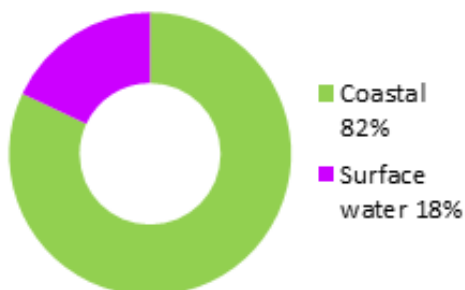


Dundee and Broughty Ferry (Potentially Vulnerable Area 07/13)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

Summary of flooding impacts



At risk of flooding

- 1,300 residential properties
- 460 non-residential properties
- £4.3 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	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	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

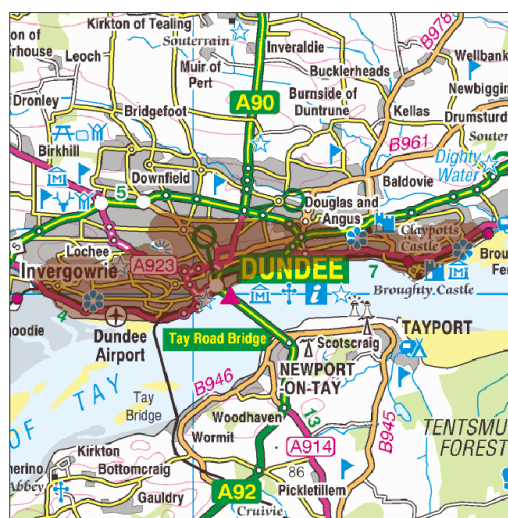
Actions

Dundee and Broughty Ferry (Potentially Vulnerable Area 07/13)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

Background

This Potentially Vulnerable Area is 21km² (shown below). It contains small coastal watercourses that flow into the Firth of Tay and includes Dundee and Broughty Ferry.



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The area has a risk of coastal and surface water flooding with the majority of damages caused by coastal flooding.

There are approximately 1,300 residential properties and 460 non-residential properties at risk of flooding. The Annual Average Damages are approximately £4.3 million.

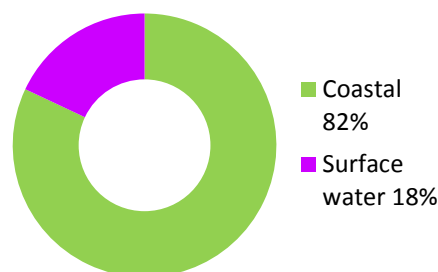


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of flooding is in Dundee and Broughty Ferry from coastal 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. For this Potentially Vulnerable Area the highest damages are to roads and non-residential properties followed by damages to residential properties. Other parts of the transport network (Dundee airport and railway routes) are also notably impacted. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

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 12 assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 41,000)	560	1,300	1,600
Non-residential properties (total 4,400)	160	460	620
People	1,200	2,800	3,600
Community facilities	<10 Emergency services	<10 Includes: emergency services, educational buildings and healthcare facilities	<10 Includes: emergency services, educational buildings and healthcare facilities
Utilities assets	10	40	50
Transport links (excluding minor roads)	5 A roads, 1 B road at 69 locations 3 Railway routes at 36 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions Dundee Airport	7 A roads, 3 B roads at 250 locations 3 Railway routes at 65 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions Dundee Airport	7 A roads, 4 B road at 336 locations 3 Railway routes at 74 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions Dundee Airport
Environmental designated areas (km ²)	0.9	0.9	1.0
Designated cultural heritage sites	8	23	26
Agricultural land (km ²)	0.4	0.5	0.6

Table 1: Summary of flooding impacts

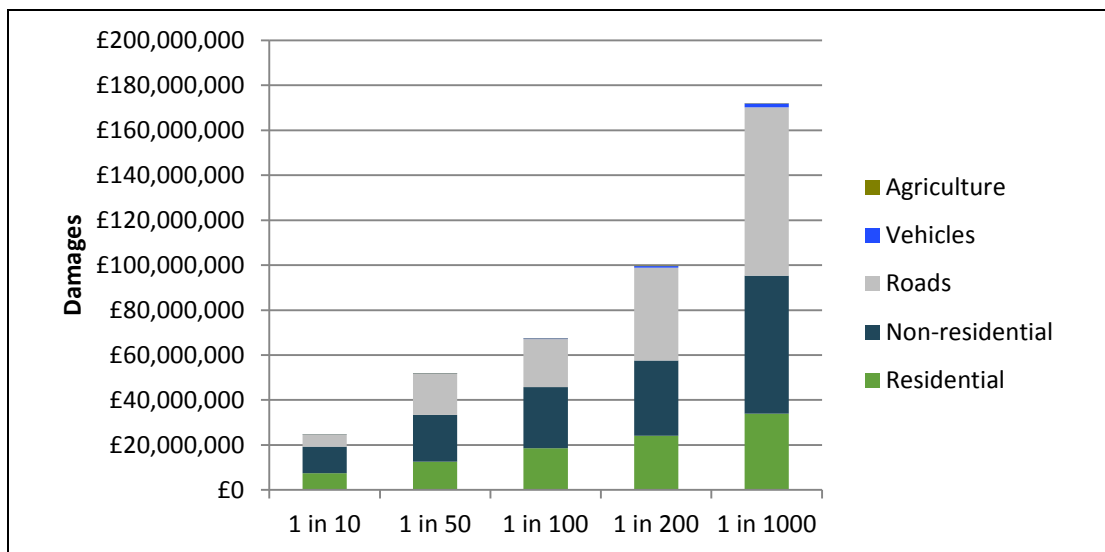


Figure 2: Damages by flood likelihood

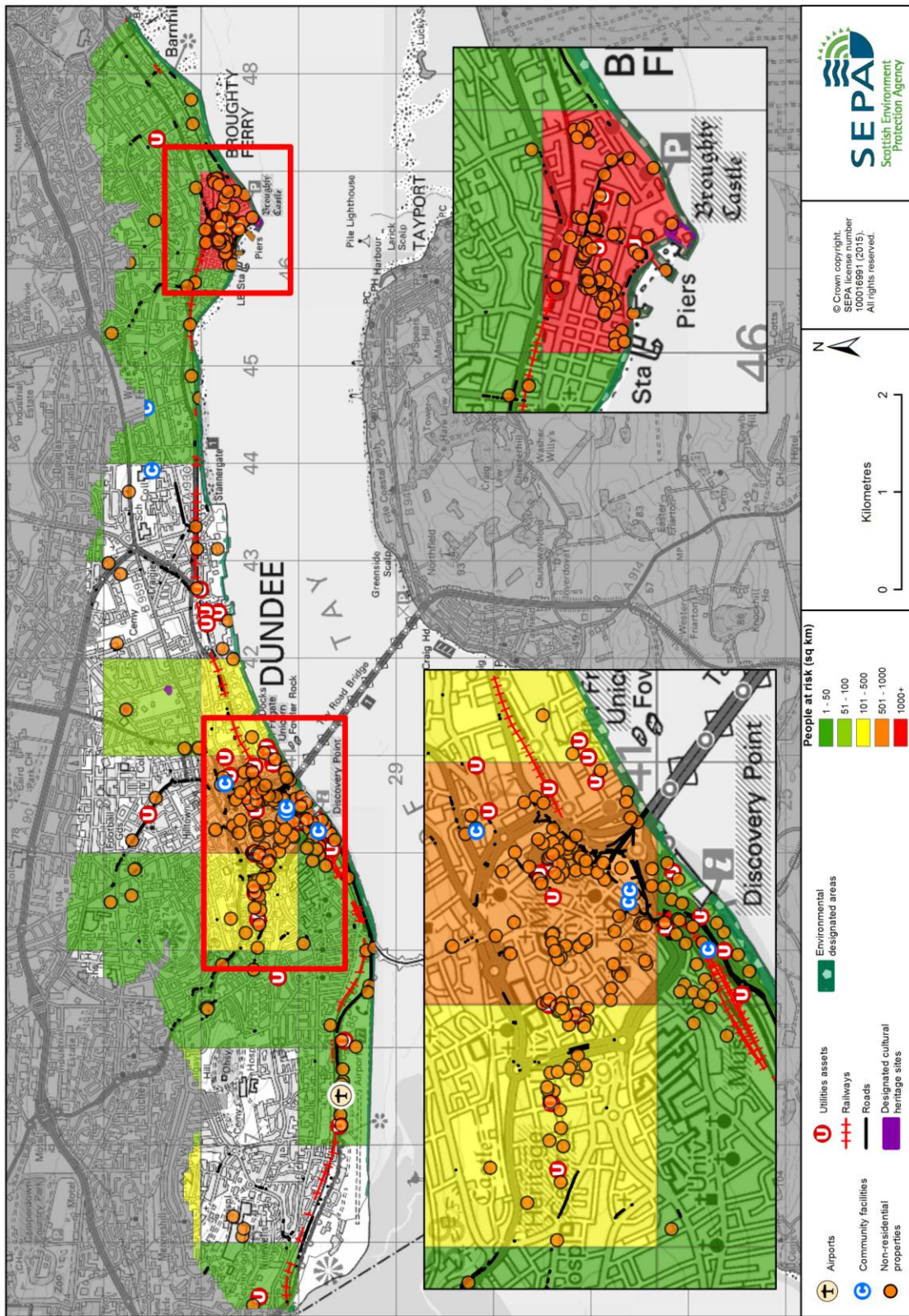


Figure 3: Impacts of flooding

History of flooding

This area has a long history of coastal flooding and more recently surface water flooding. The following significant floods have been recorded in this Potentially Vulnerable Area:

- 7 September 2010: Dundee businesses forced to evacuate staff in Seagate, West Henderson's Wynd, Hospital Street, and Dock Street due to surface water flooding.
- 21 August 2008: Flooding primarily to Dundee City centre and other locations across the city from surface water. The flooding resulted in disruption to traffic flows and basement flooding in areas of the city centre.
- 2006: Riverside Drive, Dundee closed due to wave overtopping.
- 16 August 2004: Dundee City centre was affected by surface water flooding, resulting in basement flooding and disruption to traffic flows. The event was estimated to be a 1 in 100 year event.
- 11 August 2004: Surface water flooding occurred in Dundee City centre and many smaller locations across the city. Additionally, the green urban fringe of the city was affected by surface water runoff causing some roads to become impassable. The rainfall event was estimated to be a 1 in 200 year event.
- 5 February 1983: Coastal flooding at Broughty Ferry resulted in Newport Pier being submerged almost to the booking office. Water entered sheds at Eastern Wharf and King William Dock. Fishing boats were moored to lamp posts in Fisher Street.
- 17 December 1921: Broughty Ferry's Newport Pier and Fisher Street inundated by highest coastal flood level in the period 1883-1983. Water overflowed the docks at Dundee and flowed into the adjacent streets and sheds.
- 12 February 1899: Exceptional high tide in the River Tay estuary caused widespread flooding.
- 28 December 1879: Approximately 75 deaths occurred and damage caused to lighthouse and numerous homes when the Tay Bridge collapsed under heavy flooding from high tides.
- 8 February 1868: Dundee Harbour flooded.

Objectives to manage flooding in Potentially Vulnerable Area 07/13

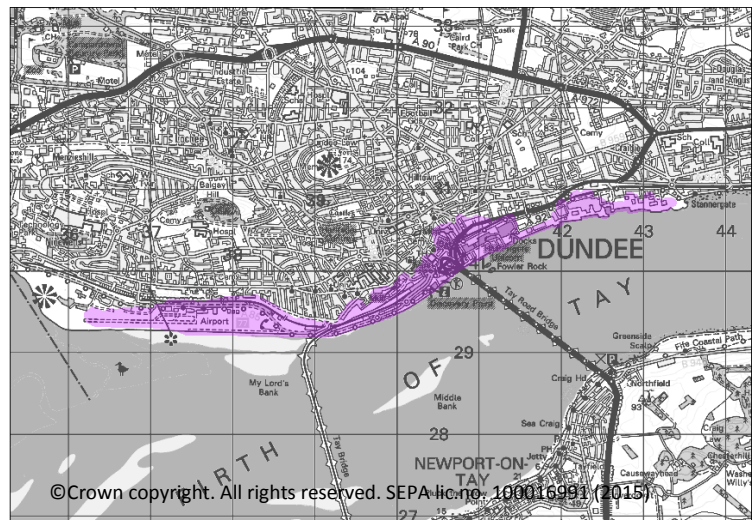
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target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

Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding

Indicators:

- £310,000 Annual Average Damages from residential properties
- £1.0 million Annual Average Damages from non-residential properties

Target area:



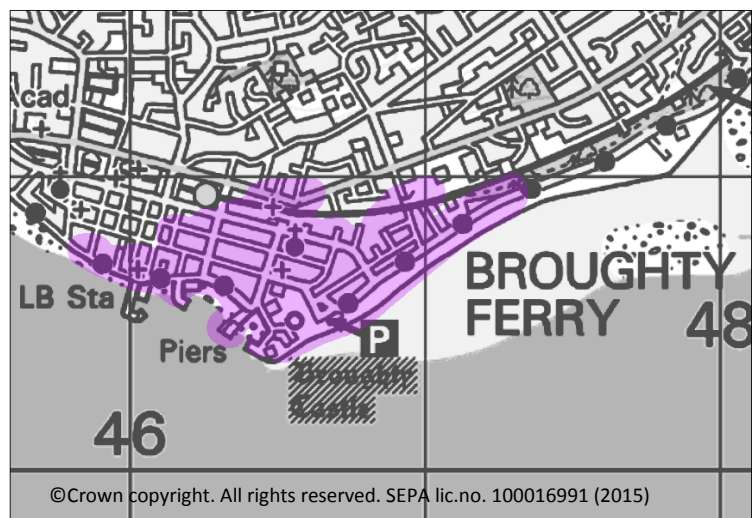
Objective ID: 7034

Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding

Indicators:

- 1,600 people
- £690,000 Annual Average Damages from residential properties
- £150,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7035, 7036

Target area	Objective	ID	Indicators within PVA
Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical	7021	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> • 1,300 residential properties • £4.3 million Annual Average Damages
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> • 1,300 residential properties • £4.3 million Annual Average Damages
Applies across Tay Estuary and Montrose Basin 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 07/13 there are 260 residential properties at risk and Annual Average Damages of £800,000.

Actions to manage flooding in Potentially Vulnerable Area 07/13

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Dundee and Broughty Ferry 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 (70350006)				
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding (7035, 7036)				
Delivery lead:	Dundee City Council				
Priority:	National:		Within local authority:		
	2 of 42		1 of 2		
Status:	Under development	Indicative delivery:	2016-2021		
Description:	A flood protection scheme has been proposed along the Broughty Ferry coastline. The scheme will include new sea walls and set-back embankments, sand dune replenishment and rock armour. The scheme will provide a 1 in 200 year (plus climate change) standard of protection.				
Potential impacts					
Economic:	The proposed scheme may benefit 450 residential properties at risk of flooding in this location, with estimated damages avoided of £97 million. The flood protection scheme has an estimated benefit cost ratio of 9.8.				
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 scheme area. There may be negative impacts through disturbance to the local community during the construction phase.				
Environmental:	Flood protection schemes may have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority)				

Environmental:	should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, listed buildings and designated bathing waters.
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Action (ID):	FLOOD PROTECTION SCHEME/WORKS (70340006)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding (7034)		
Delivery lead:	Dundee City Council		
Priority:	National:	Within local authority:	
	5 of 42	2 of 2	
Status:	Under development	Indicative delivery:	2016-2021
Description:	A flood protection scheme has been proposed for the Dundee coastline. The scheme will include set-back walls and flood defences. The construction work to raise the sea wall at the Central Waterfront is to commence in 2015/16. The scheme will provide a 1 in 200 year (plus climate change) standard of protection.		
Potential impacts			
Economic:	The proposed scheme may benefit 200 residential and non-residential properties at risk of flooding. The economic benefits have been estimated west and east of the rail bridge. West of the rail bridge to the airport has estimated damages avoided of £55 million. The scheme has an estimated benefit cost ratio of 2.2. East of the rail bridge to Stannergate has estimated damages avoided of £330 million. The scheme has an estimated benefit cost ratio of 35.8.		
Social:	A reduction in flood risk may have a positive benefit to the health and wellbeing of the community. In addition there are two emergency services and one railway station which have 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 scheme may have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted by the action. These include listed buildings, local nature reserves and Sites of Special Scientific Interest.		

Action (ID):	SURFACE WATER PLAN/STUDY (70210018)
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie,

	Lochee and Monifieth where practical (7021)		
Delivery lead:	Dundee City Council, Perth and Kinross Council and Angus 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 (70210019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (70540016)		
Objective (ID):	Reduce overall flood risk (7054)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. A detailed local authority led study has already been undertaken in this area and SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (70540019)		
Objective (ID):	Reduce overall flood risk (7054)		
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 (70340017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding (7034)		
Delivery lead:	Dundee City Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain existing flood defences along the coast.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (70350017)		
Objective (ID):	Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding (7035, 7036)		
Delivery lead:	Dundee City Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain existing flood defences along the coast.		

Action (ID):	MAINTAIN FLOOD WARNING (70540030)		
Objective (ID):	Reduce overall flood risk (7054)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Broughty Ferry, Dundee Central and Riverside West flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (70540009)		
Objective (ID):	Reduce overall flood risk (7054)		
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 (70540011)		
Objective (ID):	Reduce overall flood risk (7054)		
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 (70540013)		
Objective (ID):	Reduce overall flood risk (7054)		
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 and promote Floodline. This will be achieved through community safety partnership events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	MAINTENANCE (70540007)		
Objective (ID):	Reduce overall flood risk (7054)		
Delivery lead:	Angus Council and Dundee City 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 (70540014)		
Objective (ID):	Reduce overall flood risk (7054)		
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. Dundee City Council owns and operates an emergency flood plan for Dundee City.		

Action (ID):	PLANNING POLICIES (70010001)		
Objective (ID):	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
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.		