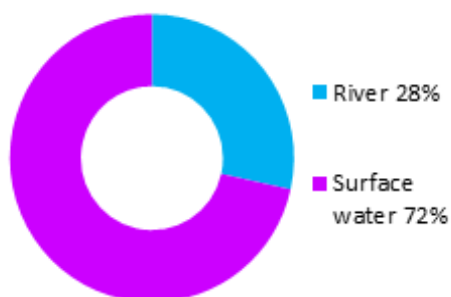


Linlithgow Bridge, Bathgate, Whiteside and Slamannan (Potentially Vulnerable Area 10/13)

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

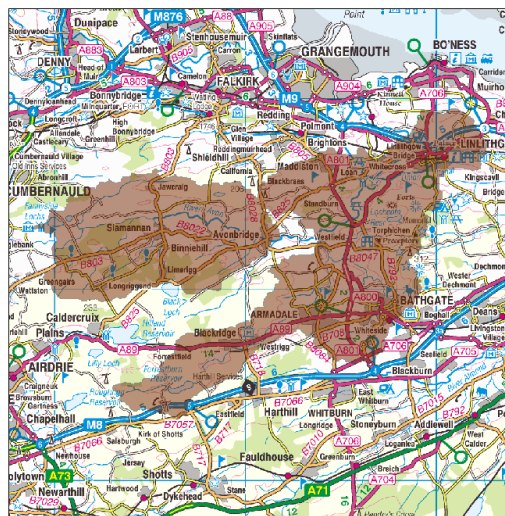
This Potentially Vulnerable Area is 165km² and part of the Firth of Forth catchment (shown below). This is a large, mainly rural area containing the towns of Linlithgow, Armadale, Slamannan and Bathgate. The main watercourse is the River Avon which flows eastward through Slamannan and Avonbridge, before 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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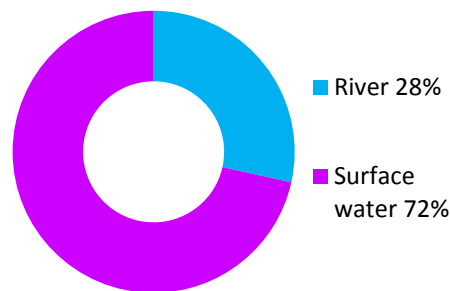


Figure 1: Annual Average Damages by flood source

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

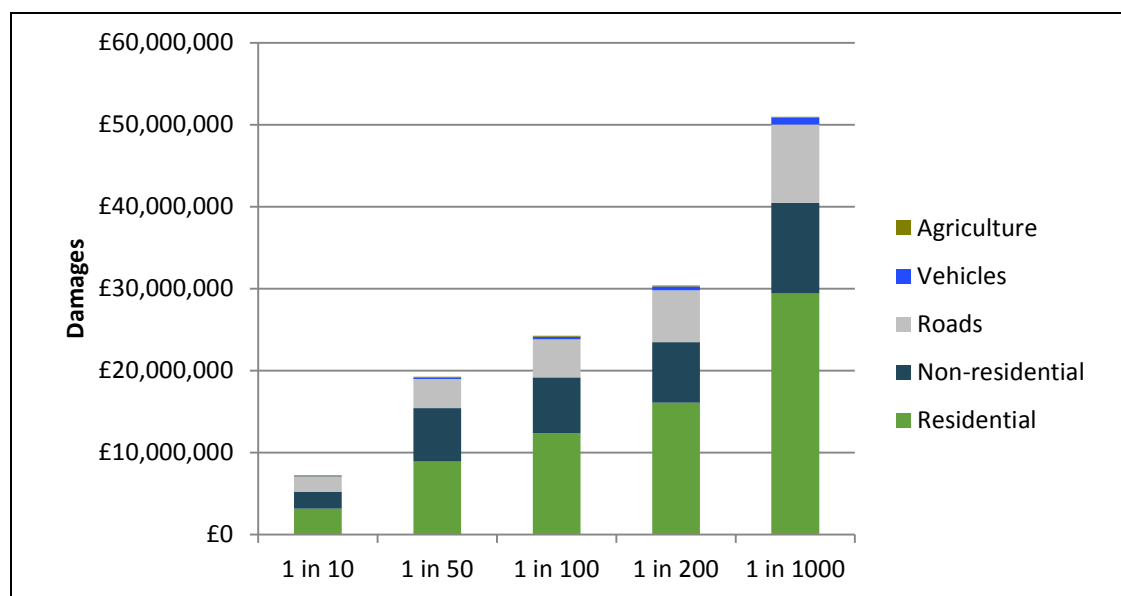


Figure 2: Damages by flood likelihood

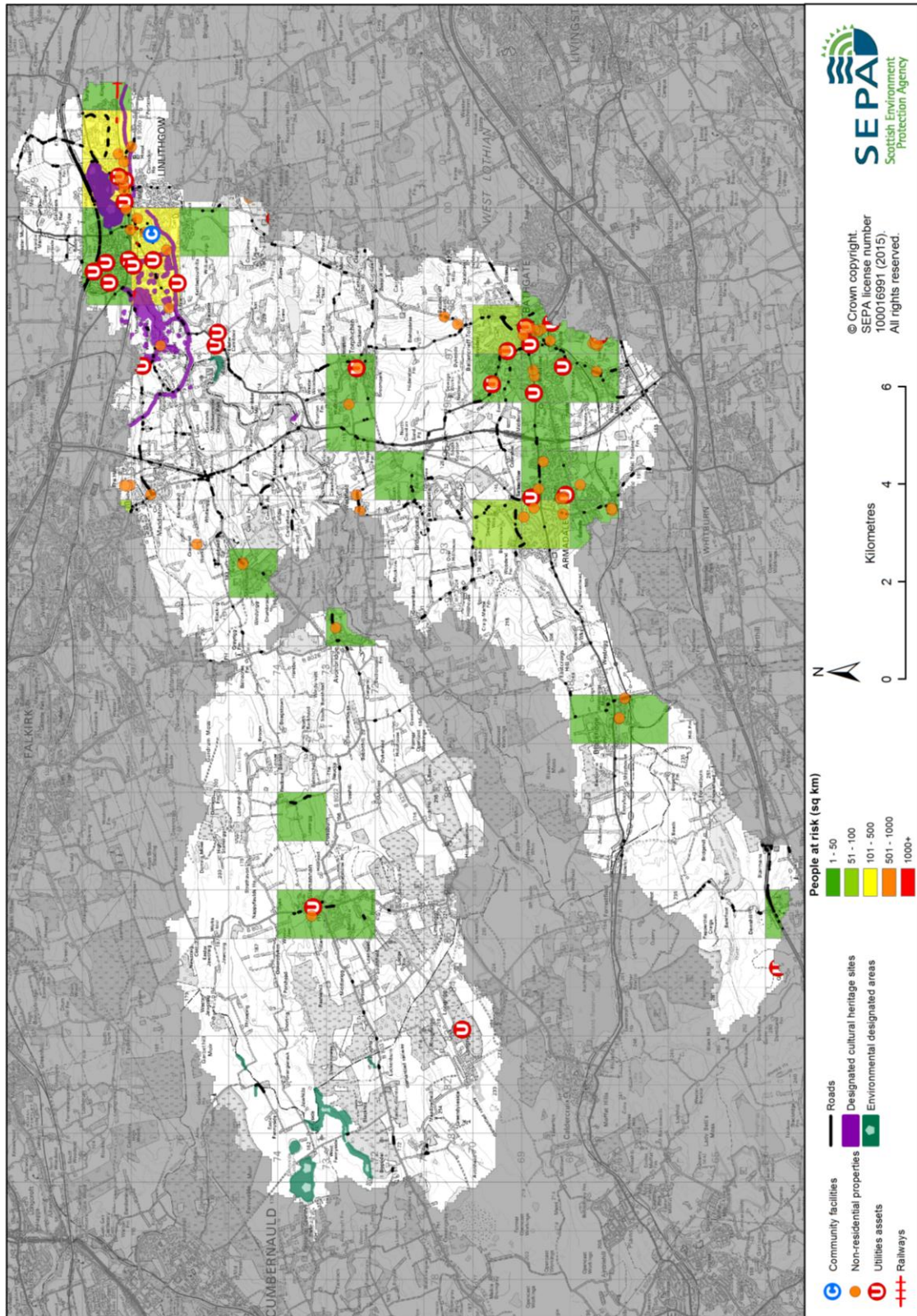


Figure 3: Impacts of flooding

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

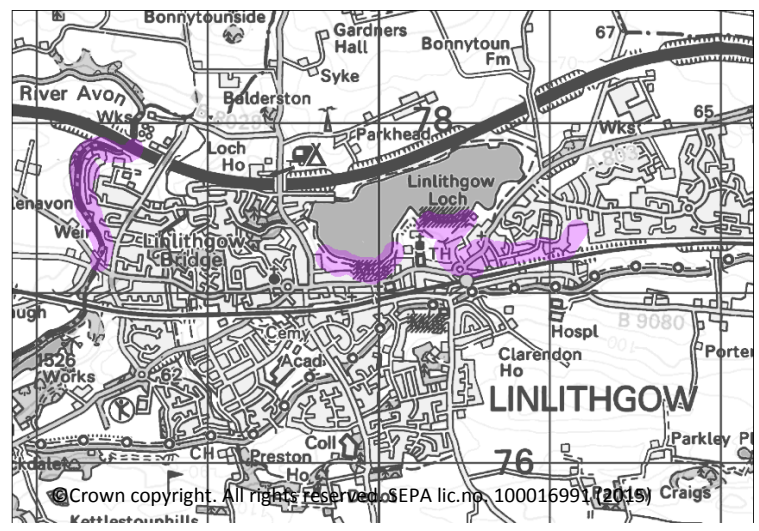
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target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



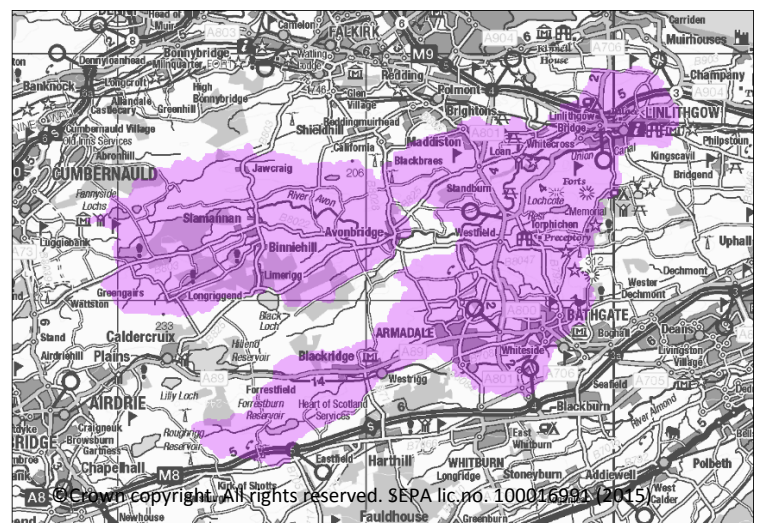
Objective ID: 10047

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.
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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 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.		