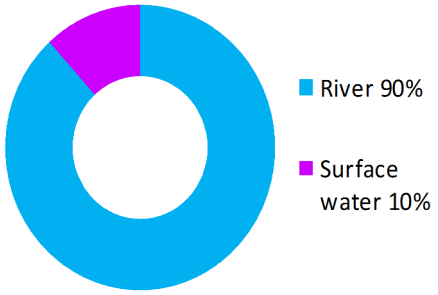
Upper Garnock catchment (Potentially Vulnerable Area 12/04)

Local Plan District	Local authority	Main catchment
Ayrshire	North Ayrshire Council, Renfrewshire Council	River Garnock

Summary of flooding impacts



At risk of flooding

- 810 residential properties
- 100 non-residential properties
- £790,000 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.

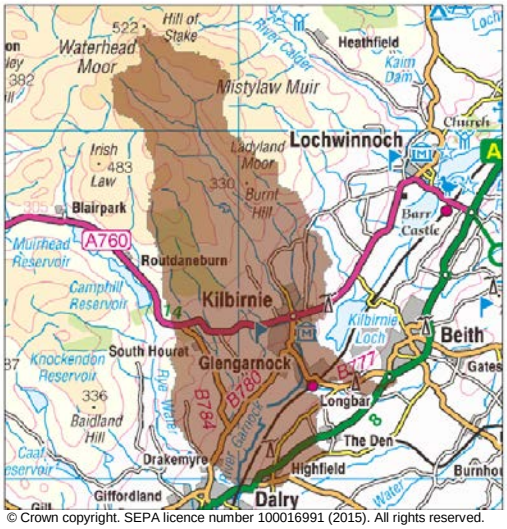
Flood protection scheme/works	*Natural flood management works*	New flood warning	*Community flood action groups*	*Property level protection scheme*	*Site protection plans*
Flood protection study	Natural flood management study	*Maintain flood warning*	Awareness raising	*Surface water plan/study*	Emergency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

Upper Garnock catchment (Potentially Vulnerable Area 12/04)

Local Plan District	Local authority	Main catchment
Ayrshire	North Ayrshire Council, Renfrewshire Council	River Garnock

Background

This Potentially Vulnerable Area is located in the north of the Ayrshire Local Plan District, between Dalry and Clyde Muirshiel Regional Park and it is approximately 50km^2 (shown below).



There are approximately 810 residential properties and 100 non-residential properties at risk of flooding. The Annual Average Damages are approximately £790,000.

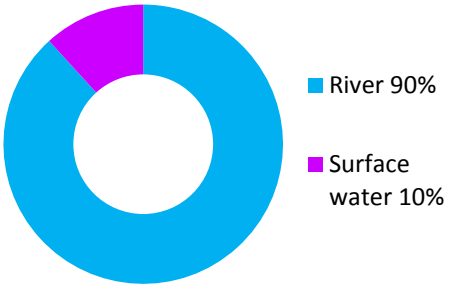


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

River flooding in the area is primarily attributed to the River Garnock which flows from north to south through the town of Kilbirnie and towards Dalry. A large number of residential and non-residential properties are at risk in the town. Flooding may occur to transport routes (notably the A737 and A760) and within the town. A number of areas of river erosion have also been noted in Kilbirnie. To the north of Kilbirnie the floodplain is restricted as it flows through a steep sided valley; however, there are substantial areas of flooding to the south, which would predominantly impact agricultural land. These southern floodplains are located upstream of the town of Dalry. The Rye Water flows into Dalry from the north west with a risk of flooding to an industrial area which may be attributed to the downstream confluence of the Rye Water and the Garnock Water.

Surface water flooding within the area occurs predominantly in rural locations, or is potentially combined with flooding to smaller watercourses. Areas in the north of Dalry are at risk of combined surface water and river 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 80% 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 810 to 1040 and the number of non-residential properties from approximately 100 to 120.

The location of the impacts of flooding is shown in Figure 3. Most of the impacts from flooding are south of the A760 at Kilbirnie, these include flooding risk to people, non-residential properties, community facilities, utilities, roads and railways. The A760 itself is at risk of flooding at Kilbirnie.

History of flooding

There has been regular flooding reported within this area. River flooding accounts for almost all records which date back to the late 19th Century and are predominantly from Kilbirnie and Glengarnock. Flooding from the River Garnock on 9 August 2004, 1 August 2008 and 28 September 2010 caused impact to properties, gardens, roads and people in Kilbirnie and Glengarnock.

Surface water floods are infrequent within this area, with only one recent report from November 1999 when residential properties flooded. Prior to this, surface water flooding was last attributed as the cause of flooding in 1882.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,900)	70	810	990
Non-residential properties (total 280)	<10	100	120
People	160	1,800	2,000
Community facilities	0	<10 Including: educational buildings and emergency services	<10 Including: educational buildings and emergency services
Utilities assets	<10	20	20
Transport links - road (km)	1.1	2.0 (of which 0.1 is A road)	2.9 (of which 0.1 is A road)
Transport links - rail (km)	0.5	2.4	2.8
Environmental designated areas (km^2)	0	0	0
Designated cultural heritage sites	2	2	2
Agricultural land (km^2)	1.6	2.0	2.1

Table 1: Summary of flooding impacts[1]

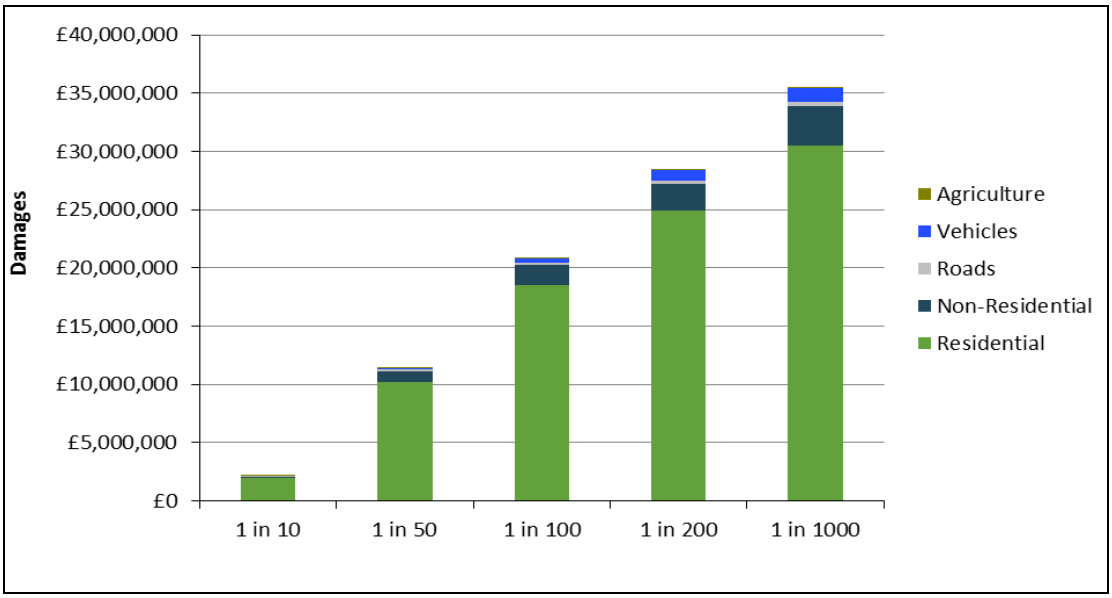


Figure 2: Damages by flood likelihood

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

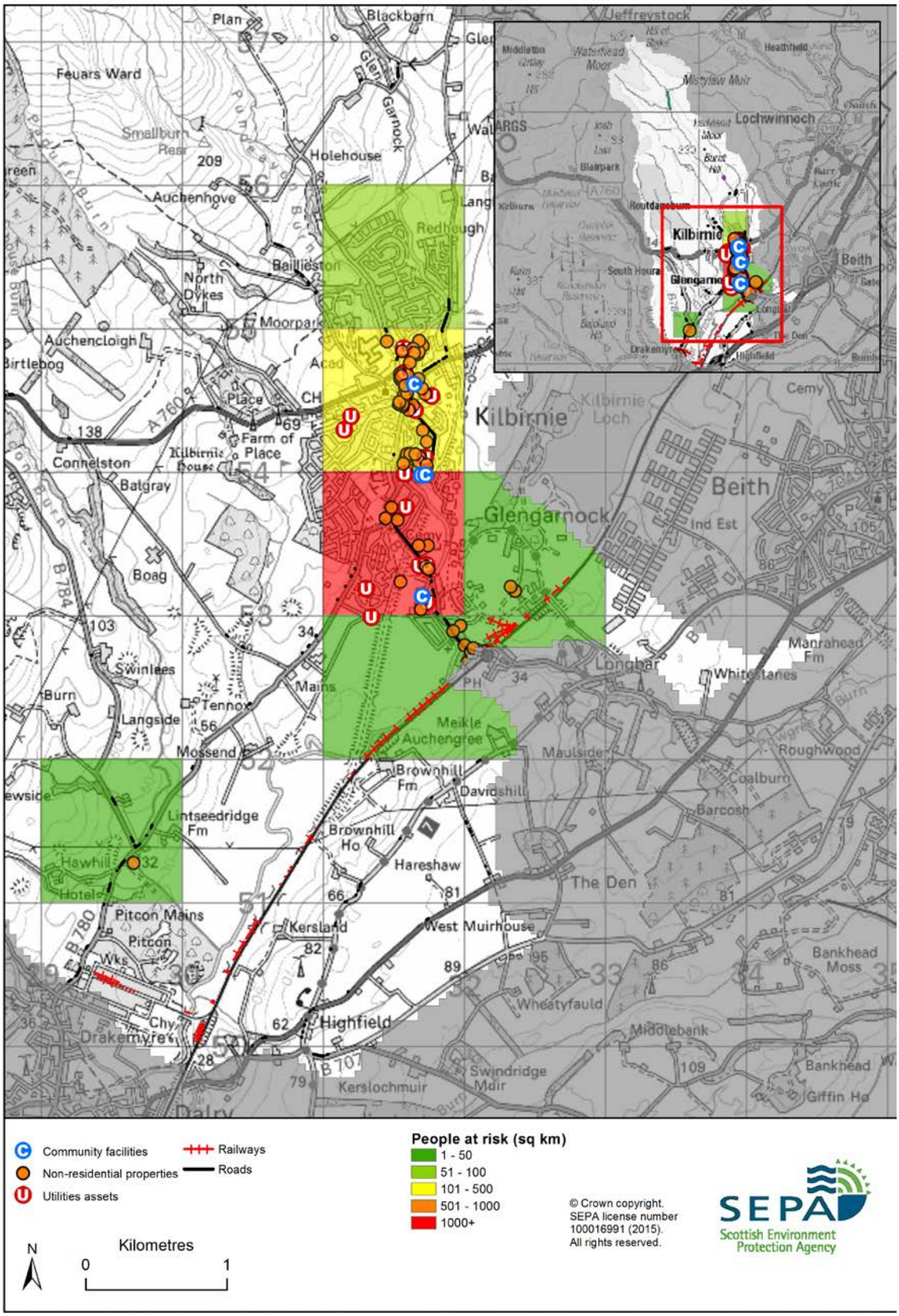


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 12/04

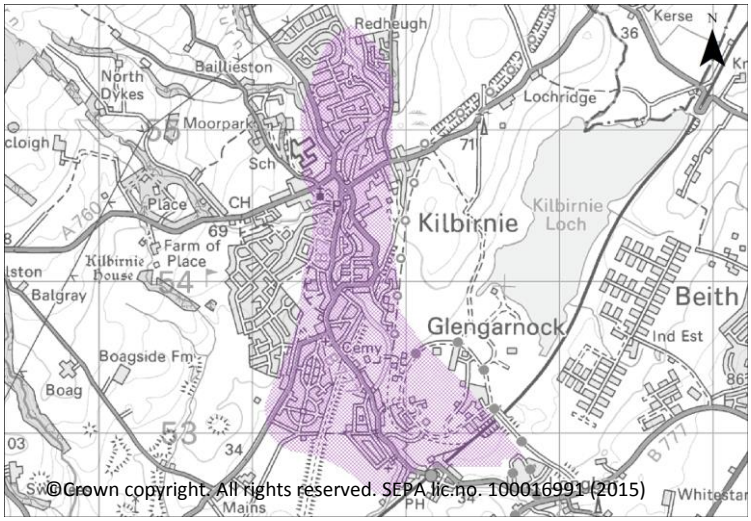
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target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

Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Kilbirnie, Glengarnock and Longbar

Indicators:

- 780 residential properties
- 100 non-residential properties
- £720,000 Annual Average Damages

Target area:



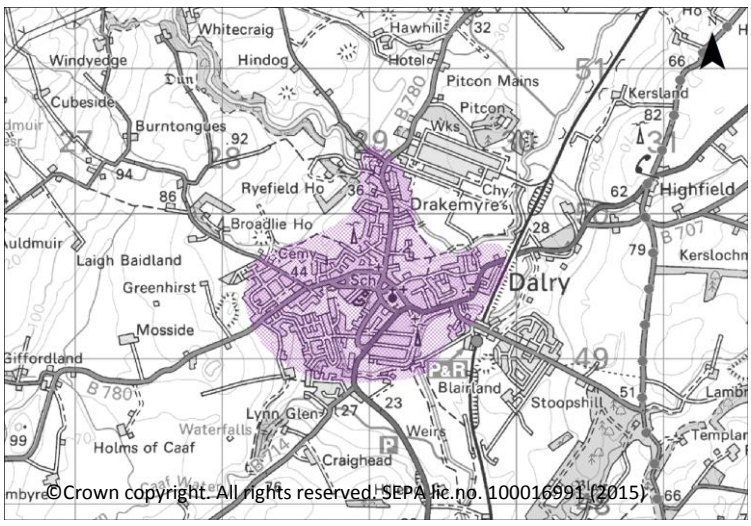
Objective ID: 12010

Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Dalry

Indicators:

- 70 residential properties
- <10 non-residential properties
- £380,000 Annual Average Damages

Target area:



Objective ID: 12102

Target area	Objective	ID	Indicators within PVA
Applies across Ayrshire Local Plan District	Avoid an overall increase in flood risk	12039	• 810 residential properties • £790,000 Annual Average Damages
Applies across Ayrshire Local Plan District	Reduce overall flood risk	12082	• 810 residential properties • £790,000 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.		

Actions to manage flooding in Potentially Vulnerable Area 12/04

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 the Upper Garnock catchment Potentially Vulnerable Area.

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

Action (ID):	**FLOOD PROTECTION SCHEME/WORKS** (120100006)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Kilbirnie, Glengarnock and Longbar (12010)		
Delivery lead:	North Ayrshire Council		
Priority:	National:	Within local authority:	
	12 of 42	**2 of 3**	
Status:	**Under development**	Indicative delivery:	**2016-2021**
Description:	It is recommended that the council progress work on the proposed flood protection scheme on the upper River Garnock. detailed modelling and options assessment has been carried out with an economic assessment of action. The proposed scheme consisting of storage and direct defences would provide protection to properties in Kilbirnie and Glengarnock from the River Garnock and Powgree Burn. Once that scheme has been completed the flood mapping for the River Garnock should be revised to identify the areas protected by the scheme and any remaining residual risk now and in the future.		
Potential impacts			
Economic:	The proposed scheme on the upper River Garnock, may benefit 470 residential and non-residential properties at risk of flooding in this location, damages avoided are estimated to be £61 million. The flood protection scheme has an estimated benefit cost ratio of 4.3.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.		

Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. River Garnock (water body ID 10381), within this study area, is identified by river basin management planning to be at less than good status. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. There are no international, national or local level environmental designations that are likely to be impacted by this action. There is likely to be a loss of natural and semi-natural habitat in the direct footprint of the engineered storage and defences. Downstream of the storage action there may be negative impacts on water quality through increased erosion and sedimentation. Implementation of the storage action will have permanent negative impacts on the water body morphology. There is the potential for negative impacts on local water quality downstream of works during the construction period.

Action (ID):	**FLOOD PROTECTION SCHEME/WORKS** (121020006)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Dalry (12102)		
Delivery lead:	North Ayrshire Council		
Priority:	National:	Within local authority:	
	12 of 42	**2 of 3**	
Status:	**Under development**	Indicative delivery:	**2016-2021**
Description:	It is recommended that the council progress work on the proposed flood protection scheme on the upper River Garnock. Detailed modelling and options assessment have been carried out with an economic assessment of actions. The proposed scheme consisting of storage and direct defences would provide protection to properties in Dalry from the River Garnock and Rye Water. Once that scheme has been completed the flood mapping for the River Garnock should be revised to identify the areas protected by the scheme and any remaining residual risk now and in the future.		
Potential impacts			
Economic:	The proposed scheme on the upper River Garnock, may benefit 470 residential and non-residential properties in this location, damages avoided are estimated to be £61 million. The flood protection scheme has an estimated benefit cost ratio of 4.3.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. This flood protection scheme is proposed for a number of rivers. The physical condition of the River Garnock (water body ID 10381) 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		

Environmental:	local level environmental designations that are likely to be impacted by this action. There is likely to be a loss of natural and semi-natural habitats and displacement of species in the footprint and vicinity of the defences. There is the potential for negative impacts on local water quality downstream of works during the construction period.

Action (ID):	**NEW FLOOD WARNING** (120820010)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	SEPA		
Status:	**Ongoing**	Indicative delivery:	**2016-2021**
Description:	Continue with the development and implementation of a flood warning scheme on the River Garnock. Detail of communities that will benefit from the warnings will be determined during scheme development.		

Action (ID):	**NATURAL FLOOD MANAGEMENT STUDY** (120100003)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Kilbirnie, Glengarnock and Longbar (12010)		
Delivery lead:	North Ayrshire Council		
Status:	**Not started**	Indicative delivery:	**2016-2021**
Description:	It is recommended that a natural flood management study should be undertaken to further investigate the potential benefit of runoff control and sediment management around Kilbirnie and Glengarnock. A previous assessment of the potential benefit of these actions on the upper River Garnock has been carried out during the work on the upper River Garnock flood protection scheme. However, this study should focus on the potential benefit of these actions to the tributaries of the River Garnock, and how these combined actions may reduce risk on the River Garnock.		
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. In this location, it has been estimated that 59 residential and non-residential properties could potentially benefit from natural flood management actions.		
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 natural flood management study area. In addition there are two utilities which have been identified as potentially benefitting from this action. 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 proposed for the River Garnock (water		

Environmental:	body ID 10381). The physical condition of this river is identified by river basin management planning to be at less than good status. Natural flood management actions are likely to improve the condition of rivers. Proposed actions should be coordinated with river basin management planning. Proposed runoff control in the upper catchment area north west of Murchan Hill has the potential to impact upon the Renfrewshire Heights Special Area of Conservation and Site of Special Scientific Interest. To be in accord with the flood risk management 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 Renfrewshire Heights Special Protection Area. Runoff control in the lower catchment area, to the north west of Kilbirnie, is unlikely to impact these designated sites. There is the potential for the existing ecosystems in the area to be impacted through a change of land use if woodland planting is undertaken. In areas of grazing grassland this could improve biodiversity; however, in the bog areas from Blacks Law to High Blaeberry Craigs this would have significant negative impacts. Depending on the status of the bog there may, however, be potential for some land management activities, such as drain blocking. 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. There are likely to be local improvements in water quality through reduced sedimentation; however, increased flows may have localised erosion impacts downstream. Sediment management works and bank restoration may cause the short term loss of some habitats and displacement of species, which should recolonise and return to the area following sediment management activities. There is the potential for improved water quality, reduced sediment and reduced scour in the River Garnock. There is also the potential for a slight increase in carbon storage with this action, provided the upland bogs are not negatively impacted upon. There is the potential for woodland planting to impact upon the setting of Glengarnock Castle. Bank restoration and sediment management activities on the River Garnock have the potential to temporarily impact upon the heritage features of Glengarnock Castle and the Kilbirnie heritage conservation area.

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 carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

Action (ID):	**FLOOD FORECASTING** (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):	**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 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** (120820007)		
Objective (ID):	Reduce overall flood risk (12082)		
Delivery lead:	North Ayrshire Council, Renfrewshire Council, asset / land managers		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

Action (ID):	**EMERGENCY PLANS/RESPONSE** (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.		