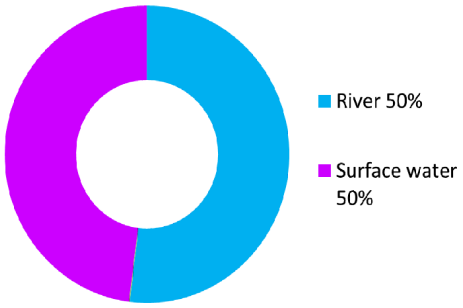
Kilsyth to Bearsden - north of Glasgow City (Potentially Vulnerable Area 11/04)

Local Plan District	Local authority	Main catchment
Clyde and Loch Lomond	East Dunbartonshire Council, Falkirk Council, Glasgow City Council, North Lanarkshire Council, Stirling Council, West Dunbartonshire Council	River Kelvin

Summary of flooding impacts



At risk of flooding

- 2,300 residential properties
- 1,100 non-residential properties
- £4.6 million Annual Average Damages

(damages by flood source shown left)

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.

Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

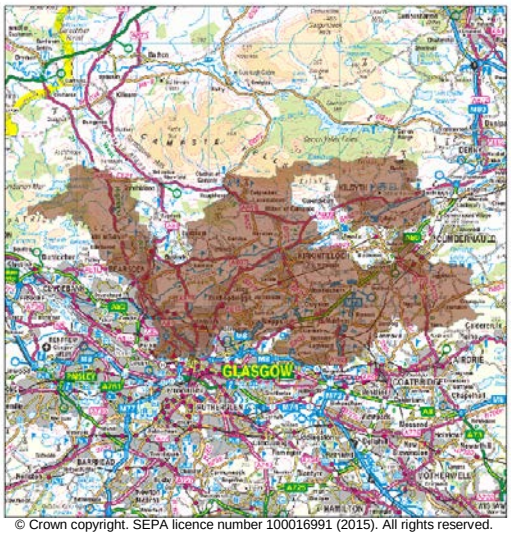
Flood protection scheme/works	*Natural flood management works*	New flood warning	Community flood action groups	*Property level protection scheme*	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response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

Kilsyth to Bearsden – north of Glasgow City (Potentially Vulnerable Area 11/04)

Local Plan District	Local authority	Main catchment
Clyde and Loch Lomond	East Dunbartonshire Council, Falkirk Council, Glasgow City Council, North Lanarkshire Council, Stirling Council, West Dunbartonshire Council	River Kelvin

Background

This Potentially Vulnerable Area incorporates the northern urban extent of the City of Glasgow, between Clydebank and Cumbernauld and is approximately 290km^2 (shown below).



The area has a risk of river and surface water flooding. The damages are evenly split.

There are approximately 2,300 residential properties and 1,100 non-residential properties at risk of flooding. The Annual Average Damages are approximately £4.6 million.

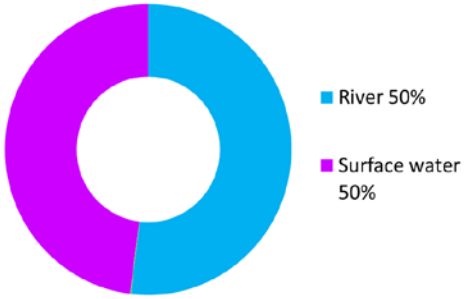


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The main river catchment in this area is the River Kelvin which, along with its tributaries, is responsible for the majority of the river flood risk. This includes parts of Kilsyth, Kirkintilloch, Bishopbriggs, Bearsden and Milngavie where a large number of residential and non-residential properties are shown to be impacted. In the south river flooding presents a risk to a number of properties within the Gartcosh and Gartloch area, in the vicinity of the Seven Lochs Wetland Park. The water levels in the lochs are controlled and their operation is vital for managing flood risk.

Agricultural land is also predicted to flood from river sources in the vicinity of Torrance and Balmore and to the north of Kirkintilloch. As the area is heavily urbanised in the south, flooding from minor culverted or heavily modified watercourses is a problem, with complex interaction between flooding sources. The

Forth and Clyde Canal also runs through this area, parallel to the River Kelvin, before diverging to the north of Bishopbriggs and then crossing to the south of Cowal Road in the city. The canal provides drainage relief in a number of locations where overflows have been connected to it.

This area contains a large number of river structures and culverts which complicate our understanding of flood risk. Local authorities are aiming to improve modelling in the area by carrying out more detailed investigations.

Widespread surface water flooding is expected across the area with almost all of the main urban areas being affected. This is shown to impact residential properties, non-residential properties and main transport routes including sections of railway lines and roads (notably the M73, M8, M80 and A80). Kirkintilloch and Kilsyth are susceptible to runoff from the surrounding hills, whereas the surface water flooding in the south of the area is more likely to be caused from drainage capacity issues, historical culverting or diversion of watercourses. The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

Scottish Water and local authorities have completed a number of studies in the area. These have included strategic and detailed assessments of surface water risk and its interaction with river flooding as well as considering mitigating actions. Many of these studies have been helped by the partnership working developed within the Metropolitan Glasgow Strategic Drainage Partnership. This has led to the implementation of schemes and works to protect properties from river and surface water flooding.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1. The damages associated with floods of different likelihood are shown in Figure 2. Residential properties affected by river flooding experience the highest economic impact at approximately 35% of the damages.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 2,300 to 3,300 and the number of non-residential properties from approximately 1,100 to 1,500.

The locations of flooding impacts in the west are shown in Figure 3a with impacts in the east shown in Figure 3b. They show there are flooding impacts throughout the area, with the greatest concentration of receptors at risk in Milngavie, Kirkintilloch and Bearsden.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 120,000)	360	2,300	3,100
Non-residential properties (total 9,000)	300	1,100	1,500
People	800	5,000	6,800
Community facilities	<10 Includes: educational buildings and healthcare facilities	<10 Includes: educational buildings, emergency services and healthcare facilities	10 Includes: educational buildings, emergency services and healthcare facilities
Utilities assets	30	90	110
Transport links - roads (km)	13.3 (of which 0.5 is motorway and 0.2 is A road)	32.5 (of which 1.8 is motorway and 0.7 is A road)	40.3 (of which 2.8 is motorway and 1.0 is A road)
Transport links - rail (km)	6.4	16.4	18.6
Environmental designated areas (km²)	0.8	0.9	0.9
Designated cultural heritage sites	43	59	81
Agricultural land (km²)	12.2	12.6	13.3

Table 1: Summary of flooding impacts[1]

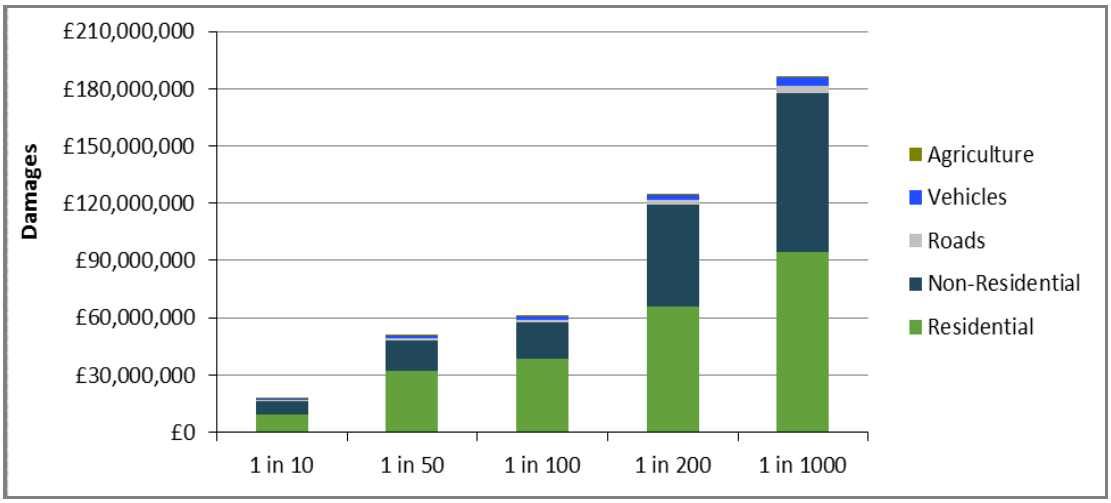


Figure 2: Damages by flood likelihood

[1] Some receptors are counted more than once if flooded from multiple sources

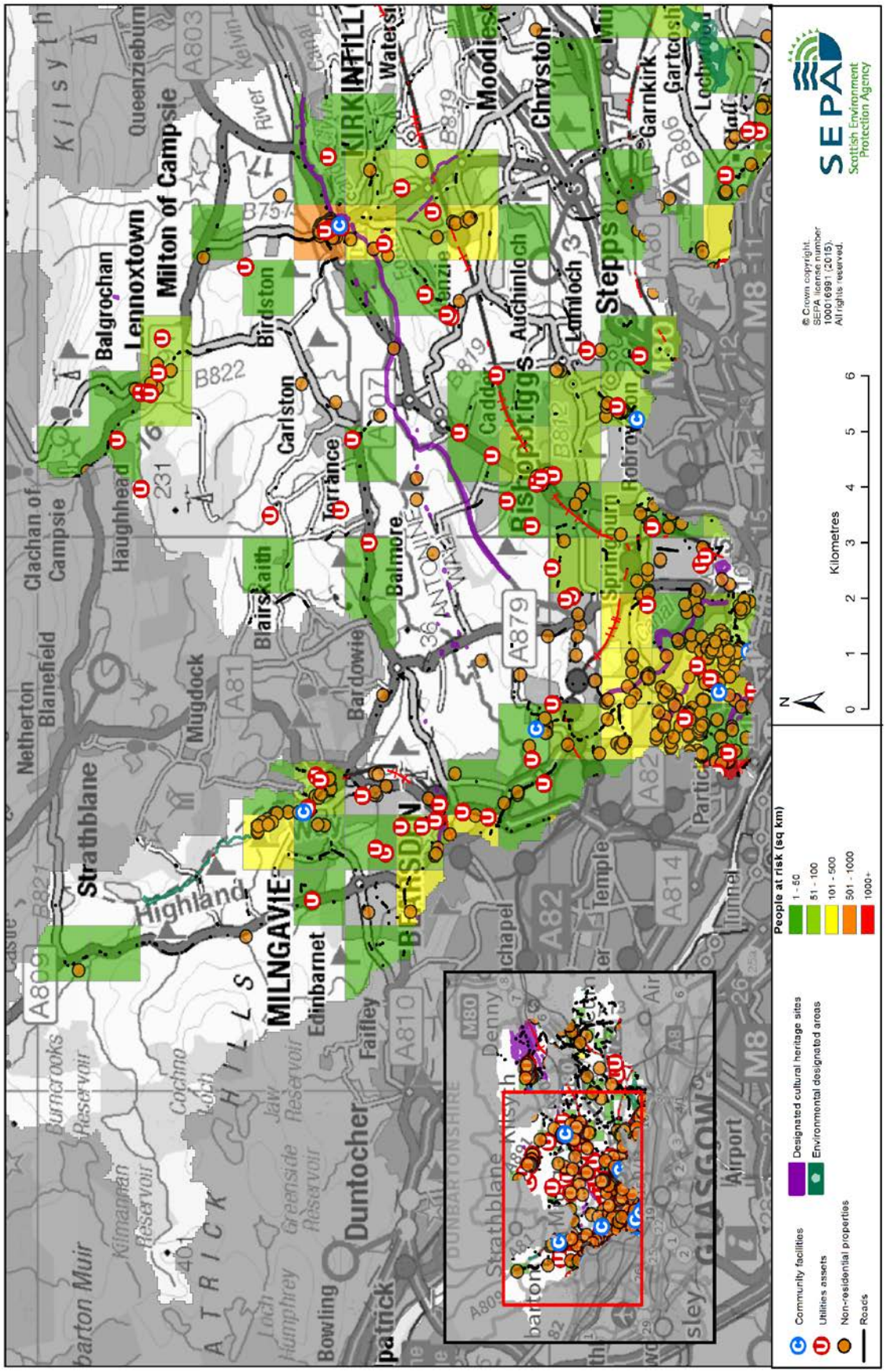


Figure 3a: Impacts of flooding

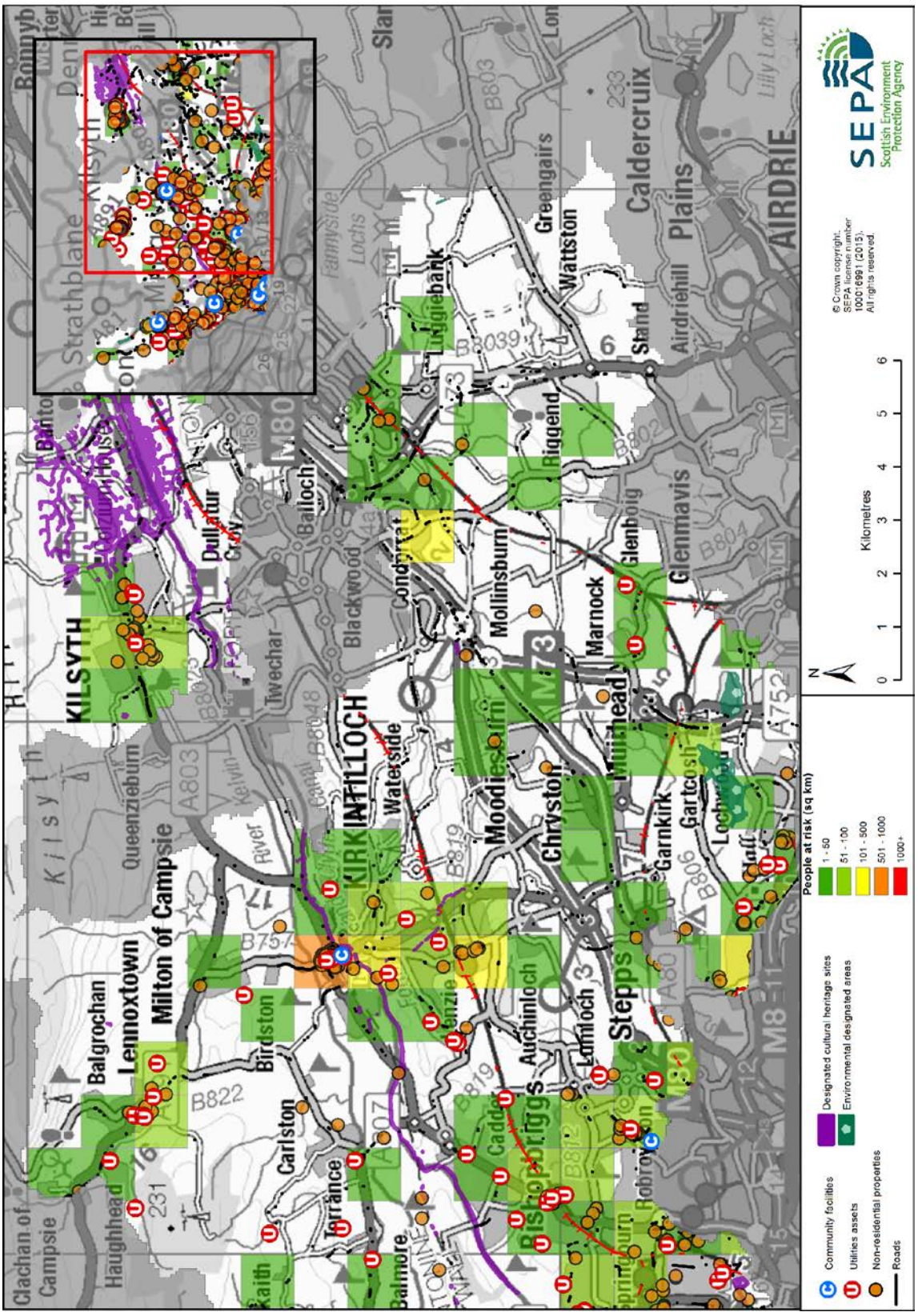


Figure 3b: Impacts of flooding

History of flooding

Records of river flooding are spread throughout the area. The locations with the highest concentrations of river flooding include Bearsden, Kirkintilloch and Glasgow City. The Manse Burn flooded in 2007 in Bearsden, affecting roads, properties and gardens. River floods have recently affected residents and properties in Lennoxtown after the Rannie Burn flooded in January 2011 and December 2006.

Between 10-12 December 1994 major flooding occurred in rivers and urban watercourses across Glasgow and surrounding areas. A slow-moving weather system delivered persistent rain over a 48 hour period, across a wide geographical area. Previously recorded peak river flows were exceeded in all major catchments in the region. The River Clyde, to the south of the Potentially Vulnerable Area, is thought to have reached its highest level in 150 years, and the total cost of the damage across the whole region reached approximately £100 million. This flood caused significant damages in the Kirkintilloch and Glasgow City areas. Flood water from the River Kelvin caused power failures and flooded 60 properties in the Summerfield Gate area as well as various areas bounding the Kelvin, including in particular; Cleveden Gardens, the District Subway at Kelvinbridge and part of the North Glasgow Electric Railway System. A further 80 properties in Glasgow were also flooded which alone caused an estimated £11 million in damages.

Maree Drive and the ring road underpass in Condorrat were affected by surface water floods on the 4 July 2012. The area of Bearsden in East Dunbartonshire is particularly affected by surface water flooding. SEPA have records of reported floods dating back to 1882; however, the majority of surface water floods were recorded between 2004 and 2009.

Objectives to manage flooding in Potentially Vulnerable Area 11/04

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 Kilsyth to Bearsden - north of Glasgow City Potentially Vulnerable Area.

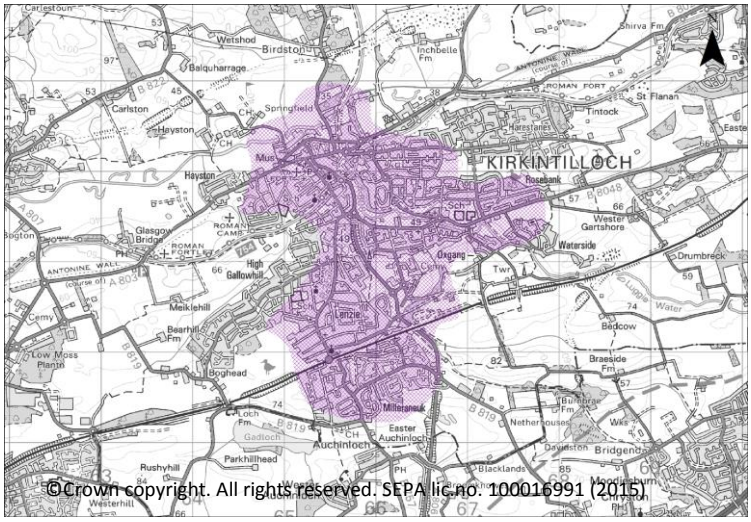
Reduce the risk of river and surface water flooding to residential properties, non-residential properties, community facilities and transport routes in Kirkintilloch

Indicators:

- 510 residential properties
- 130 non-residential properties
- £690,000 Annual Average Damages
- 1 healthcare facility
- 2.8km of road

Objective ID: 11008

Target area:



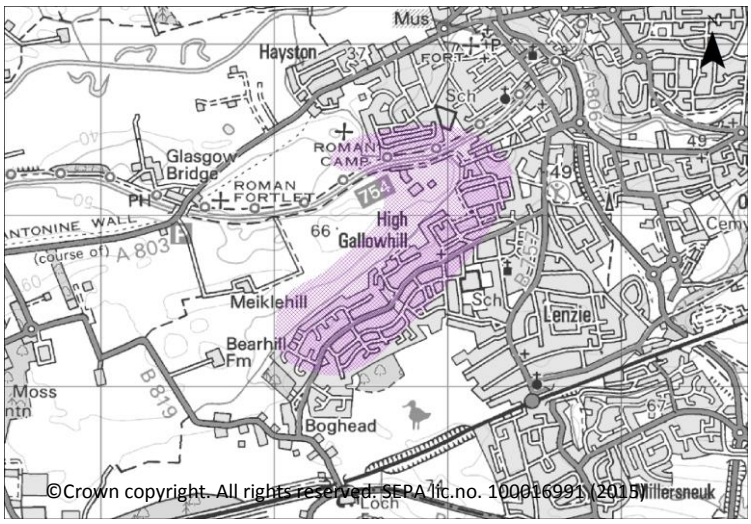
Reduce the risk of flooding from the Park Burn and surface water to residential properties in Kirkintilloch

Indicators:

- 50 residential properties
- £86,000 Annual Average Damages

Objective ID: 11009

Target area:

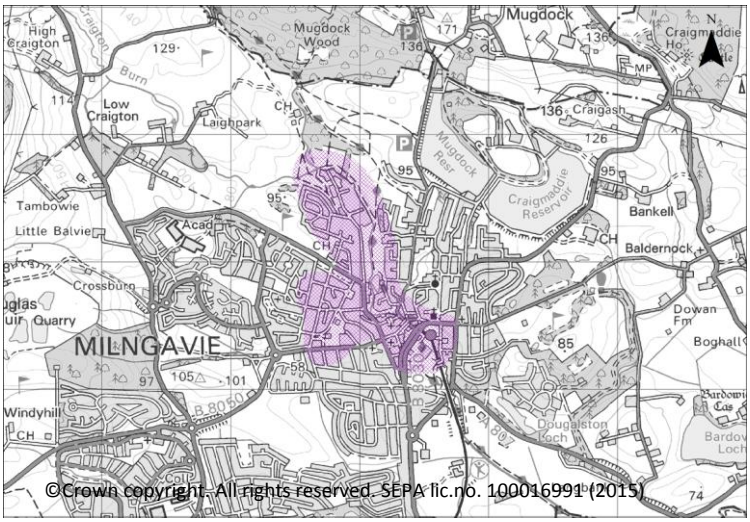


Reduce the risk of flooding from the Allander Water and surface water to residential properties and non-residential properties in Milngavie

Indicators:

- 190 residential properties
- 90 non-residential properties
- £690,000 Annual Average Damages

Target area:



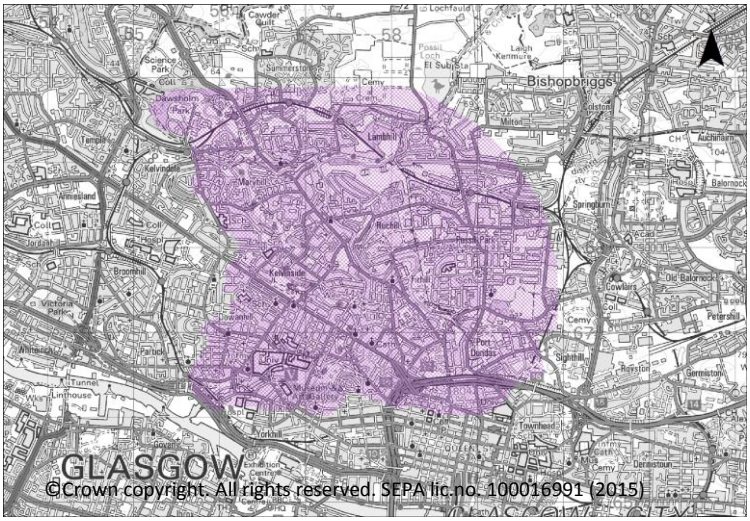
Objective ID: 11011

Reduce the risk of flooding from the River Kelvin and surface water to residential properties, non-residential properties and community facilities in west and north west Glasgow

Indicators:

- 660 residential properties
- 600 non-residential properties
- £950,000 Annual Average Damages
- 1 educational building

Target area:



Objective ID: 11014

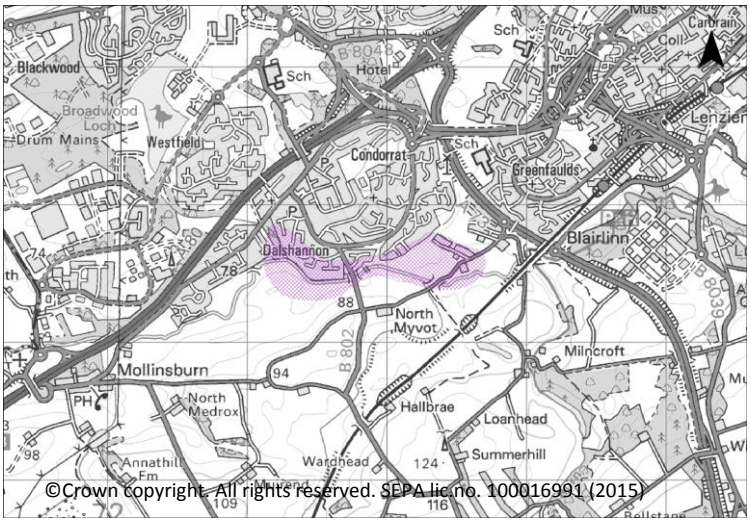
Reduce the risk of flooding from the Luggie Water to residential properties in Cumbernauld

Indicators:

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

Objective ID: 11035

Target area:



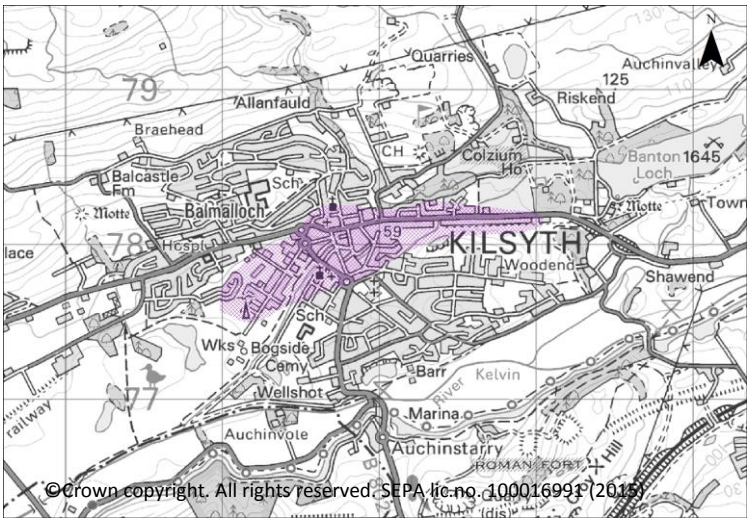
Reduce the risk of river flooding to residential properties and non-residential properties in Kilsyth

Indicators:

- 90 residential properties
- 60 non-residential properties
- £140,000 Annual Average Damages

Objective ID: 11036

Target area:



Target area	Objective	ID	Indicators within PVA
Glasgow	Reduce the economic damages and number of people at risk of surface water flooding in Glasgow City	11007	* See note below
Bishopbriggs	Reduce the economic damages and risk to people from surface water flooding in Bishopbriggs	11085	* See note below
Milngavie	Reduce the economic damages and risk to people from surface water flooding in Milngavie	11086	* See note below
Bearsden	Reduce the economic damages and risk to people from surface water flooding in Bearsden	11087	* See note below
Milton, Glasgow	Reduce the economic damages and risk to people from surface water flooding in Milton	11099	* See note below
Stand Burn catchment, Ferness, Glasgow	Reduce the economic damages and risk to people from surface water flooding in the Stand Burn catchment, Ferness	11103	* See note below
Cumbernauld (west)	Reduce the economic damages and risk to people from surface water flooding in Cumbernauld	11111	* See note below
Kilsyth	Reduce the economic damages and risk to people from surface water flooding in Kilsyth	11112	* See note below
Possilpark	Reduce the economic damages and risk to people from surface water flooding in Possilpark	11128	* See note below
Kirkintilloch	Reduce the economic damages and risk to people from surface water flooding in Kirkintilloch	11204	* See note below
Applies across Clyde and Loch Lomond Local Plan District	Avoid an overall increase in flood risk	11127	• 2,300 residential properties • £4.6 million Annual Average Damages
Applies across Clyde and Loch Lomond Local Plan District	Reduce overall flood risk	11132	• 2,300 residential properties • £4.6 million Annual Average Damages
Applies across Clyde and Loch Lomond 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 11/04 there are 1,400 residential properties at risk and Annual Average Damages of £2.4 million.

Actions to manage flooding in Potentially Vulnerable Area 11/04

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 Kilsyth to Bearsden - north of Glasgow City 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** (110090006)		
Objective (ID):	Reduce the risk of flooding from the Park Burn and surface water to residential properties in Kirkintilloch (11009)		
Delivery lead:	East Dunbartonshire Council		
Priority:	National:	Within local authority:	
	13 of 42	**1 of 1**	
Status:	**Under development**	Indicative delivery:	**2016-2021**
Description:	It is recommended that the council look to progress flood protection works along the Park Burn. Before the final design of the works the flood modelling in the area should be updated to improve the representation of the River Kelvin. This will help to more accurately represent the risk of flooding downstream. If there is found to be an interaction between the Park Burn and River Kelvin, joint probability analysis should also be carried out. The potential for natural flood management actions to help reduce runoff should also be investigated. The works will include the profiling of the channel and provide scope to improve the ecology and morphology of the river in addition to the flooding benefits. The proposed works could offer protection up to a 1 in 75 year flood; however, it is recommended that additional property level protection options be investigated to improve the overall protection of the scheme. The flood mapping for the Park Burn should be revised to identify the areas protected by the works and any remaining residual risk now and in the future. SEPA will review the study outputs for possible inclusion in the Flood Maps.		

Potential impacts	
Economic:	The proposed flood protection scheme may benefit 70 residential properties at this location, damages avoided are estimated to be £1.5 million. The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. The flood protection scheme has an estimated benefit cost ratio of 4.
Social:	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. 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 flood protection works are proposed for the Park Burn (water body ID 10731). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There are no international, national or local level environmental designations that are likely to be impacted by this action. There would be the temporary loss of aquatic habitat and displacement of aquatic species from the re-grading footprint; however, these may re-establish and return to the channel in the future. There are likely to be short term negative impacts on water quality during works from increased sediment. Re-grading activities would have temporary negative impacts on the visual setting of the nearby Antonine Wall World Heritage Site and Scheduled Monument, along with the Forth and Clyde Canal Scheduled Monument.

Action (ID):	**NEW FLOOD WARNING** (111320010)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	SEPA		
Status:	**Not started**	Indicative delivery:	**post 2021**
Description:	The area under consideration includes properties in Lennoxtown affected by flooding from the Glazert Water. To deliver a warning in this location an extension to the Kelvin flood forecasting system will be required. Further assessment will help to determine appropriate timescales for delivery. A second area under consideration includes properties in Milngavie affected by flooding from the Allander Water. Further studies being undertaken will give more detail on whether flood warning is required in this location and subsequent to that appropriate timescales for delivery.		

Action (ID):	**FLOOD PROTECTION STUDY** (110080005)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties, non-residential properties, community facilities and transport routes in Kirkintilloch (11008)		
Delivery lead:	East Dunbartonshire Council		
Priority:	National:	Within local authority:	
	14 of 168	**1 of 2**	
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	A study of the River Kelvin catchment is being undertaken and will assess the current level of flood risk. The study is being undertaken by East Dunbartonshire Council in conjunction with Glasgow City Council and SEPA. The study will provide revised data on flood risk in the area and assess the benefit offered by the existing flood protection scheme in Kirkintilloch. It is recommended that the outcomes of the River Kelvin study are reviewed to determine the current risk in the town and the potential future risk with climate change. This will determine if / when further work is required to investigate how to reduce the flood risk from the River Kelvin to Kirkintilloch. SEPA will review the study outputs for possible inclusion in the Flood Maps.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flooding to 510 residential properties and 130 non-residential properties. The potential damages avoided are estimated to be up to £84 million. The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.		
Social:	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. This study is proposed for the River Kelvin (Glazert Water to Tidal Limit) (water body ID 10130). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning.		

Action (ID):	**FLOOD PROTECTION STUDY** (110140005)
Objective (ID):	Reduce the risk of flooding from the River Kelvin and surface water to residential properties, non-residential properties and community facilities in west and north west Glasgow (11014)

Delivery lead:	Glasgow City Council and East Dunbartonshire Council		
Priority:	National:		Within local authority:
	43 of 168		**7 of 8**
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	A study of the River Kelvin catchment is being undertaken and will assess the current level of flood risk. The study is being undertaken by East Dunbartonshire Council in conjunction with Glasgow City Council and SEPA. The study will provide a revised assessment of risk within the area. It is recommended that the outcomes of the River Kelvin study are reviewed to determine the current risk in the town and the potential future risk with climate change. This will determine if / when further work is required to investigate how to reduce the flood risk from the River Kelvin. The additional benefits from natural flood management are being considered within a separate catchment study, and both studies should be considered to select the most sustainable combination of actions. SEPA will review the study outputs for possible inclusion in the Flood Maps.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flooding to 140 residential properties and 30 non-residential properties in this location. The potential damages avoided are estimated to be up to £10 million.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there is one utility which has been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. This study is proposed for part of the River Kelvin (water body ID 10130). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of this river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There is the potential for negative impacts from the storage action on the Dawsholm Park Local Nature Reserve, which is mostly woodland. Downstream of this action there may be negative impacts on water quality through increased erosion and sedimentation. Implementation of this storage action will have permanent negative impacts on the water body morphology. There may be a loss of agricultural land and semi-natural habitats in the footprint of the storage areas, and a loss of semi-natural habitat in the footprint and vicinity of the enhanced defences. There is the potential for slight positive impacts on water quality from the implementation of sustainable drainage systems in the area. There is potential for storage in this area to have negative impacts on the setting of the nearby Antonine Wall World Heritage Site and Scheduled Monument and the Forth and Clyde Canal Scheduled Monument. There is also potential for negative impacts on the Kelvin Walkway. Changes to the conveyance would have		

Environmental:	temporary negative impacts on the visual setting of the Forth and Clyde Canal, and North Woodside Flint Mill scheduled monuments and the setting of the Glasgow Botanical Gardens and Kelvingrove Park. Many of the bridges in the area are listed structures, changes in the conveyance could cause erosion which could have a permanent negative impact. The creation of direct defences could have potentially negative impacts on the visual setting of the Glasgow City Heritage conservation areas and Kelvingrove Park.

Action (ID):	**FLOOD PROTECTION STUDY** (110110005)		
Objective (ID):	Reduce the risk of flooding from the Allander Water and surface water to residential properties and non-residential properties in Milngavie (11011)		
Delivery lead:	East Dunbartonshire Council		
Priority:	National:		Within local authority:
	49 of 168		**2 of 2**
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	A study is recommended to further investigate the feasibility of a flood protection scheme on the Allander Water in Milngavie, focusing on the construction of direct defences along with the benefits of property level protection and other actions which may enhance the level of protection offered. The additional benefits from natural flood management are being considered within a separate catchment study, and both studies should be considered to select the most sustainable combination of actions.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flood risk to 60 residential properties and 20 non-residential properties in this location, with potential damages avoided of up to £11 million.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be changes in visual amenity and land use as a result of this action.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. This study is proposed for the Allander Water (water body ID 10132). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. This action has the potential to impact upon the ancient woodland of Mugdock Wood Site of Special Scientific Interest. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences. There is the potential for local negative impacts on morphology and sediment dynamics which in turn may impact fish through increased sediment load.		

Action (ID):	**FLOOD PROTECTION STUDY** (110350005)		
Objective (ID):	Reduce the risk of flooding from the Luggie Water to residential properties in Cumbernauld (11035)		
Delivery lead:	North Lanarkshire Council		
Priority:	National:	Within local authority:	
	100 of 168	**1 of 4**	
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	A study is recommended to further investigate the flood risk along the Luggie Water. As part of this study the feasibility of flood protection work in Cumbernauld should be examined, focusing on the potential to redesign the Badenheath Bridge to increase conveyance of the Luggie Water, and the benefit of direct defences along the Luggie Water. This study should consider property level protection and other complementary actions to determine the most sustainable combination of actions. North Lanarkshire Council and East Dunbartonshire Council may undertake this as a joint study to identify any further potential flood risk areas along the river.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flood risk to 60 residential properties in this location, with potential damages avoided of up to £4.4 million.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be changes in visual amenity and land use as a result of this action.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. There are no international or national level environmental designations that are likely to be impacted by this action. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences. There is likely to be a loss of habitat and displacement of species in the vicinity of the conveyance works; however, these may re-establish and return to the area. Downstream of engineering works there may be negative impacts on water quality through localised increased erosion and sedimentation on the Luggie Water.		

Action (ID):	**FLOOD PROTECTION STUDY** (110360005)		
Objective (ID):	Reduce the risk of river flooding to residential properties and non-residential properties in Kilsyth (11036)		
Delivery lead:	North Lanarkshire Council		
Priority:	National:	Within local authority:	
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Status:	**Not started**	Indicative delivery:	**2016-2021**

Description:	A study is recommended to further investigate the feasibility of flood protection work in Kilsyth, focusing on the use of the Scottish Canals feeder as a bypass channel to divert flow from the Colzium Burn to Banton Loch for storage, and increasing the conveyance of the Ebroch Burn by altering the footbridge at Burngreen Park. This study should also investigate the use of property level protection to reduce residual risk. Other actions may also be considered to select the most sustainable combination of actions.
Potential impacts	
Economic:	The flood protection study should consider how to reduce flood risk to 30 residential properties and 10 non-residential properties in this location, with potential damages avoided of up to £1.7 million.
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 study area. In addition there are one community facility, one emergency service and one utility which have been identified as potentially benefitting from this action.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. This study includes the Garrel Burn (water body ID 10148). The physical condition of this river is identified by river basin management planning to be at less than good status. Future works could improve the condition of the river or degrade it. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. There are no international or national level environmental designations that are likely to be impacted by this action. There is likely to be a loss of habitat and displacement of species in the vicinity of these works; however, these may re-establish and return to the area. Downstream of engineering works there may be negative impacts on water quality through localised increased erosion and sedimentation on the Ebroch Burn. There are likely to be impacts to the existing flora and fauna in the loch with alterations to water levels and flows. There is the potential for impacts to the Castle Hill Scheduled Monument and the Kilsyth battlefield heritage site from engineering works and water levels and therefore monitoring may be required during engineering works.

Action (ID):	**NATURAL FLOOD MANAGEMENT STUDY** (110080003)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties, non-residential properties, community facilities and transport routes in Kirkintilloch (11008)		
Delivery lead:	SEPA		
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	SEPA are currently carrying out a pilot study looking at potential options for river restoration and natural flood management in the Glazert catchment. This study should assess in detail runoff control and floodplain restoration. This action may also have a positive flooding impact near Kirkintilloch within the River Kelvin catchment.		

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. 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. This study is being carried out in coordination with river basin management planning to improve the condition of River Glazert. Further environmental impacts will be assessed during the study.

Action (ID):	**NATURAL FLOOD MANAGEMENT STUDY** (110110003)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Bearsden (11087) Reduce the risk of flooding from the River Kelvin and surface water to residential properties, non-residential properties and community facilities in west and north west Glasgow (11014) Reduce the risk of flooding from the Allander Water and surface water to residential properties and non-residential properties in Milngavie (11011) Reduce the risk of flooding from the Park Burn and surface water to residential properties in Kirkintilloch (11009)		
Delivery lead:	Glasgow Clyde Valley Green Network and local authorities		
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	The strategic assessment identified that there are widespread areas with the potential for runoff control and floodplain restoration, therefore a catchment wide natural flood management study is recommended for the River Kelvin. The study should focus on the potential benefit natural flood management actions may have on the tributaries of the River Kelvin but also if these actions combined would start to reduce flood risk on the River Kelvin.		

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:	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. There may be changes in visual amenity and land use as a result of this action.
Environmental:	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. This study is proposed for part of the River Kelvin, Allander Water and Craigmaddie Burn (water body IDs 10130, 10132 and 10133). The physical condition of these rivers is identified by river basin management planning to be at less than good status.

Environmental:	Natural flood management actions are likely to improve the condition of rivers. Proposed actions should be coordinated with river basin management planning. This action has the potential to impact upon multiple Sites of Special Scientific Interest including the Craigallian Marshes on the Allander Water. There is the potential for the existing ecosystems in the area to be impacted through a potential change of land use if woodland planting is undertaken. There are likely to be improvements in water quality through reduced agricultural chemical and sediment runoff, which will have positive impacts on the terrestrial and freshwater habitats and species in the area. The existing ecosystems in the area for restoration will be impacted through a potential change in local hydrology. There may be improvements in biodiversity and water quality through this action. There is the potential for implementation of the runoff control action to negatively impact upon the Carbeth North and South conservation areas.

Action (ID):	**SURFACE WATER PLAN/STUDY** (110070018)		
Objective (ID):	Reduce the economic damages and number of people at risk of surface water flooding in Glasgow City (11007)		
Delivery lead:	Glasgow City Council		
Status:	**Not started**	Indicative delivery:	**2028-2033**
Description:	The area must be covered by a strategy to manage and reduce surface water flood risk and identify the most sustainable actions to achieve the objectives. This strategy has been developed by the Metropolitan Glasgow Strategic Drainage Partnership. The detailed objectives and actions to manage and reduce surface water flood risk will be set out in the area specific surface water management plans described below.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (110850018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Bishopbriggs (11085)		
Delivery lead:	East Dunbartonshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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** (110860018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Milngavie (11086)		
Delivery lead:	East Dunbartonshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (110870018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Bearsden (11087)		
Delivery lead:	East Dunbartonshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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** (110990018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Milton (11099)		
Delivery lead:	Glasgow City Council		
Status:	**Not started**	Indicative delivery:	**2022-2027**
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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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** (111030018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in the Stand Burn catchment, Ferness (11103)		
Delivery lead:	Glasgow City Council		
Status:	**Not started**	Indicative delivery:	**2022-2027**
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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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** (111110018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Cumbernauld (11111)		
Delivery lead:	North Lanarkshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (111120018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Kilsyth (11112)		
Delivery lead:	North Lanarkshire Council		
Status:	**Not started**	Indicative delivery:	**2022-2027**
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. The Metropolitan Glasgow Strategic Drainage Partnership will support the process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (111280018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Possilpark (11128)		
Delivery lead:	Glasgow City Council		
Status:	**Not started**	Indicative delivery:	**2022-2027**
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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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** (112040018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Kirkintilloch (11204)		
Delivery lead:	East Dunbartonshire Council		
Status:	**Not started**	Indicative delivery:	**2022-2027**
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. The plan will also look to cover areas of Lenzie. The Metropolitan Glasgow Strategic Drainage Partnership will support the process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.		

Action (ID):	**STRATEGIC MAPPING AND MODELLING** (111320019)		
Objective (ID):	Reduce overall flood risk (11132)		
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** (110080017)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties, non-residential properties, community facilities and transport routes in Kirkintilloch (11008)		
Delivery lead:	East Dunbartonshire Council		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	The River Kelvin Flood Protection Scheme 1998 consists of embankments, retaining walls, channel improvements, culverts, floodgates and various other works. The scheme was completed in 2004 and provides protection to Kirkintilloch. The level of protection offered by the scheme is being assessed. This scheme will be maintained and will continue to mitigate flooding. The level of flood risk is likely to increase over time as a consequence of climate change.		

Action (ID):	**MAINTAIN FLOOD PROTECTION SCHEME** (110140017)		
Objective (ID):	Reduce the risk of flooding from the River Kelvin and surface water to residential properties, non-residential properties and community facilities in west and north west Glasgow (11014)		
Delivery lead:	Glasgow City Council		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	There a number of sections of flood defence along the River Clyde which offer protection to properties in the area. These defences will be maintained, and will continue to manage flooding according to the design standard at the time of construction. Levels of flood risk are likely to increase over time as a consequence of climate change.		

Action (ID):	**MAINTAIN FLOOD WARNING** (111320030)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	SEPA		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	Continue to maintain the Cleveden Park, Goyle Bridge and Kelvinbridge Underground flood warning areas which are part of the Kelvin river flood warning scheme.		

Action (ID):	**FLOOD FORECASTING** (111320009)		
Objective (ID):	Reduce overall flood risk (11132)		
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** (111320012)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	Community		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	East Dunbartonshire Council have approached the Scottish Flood Forum for support in creating a community flood action group.		

Action (ID):	**SELF HELP** (111320011)		
Objective (ID):	Reduce overall flood risk (11132)		
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** (111320013)		
Objective (ID):	Reduce overall flood risk (11132)		
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 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** (111320007)		
Objective (ID):	Reduce overall flood risk (11132)		
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):	**SITE PROTECTION PLANS** (110140015)		
Objective (ID):	Reduce the risk of flooding from the River Kelvin and surface water to residential properties, non-residential properties and community facilities in west and north west Glasgow (11014)		
Delivery lead:	Glasgow City Council		
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	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. A Site Protection Plan should be developed for the Kelvin Bridge Subway.		

Action (ID):	**EMERGENCY PLANS/RESPONSE** (111320014)		
Objective (ID):	Reduce overall flood risk (11132)		
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** (111270001)		
Objective (ID):	Avoid an overall increase in flood risk (11127) Reduce overall flood risk (11132)		
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.		