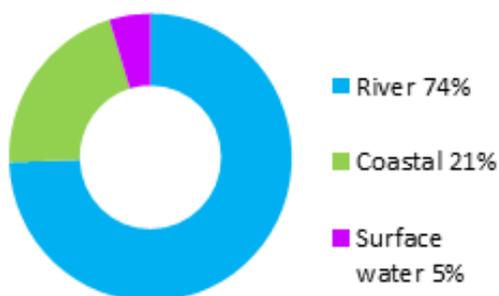


Musselburgh (Potentially Vulnerable Area 10/21)

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.

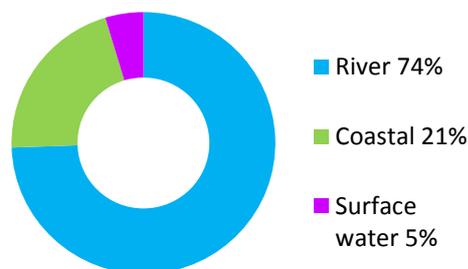


Figure 1: Annual Average Damages by flood source

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

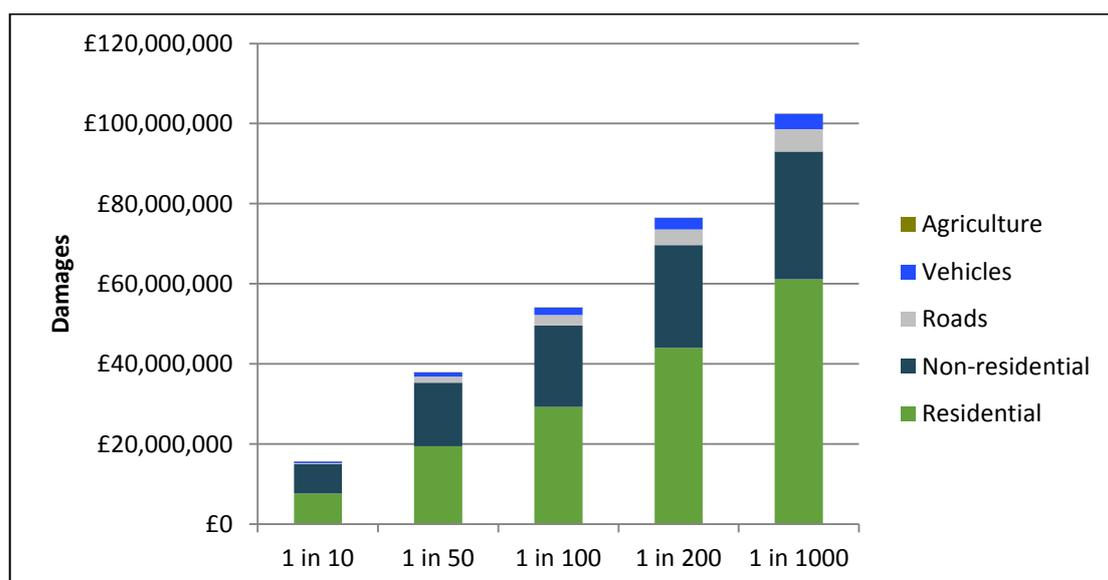


Figure 2: Damages by flood likelihood

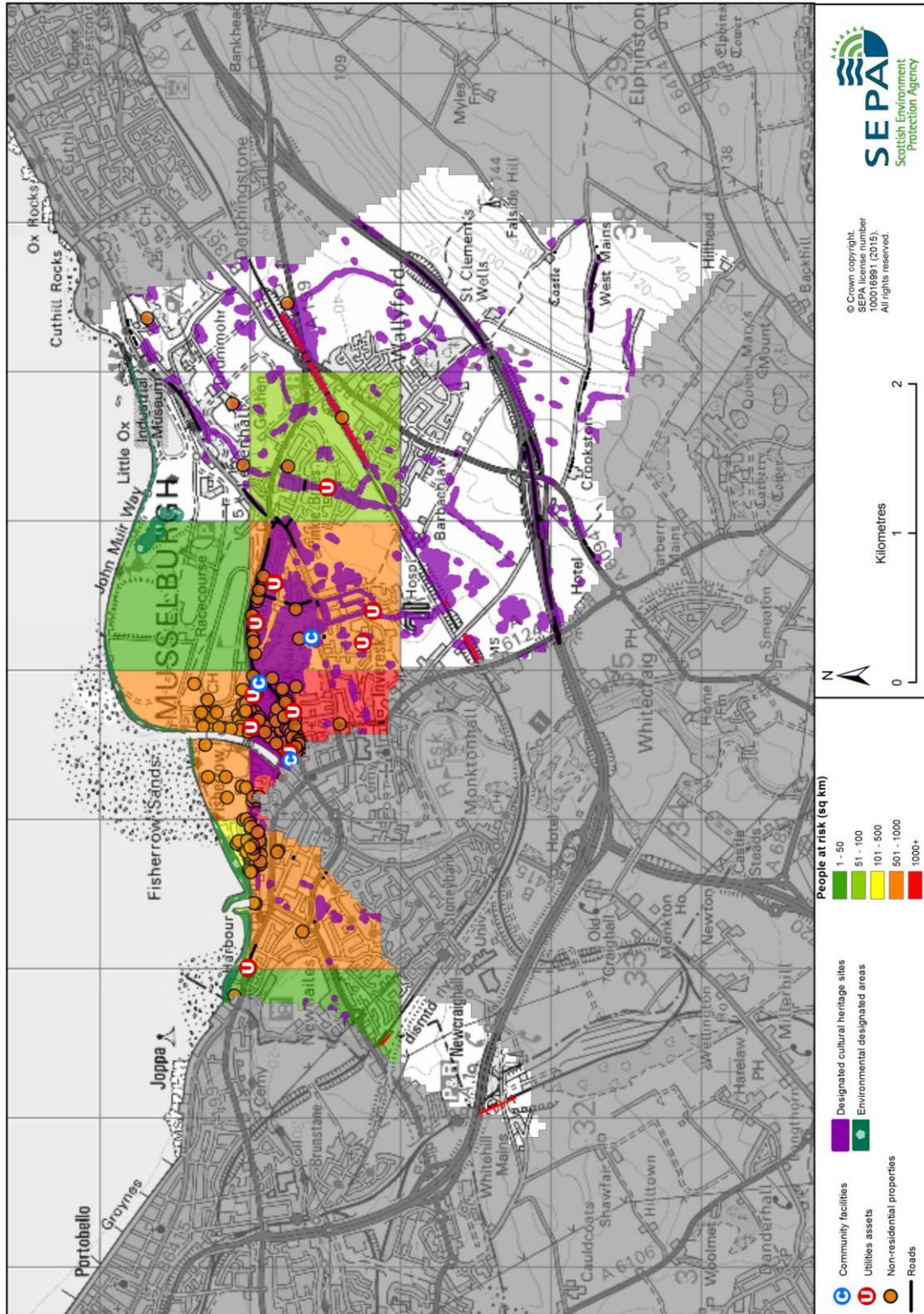


Figure 3: Impacts of flooding

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.

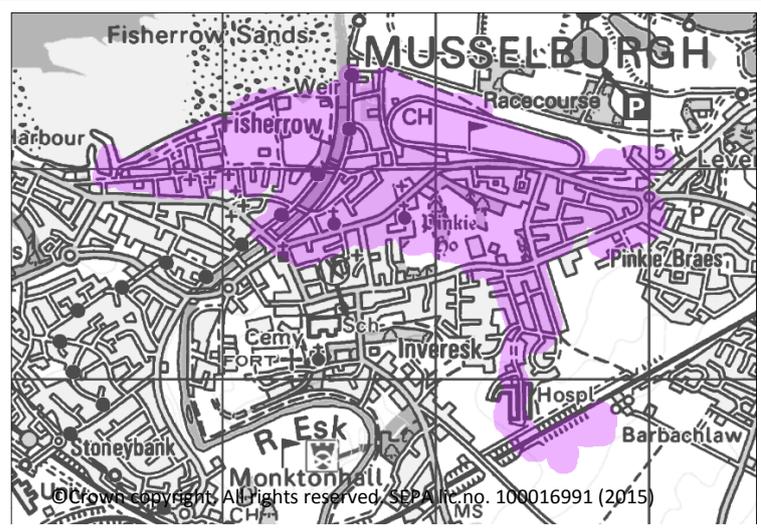
Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding

Indicators:

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

Objective ID: 10075, 10076

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"> • 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>		