



Flood Risk Management Strategy

Forth Estuary



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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 14,000 residential and 3,800 non-residential properties are at risk of flooding in the Forth Estuary Local Plan District. Grangemouth, Edinburgh and Musselburgh 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 £36 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 The City of Edinburgh 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 The City of Edinburgh Council, Clackmannanshire Council, East Lothian Council, Falkirk Council, Fife Council, Midlothian Council, North Lanarkshire Council, Perth and Kinross Council, Scottish Borders Council, Stirling Council, West Lothian 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

Flood Risk Management Strategy

Forth Estuary Local Plan District

Section 1: Flood Risk Management in Scotland 1

1.1	What is a Flood Risk Management Strategy?	1
1.2	How to read this Strategy	1
1.3	Managing flooding in Scotland.....	2
1.4	How the Flood Risk Management Strategy was developed	3
1.5	Roles and responsibilities for flood risk management planning	5
1.6	Links with other plans and policies	8
1.7	Supporting information	9
1.8	Next steps and monitoring progress	10

Section 2: Understanding and managing flooding 12

2.1	Summary of flooding in the Forth Estuary Local Plan District.....	13
2.2	Potentially Vulnerable Areas.....	20
	• Crail (10/01)	21
	• Pittenweem (10/02)	31
	• Leven (10/03).....	41
	• Kinross, Milnathort, Glenrothes and Kinglassie (10/04)	53
	• Kircaldy, East Wemyss and Methil (10/05).....	68
	• Inverkeithing, Rosyth, Dunfermline and Wellwood (10/06)	82
	• Cairneyhill (10/07)	95
	• Hawkhill, Kincardine, Kennet Pans and Culross (10/08).....	107
	• Airth (10/09)	120
	• North Queensferry and Inverkeithing (10/10).....	129
	• Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (10/11)	140
	• Bo'ness (10/12)	159
	• Linlithgow Bridge, Bathgate, Whiteside and Slamannan (10/13)	169
	• Philipstoun (10/14)	185
	• South Queensferry (10/15).....	194
	• Cramond Bridge (10/16).....	203
	• Granton (10/17).....	212
	• Water of Leith catchment (10/18)	225
	• Braid Burn Catchment (10/19).....	240
	• Niddrie and Burdiehouse Burn catchment (10/20)	252
	• Musselburgh (10/21)	263
	• Lasswade, Penicuik, Dalkeith and Musselburgh (10/22).....	276
	• Cockenzie and Port Seton, Longniddry and Prestonpans (10/23)	292
	• Haddington (10/24)	305
	• Dunbar and West Barns (10/25).....	316
	• Berwickshire Coast (10/26)	327
	• South Gyle, Broxburn and Bathgate (10/27).....	338

- Cowdenbeath (10/28c) 356
- Whitburn (10/29c)..... 368

Section 3: Supporting information 378

- 3.1 Introduction 379
- 3.2 River flooding 380
- 3.3 Coastal flooding..... 408
- 3.4 Surface water flooding..... 418

Annexes

- A1. Glossary 424
- A2. Land use planning 434
- A3. Acknowledgements 435

Flood Risk Management Strategy

Forth Estuary Local Plan District

Section 1: Flood Risk Management in Scotland

1.1	What is a Flood Risk Management Strategy?	1
1.2	How to read this Strategy	1
1.3	Managing flooding in Scotland.....	2
1.4	How the Flood Risk Management Strategy was developed	3
1.5	Roles and responsibilities for flood risk management planning	5
1.6	Links with other plans and policies	8
1.7	Supporting information	9
1.8	Next steps and monitoring progress	10

Forth Estuary Local Plan District

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.

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:

- The City of Edinburgh Council (lead local authority), Clackmannanshire Council, East Lothian Council, Falkirk Council, Fife Council, Midlothian Council, North Lanarkshire Council, Perth and Kinross Council, Scottish Borders Council, Stirling Council and West Lothian 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 Forth Local Advisory Group includes representatives from a range of sectors, including government agencies, National Park Authorities, local authorities, non-government organisations, utility companies and land and asset managers.

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. 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 associated 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

Forth Estuary 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

2.1 Summary of flooding in the Forth Estuary Local Plan District.....	13
2.2 Potentially Vulnerable Areas.....	20
• Crail (10/01)	21
• Pittenweem (10/02)	31
• Leven (10/03).....	41
• Kinross, Milnathort, Glenrothes and Kinglassie (10/04)	53
• Kirkcaldy, East Wemyss and Methil (10/05).....	68
• Inverkeithing, Rosyth, Dunfermline and Wellwood (10/06)	82
• Cairneyhill (10/07)	95
• Hawkhill, Kincardine, Kennet Pans and Culross (10/08).....	107
• Airth (10/09)	120
• North Queensferry and Inverkeithing (10/10).....	129
• Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (10/11)	140
• Bo'ness (10/12).....	159
• Linlithgow Bridge, Bathgate, Whiteside and Slamannan (10/13)	169
• Philipstoun (10/14)	185
• South Queensferry (10/15).....	194
• Cramond Bridge (10/16).....	203
• Granton (10/17).....	212
• Water of Leith catchment (10/18)	225
• Braid Burn catchment (10/19).....	240
• Niddrie and Burdiehouse Burn catchment (10/20)	252
• Musselburgh (10/21)	263
• Lasswade, Penicuik, Dalkeith and Musselburgh (10/22).....	276
• Cockenzie and Port Seton, Longniddry and Prestonpans (10/23)	292
• Haddington (10/24)	305
• Dunbar and West Barns (10/25).....	316
• Berwickshire Coast (10/26)	327
• South Gyle, Broxburn and Bathgate (10/27).....	338
• Cowdenbeath (10/28c).....	356
• Whitburn (10/29c).....	368

2.1 Summary of flooding in the Forth Estuary Local Plan District

The Forth Estuary Local Plan District covers an area of 3,256km² with a population of approximately 1.4 million. It contains 13 local authorities, 27 Potentially Vulnerable Areas and 2 candidate Potentially Vulnerable Areas.

Flood risk in the Forth Estuary

There are approximately 14,000 residential and 3,800 non-residential properties at risk of flooding within the Local Plan District. This equates to approximately 16% of all properties at risk of flooding nationally. Within the Local Plan District, approximately 2% of all residential and 6% of all non-residential properties are at risk and it is estimated that 95% of these properties are located within Potentially Vulnerable Areas or candidate Potentially Vulnerable Areas. The Annual Average Damages from flooding (see glossary) are approximately £36 million.

River flooding is the main source of flood risk, followed by surface water flooding. The Annual Average Damages caused by river flooding are £18 million, those caused by surface water flooding are £12 million and those caused by coastal flooding are £5.5 million (Figure 1).

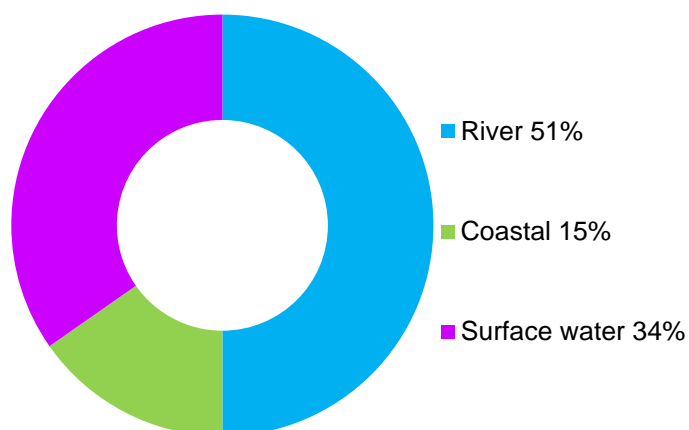


Figure 1: Annual Average Damages by flood source

Table 1 and Figure 3 show the 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 information on damages at this scale is not available.

	Residential and non-residential properties at risk of flooding	Annual Average Damages
Edinburgh	6,600	£8.5 million
Musselburgh	1,800	£3.8 million
Grangemouth	810	£940,000
Carron-Carronshore-Bainsford	640	£930,000
Dunfermline	420	£1.2 million
Haddington	370	£700,000
Linlithgow	330	£860,000
Leven-Methil	300	£850,000
Falkirk	300	£400,000
Livingston	290	£380,000

Table 1: Main areas at risk of flooding

Background information on the Forth Estuary Local Plan District

The extent of the Forth Estuary Local Plan District and the location of the Potentially Vulnerable Areas are shown in Figure 2. It includes the urban areas of Edinburgh, Livingston, Cumbernauld, Falkirk, Dunfermline, Kirkcaldy and Glenrothes.

The main river catchments include the River Leven, River Carron, River Avon, River Almond, Water of Leith, River Esk, River Tyne and the Eye Water. The largest lochs include the Carron Valley and Loch Coulter reservoirs that are in the River Carron catchment. Other lochs include Loch Leven in the River Leven catchment, Cobbinshaw Reservoir in the River Almond catchment, and Harperrig, Threipmuir and Harlaw Reservoirs in the Water of Leith catchment.

The Forth Estuary Local Plan District includes part of the central belt that is heavily urbanised. Rural areas are located in the north of the Forth of Forth, in East Lothian and along the Berwickshire coast in the Scottish Borders. Across the area the main types of land cover include heather and grassland (37%), arable and horticultural land (35%), and coniferous and broadleaved woodland (13%). Urban areas represent approximately 10% of total land cover.

The Local Plan District has 375km of coastline that includes the Firth of Forth and the Berwickshire coast. The Firth of Forth is the largest estuary on the east coast of Scotland. It extends 95km from Stirling in the west, where the River Forth flows into the estuary, to Fife Ness in the east where it meets the North Sea.

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

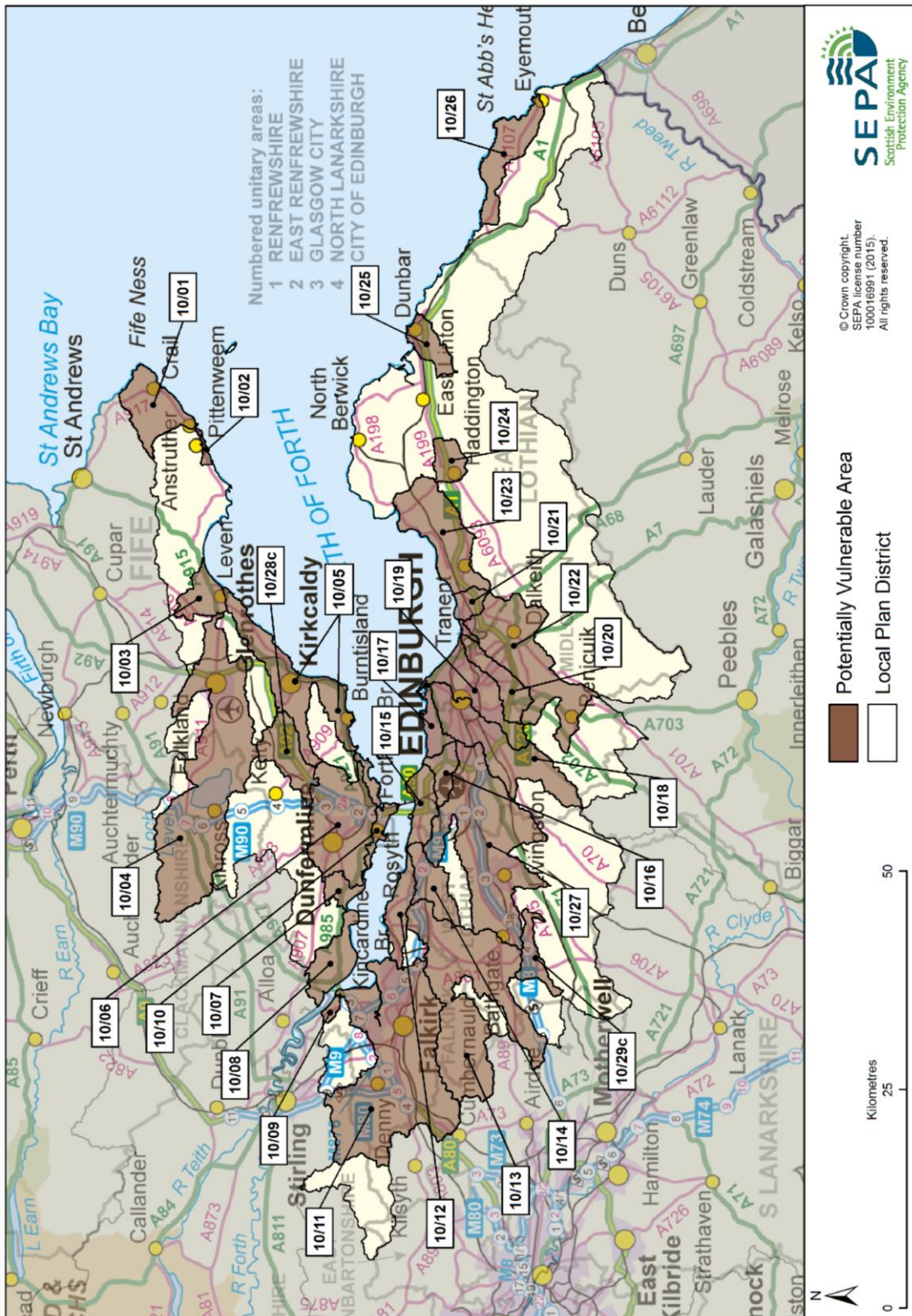


Figure 2: The Forth Estuary Local Plan District with Potentially Vulnerable Areas identified

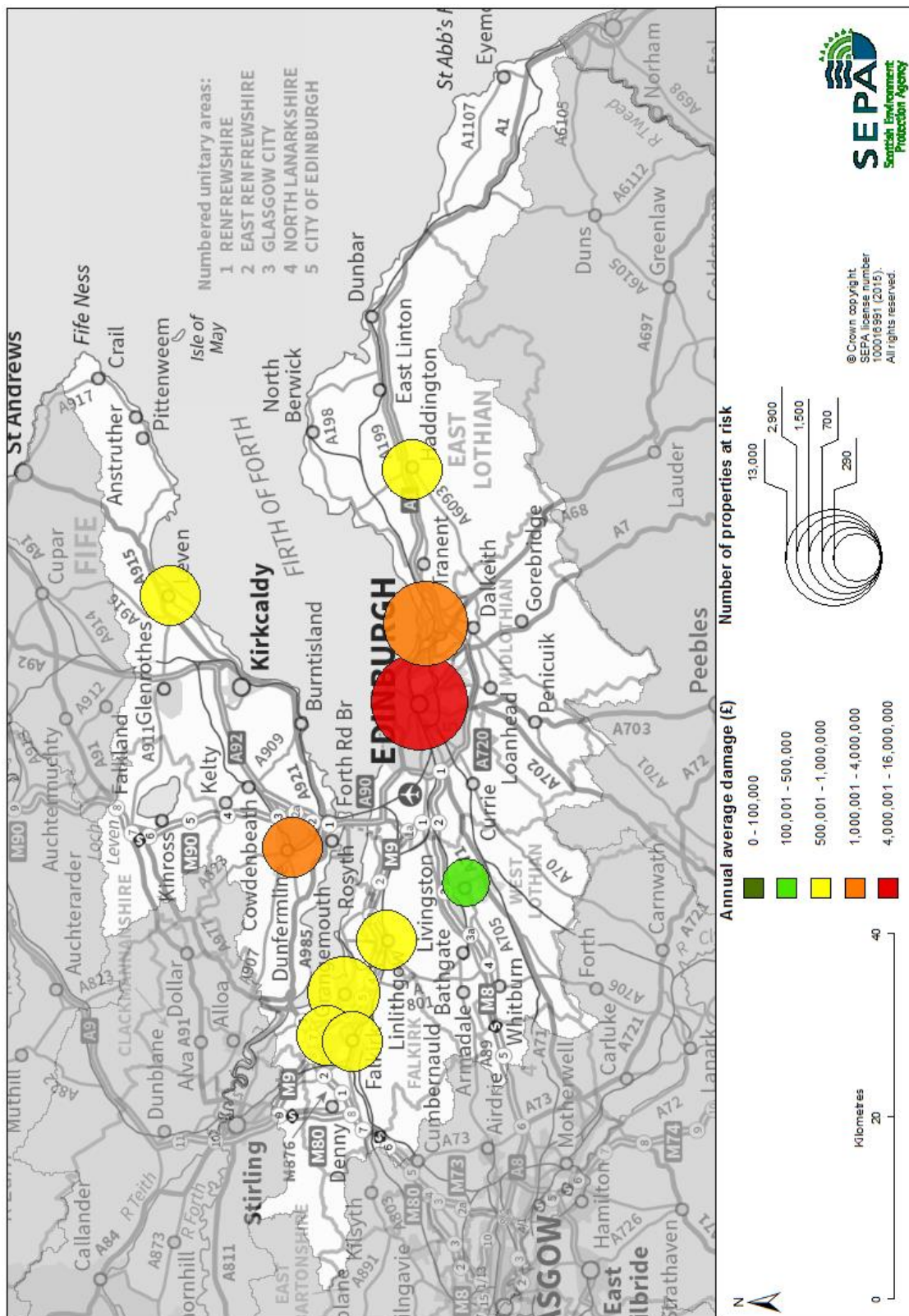


Figure 3: The Forth Estuary Local Plan District showing areas with most properties at risk of flooding and associated damages

Objectives and actions in the Forth Estuary 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 Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 14,000 residential properties • 3,800 non-residential properties • 31,000 people
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 14,000 residential properties • 3,800 non-residential properties • 31,000 people

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	-		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authority, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	EMERGENCY PLANS / RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.

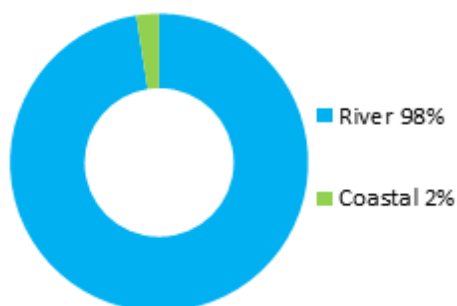
PVA	Flood protection scheme/ works	Natural flood management works	New flood warning	Flood protection study	Natural flood management study	Surface water plan/study	Strategic mapping and modelling	Maintain flood protection scheme*	Maintain flood warning*	Flood forecasting	Property level protection scheme	Community flood action groups	Self help	Awareness raising	Maintenance	Site protection plans	Emergency plans/ response	Planning policies
10/01							✓	N/A	✓	✓			✓	✓	✓		✓	✓
10/02							✓	N/A	✓	✓			✓	✓	✓		✓	✓
10/03			✓	✓		✓	✓	N/A	✓	✓			✓	✓	✓		✓	✓
10/04	✓		✓	✓		✓	✓	✓	N/A	✓		✓	✓	✓	✓		✓	✓
10/05	✓			✓		✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/06				✓		✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
10/07				✓	✓	✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/08	✓			✓			✓	✓	✓	✓			✓	✓	✓		✓	✓
10/09			✓	✓			✓	N/A	N/A	✓			✓	✓	✓		✓	✓
10/10						✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/11	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
10/12						✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/13				✓	✓	✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
10/14							✓	N/A	N/A	✓			✓	✓	✓		✓	✓
10/15							✓	N/A	N/A	✓			✓	✓	✓		✓	✓
10/16						✓	✓	N/A	✓	✓			✓	✓	✓		✓	✓
10/17				✓		✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/18	✓					✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/19						✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
10/20				✓		✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
10/21	✓				✓	✓	✓	N/A	✓	✓		✓	✓	✓	✓		✓	✓
10/22	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
10/23				✓			✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
10/24	✓						✓	N/A	✓	✓		✓	✓	✓	✓		✓	✓
10/25				✓			✓	N/A	✓	✓		✓	✓	✓	✓		✓	✓
10/26				✓			✓	N/A	✓	✓		✓	✓	✓	✓		✓	✓
10/27	✓			✓		✓	✓	✓	N/A	✓		✓	✓	✓	✓	✓	✓	✓
10/28c			✓	✓		✓		N/A	N/A	✓			✓	✓	✓		✓	✓
10/29c				✓				N/A	N/A	✓			✓	✓	✓		✓	✓

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

Crail (Potentially Vulnerable Area 10/01)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 120 residential properties
- 40 non-residential properties
- £310,000 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

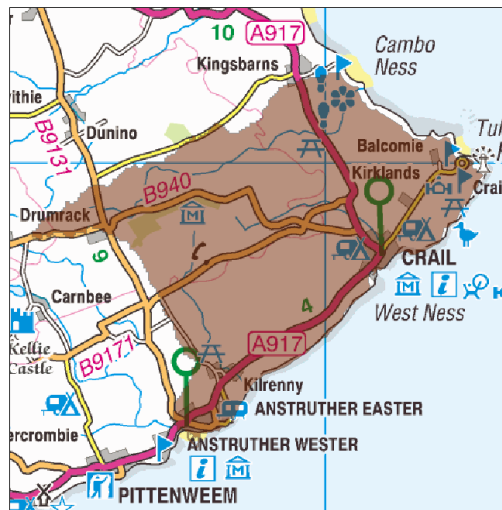
Crail (Potentially Vulnerable Area 10/01)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 42km² and part of the Firth of Forth catchment (shown below). It is a small coastal area including the villages of Crail and Anstruther Easter.

The main watercourse is the Crail Burn which flows through Crail and into the Firth of Forth.



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The area has a risk of river and coastal flooding. The majority of damages in this Potentially Vulnerable Area are caused by river flooding.

There are approximately 120 residential properties and 40 non-residential properties at risk of flooding. The Annual Average Damages are approximately £310,000.

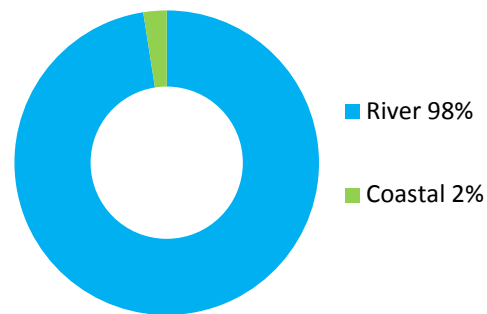


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The greatest risk of flooding is to the village of Crail from the Crail Burn.

The risk of flooding to people, 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. 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.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are two assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,100)	<10	120	260
Non-residential properties (total 500)	<10	40	50
People	10	260	580
Community facilities	<10 Educational buildings	<10 Educational buildings	<10 Educational buildings
Utilities	0	<10	<10
Transport links (excluding minor roads)	1 A road, 1 B road at 8 locations	1 A road, 2 B roads at 12 locations	1 A road, 2 B roads at 14 locations
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	7	9	10
Agricultural land (km ²)	0.3	0.4	0.5

Table 1: Summary of flooding impacts

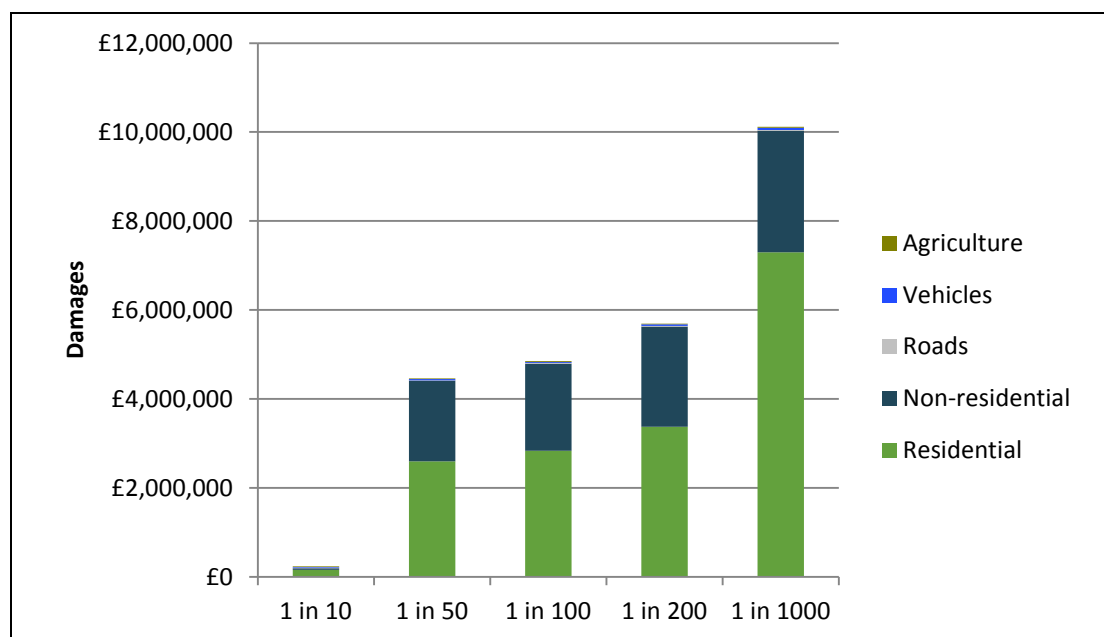


Figure 2: Damages by flood likelihood

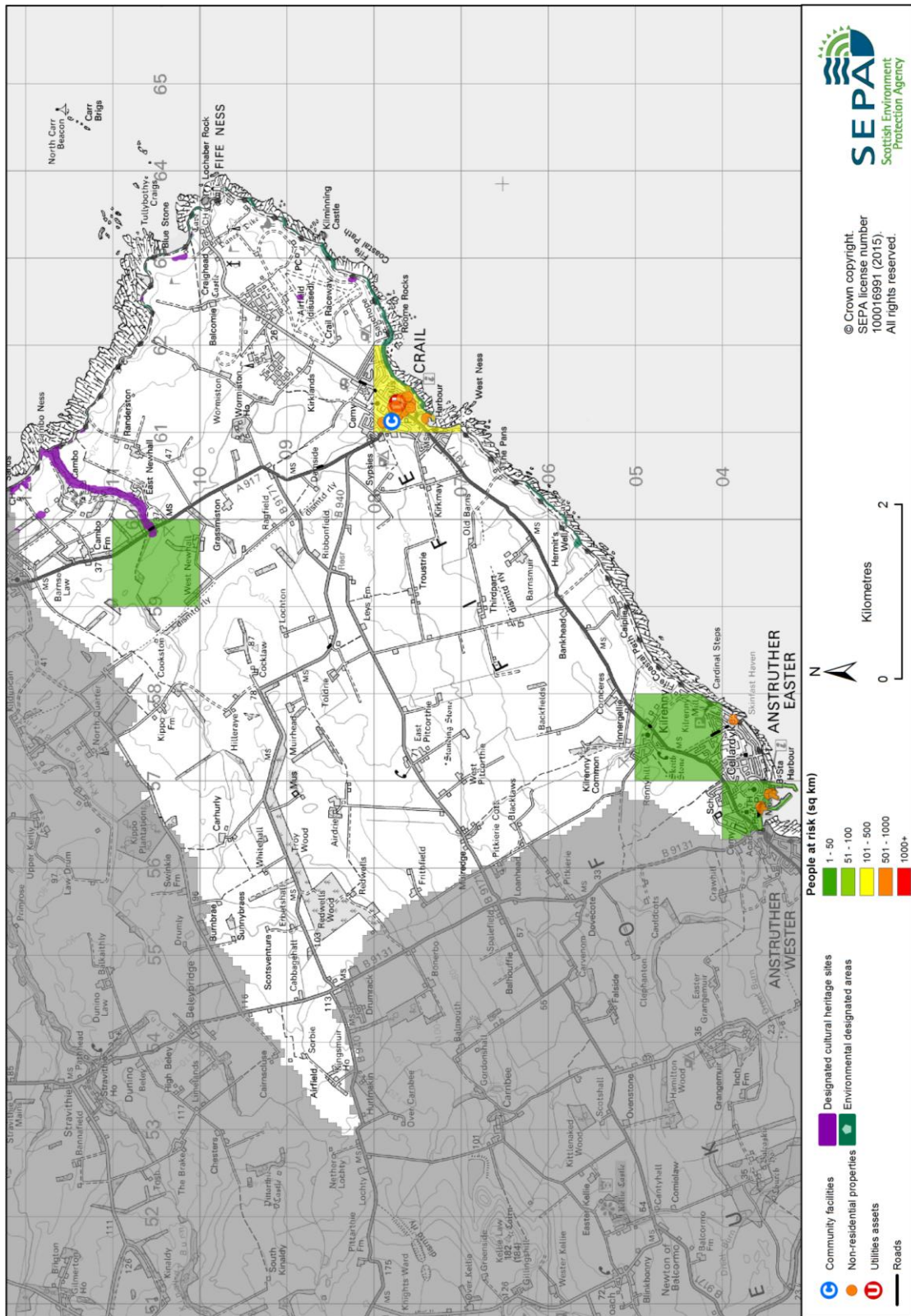


Figure 3: Impacts of flooding

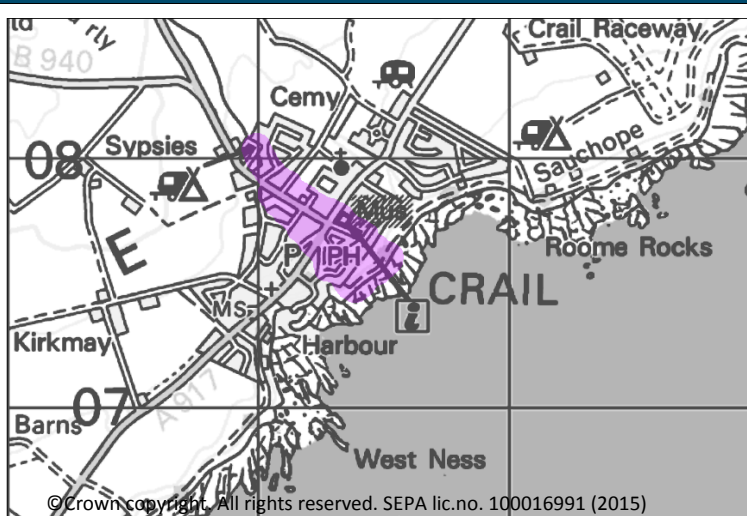
History of flooding

One significant coastal flood has been recorded in this area. On 4 April 1958, flooding affected several areas along the Fife coastline including Anstruther. Homes and businesses were affected, cars washed away and civil infrastructure damaged.

Objectives to manage flooding in Potentially Vulnerable Area 10/01

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 Crail Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties and flood risk to community facilities in Crail caused by flooding from the Crail Burn

Indicators:	Target area:
<ul style="list-style-type: none"> £160,000 Annual Average Damages from residential properties £91,000 Annual Average Damages from non-residential properties One educational building 	
Objective ID: 10002	

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> 120 residential properties £310,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> 120 residential properties £310,000 Annual Average Damages
Applies across Forth Estuary 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 10/01

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 Crail 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

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Anstruther to Elie flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and flood risk to community facilities in Crail caused by flooding from the Crail Burn (10002) Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. Fife Council will continue to undertake culvert maintenance activities that reduce the risk of flooding to Crail from the Crail Burn.		

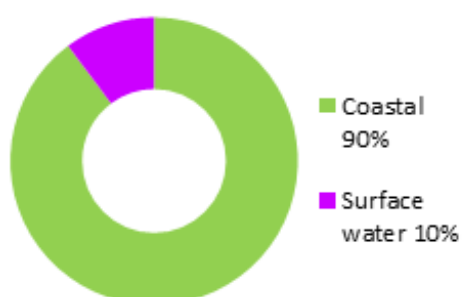
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Pittenweem (Potentially Vulnerable Area 10/02)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- <10 residential properties
- <10 non-residential properties
- £17,000 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

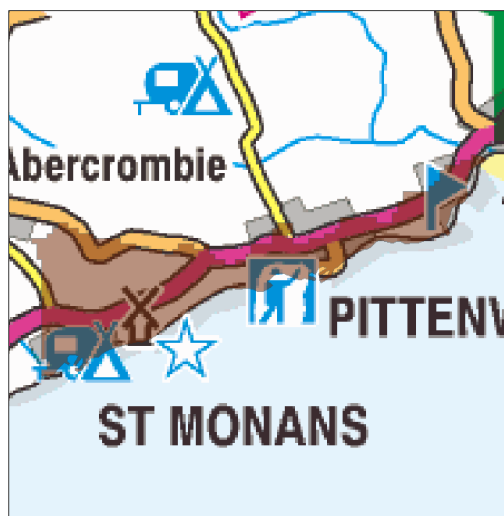
Actions

Pittenweem (Potentially Vulnerable Area 10/02)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 3km² and part of the Forth Estuary coastal area (shown below). This is a small coastal area containing the villages of Anstruther Wester, Pittenweem and the majority of the seaside town of St Monans.



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The area has a risk of coastal and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by coastal flooding.

There are fewer than 10 residential and non-residential properties at risk of flooding. The Annual Average Damages are approximately £17,000.

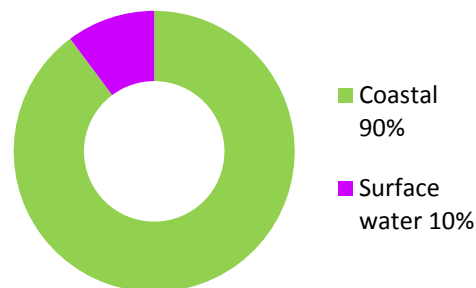


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are two assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,600)	<10	<10	<10
Non-residential properties (total 200)	<10	<10	<10
People	<10	<10	10
Community facilities	0	0	0
Utilities	0	<10	<10
Transport links (excluding minor roads)	1 A road at 1 location	1 A road at 1 location	1 A road at 1 location
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	3	6	6
Agricultural land (km ²)	< 0.01	< 0.01	< 0.01

Table 1: Summary of flooding impacts

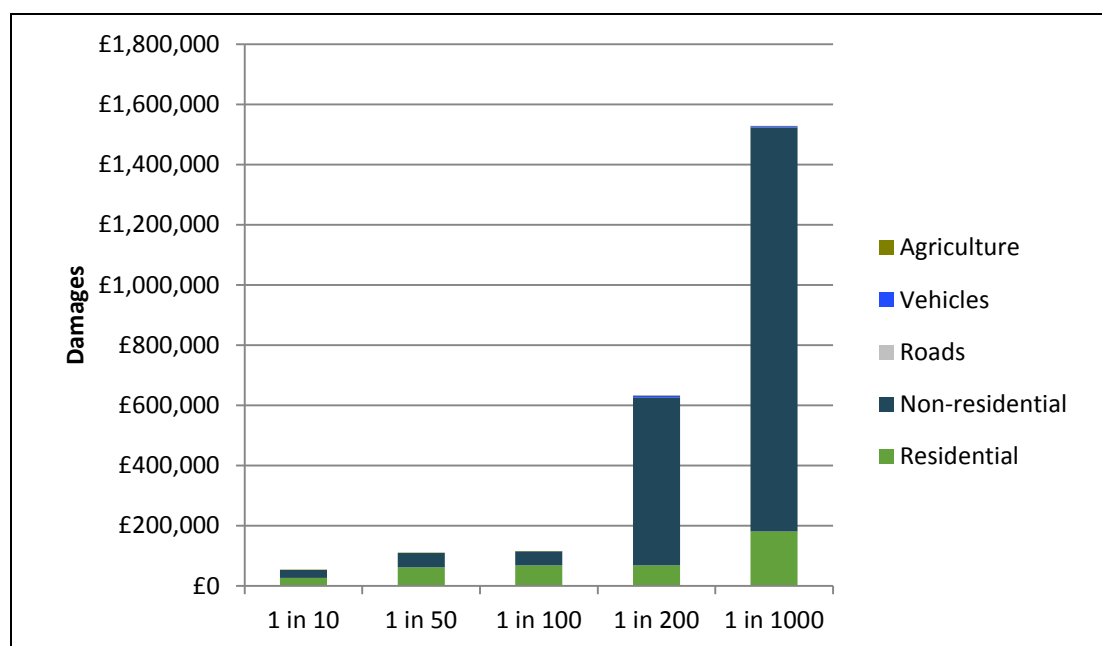


Figure 2: Damages by flood likelihood

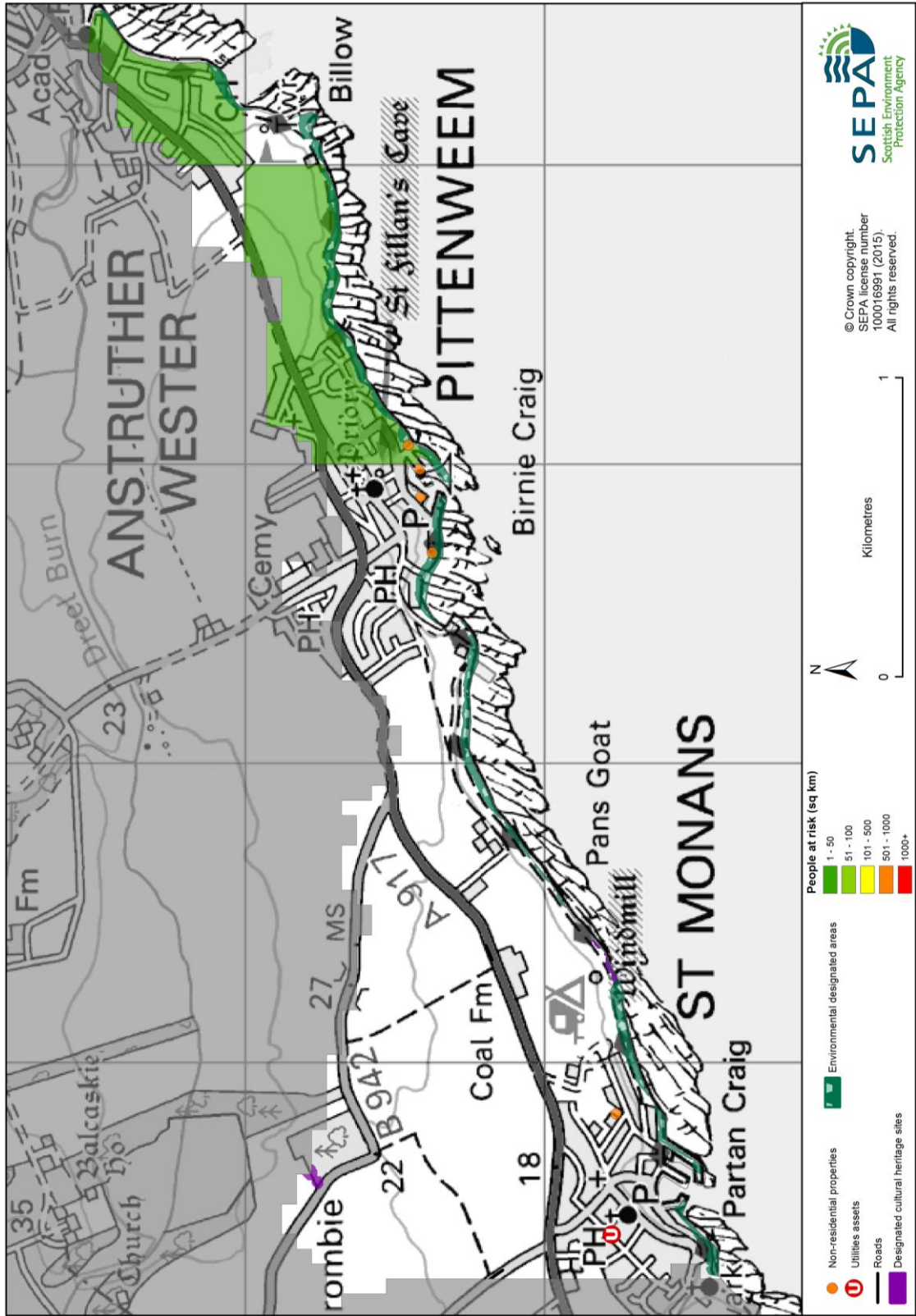


Figure 3: Impacts of flooding

History of flooding

One significant coastal flood has been recorded in this area. On 4 April 1958, flooding affected areas along the Fife coastline including Pittenweem and Shore Street in Anstruther. Homes and businesses were flooded, cars washed away and civil infrastructure damaged.

Objectives to manage flooding in Potentially Vulnerable Area 10/02

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 Pittenweem Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • <10 residential properties • £17,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • <10 residential properties • £17,000 Annual Average Damages
Applies across Forth Estuary 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 10/02

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 Pittenweem 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

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Anstruther to Elie flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

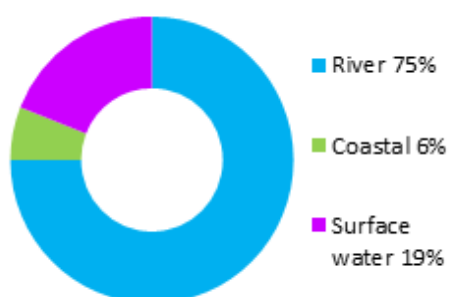
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Leven (Potentially Vulnerable Area 10/03)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	River Leven (Fife)

Summary of flooding impacts



At risk of flooding

- 180 residential properties
- 90 non-residential properties
- £820,000 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>	New flood warning	<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	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

Leven (Potentially Vulnerable Area 10/03)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	River Leven (Fife)

Background

This Potentially Vulnerable Area is 22km² and part of the Firth of Forth catchment (shown below). This is a small coastal area containing the towns of Leven and Methil and villages of Kennoway and Lower Largo. The main watercourse is the River Leven. There is one other notable watercourse, the Sconie Burn, which is situated to the north of Leven.



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The area has a risk of river, surface water and coastal flooding. The majority of damages in this Potentially Vulnerable Area are caused by river flooding.

There are approximately 180 residential properties and 90 non-residential properties at risk of flooding. The Annual Average Damages are approximately £820,000.

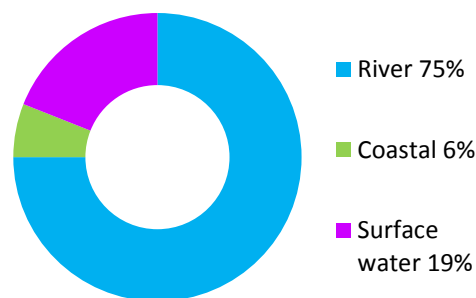


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risks of river flooding are from the River Leven and the Sconie Burn to Methil and Leven. The highest risk of surface water flooding is in Leven.

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

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 followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 8,100)	50	180	260
Non-residential properties (total 700)	40	90	100
People	110	400	570
Community facilities	<10 Emergency services	<10 Emergency services	<10 Emergency services
Utilities	<10	10	10
Transport links (excluding minor roads)	2 A roads, 2 B roads at 28 locations	3 A roads, 2 B roads at 82 locations	3 A roads, 2 B roads at 94 locations
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	2	2	2
Agricultural land (km ²)	0.2	0.3	0.3

Table 1: Summary of flooding impacts

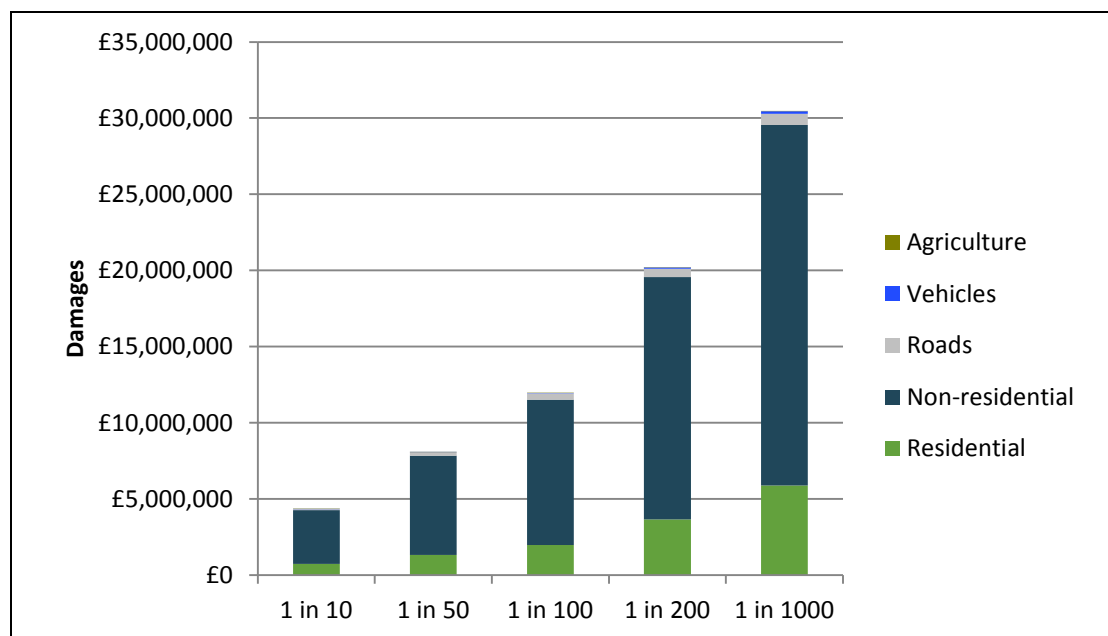


Figure 2: Damages by flood likelihood

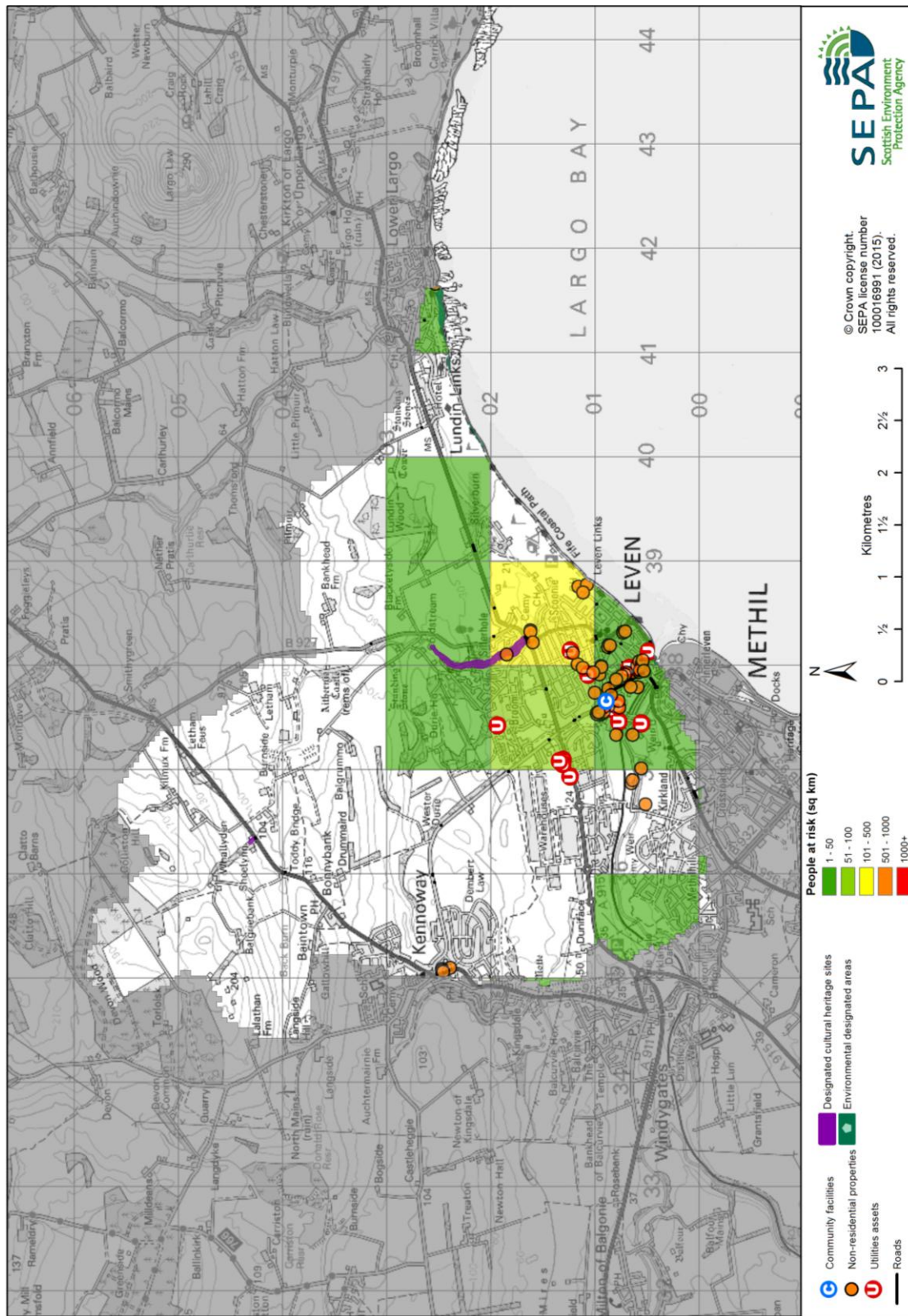


Figure 3: Impacts of flooding

History of flooding

One significant flood has been recorded in this Potentially Vulnerable Area. This occurred on 6 February 2001 when widespread flooding problems were recorded across Fife after heavy snow falls over two days were followed by a thaw combined with prolonged rainfall. Problems were made worse by exceptionally high tides. High river levels on the River Leven caused drainage problems resulting in flooding in Leven including Shorehead, Riverside Road, Bridge Street and Leven Vale trading estate.

Objectives to manage flooding in Potentially Vulnerable Area 10/03

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 Leven Potentially Vulnerable Area.

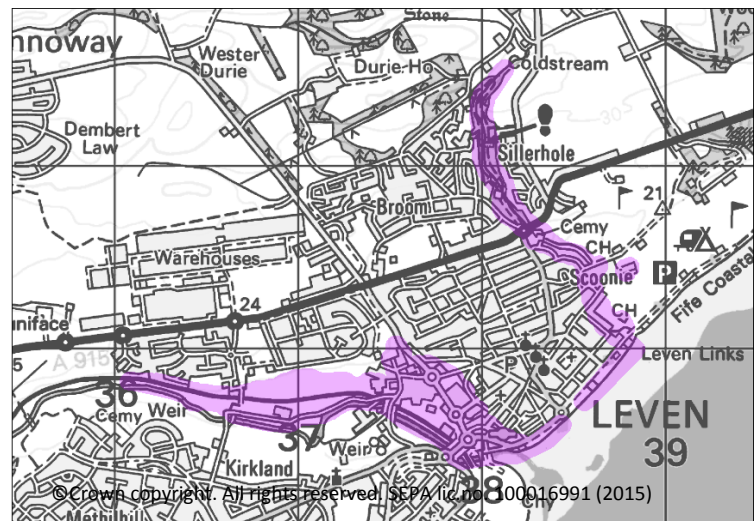
Reduce economic damages to residential and non-residential properties and risk to people in Leven caused by flooding from the River Leven and Scoonie Burn

Indicators:

- 90 people
- £53,000 Annual Average Damages from residential properties
- £330,000 Annual Average Damages from non-residential properties

Objective ID: 10006, 10007

Target area:



Target area	Objective	ID	Indicators within PVA
Leven and Eastern Methil	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical	10004	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 180 residential properties • £820,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 180 residential properties • £820,000 Annual Average Damages
Applies across Forth Estuary 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 10/03 there are 160 residential properties at risk and Annual Average Damages of £150,000.

Actions to manage flooding in Potentially Vulnerable Area 10/03

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 Leven Potentially Vulnerable Area.

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

Action (ID):	NEW FLOOD WARNING (100990010)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include Leven. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

Action (ID):	FLOOD PROTECTION STUDY (100060005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Leven caused by flooding from the River Leven and Scoonie Burn (10006, 10007)		
Delivery lead:	Fife Council		
Priority:	National: 38 of 168	Within local authority: 6 of 16	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Leven to assess whether flood storage on Scoonie Burn, modification of conveyance, direct flood defences, sediment management and natural flood management could reduce flood risk. The study should also investigate the viability of property level protection. Natural flood management options that should be considered include river/		

	floodplain restoration and sediment management. The assessment should consider these actions in combination and the impacts on flood risk upstream and downstream of each action.
Potential impacts	
Economic:	The study could benefit 26 residential properties and 52 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £8.3 million.
Social:	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 and socially vulnerable people located within the flood protection study area. In addition the study could benefit one emergency service, five utilities and two roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. The physical condition of a number of rivers within the study area is identified by SEPA to be at less than good status. These include River Leven, Kennoway Burn, Lochty Burn, Gairney Water and North Queich River (water body IDs 6301, 6303, 6312, 6315, 6320). Opportunities to improve the condition of these rivers should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. Conservation areas, gardens and designed landscapes, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	SURFACE WATER PLAN/STUDY (100040018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical (10004)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100040019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical (10004)		

Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Lower Largo and the Leven and Methil flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

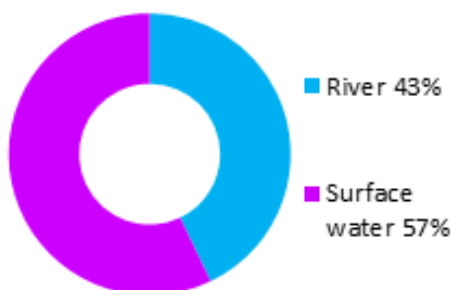
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Kinross, Milnathort, Glenrothes and Kinglassie (Potentially Vulnerable Area 10/04)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council, Perth and Kinross Council	River Leven (Fife)

Summary of flooding impacts



At risk of flooding

- 210 residential properties
- 150 non-residential properties
- £1.2 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


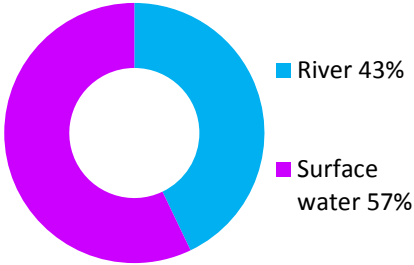
The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	New flood warning	Community flood action groups	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	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

Kinross, Milnathort, Glenrothes and Kinglassie (Potentially Vulnerable Area 10/04)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council, Perth and Kinross Council	River Leven (Fife)

Background	
<p>This Potentially Vulnerable Area is 201km² and includes the northern half of the River Leven catchment (shown below). It includes Glenrothes, Kinross and Milnathort. The main watercourses are the River Leven and its tributaries, the Lochty Burn, North and South Queich and the Back Burn.</p>  <p>© Crown copyright. SEPA licence number 100016991 (2015). All rights reserved.</p>	<p>The area has a risk of river and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.</p> <p>There are approximately 210 residential properties and 150 non-residential properties at risk of flooding. The Annual Average Damages are approximately £1.2 million.</p>  <p>Figure 1: Annual Average Damages by flood source</p>

Summary of flooding impacts

The greatest risk of flooding is in Glenrothes and Milnathort from rivers and surface water.

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

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 followed by damages to roads, notably the A91, A971 and A911. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 26,000)	60	210	320
Non-residential properties (total 2,700)	50	150	200
People	130	470	710
Community facilities	<10 Educational buildings	<10 Includes: educational buildings and healthcare facilities	<10 Includes: educational buildings and healthcare facilities
Utilities	<10	30	40
Transport links (excluding minor roads)	1 M road (M90), 7 A roads, 9 B roads at 205 locations 2 railway routes at 13 locations: Fife Circle Perth to Ladybank	1 M road (M90), 7 A roads, 9 B roads at 326 locations 2 railway routes at 16 locations: Fife Circle Perth to Ladybank Fife Airport	1 M road (M90), 7 A roads, 9 B roads at 360 locations 2 railway routes at 16 locations: Fife Circle Perth to Ladybank Fife Airport
Environmental designated areas (km ²)	46.5	46.5	46.5
Designated cultural heritage sites	7	8	8
Agricultural land (km ²)	8.0	10.5	11.1

Table 1: Summary of flooding impacts

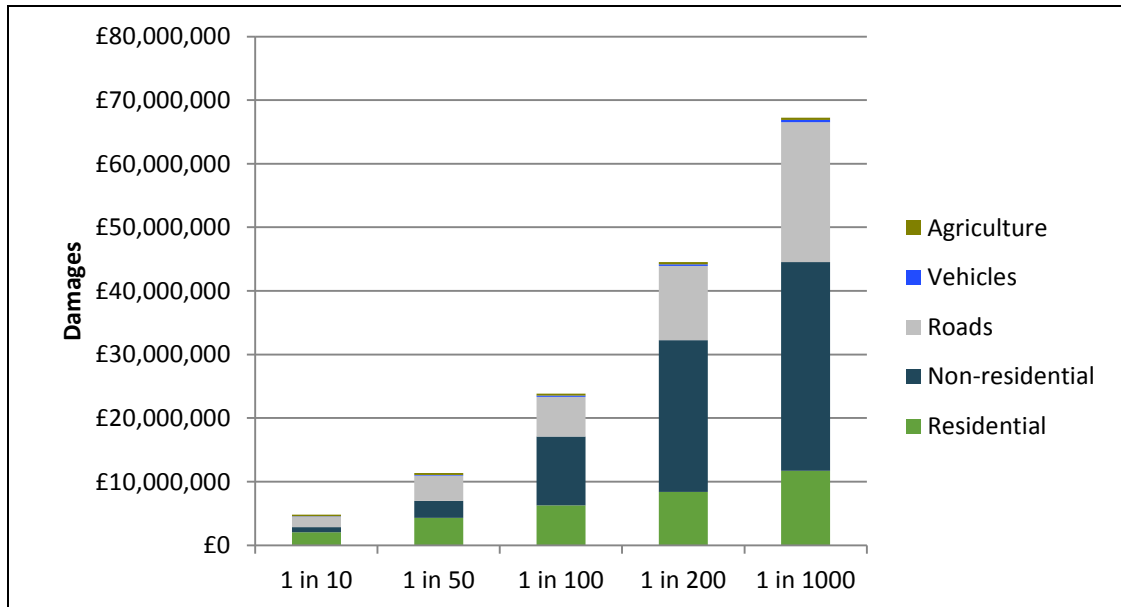


Figure 2: Damages by flood likelihood

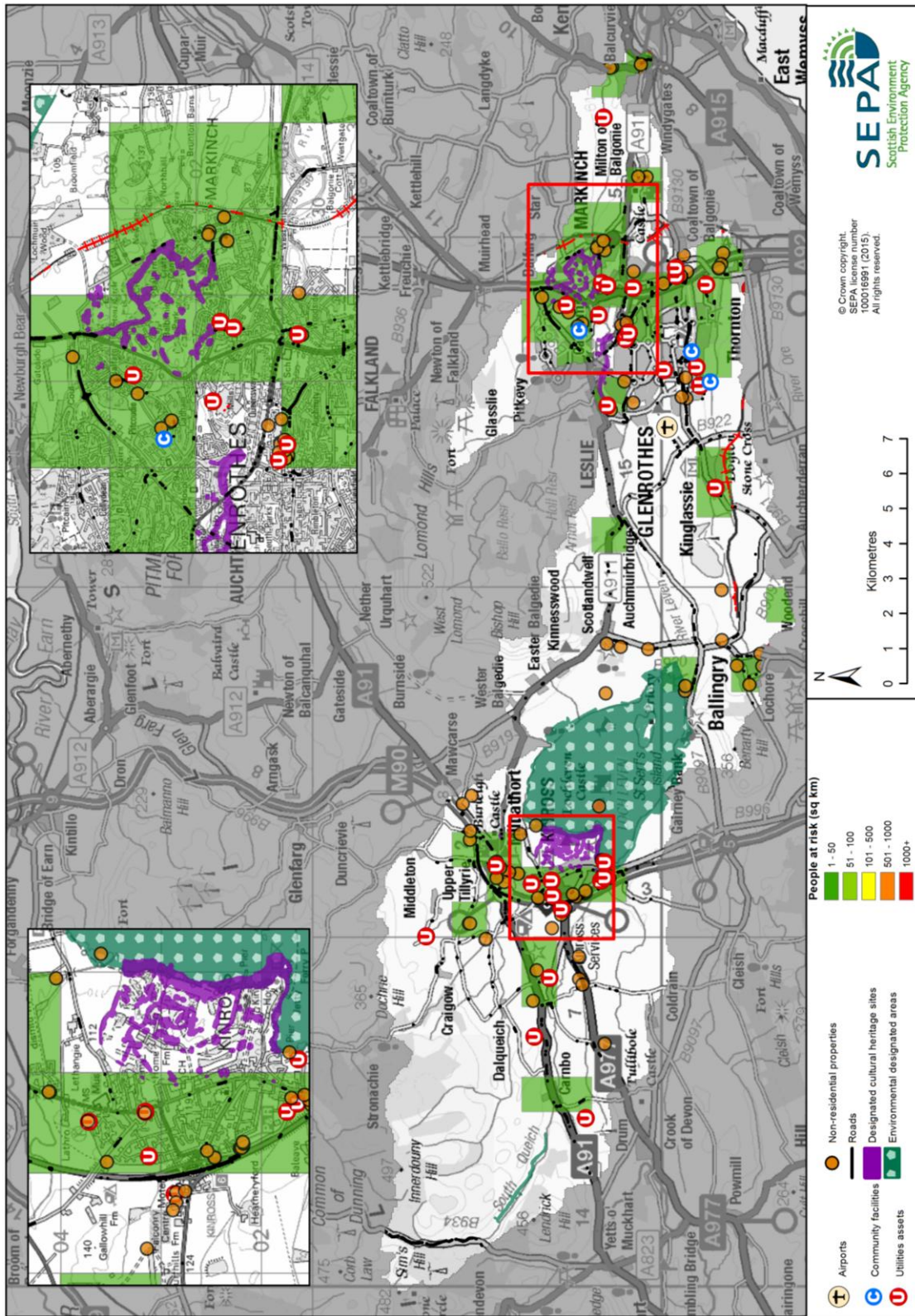


Figure 3: Impacts of flooding

History of flooding

The following significant floods have been recorded in this area:

- 6 June 2009: Heavy rain caused surface water flooding in areas of Fife and Perth and Kinross, including Milnathort.
- 13 December 2006: The centre of Milnathort was flooded from Back Burn affecting a number of non-residential and residential properties. In Kinross, properties on the Industrial Estate, Queich Place, High Street and the auction mart were affected by the South Queich flooding.
- 13-14 January 1993: The centre of Milnathort was flooded from Back Burn. The South Queich also flooded, affecting houses and industrial properties in the South of Kinross.

Objectives to manage flooding in Potentially Vulnerable Area 10/04

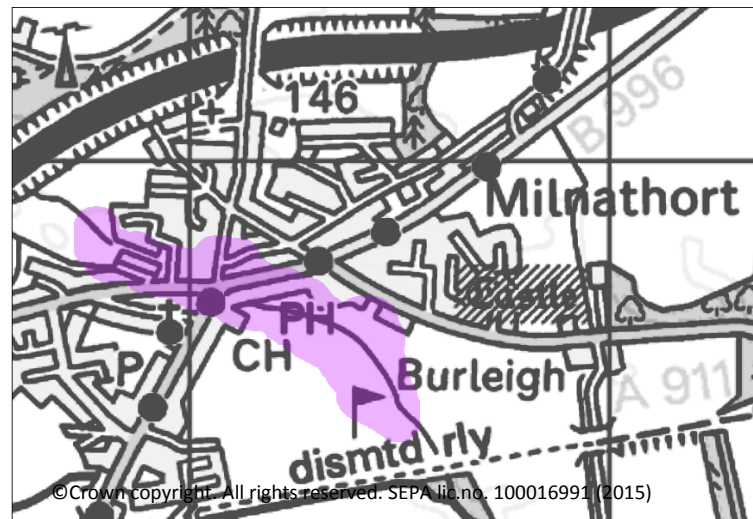
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Kinross, Milnathort, Glenrothes and Kinglassie Potentially Vulnerable Area.

Accept that significant flood risk in Milnathort is being managed appropriately. Maintain existing actions that reduce the risk of flooding in Milnathort from the Back Burn.

Indicators:

- 40 residential and non-residential properties protected (1 in 100 year standard of protection)
- £260,000 damages avoided

Target area:



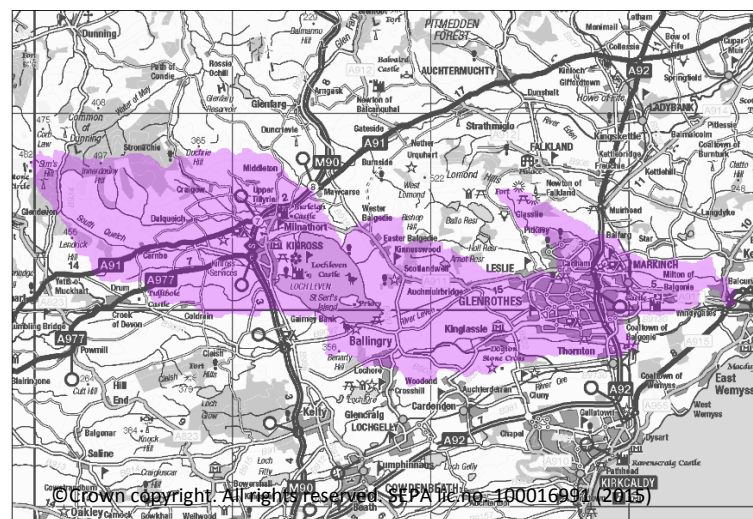
Objective ID: 10010

Reduce economic damages to residential and non-residential properties in the Kinross, Milnathort, Glenrothes and Kinglassie Potentially Vulnerable Area caused by river flooding

Indicators:

- £180,000 Annual Average Damages from residential properties
- £250,000 Annual Average Damages from non-residential properties

Target area:



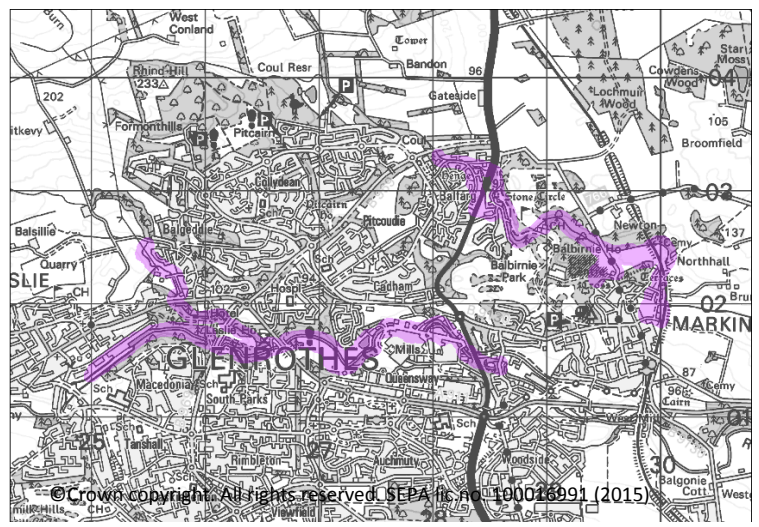
Objective ID: 10011

Reduce risk to people in Glenrothes from river flooding

Indicators:

Target area:

- 30 people



Objective ID: 10012

Target area	Objective	ID	Indicators within PVA
Leven and Eastern Methil	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical	10004	* See note below
Milnathort	Reduce economic damages and number of residential properties at risk of surface water flooding in Milnathort where practical	10008	* See note below
Glenrothes and Markinch	Reduce economic damages and number of residential properties at risk of surface water flooding in Glenrothes and Markinch where practical	10103	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 210 residential properties • £1.2 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 210 residential properties • £1.2 million Annual Average Damages
Applies across Forth Estuary 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 10/04 there are 160 residential properties at risk and Annual Average Damages of £700,000.

Actions to manage flooding in Potentially Vulnerable Area 10/04

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 Kinross, Milnathort, Glenrothes and Kinglassie Potentially Vulnerable Area.

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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100080006)				
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Milnathort where practical (10008)				
Delivery lead:	Perth and Kinross Council				
Priority:	National:		Within local authority:		
	19 of 42		2 of 4		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed for Milnathort to address surface water flooding. The scheme would consist of pumping stations and provide a 1 in 100 year (plus climate change) standard of protection.				
Potential impacts					
Economic:	The proposed scheme may benefit 66 residential properties and 13 non-residential properties at risk for a 1 in 100 year flood. Estimated damages avoided are £4.6 million. The flood protection scheme has an estimated benefit cost ratio of 3.0.				
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.				
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Loch Leven Special Protection Area.				

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100110006)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Kinross, Milnathort, Glenrothes and Kinglassie Potentially Vulnerable Area caused by river flooding (10011)		
Delivery lead:	Perth and Kinross Council		
Priority:	National:	Within local authority:	
	28 of 42	3 of 4	
Status:	Under development	Indicative delivery:	2016-2021
Description:	A flood protection scheme has been proposed for South Kinross to address flooding from the South Queich, Gelly Burn and Clash Burn. The scheme would consist of flood defence walls and provide a 1 in 200 year (plus climate change) standard of protection.		
Potential impacts			
Economic:	The scheme has estimated damages avoided of £5.5 million and an estimated benefit cost ratio of 1.48.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. The proposed flood protection works are located on the North Queich River (water body ID 6320). The physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Loch Leven Special Protection Area.		

Action (ID):	NEW FLOOD WARNING (100990010)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include Kinross. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

Action (ID):	FLOOD PROTECTION STUDY (100120005)		
Objective (ID):	Reduce risk to people in Glenrothes from river flooding (10012)		
Delivery lead:	Fife Council		
Priority:	National:	Within local authority:	
	79 of 168	11 of 16	
Status:	Not started	Indicative delivery:	2022-2027
Description:	An Integrated Catchment Study looking at surface water management in Glenrothes is scheduled to start in 2017. This study may identify future study needs that would be taken forward in the second flood risk management cycle.		
Potential impacts			
Economic:	Potential damages avoided of up to £5.1 million.		
Social:	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 and socially vulnerable people located within the flood protection study area.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. River Leven (water body ID 6301) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Action (ID):	SURFACE WATER PLAN/STUDY (100040018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical (10004)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100040019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Leven and Eastern Methil where practical (10004)		

Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (100080018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Milnathort where practical (10008)		
Delivery lead:	Perth and Kinross Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101030018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Glenrothes and Markinch where practical (10103)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101030019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Glenrothes and Markinch where practical (10103)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100100017)		
Objective (ID):	Accept that significant flood risk in Milnathort is being managed appropriately. Maintain existing actions that reduce the risk of flooding in Milnathort from the Back Burn. (10010)		
Delivery lead:	Perth and Kinross Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood protection schemes along the Back Burn in Milnathort. These include the Milnathort Flood Protection Schemes completed in 2006 and 2010.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100100012)		
Objective (ID):	Accept that significant flood risk in Milnathort is being managed appropriately. Maintain existing actions that reduce the risk of flooding in Milnathort from the Back Burn. (10010)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	A community resilience group operates in this area. The group is supported by Perth and Kinross Council and works with various communities including Milnathort to develop community resilience plans.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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 Fife Council and 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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council and Perth and Kinross Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

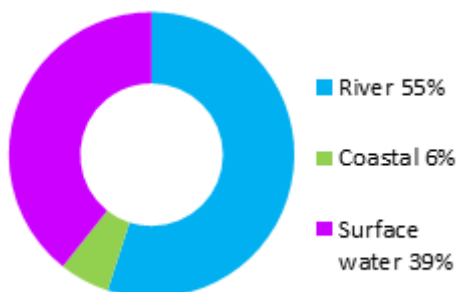
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Kirkcaldy, East Wemyss and Methil (Potentially Vulnerable Area 10/05)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 190 residential properties
- 180 non-residential properties
- £850,000 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

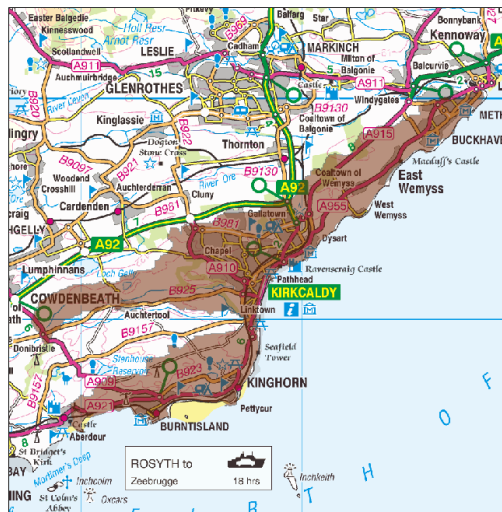
Actions

Kirkcaldy, East Wemyss and Methil (Potentially Vulnerable Area 10/05)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 71km² and part of the Firth of Forth catchment (shown below). This is a moderately sized, partially urbanised area containing the towns of Kirkcaldy, Burntisland and Methil. The main watercourses are the Tiel, East and Den Burns in Kirkcaldy and the Chemiss and Kingslaw Burns in East Wemyss.



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The area has a risk of river, surface water and coastal flooding. The majority of damages in this Potentially Vulnerable Area are caused by river flooding with surface water also posing a significant risk.

There are approximately 190 residential properties and 180 non-residential properties at risk of flooding. The Annual Average Damages are approximately £850,000.

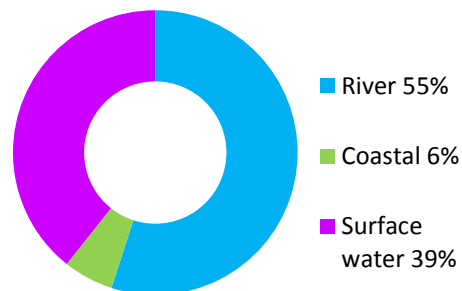


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from Tiel Burn to Kirkcaldy. The highest risk of surface water flooding is also in Kirkcaldy.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. A railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are seven assets identified as being at risk of flooding.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 36,000)	40	190	510
Non-residential properties (total 3,900)	80	180	260
People	90	410	1,100
Community facilities	<10 Healthcare facilities	<10 Healthcare facilities	<10 Includes: educational buildings, emergency services and healthcare facilities
Utilities	<10	30	40
Transport links (excluding minor roads)	6 A roads, 9 B roads at 85 locations 1 Railway route at 12 locations: Fife Circle	6 A roads, 10 B roads at 165 locations 1 Railway route at 33 locations: Fife Circle	6 A roads, 10 B roads at 203 locations 1 Railway route at 40 locations: Fife Circle
Environmental designated areas (km²)	0.5	0.5	0.5
Designated cultural heritage sites	7	8	9
Agricultural land (km²)	0.4	0.5	0.6

Table 1: Summary of flooding impacts

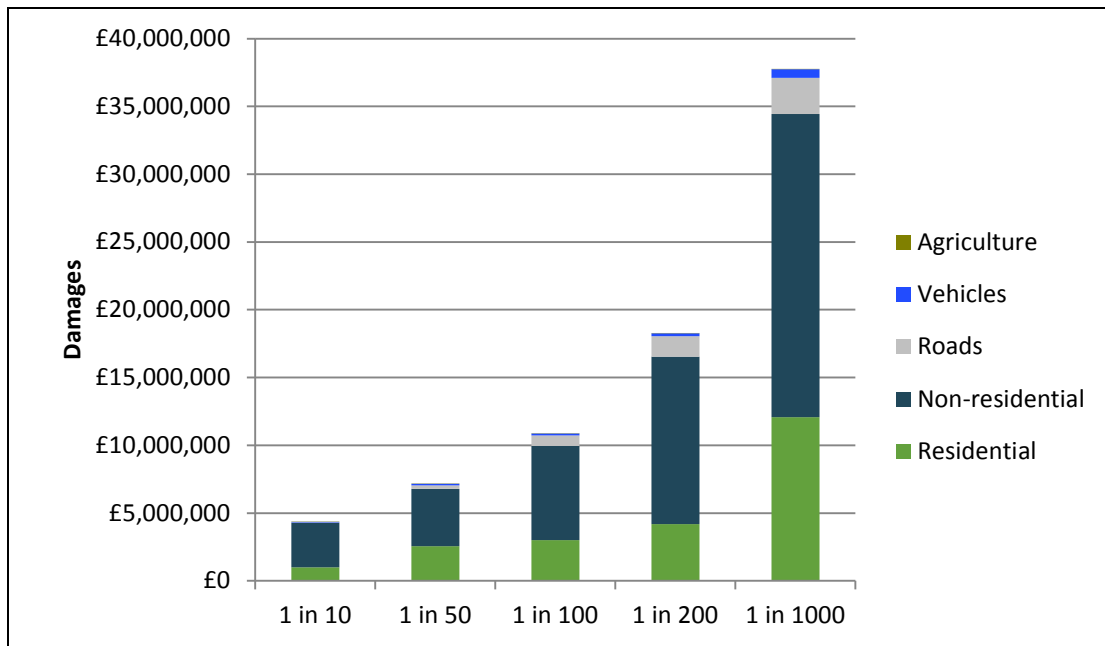


Figure 2: Damages by flood likelihood

History of flooding

The following significant coastal floods have been recorded in Kirkcaldy:

- 30 March 2010: Non-residential property affected after coastal flooding to Esplanade Road.
- 18 March 1969: Two boats sunk in the harbour and Kirkcaldy esplanade flooded under two feet of water. Transport services interrupted.
- 4 April 1958: Homes and businesses flooded, cars washed away and civil infrastructure damaged. Forty families were evacuated.
- 1 October 1947: Waves up to 30 feet affected Kirkcaldy with properties and cars damaged from flood waters.

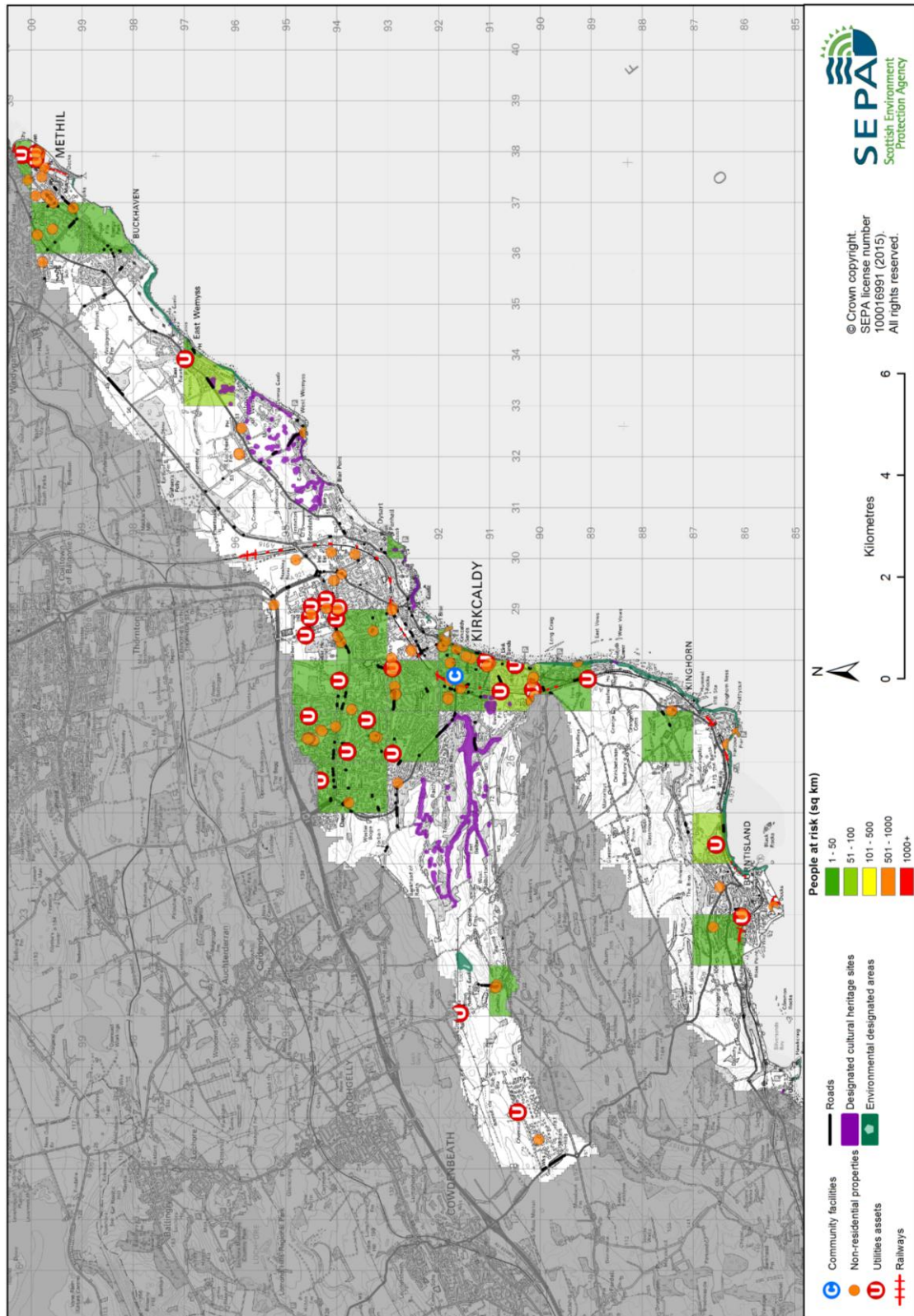


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/05

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 Kirkcaldy, East Wemyss and Methil Potentially Vulnerable Area.

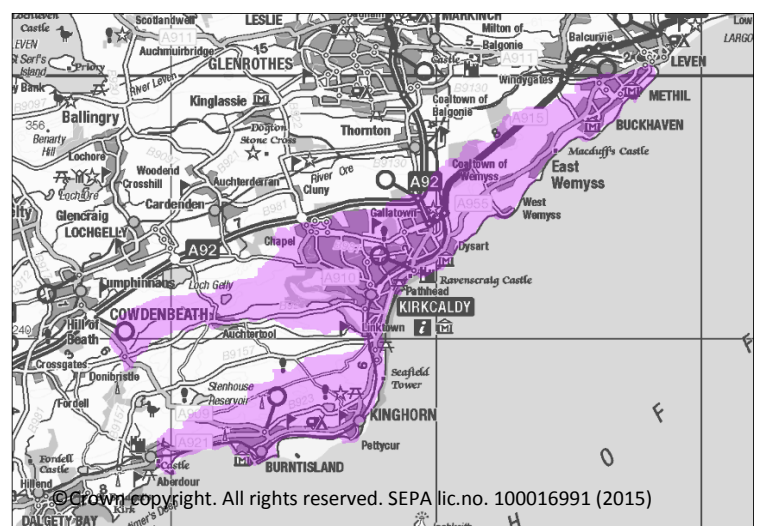
Reduce economic damages to residential and non-residential properties in the Kirkcaldy, East Wemyss and Methil Potentially Vulnerable Area caused by river and coastal flooding

Indicators:

- £130,000 Annual Average Damages from residential properties
- £330,000 Annual Average Damages from non-residential properties

Objective ID: 10015

Target area:



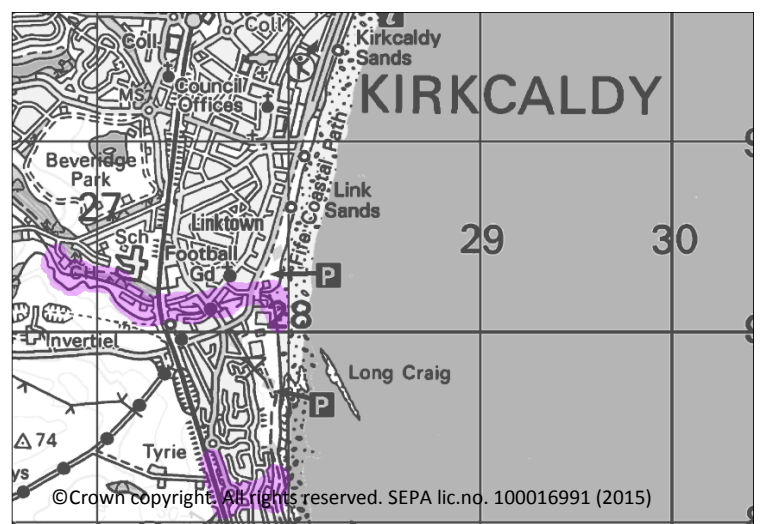
Reduce risk to people in Kirkcaldy from river flooding

Indicators:

- 110 people

Objective ID: 10016

Target area:



Target area	Objective	ID	Indicators within PVA
Burntisland	Reduce the physical or disruption risk related to the transport network for rail	10300	<ul style="list-style-type: none"> • 0.3km of rail track at six locations
Kirkcaldy and Cluny	Reduce economic damages and number of residential properties at risk of surface water flooding in Kirkcaldy and Cluny where practical	10013	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 190 residential properties • £850,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 190 residential properties • £850,000 Annual Average Damages
Applies across Forth Estuary 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 10/05 there are 130 residential properties at risk and Annual Average Damages of £330,000.

Actions to manage flooding in Potentially Vulnerable Area 10/05

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 Kirkcaldy, East Wemyss and Methil 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (10300021)		
Objective (ID):	Reduce the physical or disruption risk related to the transport network for rail (10300)		
Delivery lead:	Network Rail		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Network Rail will carry out civil engineering work which will reduce the risk of flooding on identified sections of the rail network within this Potentially Vulnerable Area.		

Action (ID):	FLOOD PROTECTION STUDY (100150025)		
Objective (ID):	Reduce risk to people in Kirkcaldy from river flooding (10016) Reduce economic damages to residential and non-residential properties in the Kirkcaldy, East Wemyss and Methil Potentially Vulnerable Area caused by river and coastal flooding (10015)		
Delivery lead:	Fife Council		
Priority:	National: 25 of 168	Within local authority: 2 of 16	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Linktown and Kirkcaldy to assess whether flood storage, sediment management, modification of conveyance, flood defences and natural flood management could reduce flood risk. The study should also investigate property relocation. Natural flood management options		

	that should be considered include runoff control, river/ floodplain restoration, sediment management and wave attenuation. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.
Potential impacts	
Economic:	The study could benefit 42 residential properties and 50 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £13 million.
Social:	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 and socially vulnerable people located within the flood protection study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Firth of Forth Special Protection Area. Scheduled monuments, gardens and designed landscapes, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	FLOOD PROTECTION STUDY (100150005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Kirkcaldy, East Wemyss and Methil Potentially Vulnerable Area caused by river and coastal flooding (10015)		
Delivery lead:	Fife Council		
Priority:	National:		Within local authority:
	138 of 168		16 of 16
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for East Wemyss to assess whether flood storage, sediment management, modification of conveyance, flood defences and natural flood management could reduce flood risk. The study should also consider property relocation and the viability of property level protection. Natural flood management options that should be considered include runoff control, river/ floodplain restoration, sediment management and wave attenuation. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.		
Potential impacts			

Economic:	The study could benefit 23 residential properties and nine non-residential properties at risk of flooding in this location, with potential damages avoided of up to £930,000.
Social:	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 and socially vulnerable people located within the flood protection study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Firth of Forth Special Protection Area. Scheduled monuments, gardens and designed landscapes, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	SURFACE WATER PLAN/STUDY (100130018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Kirkcaldy and Cluny where practical (10013)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 when these projects are completed.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100150017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Kirkcaldy, East Wemyss and Methil Potentially Vulnerable Area caused by river and coastal flooding (10015)		
Delivery lead:	Fife Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing coastal flood defences.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Leven and Methil, Burntisland to Aberdour, Kinghorn and Kirkcaldy flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fire Council and community resilience groups and participate in property level protection events delivered by the Scottish Flood Forum where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

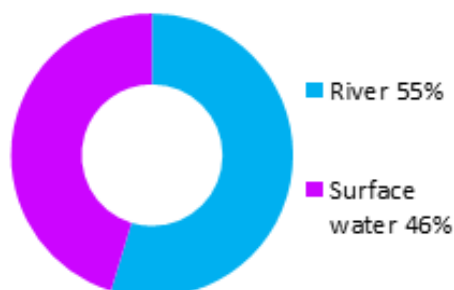
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Inverkeithing, Rosyth, Dunfermline and Wellwood (Potentially Vulnerable Area 10/06)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 410 residential properties
- 230 non-residential properties
- £2.0 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


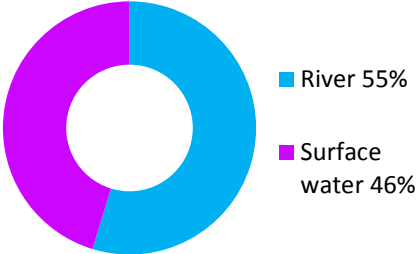
The actions below have been selected to manage flood risk.

<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

Inverkeithing, Rosyth, Dunfermline and Wellwood (Potentially Vulnerable Area 10/06)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background	
<p>This Potentially Vulnerable Area is 82km² and part of the Firth of Forth catchment (shown below). This is a moderately sized, partially urbanised area centrally located within the catchment. It contains the towns of Dunfermline, Rosyth and the majority of Inverkeithing.</p>  <p>© Crown copyright. SEPA licence number 100016991 (2015). All rights reserved.</p>	<p>The main watercourse is the Lyne Burn, flowing from its source in the north east, westward through Dunfermline and into the Firth of Forth at Charleston. Other notable watercourses include the Tower Burn, Baldrige Burn, Broomhead Burn and the Keithing Burn.</p> <p>The area has a risk of river and surface water flooding. The majority of damages are caused by river flooding.</p> <p>There are approximately 410 residential properties and 230 non-residential properties at risk of flooding. The Annual Average Damages are approximately £2.0 million.</p>  <p>Figure 1: Annual Average Damages by flood source</p>

Summary of flooding impacts

The highest risk of river flooding is from Tower Burn and the Lyne Burn to Dunfermline, Rosyth and Inverkeithing. The highest risk of surface water flooding is in Dunfermline.

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. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are three assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 33,000)	50	410	730
Non-residential properties (total 3,600)	70	230	260
People	120	910	1,600
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10	30	30
Transport links (excluding minor roads)	1 M road (M90), 8 A roads, 8 B roads at 158 locations 1 Railway route at 41 locations: Fife Circle	1 M road (M90), 8 A roads, 8 B roads at 283 locations 1 Railway route at 63 locations: Fife Circle	1 M road (M90), 8 A roads, 8 B roads at 330 locations 1 Railway route at 63 locations: Fife Circle
Environmental designated areas (km²)	0.1	0.1	0.1
Designated cultural heritage sites	6	6	8
Agricultural land (km²)	2.3	2.8	3.0

Table 1: Summary of flooding impacts

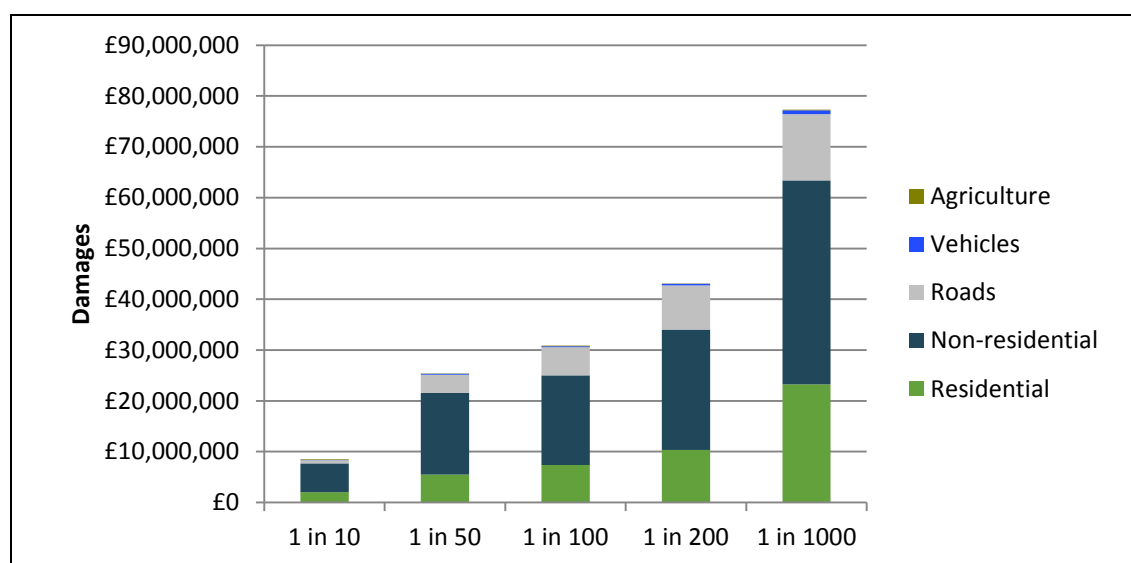


Figure 2: Damages by flood likelihood

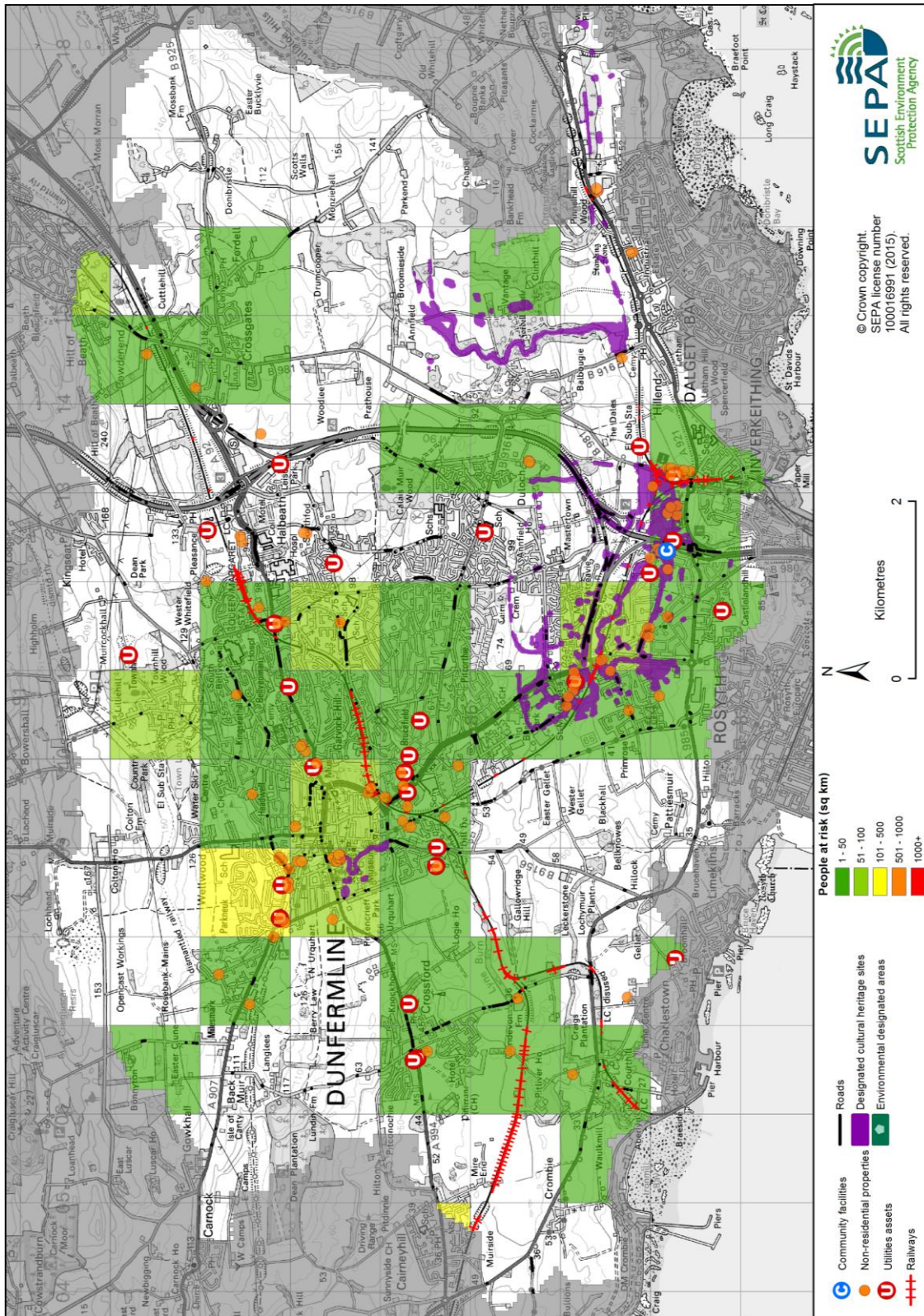


Figure 3: Impacts of flooding

History of flooding

One significant flood has been recorded in this area. On 1 April 1992, an extreme weather event resulted in 80mm of rain falling in 24 hours. This caused flooding of the Lyne Burn and its tributaries, the Tower Burn and Calais Burn and affected residential and non-residential properties in Dunfermline.

Objectives to manage flooding in Potentially Vulnerable Area 10/06

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 Inverkeithing, Rosyth, Dunfermline and Wellwood Potentially Vulnerable Area.

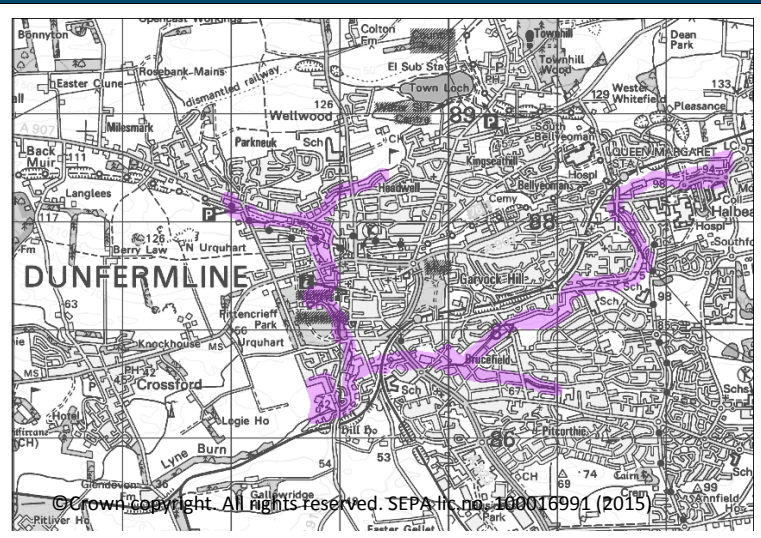
Reduce economic damages to residential and non-residential properties and risk to people in Dunfermline caused by flooding from the Lyne Burn and Tower Burn

Indicators:

- 210 people
- £190,000 Annual Average Damages from residential properties
- £450,000 Annual Average Damages from non-residential properties

Objective ID: 10019, 10022

Target area:



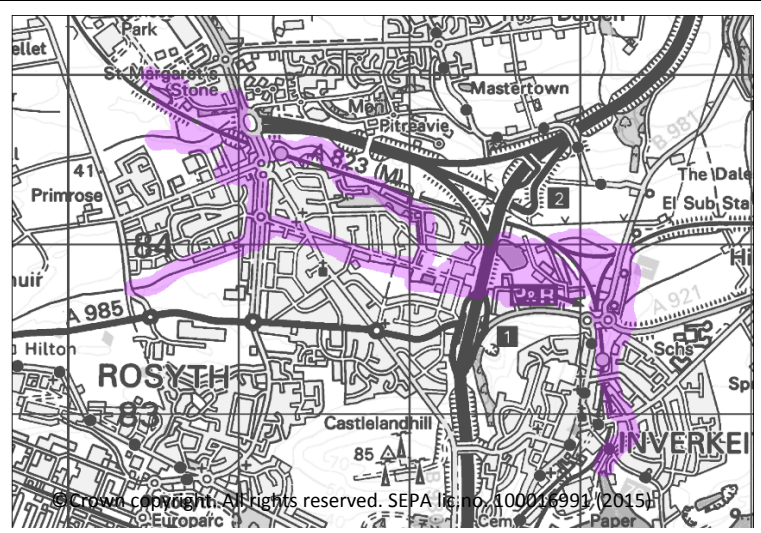
Reduce economic damages to residential and non-residential properties and flood risk to community facilities in Rosyth and Inverkeithing caused by river flooding

Indicators:

- £42,000 Annual Average Damages from residential properties
- £280,000 Annual Average Damages from non-residential properties
- One educational building

Objective ID: 10020

Target area:



Target area	Objective	ID	Indicators within PVA
Dunfermline, Bowershall, Crossford, Wellwood, Townhill and Halbeath	Reduce economic damages and number of residential properties at risk of surface water flooding in Dunfermline, Bowershall, Crossford, Wellwood, Townhill and Halbeath where practical	10017	* See note below
Cairneyhill, Crombie and Muirside	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical	10023	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 410 residential properties • £2.0 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 410 residential properties • £2.0 million Annual Average Damages
Applies across Forth Estuary 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 10/06 there are 290 residential properties at risk and Annual Average Damages of £900,000.

Actions to manage flooding in Potentially Vulnerable Area 10/06

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 Inverkeithing, Rosyth, Dunfermline and Wellwood 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

Action (ID):	FLOOD PROTECTION STUDY (100190005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Dunfermline caused by flooding from the Lyne Burn and Tower Burn (10019, 10022)		
Delivery lead:	Fife Council		
Priority:	National:		Within local authority:
	25 of 168		2 of 16
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Dunfermline to assess whether modification of conveyance, sediment management, installation/ modification of fluvial control structures, flood defences and natural flood management could reduce flood risk. The study should also investigate property relocation and the viability of property level protection. Natural flood management options that should be considered include runoff control and sediment management. The assessment should consider these actions in combination and the impacts on flood risk upstream and downstream of each action.		
Potential impacts			
Economic:	The study could benefit 59 residential properties and 31 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £12 million.		
Social:	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 and socially vulnerable people located within the flood protection study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. Tower Burn and Lyne Burn (water body IDs 4330 and 6907) are located within the study area and the physical condition of these rivers is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Conservation areas, scheduled monuments, gardens and designed landscapes, listed buildings and ancient woodlands are also present in the study area and could be positively or negatively impacted.
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Action (ID):	SURFACE WATER PLAN/STUDY (100170018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Dunfermline, Bowershall, Crossford, Wellwood, Townhill and Halbeath where practical (10017)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100170019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Dunfermline, Bowershall, Crossford, Wellwood, Townhill and Halbeath where practical (10017) Reduce economic damages to residential and non-residential properties and flood risk to community facilities in Rosyth and Inverkeithing caused by river flooding (10020)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (100230018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical (10023)		
Delivery lead:	Fife Council		

Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100230019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical (10023)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 when these projects are completed.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100190017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Dunfermline caused by flooding from the Lyne Burn and Tower Burn (10019, 10022)		
Delivery lead:	Fife Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood protection schemes. These include the Dunfermline Flood Protection Scheme in the south west of the town and Parkneuk Flood Protection Scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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 Fife Council and 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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

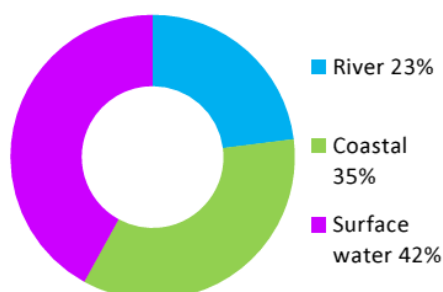
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Cairneyhill (Potentially Vulnerable Area 10/07)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 110 residential properties
- 10 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.

<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

Cairneyhill (Potentially Vulnerable Area 10/07)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 11km² and part of the Firth of Forth catchment (shown below). This is a small, largely rural coastal area containing the villages of Cairneyhill and Torryburn. The main watercourse is the Torry Burn, flowing westward through Cairneyhill and into the Torry Bay on the Firth of Forth.



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The area has a risk of river, coastal and surface water flooding. The majority of damages are caused by surface water.

There are approximately 110 residential properties and 10 non-residential properties at risk of flooding. The Annual Average Damages are approximately £520,000.

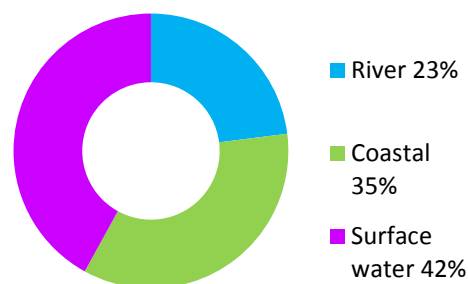


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of surface water flooding is in Cairneyhill and South Crombie. The highest risk of river flooding is from the Torry Burn to Cairneyhill and Torryburn, whilst the highest risk of coastal flooding is from the Firth of Forth to Newmills and Torryburn.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to non-residential and residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are three assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,500)	40	110	240
Non-residential properties (total 90)	<10	10	20
People	80	240	520
Community facilities	0	0	0
Utilities	0	<10	<10
Transport links (excluding minor roads)	3 A roads at 18 locations	3 A roads at 27 locations	3 A roads at 27 locations
Environmental designated areas (km ²)	0.1	0.2	0.2
Designated cultural heritage sites	1	1	1
Agricultural land (km ²)	< 0.01	< 0.01	< 0.01

Table 1: Summary of flooding impacts

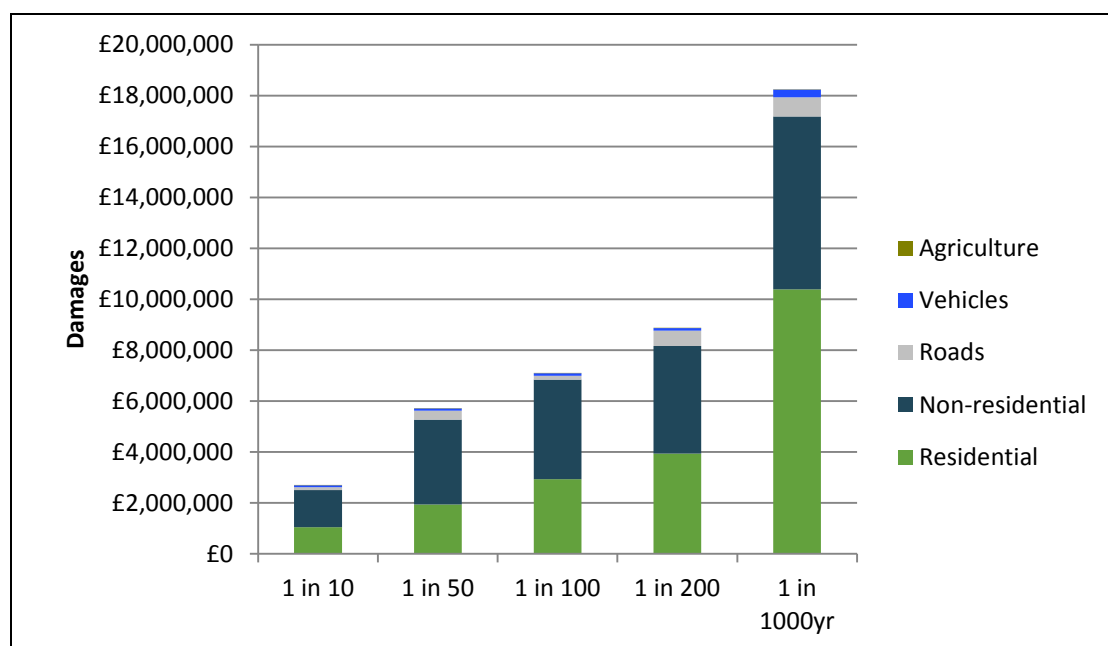


Figure 2: Damages by flood likelihood

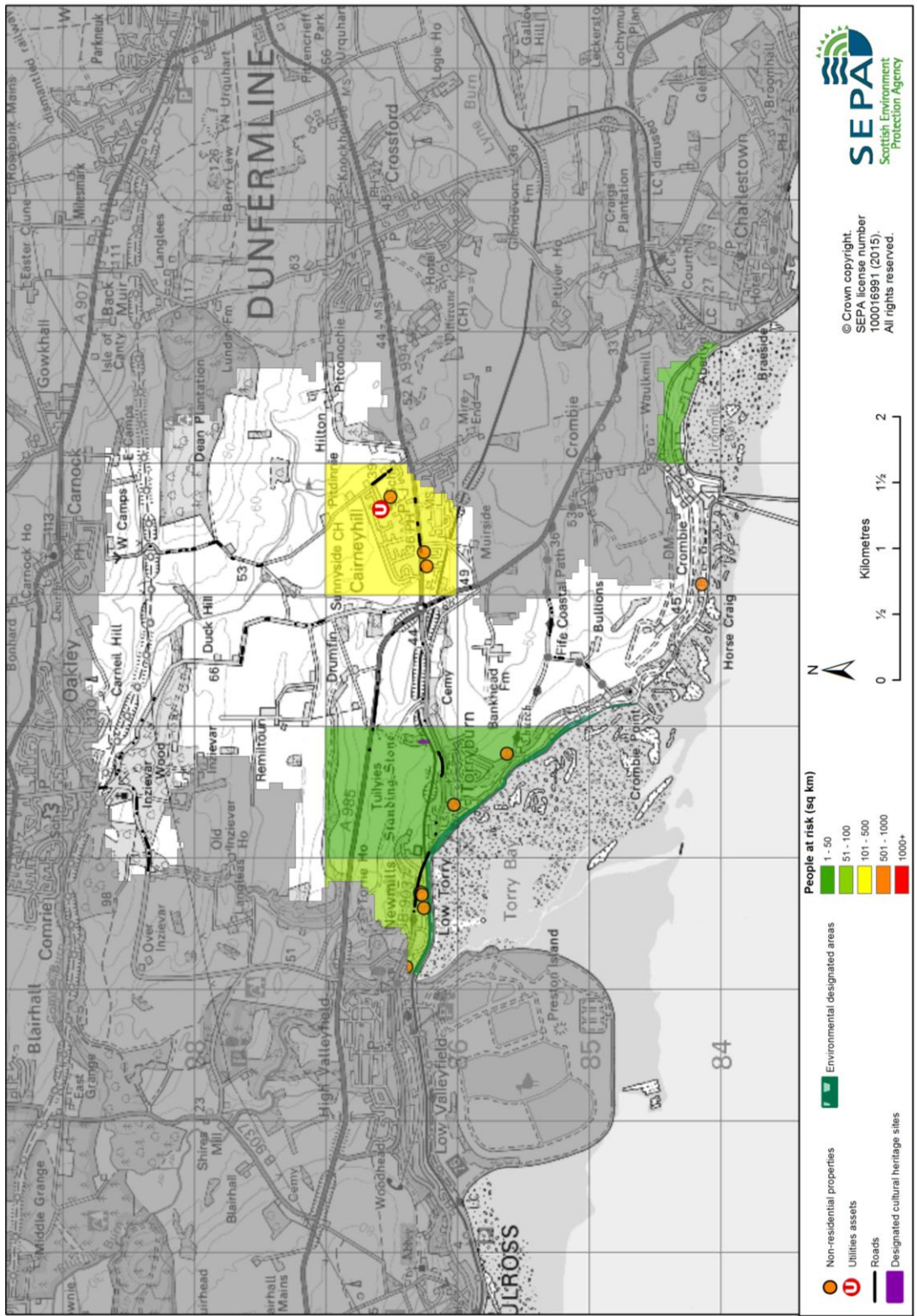


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/07

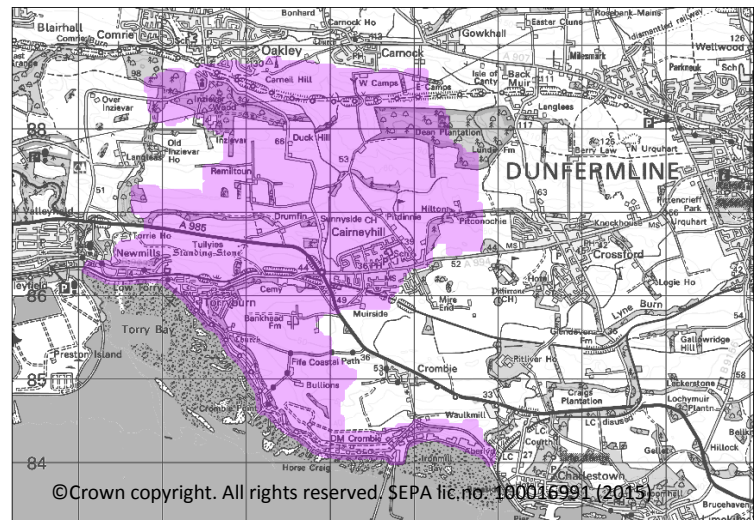
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Cairneyhill Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in the Cairneyhill Potentially Vulnerable Area caused by river and coastal flooding

Indicators:

- £120,000 Annual Average Damages from residential properties
- £130,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10025

Target area	Objective	ID	Indicators within PVA
Cairneyhill, Crombie and Muirside	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical	10023	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 110 residential properties • £520,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 110 residential properties • £520,000 Annual Average Damages
Applies across Forth Estuary 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 10/07 there are 60 residential properties at risk and Annual Average Damages of £220,000.

Actions to manage flooding in Potentially Vulnerable Area 10/07

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 Cairneyhill 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

Action (ID):	FLOOD PROTECTION STUDY (100250005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cairneyhill Potentially Vulnerable Area caused by river and coastal flooding (10025)		
Delivery lead:	Fife Council		
Priority:	National:		Within local authority:
	70 of 168		8 of 16
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Cairneyhill to assess whether sediment management, modification of conveyance, installation/ modification of fluvial control structures, flood defences and natural flood management could reduce flood risk. The study should also investigate property relocation and the viability of property level protection. Natural flood management options that should be considered include runoff control and sediment management. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.		
Potential impacts			
Economic:	The study could benefit 38 residential properties and six non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.6 million.		
Social:	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. In addition the study could benefit one utility, one road and one railway line located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for		

Social:	recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. Middle Forth Estuary (water body ID 200436) is located within the study area and the physical condition of this estuary is identified by SEPA to be at less than good status. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. Listed buildings, local nature reserves, Sites of Special Scientific Interest and Ramsar sites are also present in the study area and could be positively or negatively impacted.

Action (ID):	NATURAL FLOOD MANAGEMENT STUDY (100250003)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cairneyhill Potentially Vulnerable Area caused by river and coastal flooding (10025)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	A natural flood management study has been recommended to assess whether wave attenuation could help reduce flood risk in Torryburn.		

Potential impacts	
Economic:	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. Twenty-eight residential and non-residential properties could potentially benefit from natural flood management actions in this location.
Social:	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.
Environmental:	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. Middle Forth Estuary (water body ID 200436) is located within the study area and the physical condition of this estuary has been identified by SEPA to be at less than good status. Opportunities to improve the condition of this estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area.

Action (ID):	SURFACE WATER PLAN/STUDY (100230018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical (10023)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100230019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cairneyhill, Crombie and Muirside where practical (10023)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100250017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cairneyhill Potentially Vulnerable Area caused by river and coastal flooding (10025)		
Delivery lead:	Fife Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood defences along the coast and river. This includes the Cairneyhill Flood Protection Scheme comprising of a flow diversion scheme and defences along the Torry Burn.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Torryburn and Newmills flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

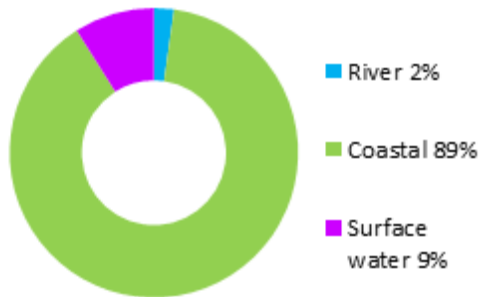
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Hawkhill, Kincardine, Kennet Pans and Culross (Potentially Vulnerable Area 10/08)

Local Plan District	Local authority	Main catchment
Forth Estuary	Clackmannanshire Council, Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 240 residential properties
- 30 non-residential properties
- £1.4 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	<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

Hawkhill, Kincardine, Kennet Pans and Culross (Potentially Vulnerable Area 10/08)

Local Plan District	Local authority	Main catchment
Forth Estuary	Clackmannanshire Council, Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 31km² and part of the Firth of Forth catchment (shown below). This is a small coastal area containing the villages of Kincardine and Culross. There are numerous small burns around Kincardine which collectively cause flooding issues in the area.



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The area has a risk of coastal, surface water and river flooding. The majority of damages in this Potentially Vulnerable Area are caused by coastal flooding.

There are approximately 240 residential properties and 30 non-residential properties at risk of flooding.

The Annual Average Damages from flooding are approximately £1.4 million.

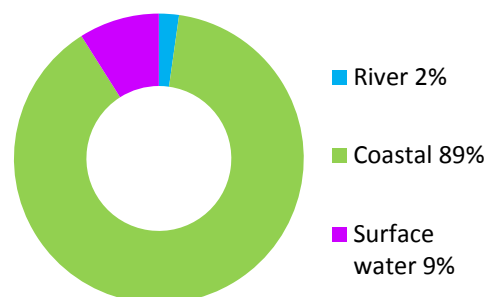


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of coastal flooding is from the Firth of Forth to Culross and Kincardine. The highest risk of river flooding is to Kincardine.

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. For this Potentially Vulnerable Area the highest damages are to residential properties and roads. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are six assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 2,200)	80	240	330
Non-residential properties (total 190)	20	30	40
People	180	520	730
Community facilities	0	0	<10 Educational buildings
Utilities	<10	<10	<10
Transport links (excluding minor roads)	3 A roads, 1 B road at 14 locations	3 A roads, 1 B road at 19 locations	3 A roads, 1 B road at 23 locations
Environmental designated areas (km ²)	0.2	0.3	0.3
Designated cultural heritage sites	6	9	9
Agricultural land (km ²)	2.9	3.2	3.6

Table 1: Summary of flooding impacts

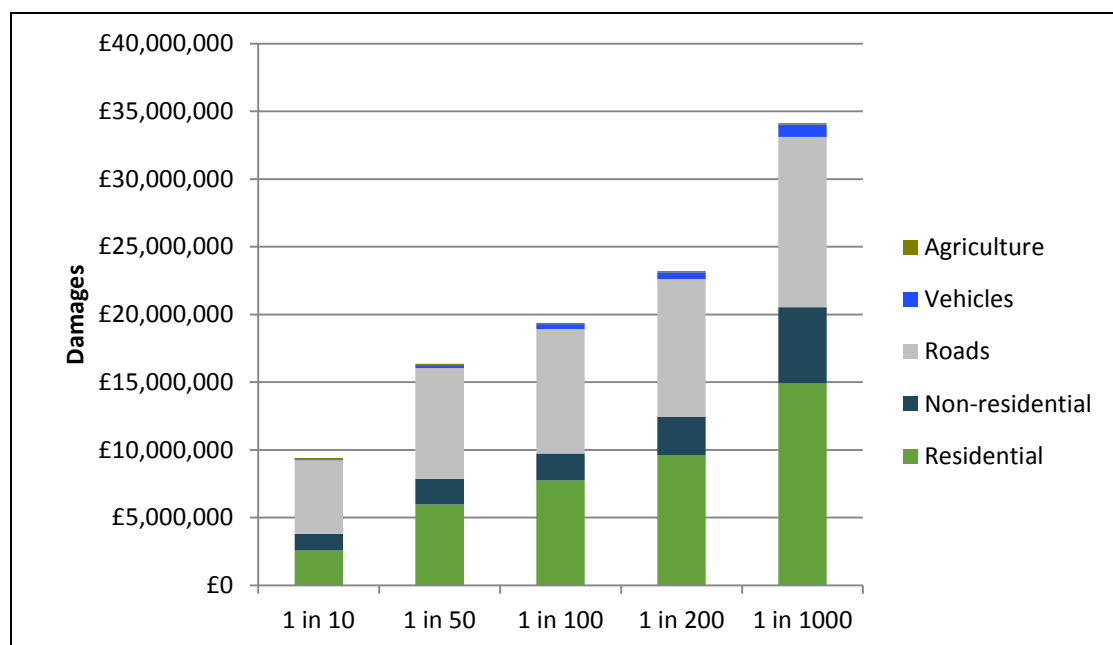


Figure 2: Damages by flood likelihood

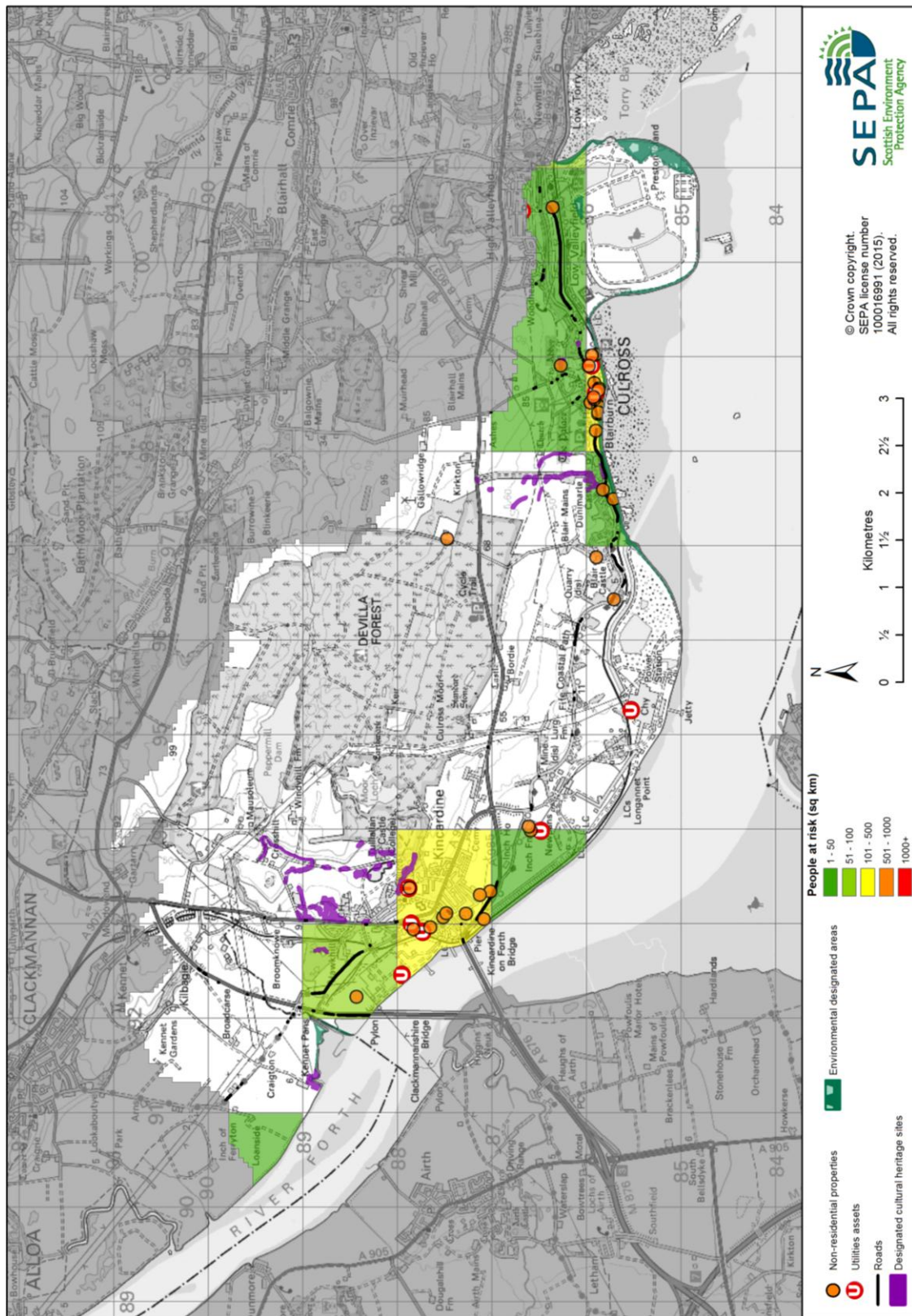


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Hawkhill, Kincardine, Kennet Pans and Culross	Accept the physical or disruption risk related to the transport network for roads	10301	<ul style="list-style-type: none"> • 330m of the A985 at two locations • 360m of the A876 at one location
Culross	Reduce the physical or disruption risk related to the transport network for rail	10302	<ul style="list-style-type: none"> • 3.5km of rail track at 10 locations
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 240 residential properties • £1.4 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 240 residential properties • £1.4 million Annual Average Damages
Applies across Forth Estuary 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 10/08

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 Hawkhill, Kincardine, Kennet Pans and Culross 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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (10301021)		
Objective (ID):	Accept the physical or disruption risk related to the transport network for roads (10301)		
Delivery lead:	Transport Scotland		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Transport Scotland will carry out civil engineering work which will reduce the risk of flooding on identified sections of the trunk road.		

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (10302021)		
Objective (ID):	Reduce the physical or disruption risk related to the transport network for rail (10302)		
Delivery lead:	Network Rail		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Network Rail will carry out civil engineering work which will reduce the risk of flooding on identified sections of the rail network within this Potentially Vulnerable Area.		

Action (ID):	FLOOD PROTECTION STUDY (100270005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Kincardine caused by river flooding and coastal flooding (10027)		
Delivery lead:	Fife Council		
Priority:	National:	Within local authority:	
	21 of 168	1 of 16	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Kincardine to assess whether flood storage, flood defences, sediment management and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be considered include surge attenuation. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.		
Potential impacts			
Economic:	The study could benefit 147 residential properties and nine non-residential properties at risk of flooding in this location, with potential damages avoided of up to £12 million.		
Social:	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. In addition the study could benefit four utilities and two roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Middle Forth Estuary and Upper Forth Estuary (water body IDs 200436 and 200437) are located within the study area and the physical condition of these estuaries is identified by SEPA to be at less than good status. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. Conservation areas, gardens and designed landscapes, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands are also present in the study area and could be positively or negatively impacted.		
Action (ID):	FLOOD PROTECTION STUDY (100260005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Culross caused by coastal flooding (10026, 10028)		

Delivery lead:	Fife Council		
Priority:	National:	Within local authority:	
	90 of 168	13 of 16	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Culross to assess flood defences, sediment management and natural flood management. The study should also investigate the viability of property level protection. Natural flood management options that should be considered include wave and surge attenuation. The study should take a sustainable approach and consider the interaction between actions and potential effects on coastal processes along the shoreline.		
Potential impacts			
Economic:	The study could benefit 83 residential properties and 13 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.0 million.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Middle Forth Estuary (water body ID 200436) is located within the study area and the physical condition of this estuary is identified by SEPA to be at less than good status. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. Conservation areas, scheduled monuments, listed buildings, local nature reserves, Sites of Special Scientific Interest and Ramsar sites are also present in the study area and could be positively or negatively impacted.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling 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.
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Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100270017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Kincardine caused by river flooding and coastal flooding (10027)		
Delivery lead:	Fife Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Kincardine-on-Forth Flood Protection Scheme that provides protection against flooding from the Peffermill Burn. The scheme includes flow diversion from the Moor Loch Burn, culverts and channel improvements.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Culross, Longannet and Kincardine flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through SEPA-led education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council and Clackmannanshire Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Airth (Potentially Vulnerable Area 10/09)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council	Forth Estuary (south) coastal

Summary of flooding impacts



At risk of flooding

- 110 residential properties
- <10 non-residential properties
- £720,000 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>	New flood warning	<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>	<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

Actions

Airth (Potentially Vulnerable Area 10/09)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council	Forth Estuary (south) coastal

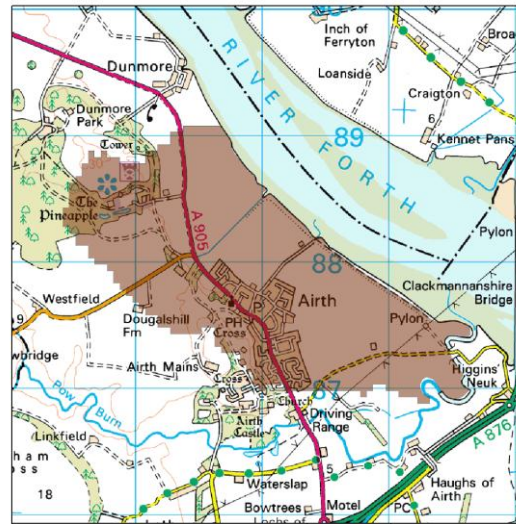
Background

This Potentially Vulnerable Area is 4km² and part of the Firth of Forth catchment (shown right). This is a small coastal area containing the village of Airth.

All of the damages in this Potentially Vulnerable Area are caused by coastal flooding to the town of Airth.

There are approximately 110 residential properties and fewer than 10 non-residential properties at risk of flooding.

The Annual Average Damages from flooding are approximately £720,000.



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Summary of flooding impacts

The greatest risk of flooding is to the town of Airth.

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 1. 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 2.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are two assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 680)	90	110	120
Non-residential properties (total 50)	<10	<10	<10
People	200	240	260
Community facilities	0	0	0
Utilities	0	0	0
Transport links (excluding minor roads)	2 A roads at 2 locations	2 A roads at 4 locations	2 A roads at 4 locations
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	1	1	1
Agricultural land (km ²)	1.3	1.4	1.5

Table 1: Summary of flooding impacts

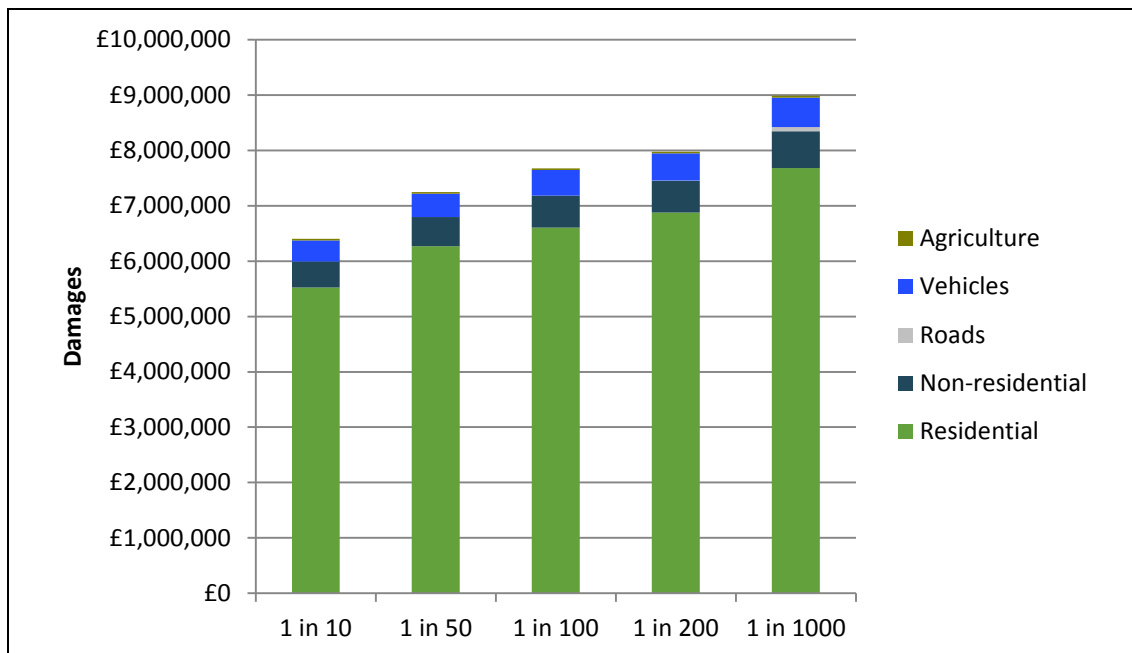


Figure 1: Damages by flood likelihood

History of flooding

One significant coastal flood has been recorded in this area. In December 2013 a combination of surge and high tide resulted in a breach of an existing bund and led to flooding of Airth Wastewater Treatment Works and agricultural land.

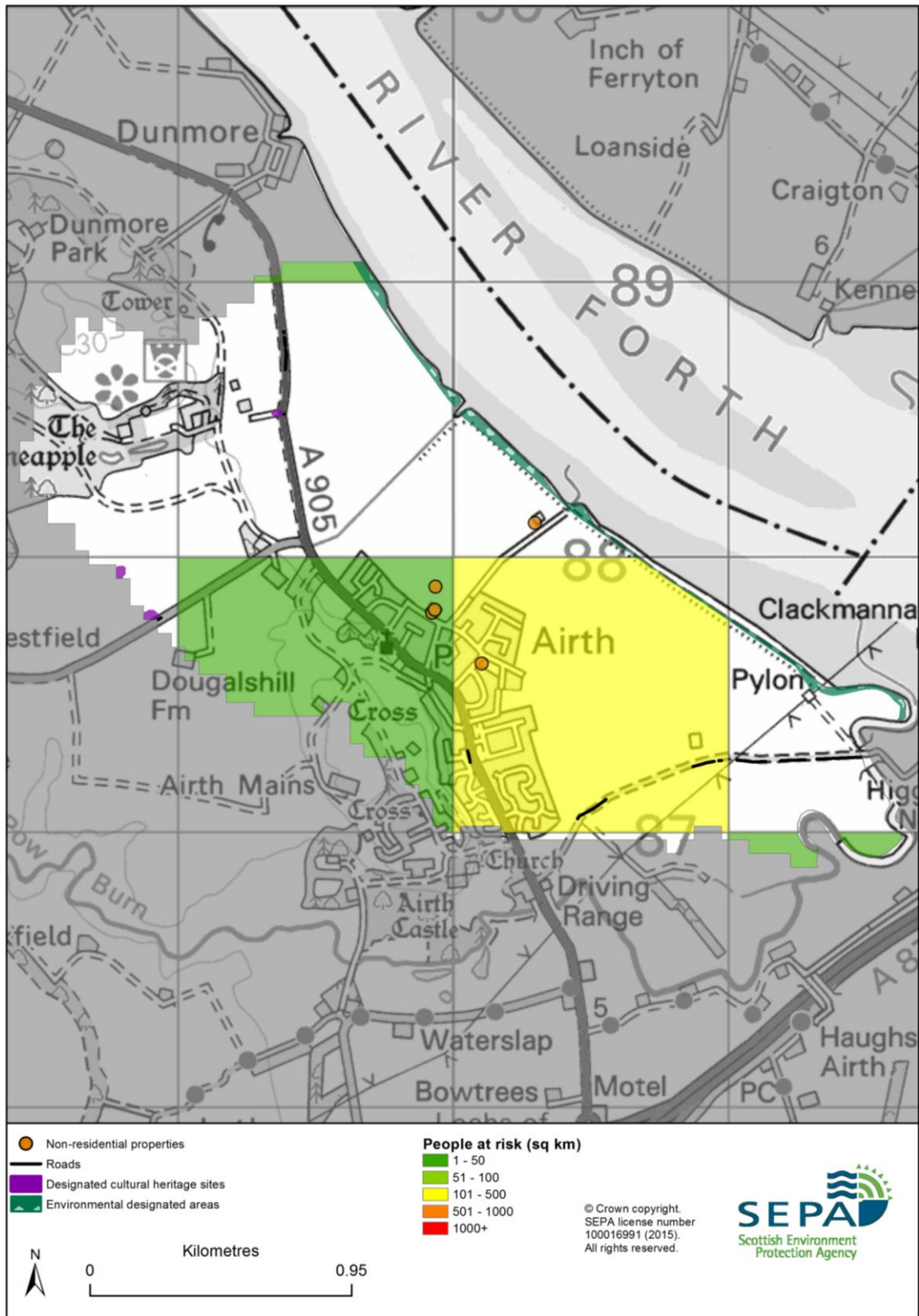
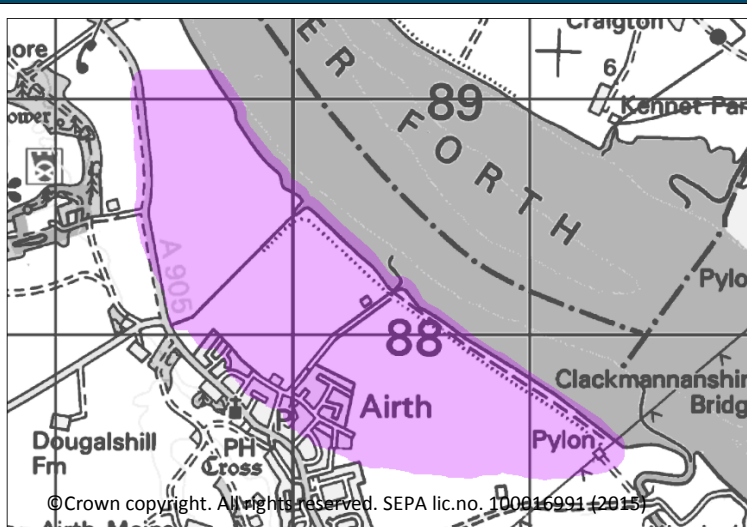


Figure 2: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/09

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 Airth Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties and risk to people in Airth caused by coastal flooding

Indicators: <ul style="list-style-type: none"> 320 people £530,000 Annual Average Damages from residential properties £47,000 Annual Average Damages from non-residential properties 	Target area: 
Objective ID: 10029, 10030	

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> 110 residential properties £720,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> 110 residential properties £720,000 Annual Average Damages
Applies across Forth Estuary 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 10/09

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 Airth Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	New flood warning	<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>	<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

Action (ID):	NEW FLOOD WARNING (100990010)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	Flood warning is required for properties at risk of coastal flooding in Airth. Delivery of new warnings in this area can potentially be undertaken through an extension to the existing Firth of Forth and Tay flood forecasting system and warning scheme.		

Action (ID):	FLOOD PROTECTION STUDY (100290005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Airth caused by coastal flooding (10029, 10030)		
Delivery lead:	Falkirk Council		
Priority:	National: 20 of 168	Within local authority: 2 of 5	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Airth to assess flood defences and natural flood management. The study should also consider the viability of property level protection. Natural flood management options that should be considered include surge attenuation. The study should take a sustainable approach and consider the interaction between actions and potential effects on		

	coastal processes along the shoreline.
Potential impacts	
Economic:	The study could benefit 108 residential properties and five non-residential properties at risk of flooding in this location, with potential damages avoided of up to £19 million.
Social:	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 and socially vulnerable people located within the flood protection study area. In addition the study could benefit four utilities and two roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Upper Forth Estuary (water body ID 200437) is located within the study area and the physical condition of this estuary is identified by SEPA to be at less than good status. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. Conservation areas, listed buildings, Sites of Special Scientific Interest and Ramsar sites are also present in the study area and could be positively or negatively impacted.

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² of improved surface water data is currently available within this Local Plan District.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Falkirk Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

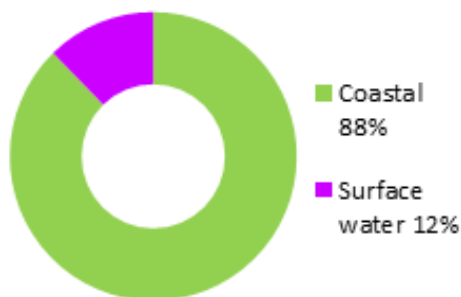
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

North Queensferry and Inverkeithing (Potentially Vulnerable Area 10/10)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Summary of flooding impacts



At risk of flooding

- 40 residential properties
- 30 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>	<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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

North Queensferry and Inverkeithing (Potentially Vulnerable Area 10/10)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	South Fife coastal

Background

This Potentially Vulnerable Area is 15km² and is part of the Firth of Forth catchment (shown below). This is a large coastal area containing the towns of Dalgety Bay, North Queensferry, Rosyth and Inverkeithing.



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The area has a risk of surface water and coastal flooding. The majority of damages in this Potentially Vulnerable Area are caused by coastal flooding.

There are approximately 40 residential properties and 30 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £590,000.

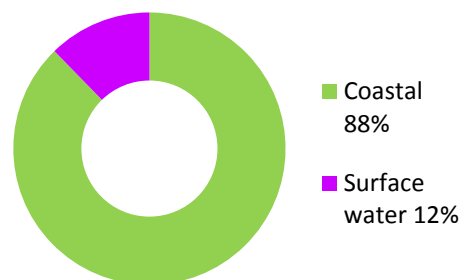


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of coastal flooding is from the Firth of Forth to Rosyth, Inverkeithing and North Queensferry.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are seven assets identified as being at risk of flooding.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 8,200)	<10	40	70
Non-residential properties (total 630)	10	30	60
People	<10	80	150
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	1 A road, 2 B roads at 26 locations 1 Railway route at 3 locations: Fife Circle	1 A road, 2 B roads at 34 locations 1 Railway route at 7 locations: Fife Circle	1 A road, 2 B roads at 36 locations 1 Railway route at 11 locations: Fife Circle
Environmental designated areas (km ²)	0.4	0.4	0.5
Designated cultural heritage sites	8	9	10
Agricultural land (km ²)	0.1	0.2	0.3

Table 1: Summary of flooding impacts

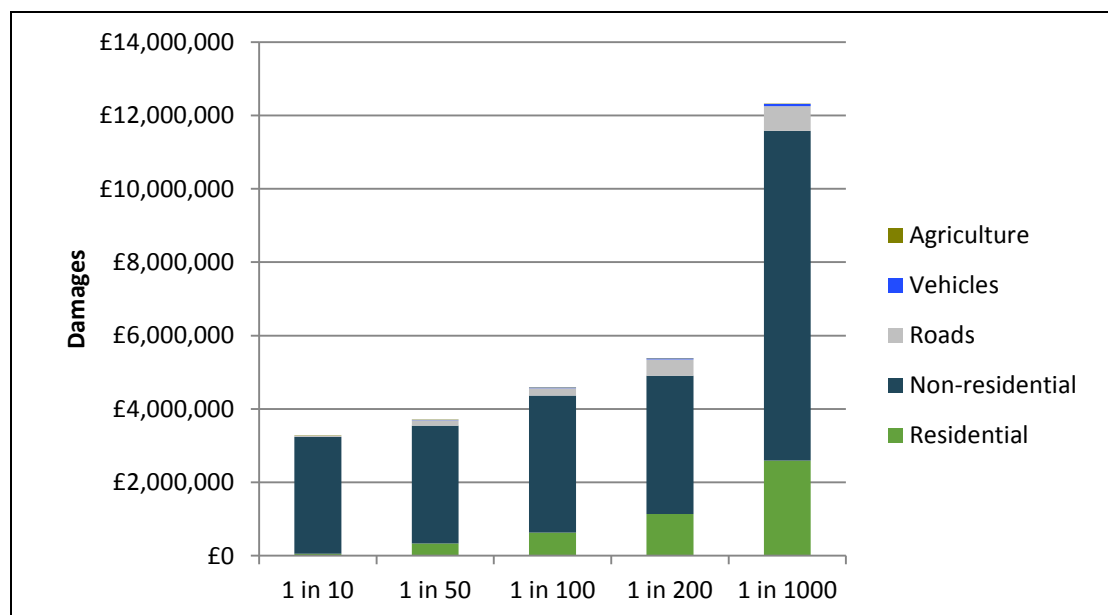


Figure 2: Damages by flood likelihood

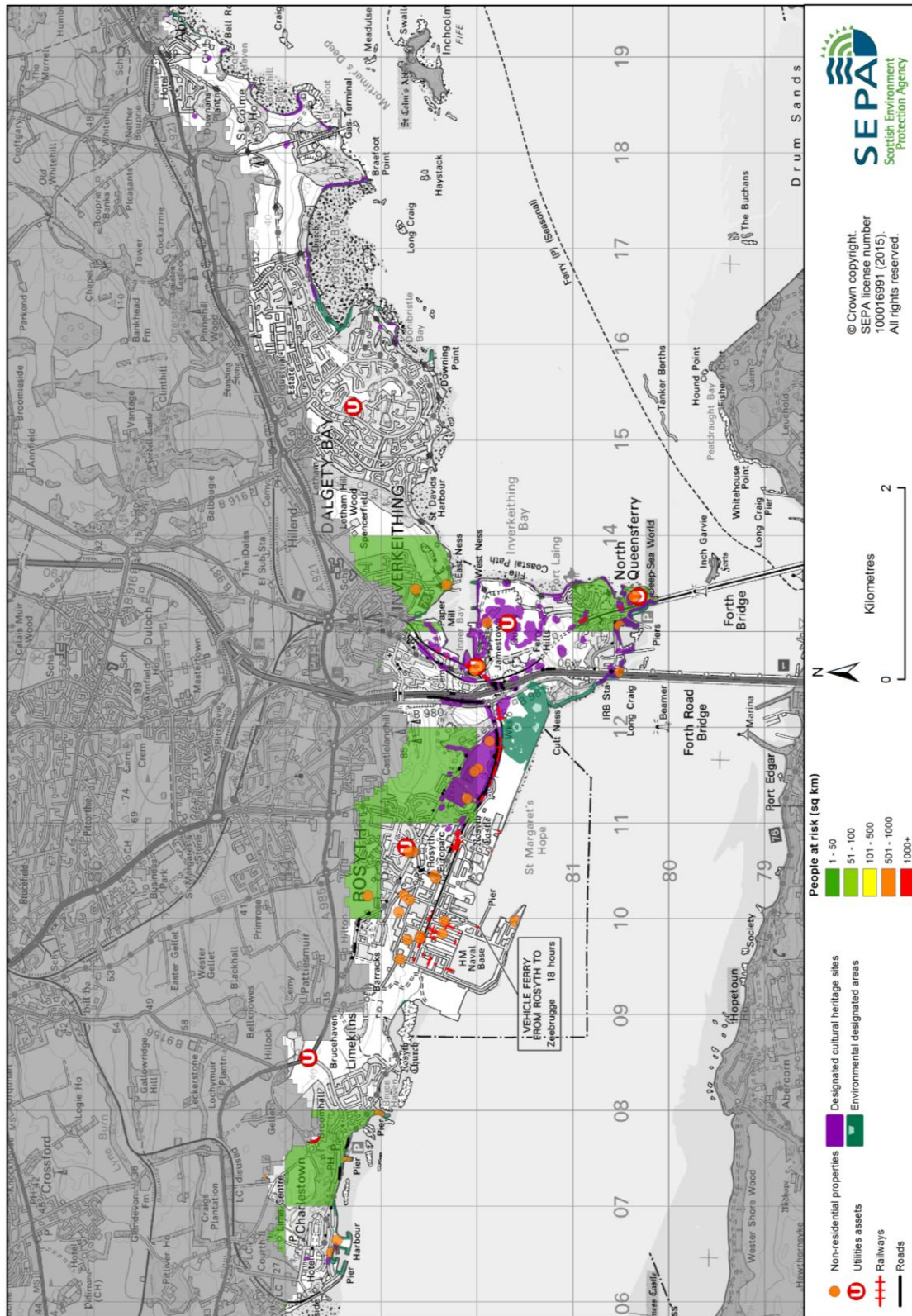


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/10

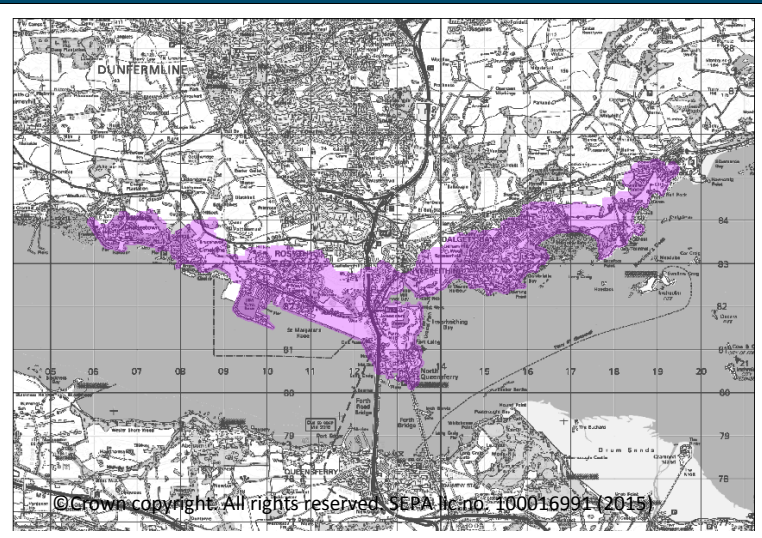
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 North Queensferry and Inverkeithing Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in the North Queensferry and Inverkeithing Potentially Vulnerable Area caused by coastal flooding

Indicators:

- £13,000 Annual Average Damages from residential properties
- £310,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10031

Target area	Objective	ID	Indicators within PVA
Rosyth	Reduce economic damages and number of residential properties at risk of surface water flooding in Rosyth where practical	10024	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 40 residential properties • £590,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 40 residential properties • £590,000 Annual Average Damages
Applies across Forth Estuary 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 10/10 there are 10 residential properties at risk and Annual Average Damages of £50,000.

Actions to manage flooding in Potentially Vulnerable Area 10/10

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 North Queensferry and Inverkeithing 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	SURFACE WATER PLAN/STUDY (100240018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Rosyth where practical (10024)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100240019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Rosyth where practical (10024)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 Dunbar to Stirling area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100310017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the North Queensferry and Inverkeithing Potentially Vulnerable Area caused by coastal flooding (10031)		
Delivery lead:	Fife Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing coastal flood defences.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Burntisland to Aberdour, North Queensferry and Inverkeithing Bay and the Rosyth, Limekilns and Charlestown flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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, the Scottish Flood Forum will undertake property level protection events. SEPA will participate in the these and engage with 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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

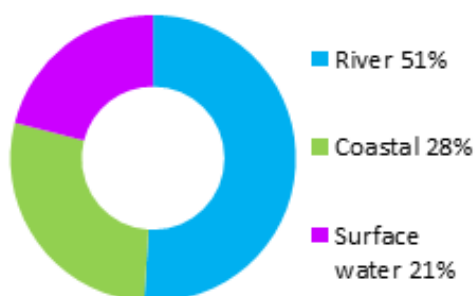
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (Potentially Vulnerable Area 10/11)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, North Lanarkshire Council, Stirling Council	Forth Estuary (south) coastal

Summary of flooding impacts



At risk of flooding

- 2,000 residential properties
- 330 non-residential properties
- £3.8 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	<i>Natural flood management works</i>	New flood warning	Community flood action groups	<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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

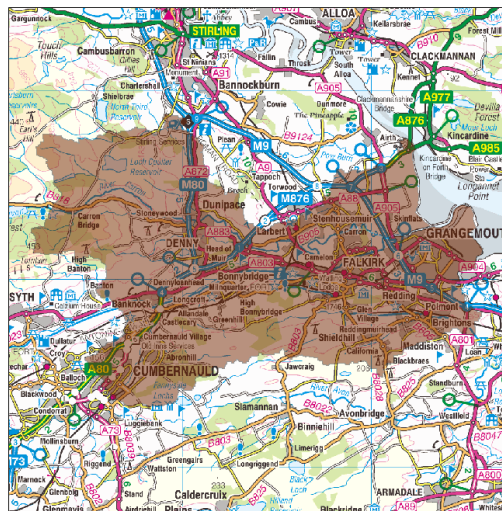
Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (Potentially Vulnerable Area 10/11)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, North Lanarkshire Council, Stirling Council	Forth Estuary (south) coastal

Background

This large Potentially Vulnerable Area is 215km² and part of the Firth of Forth catchment (shown below). It contains the towns of Grangemouth, Falkirk, Denny and eastern Cumbernauld.

The main watercourse is the River Carron, flowing from the Carron Valley Reservoir in the west through Dunipace and Denny. Here it meets the Bonny Water and continues eastward through Larbert, Stenhousemuir and Carron before finally flowing into the Firth of Forth at Grangemouth.



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Other notable watercourses include the Westquarter Burn and the Bonny Water. The area has a risk of river, coastal and surface water flooding.

Interaction of coastal and river flooding occurs on the River Carron, as well as downstream of the River Avon and on the Pow Burn south of Airth. Coastal flooding affects areas of Grangemouth, Carron, Carronshore and Falkirk. However, the majority of flood damages are caused by river flooding.

There are approximately 2,000 residential properties and 330 non-residential properties at risk of flooding. The Annual Average Damages are approximately £3.8 million.

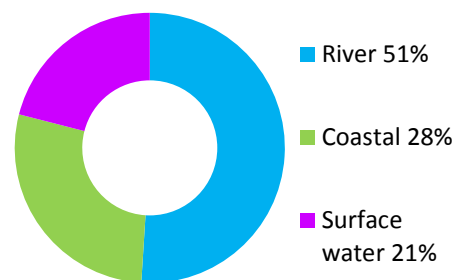


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the River Carron in the Carron / Carronshore area; the Grange Burn in Grangemouth; the Westquarter Burn in Falkirk Westquarter; and the River Carron, Avon Burn and Castlerankine Burn in Denny and Dunipace. The highest risk of coastal flooding is from the Firth of Forth in Grangemouth, and Carron / Carronshore. The highest risk of surface water flooding is in Falkirk, Denny and Cumbernauld.

The risk of flooding to people, 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. 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.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are six assets identified as being at risk of flooding.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 70,000)	250	2,000	5,800
Non-residential properties (total 5,900)	80	330	980
People	550	4,400	13,000
Community facilities	<10 Educational buildings	<10 Educational buildings	10 Includes: educational buildings, healthcare facilities and emergency services
Utilities	20	90	270
Transport links (excluding minor roads)	3 M roads (M80, M876, M9), 11 A roads, 11 B roads at 344 locations 3 Railway routes at 80 locations: Carmuir Junction to Polmont Junction Dunblane to Greenhill Lower Edinburgh Waverley to Glasgow Queen Street	3 M roads (M80, M876, M9), 12 A roads, 12 B roads at 563 locations 3 Railway routes at 115 locations: Carmuir Junction to Polmont Junction Dunblane to Larbert/Stirling Edinburgh Waverley to Glasgow Queen Street	3 M roads (M80, M876, M9), 12 A roads, 12 B roads at 614 locations 3 Railway routes at 144 locations: Carmuir Junction to Polmont Junction Dunblane to Larbert/Stirling Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km²)	1.0	1.7	1.8
Designated cultural heritage sites	34	44	54
Agricultural land (km²)	6.4	8.5	10.6

Table 1: Summary of flooding impacts

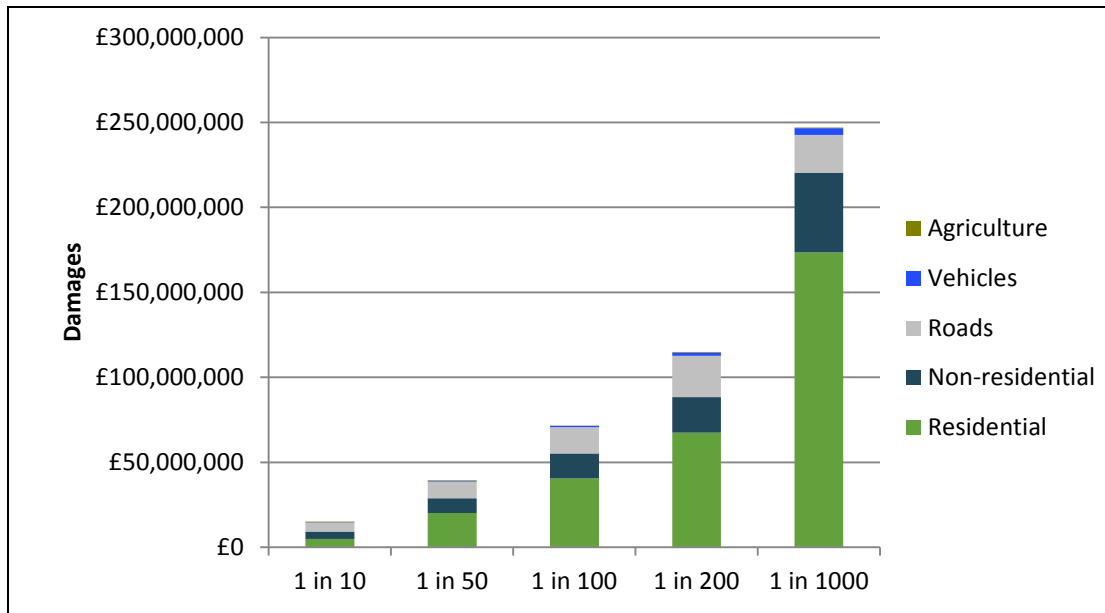


Figure 2: Damages by flood likelihood

History of flooding

The following significant floods have been recorded in this area:

- 13 December 2006: Widespread flooding throughout the Falkirk area with businesses, residential properties and gardens affected. Large bus depot on Stirling Road was impacted and Anchor Burn footbridge was washed away. Flooding resulted in the closure of the A883 at Checkbar and an electricity substation was threatened. Three residential and two non-residential properties flooded at Threepwood along the River Carron. Carronside Place in Dunipace was evacuated amid fears of flooding. Flooding of the Tor Burn affected Bogend Road.
- 2002: Flooding of the Chapel Burn affected Alloa Road in Stenhousemuir, resulting in 22 properties being flooded and up to 60 properties threatened.
- 30 September 1959: Grangemouth Docks flooded from the sea with highest tides on record at 4.47m.

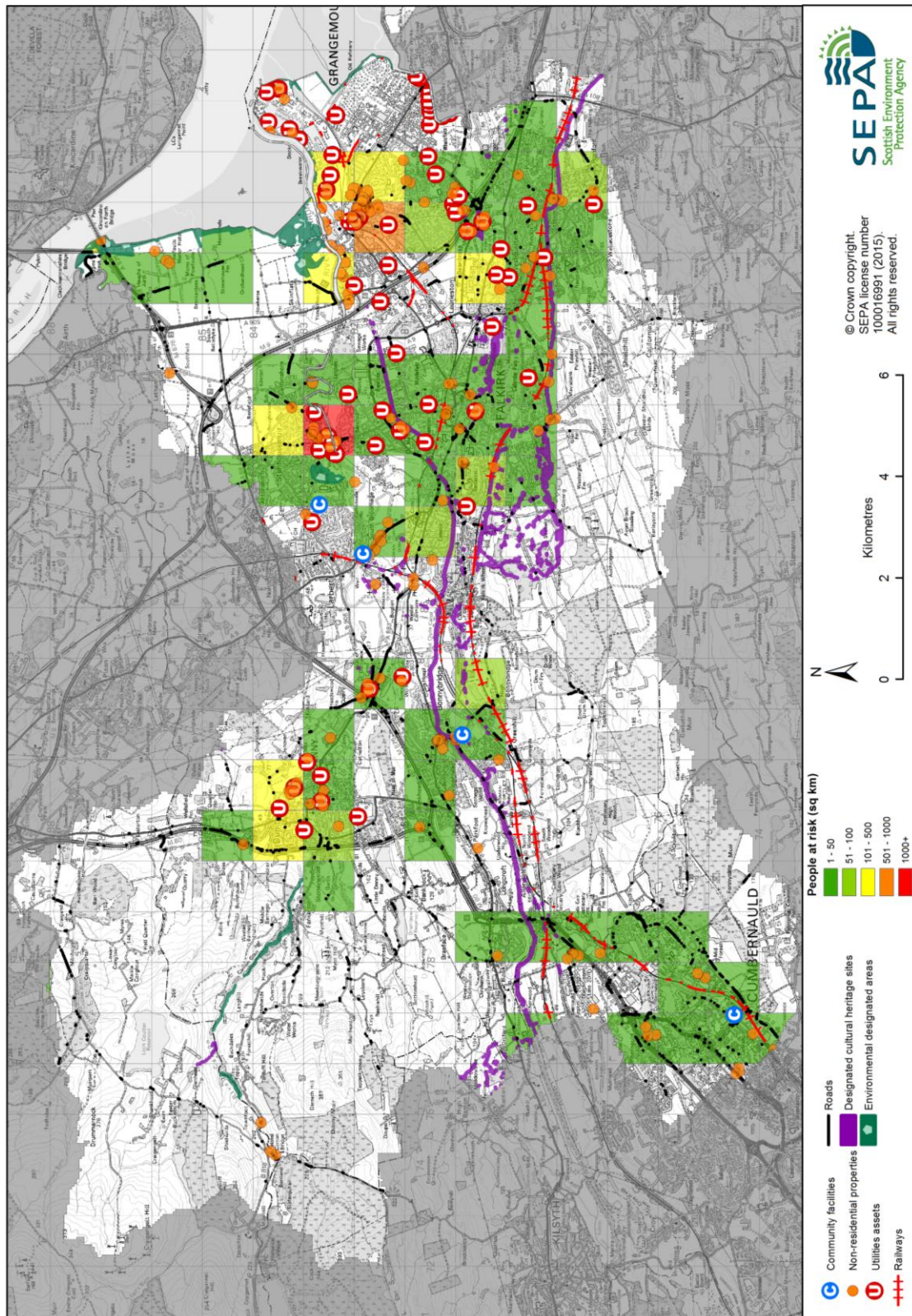


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/11

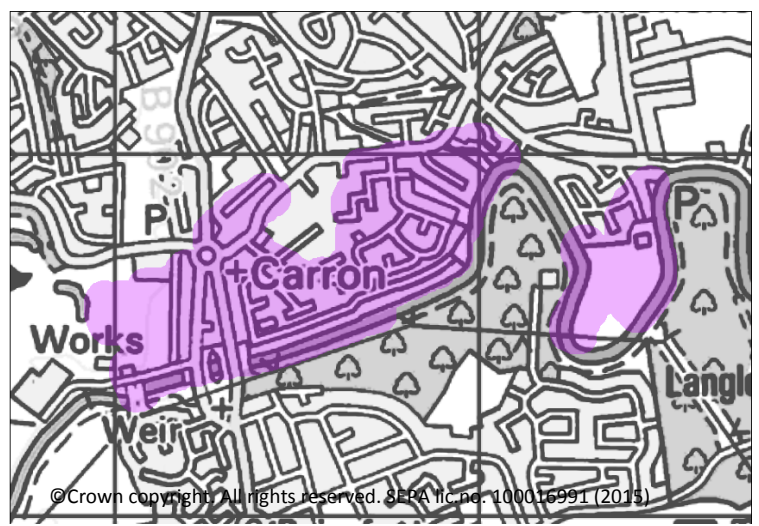
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Carron and Carronshore caused by flooding from the River Carron and coastal flooding

Indicators:

- £280,000 Annual Average Damages from residential properties
- £190,000 Annual Average Damages from non-residential properties

Target area:



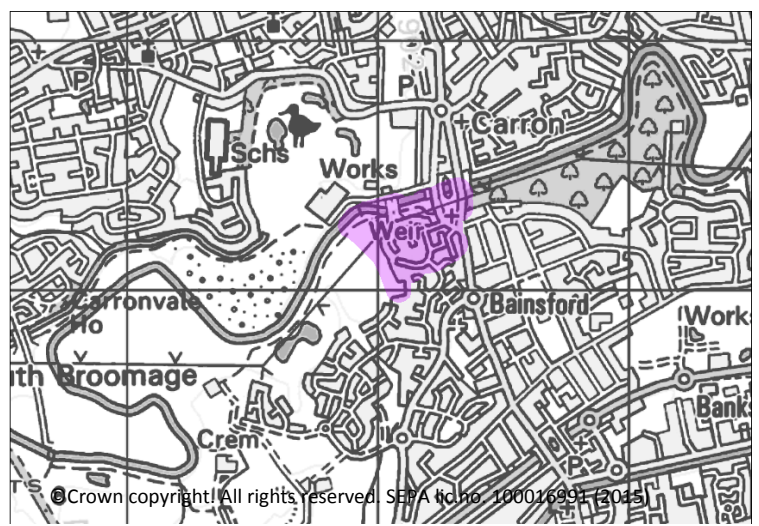
Objective ID: 10035

Reduce economic damages to residential and non-residential properties in Falkirk caused by flooding from the River Carron

Indicators:

- £400,000 Annual Average Damages from residential properties
- £10,000 Annual Average Damages from non-residential properties

Target area:



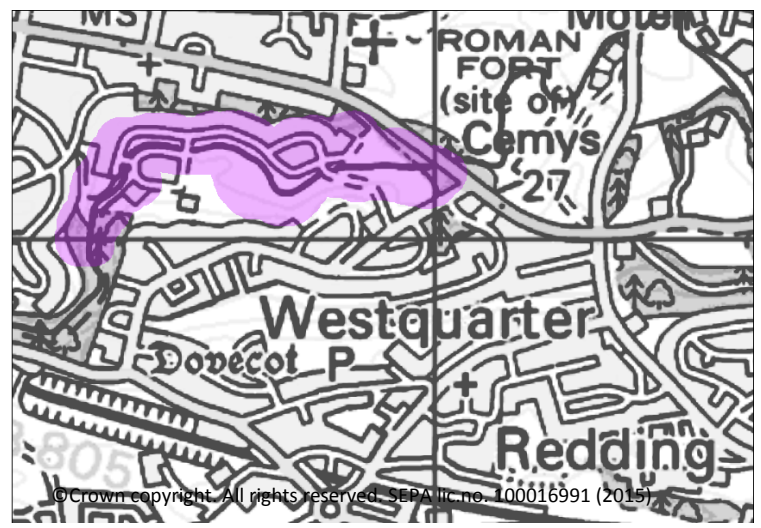
Objective ID: 10036

Reduce economic damages to residential and non-residential properties in Falkirk Westquarter caused by flooding from the Westquarter Burn

Indicators:

Target area:

- £130,000 Annual Average Damages from residential properties
- £280 Annual Average Damages from non-residential properties



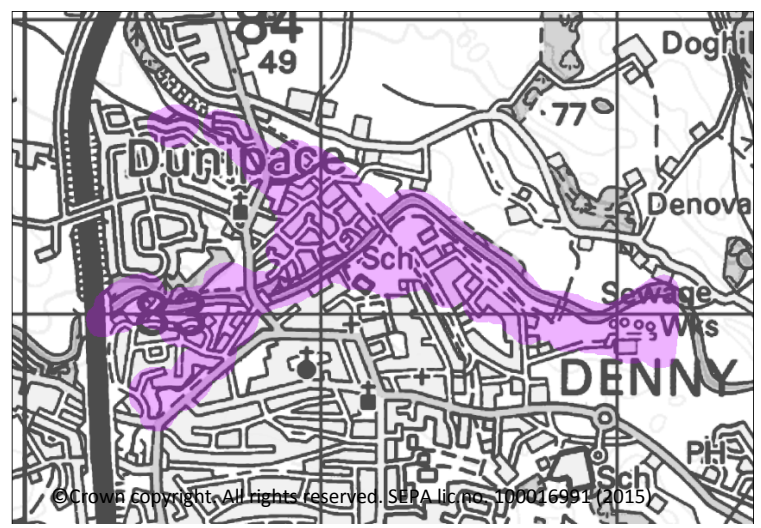
Objective ID: 10037

Reduce economic damages to residential and non-residential properties in Denny and Dunipace caused by flooding from the River Carron, Avon Burn and Castlerankine Burn

Indicators:

Target area:

- £260,000 Annual Average Damages from residential properties
- £42,000 Annual Average Damages from non-residential properties



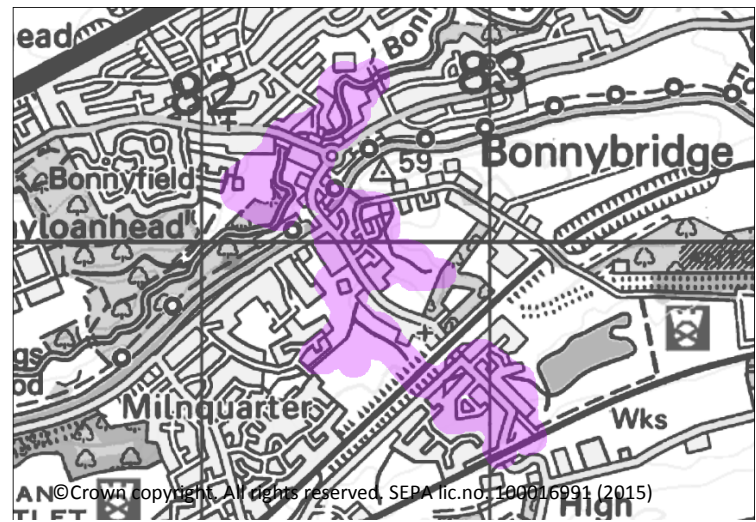
Objective ID: 10038

Reduce economic damages to residential and non-residential properties and flood risk to community facilities in Bonnybridge and Banknock caused by flooding from the Bonny Water and its tributaries

Indicators:

Target area:

- £52,000 Annual Average Damages from residential properties
- £69,000 Annual Average Damages from non-residential properties
- One educational building



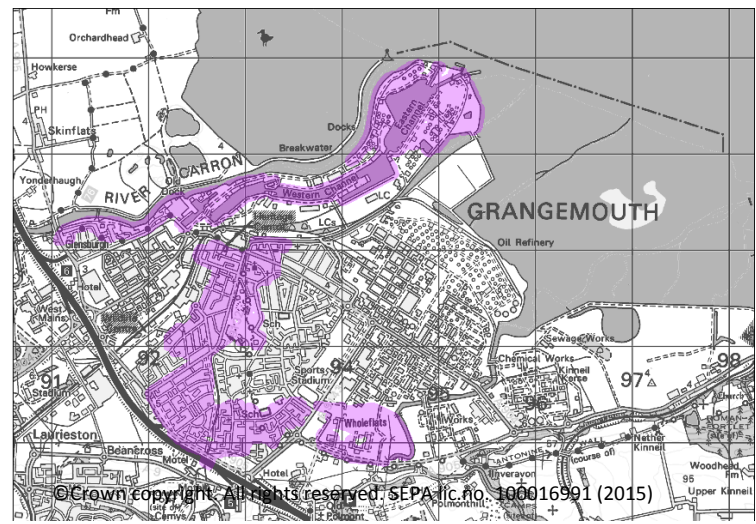
Objective ID: 10039

Reduce economic damages to residential and non-residential properties in Grangemouth caused by river flooding and coastal flooding

Indicators:

Target area:

- £630,000 Annual Average Damages from residential properties
- £53,000 Annual Average Damages from non-residential properties



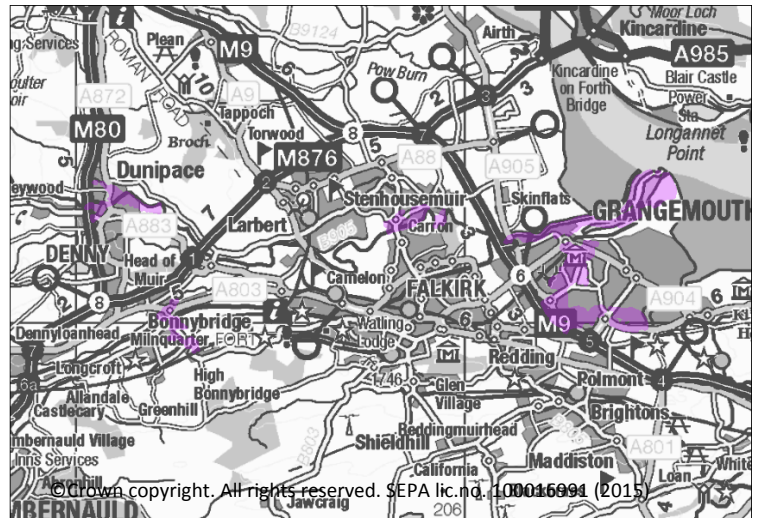
Objective ID: 10040

Reduce risk to people in Bonnybridge, Denny, Carron and Grangemouth from river and coastal flooding

Indicators:

Target area:

- 2,900 people



Objective ID: 10041

Target area	Objective	ID	Indicators within PVA
Falkirk, Stenhousemuir and Carron	Reduce economic damages and number of residential properties at risk of surface water flooding in Falkirk, Stenhousemuir and Carron where practical	10033	* See note below
Cumbernauld (east)	Reduce economic damages and number of residential properties at risk of surface water flooding in Cumbernauld (east) where practical	10101	* See note below
Polmont and Maddiston	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical	10104	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 2,000 residential properties • £3.8 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 2,000 residential properties • £3.8 million Annual Average Damages
Applies across Forth Estuary 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 10/11 there are 460 residential properties at risk and Annual Average Damages of £730,000.

Actions to manage flooding in Potentially Vulnerable Area 10/11

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 Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir Potentially Vulnerable Area.

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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100400006)				
Objective (ID):	<p>Reduce risk to people in Bonnybridge, Denny, Carron and Grangemouth from river and coastal flooding (10041)</p> <p>Reduce economic damages to residential and non-residential properties in Grangemouth caused by river flooding and coastal flooding (10040)</p> <p>Reduce economic damages to residential and non-residential properties in Falkirk caused by flooding from the River Carron (10036)</p> <p>Reduce economic damages to residential and non-residential properties in Carron and Carronshore caused by flooding from the River Carron and coastal flooding (10035)</p>				
Delivery lead:	Falkirk Council				
Priority:	National:		Within local authority:		
	1 of 42		1 of 1		
Status:	Under development	Indicative delivery:	2016-2027		
Description:	<p>A flood protection scheme has been proposed for the Grangemouth area. It would include the River Carron, Grange Burn, River Avon and the Forth Estuary shoreline. The scheme would consist of flood defences, sediment management, tidal barriers/ gates and natural flood management and would provide a 1 in 200 year standard of protection. Implementation of this scheme is likely to span a 10 year period from 2017-2027.</p>				
Potential impacts					
Economic:	The proposed scheme may benefit 1261 residential properties and 99 non-residential properties at risk of flooding in this location, with				

Economic:	estimated damages avoided of £6.0 billion. The flood protection scheme has an estimated benefit cost ratio of 58.
Social:	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 negative impacts through disturbance to the local community during the construction phase.
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. The proposed flood protection scheme is located on a number of rivers and a part of the Forth Estuary whose physical condition has been identified by SEPA to be at less than good status. These include the Grange Burn, part of the River Carron and the Middle Forth Estuary (water body IDs 3300, 4200 and 200436). Opportunities to improve the condition of the rivers and estuary should be considered by coordinating with river basin management planning. To be in accord with the FRM Strategy, the responsible authority (and, where applicable, the licensing authority) should seek to ensure that the scheme will not have an adverse effect on the integrity of the Firth of Forth Special Protection Area. World Heritage Sites, scheduled monuments, listed buildings, local nature reserves, Sites of Special Scientific Interest and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	NEW FLOOD WARNING (100990010)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	The area under consideration includes properties affected by flooding from the River Carron and tributaries downstream of the Carron Valley Reservoir. Full scoping, infrastructure and a flood forecasting system will be required before a flood warning service can be delivered in this area. Communities that will benefit from a warning will be identified during development of the scheme.		

Action (ID):	FLOOD PROTECTION STUDY (100400005)		
Objective (ID):	Reduce risk to people in Bonnybridge, Denny, Carron and Grangemouth from river and coastal flooding (10041) Reduce economic damages to residential and non-residential properties in Grangemouth caused by river flooding and coastal flooding (10040) Reduce economic damages to residential and non-residential properties in Falkirk caused by flooding from the River Carron (10036) Reduce economic damages to residential and non-residential properties in Carron and Carronshore caused by flooding from the River Carron and coastal flooding (10035)		

Delivery lead:	Falkirk Council		
Priority:	National:	Within local authority:	
	11 of 168	1 of 5	
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	A flood protection study is currently underway for Grangemouth to develop a flood protection scheme. The flood risk management options under consideration include flood defences, sediment management, tidal barriers/ gates and natural flood management. Natural flood management includes surge attenuation and sediment management. The study will also consider the viability of property level protection. The study is due to complete in 2017, followed by phased delivery of actions from 2018-2027.		
Potential impacts			
Economic:	The study could benefit 1261 residential properties and 99 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.0 billion.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The physical condition of a number of rivers and a part of the Forth Estuary within the study area is identified by SEPA to be at less than good status. These include the Grange Burn, parts of the River Carron, Auchenbowie Burn and the Middle Forth Estuary (water body IDs 3300, 4200, 4210 and 200436). Opportunities to improve the condition of the rivers and estuary should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area. World Heritage Sites, scheduled monuments, listed buildings, local nature reserves, Sites of Special Scientific Interest and ancient woodlands are also present in the study area and could be positively or negatively impacted.		

Action (ID):	FLOOD PROTECTION STUDY (100380005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Denny and Dunipace caused by flooding from the River Carron, Avon Burn and Castlerankine Burn (10038)		
Delivery lead:	Falkirk Council		
Priority:	National:	Within local authority:	
	43 of 168	3 of 5	

Status:	Ongoing	Indicative delivery:	2016-2021
Description:	Initial flood risk investigations are currently underway for Denny/ Dunipace, including modelling work. These initial investigations are due to report in 2016. It is likely that further flood protection study will be needed to assess options to manage flood risk including flood defences, sediment management and natural flood management. The study should also consider the viability of property level protection. Natural flood management options that should be considered include runoff control and sediment management. The assessment should consider these actions in combination and the impacts on flood risk upstream and downstream of each action.		
Potential impacts			
Economic:	The study could benefit 155 residential properties and 12 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £8.6 million. Fifty of these residential and non-residential properties are at risk from high likelihood flooding and may benefit from natural flood management actions.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Auchenbowie Burn (water body ID 4210) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Action (ID):	FLOOD PROTECTION STUDY (100370005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Falkirk Westquarter caused by flooding from the Westquarter Burn (10037)		
Delivery lead:	Falkirk Council		
Priority:	National:	Within local authority:	
	110 of 168	4 of 5	
Status:	Not started	Indicative delivery:	2016-2027
Description:	Vegetation management and general maintenance are carried out by Falkirk Council to control erosion at Falkirk Westquarter. In future there may be a need for a flood protection study to assess whether direct flood defences and sediment management could further reduce flood risk in this area.		
Potential impacts			
Economic:	The study could benefit 67 residential properties and one non-residential property at risk of flooding in this location, with potential		

Economic:	damages avoided of up to £3.3 million.
Social:	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.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Grange Burn (water body ID 3300) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	SURFACE WATER PLAN/STUDY (100330018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Falkirk, Stenhousemuir and Carron where practical (10033)		
Delivery lead:	Falkirk Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100330019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Falkirk, Stenhousemuir and Carron where practical (10033)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (101010018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cumbernauld (east) where practical (10101)		
Delivery lead:	North Lanarkshire Council		

Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101010019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cumbernauld (east) where practical (10101)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (101040018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical (10104)		
Delivery lead:	Falkirk Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101040019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical (10104)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100400017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Grangemouth caused by river flooding and coastal flooding (10040)		
Delivery lead:	Falkirk Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Grangeburn Road Flood Protection Scheme on the Grange Burn. The scheme includes a flood relief channel conveying flows to the River Avon.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Grangemouth flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100350012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Carron and Carronshore caused by flooding from the River Carron and coastal flooding (10035)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Carronvale Residents and Tenants Association operates in this area. The group raises flooding issues and promotes flood resilience.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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 business liaison and 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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

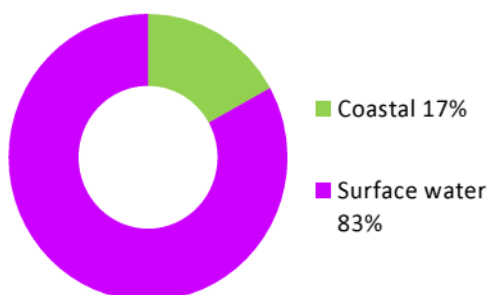
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Bo'ness (Potentially Vulnerable Area 10/12)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, West Lothian Council	Forth Estuary (south) coastal

Summary of flooding impacts



At risk of flooding

- 200 residential properties
- 70 non-residential properties
- £620,000 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

Bo'ness (Potentially Vulnerable Area 10/12)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, West Lothian Council	Forth Estuary (south) coastal

Background

This Potentially Vulnerable Area is 23km² and part of the Firth of Forth catchment (shown below). This is a small, partially urbanised coastal area centred on the town of Bo'ness.



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The area has a risk of surface water and coastal flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.

There are approximately 200 residential properties and 70 non-residential properties at risk of flooding. The Annual Average Damages are approximately £620,000.

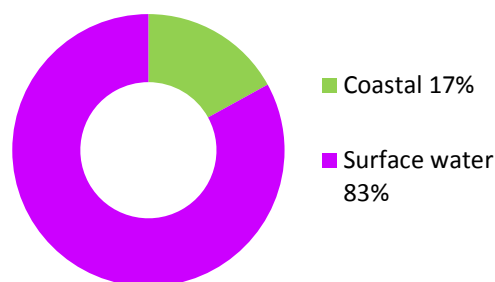


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of coastal flooding is to Bo'ness from the Firth of Forth. The highest risk of surface water flooding is also in Bo'ness.

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. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads, notably the A993 and A904. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 7,200)	110	200	950
Non-residential properties (total 530)	10	70	280
People	240	430	2,100
Community facilities	0	0	<10 Emergency services buildings
Utilities	<10	20	50
Transport links (excluding minor roads)	4 A roads, 2 B roads at 46 locations	5 A roads, 2 B roads at 73 locations	5 A roads, 2 B roads at 81 locations
Environmental designated areas (km ²)	0.3	0.3	0.3
Designated cultural heritage sites	6	12	27
Agricultural land (km ²)	0.1	0.4	0.6

Table 1: Summary of flooding impacts

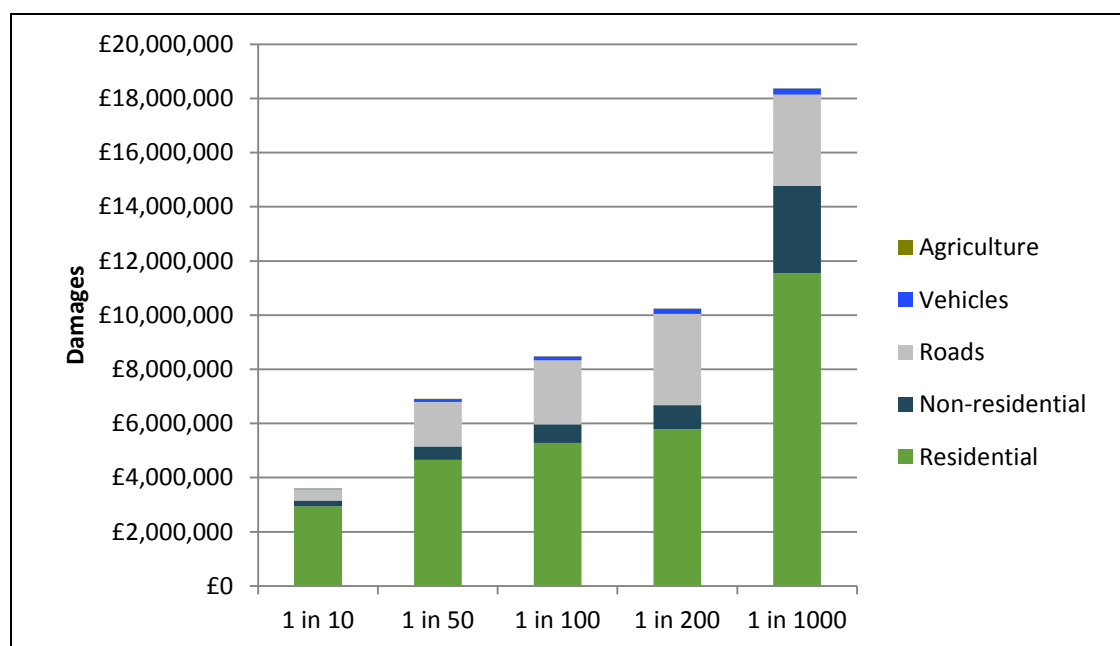


Figure 2: Damages by flood likelihood

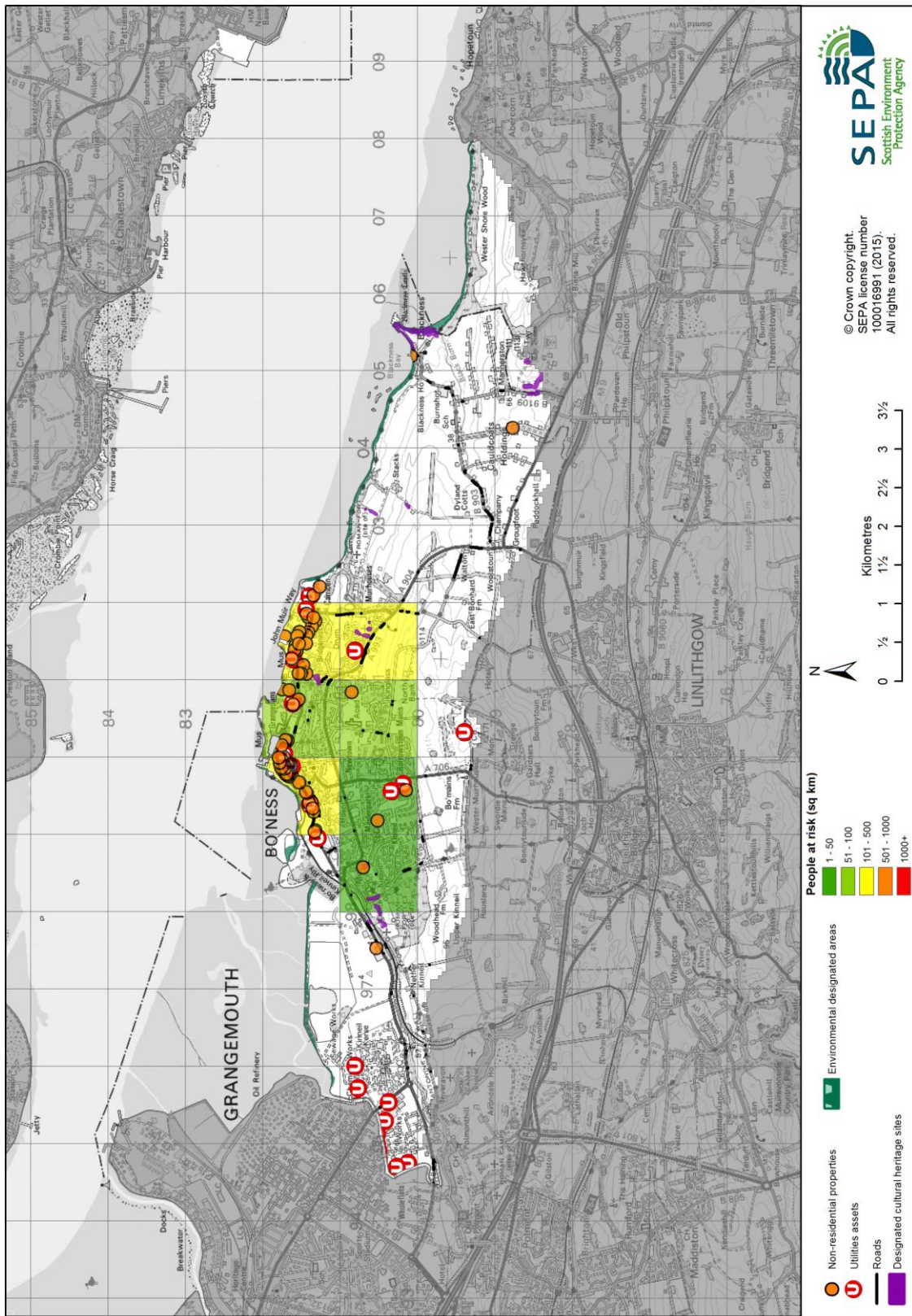


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/12

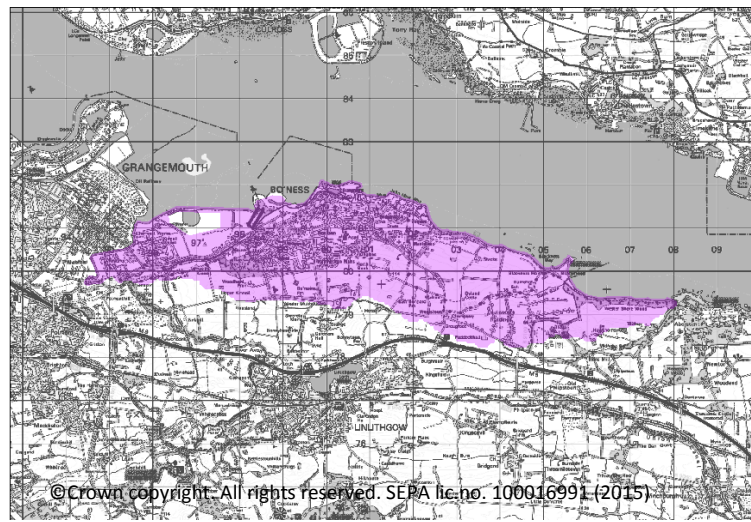
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Bo'ness Potentially Vulnerable Area.

Accept significant flood risk in Bo'ness is managed appropriately. Maintain existing actions that reduce the risk of coastal flooding in Bo'ness.

Indicators:

- 270 residential properties protected (1 in 200 year event).

Target area:



Target area	Objective	ID	Indicators within PVA
Bo'ness, Carriden and Muirhouses	Reduce economic damages and number of residential properties at risk of surface water flooding in Bo'ness, Carriden and Muirhouses where practical	10042	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 200 residential properties • £620,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 200 residential properties • £620,000 Annual Average Damages
Applies across Forth Estuary 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 10/12 there are 200 residential properties at risk and Annual Average Damages of £510,000.

Actions to manage flooding in Potentially Vulnerable Area 10/12

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 Bo'ness 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	SURFACE WATER PLAN/STUDY (100420018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bo'ness, Carriden and Muirhouses where practical (10042)		
Delivery lead:	Falkirk Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100420019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bo'ness, Carriden and Muirhouses where practical (10042)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100440017)		
Objective (ID):	Accept significant flood risk in Bo'ness is managed appropriately. Maintain existing actions that reduce the risk of coastal flooding in Bo'ness. (10044)		
Delivery lead:	West Lothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing coastal flood defences.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Blackness and Grangemouth flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Falkirk Council and West Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

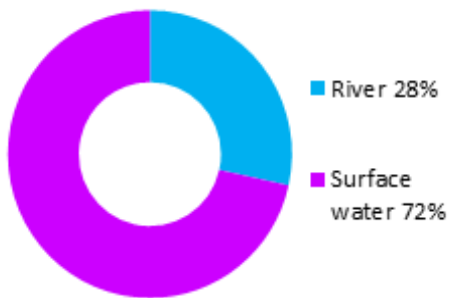
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Linlithgow Bridge, Bathgate, Whiteside and Slamannan (Potentially Vulnerable Area 10/13)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, North Lanarkshire Council, West Lothian Council	River Avon

Summary of flooding impacts



At risk of flooding

- 490 residential properties
- 210 non-residential properties
- £1.6 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.

<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

Linlithgow Bridge, Bathgate, Whiteside and Slamannan (Potentially Vulnerable Area 10/13)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, North Lanarkshire Council, West Lothian Council	River Avon

Background

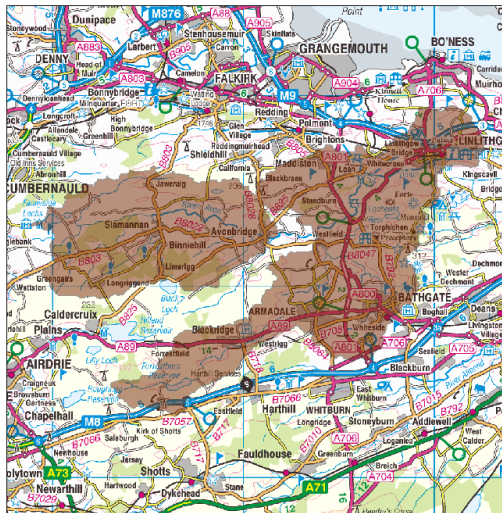
This Potentially Vulnerable Area is 165km² and part of the Firth of Forth catchment (shown below). This is a large, mainly rural area containing the towns of Linlithgow, Armadale, Slamannan and Bathgate. The main watercourse is the River Avon which flows eastward through Slamannan and Avonbridge, before flowing north past Linlithgow. Other notable watercourses include the Logie Water, Couston Water, Bathgate Water, Brunton Burn and Mains Burn.

The area has a risk of river and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.

The highest risk of river flooding is from Bathgate Water, Bell's Burn, River Avon and Culloch Burn to Linlithgow, Bathgate and Slamannan. There is also a risk of flooding from Linlithgow Loch.

There are approximately 490 residential properties and 210 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £1.6 million.



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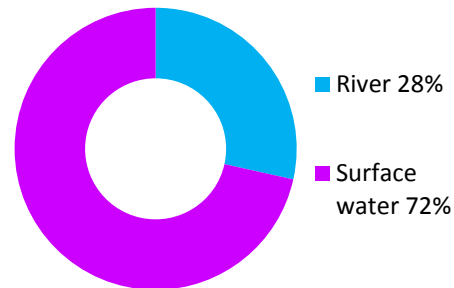


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of surface water flooding is in Linlithgow, Armadale and Bathgate.

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

The damages associated with floods of different scale 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 is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 21,000)	110	490	940
Non-residential properties (total 2,400)	110	210	450
People	240	1,100	2,100
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10	30	50
Transport links (excluding minor roads)	2 M roads, (M8, M9), 6 A roads, 14 B roads at 192 locations 1 Railway route at 5 locations: Edinburgh Waverley to Glasgow Queen Street	2 M roads, (M8, M9), 6 A roads, 14 B roads at 275 locations 1 Railway routes at 10 locations: Edinburgh Waverley to Glasgow Queen Street	2 M roads, (M8, M9), 6 A roads, 14 B roads at 276 locations 1 Railway route at 15 locations: Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km ²)	2.1	2.1	2.2
Designated cultural heritage sites	11	11	20
Agricultural land (km ²)	4.3	5.2	5.5

Table 1: Summary of flooding impacts

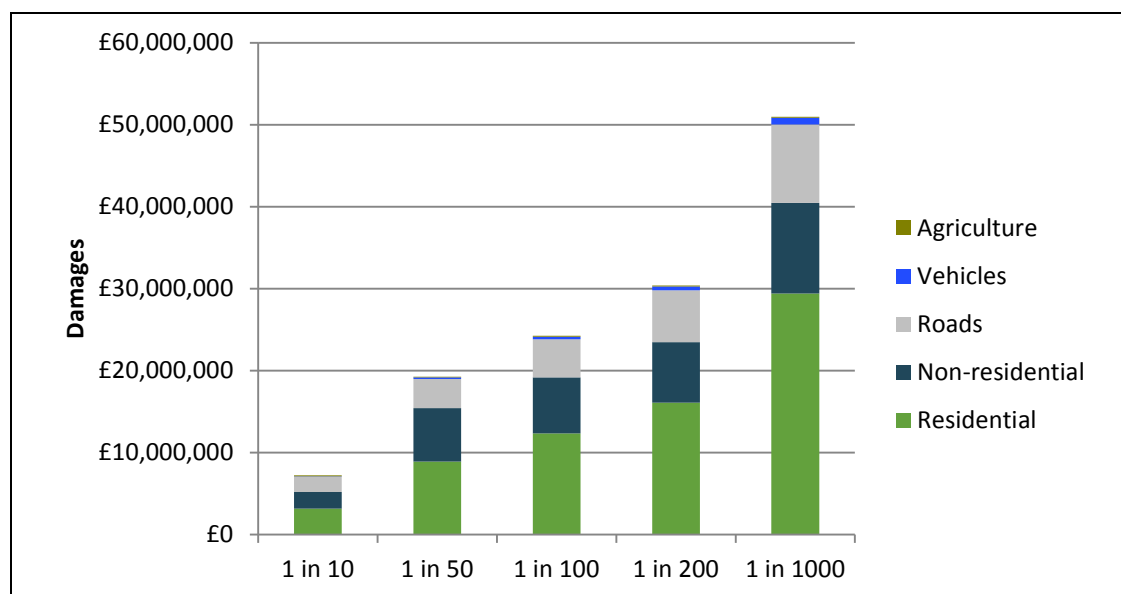


Figure 2: Damages by flood likelihood

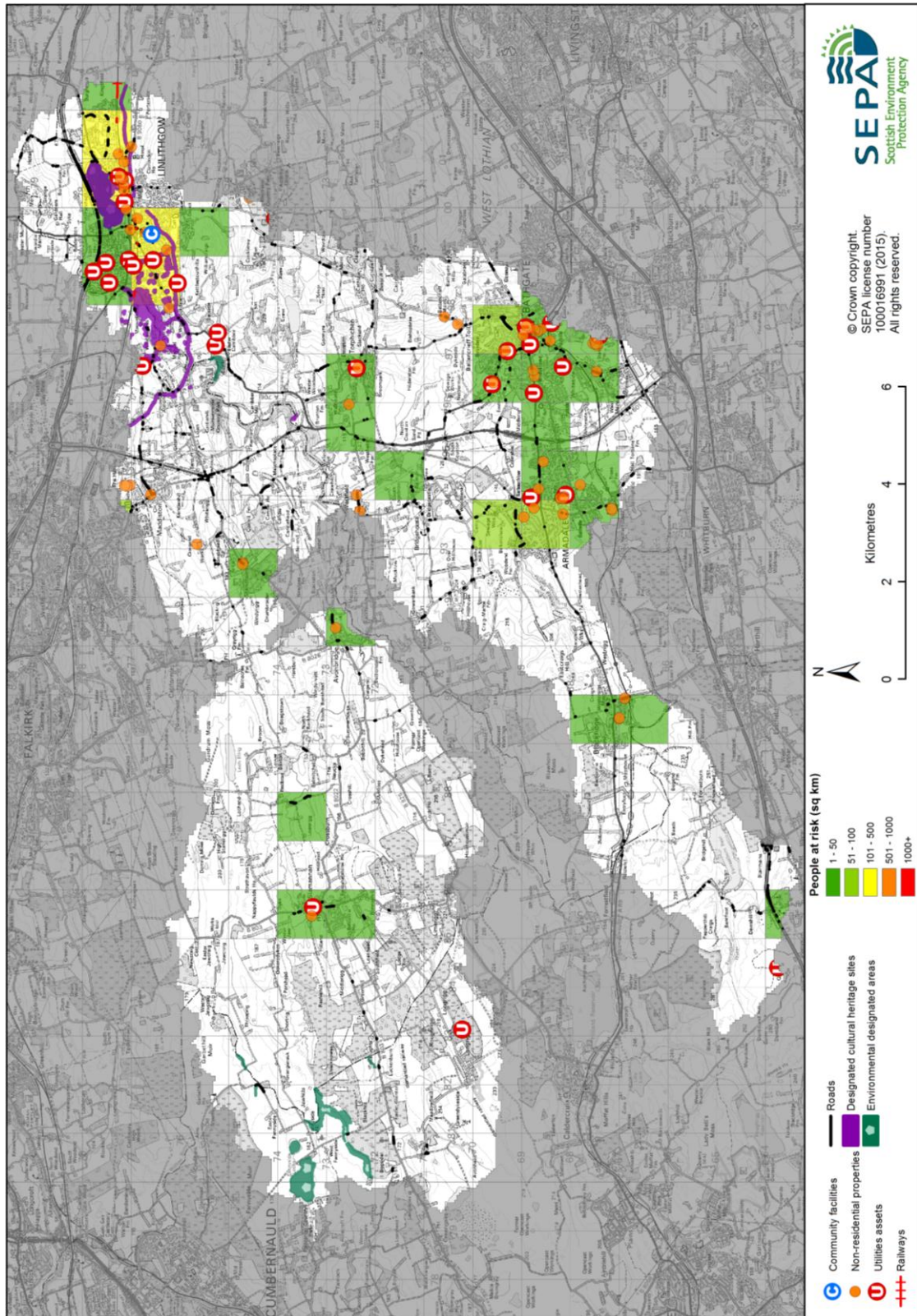


Figure 3: Impacts of flooding

History of flooding

A series of flood events in Linlithgow throughout 1998 and 1999 resulted in the promotion of the Linlithgow Flood Prevention Scheme.

Objectives to manage flooding in Potentially Vulnerable Area 10/13

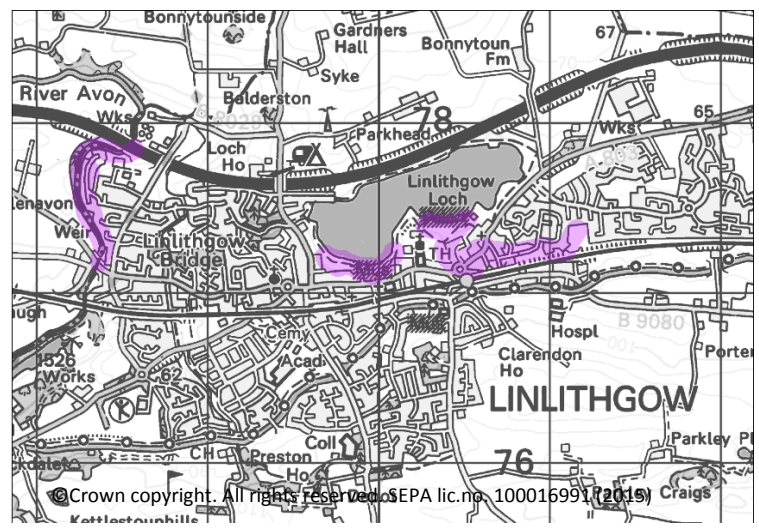
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Linlithgow caused by flooding from the River Avon and Bell's Burn

Indicators:

- £120,000 Annual Average Damages from residential properties
- £66,000 Annual Average Damages from non-residential properties

Target area:



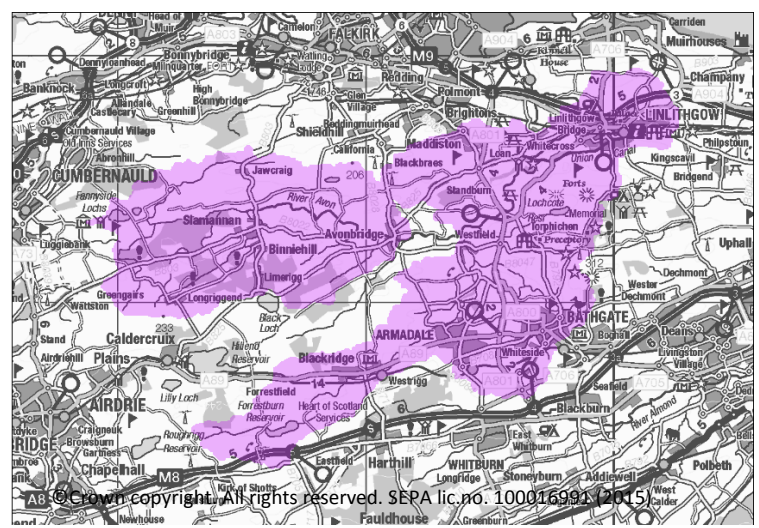
Objective ID: 10047

Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding

Indicators:

- 240 people
- £130,000 Annual Average Damages from residential properties
- £68,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10048, 10049

Target area	Objective	ID	Indicators within PVA
Bathgate	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical	10045	* See note below
Linlithgow	Reduce economic damages and number of residential properties at risk of surface water flooding in Linlithgow where practical	10100	* See note below
Polmont and Maddiston	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical	10104	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 490 residential properties • £1.6 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 490 residential properties • £1.6 million Annual Average Damages
Applies across Forth Estuary 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 10/13 there are 400 residential properties at risk and Annual Average Damages of £1.1 million.

Actions to manage flooding in Potentially Vulnerable Area 10/13

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 Linlithgow Bridge, Bathgate, Whiteside and Slamannan 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

Action (ID):	FLOOD PROTECTION STUDY (100470005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Linlithgow caused by flooding from the River Avon and Bell's Burn (10047)		
Delivery lead:	West Lothian Council		
Priority:	National:		Within local authority:
	90 of 168		2 of 4
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Linlithgow to assess whether modification of conveyance, flood defences and sediment management could reduce flood risk. The study should also consider the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit 56 residential properties and 13 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.1 million.		
Social:	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 and socially vulnerable people located within the study area.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example		

Environmental:	through natural flood management. Conservation areas, listed buildings and ancient woodlands are also present in the study area and could be positively or negatively impacted.
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Action (ID):	FLOOD PROTECTION STUDY (100490005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding (10048, 10049)		
Delivery lead:	Falkirk Council		
Priority:	National:	Within local authority:	
	121 of 168	5 of 5	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Slamannan to assess whether sediment management, direct flood defences and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be considered include runoff control and sediment management. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. The study should be informed by the ongoing surface water investigations and an Integrated Catchment Study.		
Potential impacts			
Economic:	The study could benefit 18 residential properties and one non-residential property at risk of flooding in this location, with potential damages avoided of up to £2.1 million.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. Parts of the River Avon (water body IDs 3101 and 3102) are located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. 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 Slamannan Plateau Special Protection Area.		

Action (ID):	FLOOD PROTECTION STUDY (100490025)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding (10048, 10049)		
Delivery lead:	West Lothian Council		
Priority:	National:	Within local authority:	
	138 of 168	3 of 4	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Bathgate to assess whether sediment management, flood defences and natural flood management could reduce flood risk. The study should also consider property relocation and the viability of property level protection. Natural flood management options that should be considered include runoff control and sediment management. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. There is an opportunity for partnership working with the Almond / Avon reconnection project and Bathgate restoration project.		
Potential impacts			
Economic:	The study could benefit 11 residential properties and one non-residential property at risk of flooding in this location, with potential damages avoided of up to £1.0 million. Sixteen of these residential and non-residential properties are at risk from high likelihood flooding and may benefit from natural flood management actions.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Couston Water (water body ID 3107) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Action (ID):	FLOOD PROTECTION STUDY (100490027)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding (10048, 10049)		

Delivery lead:	West Lothian Council		
Priority:	National:	Within local authority:	
	156 of 168	4 of 4	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Blackridge to assess whether sediment management and modification of conveyance (with a focus on existing culverts) could reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit five residential properties and three non-residential properties at risk of flooding in this location, with potential damages avoided of up to £55,000.		
Social:	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 and socially vulnerable people located within the study area.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Blawhorn Moss Special Area of Conservation.		

Action (ID):	NATURAL FLOOD MANAGEMENT STUDY (100490003)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding (10048, 10049)		
Delivery lead:	West Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	A natural flood management study has been recommended for Bathgate, Blackridge, Linlithgow and Slamannan to assess whether runoff control and sediment management could help reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. The study should be carried out in conjunction with the flood protection studies and in collaboration with Falkirk Council.		
Potential impacts			
Economic:	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. Sixteen residential and non-residential properties could potentially benefit from natural flood management actions in		

Economic:	this location.
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
Environmental:	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. The physical condition of a number of rivers within the study area is identified by SEPA to be at less than good status. These include parts of the River Avon, Mains Burn and Boghead Burn (water body IDs 3101, 3103 and 3107). Opportunities to improve the condition of this estuary should be considered by coordinating with river basin management planning. 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 Slamannan Plateau Special Protection Area and Blawhorn Moss Special Area of Conservation.

Action (ID):	SURFACE WATER PLAN/STUDY (100450018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100450019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (101000018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Linlithgow where practical (10100)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101000019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Linlithgow where practical (10100)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (101040018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical (10104)		
Delivery lead:	Falkirk Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101040019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Polmont and Maddiston where practical (10104)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses		

and the sea.

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100470017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Linlithgow caused by flooding from the River Avon and Bell's Burn (10047) Reduce economic damages to residential and non-residential properties and risk to people in the Linlithgow Bridge, Bathgate, Whiteside and Slamannan Potentially Vulnerable Area caused by river flooding (10048, 10049)		
Delivery lead:	West Lothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Linlithgow Flood Protection Scheme along the Mains Burn. The scheme provides protection to part of the town and includes reservoirs storage, a diversion channel and channel improvements.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

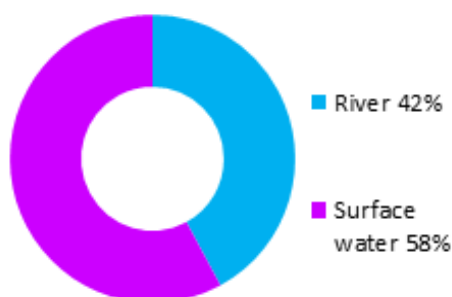
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Philipstoun (Potentially Vulnerable Area 10/14)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, West Lothian Council	Forth Estuary (south) coastal

Summary of flooding impacts



At risk of flooding

- <10 residential properties
- 10 non-residential properties
- £23,000 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>	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

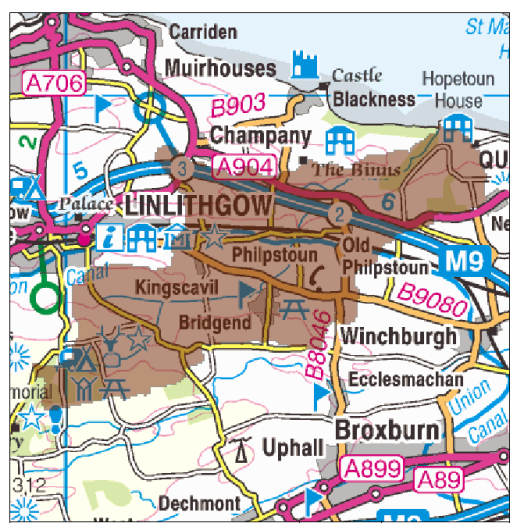
Actions

Philipstoun (Potentially Vulnerable Area 10/14)

Local Plan District	Local authority	Main catchment
Forth Estuary	Falkirk Council, West Lothian Council	Forth Estuary (south) coastal

Background

This Potentially Vulnerable Area is 27km² and part of the Firth of Forth catchment (shown below). This is a small, rural area containing the rural village of Philipstoun.



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There is a low risk of flooding in this area, with the majority of the damages caused by surface water flooding.

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

The Annual Average Damages are approximately £23,000.

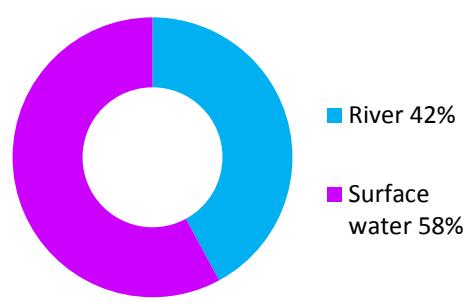


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The risk of flooding to people, 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. Surface water damages may be under-represented in Figure 2 due to limitations in the available modelling output.

For this Potentially Vulnerable Area the highest damages are to agricultural land followed by damages to non-residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 760)	<10	<10	<10
Non-residential properties (total 60)	<10	10	10
People	<10	<10	<10
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	1 M road (M9), 1 A road, 2 B roads at 17 locations 1 Railway route at 6 locations: Edinburgh Waverley to Glasgow Queen Street	1 M road (M9), 1 A road, 2 B roads at 17 locations 1 Railway route at 7 locations: Edinburgh Waverley to Glasgow Queen Street	1 M road (M9), 1 A road, 2 B roads at 17 locations 1 Railway route at 7 locations: Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	3	3	3
Agricultural land (km ²)	0.6	0.7	0.7

Table 1: Summary of flooding impacts

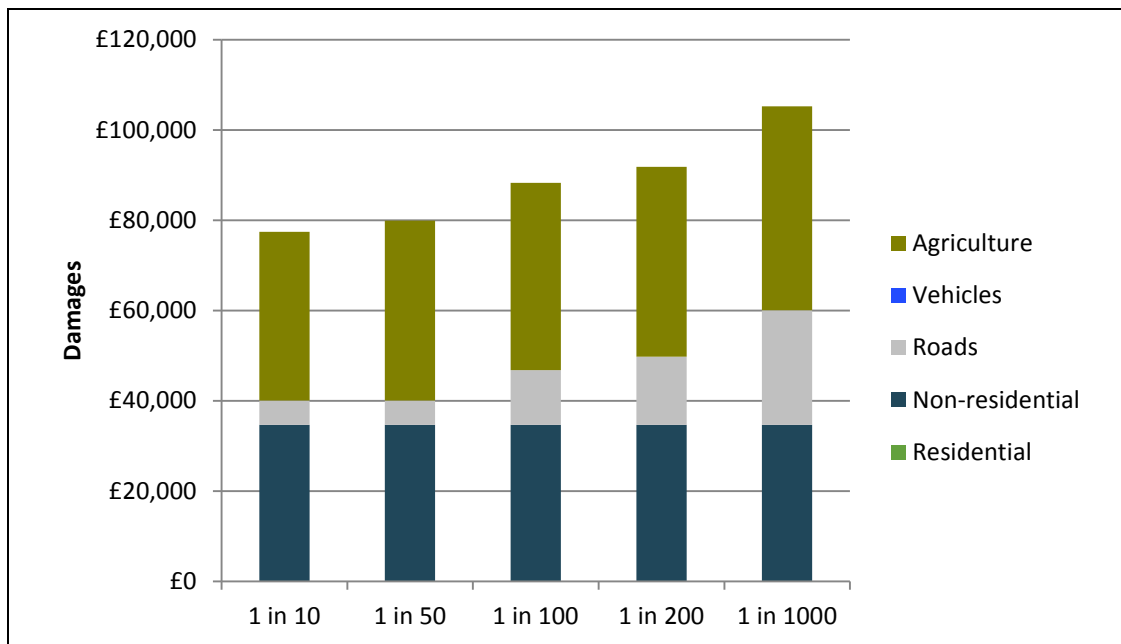


Figure 2: Damages by flood likelihood

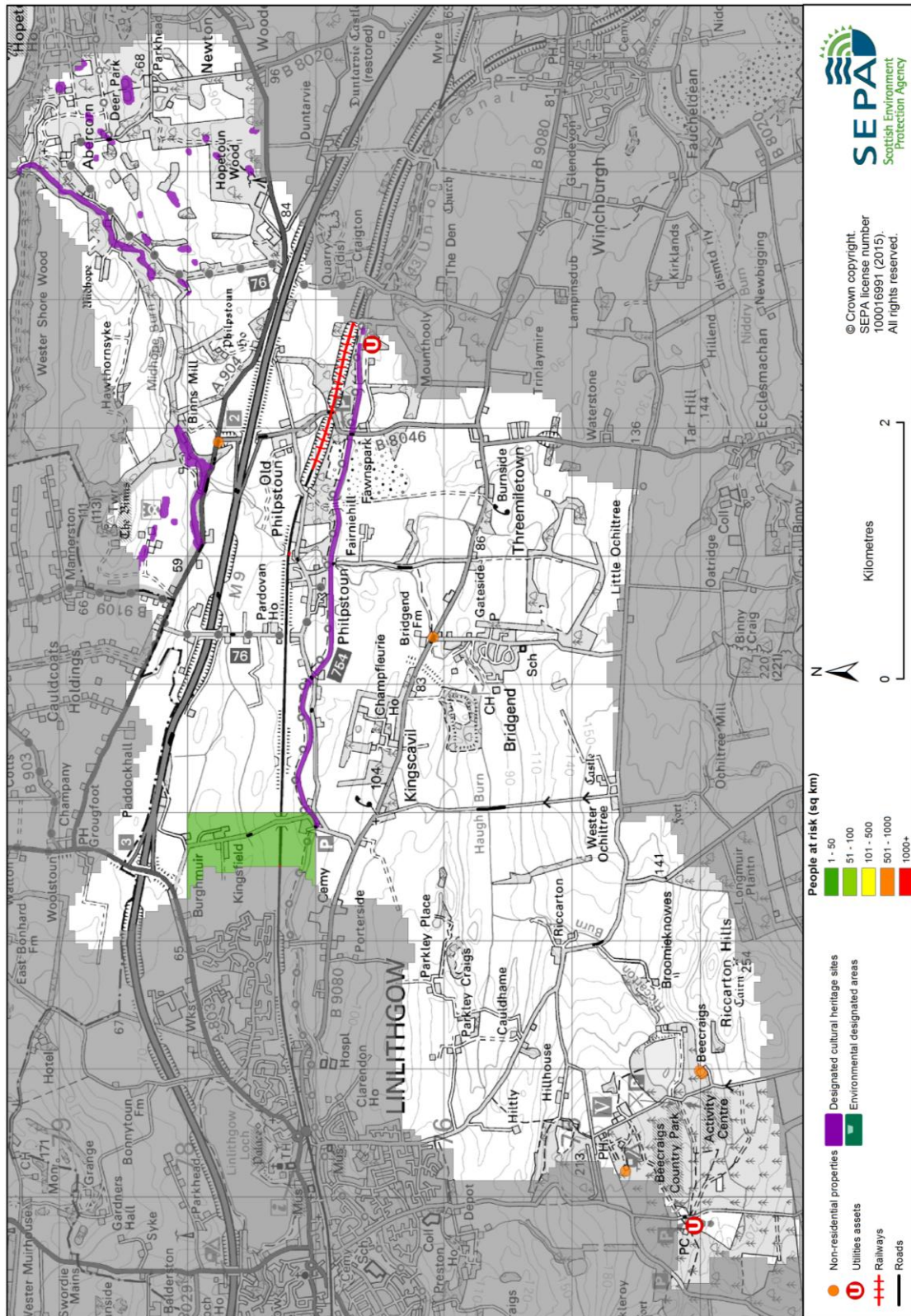


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/14

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 Philipstoun Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 10 non-residential properties • £23,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 10 non-residential properties • £23,000 Annual Average Damages
Applies across Forth Estuary 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 10/14

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 Philipstoun 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	<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

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² of improved surface water data is currently available within this Local Plan District.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Falkirk Council and West Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

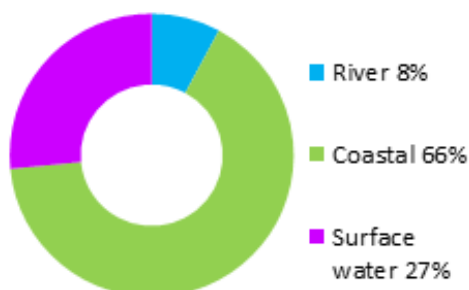
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

South Queensferry (Potentially Vulnerable Area 10/15)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	Forth Estuary (south) coastal

Summary of flooding impacts



At risk of flooding

- 10 residential properties
- 10 non-residential properties
- £31,000 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>	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

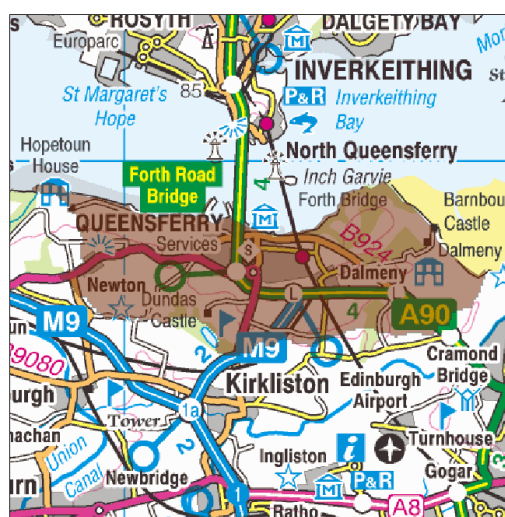
Actions

South Queensferry (Potentially Vulnerable Area 10/15)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	Forth Estuary (south) coastal

Background

This Potentially Vulnerable Area is 23km² and is part of the Firth of Forth catchment (shown below). This is a small, coastal area centred around the town of Queensferry on the southern bank of the Firth of Forth.



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There is low risk of flooding in this area and the majority of flood damages are caused by coastal flooding.

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

The Annual Average Damages are approximately £31,000.

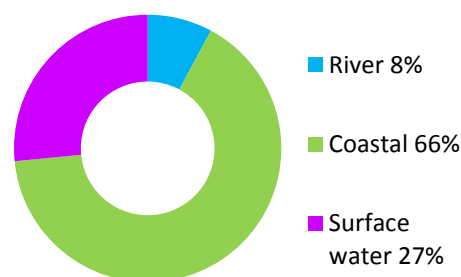


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to residential and non-residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 are three assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 4,100)	<10	10	10
Non-residential properties (total 250)	<10	10	10
People	<10	30	30
Community facilities	0	0	0
Utilities	0	0	<10
Transport links (excluding minor roads)	1 M road (M9), 1 A road, 2 B roads at 22 locations 2 Railway routes at 2 locations: Dalmeny to Winchburgh and Haymarket West Junctions	1 M road (M9), 1 A road, 2 B roads at 26 locations 2 Railway routes at 2 locations: Dalmeny to Winchburgh and Haymarket West Junctions	1 M road (M9), 1 A road, 2 B roads at 27 locations 2 Railway routes at 2 locations: Dalmeny to Winchburgh and Haymarket West Junctions
Environmental designated areas (km ²)	0.3	0.3	0.3
Designated cultural heritage sites	3	4	4
Agricultural land (km ²)	<0.01	0.1	0.1

Table 1: Summary of flooding impacts

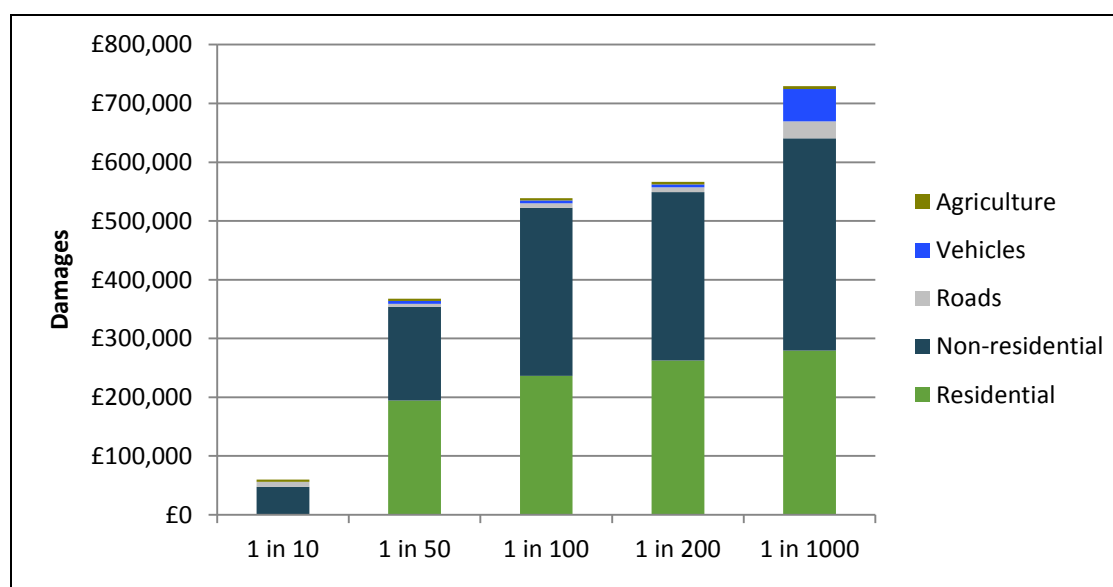


Figure 2: Damages by flood likelihood

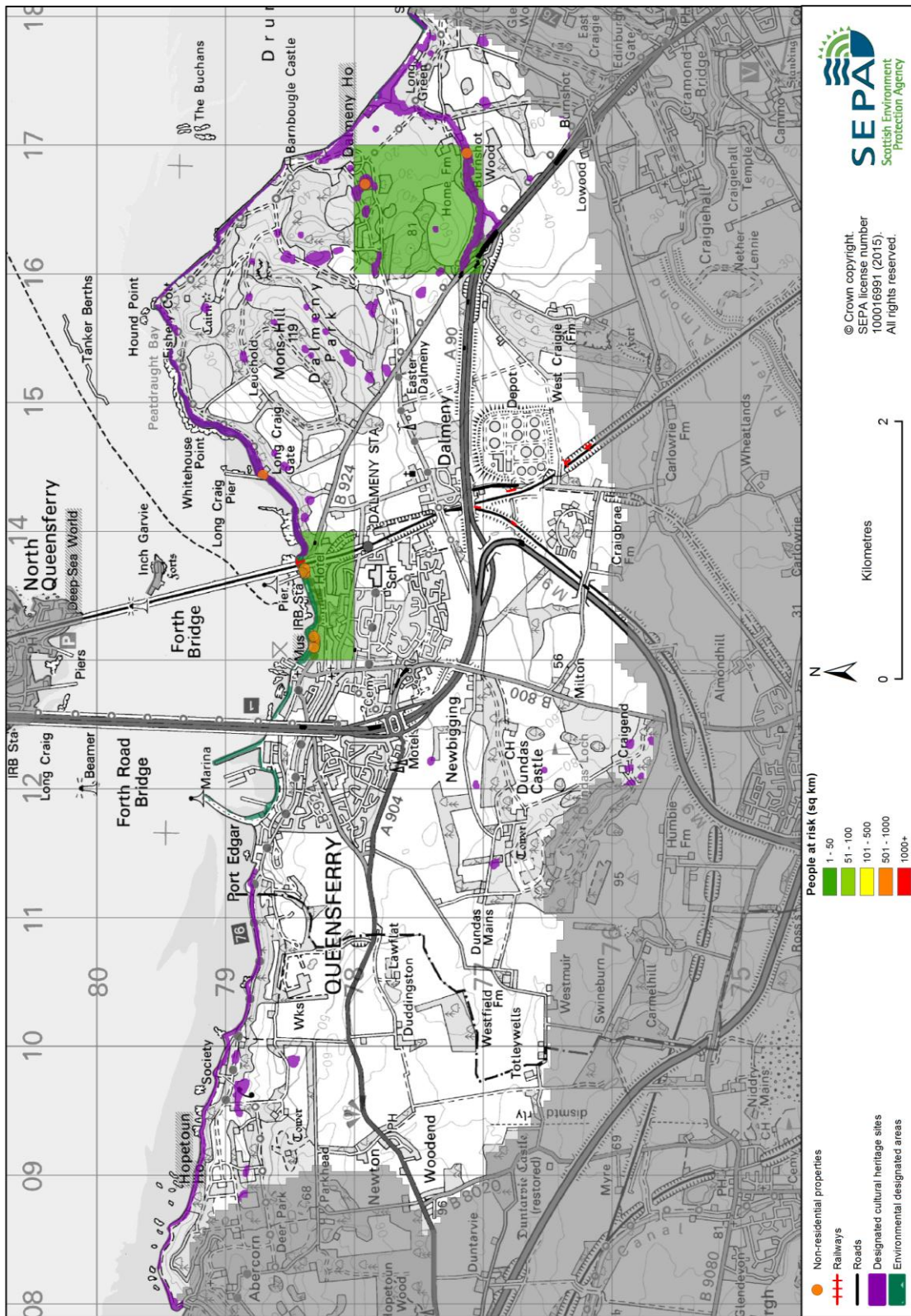


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/15

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 South Queensferry Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 10 residential properties • £31,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 10 residential properties • £31,000 Annual Average Damages
Applies across Forth Estuary 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 10/15

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 South Queensferry 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	<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

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² of improved surface water data is currently available within this Local Plan District.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

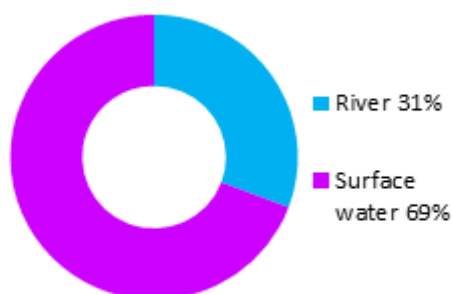
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council also owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Cramond Bridge (Potentially Vulnerable Area 10/16)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Edinburgh coastal

Summary of flooding impacts



At risk of flooding

- 60 residential properties
- 20 non-residential properties
- £110,000 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	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

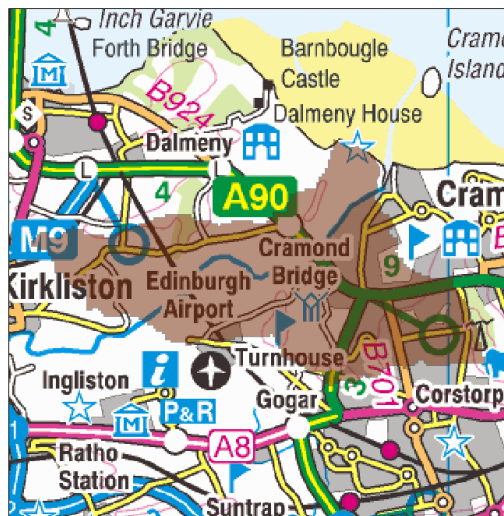
Actions

Cramond Bridge (Potentially Vulnerable Area 10/16)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Edinburgh coastal

Background

This Potentially Vulnerable Area is 15km² and is part of the Almond and Edinburgh Group catchment (shown below). This is a small area on the eastern outskirts of Edinburgh containing the suburbs of Clermiston and Cramond.



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The area has a risk of river and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.

There are approximately 60 residential properties and 20 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £110,000.

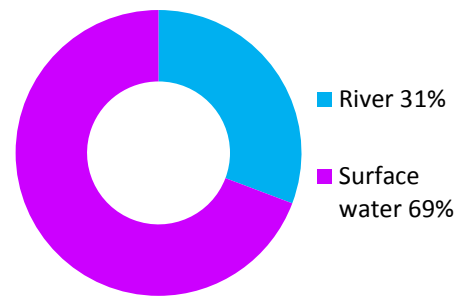


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of flooding is to Clermiston from surface water flooding.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 9,100)	10	60	110
Non-residential properties (total 280)	<10	20	30
People	20	130	230
Community facilities	0	0	0
Utilities	0	<10	<10
Transport links (excluding minor roads)	2 A roads at 6 locations 1 Railway route at 5 locations: Dalmeny to Haymarket West Junction	2 A roads, 1 B road at 15 locations 1 Railway route at 5 locations: Dalmeny to Haymarket West Junction Edinburgh Airport	2 A roads, 1 B road at 20 locations 1 Railway route at 6 locations: Dalmeny to Haymarket West Junction Edinburgh Airport
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	7	7	8
Agricultural land (km ²)	1.7	1.9	2.0

Table 1: Summary of flooding impacts

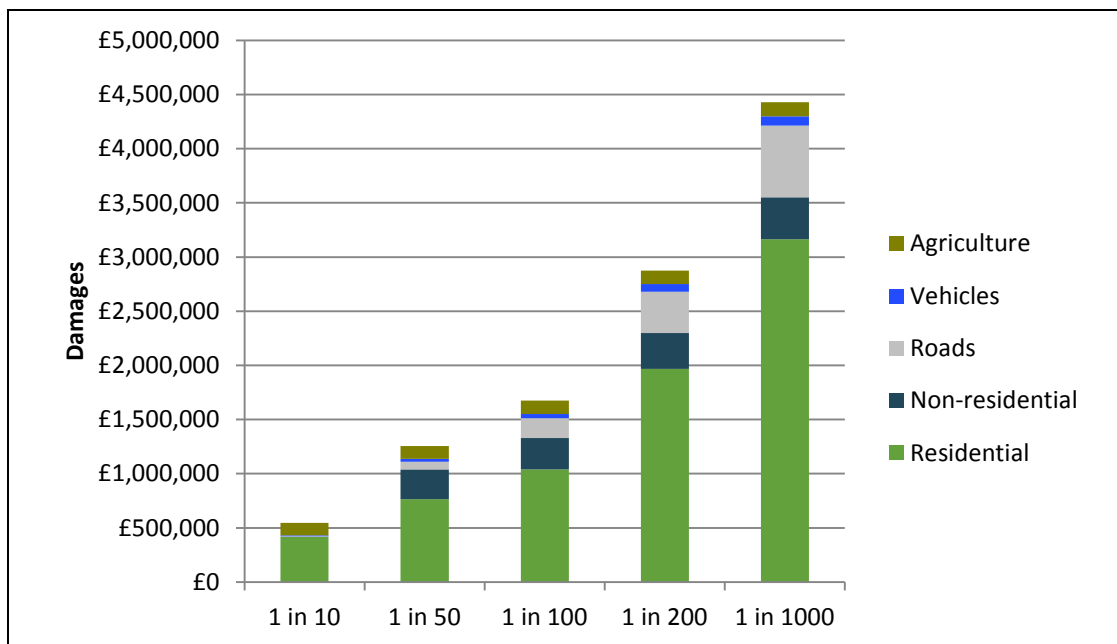


Figure 2: Damages by flood likelihood

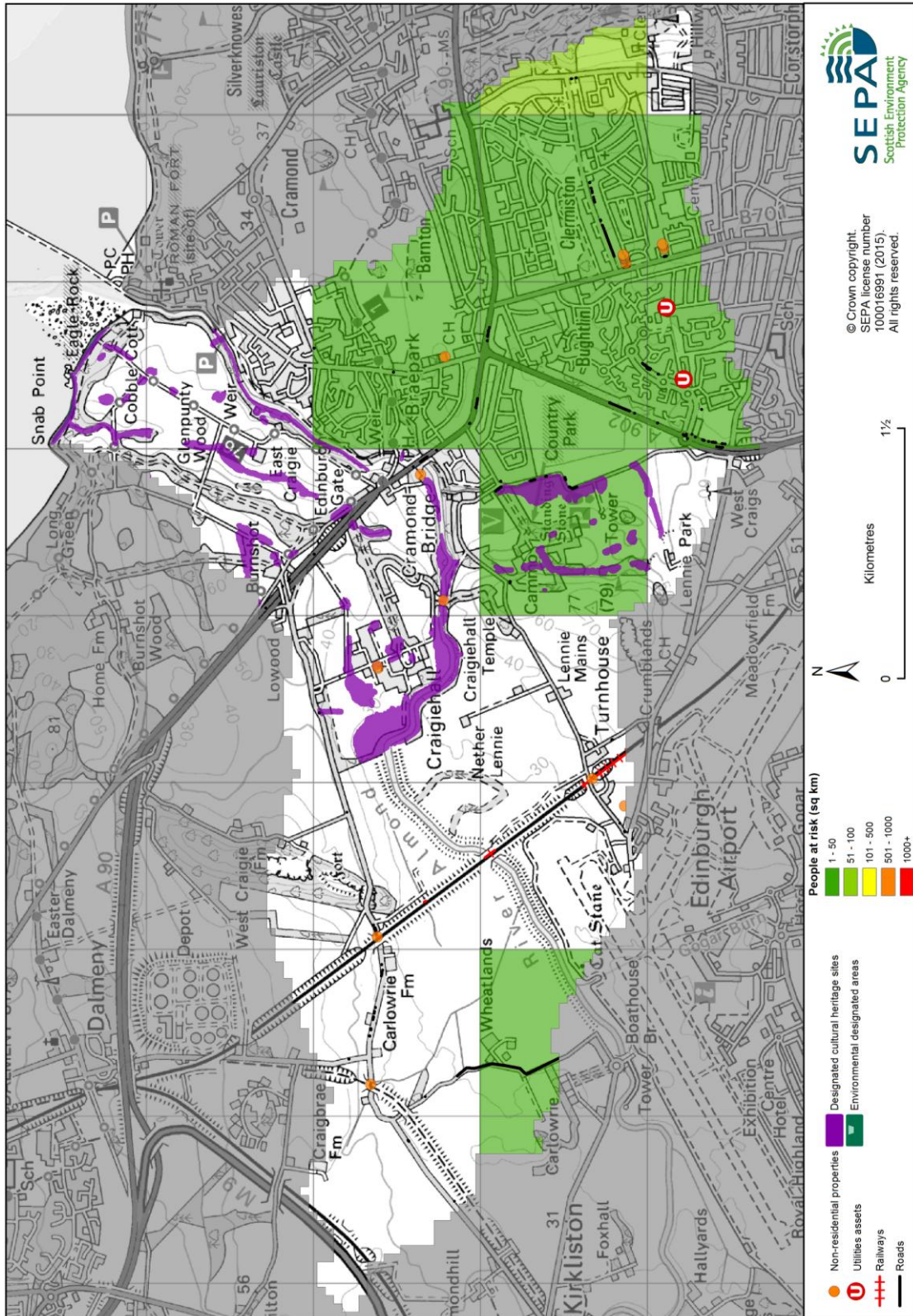


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/16

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 Cramond Bridge Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 60 residential properties • £110,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 60 residential properties • £110,000 Annual Average Damages
Applies across Forth Estuary 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 10/16 there are 60 residential properties at risk and Annual Average Damages of £74,000.

Actions to manage flooding in Potentially Vulnerable Area 10/16

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 Cramond Bridge 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	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Cramond flood warning area which is part of the Almond (West Lothian) river flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	The City of Edinburgh Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

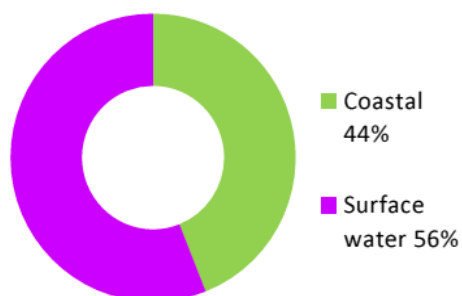
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council also owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Granton (Potentially Vulnerable Area 10/17)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Edinburgh coastal

Summary of flooding impacts



At risk of flooding

- 290 residential properties
- 60 non-residential properties
- £280,000 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

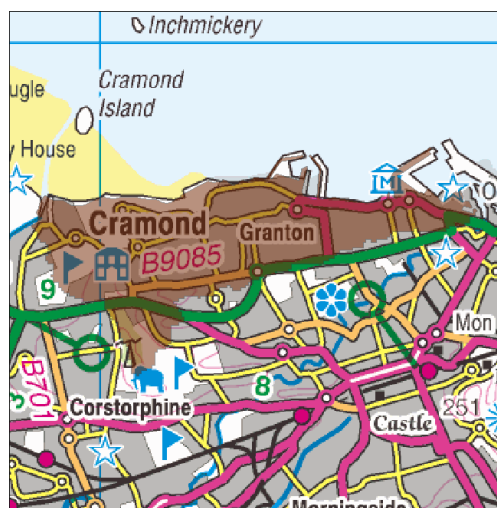
Actions

Granton (Potentially Vulnerable Area 10/17)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Edinburgh coastal

Background

This Potentially Vulnerable Area is 13km² and is part of the Almond and Edinburgh catchment group (shown below). This is a small, urbanised coastal area in the north of Edinburgh containing the suburbs of Silverknowes, Muirhouse, Granton, eastern Cramond and the Port of Leith.



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The area has a risk of coastal and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.

There are approximately 290 residential properties and 60 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £280,000.

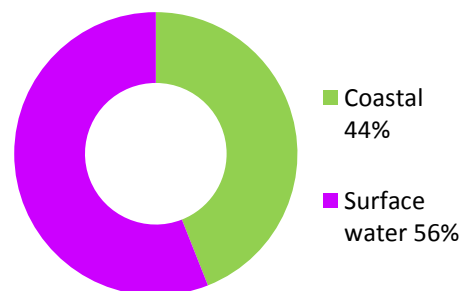


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of surface water flooding is to Granton and Muirhouse.

The risk of flooding to people, property, 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. 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.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 2,400)	10	290	360
Non-residential properties (total 1,100)	<10	60	80
People	30	630	800
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10	20	30
Transport links (excluding minor roads)	2 A roads, 1 B road at 10 locations	3 A roads, 1 B road at 31 locations	3 A roads, 1 B road at 38 locations
Environmental designated areas (km ²)	0.3	0.3	0.3
Designated cultural heritage sites	2	4	4
Agricultural land (km ²)	<0.01	<0.01	<0.01

Table 1: Summary of flooding impacts

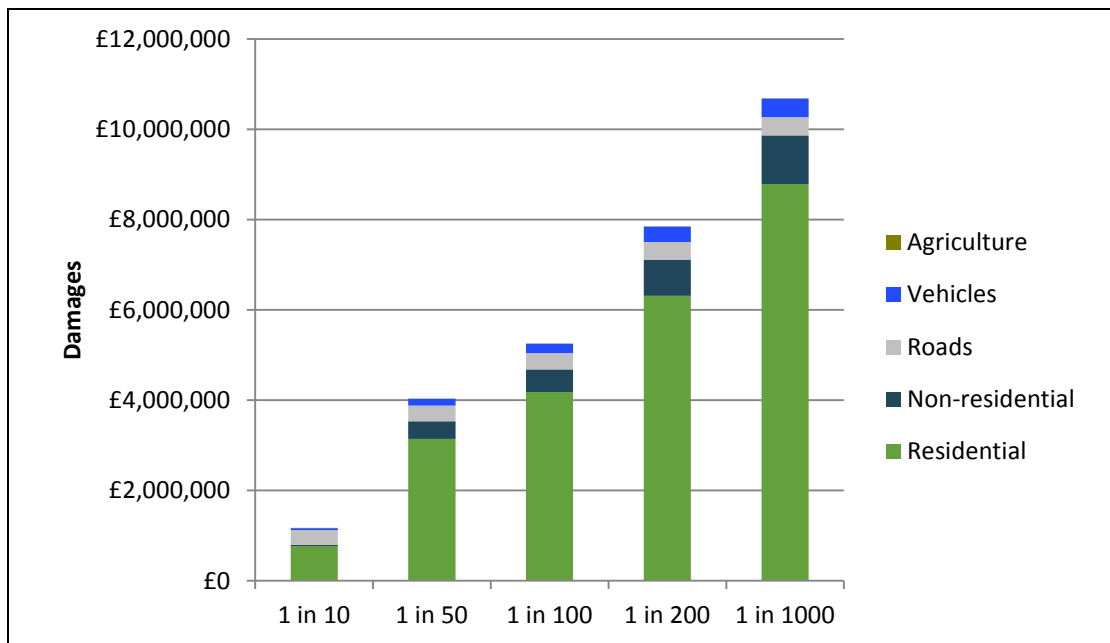


Figure 2: Damages by flood likelihood

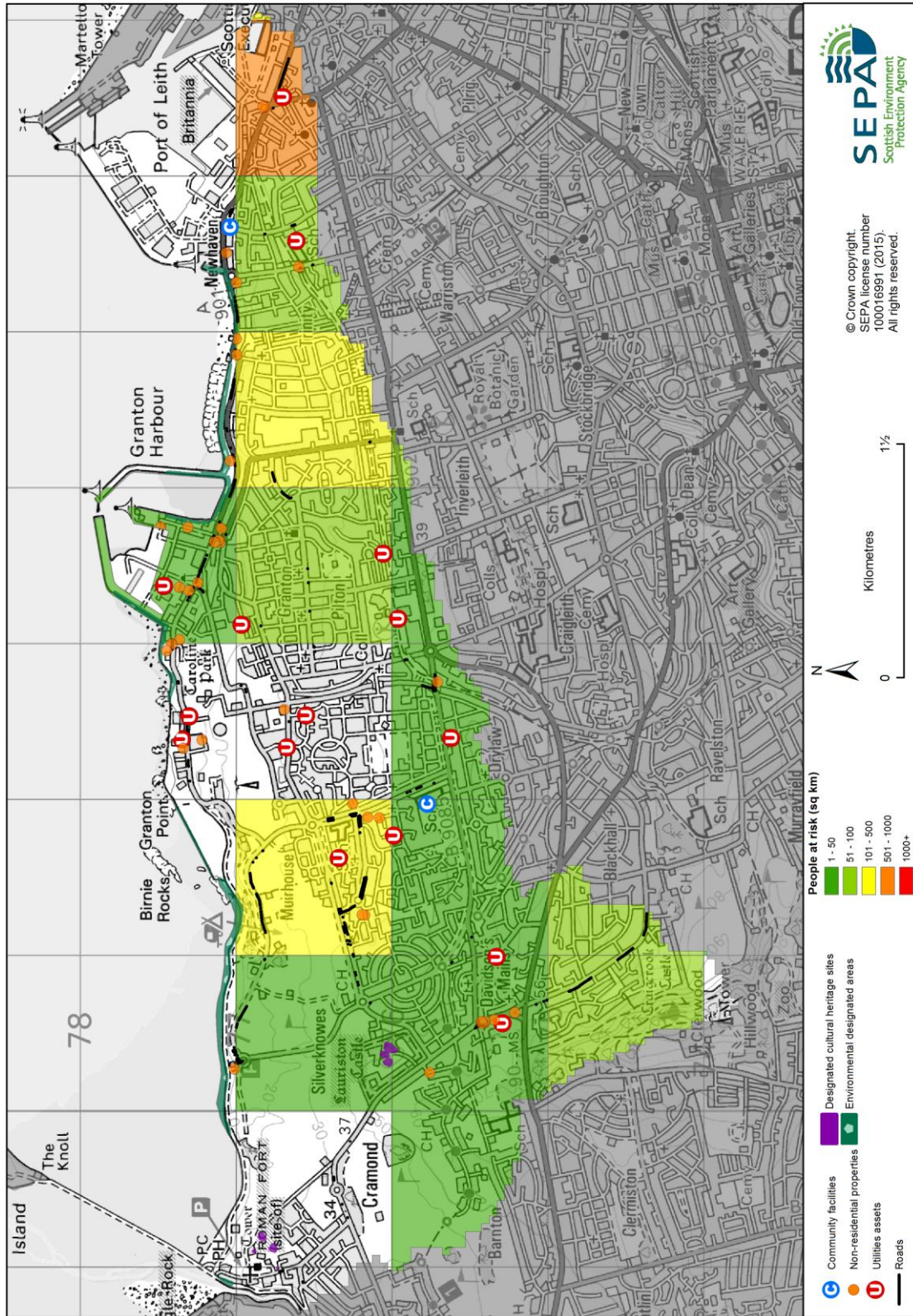


Figure 3: Impacts of flooding

History of flooding

The following significant floods have been recorded in this area:

- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the east coast of Scotland, with the Firth of Forth being one of the worst affected areas. Many locations were affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads. The City of Edinburgh Council estimated the costs of repair to be in the region of £650,000.
- 17 October 1898: Newhaven Pier in Edinburgh washed away as a result of coastal flooding.

Objectives to manage flooding in Potentially Vulnerable Area 10/17

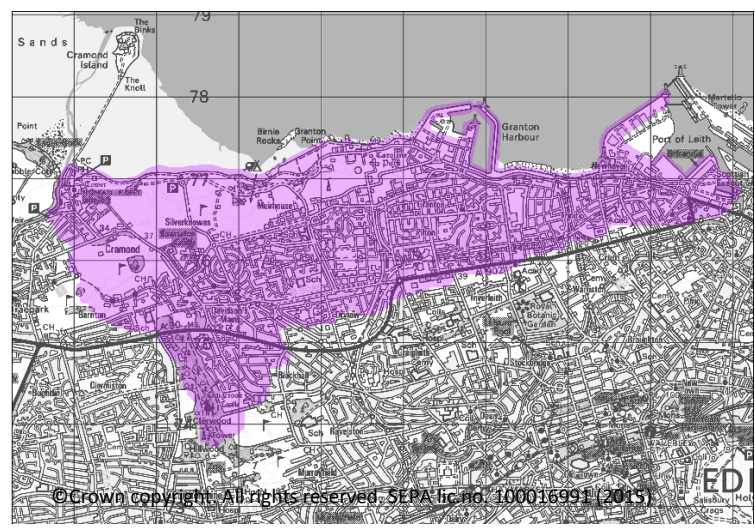
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Granton Potentially Vulnerable Area.

Accept coastal flooding in Cramond, Silverknowes and Granton is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.

Indicators:

- £79,000 Annual Average Damages from residential properties
- £14,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10095

Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 290 residential properties • £280,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 290 residential properties • £280,000 Annual Average Damages
Applies across Forth Estuary 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 10/17 there are 280 residential properties at risk and Annual Average Damages of £150,000.

Actions to manage flooding in Potentially Vulnerable Area 10/17

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 Granton 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	FLOOD PROTECTION STUDY (100950005)		
Objective (ID):	Accept coastal flooding in Cramond, Silverknowes and Granton is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding. (10095)		
Delivery lead:	The City of Edinburgh Council		
Priority:	National:		Within local authority:
	104 of 168		2 of 3
Status:	Not started	Indicative delivery:	2016-2021
Description:	A study should be undertaken of siltation in the Water of Leith basin in conjunction with the operation of the docks.		
Potential impacts			
Economic:	The economic impacts have not been defined at this stage.		
Social:	The social impacts will depend on the outcome of the study and recommended actions.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Water of Leith (water body ID 3700) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Environmental:	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 Firth of Forth Special Protection Area and Imperial Dock Loch Leith Special Protection Area.
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Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100950017)		
Objective (ID):	Accept coastal flooding in Cramond, Silverknowes and Granton is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding. (10095)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing rock armour, concrete and masonry walls and revetments along the coast in Cramond, Silverknowes and Granton.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Granton and Leith flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through increased media awareness and partnership project working. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	The City of Edinburgh Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

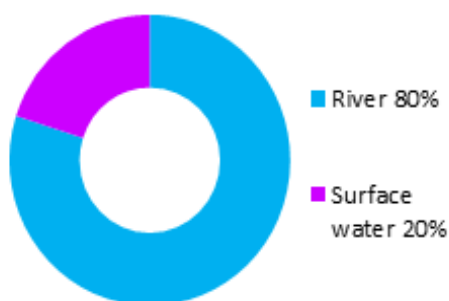
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Water of Leith catchment (Potentially Vulnerable Area 10/18)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, Midlothian Council	Water of Leith

Summary of flooding impacts



At risk of flooding

- 3,300 residential properties
- 480 non-residential properties
- £5.8 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	<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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

Water of Leith Catchment (Potentially Vulnerable Area 10/18)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, Midlothian Council	Water of Leith

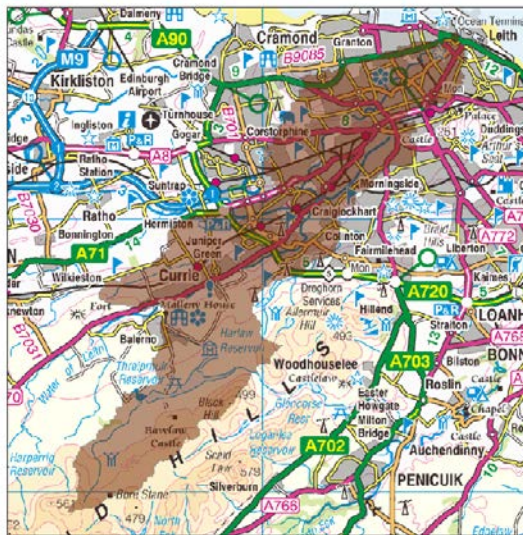
Background

This Potentially Vulnerable Area is 73km² and includes the lower reaches of the Water of Leith catchment (shown below). It includes central Edinburgh and suburban areas to the south west including Balerno, Currie and the foothills of the Pentland Hills. The main watercourses are the Water of Leith and its tributary, the Murray Burn. The Union Canal also flows through this Potentially Vulnerable Area.

The area has a risk of river and surface water flooding. The majority of damages are caused by river flooding.

There are approximately 3,300 residential properties and 480 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £5.8 million.



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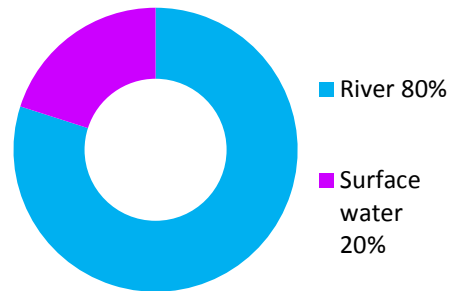


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the Water of Leith and Murray Burn to Murrayfield, Roseburn and Sighthill. The risk of surface water flooding is spread across the greater Edinburgh urban area.

The risk of flooding to people, 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. 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.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

In the Water of Leith catchment, the local authority has undertaken more detailed studies for the design and build of the Water of Leith flood protection scheme. The information in this report uses SEPA data which may be different from the more detailed information held by the local authority arising from differences in modelling approach.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 110,000)	410	3,300	7,800
Non-residential properties (total 9,700)	70	480	950
People	910	7,300	17,000
Community facilities	0	<10 Includes: educational buildings, emergency services and healthcare facilities	<10 Includes: educational buildings, emergency services and healthcare facilities
Utilities	10	60	80
Transport links (excluding minor roads)	11 A roads, 3 B roads at 90 locations 3 Railway routes at 29 locations: Dalmeny to Haymarket West Junction Carstairs to Edinburgh Edinburgh Waverley to Glasgow Queen Street	11 A roads, 4 B roads at 196 locations 3 Railway routes at 45 locations Dalmeny to Haymarket West Junction Carstairs to Edinburgh Edinburgh Waverley to Glasgow Queen Street	11 A roads, 4 B roads at 241 locations 3 Railway routes at 56 locations Dalmeny to Haymarket West Junction Carstairs to Edinburgh Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km²)	0.2	0.2	0.2
Designated cultural heritage sites	31	237	336
Agricultural land (km²)	0.4	0.8	0.9

Table 1: Summary of flooding impacts

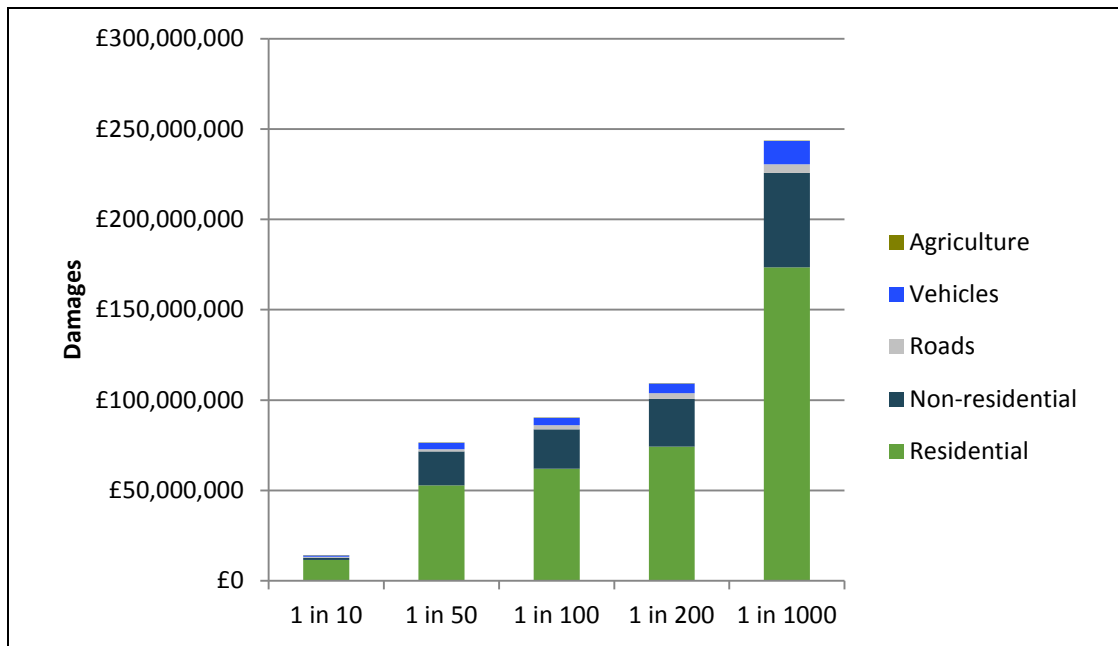


Figure 2: Damages by flood likelihood

History of flooding

Edinburgh has a long history of flooding from the Water of Leith. The following significant floods have been recorded in this area:

- 26 April 2000: Flooding on the Water of Leith caused boundary walls at Saughton, Balgreen, Stockbridge, Warriston and Bonnington to collapse resulting in the inundation of over 500 properties. Murrayfield Stadium, Murrayfield Ice Rink and two residential care homes also flooded.
- 6 October 1990: The Water of Leith flooded in multiple locations with Roseburn badly affected.
- 3 November 1984: Flooding on the Water of Leith resulted in the inundation of two sheltered housing schemes. The Saughton and Roseburn areas were worst affected.
- 15 October 1907: Water of Leith water levels in Currie were 1.5m above normal levels resulting in the flooding of Woodhall Paper Mill at Juniper Green. Flooding was contained at Cannonmills due to retaining walls however it overtopped at Warriston Green causing road closures.
- 17 August 1907: Serious flooding within the Roseburn Park area of Edinburgh after the Water of Leith burst its banks.

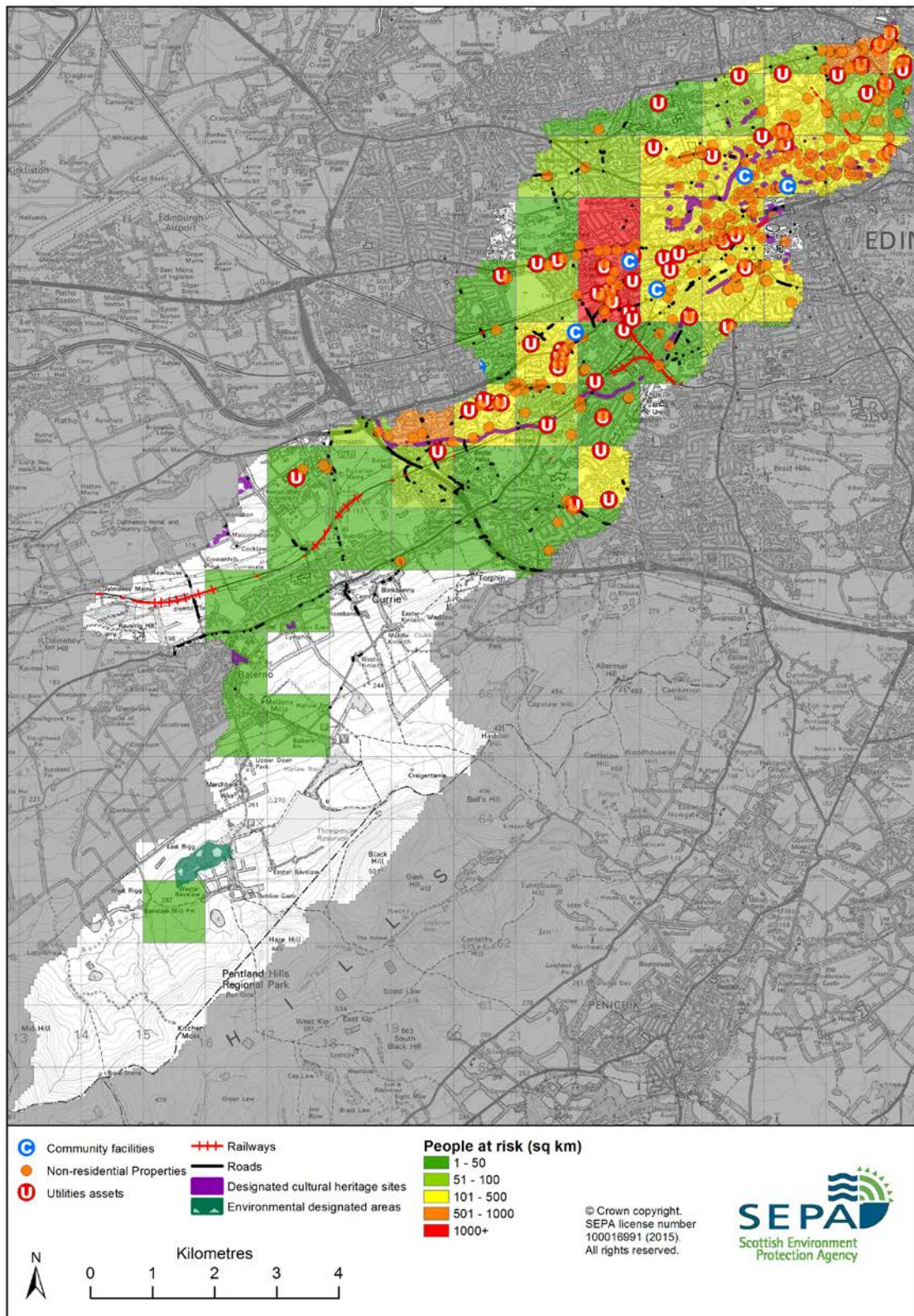


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/18

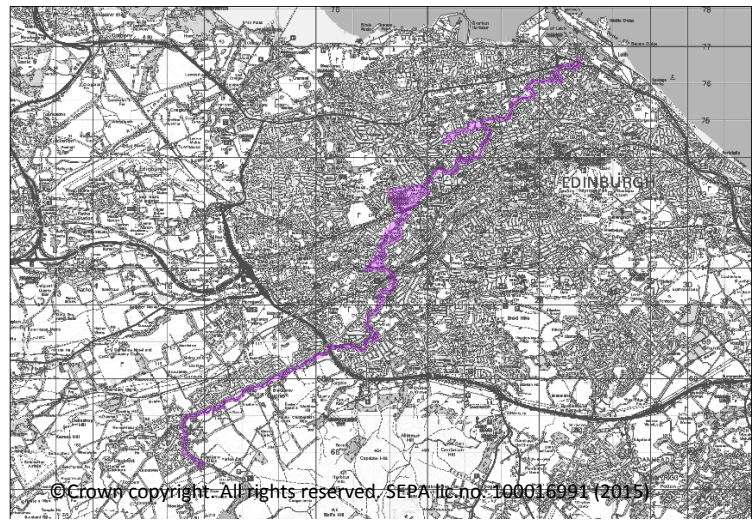
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 the Water of Leith catchment Potentially Vulnerable Area.

Accept flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme (reservoir) that reduces economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Water of Leith.

Indicators:

- Reduction in peak flow of 106 cumecs

Target area:



Objective ID: 10059

Accept flood risk in Edinburgh (between Bonnington and Veitch's Square) is managed appropriately. Maintain the Water of Leith Flood Protection Scheme that reduces the risk of flooding.

Indicators:

- 480 residential properties protected
- 80 non-residential properties protected
- Three community facilities

Target area:



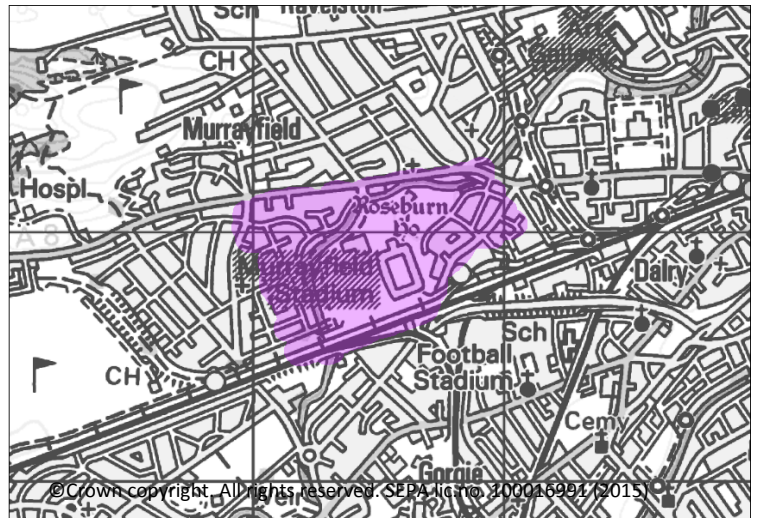
Objective ID: 10060

Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh at Murrayfield and Roseburn caused by flooding from the Water of Leith

Indicators:

Target area:

- 440 residential properties
- <10 non-residential properties
- Three community facilities



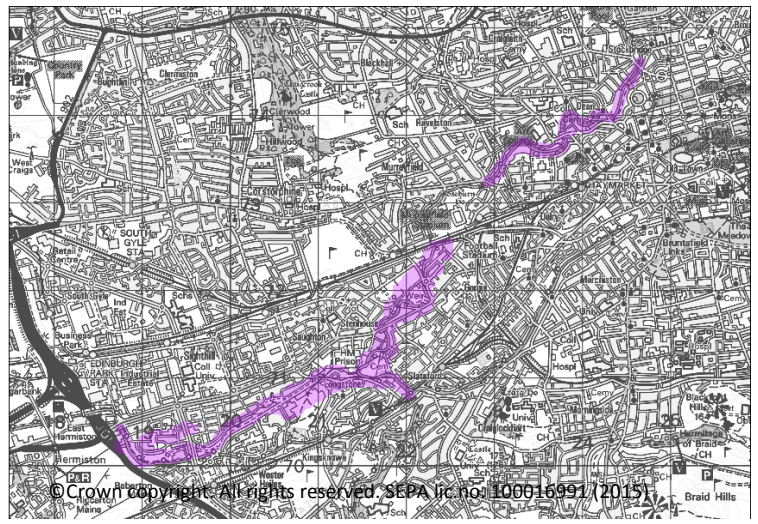
Objective ID: 10061

Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh (Coltbridge, Gorgie and Saughton) from the Water of Leith

Indicators:

Target area:

- 80 residential and non-residential properties
- One educational building



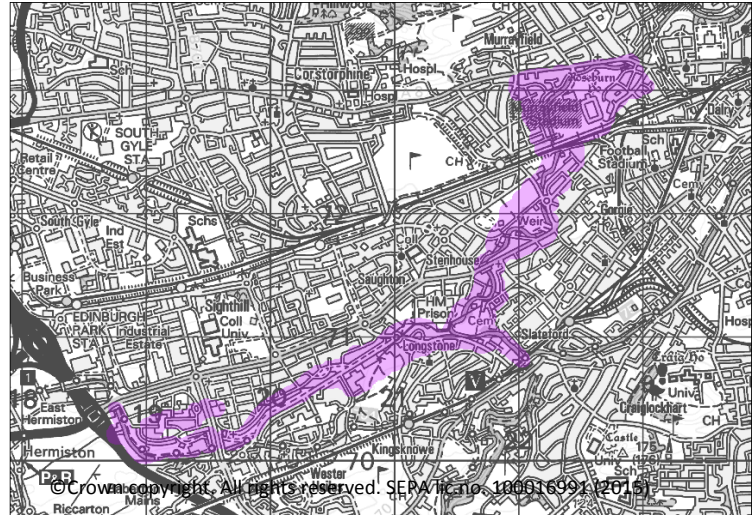
Objective ID: 10062

Reduce risk to people from river flooding in Edinburgh (Murrayfield, Gorgie, Saughton, Stenhouse and Longstone) caused by flooding from the Water of Leith

Indicators:

Target area:

- 5,300 people



Objective ID: 10063

Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 3,300 residential properties • £5.8 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 3,300 residential properties • £5.8 million Annual Average Damages
Applies across Forth Estuary 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 10/18 there are 1,200 residential properties at risk and Annual Average Damages of £1.2 million.

Actions to manage flooding in Potentially Vulnerable Area 10/18

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 the Water of Leith catchment 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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100610006)		
Objective (ID):	Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh at Murrayfield and Roseburn caused by flooding from the Water of Leith (10061)		
Delivery lead:	The City of Edinburgh Council		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	The Water of Leith (Phase 2) Flood Protection Scheme is currently under construction, scheduled to be completed by 2017. The scheme will protect Murrayfield and Roseburn from flooding from the Water of Leith.		
Potential impacts			
Economic:	The flood protection scheme has an estimated benefit cost ratio of 4.9.		
Social:	A reduction in flood risk will 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 negative impacts through disturbance to the local community during the construction phase and changes in visual amenity and land use as a result of these works.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. As part of the planning process, an environmental impact assessment was carried out and an action plan prepared for each phase of the scheme.		

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100620006)		
Objective (ID):	Reduce risk to people from river flooding in Edinburgh (Murrayfield, Gorgie, Saughton, Stenhouse and Longstone) caused by flooding from the Water of Leith (10063) Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh (Coltbridge, Gorgie and Saughton) from the Water of Leith (10062)		
Delivery lead:	The City of Edinburgh Council		
Priority:	National:	Within local authority:	
	22 of 42	1 of 1	
Status:	Under development	Indicative delivery:	2016-2021
Description:	Flood protection works have been proposed for Edinburgh to further reduce flooding from Water of Leith. The proposed works will likely include Coltbridge, Gorgie and Saughton, subject to the availability of funding.		
Potential impacts			
Economic:	The proposed works may benefit 75 residential properties at risk of flooding in this location, with estimated damages avoided of £22.9 million. The flood protection works have an estimated benefit cost ratio of 2.53 (Coltbridge); 0.98 (Gorgie); 2.45 (Saughton).		
Social:	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 area. In addition there is one educational building which has been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.		
Environmental:	Flood protection works can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. The proposed flood protection works are located on parts of the Water of Leith (water body ID 3700). The physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100590017)		
Objective (ID):	Accept flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme (reservoir) that reduces economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Water of Leith. (10059)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the reservoirs in the upper catchment of the Water of Leith to reduce peak flows and lower river levels downstream. The reservoir forms part of Water of Leith Flood Protection Scheme.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100600017)		
Objective (ID):	Accept flood risk in Edinburgh (between Bonnington and Veitch's Square) is managed appropriately. Maintain the Water of Leith Flood Protection Scheme that reduces the risk of flooding. (10060)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Water of Leith Flood Protection Scheme at Bonnington, St Marks, Warriston, Stockbridge Colonies and Veitch's Square.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100610017)		
Objective (ID):	Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh at Murrayfield and Roseburn caused by flooding from the Water of Leith (10061)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Maintain the Water of Leith Flood Protection Scheme and works in Murrayfield and Roseburn when completed in 2017.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Dean Village, Warriston and Bonnington, Stockbridge, Longstone/Stenhouse and Roseburn flood warning areas which are part of the Water of Leith river flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

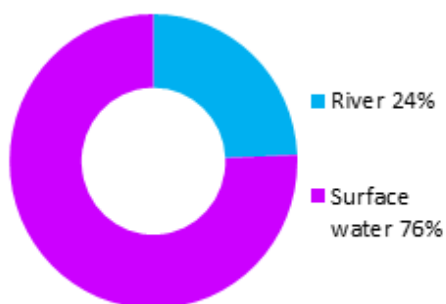
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Braid Burn catchment (Potentially Vulnerable Area 10/19)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Braid Burn

Summary of flooding impacts



At risk of flooding

- 750 residential properties
- 210 non-residential properties
- £1.2 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.

<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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

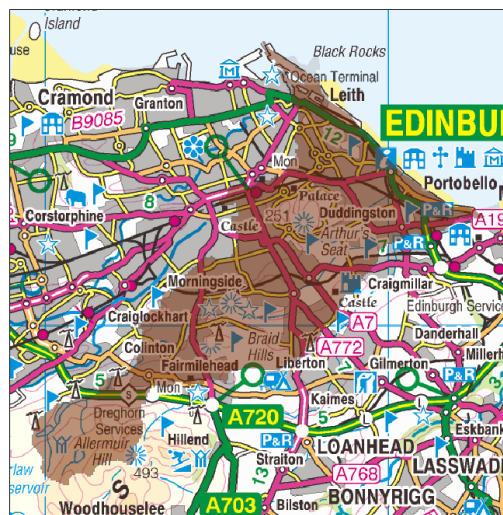
Actions

Braid Burn Catchment (Potentially Vulnerable Area 10/19)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council	Braid Burn

Background

This Potentially Vulnerable Area is 43km² and includes the whole of the Braid Burn catchment (shown below). It covers central Edinburgh and its suburbs to the south including Oxcgangs, Prestonfield and Craigmillar.



The main watercourse is the Braid Burn flowing through Colinton Mains, Oxcgangs, Duddingston and Durham before discharging into the Firth of Forth at Portobello. However, the main source of flooding is from surface water.

There are approximately 750 residential properties and 210 non-residential properties at risk of flooding. The Annual Average Damages are approximately £1.2 million.

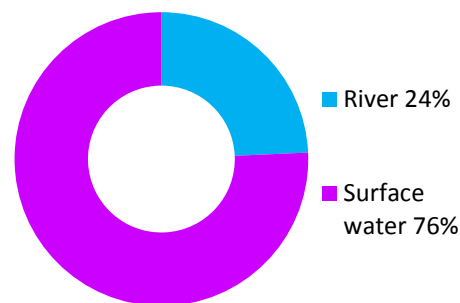


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The risk of surface water flooding is spread out across the greater Edinburgh urban area. The risk of flooding from the Braid Burn is reduced by the Braid Burn Flood Protection Scheme.

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

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 from flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 66,000)	140	750	1,900
Non-residential properties (total 5,100)	60	210	450
People	310	1,700	4,200
Community facilities	0	<10 Includes: educational buildings and healthcare facilities	<10 Includes: educational buildings and healthcare facilities
Utilities	<10	20	20
Transport links (excluding minor roads)	10 A roads, 1 B road at 53 locations 2 Railway routes at 26 locations: Berwick-upon-Tweed to Edinburgh Edinburgh Waverley to Glasgow Queen Street	12 A roads, 2 B roads at 132 locations 2 Railway routes at 36 locations: Berwick-upon-Tweed to Edinburgh Edinburgh Waverley to Glasgow Queen Street	12 A roads, 2 B roads at 173 locations 2 Railway routes at 38 locations: Berwick-upon-Tweed to Edinburgh Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km²)	0.5	0.6	0.6
Designated cultural heritage sites	14	30	43
Agricultural land (km²)	0.5	0.6	0.7

Table 1: Summary of flooding impacts

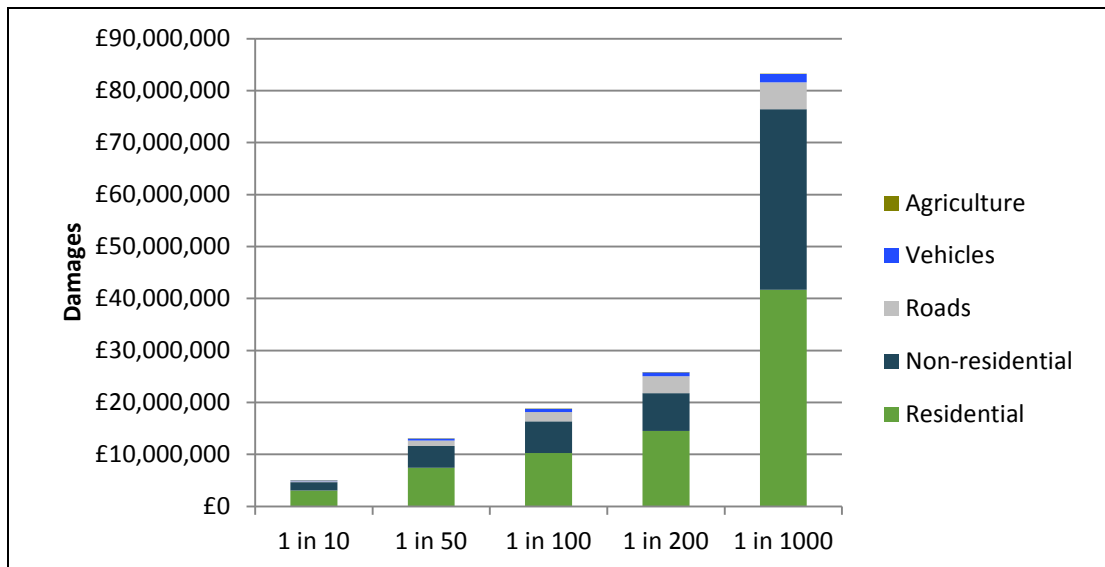


Figure 2: Damages by flood likelihood

History of flooding

This area has a long history of flooding from Braid Burn, the sea and surface water. The following significant floods have been recorded in this area:

- 8 July 2011: Surface water flooding of homes and businesses in Edinburgh. Balcarres Street in Morningside was identified as the worst affected area with around 20 residential properties and 3 commercial properties flooded.
- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive coastal flooding along the east coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads with Edinburgh City Council estimating the costs to repair damages in the region of £650,000.
- 26 April 2000: Flooding from the Braid Burn. Areas from Colinton to Portobello flooded to an estimated depth of greater than 2m in some areas.
- 4 April 1958: Portobello Promenade and nearby houses were flooded during a coastal flood event.
- 1877: Sea wall washed away between Portobello and Joppa due to flooding from the sea.

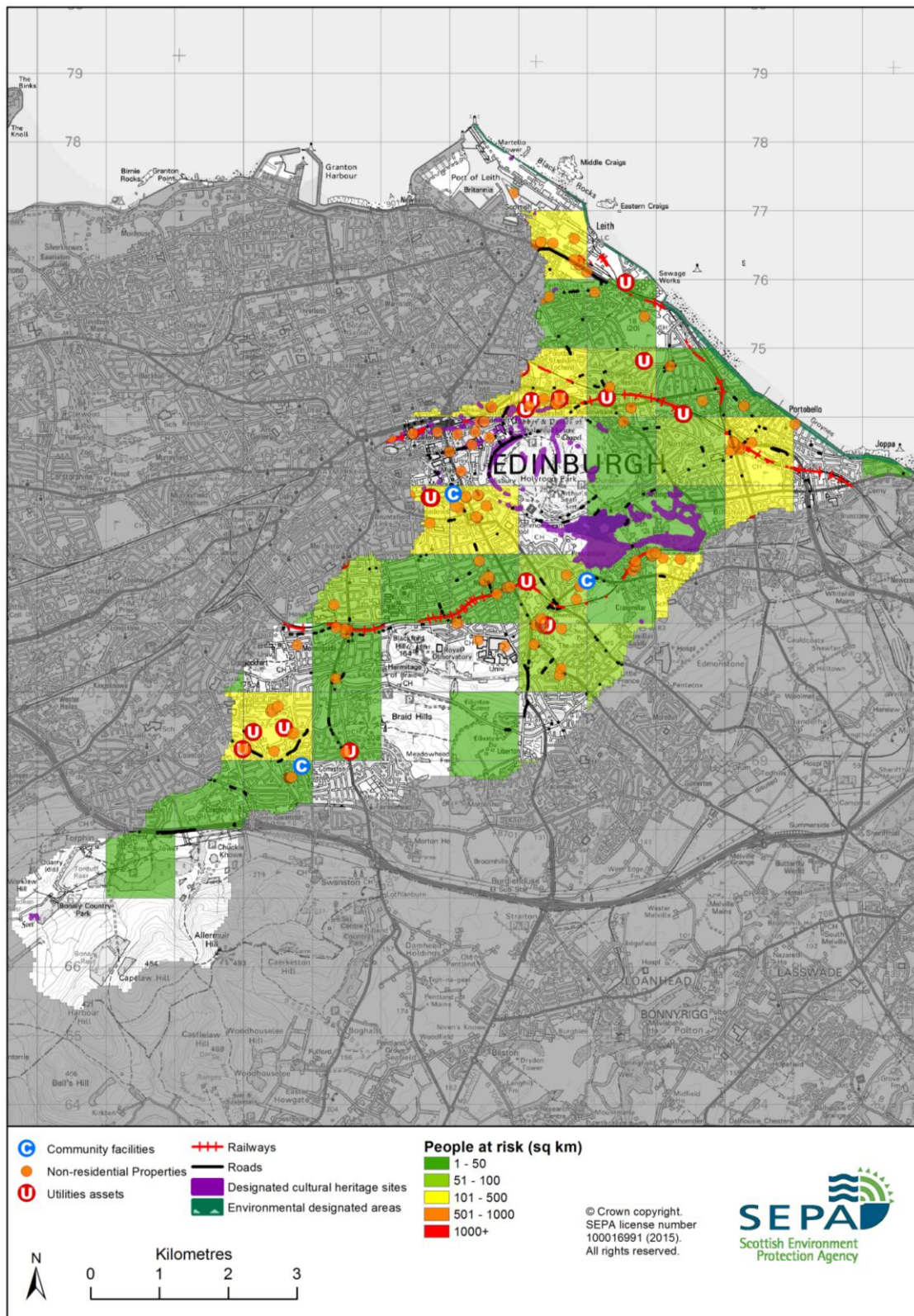


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/19

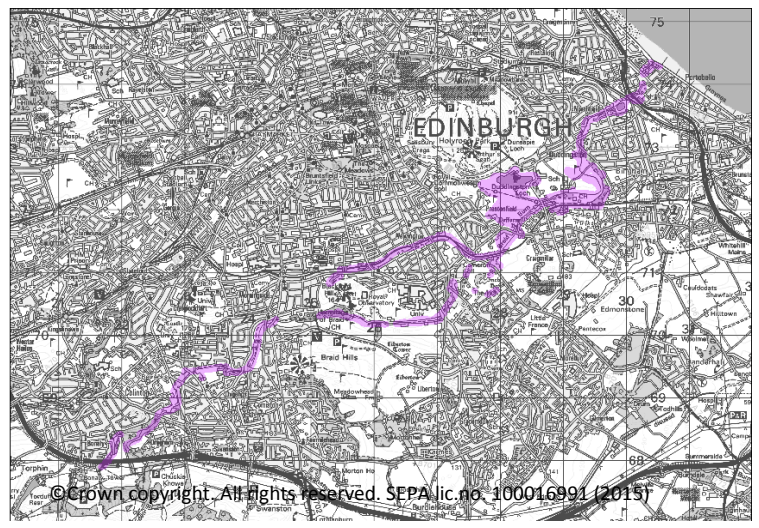
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 the Braid Burn catchment Potentially Vulnerable Area.

Accept that flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme that reduces risk to residential and non-residential properties and community facilities in Edinburgh caused by flooding from the Braid Burn.

Indicators:

- 950 residential properties protected
- 30 non-residential properties protected
- 10 community facilities

Target area:



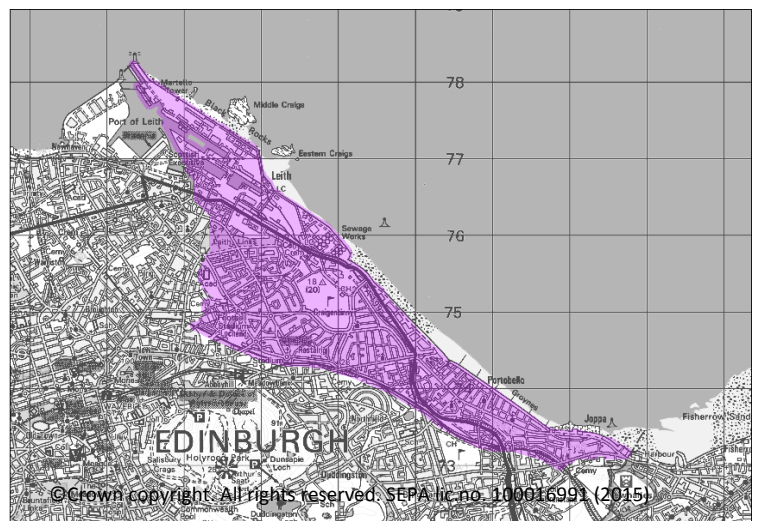
Objective ID: 10067

Accept coastal flooding in Leith and Portobello is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.

Indicators:

No indicators available

Target area:



Objective ID: 10068

Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 750 residential properties • £1.2 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 750 residential properties • £1.2 million Annual Average Damages
Applies across Forth Estuary 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 10/19 there are 720 residential properties at risk and Annual Average Damages of £890,000.

Actions to manage flooding in Potentially Vulnerable Area 10/19

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 the Braid Burn 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	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)				
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)				
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council				
Status:	Not started	Indicative delivery:	2016-2021		
Description:	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.				

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)				
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)				
Delivery lead:	Scottish Water in partnership with local authorities				
Status:	Ongoing	Indicative delivery:	2016-2021		
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.				

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100670017)		
Objective (ID):	Accept that flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme that reduces risk to residential and non-residential properties and community facilities in Edinburgh caused by flooding from the Braid Burn. (10067)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Braid Burn Flood Protection Scheme in Edinburgh. The scheme reduces the risk of flooding to homes and businesses along the Braid Burn between Redford Road and Portobello.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100680017)		
Objective (ID):	Accept coastal flooding in Leith and Portobello is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding. (10068)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood defences along the coast.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Colinton Mains, Mid Liberton and Cameron Toll, Inch Park and Peffermill and the Portobello flood warning areas which are part of the Braid Burn river flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. The City of Edinburgh Council has issued properties on Balcarres Street with door and vent flood guards.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	The City of Edinburgh Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

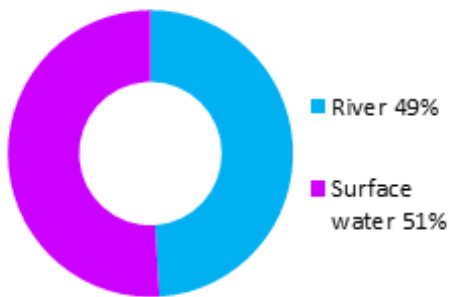
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council also owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Niddrie Burn / Burdiehouse Burn catchment (Potentially Vulnerable Area 10/20)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	Niddrie and Burdiehouse Burn catchment

Summary of flooding impacts



At risk of flooding

- 390 residential properties
- 40 non-residential properties
- £780,000 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

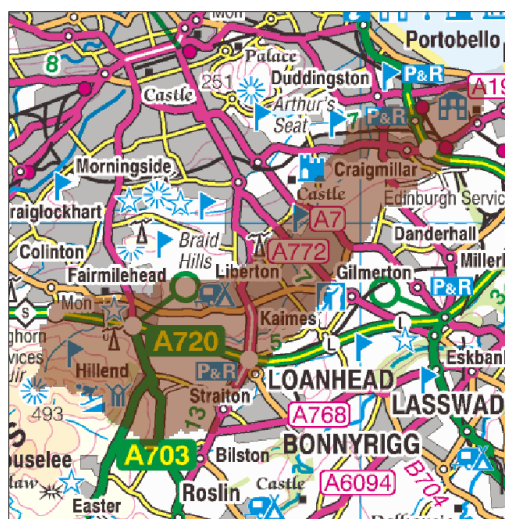
Actions

Niddrie and Burdiehouse Burn Catchment (Potentially Vulnerable Area 10/20)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	Niddrie and Burdiehouse Burn catchment

Background

This Potentially Vulnerable Area is 26km² and includes the whole of the Niddrie and Burdiehouse Burn catchment (shown below). It covers the south and east areas of Edinburgh including Brunstane, Niddrie, Burdiehouse and Fairmilehead.



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The main watercourse is the Burdiehouse Burn which changes name to the Niddrie Burn and Brunstane Burn in the lower reaches where it flows into the Firth of Forth.

There are approximately 390 residential properties and 40 non-residential properties at risk of flooding. The Annual Average Damages are approximately £780,000.

The area has a risk of surface water and river flooding.

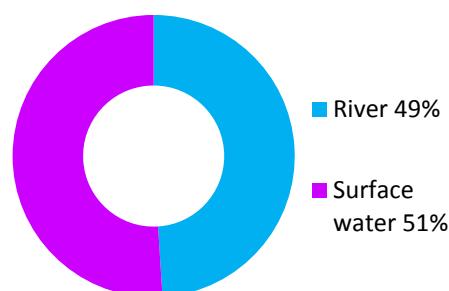


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The greatest risk of river flooding is in the Eastfield, Niddrie, Moredun and Burdiehouse areas from the Niddrie and Burdiehouse Burn. The greatest risk of surface water flooding is in the Fairmilehead, Burdiehouse and Niddrie areas.

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

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

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

In this Potentially Vulnerable Area there is lower confidence in the SEPA flood maps. SEPA and The City of Edinburgh Council are working together to improve the understanding of flooding issues in this area.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 18,000)	100	390	550
Non-residential properties (total 640)	<10	40	60
People	210	860	1,200
Community facilities	<10 Educational buildings	<10 Educational buildings	<10 Educational buildings
Utilities	<10	10	10
Transport links (excluding minor roads)	10 A roads, 2 B roads at 75 locations 1 Railway route at 1 location: Berwick-upon-Tweed to Edinburgh	10 A roads, 2 B roads at 124 locations 1 Railway route at 2 locations: Berwick-upon-Tweed to Edinburgh	10 A roads, 2 B roads at 137 locations 1 Railway route at 3 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km ²)	0.1	0.1	0.1
Designated cultural heritage sites	2	4	5
Agricultural land (km ²)	0.6	0.8	0.8

Table 1: Summary of flooding impacts

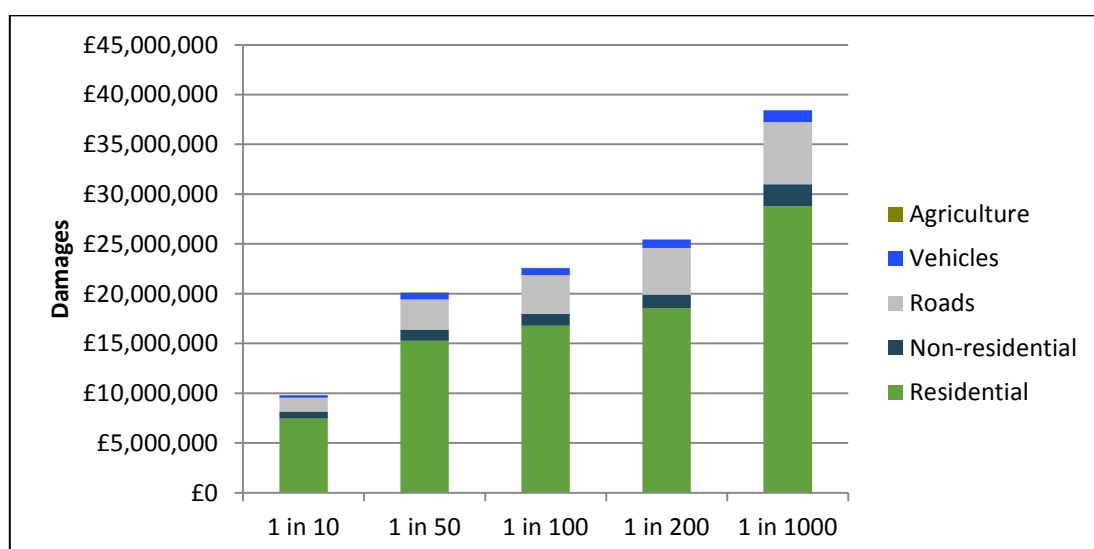


Figure 2: Damages by flood likelihood

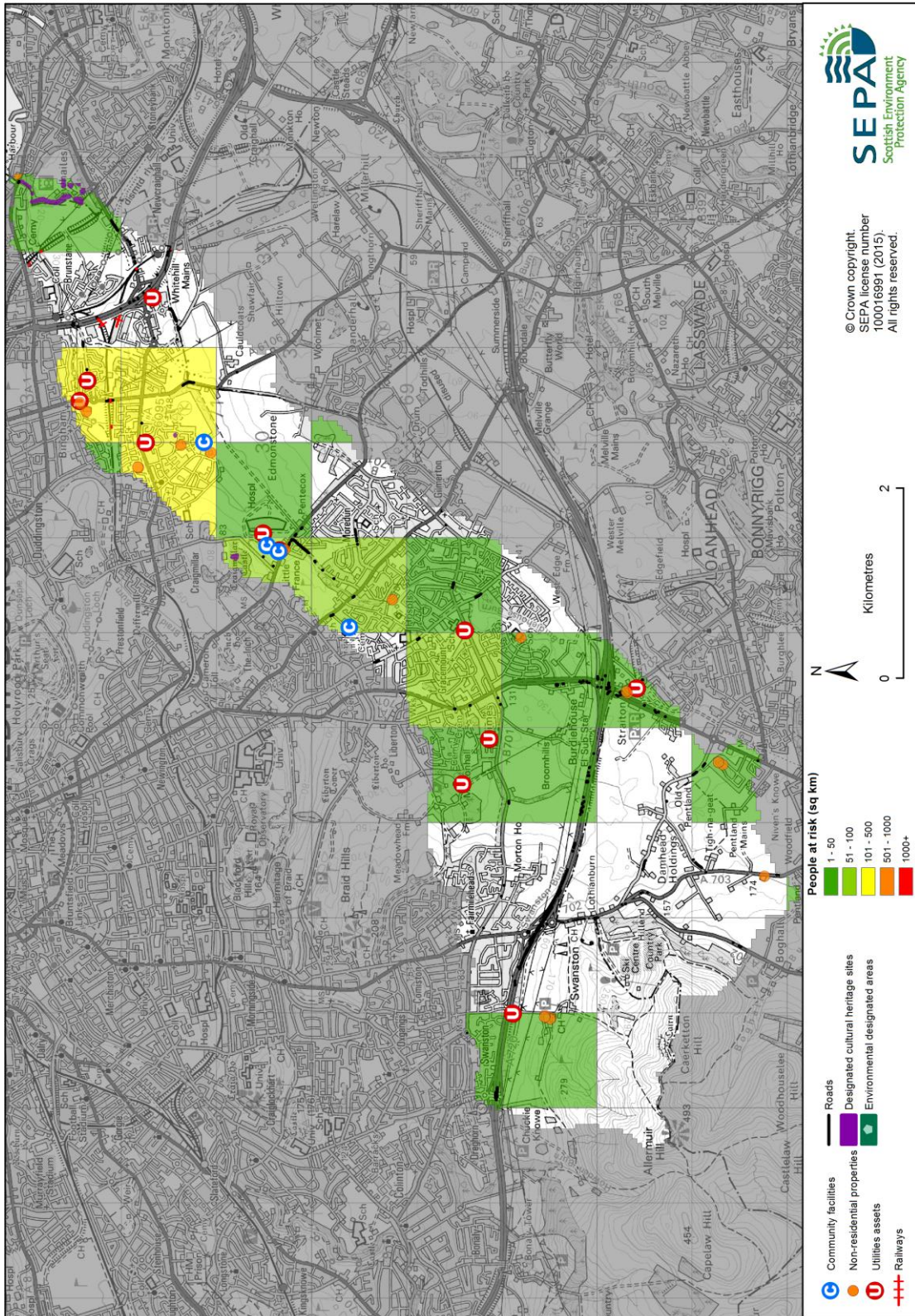


Figure 3: Impacts of flooding

History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

Objectives to manage flooding in Potentially Vulnerable Area 10/20

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 the Niddrie Burn / Burdiehouse Burn catchment Potentially Vulnerable Area.

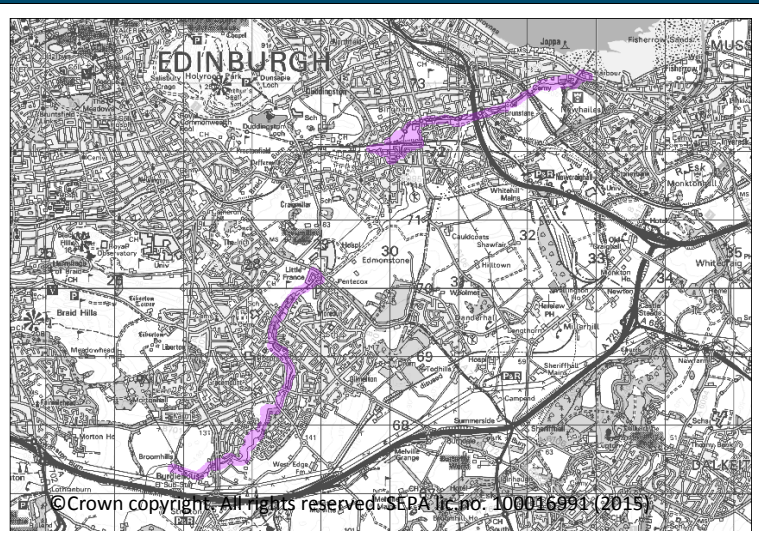
Reduce economic damages to residential and non-residential properties and risk to people in Edinburgh / Burdiehouse caused by flooding from the Niddrie Burn

Indicators:

- 7,600 people
- £1.1 million Annual Average Damages from residential properties
- £72,000 Annual Average Damages from non-residential properties

Objective ID: 10071, 10072

Target area:



Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 390 residential properties • £780,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 390 residential properties • £780,000 Annual Average Damages
Applies across Forth Estuary 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 10/20 there are 200 residential properties at risk and Annual Average Damages of £390,000.

Actions to manage flooding in Potentially Vulnerable Area 10/20

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 the Niddrie Burn / Burdiehouse Burn 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>
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

Action (ID):	FLOOD PROTECTION STUDY (100710005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Edinburgh / Burdiehouse caused by flooding from the Niddrie Burn (10071, 10072)		
Delivery lead:	The City of Edinburgh Council		
Priority:	National:		Within local authority:
	57 of 168		1 of 3
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Niddrie Burn in Edinburgh to assess whether flood storage, modification of conveyance, installation / modification of fluvial control structures, flood defences and sediment management could reduce flood risk. The study should also consider the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. This study should also aim to improve gauging on the Niddrie / Burdiehouse Burn catchment in partnership between SEPA and the City of Edinburgh Council.		
Potential impacts			
Economic:	The study could benefit 178 residential properties and 19 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.8 million.		
Social:	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 and socially vulnerable people located within the study area. In addition there is one healthcare facility which has been identified as potentially		

Social:	benefitting from any proposed actions.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Burdiehouse Burn (water body ID 3600) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Gardens and designed landscapes, listed buildings, local nature reserves, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100710017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Edinburgh / Burdiehouse caused by flooding from the Niddrie Burn (10071, 10072)		
Delivery lead:	The City of Edinburgh Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the flood control structure and flood storage area at Greendykes and flood defences at Nether Craigour once completed. The works are due to be completed in 2016/17.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

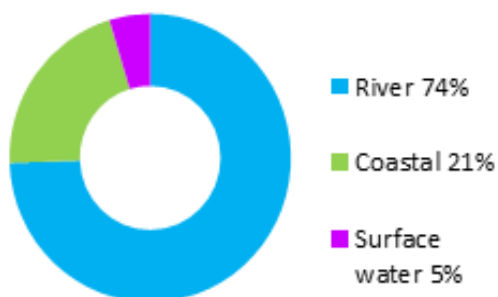
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Musselburgh (Potentially Vulnerable Area 10/21)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	Edinburgh coastal

Summary of flooding impacts



At risk of flooding

- 1,300 residential properties
- 280 non-residential properties
- £3.3 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

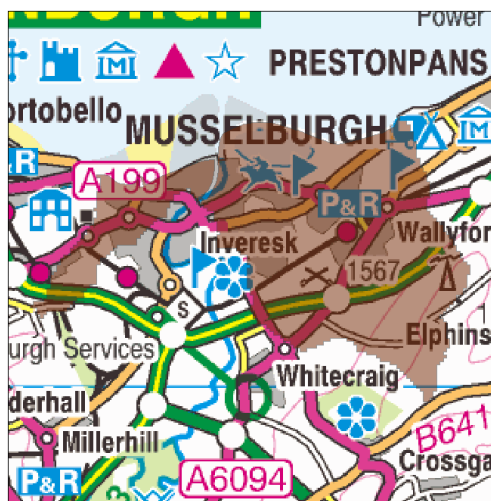
Actions

Musselburgh (Potentially Vulnerable Area 10/21)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	Edinburgh coastal

Background

This Potentially Vulnerable Area is 12km² and is part of the Almond and Edinburgh Group catchment. This is a small, partially urbanised area covering the town of Musselburgh. The main watercourse is the River Esk which passes through the centre of Musselburgh before discharging into the Firth of Forth at Fisherrow Sands.



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There are approximately 1,300 residential properties and 280 non-residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £3.3 million.

The majority of damages are caused by river flooding.

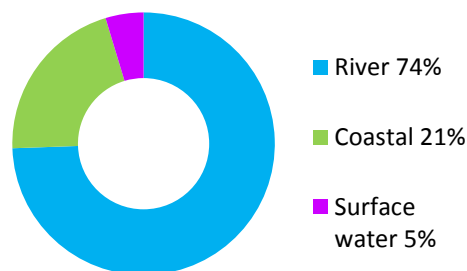


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the River Esk to Musselburgh. The highest risk of surface water flooding is in Wallyford and Pinkie Brae in Musselburgh and the highest risk of coastal flooding is from the Firth of Forth to Musselburgh and Inveresk.

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

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 7,200)	280	1,300	1,600
Non-residential properties (total 910)	60	280	320
People	610	3,000	3,500
Community facilities	<10 Includes: educational buildings and healthcare facilities	<10 Includes: educational buildings and healthcare facilities	<10 Includes: educational buildings and healthcare facilities
Utilities	<10	<10	<10
Transport links (excluding minor roads)	5 A roads, 2 B roads at 26 locations 1 Railway route at 6 locations: Berwick-upon-Tweed to Edinburgh	5 A roads, 2 B roads at 83 locations 1 Railway route at 11 locations: Berwick-upon-Tweed to Edinburgh	5 A roads, 3 B roads at 106 locations 1 Railway route at 11 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km ²)	0.3	0.3	0.3
Designated cultural heritage sites	9	18	18
Agricultural land (km ²)	0.3	0.6	0.7

Table 1: Summary of flood impacts from all sources

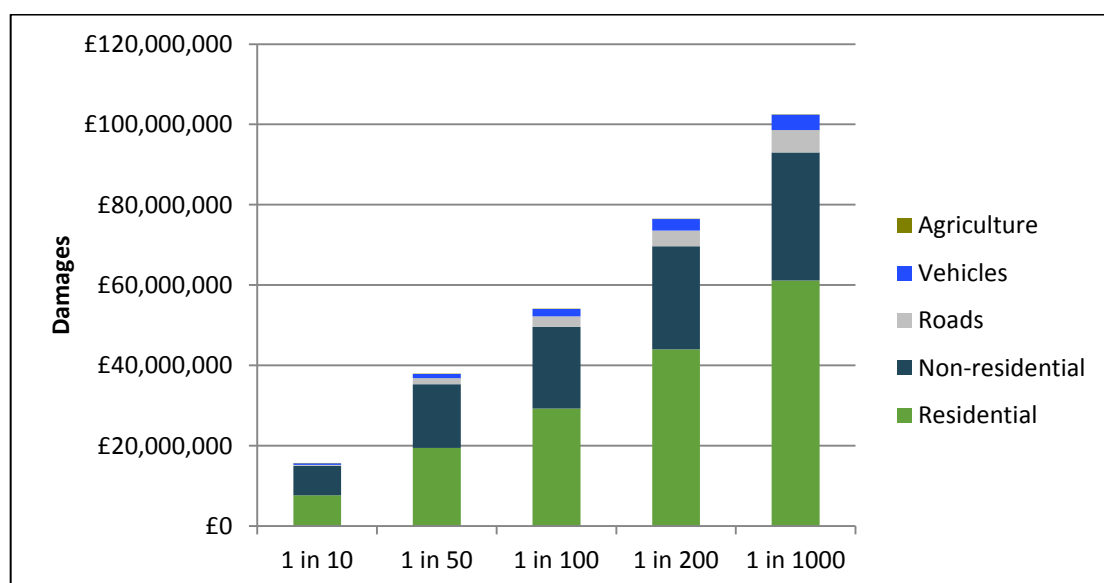


Figure 2: Damages by flood likelihood

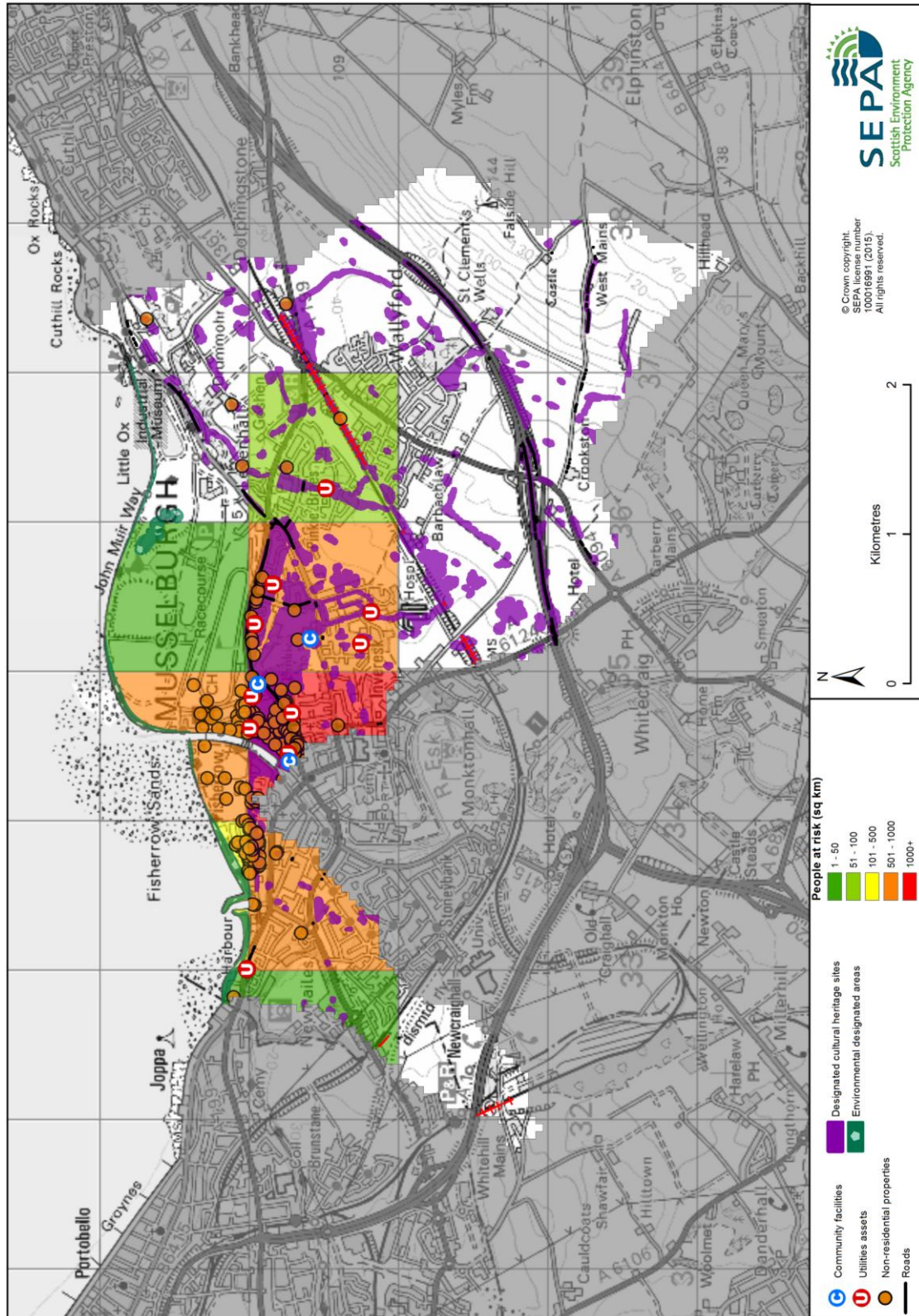


Figure 3: Impacts of flooding

History of flooding

The following significant floods have been recorded in this area:

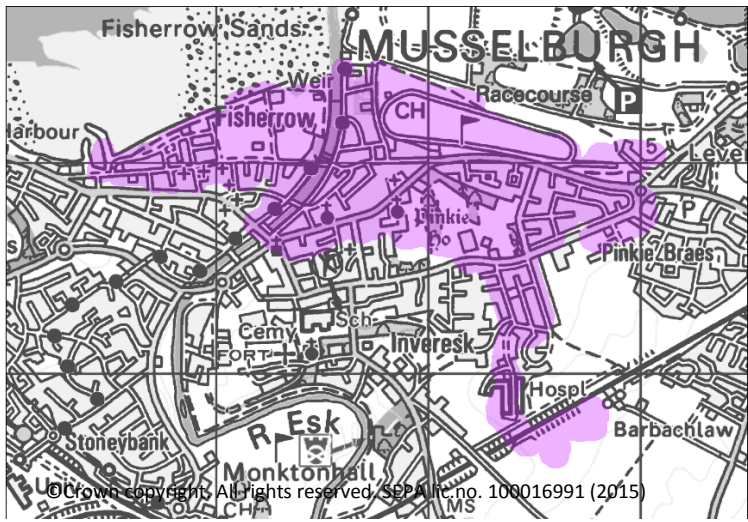
- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the east coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads.
- 13 August 1948: Evacuation required in Musselburgh after flooding from the River Esk occurred in Eskside West, Eskside East, Shorthope Street, Millhill and areas of the High Street.

There is also a history of groundwater flooding in Musselburgh, particularly around the Pinkie area.

Objectives to manage flooding in Potentially Vulnerable Area 10/21

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 Musselburgh Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding

Indicators:	Target area:
<ul style="list-style-type: none"> • 2,800 people • £1.6 million Annual Average Damages from residential properties • £1.2 million Annual Average Damages from non-residential properties 	
<p>Objective ID: 10075, 10076</p>	

Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 1,300 residential properties • £3.3 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 1,300 residential properties • £3.3 million Annual Average Damages
Applies across Forth Estuary 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 10/21 there are 50 residential properties at risk and Annual Average Damages of £150,000.

Actions to manage flooding in Potentially Vulnerable Area 10/21

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 Musselburgh 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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100750006)				
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)				
Delivery lead:	East Lothian Council				
Priority:	National:		Within local authority:		
	11 of 42		1 of 2		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed for Musselburgh to reduce flood risk from the River Esk. The scheme would consist of flood defences and earth embankments and would provide a 1 in 200 year standard of protection. Part of this proposed scheme is located in Potentially Vulnerable Area 10/22. The benefits and impacts have been assessed for the whole scheme.				
Potential impacts					
Economic:	The proposed scheme may benefit 1489 residential properties and 407 non-residential properties at risk of flooding in this location, with estimated damages avoided of £30 million. The flood protection scheme has an estimated benefit cost ratio of 5.3.				
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there are three educational buildings which have been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.				
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the				

Environmental:	responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Forth Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, gardens and designed landscapes, battlefields, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands.
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Action (ID):	NATURAL FLOOD MANAGEMENT STUDY (100750003)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)		
Delivery lead:	East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	A natural flood management study has been recommended for Musselburgh to assess whether wave attenuation could help reduce flood risk. The study should link with the proposed flood protection scheme in Musselburgh. Part of this proposed study is located in Potentially Vulnerable Area 10/22. The benefits and impacts have been assessed for the whole study.		
Potential impacts			
Economic:	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.		
Social:	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.		
Environmental:	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. The Leith Docks to Port Seton coastline (water body ID 200034) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		

Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Lower Esk area and Pinkie Burn areas to improve understanding of flood risk. SEPA will seek to develop flood mapping in the Dunbar to Stirling 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Musselburgh flood warning area which is part of the Esk (East Lothian) river flood warning scheme. Continue to maintain the Musselburgh Coastal flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100750012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Lothian Tenants and Residents Panel, Musselburgh and Inveresk Community Council and Musselburgh Waterfront Group operate in this area. The groups aim to involve the community in area-specific issues and could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

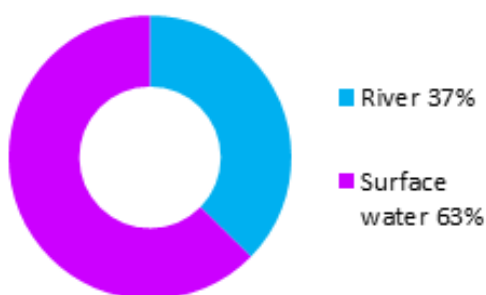
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding. East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Lasswade, Penicuik, Dalkeith and Musselburgh (Potentially Vulnerable Area 10/22)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	River Esk (Lothian)

Summary of flooding impacts



At risk of flooding

- 320 residential properties
- 320 non-residential properties
- £1.8 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	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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

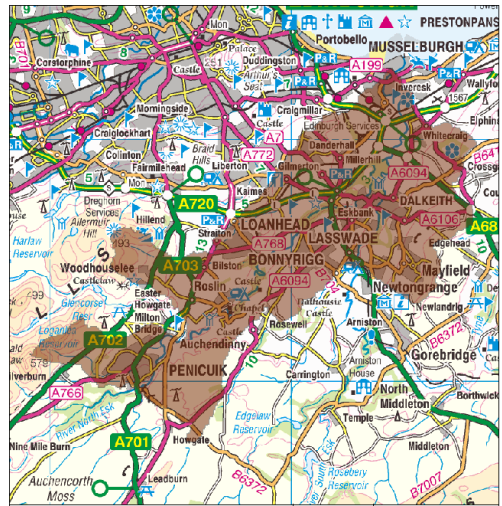
Actions

Lasswade, Penicuik, Dalkeith and Musselburgh (Potentially Vulnerable Area 10/22)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	River Esk (Lothian)

Background

This Potentially Vulnerable Area is 97km² and is part of the Almond and Edinburgh catchment (shown below). This is a large, mainly rural area covering southern Musselburgh, Dalkeith, Lasswade, Bonnyrigg and Penicuik.



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The main watercourse is the River Esk, forming after the confluence of the River North Esk and River South Esk on the outskirts of Dalkeith. Other notable watercourses include the Park Burn and the Bilston Burn. The majority of damages are caused by surface water flooding.

There are approximately 320 residential properties and 320 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £1.8 million.

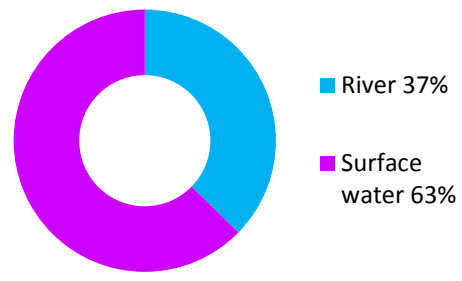


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of surface water flooding is in Dalkeith, Lasswade and Bonnyrigg. The highest risk of river flooding is from the River Esk, the River South Esk, the River North Esk and the Loan Burn to Musselburgh, Dalkeith and Newbattle, Lasswade and Bonnyrigg and Penicuik. Musselburgh is also at risk from coastal flooding from the Firth of Forth.

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. For this Potentially Vulnerable Area the highest damages are to roads, notably the A720, A7 and A1, followed by damages to non-residential properties.

The location of the impacts of flooding is shown in Figure 3. The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 34,000)	60	320	490
Non-residential properties (total 3,500)	140	320	370
People	140	700	1,100
Community facilities	<10 Educational buildings	<10 Educational buildings	<10 Includes: educational buildings and emergency services
Utilities	<10	20	30
Transport links (excluding minor roads)	15 A roads, 11 B roads at 286 locations 1 Railway route at 2 locations: Berwick-upon-Tweed to Edinburgh	15 A roads, 11 B roads at 427 locations 1 Railway route at 5 locations: Berwick-upon-Tweed to Edinburgh	15 A roads, 12 B roads at 497 locations 1 Railway route at 7 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km²)	0.1	0.1	0.1
Designated cultural heritage sites	38	47	49
Agricultural land (km²)	0.8	1.1	1.2

Table 1: Summary of flooding impacts

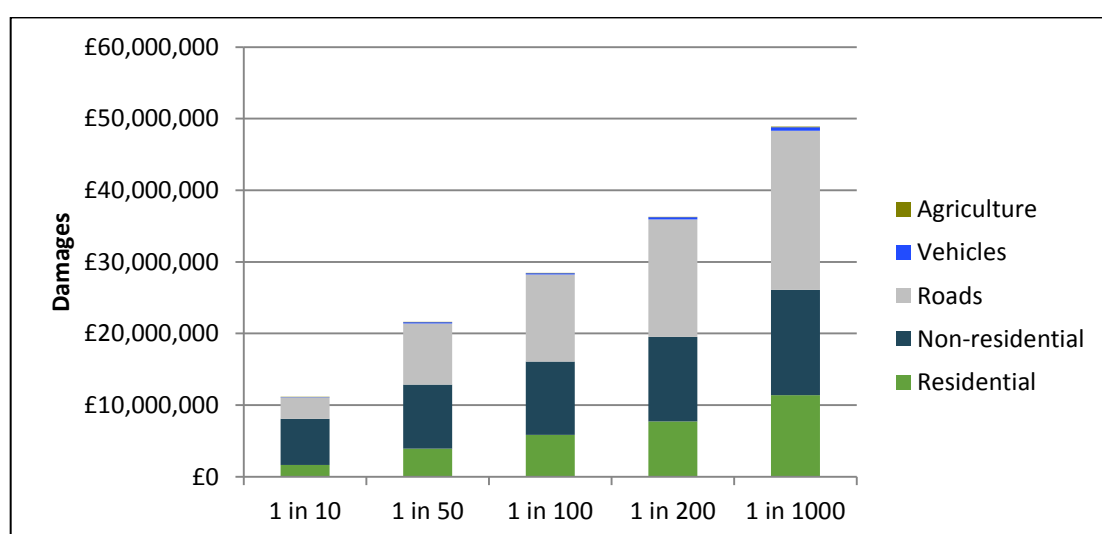


Figure 2: Damages by flood likelihood

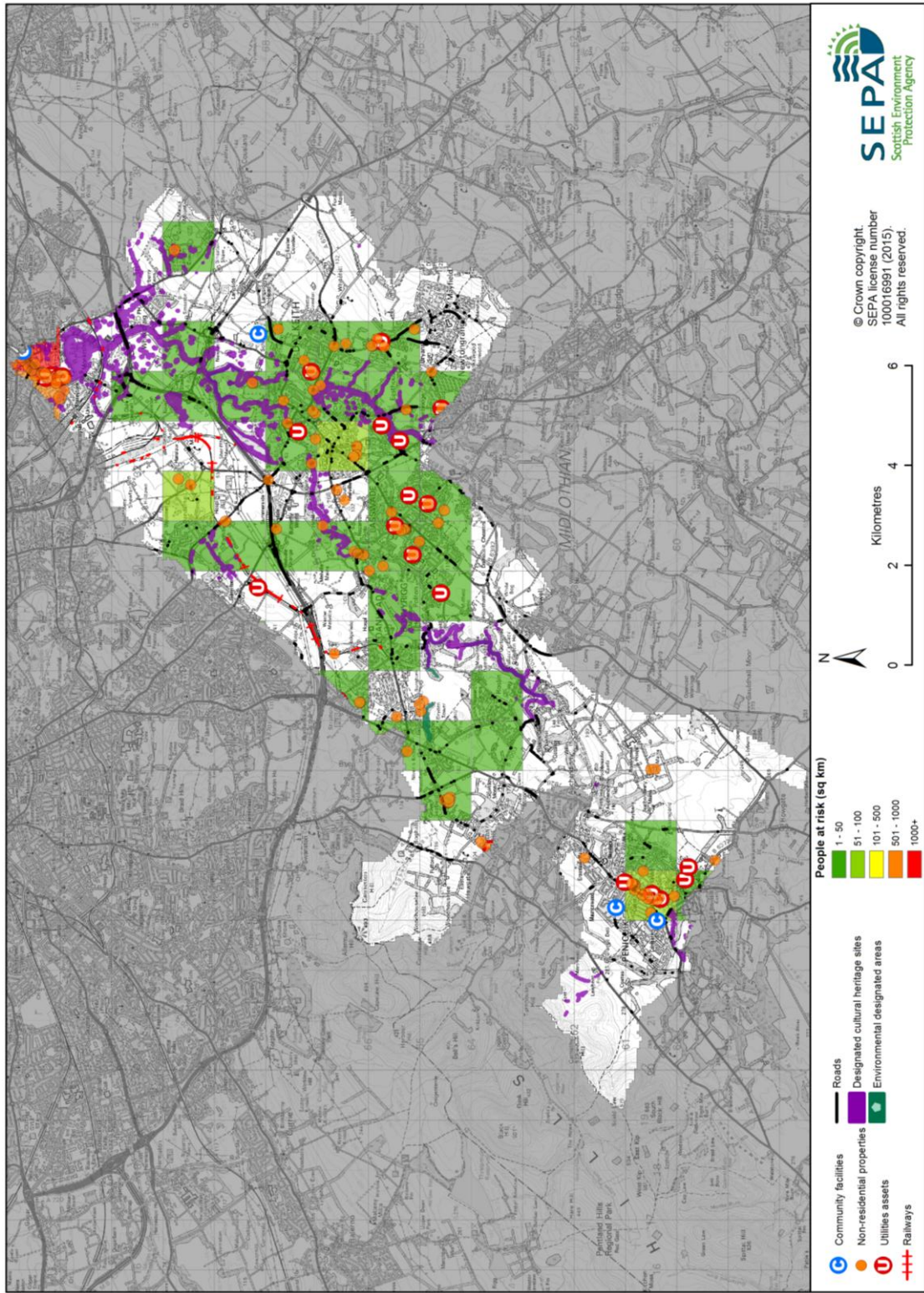


Figure 3: Impacts of flooding

History of flooding

Two significant floods have been recorded in this area. On 6 October 1990 Musselburgh was affected by flooding from the River Esk. On 13 August 1948 evacuation was required in Musselburgh after flooding occurred in Eskside West, Eskside East, Shorthope Street, Millhill and areas of the High Street.

Objectives to manage flooding in Potentially Vulnerable Area 10/22

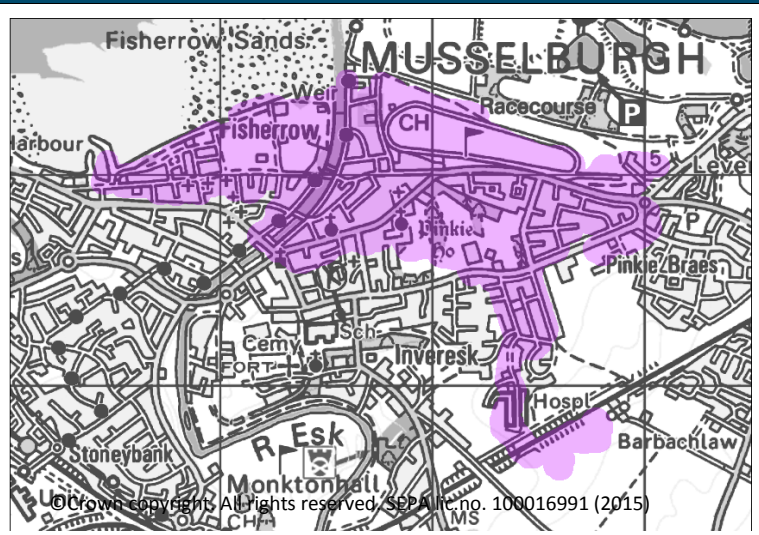
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding

Indicators:

- 2,800 people
- £1.6 million Annual Average Damages from residential properties
- £1.2 million Annual Average Damages from non-residential properties

Target area:



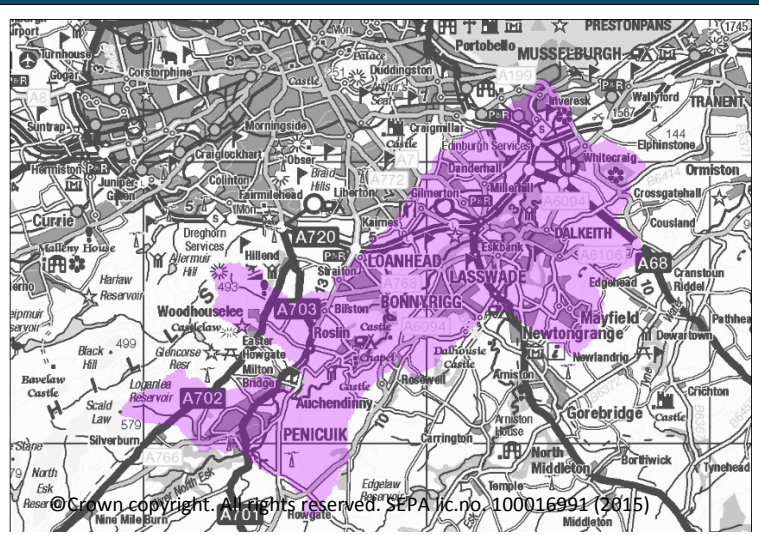
Objective ID: 10075, 10076

Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding

Indicators:

- £65,000 Annual Average Damages from residential properties
- £39,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10077

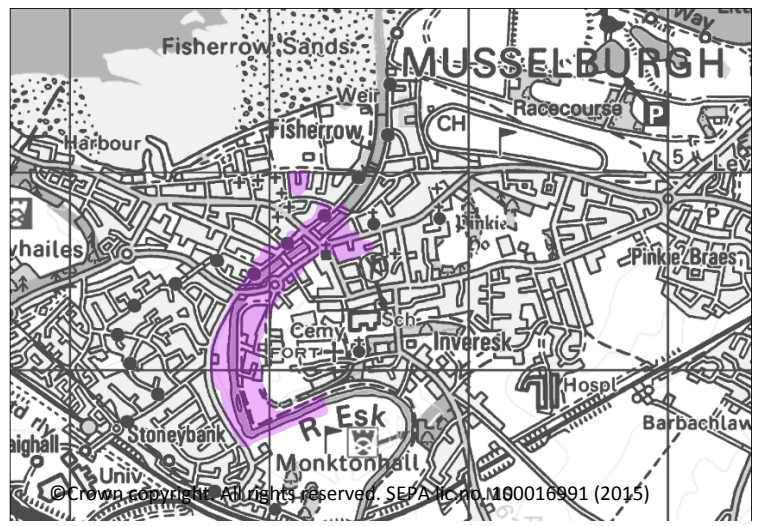
Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk

Indicators:

Target area:

- £96,000 Annual Average Damages from residential properties
- £390,000 Annual Average Damages from non-residential properties

Objective ID: 10078



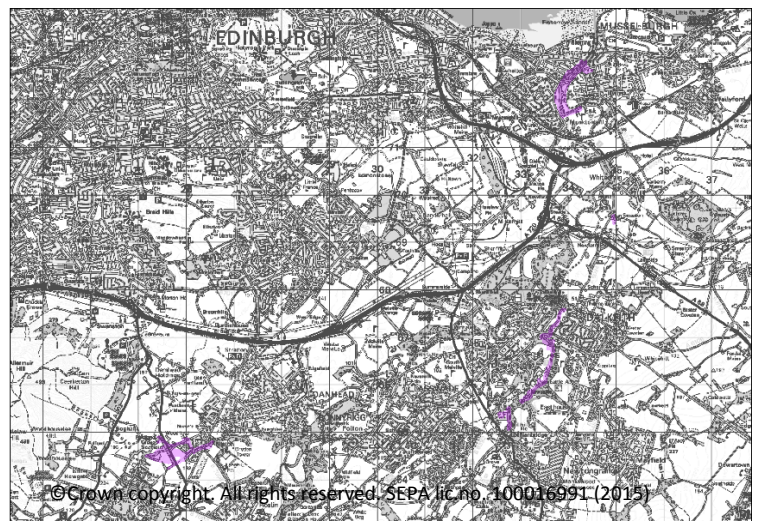
Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding

Indicators:

Target area:

- 370 people

Objective ID: 10079



Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 320 residential properties • £1.8 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 320 residential properties • £1.8 million Annual Average Damages
Applies across Forth Estuary 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 10/22 there are 170 residential properties at risk and Annual Average Damages of £1.1 million.

Actions to manage flooding in Potentially Vulnerable Area 10/22

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 Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100750006)				
Objective (ID):	<p>Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding (10079)</p> <p>Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk (10078)</p> <p>Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)</p> <p>Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)</p>				
Delivery lead:	East Lothian Council				
Priority:	National:		Within local authority:		
	11 of 42		1 of 2		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed for Musselburgh to reduce flood risk from the River Esk. The scheme would consist of flood defences and earth embankments and would provide a 1 in 200 year standard of protection. Part of this proposed scheme is located in Potentially Vulnerable Area 10/21. The benefits and impacts have been assessed for the whole scheme.				
Potential impacts					
Economic:	The proposed scheme may benefit 1489 residential properties and 407 non-residential properties at risk of flooding in this location, with estimated damages avoided of £30 million. The flood protection scheme has an estimated benefit cost ratio of 5.3.				

Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there are three educational buildings which have been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Forth Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, gardens and designed landscapes, battlefields, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands.

Action (ID):	FLOOD PROTECTION STUDY (100770005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
Delivery lead:	Midlothian Council		
Priority:	National:	Within local authority:	
	142 of 168	1 of 1	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Dalkeith and Lasswade to assess whether flood defences and sediment management could reduce flood risk. The study should also consider the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit 11 residential properties and three non-residential properties at risk of flooding in this location, with potential damages avoided of up to £650,000.		
Social:	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 and socially vulnerable people located within the study area.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. Conservation areas, gardens and designed landscapes and ancient woodlands are also present in the study area and could be positively or negatively impacted.		

Action (ID):	NATURAL FLOOD MANAGEMENT STUDY (100750003)		
Objective (ID):	<p>Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding (10079)</p> <p>Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk (10078)</p> <p>Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)</p> <p>Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)</p>		
Delivery lead:	East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	<p>A natural flood management study has been recommended for Musselburgh to assess whether wave attenuation could help reduce flood risk. The study should link with the proposed flood protection scheme in Musselburgh. Part of this proposed study is located in Potentially Vulnerable Area 10/21. The benefits and impacts have been assessed for the whole study.</p>		
Potential impacts			
Economic:	<p>The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.</p>		
Social:	<p>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.</p>		
Environmental:	<p>Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. The Leith Docks to Port Seton coastline (water body ID 200034) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. 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 Firth of Forth Special Protection Area.</p>		

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	<p>Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)</p>		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		

Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Lower Esk 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100770017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
Delivery lead:	Midlothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood protection schemes and defences. These include defences along the Bilston Burn, the Rullion Road Penicuik Flood Protection Scheme and the Polton Road Bridge Relief Culvert Flood Protection Scheme.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Musselburgh flood warning area which is part of the Esk (East Lothian) river flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100770012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Lothian Tenants and Residents Panel operate in this area. The group aims to involve the community in area-specific issues and could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

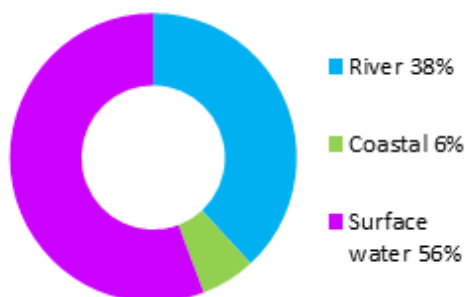
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Cockenzie, Port Seton, Longniddry and Prestonpans (Potentially Vulnerable Area 10/23)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	East Lothian coastal

Summary of flooding impacts



At risk of flooding

- 120 residential properties
- 60 non-residential properties
- £740,000 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>	Community flood action groups	<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

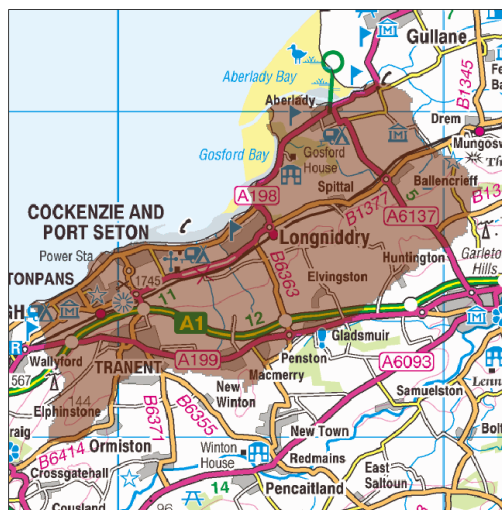
Actions

Cockenzie, Port Seton, Longniddry and Prestonpans (Potentially Vulnerable Area 10/23)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	East Lothian coastal

Background

This Potentially Vulnerable Area is 65km² and part of the East Lothian and Berwickshire catchment (shown below). This is a moderately sized coastal area covering Cockenzie and Port Seton, Tranent, Prestonpans and Longniddry. The main watercourses are the Redhouse Burn and the Seton Dean.



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The area has a risk of river, surface water and coastal flooding. The majority of damages are caused by surface water flooding.

There are approximately 120 residential properties and 60 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £730,000.

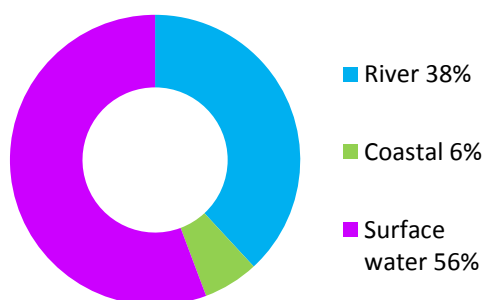


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of surface water flooding is in Tranent.

The risk of flooding to people, property, as well as 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. For this Potentially Vulnerable Area the highest damages are to roads, notably the A1 and A198, followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 14,000)	50	120	180
Non-residential properties (total 1,100)	30	60	70
People	110	260	390
Community facilities	0	0	0
Utilities	<10	10	10
Transport links (excluding minor roads)	4 A roads, 7 B roads at 103 locations 1 Railway route at 23 locations: Berwick-upon-Tweed to Edinburgh	4 A roads, 7 B roads at 158 locations 1 Railway route at 28 locations: Berwick-upon-Tweed to Edinburgh	4 A roads, 7 B roads at 174 locations 1 Railway route at 29 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km ²)	0.5	0.5	0.6
Designated cultural heritage sites	19	24	25
Agricultural land (km ²)	1.4	1.9	2.1

Table 1: Summary of flooding impacts

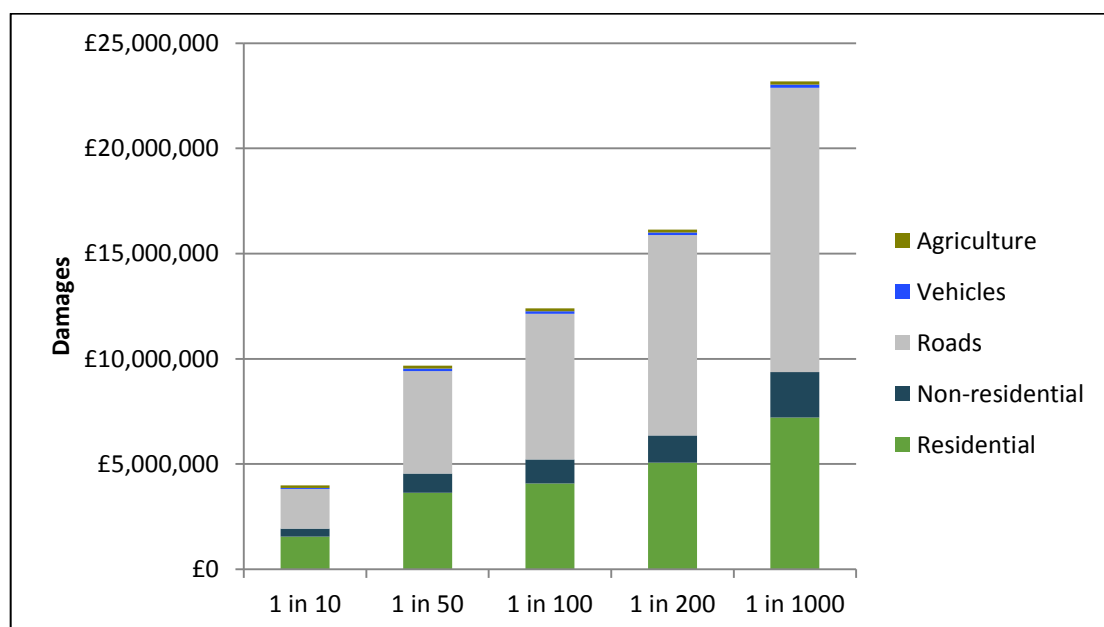


Figure 2: Damages by flood likelihood

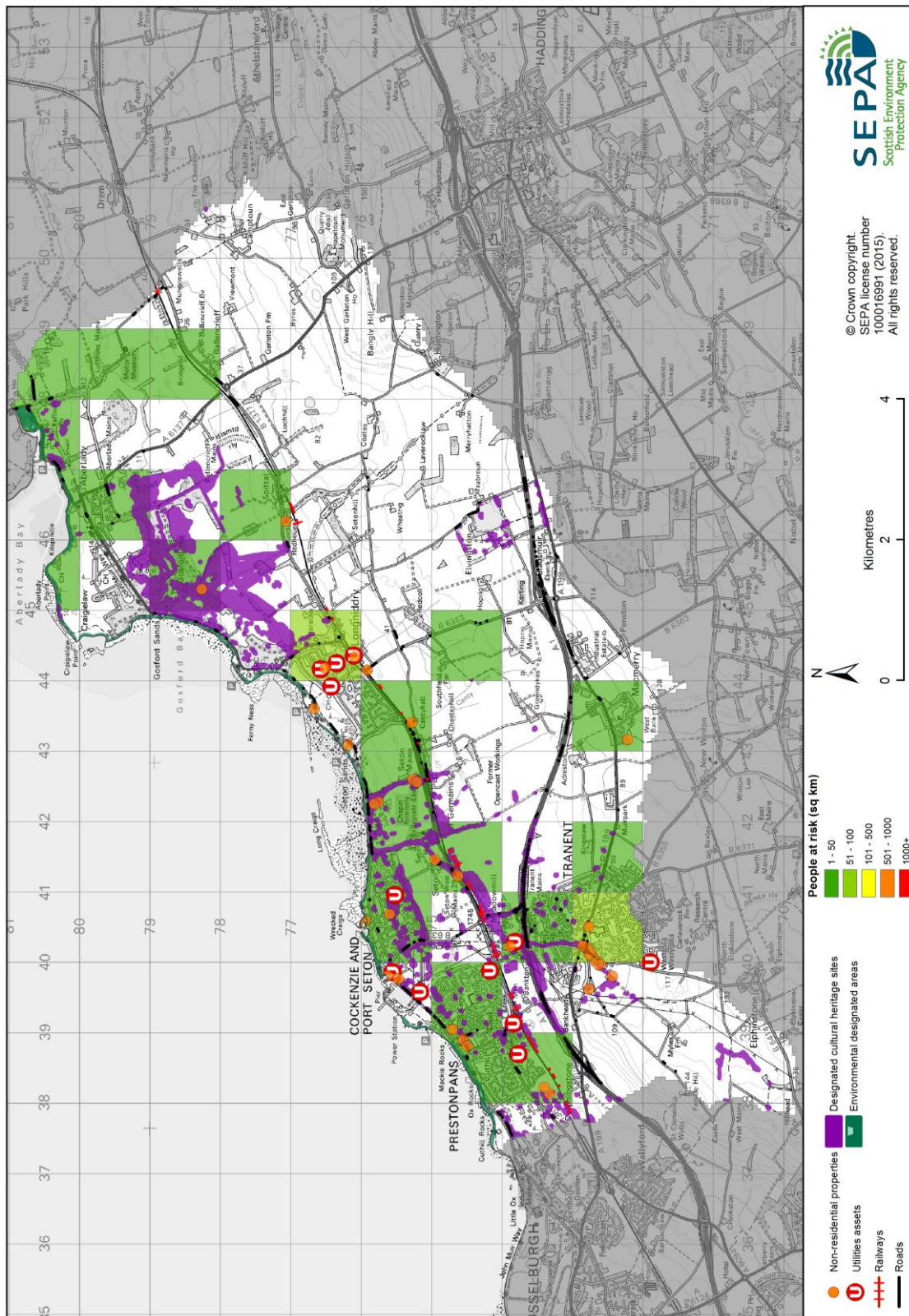


Figure 3: Impacts of flooding

History of flooding

One significant coastal flood has been recorded in this area. On 30 March 2010, a tidal surge coincided with the highest mean tides of the year and caused extensive flooding along the east coast of Scotland. The Firth of Forth, notably Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick were badly affected. Impacts included flooding of properties, damage to harbours, seawalls and roads.

Objectives to manage flooding in Potentially Vulnerable Area 10/23

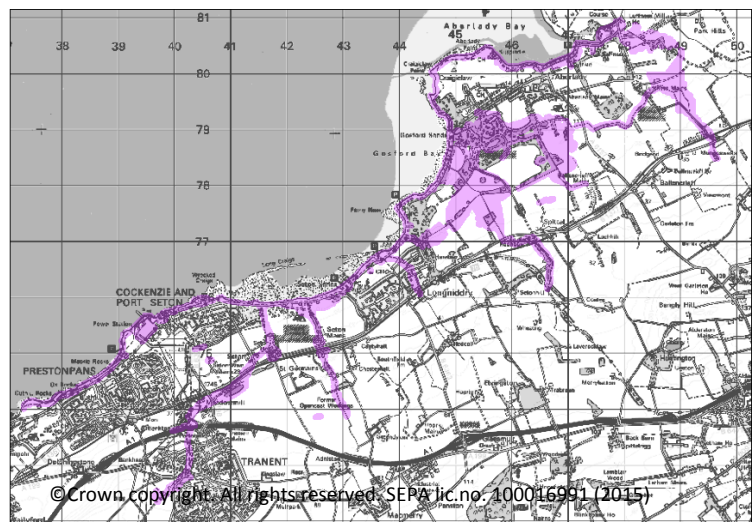
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in the Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area caused by river and coastal flooding

Indicators:

- £230,000 Annual Average Damages from residential properties
- £40,000 Annual Average Damages from non-residential properties

Target area:



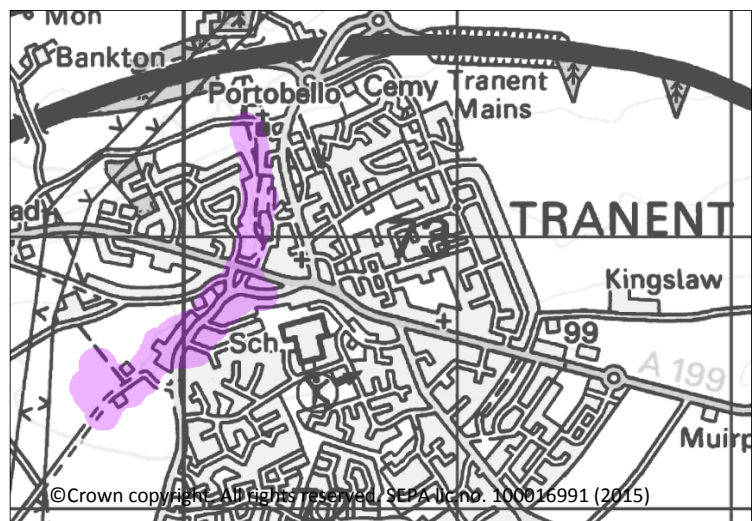
Objective ID: 10080

Reduce risk to people in Tranent from river flooding

Indicators:

- 90 people

Target area:



Objective ID: 10081

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 120 residential properties • £730,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 120 residential properties • £730,000 Annual Average Damages
Applies across Forth Estuary 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 10/23

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 Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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

Action (ID):	FLOOD PROTECTION STUDY (100800005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area caused by river and coastal flooding (10080)		
Delivery lead:	East Lothian Council		
Priority:	National:		Within local authority:
	61 of 168		1 of 3
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Cockenzie, Port Seton and Prestonpans to assess whether modification of conveyance, installation/ modification of fluvial control structures, flood defences, sediment management and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be considered include wave attenuation. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.		
Potential impacts			
Economic:	The study could benefit 63 residential properties and 14 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.2 million.		
Social:	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 and socially vulnerable people located within the study area. Natural flood management actions can restore and enhance natural environments		

Social:	and create opportunities for recreation and tourism.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Firth of Forth Special Protection Area. Conservation areas, scheduled monuments, gardens and designed landscapes and battlefields are also present in the study area and could be positively or negatively impacted.

Action (ID):	FLOOD PROTECTION STUDY (100810005)		
Objective (ID):	Reduce risk to people in Tranent from river flooding (10081)		
Delivery lead:	East Lothian Council		
Priority:	National:	Within local authority:	
	79 of 168	2 of 3	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Tranent to assess whether modification of conveyance, installation/ modification of fluvial control structures, direct flood defences and sediment management could reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit 29 residential properties and 46 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.6 million.		
Social:	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 and socially vulnerable people located within the study area.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. Conservation areas and battlefields are also present in the study area and could be positively or negatively impacted.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		

Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 when these projects are completed.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100800017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area caused by river and coastal flooding (10080)		
Delivery lead:	East Lothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing flood defences along the coast.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Prestonpans and Port Seton flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100800012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Cockenzie, Port Seton, Longniddry and Prestonpans Potentially Vulnerable Area caused by river and coastal flooding (10080)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Lothian Tenants and Residents Panel and Port Seton and Cockenzie Coastal Regeneration Group operate in this area. The groups could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	East Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

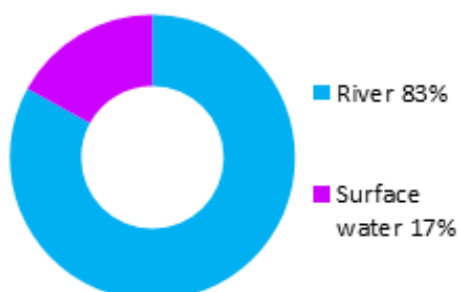
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Haddington (Potentially Vulnerable Area 10/24)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	River Tyne

Summary of flooding impacts



At risk of flooding

- 230 residential properties
- 140 non-residential properties
- £700,000 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

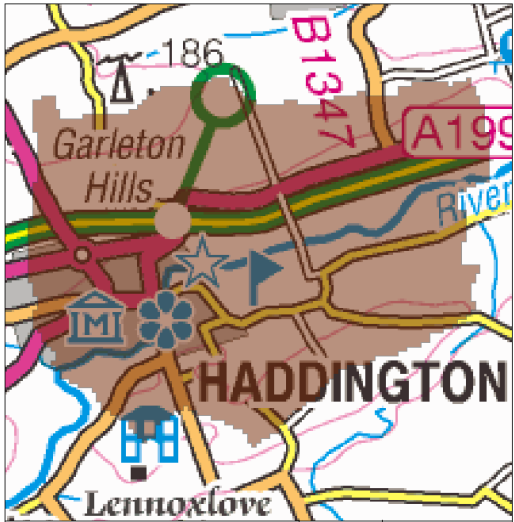
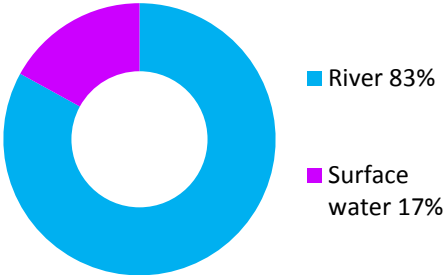
The actions below have been selected to manage flood risk.

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

Haddington (Potentially Vulnerable Area 10/24)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	River Tyne

Background	
<p>This Potentially Vulnerable Area is 16km² and part of the East Lothian and Berwickshire catchment group (shown below). This is a small, rural area covering Haddington and its surroundings. The main watercourse is the River Tyne which flows through the south of Haddington before continuing through the town centre and out to the east.</p>  <p><small>© Crown copyright. SEPA licence number 100016991 (2015). All rights reserved.</small></p>	<p>The area has a risk of river and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by river flooding.</p> <p>There are approximately 230 residential properties and 140 non-residential properties at risk of flooding.</p> <p>The Annual Average Damages are approximately £700,000.</p>  <p>Figure 1: Annual Average Damages by flood source</p>

Summary of flooding impacts

The highest risk of river flooding is from the River Tyne to Haddington and the highest risk of surface water flooding is also in Haddington.

The risk of flooding to people, 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. 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.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,800)	70	230	330
Non-residential properties (total 670)	30	140	210
People	150	500	720
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10	<10	<10
Transport links (excluding minor roads)	4 A roads, 1 B roads at 25 locations	5 A roads, 2 B roads at 59 locations	5 A roads, 2 B roads at 68 locations
Environmental designated areas (km ²)	0	0	0
Designated cultural heritage sites	9	11	13
Agricultural land (km ²)	0.6	0.8	0.9

Table 1: Summary of flooding impacts

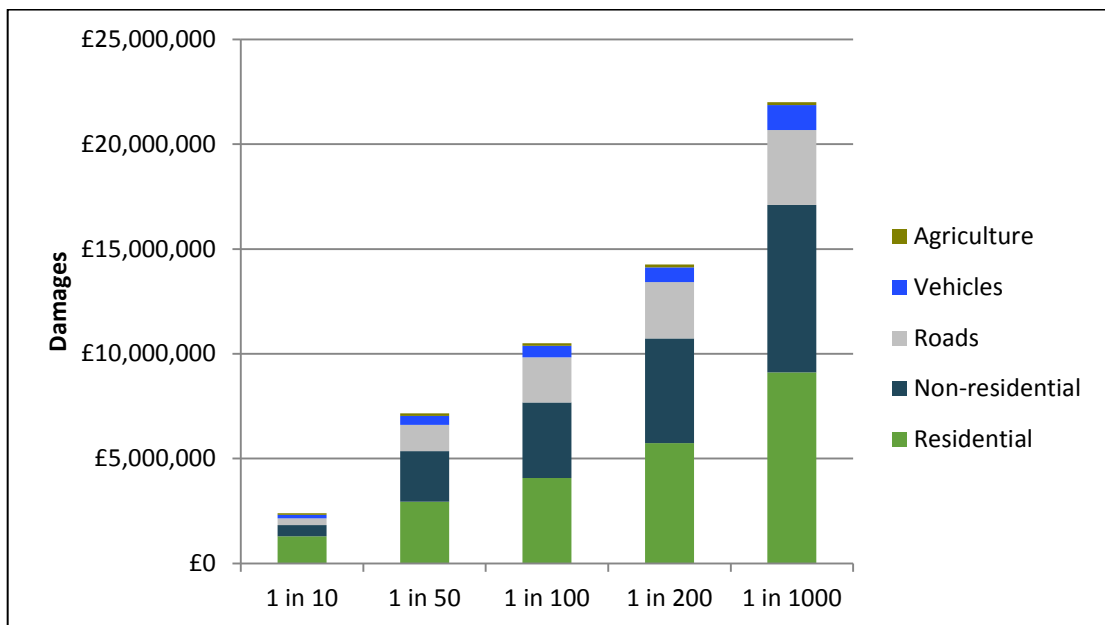


Figure 2: Damages by flood likelihood

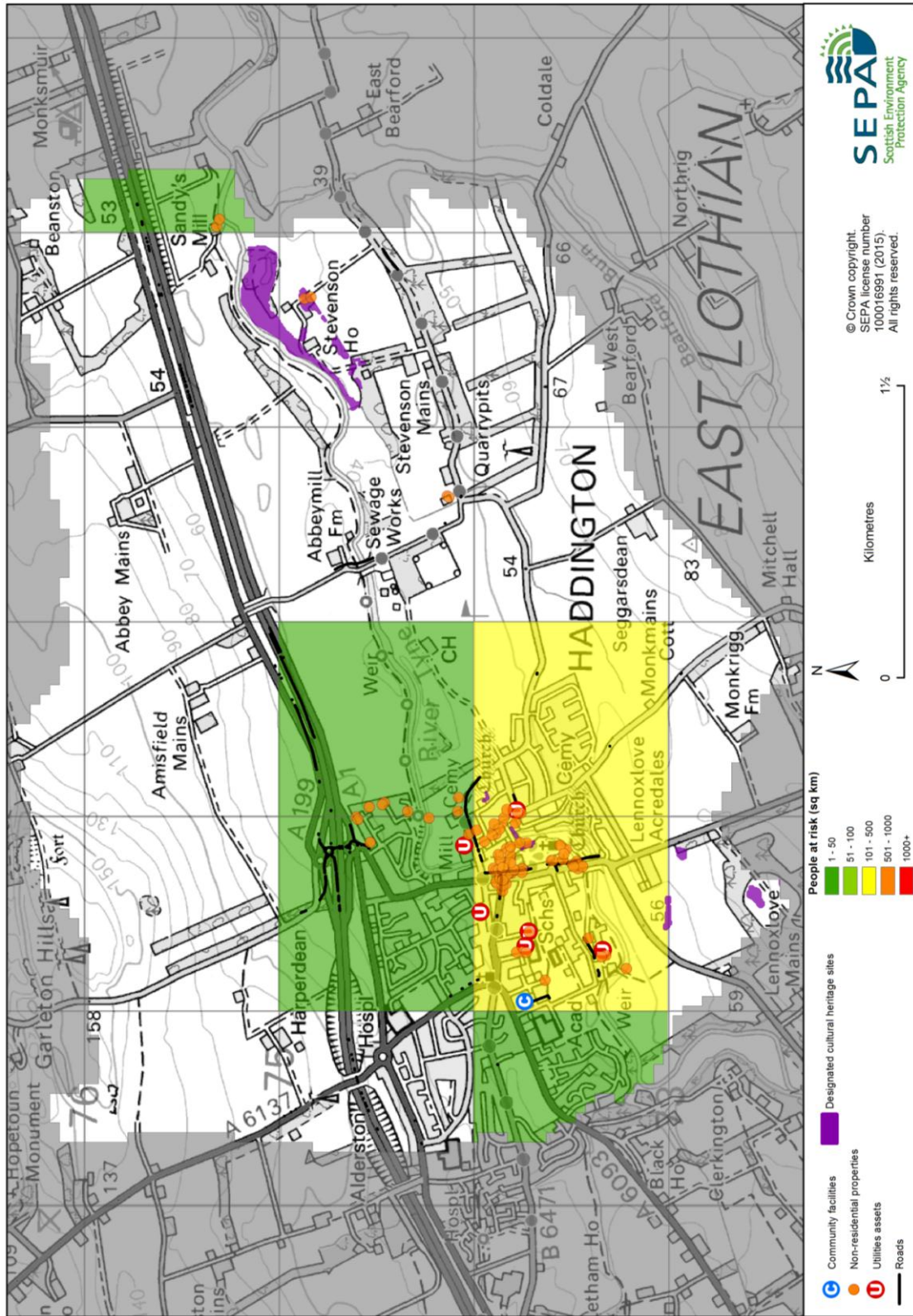


Figure 3: Impacts of flooding

History of flooding

The following significant river floods have been recorded in this area:

- 7 July and 25 Sept 2012: High river levels in Haddington caused drains and watercourses to back up and unable to discharge into the River Tyne. This resulted in property flooding.
- 12 August 1948: The waters of the River Tyne rose 2 inches above the levels reached during the large flood of 1775. The High Street flooded to a depth of 57 inches. The flood event is known to have affected a large area with railway lines and road bridges damaged or destroyed and multiple buildings flooded.
- 1926 and 1932: Photographic evidence of large flood events in Haddington.
- October 1775: A large flood event in Haddington inundated most of the town.

Objectives to manage flooding in Potentially Vulnerable Area 10/24

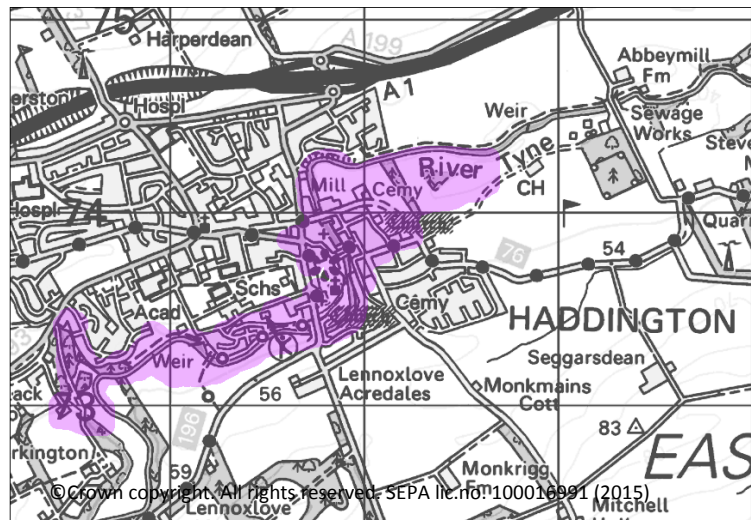
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Haddington Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Haddington caused by flooding from the River Tyne

Indicators:

Target area:

- £370,000 Annual Average Damages from residential properties
- £180,000 Annual Average Damages from non-residential properties



Objective ID: 10082

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 230 residential properties • £700,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 230 residential properties • £700,000 Annual Average Damages
Applies across Forth Estuary 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 10/24

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 Haddington 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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100820006)				
Objective (ID):	Reduce economic damages to residential and non-residential properties in Haddington caused by flooding from the River Tyne (10082)				
Delivery lead:	East Lothian Council				
Priority:	National:		Within local authority:		
	37 of 42		2 of 2		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed for Haddington to reduce flood risk from the River Tyne. The scheme would consist of flood defences, possibly in combination with natural flood management.				
Potential impacts					
Economic:	The proposed scheme may benefit 231 residential and non-residential properties at risk of flooding in this location, with estimated damages avoided of £8.8 million. The flood protection scheme has an estimated benefit cost ratio of 1.2.				
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.				
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. A number of nationally and locally designated sites are present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, gardens and designed landscapes and listed buildings.				

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the three flood warning areas in Haddington which are part of the Tyne river flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100820012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Haddington caused by flooding from the River Tyne (10082)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Lothian Tenants and Residents Panel and Friends of the River Tyne operate in this area. The groups could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through SEPA-led education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	East Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

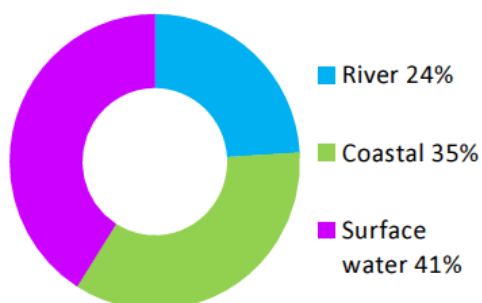
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Providing an emergency response to flooding is the responsibility of many organisations, including 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. East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Dunbar and West Barns (Potentially Vulnerable Area 10/25)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	East Lothian coastal

Summary of flooding impacts



At risk of flooding

- 40 residential properties
- 20 non-residential properties
- £220,000 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>	Community flood action groups	<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
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

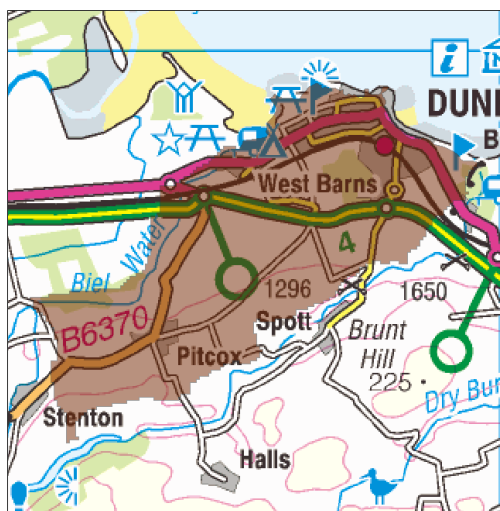
Dunbar and West Barns (Potentially Vulnerable Area 10/25)

Local Plan District	Local authority	Main catchment
Forth Estuary	East Lothian Council	East Lothian coastal

Background

This Potentially Vulnerable Area is 19km² and part of the East Lothian and Berwickshire catchment group (shown below). This is a small, coastal area covering Dunbar and West Barns and its immediate surroundings.

The main watercourse is the Biel Water which flows through the west of the area towards the north east, passing around the West Barns and discharging into the North Sea at Belhaven Bay.



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The area has a risk of river, coastal and surface water flooding. The majority of damages in this Potentially Vulnerable Area are caused by surface water flooding.

There are approximately 40 residential properties and 20 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £220,000.

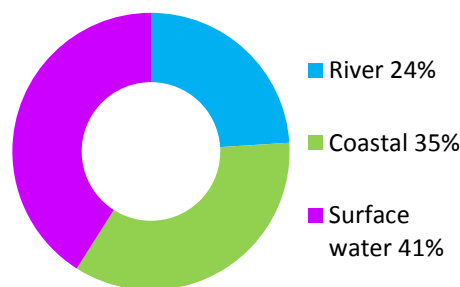


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The greatest risk of river flooding is from the Biel Water and the Hedderwick Burn to Dunbar and West Barns. The greatest risk of coastal flooding is from the North Sea to Dunbar and West Barns.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to roads, notably the A1 and Shore Road, and residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 4,100)	<10	40	60
Non-residential properties (total 600)	10	20	20
People	20	80	140
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	3 A roads, 1 B road at 39 locations 1 Railway route at 15 locations: Berwick-upon-Tweed to Edinburgh	3 A roads, 1 B road at 49 locations 1 Railway route at 17 locations: Berwick-upon-Tweed to Edinburgh	3 A roads, 1 B road at 57 locations 1 Railway route at 18 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km ²)	0.2	0.2	0.2
Designated cultural heritage sites	9	10	10
Agricultural land (km ²)	0.3	0.4	0.5

Table 1: Summary of flooding impacts

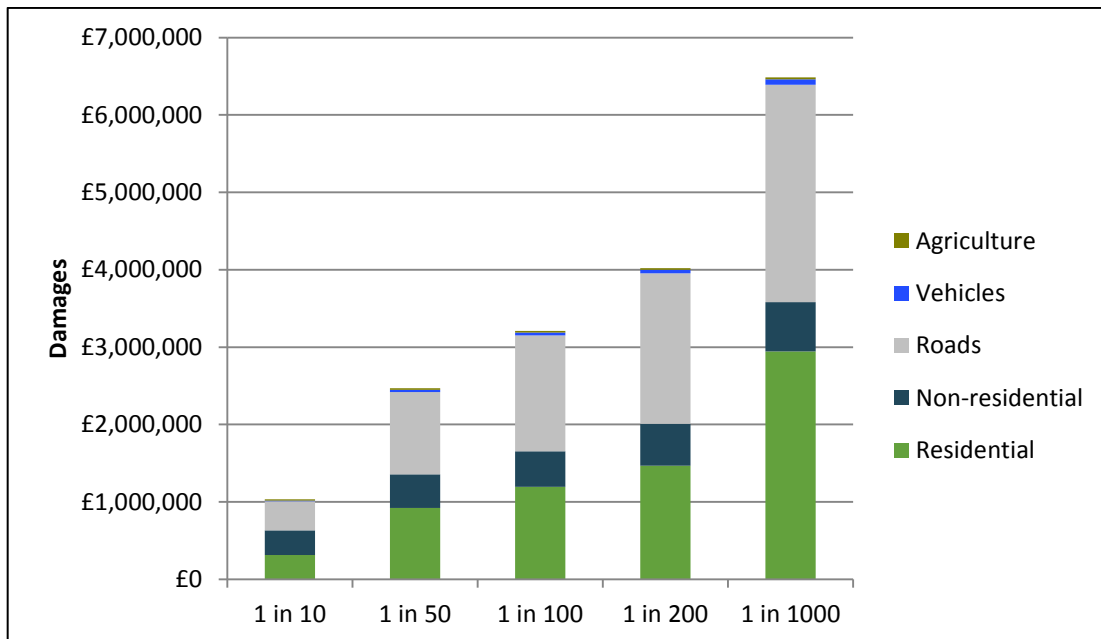
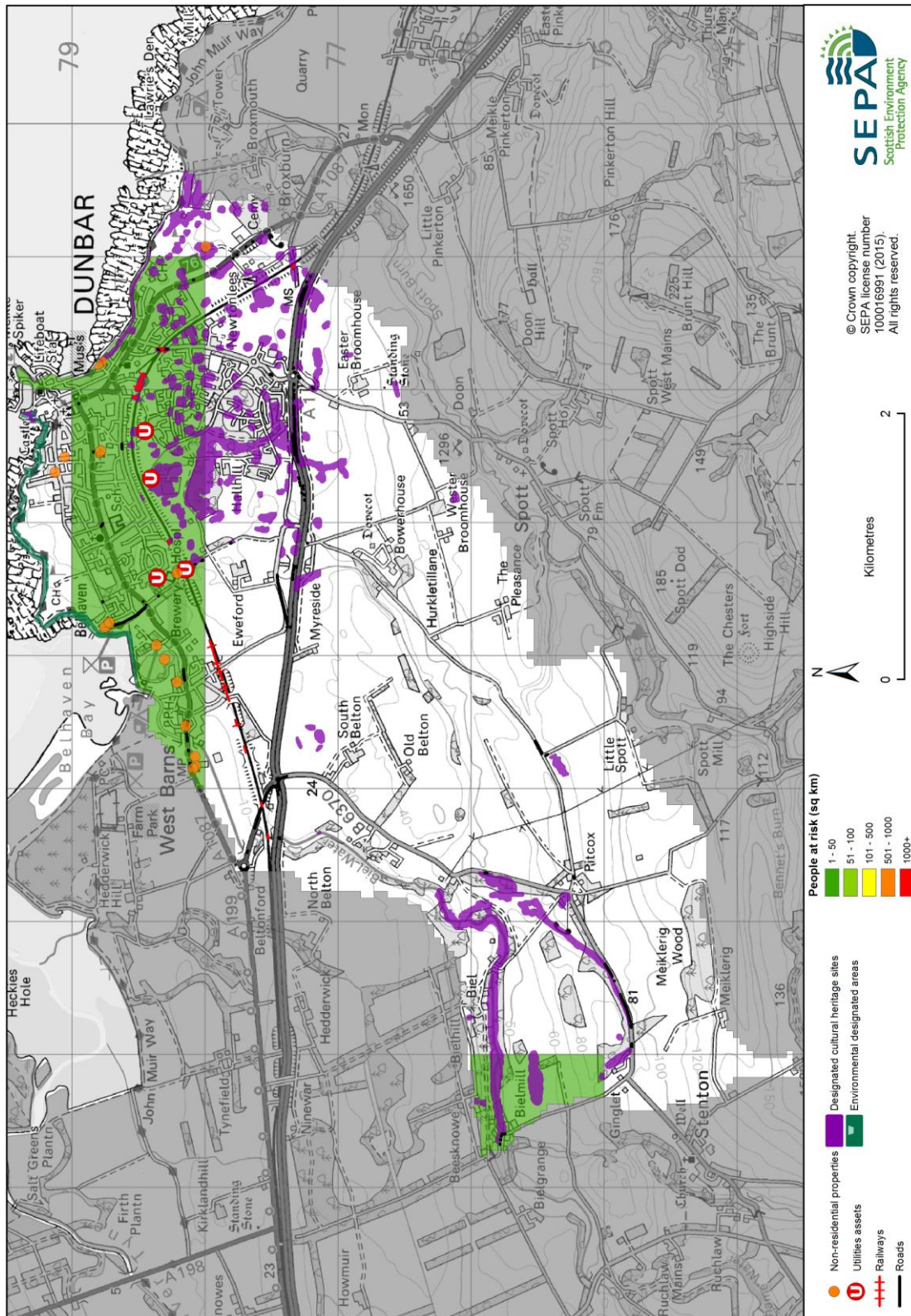


Figure 2: Damages by flood likelihood



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Kilometres

- Non-residential properties
- U Utilities assets
- Designated cultural heritage sites
- Environmental designated areas

Figure 3: Impacts of flooding

History of flooding

The following flood events have been identified as significant in this Potentially Vulnerable Area:

- 5 December 2012: A combination of wind and high tides caused large waves and coastal flooding along the east coast of Scotland. There was significant damage to North Berwick harbour and damage to the communal slipway at Dunbar harbour.
- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the east coast of Scotland. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. The flood caused damage to properties, harbours, seawalls and roads.
- 22 October 2002: Belhaven hospital flooded from the river. Patients had to be evacuated after the generator room was shut down and wards closed.
- August 1949: Storm surge resulted in flooding to Dunbar.

Objectives to manage flooding in Potentially Vulnerable Area 10/25

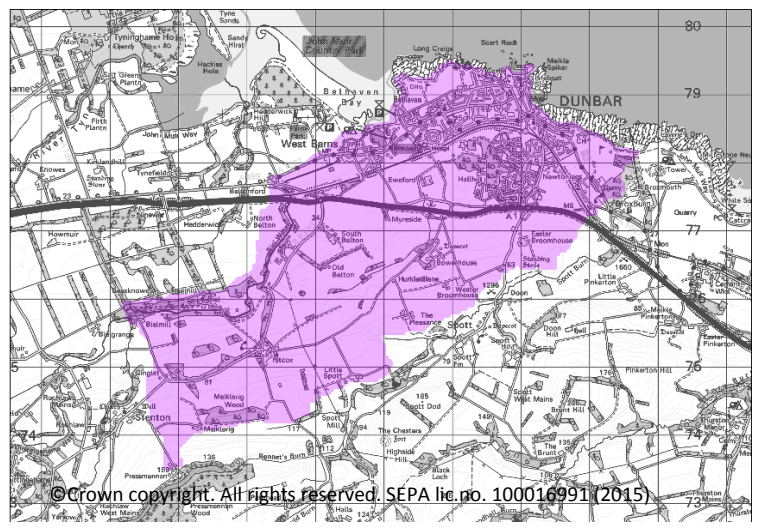
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Dunbar and West Barns Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in the Dunbar and West Barns Potentially Vulnerable Area caused by river and coastal flooding

Indicators:

Target area:

- £66,000 Annual Average Damages from residential properties
- £32,000 Annual Average Damages from non-residential properties



Objective ID: 10083

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 40 residential properties • £220,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 40 residential properties • £220,000 Annual Average Damages
Applies across Forth Estuary 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 10/25

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 Dunbar and West Barns Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	FLOOD PROTECTION STUDY (100830005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Dunbar and West Barns Potentially Vulnerable Area caused by river and coastal flooding (10083)		
Delivery lead:	East Lothian Council		
Priority:	National:		Within local authority:
	110 of 168		3 of 3
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Dunbar/ West Barns to assess whether modification of conveyance, flood defences, sediment management and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be considered include wave attenuation. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline. The study should also assess the risk and mitigation of wave overtopping at North Berwick.		
Potential impacts			
Economic:	The study could benefit 49 residential properties and 15 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £3.4 million.		
Social:	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.		

Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Firth of Forth Special Protection Area. Conservation areas, battlefields and listed buildings are also present in the study area and could be positively or negatively impacted.
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Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Dunbar to Stirling 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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Dunbar including West Barns flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100830012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in the Dunbar and West Barns Potentially Vulnerable Area caused by river and coastal flooding (10083)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Dunbar Shore and Harbour Neighbourhood Group, East Lothian Tenants and Residents Panel and North Berwick Environment Group operate in this area. The groups could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	East Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

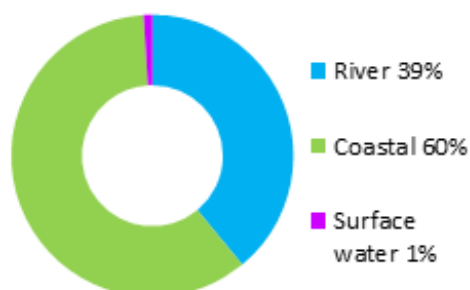
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Berwickshire Coast (Potentially Vulnerable Area 10/26)

Local Plan District	Local authority	Main catchment
Forth Estuary	Scottish Borders Council	Berwickshire coastal

Summary of flooding impacts



At risk of flooding

- 70 residential properties
- 50 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>	<i>New flood warning</i>	Community flood action groups	<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
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

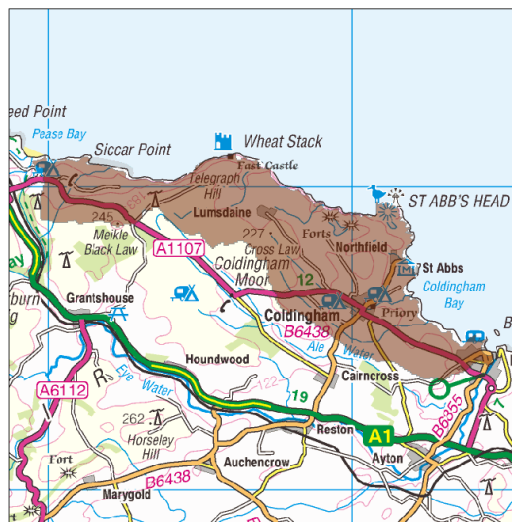
Actions

Berwickshire Coast (Potentially Vulnerable Area 10/26)

Local Plan District	Local authority	Main catchment
Forth Estuary	Scottish Borders Council	Berwickshire coastal

Background

This Potentially Vulnerable Area is 40km² and part of the East Lothian and Berwickshire catchment group (shown below). This is a small, coastal area covering part of Eyemouth, St Abb's Head and Coldingham. The main watercourses are the Eye Water, the Milldown Burn and the Dowlaw Burn. There are also a number of unnamed burns which also contribute to flooding.



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Coastal and river flood interaction occurs on the Eye Water with coastal flooding extending upstream for approximately 1.5km. The majority of flood damages in this Potentially Vulnerable Area are caused by coastal flooding.

There are approximately 70 residential properties and 50 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £300,000.

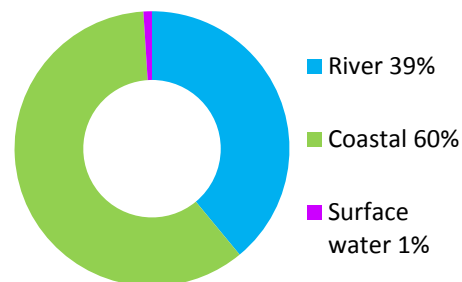


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of coastal flooding is from the North Sea to Eyemouth. The highest risk of river flooding is from the Eye Water to Eyemouth.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties.

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

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,800)	60	70	80
Non-residential properties (total 400)	20	50	50
People	130	160	170
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	1 A road, 1 B road at 3 locations	1 A road, 1 B road at 4 locations	1 A road, 1 B road at 3 locations
Environmental designated areas (km ²)	0.8	0.8	0.8
Designated cultural heritage sites	6	6	6
Agricultural land (km ²)	0.1	0.1	0.1

Table 1: Summary of flooding impacts

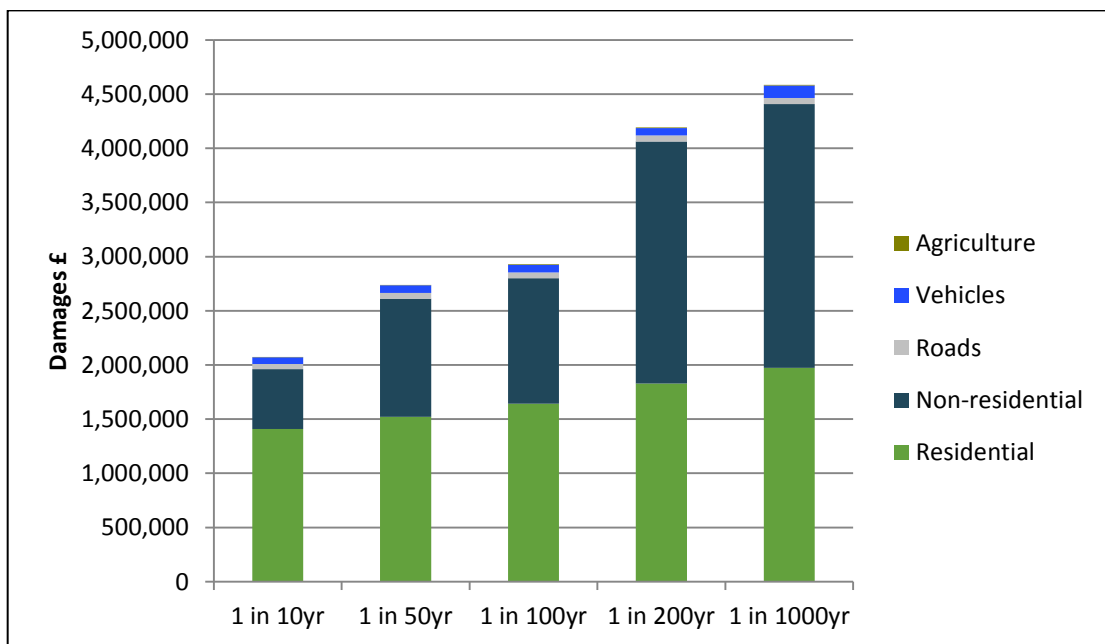


Figure 2: Damages by flood likelihood

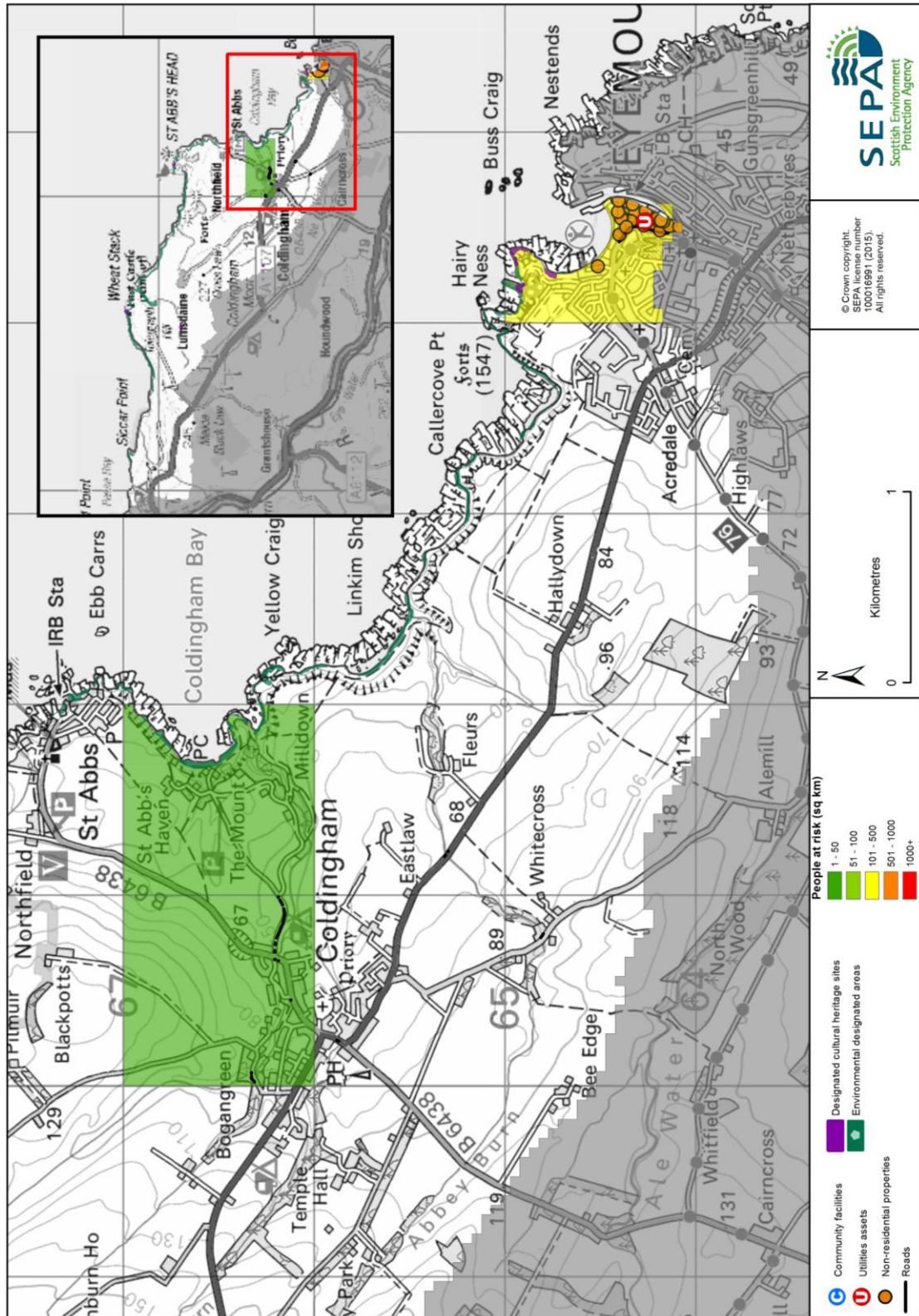


Figure 3: Impacts of flooding

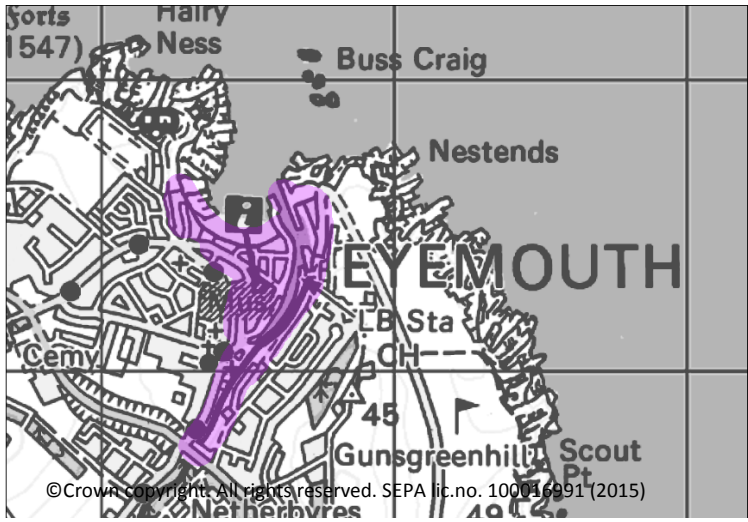
History of flooding

This area has a long history of flooding. The following significant floods have been recorded:

- 4 January 2014: A tidal surge combined with a storm surge affected coastal areas across the east of Scotland, particularly around the Forth Estuary.
- 25 July 2013: Surface water flooding in Albert Road, Church Street and Harbour Road, Eyemouth resulted in both residential and commercial property being flooded.
- 5 December 2013: 1m North Sea surge combined with a high spring tide of 5.4m caused flooding along the east coast. Eyemouth was affected. Almost all of Harbour Road in Eyemouth was flooded but water inundated only 10 properties. This is less than would have been expected as a result of preventative actions taken by the local authority and property owners.
- 28 June 2012: Surface water flooding in Albert Road, Church Street and Harbour Road, Eyemouth resulted in both residential and commercial properties being flooded.
- 30 and 31 March 2010: A tidal surge coincided with highest mean tides of the year and caused extensive flooding along the east coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected include Leith, Musselburgh, Prestonpans, Port Seton, Dunbar, Eyemouth and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads.
- 7 January 2005: Combination of river and coastal flooding affected properties at Harbour Road and various other premises in Eyemouth.
- 22 October 2002: A storm caused combined river and coastal flooding in Eyemouth. Impacts included flooding of properties in Harbour Road and the High Street.
- 12 August 1948: A major flood on Eye Water resulted in water inundating Eyemouth and up to the second floor of some buildings. The harbour was completely awash and houses were evacuated. Seven railway bridges and two road bridges were washed away. Multiple buildings were flooded. The railway was destroyed with long term restrictions on travel. This is thought to have been greater than a 1 in 200 year flood event in Eyemouth.
- 1881: The 'Eyemouth Disaster' resulted in 191 fishermen drowning.

Objectives to manage flooding in Potentially Vulnerable Area 10/26

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 Berwickshire Coast Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Eyemouth caused by coastal flooding	
Indicators:	Target area:
<ul style="list-style-type: none"> • £89,000 Annual Average Damages from residential properties • £45,000 Annual Average Damages from non-residential properties 	
Objective ID: 10084	

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 70 residential properties • £300,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 70 residential properties • £300,000 Annual Average Damages
Applies across Forth Estuary 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 10/26 there are <10 residential properties at risk and Annual Average Damages of £3,400.

Actions to manage flooding in Potentially Vulnerable Area 10/26

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 Berwickshire Coast Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Action (ID):	FLOOD PROTECTION STUDY (100840005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Eyemouth caused by coastal flooding (10084)		
Delivery lead:	Scottish Borders Council		
Priority:	National:		Within local authority:
	66 of 168		4 of 6
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Eyemouth to assess whether flood defences, sediment management and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be considered include wave attenuation. The study should be carried out in conjunction with the Shoreline Management Plan (2016-2018). The study should take a sustainable approach and consider the interaction between actions and potential effects on coastal processes along the shoreline.		
Potential impacts			
Economic:	The study could benefit 34 residential properties and 21 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £5.7 million.		
Social:	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.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

Environmental:	environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. 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 Berwickshire and North Northumberland Coast Special Area of Conservation. Conservation areas, listed buildings and designated bathing waters are also present in the study area and could be positively or negatively impacted.
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Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will work with the local authority to review the existing study data and establish any further work required to enable an update of the flood maps in the Eyemouth coastal area. SEPA will support the local authority if further work beyond a strategic scale is required.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD WARNING (100990030)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Grantshouse to Eyemouth flood warning area which is part of the Eye river flood warning scheme. Continue to maintain the Eyemouth Coastal flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100840012)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Eyemouth caused by coastal flooding (10084)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Eyemouth Resilient Community Group and the St Abbs Resilient Community Group operate in this area. The groups could help increase community resilience to flooding.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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 offers discounted flood protection products to homes and businesses at risk in the Scottish Borders.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Borders Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

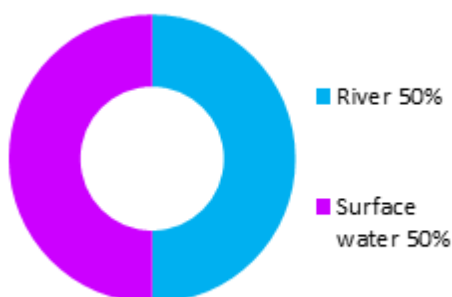
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

South Gyle, Broxburn and Bathgate (Potentially Vulnerable Area 10/27)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	River Almond

Summary of flooding impacts



At risk of flooding

- 1,600 residential properties
- 330 non-residential properties
- £2.4 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	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<i>Property level protection scheme</i>	Site protection plans
Flood protection study	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

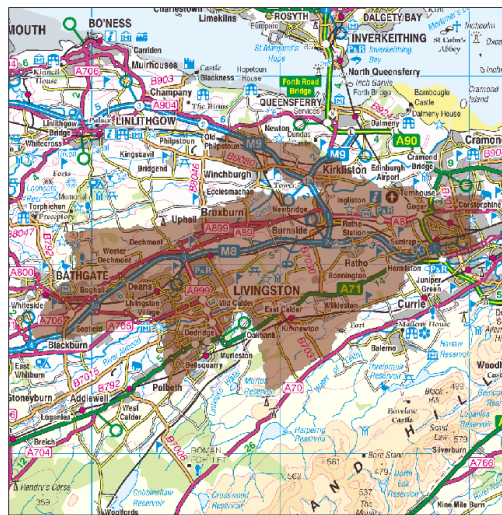
Actions

South Gyle, Broxburn and Bathgate (Potentially Vulnerable Area 10/27)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	River Almond

Background

This Potentially Vulnerable Area is 154km² and situated in the lower reaches of the River Almond catchment (shown below). It includes the western areas of Edinburgh including Edinburgh Airport and South Gyle, Bathgate, Broxburn and Livingston.



The main watercourses are the River Almond and its tributaries the Brox Burn and the Gogar Burn.

The area has a risk of river and surface water flooding.

There are approximately 1,600 residential properties and 330 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £2.4 million.

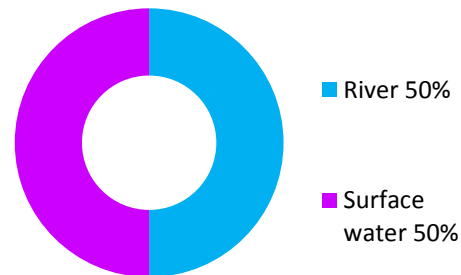


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the Gogar Burn, Brox Burn and the River Almond to South Gyle (Edinburgh), Broxburn and Kirkliston. The highest risk of surface water flooding is in Edinburgh, Broxburn, Livingston and Bathgate.

The risk of flooding to people, 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. For this Potentially Vulnerable Area the highest damages are to residential properties, non-residential properties and roads. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 51,000)	130	1,600	1,900
Non-residential properties (total 4,500)	70	330	370
People	290	3,500	4,300
Community facilities	0	<10 Includes: educational buildings and emergency services	<10 Includes: educational buildings and emergency services
Utilities	20	70	90
Transport links (excluding minor roads)	2 M roads (M8, M9), 8 A roads, 9 B roads at 352 locations 5 Railway routes at 64 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction	2 M roads (M8, M9), 8 A roads, 9 B roads at 540 locations 5 Railway routes at 120 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction Edinburgh Airport	2 M roads (M8, M9), 9 A roads, 9 B roads at 615 locations 5 Railway routes at 123 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction Edinburgh Airport
Environmental designated areas (km ²)	0	0	0
Designated cultural heritage sites	27	32	34
Agricultural land (km ²)	3.5	5.0	5.3

Table 1: Summary of flooding impacts

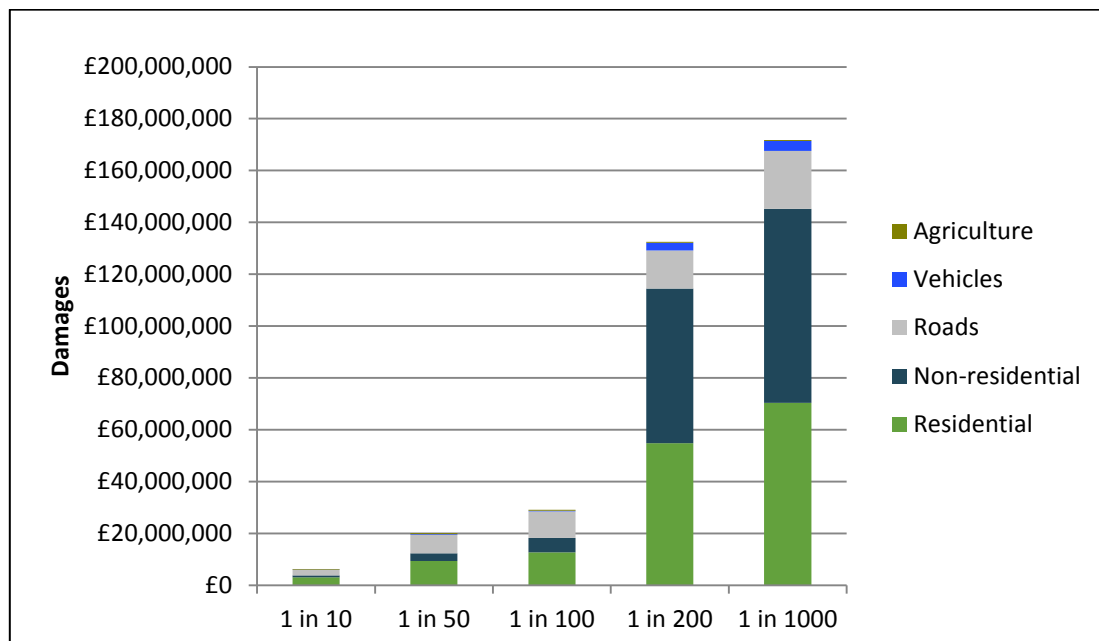


Figure 2: Damages by flood likelihood

History of flooding

The following significant floods have been recorded in this area:

- 20 August 2008: Over 100 properties flooded including at least five businesses.
- 2004 and 2005: A series of flood events in Broxburn resulted in the promotion of the Broxburn Flood Protection Scheme.
- 8 November 2000: High water levels on the River Almond caused flooding in Kirkliston.
- 26 April 2000: High water levels on the Gogar Burn caused flooding at Edinburgh Airport and nearby hotel.

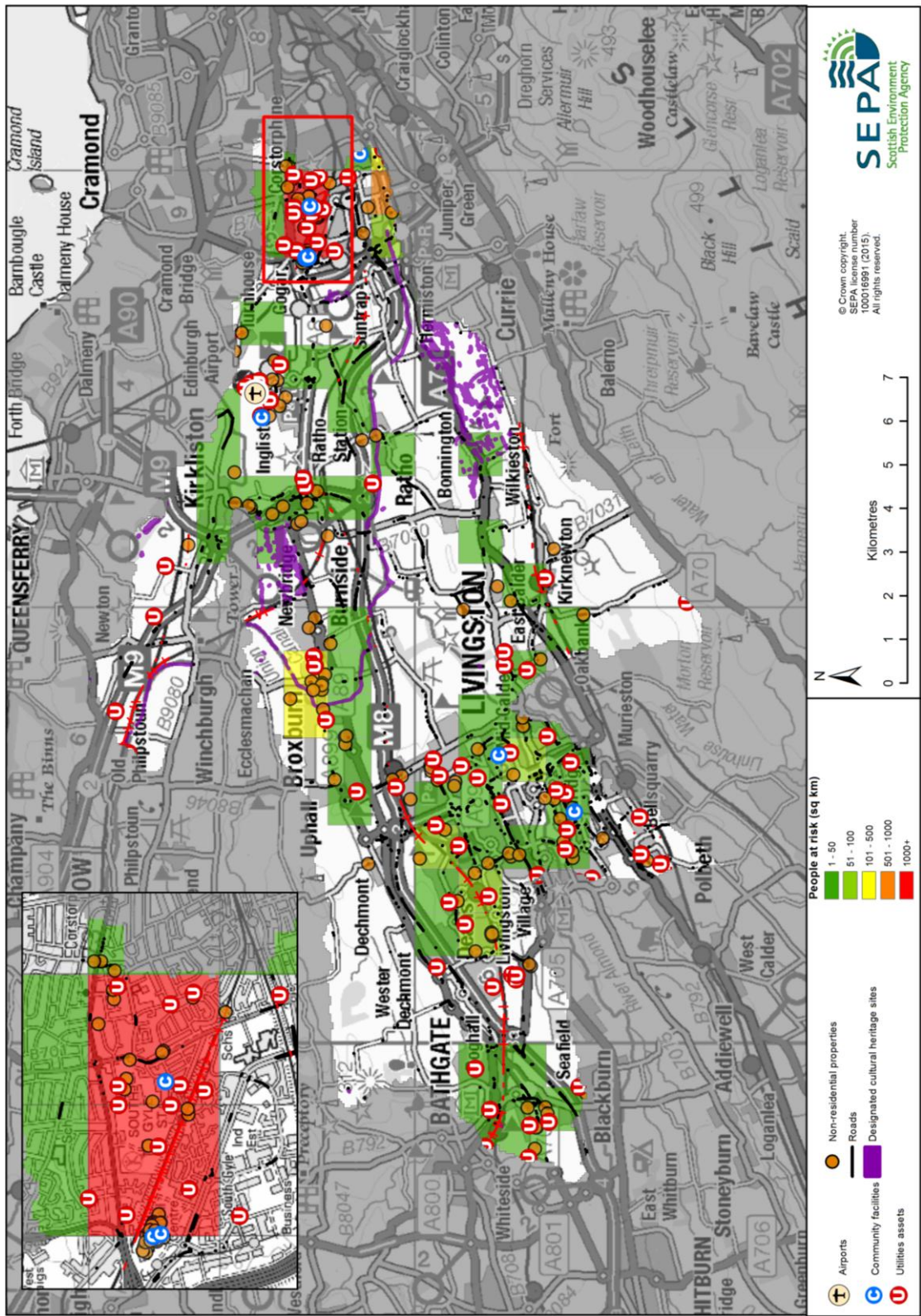


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/27

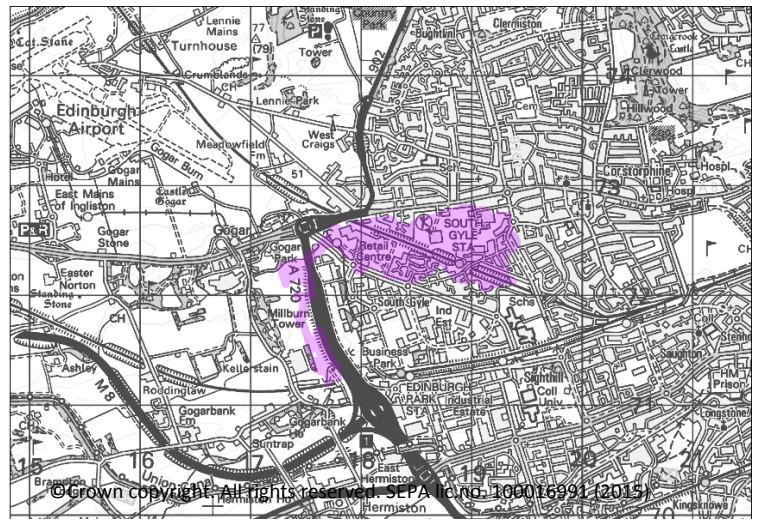
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 South Gyle, Broxburn and Bathgate Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn

Indicators:

Target area:

- £290,000 Annual Average Damages from residential properties



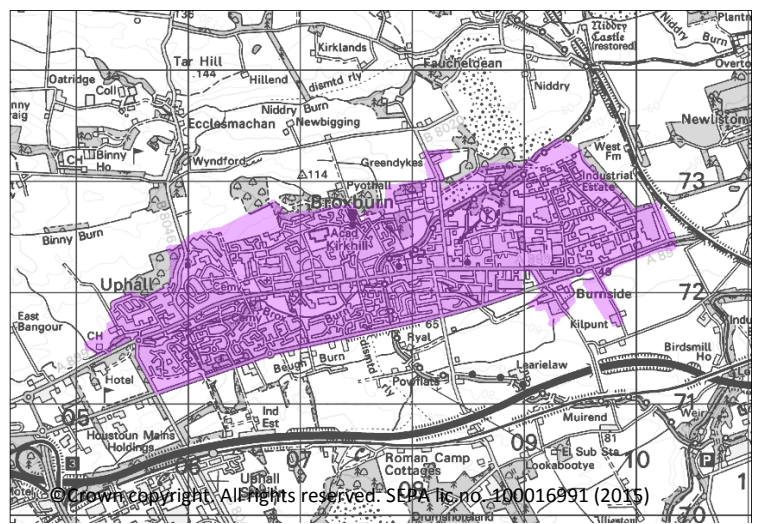
Objective ID: 10088

Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn.

Indicators:

Target area:

- £190,000 Annual Average Damages from residential properties
- £15,000 Annual Average Damages from non-residential properties



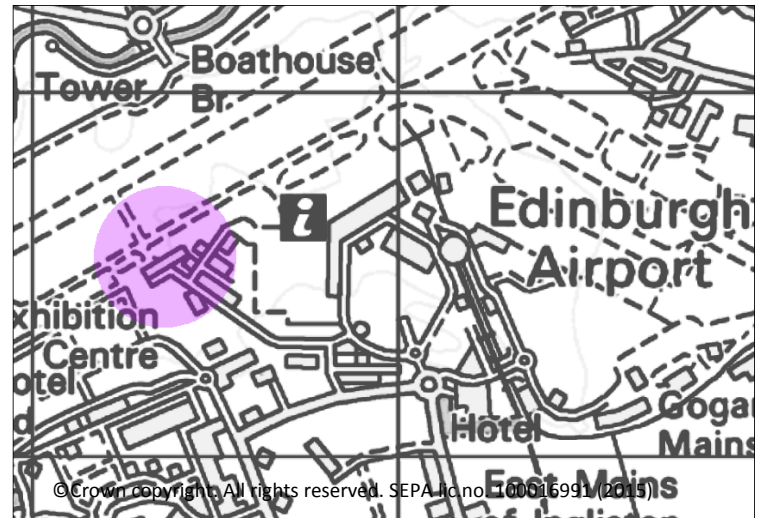
Objective ID: 10089

Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding

Indicators:

Target area:

- One emergency service (airport fire station)



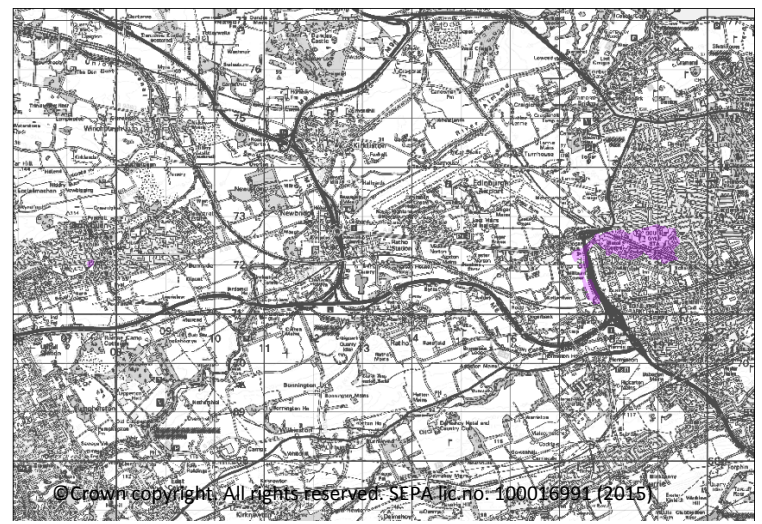
Objective ID: 10090

Reduce risk to people from river flooding in Broxburn and South Gyle

Indicators:

Target area:

- 2,000 people



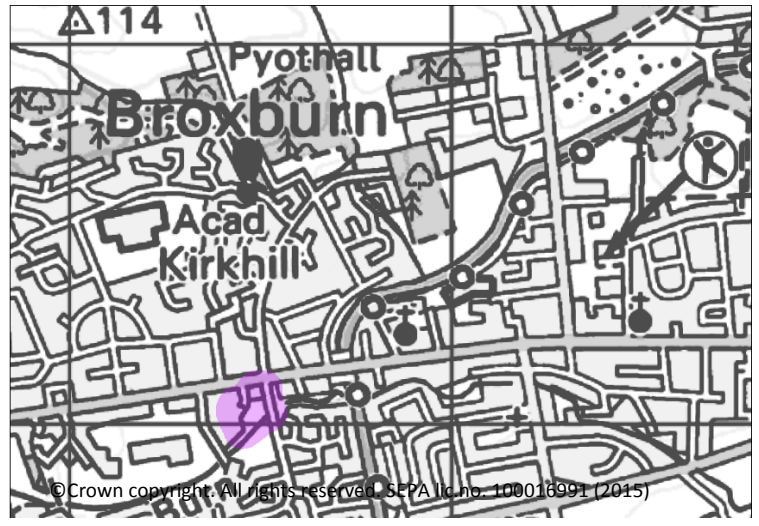
Objective ID: 10091

Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn

Indicators:

Target area:

- 30 residential properties
- £14,000 Annual Average Damages from residential properties
- <10 non-residential properties



Objective ID: 10096

Target area	Objective	ID	Indicators within PVA
Winchburgh	Reduce the physical or disruption risk related to the transport network for rail	10303	<ul style="list-style-type: none"> • 2.2km of rail track at 12 locations
Bathgate	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical	10045	* See note below
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Broxburn and eastern Uphall	Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical	10085	* See note below
Livingston and Mid Calder	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical	10102	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 1,600 residential properties • £2.4 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 1,600 residential properties • £2.4 million Annual Average Damages
Applies across Forth Estuary 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 10/27 there are 450 residential properties at risk and Annual Average Damages of £1.2 million.

Actions to manage flooding in Potentially Vulnerable Area 10/27

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 South Gyle, Broxburn and Bathgate Potentially Vulnerable Area.

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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100960006)				
Objective (ID):	Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn (10096)				
Delivery lead:	West Lothian Council				
Priority:	National:		Within local authority:		
	36 of 42		1 of 1		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed for Broxburn (Liggat Syke) to complete the Broxburn flood prevention scheme. The scheme would consist of two flood storage basins in the catchment of the Liggat Syke and provide a 1 in 100 year standard of protection.				
Potential impacts					
Economic:	The flood protection scheme has an estimated benefit cost ratio of 1.22.				
Social:	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 negative impacts through disturbance to the local community during the construction phase.				
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.				

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100850006)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102) Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Under development	Indicative delivery:	2016-2021
Description:	A surface water management project looking at 'legacy' sustainable drainage systems has been proposed for Livingston and Broxburn. The project would look to move 'legacy' sustainable drainage systems into public ownership and would be taken forward jointly by West Lothian Council and Scottish Water.		
Potential impacts			
Economic:	The economic impacts have not been defined at this stage.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.		

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100850026)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102) Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Surface water management works have been proposed for West Lothian as recommended in the West Lothian surface water management plan. The works include a range of local surface water management activities in specific locations in Livingston and Broxburn.		
Potential impacts			
Economic:	The economic impacts have not been defined at this stage.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.		

Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.
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Action (ID):	FLOOD PROTECTION SCHEME/WORKS (10303021)		
Objective (ID):	Reduce the physical or disruption risk related to the transport network for rail (10303)		
Delivery lead:	Network Rail		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Network Rail will carry out civil engineering work which will reduce the risk of flooding on identified sections of the rail network within this Potentially Vulnerable Area.		

Action (ID):	FLOOD PROTECTION STUDY (100900005)		
Objective (ID):	Reduce risk to people from river flooding in Broxburn and South Gyle (10091) Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding (10090) Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn (10088)		
Delivery lead:	The City of Edinburgh Council		
Priority:	National: 166 of 168	Within local authority: 3 of 3	
Status:	Not started	Indicative delivery:	2022-2027
Description:	A flood protection study has been recommended for Gogar Burn in Edinburgh to assess whether direct flood defences and sediment management could reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. This study should also aim to improve the accuracy of the flood mapping in the Gyle / Gogar Burn area. The study has low national priority and is to be carried out in the second flood risk management cycle.		
Potential impacts			
Economic:	Potential damages avoided of up to £160,000. The airport fire station is the key receptor at risk of flooding.		
Social:	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. In addition there is one community facility which has been identified as potentially benefitting from any proposed actions.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

Environmental:	environment land designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Gogar Burn (water body ID 3004) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.
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Action (ID):	SURFACE WATER PLAN/STUDY (100450018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100450019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	SURFACE WATER PLAN/STUDY (100850018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101020018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 when these projects are completed.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100890017)		
Objective (ID):	Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn. (10089)		
Delivery lead:	West Lothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Broxburn Flood Protection Scheme. The scheme consists of flood walls and embankments together with the replacement road bridges.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100890012)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Burnside Village Community Flood Action Group operates in this area.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	SITE PROTECTION PLANS (100900015)		
Objective (ID):	Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding (10090)		
Delivery lead:	Edinburgh Airport		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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. Edinburgh Airport operates a site protection plan.</p>		

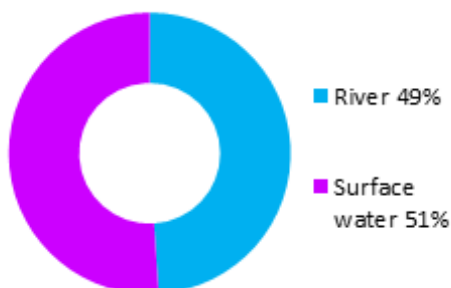
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Cowdenbeath (Candidate Potentially Vulnerable Area 10/28c)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	River Ore (Fife)

Summary of flooding impacts



At risk of flooding

- 150 residential properties
- 40 non-residential properties
- £580,000 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>	New flood warning	<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>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	<i>Strategic mapping and modelling</i>	Flood forecasting	Self help	Maintenance	Planning policies

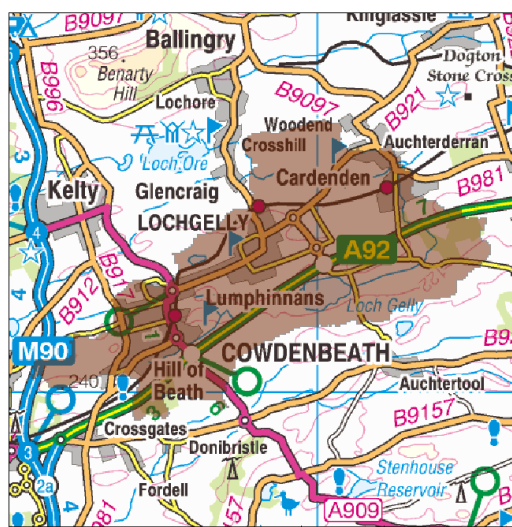
Actions

Cowdenbeath (Candidate Potentially Vulnerable Area 10/28c)

Local Plan District	Local authority	Main catchment
Forth Estuary	Fife Council	River Ore (Fife)

Background

This candidate Potentially Vulnerable Area is 21km² and part of the Firth of Forth catchment (shown below). It includes the urban areas of Cowdenbeath and Bowhill.



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Damages in this candidate Potentially Vulnerable Area are evenly distributed between surface water and river flooding.

There are approximately 150 residential properties and 40 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £580,000.

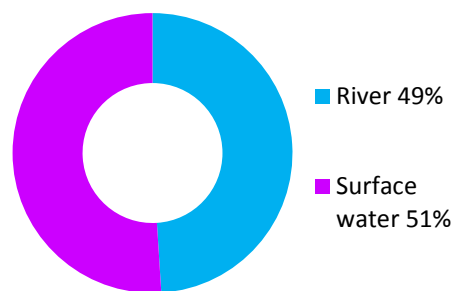


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

Whilst this area was not identified as a Potentially Vulnerable Area in 2011, the information on flood risk from the new hazard maps identified that this area should be regarded as a candidate future Potentially Vulnerable Area due to the potential risk to people and properties.

The highest risks of river flooding are at Cardenden (Bowhill) from the River Ore and the Den Burn, and at Cowdenbeath from the Lochgelly Burn. The highest risk of surface water flooding is in Cowdenbeath.

The risk of flooding to people, 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. For this candidate Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 9,800)	70	150	180
Non-residential properties (total 930)	20	40	60
People	150	340	400
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	2 A roads, 3 B roads at 41 locations 1 Railway route at 4 locations: Dunfermline to Thornton junction	1 M road (M90), 2 A roads, 3 B roads at 63 locations 1 Railway route at 4 locations: Dunfermline to Thornton junction	1 M road (M90), 2 A roads, 3 B roads at 70 locations 1 Railway route at 4 locations: Dunfermline to Thornton junction
Environmental designated areas (km²)	<0.1	0.1	0.1
Designated cultural heritage sites	0	0	0
Agricultural land (km²)	0.8	1.0	1.0

Table 1: Summary of flooding impacts

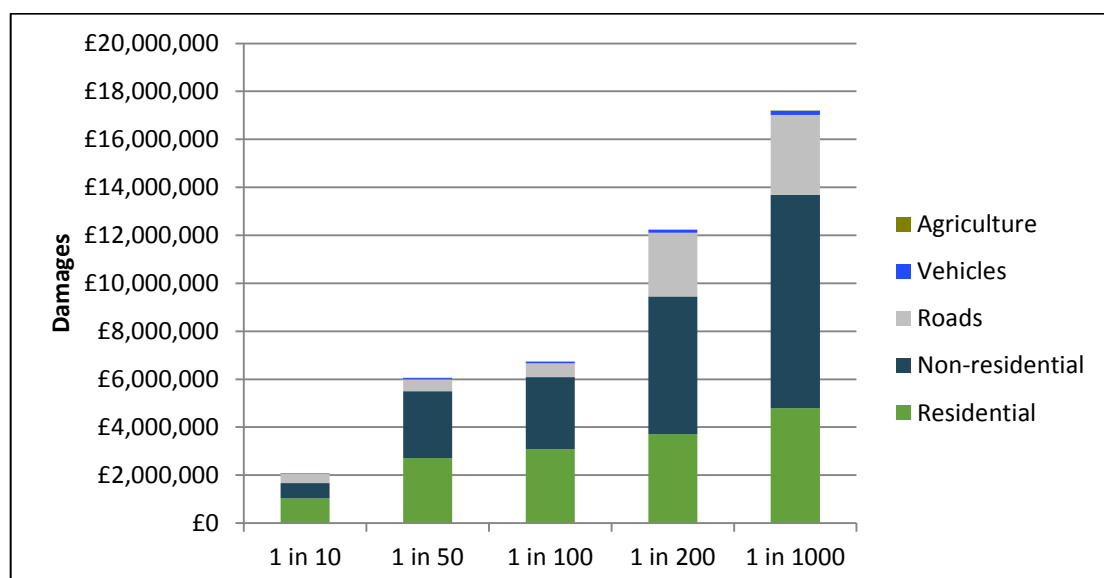


Figure 2: Damages by flood likelihood

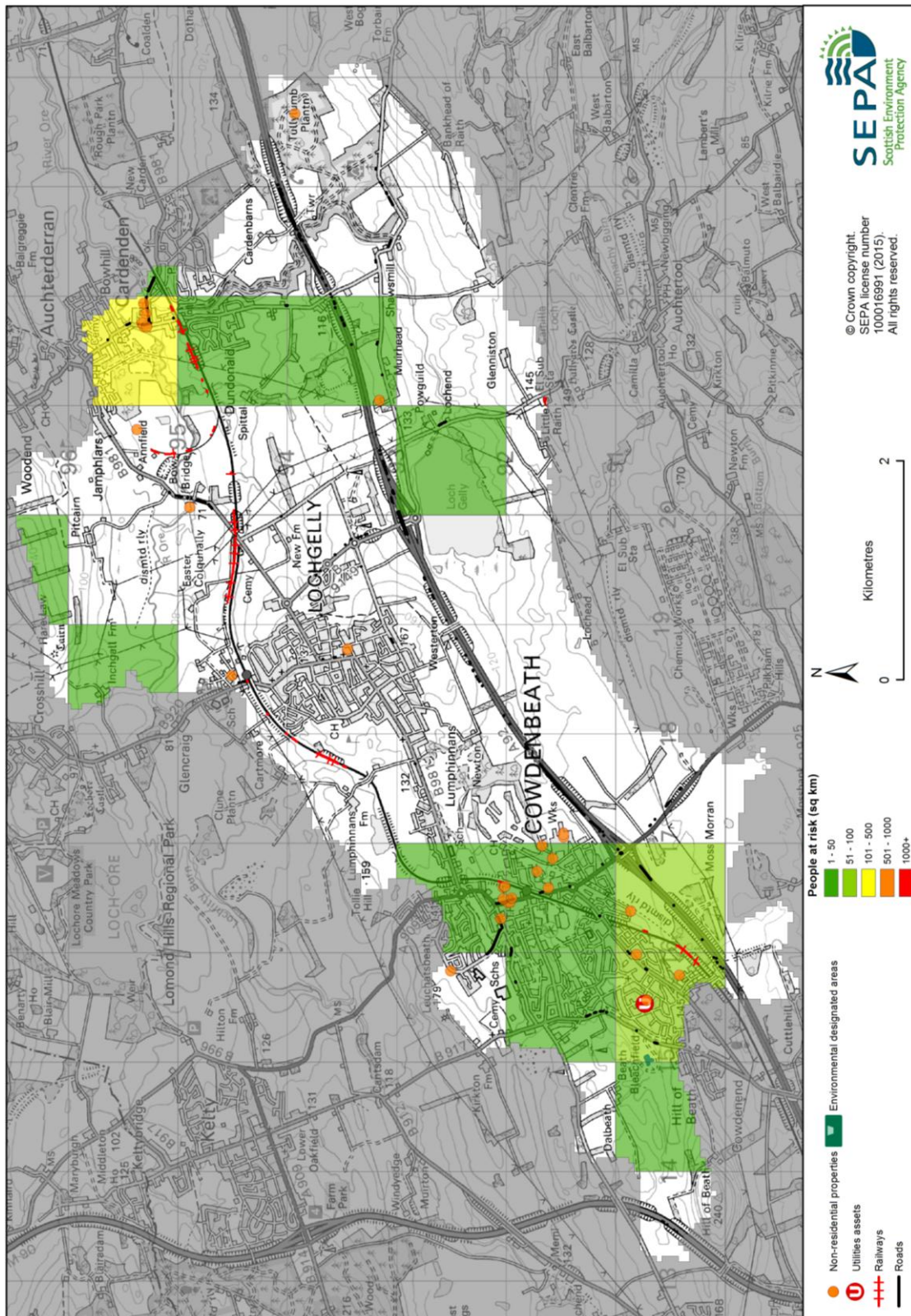


Figure 3: Impacts of flooding

History of flooding

One significant river flood event has been recorded in this area. On 8 February 1903 roads were flooded, and significant areas of land were under water from the River Ore and River Lochty. This flooding also caused the Dunfermline-Thornton junction of railway line to be submerged.

Objectives to manage flooding in Potentially Vulnerable Area 10/28c

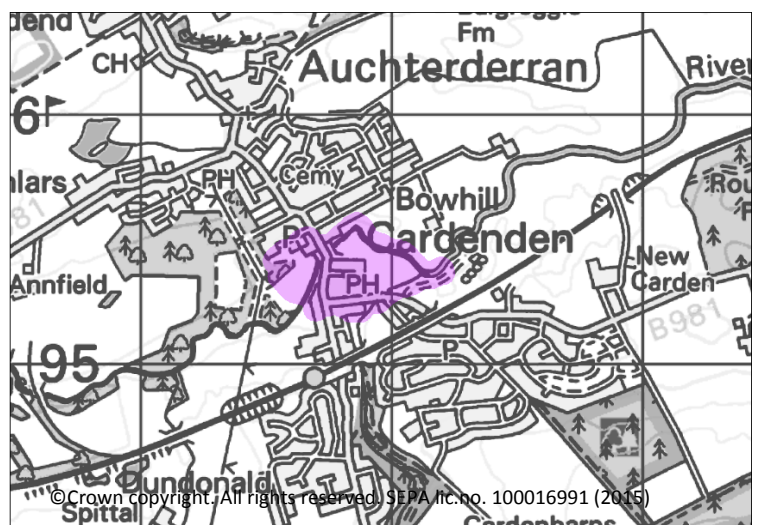
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Cowdenbeath Candidate Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties from river flooding in Cardenden (Bowhill)

Indicators:

- £60,000 Annual Average Damages from residential properties

Target area:



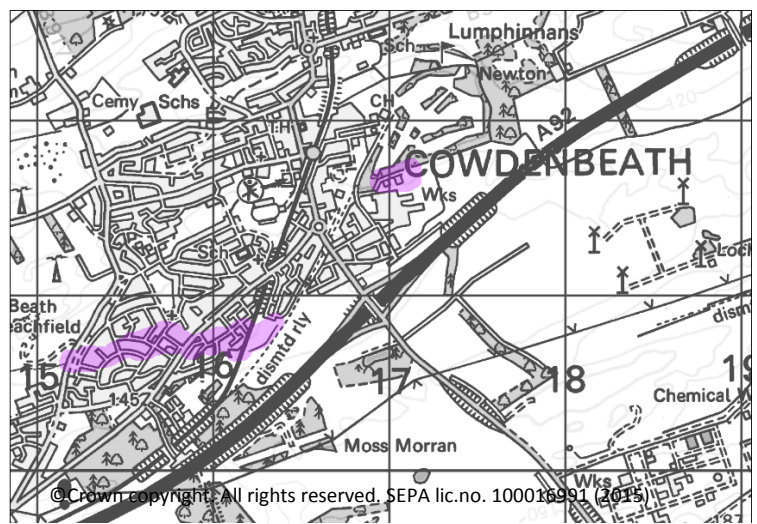
Objective ID: 10097

Reduce economic damages to residential and non-residential properties from river flooding in Cowdenbeath

Indicators:

- £71,000 Annual Average Damages from residential properties
- £23,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10098

Target area	Objective	ID	Indicators within PVA
Cowdenbeath, Leuchatsbeath and Lumphinnans	Reduce economic damages and number of residential properties at risk of surface water flooding in Cowdenbeath, Leuchatsbeath and Lumphinnans where practical	10092	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> • 150 residential properties • £580,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> • 150 residential properties • £580,000 Annual Average Damages
Applies across Forth Estuary 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 10/28c there are 80 residential properties at risk and Annual Average Damages of £290,000.

Actions to manage flooding in Potentially Vulnerable Area 10/28c

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 Cowdenbeath Candidate Potentially Vulnerable Area.

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

Action (ID):	NEW FLOOD WARNING (100990010)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include Bowhill which is affected by flooding from the River Ore. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

Action (ID):	FLOOD PROTECTION STUDY (100970005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties from river flooding in Cardenden (Bowhill) (10097)		
Delivery lead:	Fife Council		
Priority:	National:	Within local authority:	
	70 of 168	8 of 16	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Cardenden to assess whether flood storage, flood defences, sediment management and natural flood management could reduce flood risk. The study should also consider the viability of property level protection. Natural flood management options that should be		

	considered include river/ floodplain restoration and sediment management. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.
Potential impacts	
Economic:	The study could benefit 55 residential properties and five non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.7 million.
Social:	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.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Den Burn (water body ID 6311) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Listed buildings and ancient woodlands are also present in the study area and could be positively or negatively impacted.

Action (ID):	FLOOD PROTECTION STUDY (100980005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties from river flooding in Cowdenbeath (10098)		
Delivery lead:	Fife Council		
Priority:	National:		Within local authority:
	104 of 168		14 of 16
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Cowdenbeath to assess whether flood storage, modification of conveyance and sediment management could reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit 42 residential properties and five non-residential properties at risk of flooding in this location, with potential damages avoided of up to £2.5 million.		
Social:	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.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example		

Environmental: through natural flood management. Den Burn (water body ID 6311) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.

Action (ID):	SURFACE WATER PLAN/STUDY (100920018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cowdenbeath, Leuchatsbeath and Lumphinnans where practical (10092)		
Delivery lead:	Fife Council		
Status:	Not started	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100920019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Cowdenbeath, Leuchatsbeath and Lumphinnans where practical (10092)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Fife Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

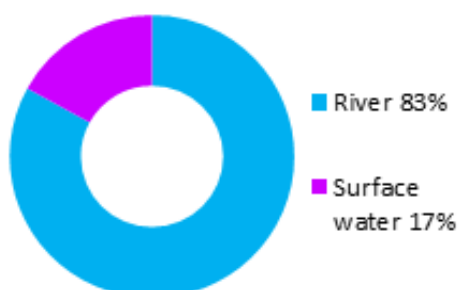
Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including 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>Fife Council operates an Emergency Flood Plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Whitburn (Candidate Potentially Vulnerable Area 10/29c)

Local Plan District	Local authority	Main catchment
Forth Estuary	West Lothian Council	River Almond

Summary of flooding impacts



At risk of flooding

- 180 residential properties
- 10 non-residential properties
- £270,000 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

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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 7,800)	10	180	200
Non-residential properties (total 560)	<10	10	20
People	30	390	440
Community facilities	0	0	0
Utilities	<10	<10	<10
Transport links (excluding minor roads)	1 M road (M8), 3 A roads, 5 B roads at 62 locations	1 M road (M8), 3 A roads, 5 B roads at 102 locations	1 M road (M8), 3 A roads, 5 B roads at 122 locations
Environmental designated areas (km ²)	0	0	0
Designated cultural heritage sites	0	2	2
Agricultural land (km ²)	0.7	0.8	0.9

Table 1: Summary of flooding impacts

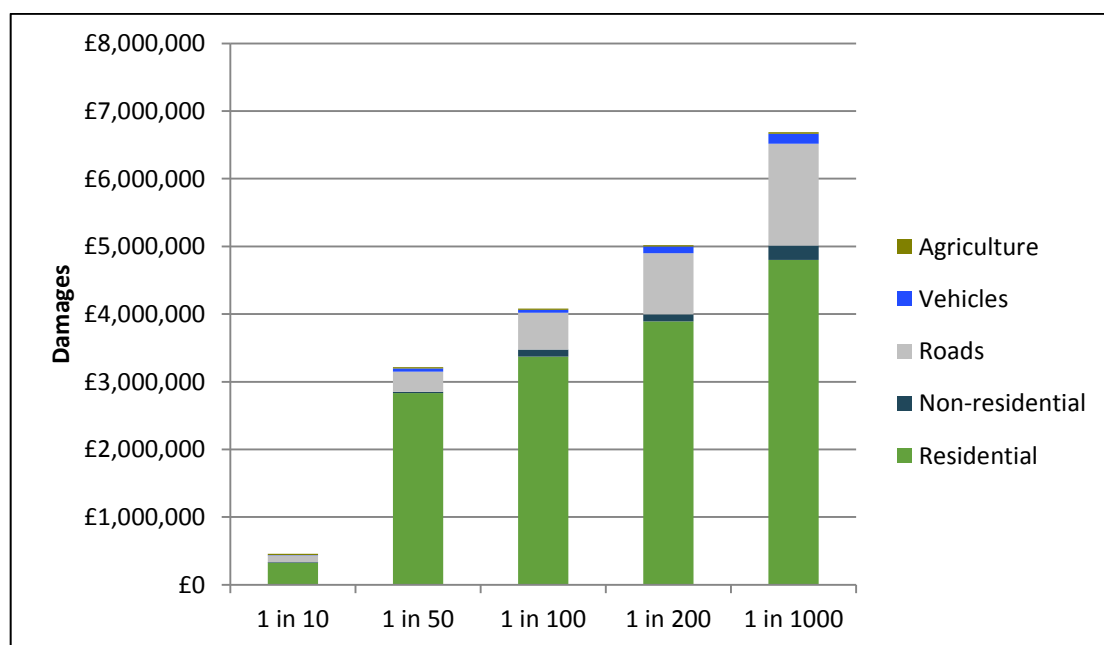


Figure 2: Damages by flood likelihood

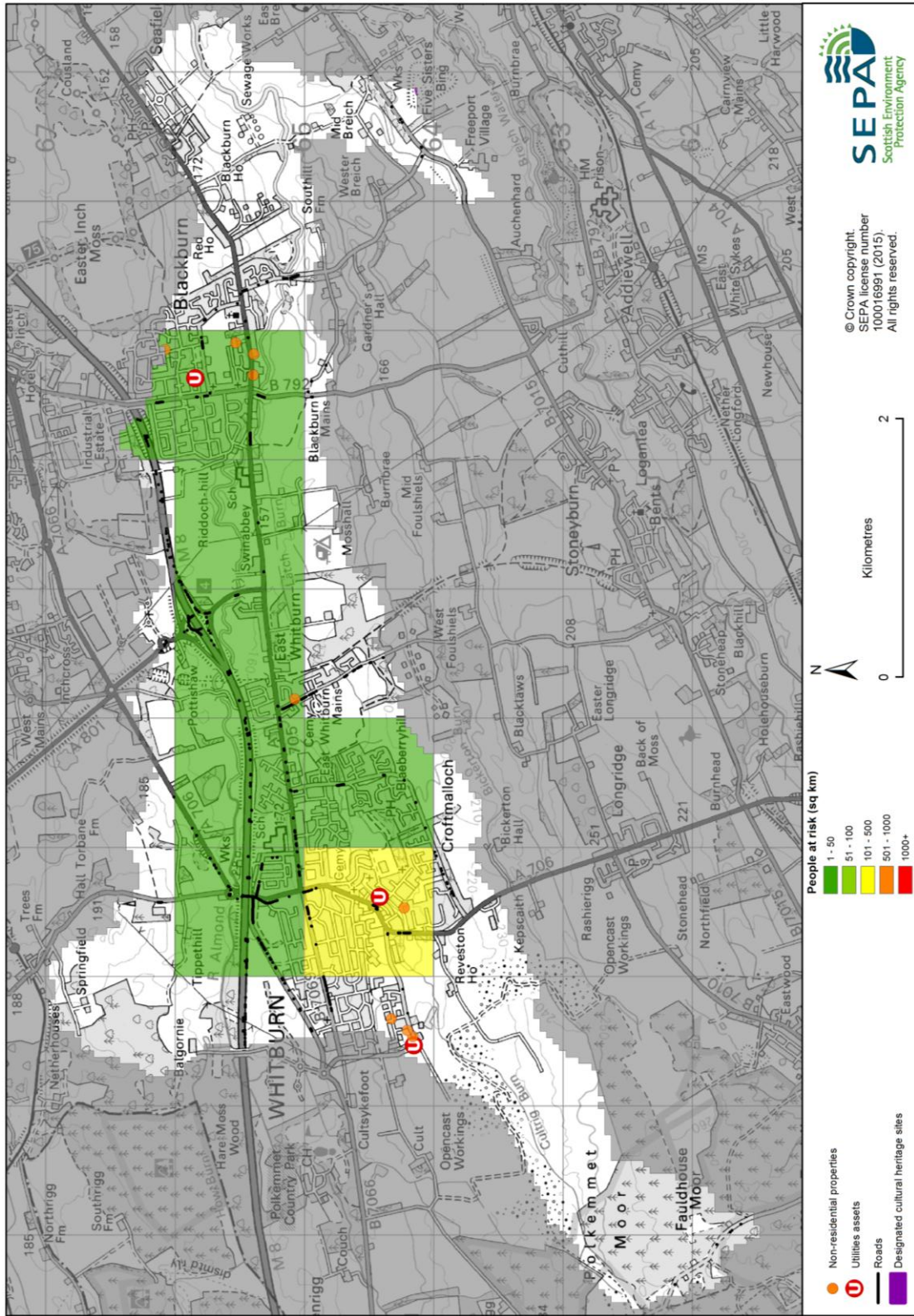


Figure 3: Impacts of flooding

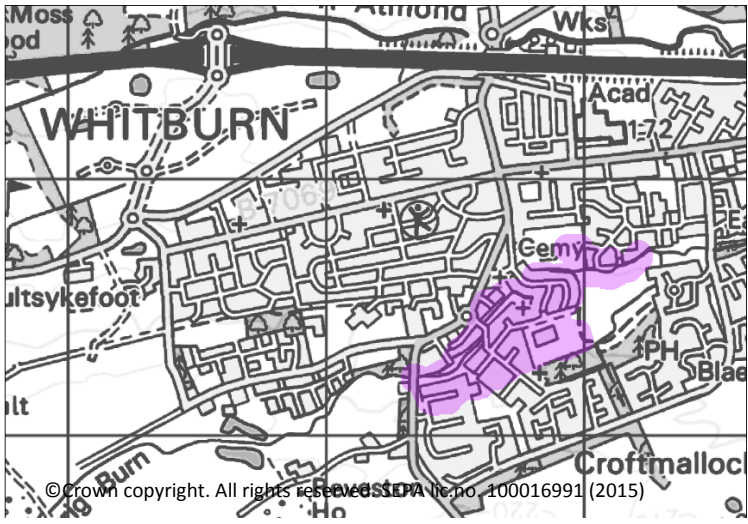
History of flooding

The following significant floods have been recorded in this area:

- 18 January 1909: A large flood event known to have affected many areas in the southern and central counties of Scotland.
- 1 February 1884: Overtopping on the River Almond resulted in large areas of flooding in Whitburn.

Objectives to manage flooding in Potentially Vulnerable Area 10/29c

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 Whitburn Candidate Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Whitburn caused by flooding from the White Burn	
Indicators:	Target area:
<ul style="list-style-type: none"> £180,000 Annual Average Damages from residential properties £700 Annual Average Damages from non-residential properties 	
Objective ID: 10094	

Target area	Objective	ID	Indicators within PVA
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> 180 residential properties £270,000 Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> 180 residential properties £270,000 Annual Average Damages
Applies across Forth Estuary 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 10/29c

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 Whitburn 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

Action (ID):	FLOOD PROTECTION STUDY (100940005)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Whitburn caused by flooding from the White Burn (10094)		
Delivery lead:	West Lothian Council		
Priority:	National:		Within local authority:
	68 of 168		1 of 4
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study has been recommended for Whitburn to assess whether modification of conveyance, flood defences and sediment management could reduce flood risk. The study should also investigate the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
Economic:	The study could benefit 137 residential properties and one non-residential property at risk of flooding in this location, with potential damages avoided of up to £5.4 million.		
Social:	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.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. 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.		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	West Lothian Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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

Forth Estuary 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.

Section 3: Supporting information

3.1	Introduction	379
3.2	River flooding	380
	• East Lothian and Berwickshire catchment group	381
	• Almond and Edinburgh catchment group.....	390
	• Firth of Forth catchment group	400
3.3	Coastal flooding.....	408
3.4	Surface water flooding.....	418

3.1 Introduction

In the Forth Estuary Local Plan District, river flooding is reported across two 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 ¹	Annual Average Damages	Local authority
River catchments			
East Lothian and Berwickshire catchment group	640	£1.7 million	East Lothian Council Midlothian Council Scottish Borders Council
Almond and Edinburgh Group catchment group	6,100	£10 million	The City of Edinburgh Council East Lothian Council Midlothian Council West Lothian Council
Firth of Forth catchment group	2,200	£6.7 million	The City of Edinburgh Council Clackmannanshire Council Falkirk Council Fife Council North Lanarkshire Council Perth and Kinross Council Stirling Council West Lothian Council
Coastal flooding			
Forth Estuary coastal area	2,000	£5.5 million	The City of Edinburgh Council East Lothian Council Falkirk Council Fife Council Scottish Borders Council Stirling Council
Surface water flooding			
Forth Estuary Local Plan District	7,800	£12.5 million	The City of Edinburgh Council Clackmannanshire Council East Lothian Council Falkirk Council Fife Council Midlothian Council North Lanarkshire Council Perth and Kinross Council Scottish Borders Council Stirling Council West Lothian Council

Table 1: Summary of flood risk from various sources within the Forth Estuary Local Plan District

¹ Total number of residential and non-residential properties at risk of flooding.

3.2 River flooding

Forth Estuary 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 Forth Estuary Local Plan District, river flooding is reported across three distinct river catchments, shown below.

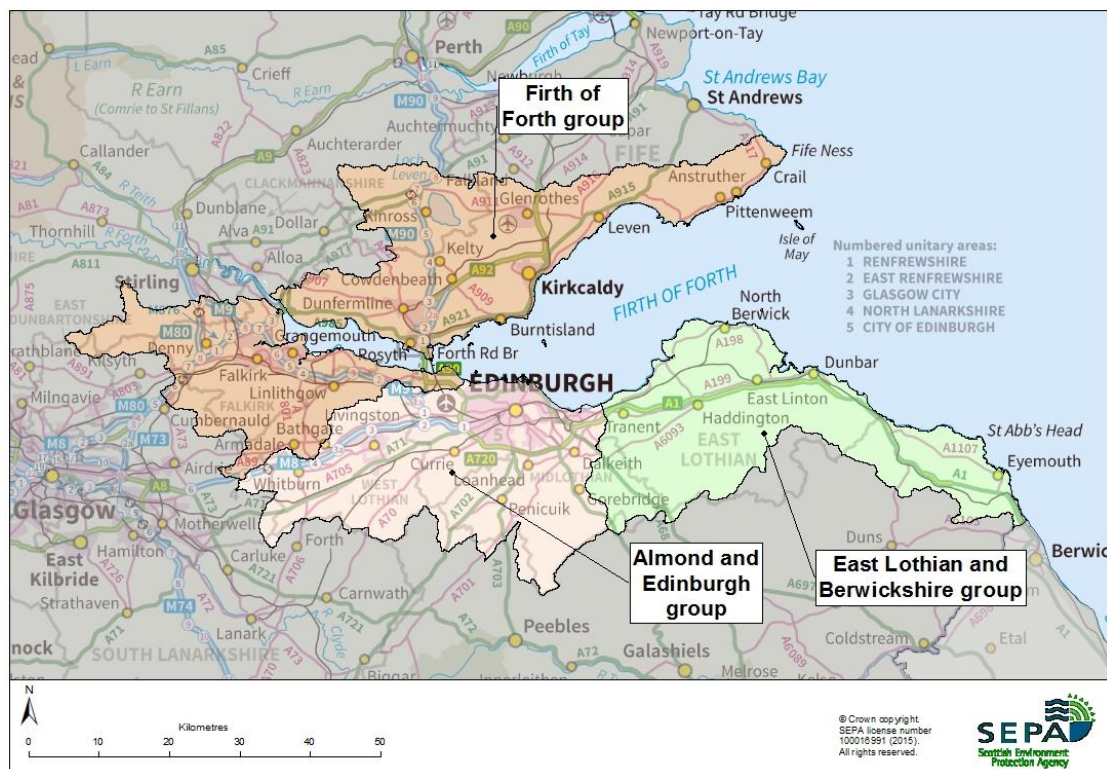


Figure 1: River catchments within the Forth Estuary Local Plan District

River flooding

East Lothian and Berwickshire catchment group

This chapter 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.

Catchment overview

The East Lothian and Berwickshire catchment group covers an area of 860km² and contains a number of catchments which are predominantly small and rural. The main watercourses include the River Tyne, Eye Water, Horn Burn, Ale Water, Pease Burn, Dunglass Burn, Tower Burn, Mill Burn, Biel Water and East Peffer Water.

The catchments in this group characteristically have steep headwaters in the Lammermuir Hills and gently rolling topography. The Eye Water catchment is recognised as a flashy watercourse due to steep valley sides and limited tree cover. On average the soils for this catchment group are generally dry due to a sheltered location on the east coast.

The average annual rainfall for this catchment is low for Scotland, with 600-700mm falling in the lower part of the catchment, rising to 700-900mm in the upper catchment.

Flood risk in the catchment

Within the East Lothian and Berwickshire catchment group approximately 460 residential properties and 180 non-residential properties are at risk of river flooding. It is estimated that 76% of these properties are located within Potentially Vulnerable Areas. There are four Potentially Vulnerable Areas at risk of river flooding in this catchment group (Figure 1):

- Cockenzie, Port Seton, Longniddry and Prestonpans (10/23)
- Haddington (10/24)
- Dunbar and West Barns (10/25)
- Berwickshire Coast (10/26).

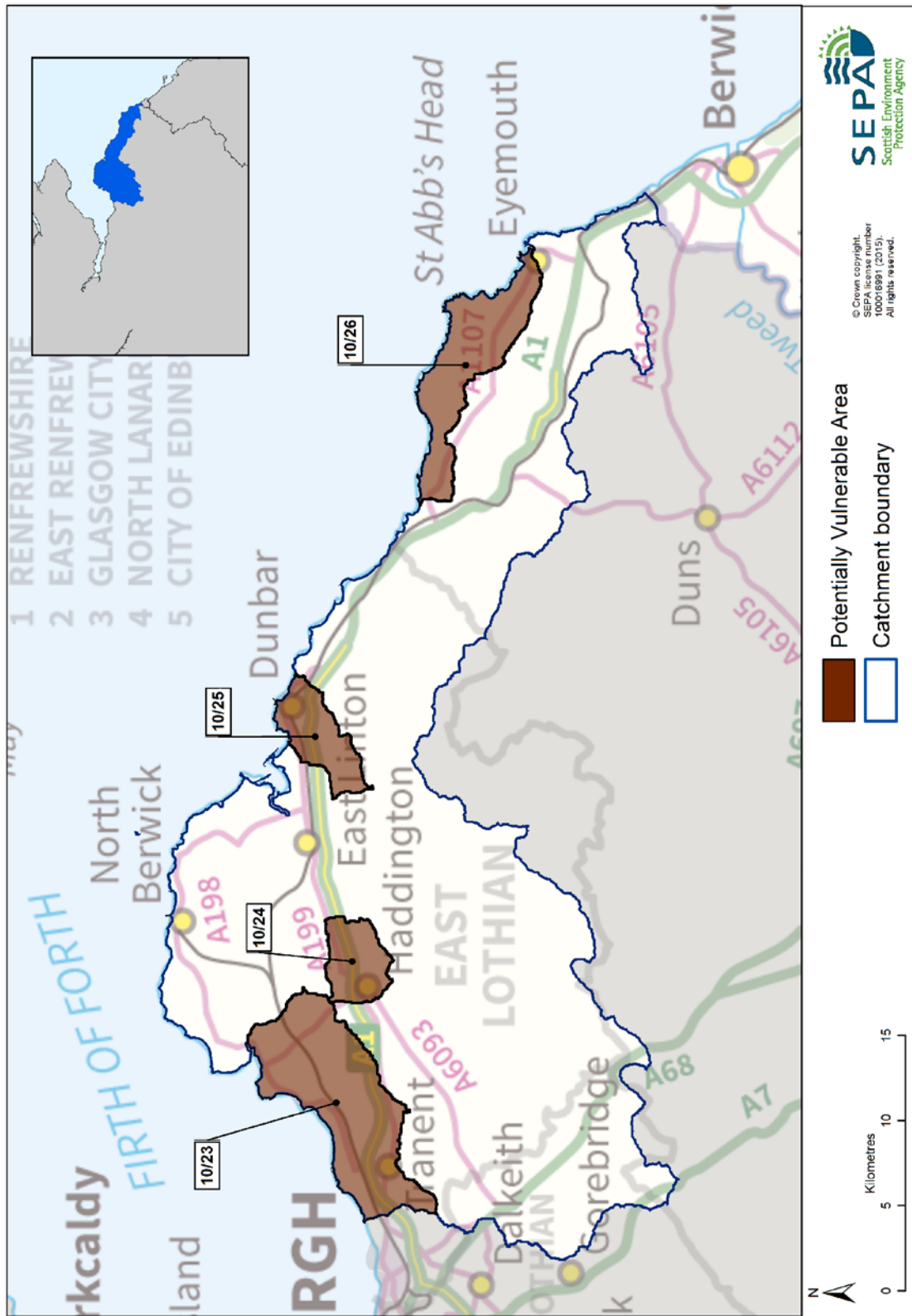


Figure 1: The East Lothian and Berwickshire catchment group

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.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Haddington	320	£560,000
Longniddry	40	£97,000
Eyemouth	40	£85,000
Tranent	30	£76,000
Dunbar and West Barns	30	£50,000
Gifford	10	£55,000
Garvald	<10	£44,000
East Linton	<10	£18,000
Ayton	<10	£12,000
North Berwick	<10	£9,000
Cockenzie and Port Seton	<10	<£1,000

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 East Lothian and Berwickshire catchment group are approximately £1.7 million. The damages are distributed as follows:

- 59% residential properties (£1.1 million)
- 18% non-residential properties (£300,000)
- 8% agriculture (£150,000)
- 7% emergency services (£120,000)
- 4% roads (£60,000)
- 4% vehicles (£60,000).

Figure 2 shows the Annual Average Damages throughout the catchment group. The highest damages can be seen around Haddington due to the high density of residential and non-residential properties in the area being affected by flooding from the River Tyne.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment group.

	Number at risk	Further detail
Community facilities	0	
Utility assets	<10	Electricity substations
Roads (excluding minor roads)	24	9 A roads at 65 locations 15 B roads at 58 locations
Railway routes	2	Berwick-upon-Tweed to Edinburgh (33 locations at risk) North Berwick to Drem Junction (1 location at risk)
Agricultural land (km ²)	42.1	

Table 2: Infrastructure and agricultural land at risk of river flooding

Designated environmental and cultural heritage sites at risk

Within the catchment group there are approximately 52 designated cultural heritage sites at risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield site and listed buildings.

It is estimated that 17 environmental designated areas are at risk of river flooding. These include two Special Areas of Conservation, two Special Protection Areas and 13 Sites of Special Scientific Interest, notably the Berwickshire and North Northumberland Coast and St Abb's Head to Fast Castle.

History of river flooding

The most significant river flooding in the East Lothian and Berwickshire catchment group is believed to have occurred in August 1948 with reports of Haddington High Street being flooded up to a depth of 57 inches from the River Tyne. The Eye Water and Whiteadder Water also caused significant flooding, with widespread impacts. Eyemouth saw evacuation at the harbour, with some buildings flooded up to the second floor. Residents from Biel Mill Lodge, West Barns also had to be rescued and transport infrastructure was damaged over a wide area.

Recent floods occurred on 7 July and 25 September 2012 with property flooding in Haddington due to drains and watercourses backing up and unable to discharge into the River Tyne. However, widespread property flooding was avoided as a result of actions taken by East Lothian Council.

The earliest record of flooding dates back to 1775 when a large flood event in Haddington inundated most of the town.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters.

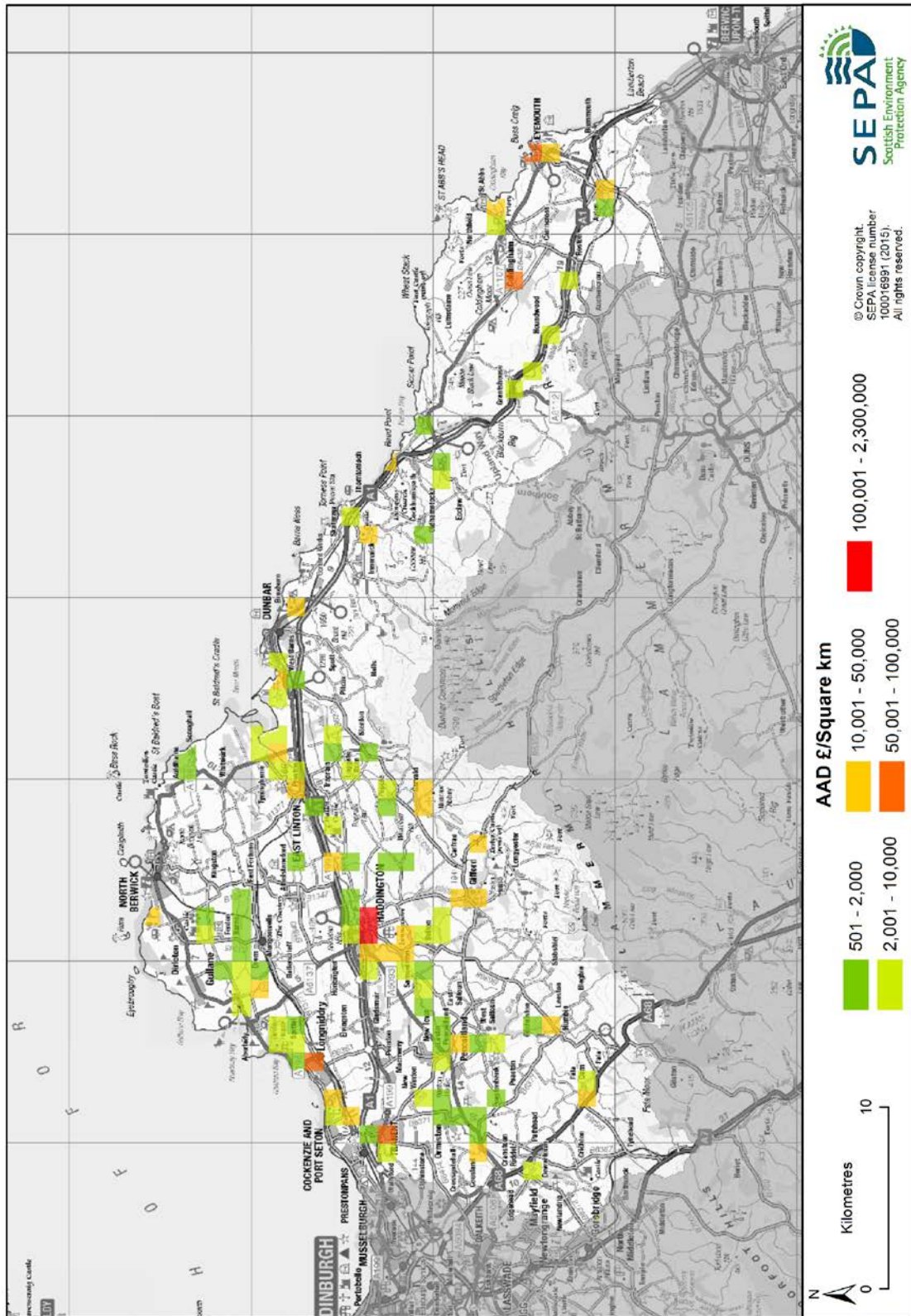


Figure 2: Annual Average Damages from river flooding

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 chapters.

River flood warning schemes

There are four river flood warning areas within this catchment group as shown in Table 3 and Figure 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. Please note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Number of properties within FWA	% of properties registered July 2014
Grantshouse to Eyemouth	Eye Water	13	100%
Haddington (Green) ¹	River Tyne	212	68%
Haddington (Orange)	River Tyne	179	40%
Haddington (Red)	River Tyne	549	33%

Table 3: Flood warning areas

Community groups

The following community groups are known to operate within this catchment:

- Friends of the River Tyne
- North Berwick Environment Group
- John Muir Trust
- East Lothian Tenants and Residential Panel.

There are also various local community councils that operate throughout the East Lothian council area.

¹ These “coloured” flood warning areas for Haddington reflect East Lothian Council’s emergency plan

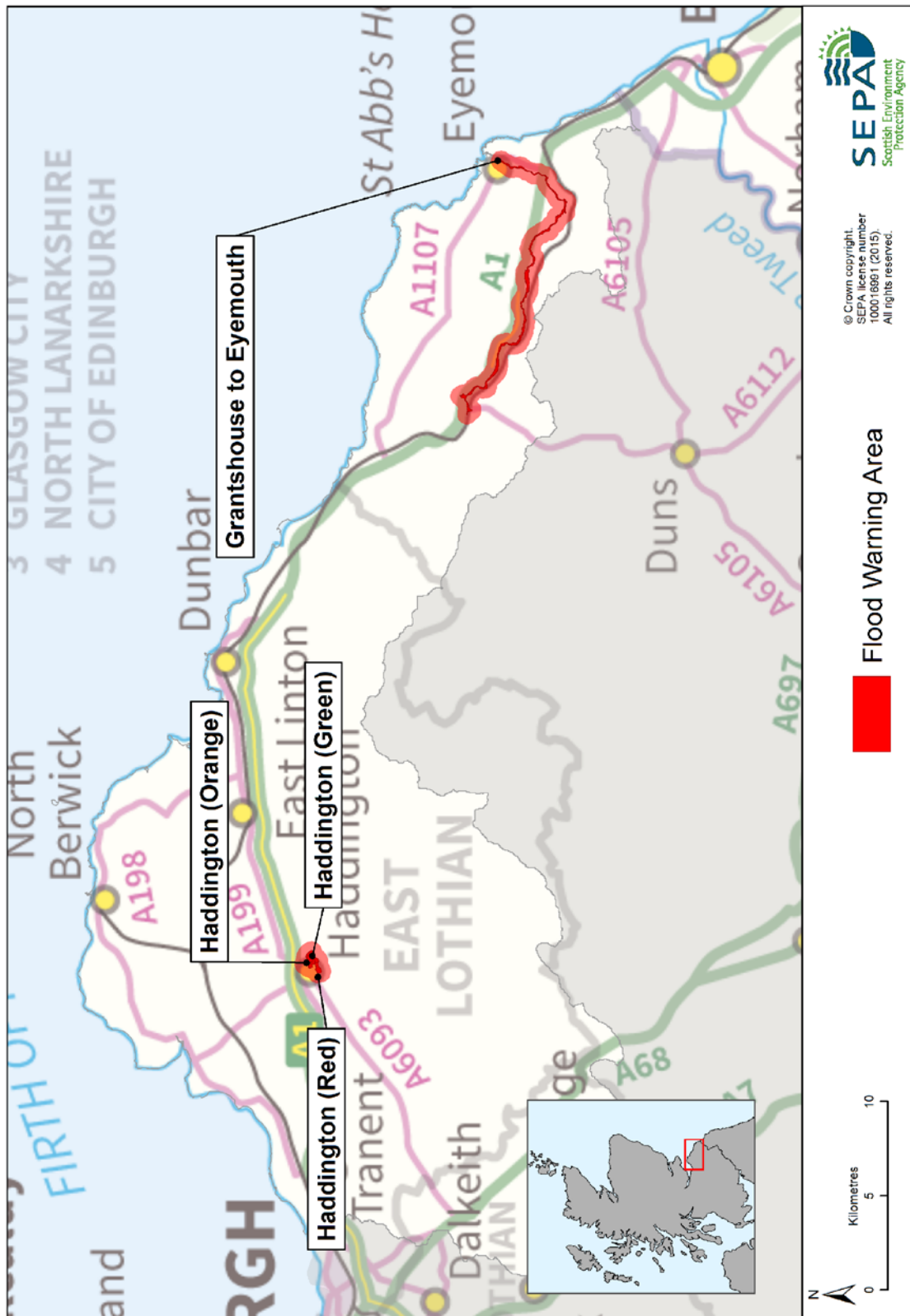


Figure 3: Flood warning areas

Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding
- Scottish Borders Council offers discounted flood protection products to homes and businesses at risk in the Scottish Borders. Several properties in Eyemouth have taken up the scheme and have been protected from flooding as a result
- Scottish Borders Council provides and maintains dedicated sandbag stores in areas of flood risk to ensure sandbags are readily available to the public in the event of a flood. These are mainly located at fire stations.

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 East Lothian and Berwickshire catchment may increase by 39%². This would potentially increase in the number of residential properties at risk of river flooding from approximately 460 to 760 and the number of non-residential properties from approximately 180 to 230.

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 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 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

In the East Lothian and Berwick catchment group, potential for runoff reduction is confined mainly to areas upstream of the Biel Water/ Luggate Burn. Actions on these potential runoff reduction sites may benefit Dunbar and West Barns Potentially Vulnerable Area (10/25).

² From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

Floodplain storage

Floodplain storage potential within the catchment group is limited. There is some potential for floodplain storage on the River Tyne upstream of Haddington Potentially Vulnerable Area (10/24). Further local assessment would be required in order to determine the suitability of these areas and to quantify any benefits.

Sediment management

Areas of high deposition and high erosion have been identified across the East Lothian and Berwickshire catchment. These may be the result of natural processes or other factors including channel modification. There are a number of watercourses across the catchment which have been modified. Deposition may also result from sediment transfer from land surrounding the watercourse, particularly if this is agricultural land or woodland areas.

River flooding

Almond and Edinburgh catchment group

Catchment overview

The Almond and Edinburgh catchment group covers an area of 930km² and comprises of a number of smaller watercourses. The main watercourses include Water of Leith, Braid Burn, River Esk, Niddrie Burn, River Almond, Brox Burn and Gogar Burn. A substantial portion of the catchment is urban, covering Edinburgh city and its wider area.

The topography of the catchment group varies, with some watercourses such as those draining the Pentland Hills being relatively steep and the remainder draining gently rolling areas. River levels will rise quickly within steep, urbanised watercourses but more slowly in those covering rural areas with shallow gradients. On average the soils are generally dry due to the sheltered location on the east coast.

The average annual rainfall for this catchment is low to average for Scotland, with 600-700mm falling in the lower part of the catchment, rising to 900-1100mm in the upper catchment.

Flood risk in the catchment

Within the Almond and Edinburgh catchment group approximately 5,400 residential properties and 720 non-residential properties are at risk of river flooding. It is estimated that 97% of these properties are located within Potentially Vulnerable Areas. There are eight Potentially Vulnerable Areas and one candidate Potentially Vulnerable Area at risk of river flooding in this catchment group (10/29c) (Figure 1):

- Cramond Bridge (10/16)
- Granton (10/17)
- Water of Leith catchment (10/18)
- Braid Burn catchment (10/19)
- Niddrie and Burdiehouse Burn catchment (10/20)
- Musselburgh (10/21)
- Lasswade, Penicuik, Dalkeith and Musselburgh (10/22)
- South Gyle, Broxburn and Bathgate (10/27)
- Whitburn (10/29c).

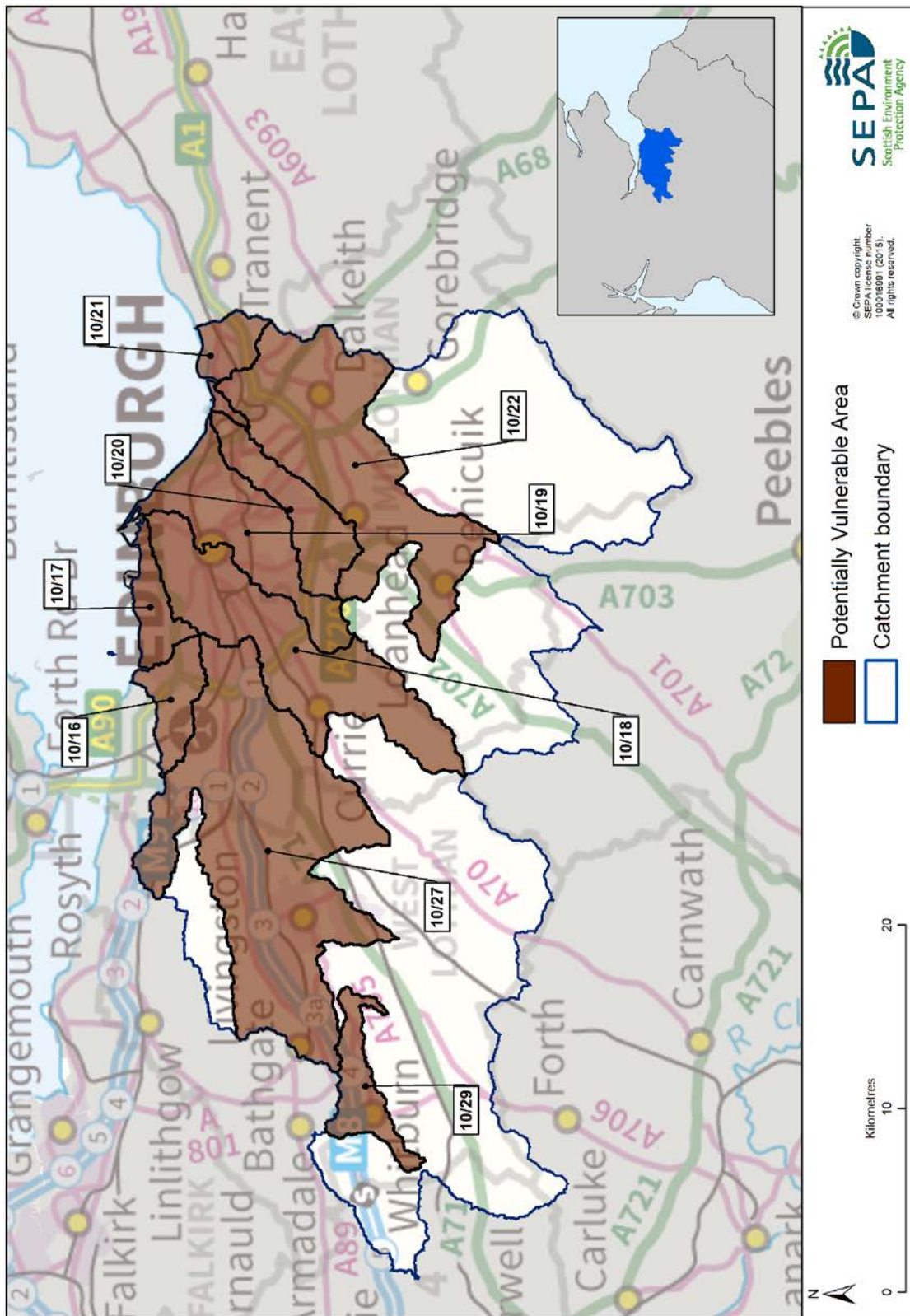


Figure 1: The Almond and Edinburgh catchment group

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.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Edinburgh	3,700	£5.9 million
Musselburgh	1,700	£3 million
Whitburn	140	£180,000
Broxburn	130	£210,000
Harthill	20	£63,000
Dalkeith and Newbattle	20	£21,000
Bathgate and Blackburn	<10	£19,000
West Calder	<10	£12,000
East Calder	<10	£11,000
Lasswade and Bonnyrigg	<10	£9,000
Penicuik	<10	£2,000
Kirkliston	<10	£1,000
Livingston	<10	<£1,000

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 Almond and Edinburgh catchment group are approximately £10 million. The damages are distributed as follows:

- 63% residential properties (£6.3 million)
- 26% non-residential properties (£2.6 million)
- 5% emergency services (£500,000)
- 4% vehicles (£450,000)
- 1% roads (£80,000)
- 1% agriculture (£70,000).

Figure 2 shows the Annual Average Damages throughout the catchment group. The highest damages can be seen around the Musselburgh area. This is due to a combination of high density areas of non-residential and residential properties which are at risk of flooding from the River Esk. High damage figures can also be seen in the Murrayfield area of Edinburgh due to a combination of scattered non-residential properties and a high number of residential properties.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment group.

	Number at risk	Further detail
Community facilities	<10	Includes: educational buildings, healthcare facilities and emergency services
Utility assets	40	Includes electricity substations and fuel extraction sites
Roads (excluding minor roads)	53	2 M roads (M8, M9) at 25 locations 26 A roads at 186 locations 25 B roads at 84 locations
Railway routes	7	Berwick-upon-Tweed to Edinburgh (4 locations at risk), Carstairs to Edinburgh (10 locations at risk) Drumgelloch to Newbridge Junction (2 locations at risk) Edinburgh Waverly to Glasgow Queen Street (8 locations at risk) Dalmeny to Winchburgh and Dalmeny to Haymarket West Junctions (7 locations at risk) Mid-calder Junction to Holytown Junction (8 locations at risk)
Airports	1	Edinburgh airport
Agricultural land (km²)	19.7	

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 124 designated cultural heritage sites are at risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites, listed buildings and World Heritage sites.

Approximately 21 environmental designated areas are at risk of river flooding. These include three Special Protection Areas and 18 Sites of Special Scientific Interest, notably the Imperial Dock Lock at Leith, Balerno Common and Roslin Glen.

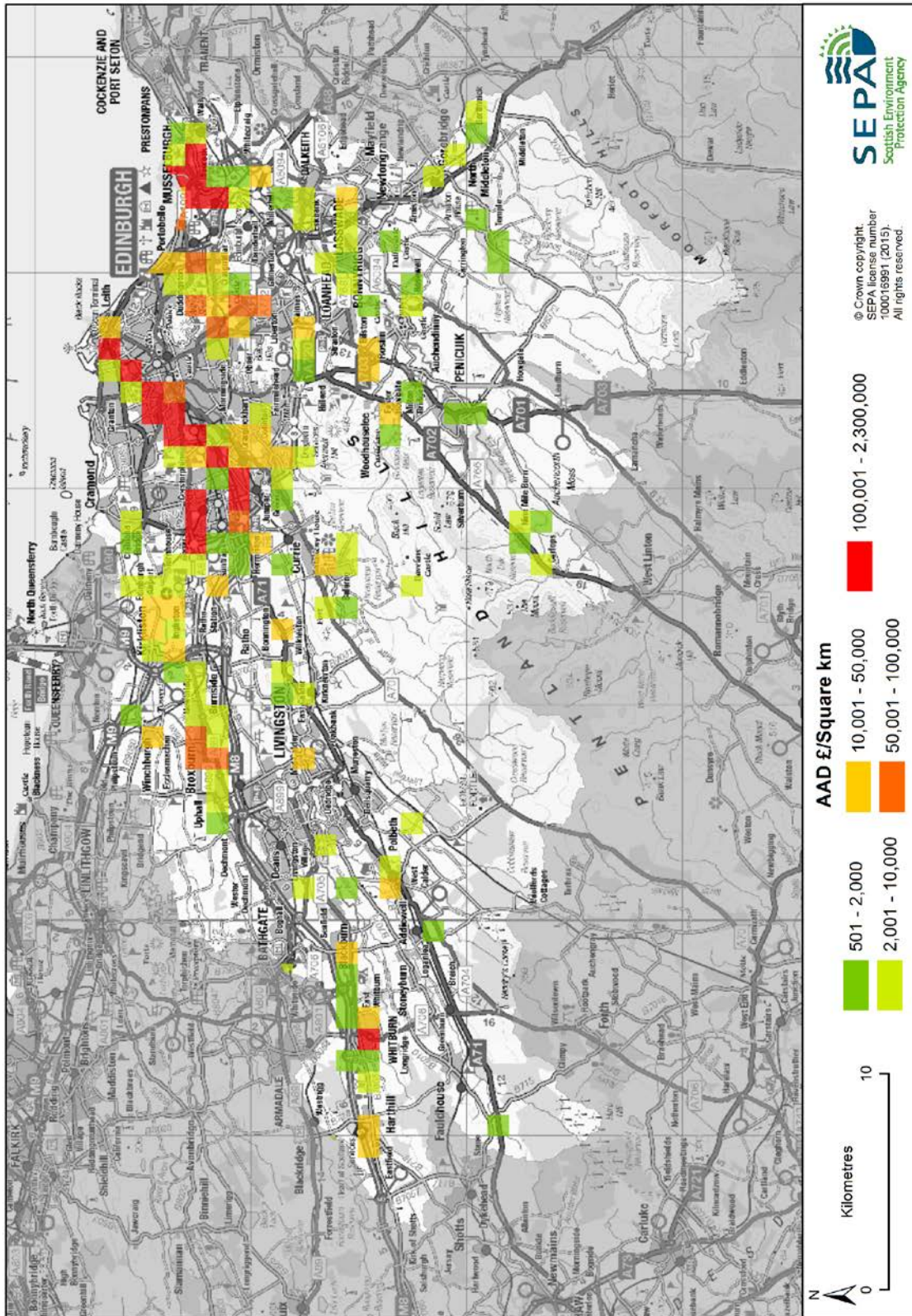


Figure 2: Annual Average Damages from river flooding

History of river flooding

The most significant flood event on the Water of Leith, River Almond, Braid Burn and Gogar Burn occurred on 8 November 2000. Over 500 properties were inundated, including Murrayfield Stadium, Murrayfield Ice Rink and two residential care homes. High water levels also caused flooding at Edinburgh Airport and Kirkliston. Probably the most significant flooding from the River Esk is believed to have occurred in August 1948 with severe flooding to Musselburgh causing evacuation of many areas of the town. The highest river level recorded at SEPA's gauging station on the River Almond at Whitburn was in December 1994, where the river levels reached 2.25m above normal levels.

The earliest flood recorded in this catchment group occurred in October 1832, when heavy rains and overtopping of the Water of Leith results in areas of Slateford, Canonmills and Warriston being inundated for 3 days. In February 1884 overtopping on the River Almond also resulted in large areas of flooding in Whitburn.

The most recent flood recorded in the catchment occurred on 20 August 2008. Over 100 properties and five businesses flooded in Broxburn following overtopping of the Brox Burn.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters.

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 chapters.

Flood protection schemes

There are six formal flood protection schemes in this catchment group:

- Polton Road Bridge Relief Culvert Flood Protection Scheme (Bilston Burn) which has a design standard of protection of 1 in 100 years
- Braid Burn Flood Protection Scheme in Edinburgh which was completed in 2010 and has a design standard of protection of 1 in 200 years plus 12% climate change
- Water of Leith Flood Protection Scheme (1984) protects the Roseburn area of Murrayfield in Edinburgh. The scheme's design standard is now estimated at 1 in 50 years to 1 in 100 years
- Water of Leith Flood Prevention Scheme (2003) in Edinburgh protects areas of Stockbridge, Bonnington, Veitch's Square and Warriston. The scheme has a design standard of protection of 1 in 200 years plus 12% climate change

- Water of Leith advanced works comprises reservoir works to Harperrig and Treipmuir/ Harlaw reservoirs
- Broxburn Flood Prevention Scheme was substantially completed in January 2014 and has a design standard of protection of 1 in 75 years plus 20% climate change.

Further work is currently ongoing on the Water of Leith by The City of Edinburgh Council. Further detail will be set out in the Local Flood Risk Management Plan.

River flood warning schemes

There are 11 river flood warning areas within this catchment group as shown in Table 3 and Figure 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. Please note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Number of properties within FWA	% of properties registered July 2014
Colinton Mains	Braid Burn	574	12%
Cramond	River Almond	33	64%
Dean Village	Water of Leith	150	25%
Inch Park and Peffermill	Braid Burn	282	14%
Longstone/Stenhouse	Water of Leith	402	20%
Mid Liberton and Cameron Toll	Braid Burn	105	10%
Musselburgh	River Esk	339	78%
Portobello	Braid Burn	230	14%
Roseburn	Water of Leith	871	35%
Stockbridge	Water of Leith	636	41%
Warriston and Bonnington	Water of Leith	1,345	25%

Table 3: Flood warning areas

Awareness raising campaigns and community groups

The following community groups are known to operate within this catchment:

- Musselburgh and Inveresk Community Council
- East Lothian Tenants and Residents Panel
- East Burnside Village Community Flood Action Group, Broxburn.

There are also various local community councils that operate throughout the East Lothian Council area.

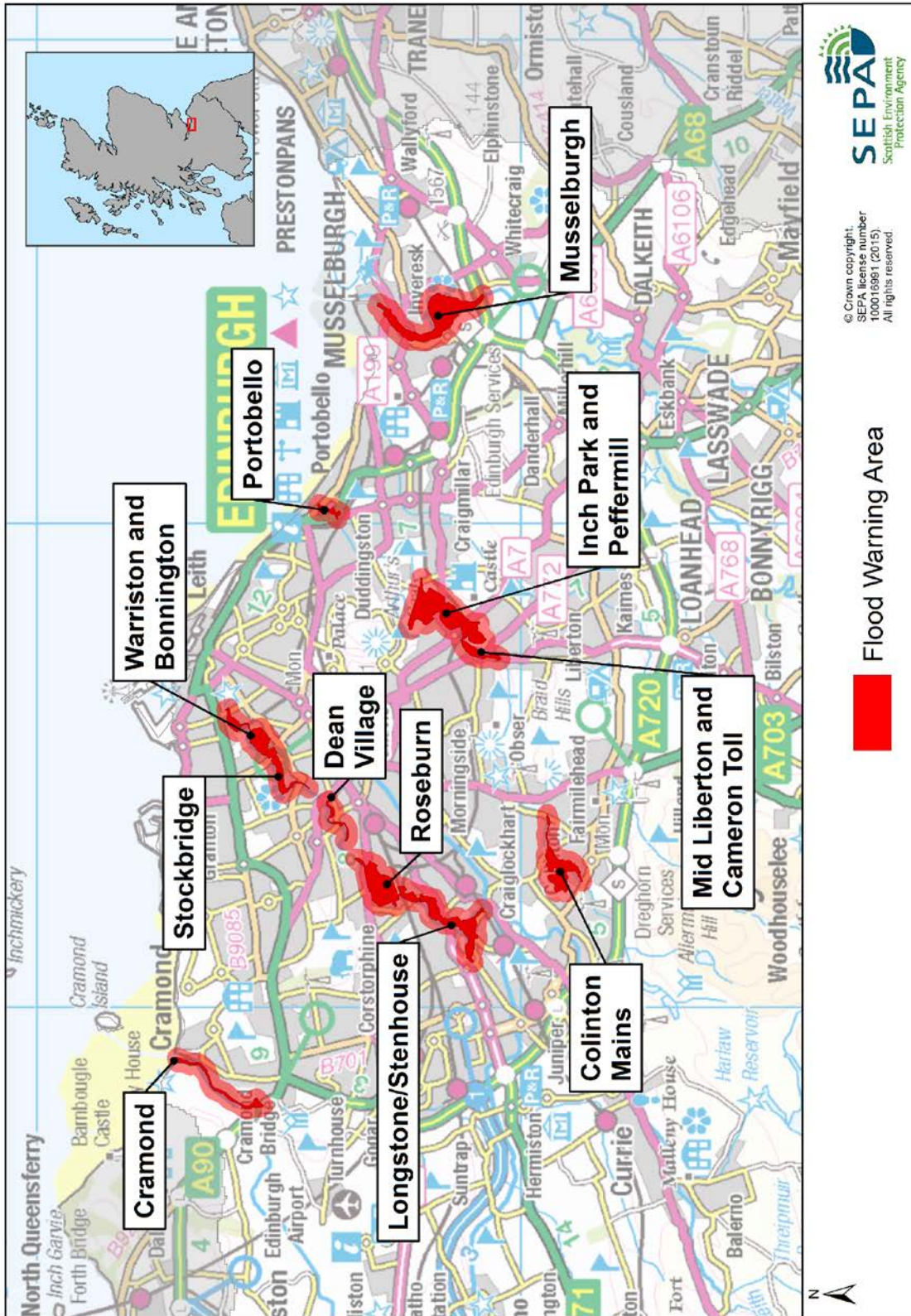


Figure 3: Flood warning areas

Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- The City of Edinburgh Council owns temporary pallet barriers that can be used to protect properties from river flooding and sandbags for public use during flood events
- The City of Edinburgh Council operates emergency action packs that are used to determine where people should be deployed during flood events.
- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding
- West Lothian Council provides sandbags and 'Aguasacs' for public use during an emergency situation.

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 Almond and Edinburgh catchment may increase by 39%¹. This would potentially increase in the number of residential properties at risk of river flooding from approximately 5,400 to 8,400 and the number of non-residential properties from approximately 720 to 1,100.

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 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 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.

Runoff reduction

There are some areas with medium potential for runoff reduction, which are mainly located to the south and south east of this catchment group. The largest of these areas surrounds Portmore Loch and Gladhouse Reservoir, with other sites including Crosswood Reservoir and the areas surrounding West Calder.

¹ From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

Floodplain storage

Areas with floodplain storage are extremely limited within this catchment group. There are two possible locations: near Edinburgh Airport and Gladhouse Reservoir, which have medium to high potential.

Sediment management

Channel erosion appears to be widespread throughout the catchment group, with all water bodies experiencing moderate levels of erosion. Zones of high erosion occur on the River South Esk downstream of the Gladhouse and Roseberry reservoirs, on the Niddry Burn at the confluence with the River Almond and on the upper reach of the Lead Burn.

Sediment deposition is also widespread throughout the catchment group. High sediment deposition occurs on the River Almond northwest of Edinburgh Airport, the Bickerton Burn and How Burn at Whitburn and in Threipmuir and Harperig reservoirs southwest of Balerno.

River flooding Firth of Forth catchment group

Catchment overview

The Firth of Forth catchment group covers an area of 1,463km² and comprises of a number of smaller watercourses. The watercourses in this group include the River Leven, River Ore, Keithing Burn, Bluther Burn, River Avon, River Carron, Bonny Water and Grange Burn. The catchment group includes several large lochs and reservoirs including Loch Leven and the Carron Valley Reservoir.

The topography is generally gently sloping although there are steep areas particularly in the headwaters of the larger catchments. On average its soils are generally dry due to its sheltered location on the east coast. The average annual rainfall for this catchment is low to average for Scotland, with 600-700mm falling in the lower part of the catchment, rising to 1500-2000mm in the upper catchment.

Flood risk in the catchment

Within the Firth of Forth catchment group approximately 1,700 residential properties and 450 non-residential properties are at risk of river flooding. It is estimated that 87% of these properties are located within Potentially Vulnerable Areas. There are 15 Potentially Vulnerable Areas and one candidate Potentially Vulnerable Area (10/28c) at risk of river flooding in this catchment group (Figure 1):

- Crail (10/01)
- Pittenweem (10/02)
- Leven (10/03)
- Kinross, Milnathort, Glenrothes and Kinglassie (10/04)
- Kirkcaldy, East Wemyss and Methil (10/05)
- Inverkeithing, Rosyth, Dunfermline and Wellwood (10/06)
- Cairneyhill (10/07)
- Hawkhill, Kincardine, Kennet Pans and Culross (10/08)
- Airth (10/09)
- North Queensferry and Inverkeithing (10/10)
- Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (10/11)
- Bo'ness (10/12)
- Linlithgow Bridge, Bathgate, Whiteside and Slammanan (10/13)
- Philipstoun (10/14)
- South Queensferry (10/15)
- Cowdenbeath (10/28c).

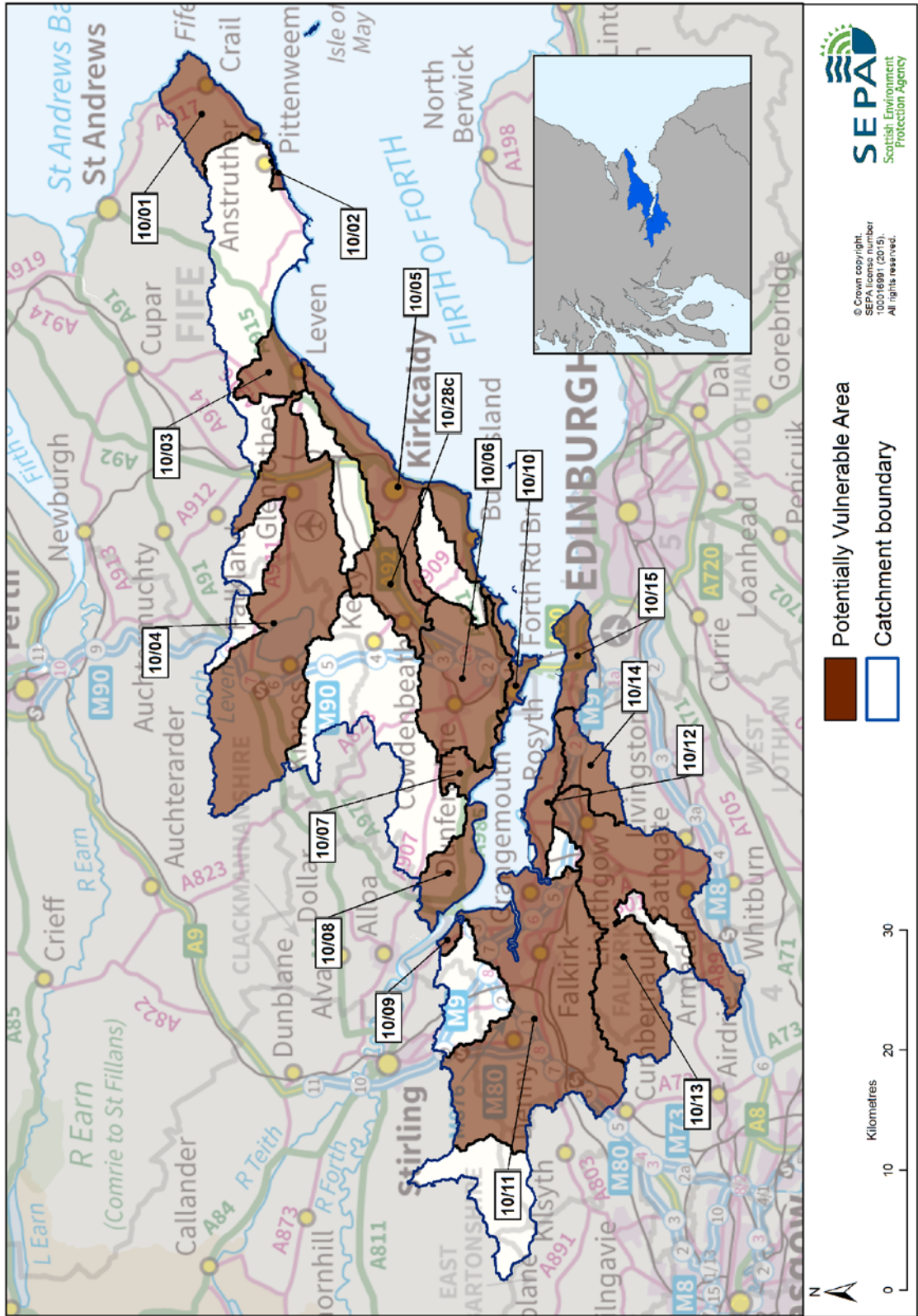


Figure 1: The Firth of Forth catchment group

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.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Carron-Carronshore-Bainsford	580	£760,000
Denny-Dunipace	160	£310,000
Dunfermline	140	£600,000
Crail	140	£280,000
Leven-Methil	90	£610,000
Kirkcaldy	80	£430,000
Linlithgow	80	£210,000
Falkirk Westquarter	70	£120,000
Cardenden-Auchterderran-Bowhill	70	£160,000
Bonnybridge-Banknock	60	£120,000
Falkirk	50	£90,000
Glenrothes-Markinch-Leslie	40	£260,000
Rosyth	40	£110,000
Lochore	40	£100,000
Cowdenbeath	40	£90,000
Inverkeithing-North Queensferry	30	£250,000
Cairneyhill	20	£80,000
Slamannan	20	£71,000
Oakley	20	£55,000
Kinross ¹	20	£20,000
Milnathort ¹	20	£19,000
Larbert-Stenhousemuir and Carmuir	10	£230,000
Torryburn	10	£34,000
Bathgate-Blackburn	10	£33,000
Anstruther-Pittenweem	10	£5,000
Grangemouth	<10	£200,000
Kennoway	<10	£38,000
Kelty	<10	£12,000

Table 1: Main areas with a risk of river flooding

¹ The numbers presented in this report are derived from SEPA data that is assessed at a strategic level. Perth and Kinross Council has identified that there may be higher numbers of properties at risk from river flooding in Kinross and Milnathort.

Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Firth of Forth catchment group are estimated to be approximately £6.7 million. The damages are distributed as follows:

:

- 47% Residential properties (£3.1 million)
- 42% Non-residential properties (£2.8 million)
- 6% Emergency services (£380,000)
- 2% Roads (£150,000)
- 2% Agriculture (£110,000)
- 1% Vehicles (£100,000).

Figure 2 shows the Annual Average Damages throughout the catchment group. The highest damages can be seen around the Methil/ Leven area due mainly to non-residential property at risk of flooding from the River Leven. High damages can also be seen in the Carron area of Falkirk due to dense areas of residential properties being affected by flooding from the River Carron.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment group.

	Number at risk	Further detail
Community facilities	<10	Includes: educational buildings and emergency services.
Utility assets	60	Includes: electricity substations, fuel extraction sites and telecommunication sites.
Roads (excluding minor roads)	78	4 M roads (M8, M9, M80, M90) at 62 locations 29 A roads at 187 locations 45 B roads at 186 locations
Railway routes	7	Carmuir Junction to Polmont Junction (1 location at risk) Dunblane to Stirling/Larbert (8 locations at risk) Edinburgh Waverly to Glasgow Queen Street (11 locations at risk) Fife Circle, Dalmeny to Winchburgh and Dalmeny to Haymarket West Junctions (32 locations at risk) Perth to Ladybank (3 locations at risk)
Agricultural land (km²)	16.9	

Table 2: Infrastructure and agricultural land at risk of river flooding

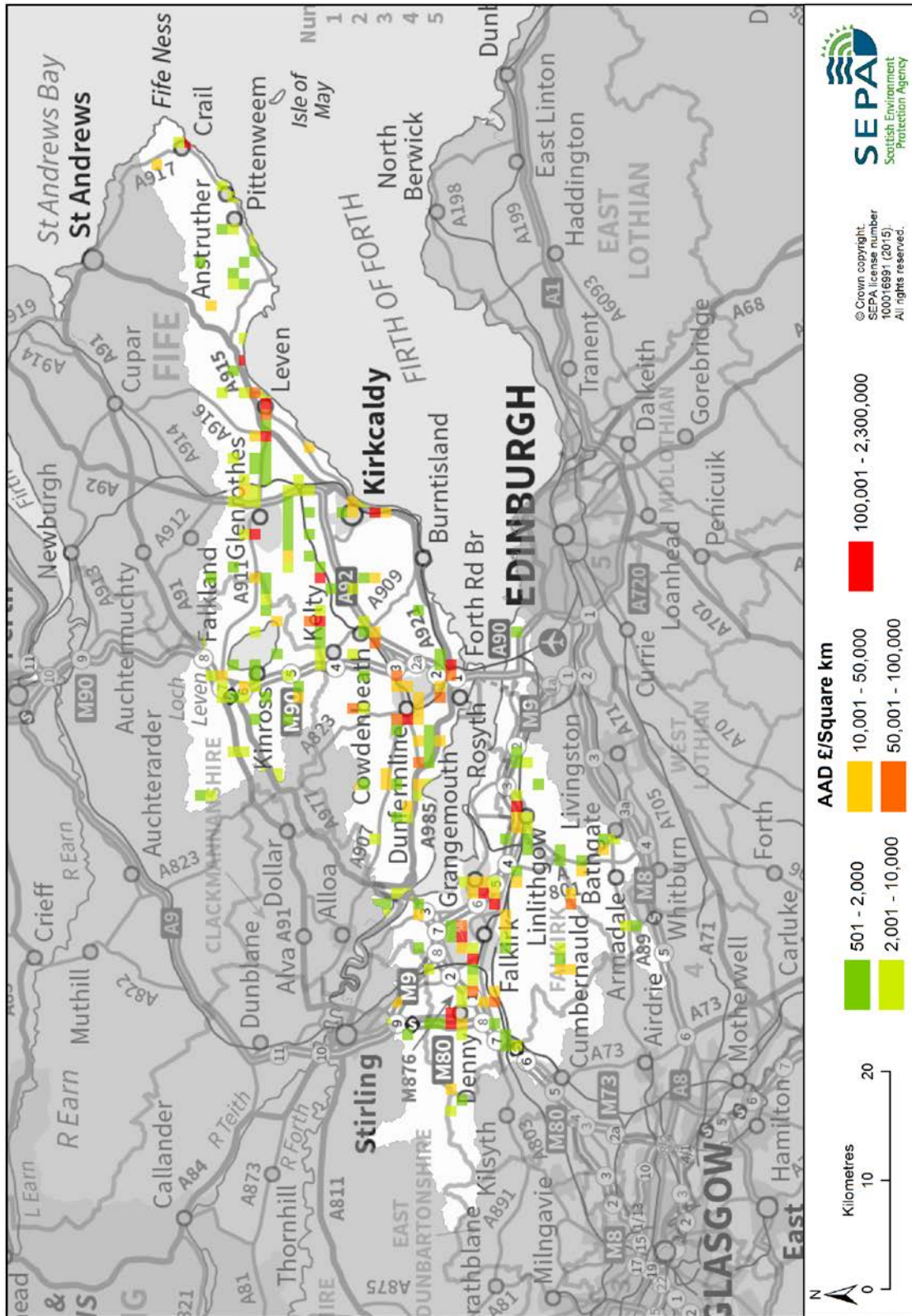


Figure 2: Annual Average Damages from river flooding

Designated environmental and cultural heritage sites at risk

Within the catchment group it is estimated that approximately 60 designated cultural heritage sites are at risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites, listed buildings and World Heritage sites.

It is estimated that 24 environmental designated areas are at risk of river flooding. These include a Special Area of Conservation, three Special Protection Areas and 20 Sites of Special Scientific Interest. Amongst these areas are West Fannyside Moss, Loch Leven and Carron Glen.

History of river flooding

The most significant river flooding in this catchment group is believed to have occurred in February 1903 when many urban areas were affected by flooding from watercourses, including the River Leven, the River Carron, the River Lochty and the River Ore.

Also of note is a flood on 13 December 2006 causing widespread damage including inundation of properties and disruption of transport links throughout the Falkirk area from the River Carron, in Milnathort from the Back Burn and in Kinross on the banks of the South Queich.

The earliest records of river flooding in the Firth of Forth catchment group include October 1864 when it was recorded that 49mm of rain fell in a single day and February 1872 when the River Leven burst its banks and many houses were flooded with furniture seen floating down the streets.

More recently, in 2012, a number of small burns and watercourses caused flooding in Dunfermline, Rosyth and Oakley.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters.

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 2.

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 chapters.

Flood protection schemes

There are seven formal flood protection schemes to reduce the risk of river flooding in the catchment group:

- Grange Burn Flood Prevention Scheme
- Cairneyhill Flood Prevention Scheme

- Parkneuk Flood Prevention Scheme
- Kincardine-on-Forth Flood Prevention Scheme
- Linlithgow Flood Prevention Scheme
- Milnathort Flood Prevention Scheme
- Dunfermline Flood Prevention Scheme.

Community groups

The following community groups are known to operate within this catchment group:

- Carronvale Residents and Tenants Association
- Perth and Kinross Council is part of a wider community resilience group which works with various communities including Milnathort to develop community resilience plans.

Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- Fife Council has installed flood pods containing flood sacks and flood snakes close to areas containing potential flood affected properties.

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 Firth of Forth catchment may increase by 39%². This would potentially increase in the number of residential properties at risk of river flooding from approximately 1,700 to 5,000 and the number of non-residential properties from approximately 450 to 660.

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 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 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.

² From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

Runoff reduction

The catchment group contains several areas of potential for runoff reduction, including large areas within the Carron Valley Forest, at Cairnoch Hill and Earl's Hill and surrounding the Earls Burn Reservoirs. These sites would require further investigation to determine whether they can contribute to reducing flood risk.

Floodplain storage

There is high floodplain storage potential at the Carron Valley Reservoir and Loch Leven. A number of other areas of medium/ high potential are located within the Potentially Vulnerable Area boundaries and therefore merit further investigation.

Sediment management

High levels of channel erosion are experienced at various locations throughout the catchment, including the Earls Burn southwest of Stirling, the Westquarter Burn southeast of Falkirk and the River Leven. Sediment deposition is also widespread throughout the catchment. While much of this will be attributable to natural processes there may be reaches which would benefit from actions that reduce erosion such as improvement of bankside vegetation. Further investigation of sediment management options may be beneficial at Ball and Harperleas Reservoirs in the Lomond Hills, Loch Ore and the River Ore, particularly north of Lochgelly and north of Kirkcaldy.

3.3 Coastal flooding

Forth Estuary 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

The Forth Estuary Local Plan District has 375km of coastline, stretching from Fife Ness in the north to the Scottish Borders in the south. The coastline includes the Firth of Forth and areas of coast exposed to the North Sea. Several urban areas are situated along the coastline including Grangemouth, Bo'ness, Edinburgh, Musselburgh, North Berwick and Eyemouth.

Due to the sheltering effects of the estuary, the main influences of coastal flooding in the Firth of Forth are storm surges. The coast itself, from around North Berwick to the Scottish border, is exposed to the North Sea. Coastal flooding here is influenced by storm surges, swell waves and locally generated wind waves.

Finer sediments in the inner Firth of Forth create habitats such as mudflats, salt marshes and reed beds, such as those at Skinflats and the Alloa Inches. Toward the outer Firth of Forth the sediments in the estuary become coarser, creating habitats such as sandy beaches and dunes, such as those at Gullane Bay and Aberlady Bay.

Flood risk

Within the Forth Estuary Local Plan District approximately 1,700 residential properties and 340 non-residential properties are at risk of coastal flooding. It is estimated that 92% of these properties are location within Potentially Vulnerable Areas. There are 22 Potentially Vulnerable Areas in this Local Plan District that have a risk of coastal flooding (Figure 1):

- Crail (10/01)
- Leven (10/03)
- Kirkcaldy, East Wemyss and Methil (10/05)
- Inverkeithing, Rosyth, Dunfermline and Wellwood (10/06)
- Cairneyhill (10/07)
- Hawkhill, Kincardine, Kennet Pans and Culross (10/08)
- Airth (10/09)
- North Queensferry, Inverkeithing and Rosyth (10/10)
- Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (10/11)
- Bo'ness (10/12)
- Philipstoun (10/14)
- South Queensferry (10/15)
- Cramond Bridge (10/16)
- Port of Leith, Granton and Cramond (10/17)
- Water of Leith Catchment (10/18)

- Braid Burn Catchment (10/19)
- Niddrie and Burdiehouse Burn Catchment (10/20)
- Musselburgh (10/21)
- Penicuik, Bonnyrigg, Lasswade, Dalkeith and Musselburgh (10/22)
- Cockenzie, Port Seton, Longniddry and Prestonpans (10/23)
- Dunbar and West Barns (10/25)
- Berwickshire Coast (10/26).

Main areas at risk

The main areas at risk of coastal flooding, the number of properties at risk and the total Annual Average Damages caused by coastal flooding are shown in Table 1. The Annual Average Damages include damages to residential and non-residential properties, transport, emergency services and agriculture.

	Residential and non-residential properties at risk of coastal flooding	Annual Average Damages
Grangemouth	730	£650,000
Musselburgh	450	£750,000
Kincardine	160	£870,000
Culross	140	£360,000
Airth	110	£680,000
Eyemouth	100	£290,000
Edinburgh	60	£160,000
Newmills and Torryburn	40	£190,000
Inverkeithing-North	20	£42,000
Dunbar and West Barns	20	£30,000
South Queensferry	20	£20,000
North Berwick	20	£13,000
Rosyth	10	£460,000
Carron-Carronshore-Bainsford	10	£110,000
Leven-Methil	10	£78,000
Anstruther-Pittenweem	10	£22,000

Table 1: Main areas with a risk of coastal flooding¹

¹ Table 1 does not show properties at risk if they are protected by a flood protection scheme with a standard of protection of 1 in 200 years.

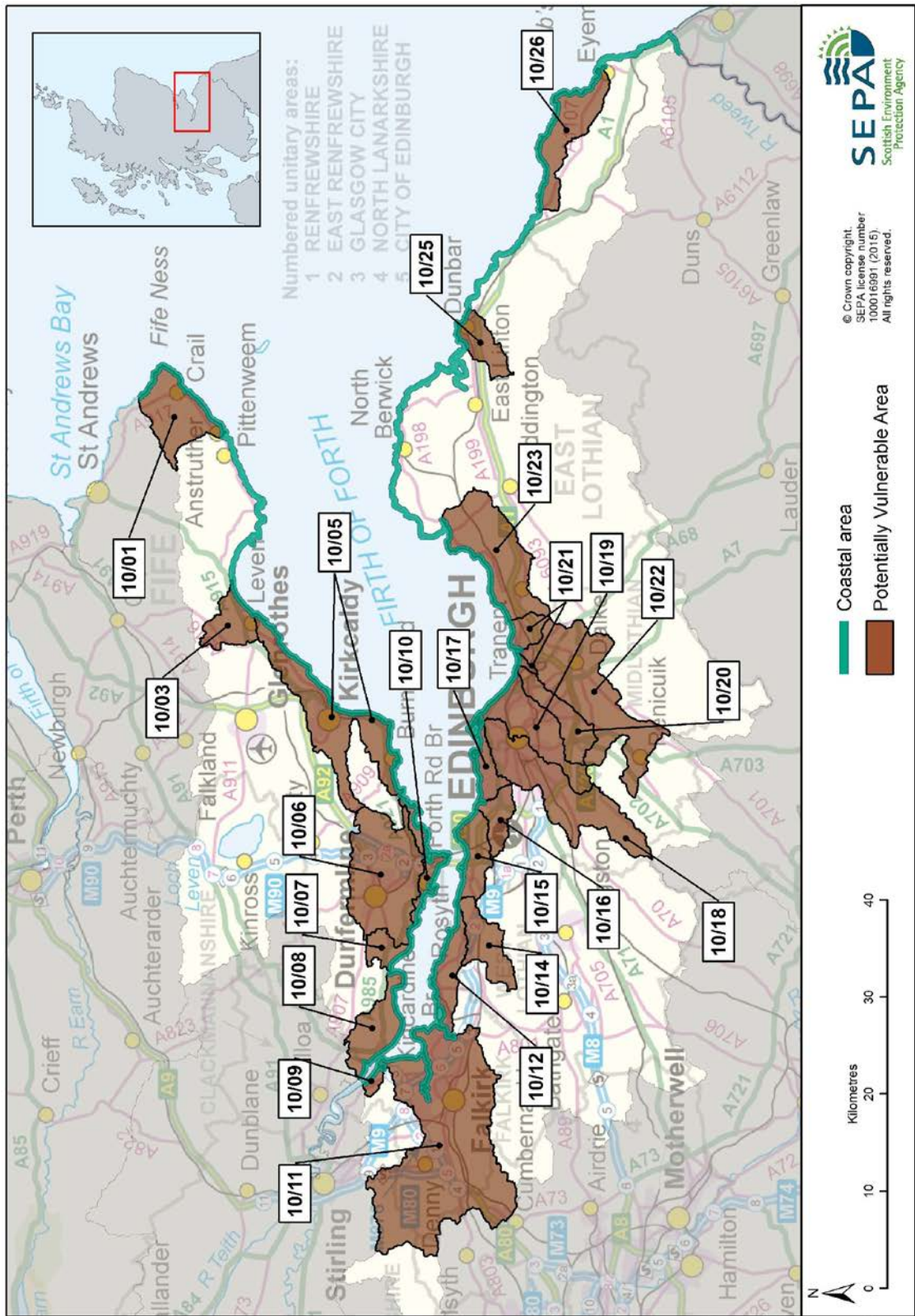


Figure 1: Forth Estuary Local Plan District coastal area and Potentially Vulnerable Areas with a risk of coastal flooding

Economic activity and infrastructure at risk

The Annual Average Damages caused by coastal flooding in the Forth Estuary Local Plan District are approximately £5.5 million. The damages are distributed as follows:

- 40% residential properties (£2.2 million)
- 32% roads (£1.8 million)
- 22% non-residential properties (£1.2 million)
- 4% emergency services (£240,000)
- 2% vehicles (£100,000)
- <1% agriculture (£22,000).

Figure 2 shows the Annual Average Damages throughout the coastal area. High damages can be seen around the Musselburgh and Airth due to the large number of residential and non-residential properties along the coastline. The greatest number of properties at risk is in Grangemouth. Industrial areas around Grangemouth, Rosyth, Kincardine and Culross also contribute to high damage values.

Table 2 shows further information about infrastructure and agricultural land at risk of coastal flooding.

	Number at risk	Further detail
Community facilities	<10	Educational buildings
Utility assets	40	Includes: electricity substations and energy production sites
Roads (excluding minor roads)	18	13 A roads at 69 locations 5 B roads at 30 locations
Railway routes	1	Fife circle: Dalmeny to Winchburgh and Haymarket West Junctions (3 locations at risk)
Agricultural land (km²)	10.5	

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 approximately 69 designated cultural heritage sites have a risk of coastal flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites, World Heritage Sites and listed buildings.

Approximately 12 environmental designated areas are at risk of coastal flooding. These include a Special Area of Conservation, five Special Protection Areas and six Sites of Special Scientific Interest, notably Bass Rock, St Abb's Head to Fast Castle and the Isle of May.

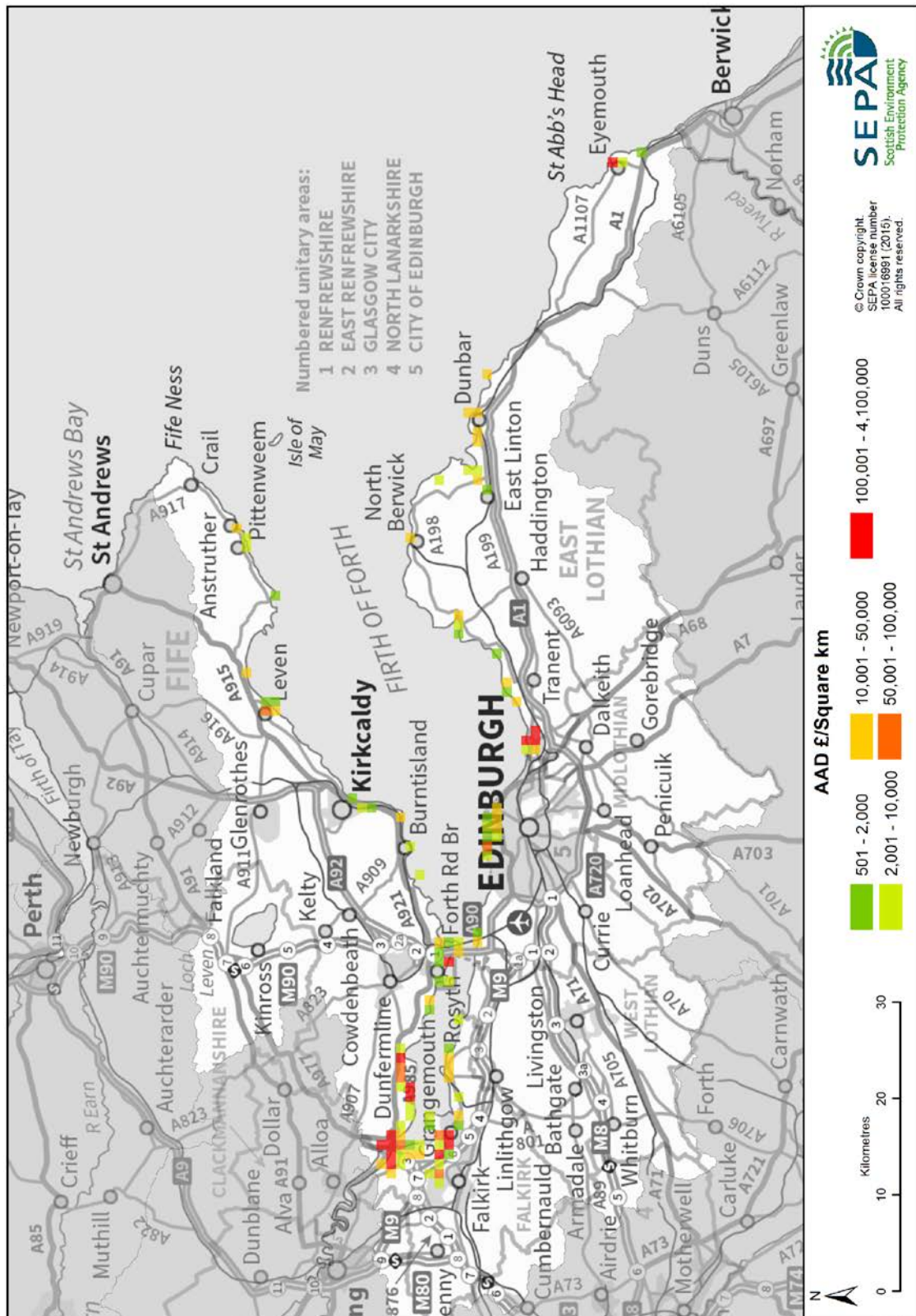


Figure 2: Annual Average Damages from coastal flooding

History of coastal flooding

The Forth Estuary has a long history of coastal flooding. The highest tide on record occurred in 1959 when a level of 4.47m was recorded at Grangemouth Docks.

A recent flood was recorded on 4 January 2014 when a tidal surge combined with a storm surge affected coastal areas across the east of Scotland.

Probably the most significant flood on record occurred in March 2010 when a tidal surge coincided with the highest mean tides of the year. The Firth of Forth was one of the worst affected areas, with Leith, Musselburgh, Prestonpans, Port Seton, Kirkcaldy, Dunbar, Eyemouth and North Berwick affected. Impacts included flooding of properties, damage to harbours, seawalls and roads. Edinburgh City Council estimated the cost to repair damages in the region of £650,000.

Another significant flood occurred in April 1958 when 40 families had to be evacuated in Kirkcaldy, homes and businesses flooded, cars were washed away and civil infrastructure was damaged. Portobello promenade and nearby houses were also inundated.

Examples of some of the earliest floods on record includes event in 1877 when the sea wall was washed away between Portobello and Joppa, and the 'Eyemouth Disaster' of 1881 when 191 fishermen died.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters in Section 2.

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 chapters.

Flood protection schemes

There are three formal flood protection schemes that reduce the risk of coastal flooding:

- Bo'ness coastal flood protection scheme with a standard of protection of 1 in 200 years
- Grangemouth Grange Burn flood protection scheme that has some coastal protection benefits
- Prestonpans coastal flood protection scheme has a standard of protection of 1 in 200 years.

Coastal flood warning schemes

There are 19 coastal flood warning areas within the Forth Estuary Local Plan District as shown in Table 3 and Figure 3. Table 3 shows the total number of properties within a flood warning area and the percentage of properties that have registered to receive flood warnings directly from SEPA. Please note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	Number of properties within FWA	% of properties registered January 2014
Anstruther to Elie	124	15%
Blackness	24	8%
Burntisland to Aberdour	26	15%
Culross, Longannet and Kincardine	615	11%
Dunbar including West Barns	198	34%
Eyemouth Coastal	88	22%
Grangemouth	1,340	14%
Granton and Leith	3,545	7%
Kinghorn	50	12%
Kirkcaldy	156	7%
Leven and Methil	285	9%
Lower Largo	38	39%
Musselburgh Coastal	2,085	15%
North Berwick	48	65%
North Queensferry and Inverkeithing Bay	184	16%
Portobello Esplanade	162	12%
Prestonpans, Cockenzie and Port Seton	297	12%
Rosyth, Limekilns and Charlestown	106	17%
Torryburn and Newmills	29	10%

Table 3: Flood warning areas

Community groups

The following community groups are known to operate within this coastal area:

- Burnmouth Resilient Community Group
- Coastal Regeneration Group for Port Seton and Cockenzie
- Cockburnpath Resilient Community Group
- Dunbar Shore and Harbour Neighbourhood Group
- East Lothian Biodiversity Group and Local Community Councils
- Eyemouth Resilient Community Group
- Friends of the River Tyne
- Musselburgh Waterfront Group
- North Berwick Environment Group
- St Abbs Resilient Community Group.

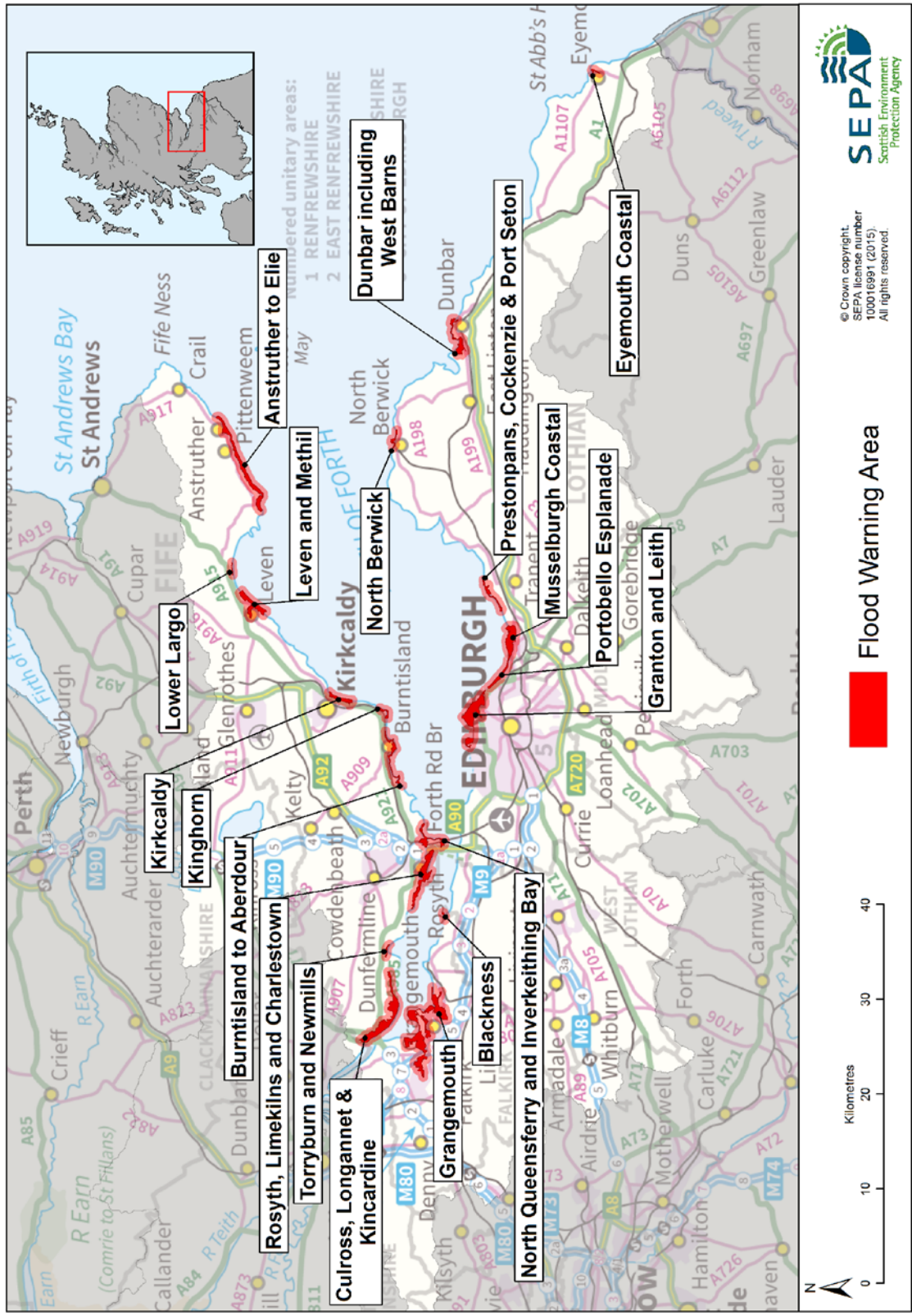


Figure 3: Flood warning areas

Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection. In this coastal area:

- East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding
- Fife Council provides Aquasacs for use in emergencies
- Scottish Borders Council operates a subsidised flood protection products scheme for residential and non-residential property owners in flood risk areas
- Scottish Borders Council also maintains dedicated sandbag stores in areas of flood risk to ensure they are available to the public in the event of a flood
- The City of Edinburgh Council owns sandbags to be used in the event of flooding.

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.

Under the UKCP09 high emissions scenario, the predicted average sea level increase around the Forth Estuary Local Plan District ranges from 0.47-0.5m by 2080. This may increase the number of residential properties at risk of coastal flooding from approximately 1,700 to 3,800 and the number of non-residential properties from approximately 340 to 970. Coastal flood modelling by SEPA has not taken into account the impacts of a future climate 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.

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

The assessment shows that there is potential for estuarine surge attenuation to reduce flood risk in and around Kincardine and Rosyth, and at Grangemouth, Bo'ness, North Queensferry, South Queensferry and Inverkeithing. There is potential for wave dissipation to provide flood risk benefits along the coastline from North

Queensferry to Fife Ness, around Grangemouth, along most of the coast from South Queensferry to North Berwick, around Dunbar and within the Berwickshire Coast.

The feasibility of implementing natural flood management actions may be limited in some locations due to the large amount of industrial sites located along this coastline.

3.4 Surface water flooding

Forth Estuary Local Plan District

This chapter provides supplementary information on surface water flooding across the 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 the Forth Estuary Local Plan District approximately 5,400 residential properties and 2,400 non-residential properties are at risk of surface water flooding. It is estimated that 96% of these properties are located within Potentially Vulnerable Areas.

Main areas at risk

The main areas at risk of surface water flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by surface water flooding. The damages include impacts to residential and non-residential properties, vehicles, emergency services and roads.

Economic activity and infrastructure at risk

The Annual Average Damages caused by surface water flooding in the Forth Estuary Local Plan District are approximately £12.5 million. The damages are distributed as follows:

- 39% roads (£4.8 million)
- 32% residential properties (£3.9 million)
- 26% non-residential properties (£3.2 million)
- 3% emergency services (£400,000)
- <1% vehicles (£120,000).

Economic damages to airports and the rail network were not assessed as information on damages at a strategic scale is not available. Of the economic damages assessed, the highest damages in the Local Plan District are to roads, of which the M9 and the Edinburgh City Bypass are significantly affected. Figure 1 shows the distribution of Annual Average Damages throughout the Local Plan District. High damages can be seen in Edinburgh due to the number of residential and non-residential properties. High damages can also be seen in Dunfermline due to the high number of non-residential properties affected.

	Residential and non-residential properties at risk of surface water flooding	Annual Average Damages
Edinburgh	3,100	£2.5 million
Dunfermline	300	£610,000
Livingston	290	£380,000
Linlithgow	280	£650,000
Bo'ness	260	£440,000
Leven-Methil	220	£160,000
Falkirk	200	£190,000
Kirkcaldy	190	£230,000
Glenrothes-Markinch-Leslie	170	£340,000
Bathgate-Blackburn	170	£140,000
Broxburn	130	£130,000
Cowdenbeath	100	£150,000
Musselburgh	90	£100,000
Carron-Carronshore-Bainsford	90	£64,000
Armadale	90	£60,000
Lasswade-Bonnyrigg	80	£64,000
Haddington	70	£140,000
Penicuik	70	£110,000
Rosyth	70	£100,000
Grangemouth	70	£62,000
Dalkeith	60	£320,000
Newtongrange	60	£140,000
Culross	50	£70,000
Cumbernauld (East)	50	£60,000
Cairneyhill	50	£51,000
Polmont	40	£60,000
Whitburn	40	£40,000
Burntisland	30	£40,000
Tranent	30	£34,000
Cardenden-Auchterderran-Bowhill	30	£24,000
Bonnybridge-Banknock	30	£20,000
Milnathort	30	£15,000
Loanhead	20	£40,000
Kinross	20	£28,000
Lochore	20	£27,000
Larbert-Stenhousemuir	20	£24,000
Denny-Dunipace	10	£46,000

Table 1: Main areas at risk of surface water flooding

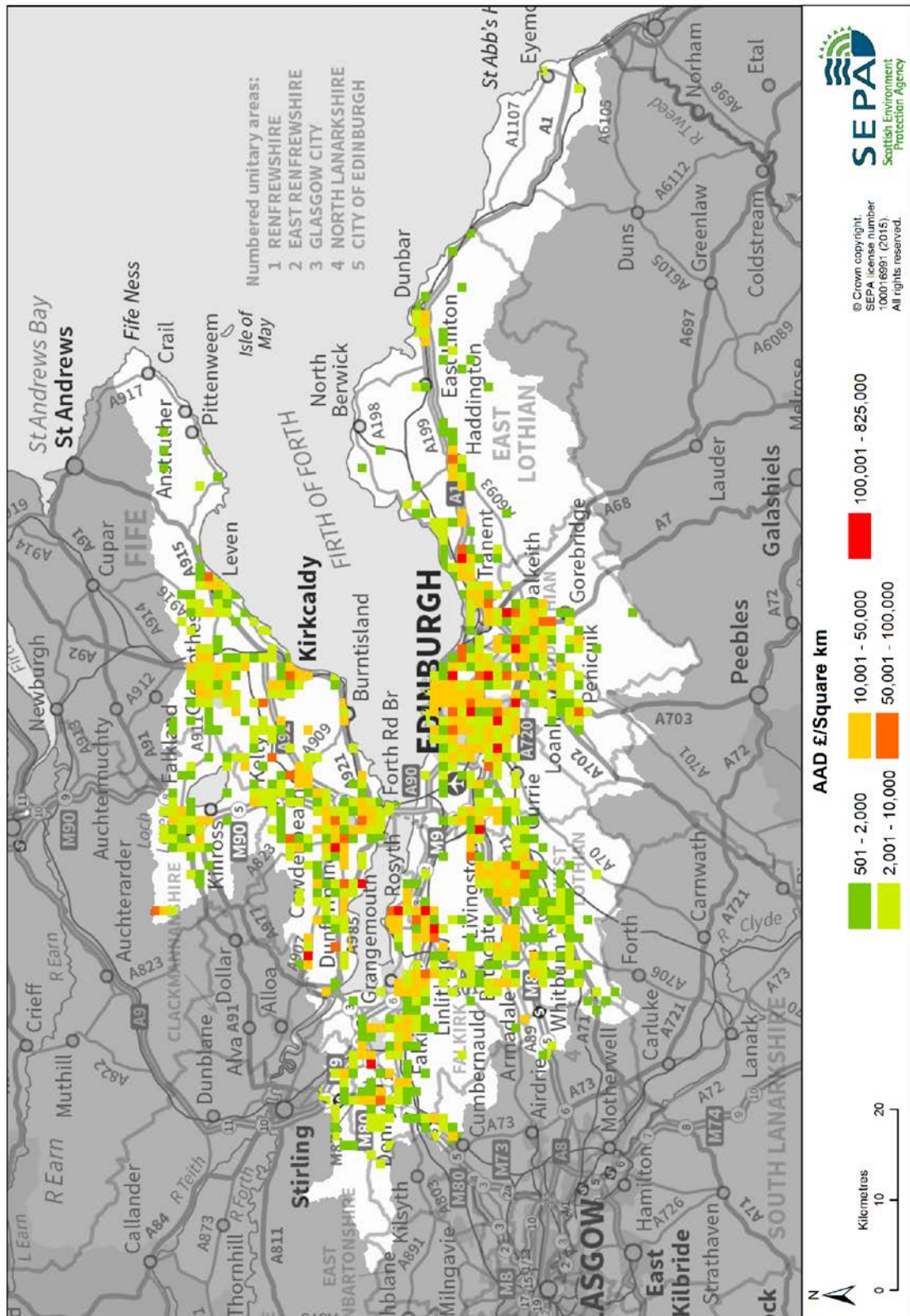


Figure 1: Annual Average Damages from surface water flooding

Table 2 shows the approximate numbers of further infrastructure assets which are at risk of flooding within this catchment.

	Number at risk	Further detail
Community facilities	30	Includes: educational buildings and healthcare service
Utility assets	410	Includes: electricity substations fuel extraction sites and telephone exchanges
Roads (excluding minor roads)	181	5 M roads (M90) at 280 locations 68 A roads at 2,000 locations 108 B roads at 1,200 locations
Railway routes	9	Berwick-upon-Tweed to Edinburgh (80 locations at risk) Carmuir Junction to Polmont Junction (15 locations at risk) Carstairs to Edinburgh (60 locations at risk) Drumgelloch to Newbridge Junction (45 locations at risk) Dunblane to Larbert / Stirling (15 locations at risk) Edinburgh to Glasgow Queen Street (90 locations at risk) Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions (110 locations at risk) Mid Calder Junction to Holytown Junction (50 locations at risk) Perth to Ladybank (10 locations at risk)
Airports	2	Edinburgh airport Fife airport

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 approximately 519 designated cultural heritage sites have a risk of surface water flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites, World Heritage sites 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

A number of surface water flood events have been recorded in this Local Plan District.

Recently, on 25 July 2013 there was flooding in Albert Road, Church Street and Harbour Road in Eyemouth to both residential and commercial property. The same area also flooded on 28 June 2012.

On 8 July 2011 there was surface water flooding of homes and businesses in Edinburgh. Balcarres Street in Morningside was identified as the area worst affected area with around 20 residential and three commercial properties flooding. Four properties were also affected from this flooding event at Greenbank Road.

In July 2009 heavy rain caused surface water flooding in areas of Fife and Perth and Kinross, including Milnathort.

The earliest flood on record occurred in August 1948 in Eyemouth when low-lying areas flooded by surface water flowing down Northburn Road.

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.

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.

Community groups

The following community groups are known to operate within the Forth Estuary Local Plan District:

- East Lothian Tenants and Residents Panel
- Eyemouth Community Resilience Group
- Friends of the River Tyne
- Musselburgh and Inveresk Community Council
- St Abbs Community Resilience Group
- Various local community councils operate throughout the East Lothian Council area
- Perth and Kinross Council is part of a wider community resilience group which works with various communities including Milnathort to develop community resilience plans.

Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- The City of Edinburgh Council has issued properties on Balcarres Street with door and vent flood guards. The City of Edinburgh Council also stores sandbags at key fire stations
- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding
- Fife Council has installed flood pods containing flood protection products

- close to flood affected properties
- Scottish Borders Council operates a subsidised flood protection products scheme for residential and non-residential property owners in flood risk areas. Scottish Borders Council has provided and maintains dedicated sandbag stores in areas of flood risk to ensure sandbags are available to the public in the event of a flood
 - West Lothian Council provides 'Aquasacs' which are stored at key fire stations through the council area.

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 surface water 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 5,400 to 9,900 and the number of non-residential properties from approximately 2,400 to 4,400. With future impacts of climate change considered, new surface water flood risk may arise in Gorebridge where currently there is estimated to be a very low risk of surface water 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.

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. ⁱ
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 ⁱⁱ), wetlands, rivers, canals (and their banks) and other watercourses ⁱⁱⁱ
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 ^{iv} .
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.^v</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. ^{vi}
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 ^{vii} .
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’ ^{viii}

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. High likelihood: 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. Medium likelihood: 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. Low likelihood: 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 ^{ix} .
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.

Term	Definition
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 ^x .
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 ^{xi} .
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 ^{xii} .
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 ^{xiii}
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. ^{xiv}
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.

ⁱ <http://apps.sepa.org.uk/bathingwaters/> accessed 14/10/2015 last updated 2015

ⁱⁱ <http://www.susdrain.org/delivering-suds/using-suds/suds-components/swales-and-conveyance-channels/swales.html> accessed 12/10/2015 last updated 2012

ⁱⁱⁱ <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

^{iv} <http://www.legislation.gov.uk/ukpga/2004/36/schedule/1> accessed 12/10/2015 last updated 2004

^v <http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter9.aspx?pagenum=10> accessed 12/10/2015 last update 07/03/2012

^{vii} http://ec.europa.eu/environment/water/flood_risk/ accessed 12/10/2015 last updated 17/09/2015

^{viii} <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

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- ^{ix} <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/local-designations/lmr/> accessed 12/10/2015 last updated 12/07/2015
- ^x <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/sssis/> accessed 12/10/2015 last updated 21/01/2015
- ^{xi} <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/sac/> accessed 12/10/2015 last updated 01/03/2013
- ^{xii} <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/spa/> accessed 12/10/2015 last updated 01/03/2013
- ^{xiii} <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
- ^{xiv} <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>AVOID DEVELOPMENT IN MEDIUM TO HIGH RISK AREAS</p> <ul style="list-style-type: none"> a) Planning authorities 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. b) Planning authorities and SEPA 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. c) SEPA 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. d) SEPA and planning authorities 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.
<p>REDUCE IMPACTS TO EXISTING BUILDINGS</p> <ul style="list-style-type: none"> a) SEPA, planning authorities and local communities 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.
<p>PROTECT AND ENHANCE NATURAL FEATURES THAT HAVE A POSITIVE IMPACT ON REDUCING OVERALL FLOOD RISK</p> <ul style="list-style-type: none"> a) SEPA and planning authorities 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.
<p>NEW DEVELOPMENTS ARE DESIGNED TO ENSURE THAT SURFACE WATER DRAINAGE DOES NOT INCREASE FLOOD RISK ON OR OFF SITE</p> <ul style="list-style-type: none"> a) SEPA prepares guidance for planning authorities and developers on the use of surface water hazard maps for land use planning purposes. b) Planning authorities 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. c) SEPA 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.
<ul style="list-style-type: none"> a) NEW DEVELOPMENT IS RESILIENT TO PREDICTED FUTURE CHANGES IN CLIMATE Planning authorities 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.

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

SEPA acknowledges the provision of flood models and other supporting data and information from local authorities in Scotland and their collaboration in the production of flood risk management information.

Scottish Water

SEPA acknowledges the inclusion of surface water flooding data generated by Scottish Water in preparation of flood risk information.

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.

