THAT HAVE A POSITIVE IMPACT ON REDUCING OVERALL FLOOD RISK</b></p> <ul style="list-style-type: none"> <li>a) <b>SEPA and planning authorities</b> are required to engage early in the development plan process to identify opportunities for the restoration and protection of natural features which help manage flood risk. Opportunities should be maximised to achieve multiple benefits such as the development of green / blue infrastructure and improved place making. Areas of land that may contribute to flood management should be identified and protected.</li> </ul>
<p><b>NEW DEVELOPMENTS ARE DESIGNED TO ENSURE THAT SURFACE WATER DRAINAGE DOES NOT INCREASE FLOOD RISK ON OR OFF SITE</b></p> <ul style="list-style-type: none"> <li>a) <b>SEPA</b> prepares guidance for planning authorities and developers on the use of surface water hazard maps for land use planning purposes.</li> <li>b) <b>Planning authorities</b> support the implementation of Surface Water Management Plans, developed by the local authorities, through development plan allocations and policies. Surface Water Management Plans should take account of development opportunities that could contribute to the reduction of surface water flood risk.</li> <li>c) <b>SEPA</b> engages at an early stage of the development plan process to progress exemplar projects that demonstrate the potential for land use planning to mitigate surface water flooding and contribute to wider environmental benefits.</li> </ul>
<ul style="list-style-type: none"> <li>a) <b>NEW DEVELOPMENT IS RESILIENT TO PREDICTED FUTURE CHANGES IN CLIMATE</b> <b>Planning authorities</b> ensure that climate change is considered in Strategic Flood Risk Assessments and Flood Risk Assessments, based upon the best scientific evidence and the information requirements of planners to make informed decisions.</li> </ul>

Table 1: Objectives and actions that reflect national Land Use Planning policies and guidance

## Annex 3: Acknowledgements

SEPA gratefully acknowledges the cooperation and input that various parties have provided, including *inter alia*, the following organisations:

### **Ordnance Survey**

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### **Local authorities**

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### **Scottish Water**

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Further detail on the datasets that have been used in the development of the Flood Risk Management Strategies can be found in the Strategic Appraisal Methodology, which is available from the SEPA webpage.

