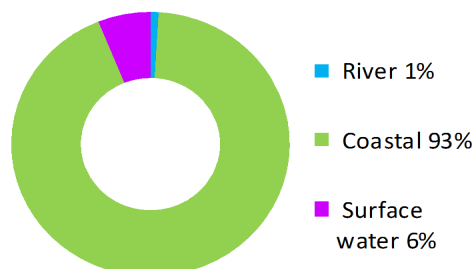


Kirkwall (Potentially Vulnerable Area 03/05)

Local Plan District	Local authority	Main catchment
Orkney	Orkney Islands Council	Orkney coastal

Summary of flooding impacts



At risk of flooding

- 490 residential properties
- 460 non-residential properties
- £2.5 million Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

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

Actions

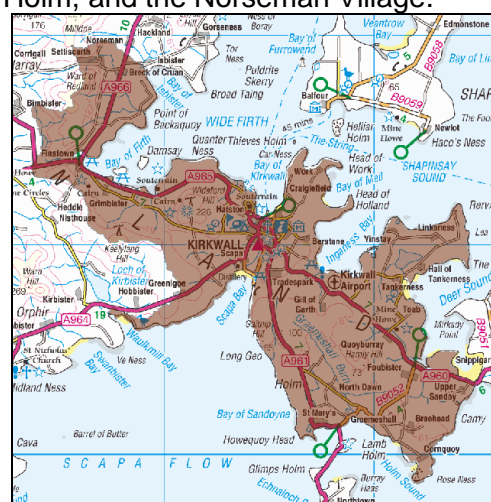
Kirkwall (Potentially Vulnerable Area 03/05)

Local Plan District	Local authority	Main catchment
Orkney	Orkney Islands Council	Orkney coastal

Background

This Potentially Vulnerable Area includes the south-east of Orkney Mainland (shown below). It is approximately 150km².

The area includes the town of Kirkwall within the parish St Ola, and other parishes such as Firth, St. Andrews, Holm, and the Norseman Village.



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The airport is located in this Potentially Vulnerable Area.

There are approximately 490 residential and 460 non-residential properties at risk of flooding.

The Annual Average Damages are estimated to be £2.5 million with the majority of these attributed to coastal flooding.

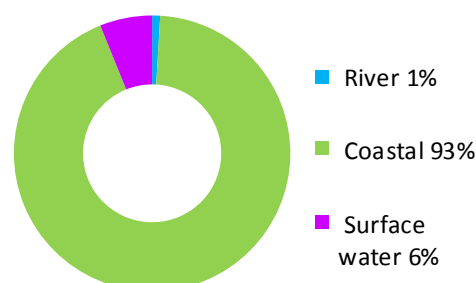


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

Coastal flood risk is mainly focused on the town of Kirkwall with a significant part of the town to the south of the harbour located in the coastal floodplain. Part of this area of the town is also subject to surface water flooding and there is a known interaction between coastal and surface water flooding during periods of intense rainfall and high sea levels.

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 risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works, and pumping stations). Within this Potentially Vulnerable Area there are two assets identified as being at risk of flooding.

Three schools in Kirkwall are identified as being at risk of flooding, along with three buildings housing emergency services. Roads affected by flooding include the A960, A961, A963, A964, A965, A966, B9053, B9054 and B9148. There are 13 designated cultural heritage sites and small areas of environmental importance also at risk. The damages associated with floods of different likelihood are shown in Figure 2. Note that cultural heritage and environmental sites are not included in the estimation

of the economic impact of flooding due to the difficulty in placing an economic value on these impacts.

The location of the impacts of flooding is shown in Figure 3.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 5,000)	30	490	540
Non-residential properties (total 1,200)	90	460	520
People	60	1,100	1,200
Community facilities	0	<10 Includes; educational buildings and emergency services	<10 Includes; educational buildings and emergency services
Utilities assets	<10	20	20
Transport links (excluding minor roads)	Roads at 180 locations	Roads at 280 locations	Roads at 280 locations
Environmental designated areas (km ²)	<0.1	<0.1	<0.1
Designated cultural heritage sites	11	13	15
Agricultural land (km ²)	2	3	4

Table 1: Summary of flooding impacts¹

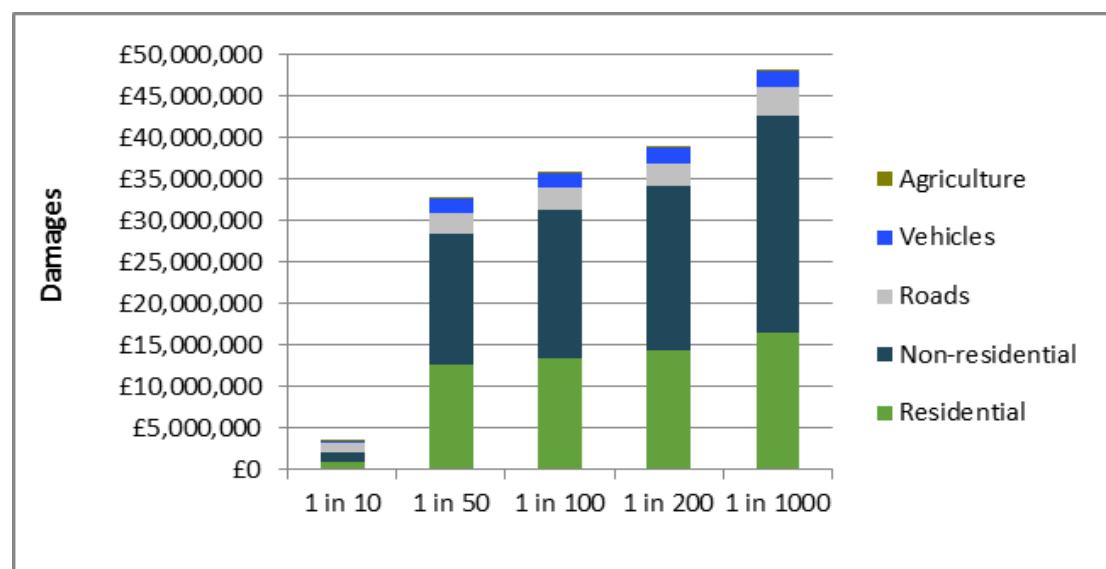


Figure 2: Damages by flood likelihood

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

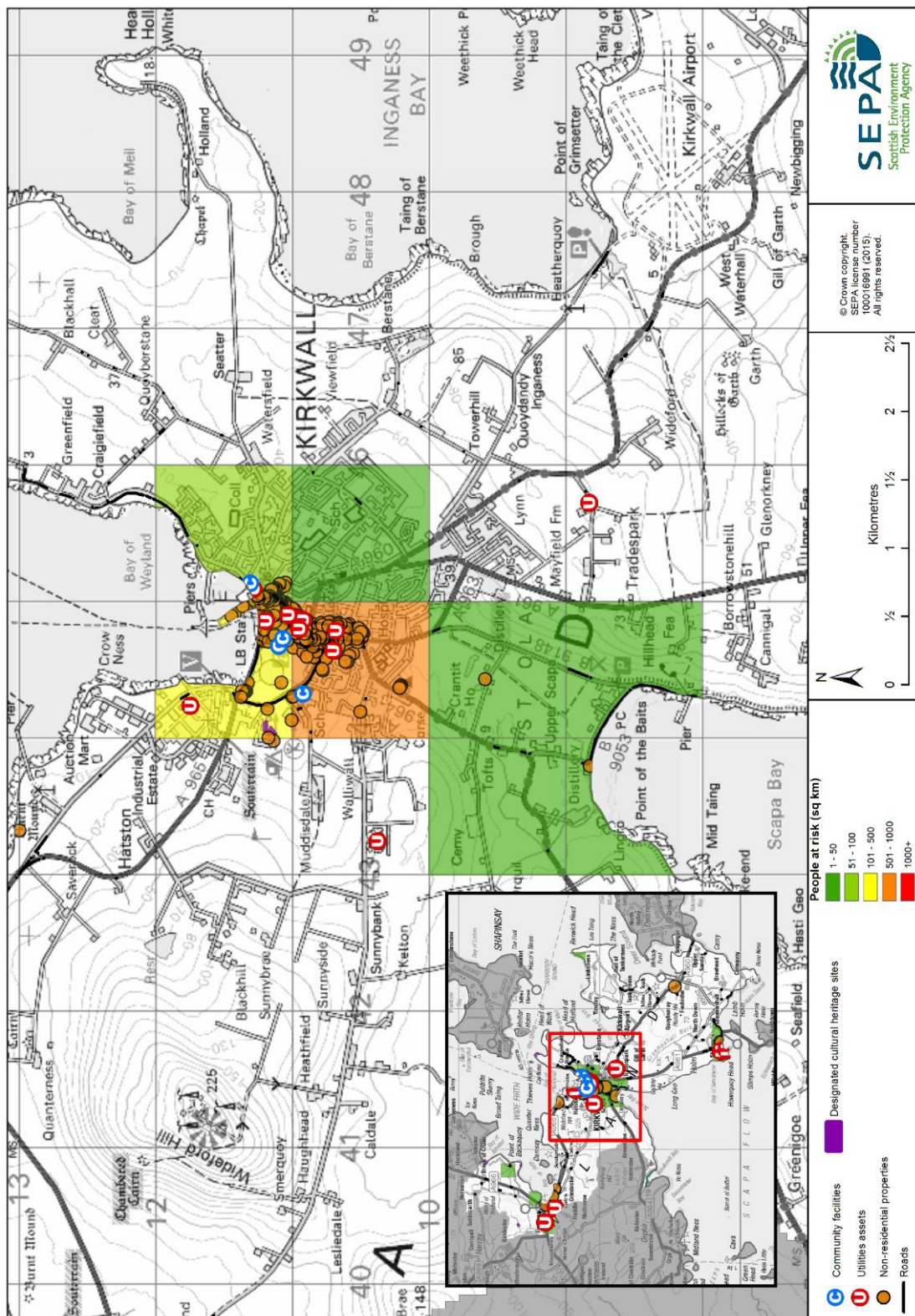


Figure 3: Impacts of flooding

History of flooding

There have been many anecdotal reports and recorded floods documented within this Potentially Vulnerable Area over the last 130 years. Flooding has come from burns, surface water or coastal sources and often as a result of complex combinations, particularly where flows from outfalls are restricted by high sea levels.

Significant coastal floods recorded within the Potentially Vulnerable Area include the 1953 North Sea Flood which caused damage to civil infrastructure, properties, businesses and shipping.

More recently recorded coastal floods were in January 2005 when properties and large sections of roads within low lying coastal areas in Kirkwall, St Mary's and Finstown were flooded. The 2005 flood saw the harbour defences at Kirkwall being breached with minor overtopping, the pier at St Mary's being completely submerged and the A961 through the village also flooded. Significant surface water and river floods have been consistently recorded in Kirkwall and still occur occasionally despite improvements to the storm water drainage network. These instances are often linked to tidal influences on outfalls.

In October 2006, heavy rainfall resulted in flooding at Maitland's Burn in Finstown, whilst in Kirkwall the Peedie Sea, Muddisdale Burn, Crantit Burn, Burn of Wideford, and Papdale Burn were all affected. During this flood the volume of surface water entering the drainage system and water from overflowing watercourses resulted in the capacity of the drainage system being exceeded. Properties affected included three schools, a museum, four social clubs, a church, an art gallery and a water treatment works. Roads and agricultural land were also affected.

Less significant surface water floods also occurred across the area in August 2007, September 2007, January 2008, December 2012, October 2013 and November 2013 with the greatest impacts in Kirkwall.

Further information on flood hazard and risk

Orkney Islands consider that surface water flood risk is underestimated for Kirkwall. However whilst there are good records of the extent of actual flooding there is no accurate record of the properties that have suffered from internal flooding.

Objectives to manage flooding in Potentially Vulnerable Area 03/05

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 Kirkwall Potentially Vulnerable Area.

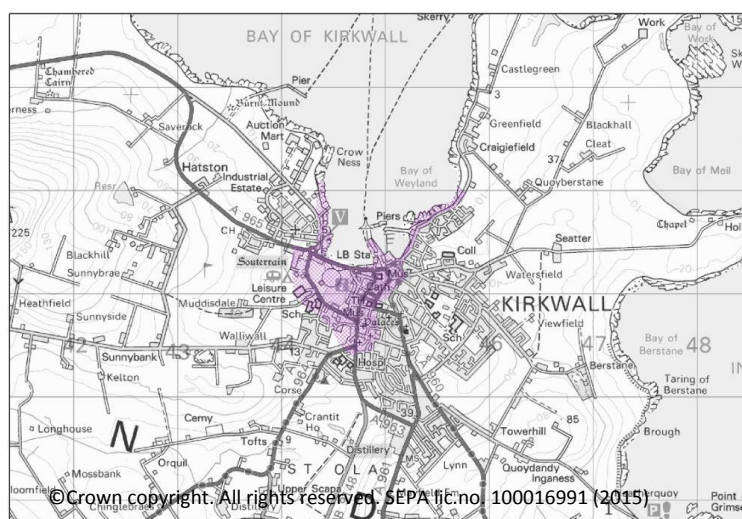
Reduce risk in Kirkwall from coastal flooding

Indicators:

Target area:

- 900 people
- £810,000 Annual Average Damages from residential properties
- £960,000 Annual Average Damages from non-residential properties
- A965 Ayre Road
- A963 through Kirkwall

Objective ID: 300501



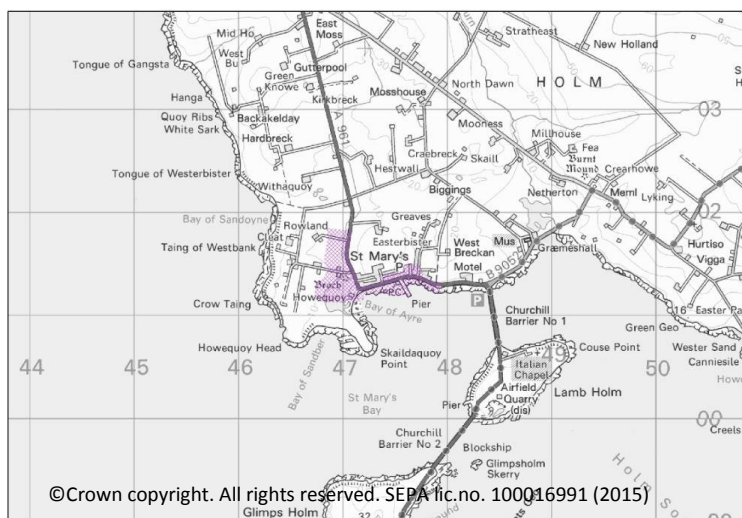
Reduce risk in St Mary's from coastal flooding

Indicators:

Target area:

- 20 people
- £16,000 Annual Average Damages from residential properties
- £4,900 Annual Average Damages from non-residential properties
- A961 through St. Mary's

Objective ID: 300502



Target area	Objective	ID	Indicators within PVA
Kirkwall	Reduce risk from surface water flooding in Kirkwall	300506	* See note below
Applies across Orkney Local Plan District	Avoid an overall increase in flood risk	300001	<ul style="list-style-type: none"> • 490 residential properties • £2.5 million Annual Average Damages
Applies across Orkney Local Plan District	Reduce overall flood risk	300002	<ul style="list-style-type: none"> • 490 residential properties • £2.5 million Annual Average Damages
Applies across Orkney 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 03/05 there are 50 residential properties at risk and Annual Average Damages of £150,000.

Actions to manage flooding in Potentially Vulnerable Area 03/05

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 Kirkwall 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 (3005010006)		
Objective (ID):	Reduce risk in Kirkwall from coastal flooding (300501)		
Delivery lead:	Orkney Islands Council		
Priority:	National:		Within local authority:
	6 of 42		1 of 1
Status:	Under development	Indicative delivery:	2016-2021
Description:	A flood protection scheme is under development for the perimeter of the harbour in Kirkwall. The scheme will complement existing defences to reduce the flood risk in Kirkwall. The scheme includes the construction of direct defences and is being designed to a 1 in 200 year standard of protection including an allowance for climate change.		
Potential impacts			
Economic:	The flood protection scheme could reduce flood risk to 383 residential properties and 158 non-residential properties.Damages avoided of £15.1 million could be achieved. The benefit-cost ratio of the proposed works is 8.03.		
Social:	The flood protection scheme could reduce flood risk for an estimated 842 people. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people. The social vulnerability is higher than average with a high percentage of the residential properties in the area currently at flood risk. Roads (A960/A965), two emergency services, a school, two telecommunication and five energy/electricity production sites would also potentially benefit from the scheme.		

Environmental:	Flood protection works can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. One scheduled monument would potentially benefit from the flood protection works. The design should minimise visual impact of the flood protection works. There are no designated sites close to the area.
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Action (ID):	NEW FLOOD WARNING (3000020010)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	The area under consideration covers the coastline of the Orkney Islands. Forecasting capability is currently under development.		

Action (ID):	FLOOD PROTECTION STUDY (3005020005)		
Objective (ID):	Reduce risk in St Mary's from coastal flooding (300502)		
Delivery lead:	Orkney Islands Council		
Priority:	National:	Within local authority:	
	146 of 168	4 of 6	
Status:	Not started	Indicative delivery:	2016-2021
Description:	A flood protection study is required to consider flood protection works for St Mary's. The study should primarily focus on coastal management actions, direct defences and property level protection, but other actions may also be considered in order to develop the most sustainable range of options. As localised defences may only be required the investigation should define the height and extent of the works.		
Potential impacts			
Economic:	The study could benefit seven residential and five non-residential properties at risk of flooding in this location, with potential damages avoided of up to £1.1 million.		
Social:	The development of flood protection works following the study would potentially reduce risk to 15 people. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people. The flood works would also potentially reduce risk to the B9052 road, which connects Mainland Orkney with South Ronaldsay, therefore access around the islands would be improved. Negative impacts through disturbance to the local community during the construction phase should be considered.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

Environmental:	environment. Opportunities to mitigate any environmental impacts may include design and timing of works. The scheduled monument would benefit from a reduction in flood risk.
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Action (ID):	SURFACE WATER PLAN/STUDY (3005060018)		
Objective (ID):	Reduce risk from surface water flooding in Kirkwall (300506)		
Delivery lead:	Orkney Islands Council		
Status:	Ongoing	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):	STRATEGIC MAPPING AND MODELLING (3000020016)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will be seeking to develop the flood hazard mapping in the Orkney Mainland area to improve understanding of the coastal flood risk. The extent and timing of the completed improvements will be dependent on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (3000020019)		
Objective (ID):	Reduce overall flood risk (300002)		
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):	FLOOD FORECASTING (3000020009)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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.</p> <p>The Potentially Vulnerable Area is within the 'Orkney' flood alert area.</p>		

Action (ID):	SELF HELP (3000020011)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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.</p>		

Action (ID):	AWARENESS RAISING (3000020013)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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.</p> <p>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.</p>		

Action (ID):	MAINTENANCE (3000020007)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	Orkney Islands Council, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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.</p> <p>The majority of storm water flows in Kirkwall are diverted to the Peedie Sea which acts as a balancing reservoir for the town, storing storm water during high tides and then releasing this water automatically when tide levels allow. This action, implemented in the early 1990s together with the provision of a pumping station at Kirkwall Pier to deal with combined sewer flooding, has vastly improved the historic flooding issues which affected the low lying areas of Kirkwall. The level of the Peedie Sea is manually reduced in advance of heavy rainfall forecasts to maximise its capacity.</p>		

Action (ID):	EMERGENCY PLANS/RESPONSE (3000020014)		
Objective (ID):	Reduce overall flood risk (300002)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Orkney Islands Council monitors the flood risk daily by comparing forecast tide and surge levels with land levels. This enables advanced warning of coastal flood events to be provided.</p>		

Action (ID):	PLANNING POLICIES (3000010001)		
Objective (ID):	Avoid an overall increase in flood risk (300001) Reduce overall flood risk (300002)		
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.		