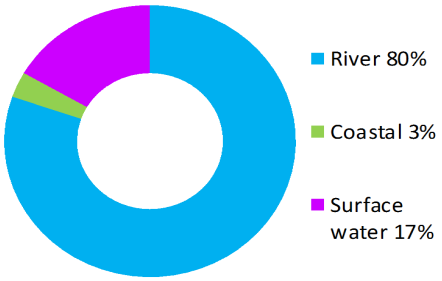
River Irvine and Annick Water catchments (Potentially Vulnerable Area 12/06)

Local Plan District	Local authority	Main catchment
Ayrshire	East Ayrshire Council, East Renfrewshire Council, North Ayrshire Council, South Ayrshire Council	River Irvine

Summary of flooding impacts



At risk of flooding

- 2,900 residential properties
- 1,200 non-residential properties
- £7.1 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.

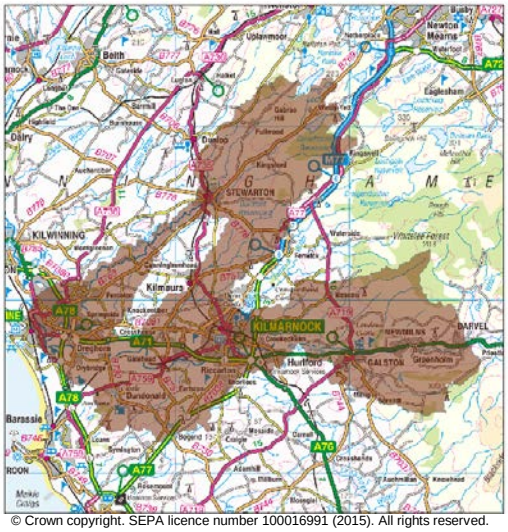
Flood protection scheme/works	*Natural flood management works*	New flood warning	Community flood action groups	*Property level protection scheme*	*Site protection plans*
Flood protection study	*Natural flood management study*	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency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

River Irvine and Annick Water catchments (Potentially Vulnerable Area 12/06)

Local Plan District	Local authority	Main catchment
Ayrshire	East Ayrshire Council, East Renfrewshire Council, North Ayrshire Council, South Ayrshire Council	River Irvine

Background

This Potentially Vulnerable Area is in the centre of the Ayrshire Local Plan District and covers an extensive section of the River Irvine catchment, including the towns of Kilmarnock and Irvine (shown below). The area is centred on Kilmarnock, extending west to the Irvine coast and north encompassing Stewarton with an area of approximately 220km^2.



© Crown copyright. SEPA licence number 100016991 (2015). All rights reserved.

The area has a risk of river, surface water and coastal flooding. The majority of damages are caused by river flooding predominately from the River Irvine and Annick Water.

There are approximately 2,900 residential properties and 1,200 non-residential properties at risk of flooding. The Annual Average Damages are approximately £7.1 million.

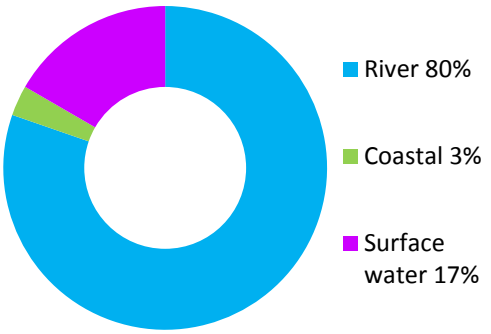


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

River flooding within the area is primarily from the River Irvine, which flows west towards the Firth of Clyde. There are also a number of tributaries of the River Irvine including the Annick Water, Carmel Water, Fenwick Water, Cessnock Water and Kilmarnock Water, which all present a risk to people, properties and transport routes. There are also a number of structures on the Annick Water within the Stewarton area which could possibly impede the flow of flood water. This may contribute towards a heightened risk of flooding to local properties, particularly in the area where the B778 crosses the Annick Water.

There are sections of road and rail infrastructure at risk of flooding, notably; the M77, A71, A76, A77 and A78, which could affect access to Irvine and other main access routes.

There are approximately 620 residential properties at risk of surface water flooding around Irvine, Kilmarnock and Galston. The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

The tidal weir downstream of the Marress Bridge in Irvine limits the impact from coastal flooding in the area, with no residential properties at identified at risk.

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 50% of the damages. Non-residential properties also contribute a notable portion 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 2,900 to 4,000 and the number of non-residential properties from approximately 1,200 to 1,500.

The location of the impacts of flooding is shown in Figure 3. Most of the impacts are within Kilmarnock, Irvine, Galston and Newmilns and include flooding to people, non-residential properties, community facilities, utilities, roads and railways. The A71 is at risk of flooding at various locations including Kilmarnock and Irvine. Thirteen designated cultural heritage sites are at risk of flooding, along with small areas of environmentally designated sites.

History of flooding

There have been frequent reports of river flooding in this area for a number of years. The most notable floods occurred in 1852, 1873, 1909 and 1932, which impacted people and caused damage to properties.

Waterside in Irvine was flooded in December 1994 when the south west of Scotland was affected by severe flooding. Although the December 1994 flooding affected the south west of Scotland, flow records from the SEPA gauge at Shewalton show that flows in the River Irvine have been exceeded on two other occasions since the records started in 1977. The largest flow was recorded in 1980, followed by 1977 and 1994. Waterside may have also flooded in 1979 and 1981, as high flows were recorded on both of these dates. This would indicate that Waterside has flooded at least three times, but most likely five times since 1977.

The most recent flooding in the area occurred in December 2014. This affected properties along the River Irvine and Kilmarnock Water. The River Irvine, Kilmarnock Water and Back Burn are also known to have flooded in 2008 which mainly affected the Riccarton and Newmilns area in Kilmarnock. On 18 July 2007 a prolonged and intense thunderstorm caused the Caffle Burn to overtop at Kilnholm Street garages in Newmilns. The Back Burn also overtopped on High Street where 25 residential properties and numerous commercial properties were affected by the flood waters.

Surface water floods have also been reported to SEPA in Irvine, Kilmarnock, Galston and Newmilns, but with only minor impacts on the local area.

	1 in 10	1 in 200	1 in 1000
	High likelihood	Medium likelihood	Low likelihood
Residential properties (total 51,000)	400	2,900	3,900
Non-residential properties (total 5,000)	250	1,200	1,500
People	890	6,500	8,500
Community facilities	0	10 Includes: educational buildings, emergency services and healthcare facilities	10 Includes: educational buildings, emergency services and healthcare facilities
Utilities assets	20	80	100
Transport links - roads (km)	16.4 (of which 0.1 is motorway and 2.8 is A road)	37.0 (of which 0.2 is motorway and 8.7 is A road)	41.2 (of which 0.2 is motorway and 9.8 is A road)
Transport links - rail (km)	2.2	5.1	5.1
Environmental designated areas (km^2)	<0.1	<0.1	<0.1
Designated cultural heritage sites	8	13	22
Agricultural land (km^2	8.7	11.0	12.1

Table 1: Summary of flooding impacts[1]

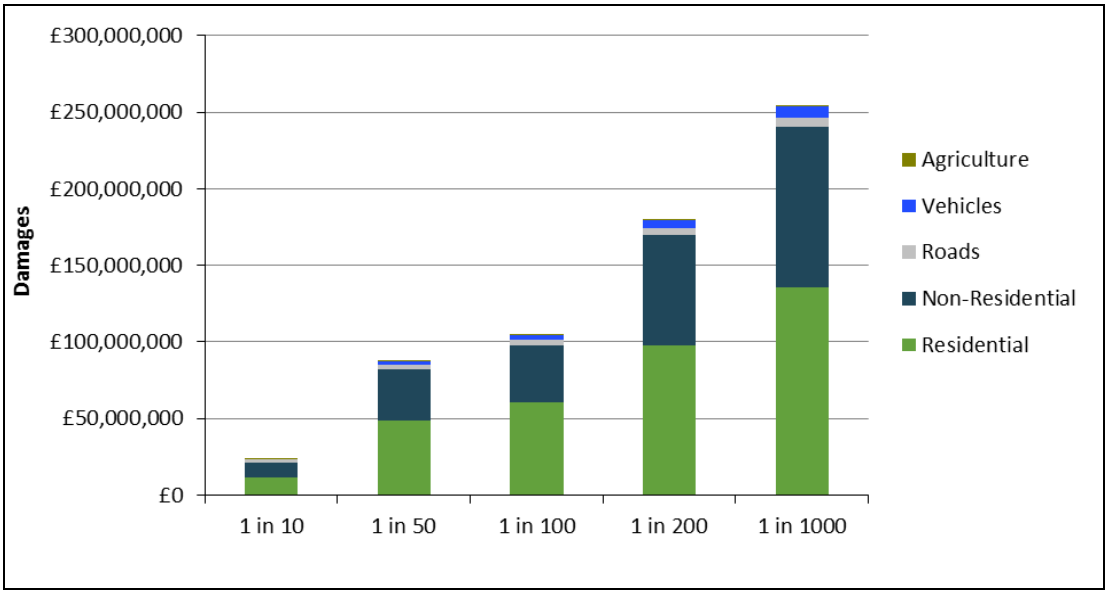


Figure 2: Damages by flood likelihood

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

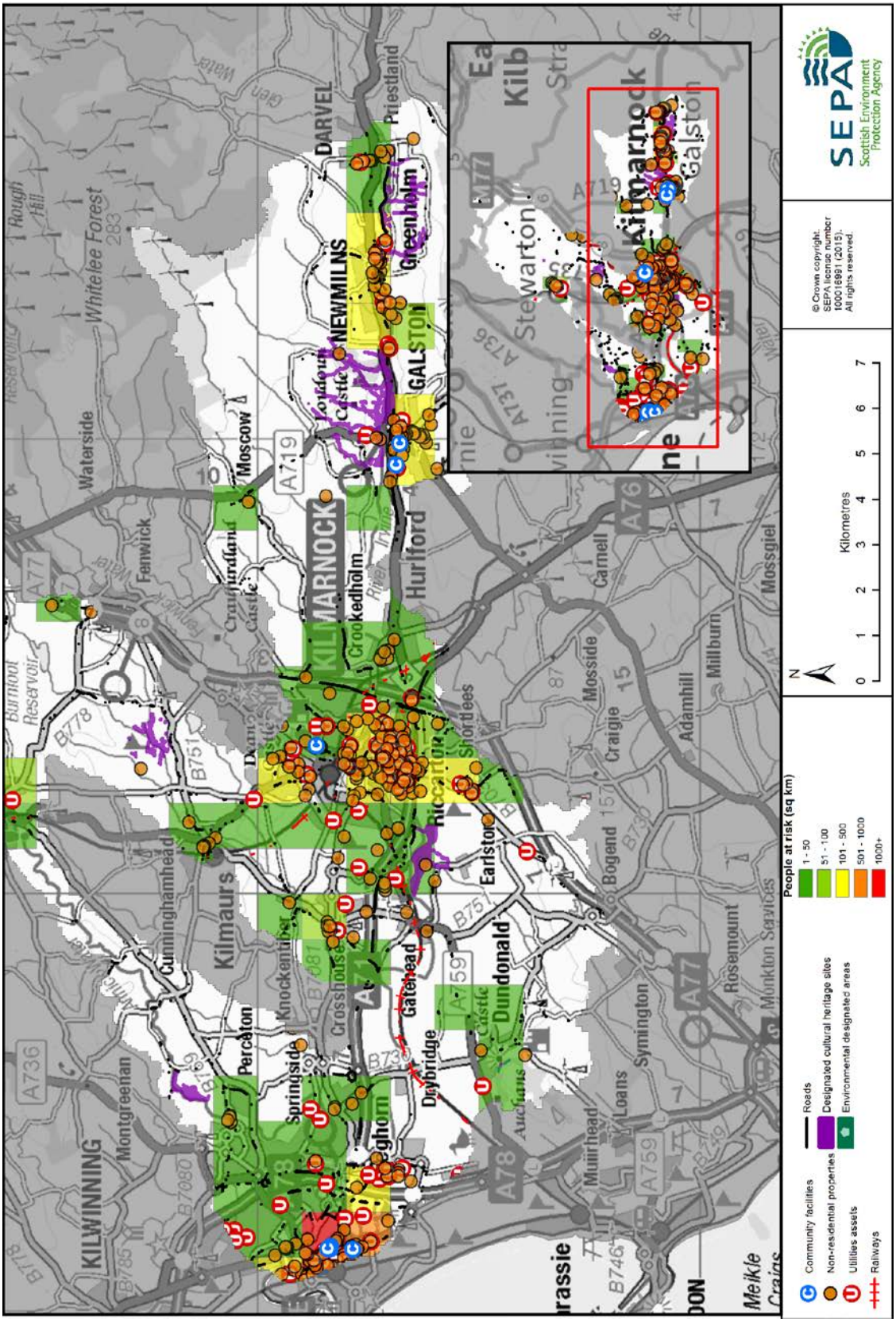
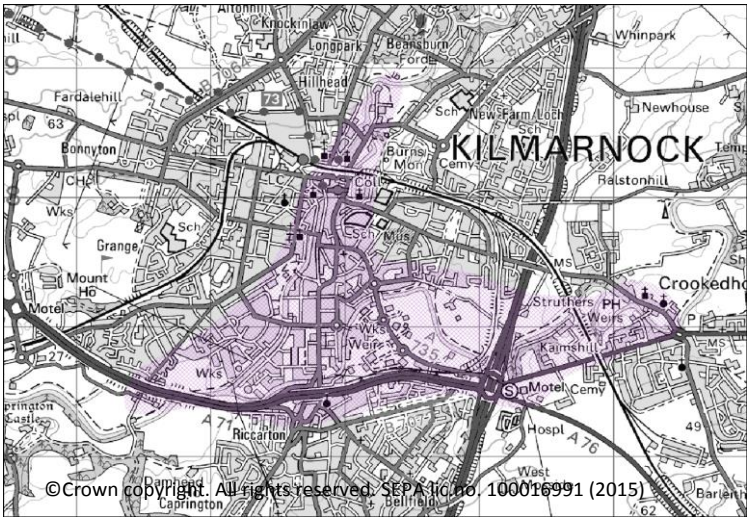


Figure 3: Impacts of flooding

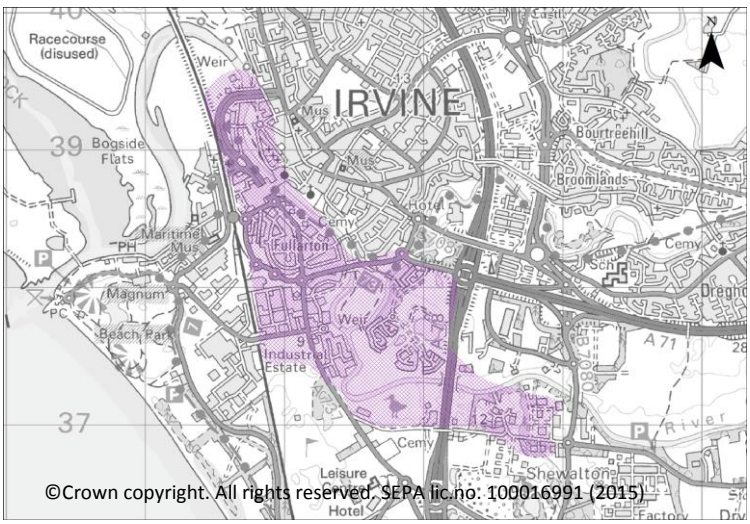
Objectives to manage flooding in Potentially Vulnerable Area 12/06

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

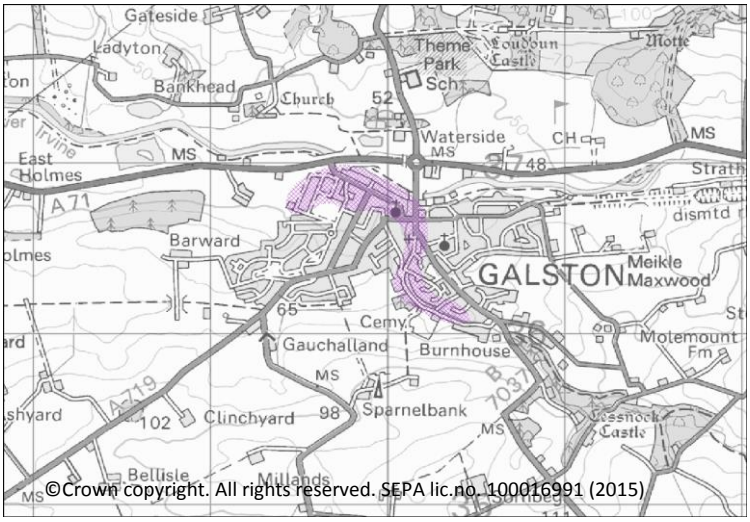
Reduce the risk of flooding from the River Irvine and the Kilmarnock Water in Kilmarnock

Indicators:	Target area:
• 420 residential properties • 400 non-residential properties • £820,000 Annual Average Damages	
Objective ID: 12015	

Reduce the risk of flooding from the River Irvine and the Annick Water combined with surface water, to residential properties and non-residential properties in Irvine

Indicators:	Target area:
• 1,000 residential properties • 190 non-residential properties • £3.3 million Annual Average Damages	
Objective ID: 12017	

Reduce the risk of flooding from the River Irvine in Galston

Indicators:	Target area:
• 280 residential properties • 90 non-residential properties • £120,000 Annual Average Damages	 ©Crown copyright. All rights reserved. SEPA lic.no. 100016991 (2015)
Objective ID: 12019	

Target area	Objective	ID	Indicators within PVA
Kilmarnock and Greenholm	Reduce the economic damages and risk to people from surface water flooding in Kilmarnock and Greenholm	12040	* See note below
Irvine	Reduce the economic damages and risk to people from surface water flooding in Irvine	12042	* See note below
Applies across Ayrshire Local Plan District	Avoid an overall increase in flood risk	12039	• 2,900 residential properties • £7.1 million Annual Average Damages
Applies across Ayrshire Local Plan District	Reduce overall flood risk	12082	• 2,900 residential properties • £7.1 million Annual Average Damages
Applies across Ayrshire 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 12/06 there are 620 residential properties at risk and Annual Average Damages of £1.2 million.

Actions to manage flooding in Potentially Vulnerable Area 12/06

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for River Irvine and Annick Water catchments 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):	**NEW FLOOD WARNING** (120820010)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	SEPA		
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	The area under consideration includes properties in Newmilns affected by flooding from the River Irvine. It should also be clarified whether the risk at Galston comes from the River Irvine or the Burn Anne as this could impact on the potential for provision of warnings at Galston. For areas where the risk is from the Irvine an update to the flood forecasting system will be required. Another area under consideration includes properties in Kilmarnock affected by flooding from the Kilmarnock Water and River Irvine. An update to the existing flood forecasting system will be required to deliver flood warning in thislocation. Flood warning is also required for properties mainly in Irvine and Stewarton affected by flooding from the Annick Water. Full scoping, infrastructure and a flood forecasting system will be required to develop a new flood warning scheme in this area.		

Action (ID):	**FLOOD PROTECTION STUDY** (120150005)
Objective (ID):	Reduce the risk of flooding from the River Irvine in Galston (12019) Reduce the risk of flooding from the River Irvine and the Kilmarnock Water in Kilmarnock (12015)
Delivery lead:	East Ayrshire Council

Priority:	National:		Within local authority:
	37 of 168		**1 of 4**
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	A study is recommended to further investigate the flood risk from the River Irvine and Kilmarnock Water. The study will look at the actions that have previously been implemented in the area to assess the level of protection that is offered within Kilmarnock and in other areas along the River Irvine valley including Galston. Depending on the findings from the study there may be the requirement to look at enhancing the current defences or complimentary actions which could help to improve the level of protection offered. One of the actions that should be investigated is a property level protection scheme.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flood risk to 400 residential properties and 420 non-residential properties in this location, with potential damages avoided of up to £24 million.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Further impacts will be assessed by the local authority.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (120400018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Kilmarnock and Greenholm (12040)		
Delivery lead:	Scottish Water in partnership with East Ayrshire 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** (120400019)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Kilmarnock and Greenholm (12040)		
Delivery lead:	East Ayrshire Council		
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	An integrated catchment study for Kilmarnock is under development which will support the assess the most sustainable combination of actions to mitigate flooding.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (120421018)		
Objective (ID):	Reduce the risk of flooding from the River Irvine and the Annick Water combined with surface water, to residential properties and non-residential properties in Irvine (12017) Reduce the economic damages and risk to people from surface water flooding in Irvine (12042)		
Delivery lead:	North Ayrshire 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** (120421019)		
Objective (ID):	Reduce the risk of flooding from the River Irvine and the Annick Water combined with surface water, to residential properties and non-residential properties in Irvine (12017) Reduce the economic damages and risk to people from surface water flooding in Irvine (12042)		
Delivery lead:	Scottish Water in partnership with North Ayrshire Council		
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	An integrated catchment study for Irvine is under development which will assess flood mitigation actions in detail. As this study progresses it should further investigate in detail the potential benefit of natural flood management for runoff control to Irvine.		

Action (ID):	**STRATEGIC MAPPING AND MODELLING** (120820016)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	SEPA		
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	SEPA will seek to develop flood mapping in the River Irvine area to improve understanding of flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied. SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,300km² 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 Management Studies will be considered as these projects are completed.		

Action (ID):	**STRATEGIC MAPPING AND MODELLING** (120820019)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120150017)		
Objective (ID):	Reduce the risk of flooding from the River Irvine and the Kilmarnock Water in Kilmarnock (12015)		
Delivery lead:	East Ayrshire Council		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	The Kilmarnock Flood Protection Scheme was designed to mitigate flooding from the River Irvine in the Riccarton and Crookedholm areas of Kilmarnock. The scheme includes flood walls, flood embankments, channel improvements, storage areas and control structures and has a standard of protection of 100 years. 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 PROTECTION SCHEME** (120170017)		
Objective (ID):	Reduce the risk of flooding from the River Irvine and the Annick Water combined with surface water, to residential properties and non-residential properties in Irvine (12017)		
Delivery lead:	North Ayrshire Council		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	Defences along the banks of the Irvine River protects properties in the Waterside up to a 20 year flood. 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** (120820030)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	SEPA		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	Continue to maintain the Irvine Waterside/Low Green flood warning area in Irvine and the Queen's Drive, New Mill Road and Samson Avenue flood warning area in Kilmarnock which are part of the Irvine river flood warning scheme.		

Action (ID):	**FLOOD FORECASTING** (120820009)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120820012)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	Community		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	Although not part of a community flood action group the public take an active interest in flooding issues within Galston and inform the council about debris in the watercourse.		

Action (ID):	**SELF HELP** (120820011)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120820013)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120820007)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120820014)		
Objective (ID):	Reduce overall flood risk (12082)		
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** (120390001)		
Objective (ID):	Avoid an overall increase in flood risk (12039) Reduce overall flood risk (12082)		
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.		