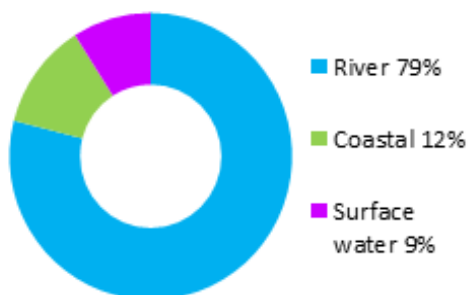


Stirling (Raploch and Riverside) (Potentially Vulnerable Area 09/07)

| Local Plan District | Local authority | Main catchment |
|---------------------|------------------|------------------|
| Forth | Stirling Council | Stirling coastal |

Summary of flooding impacts



At risk of flooding

- 730 residential properties
- 80 non-residential properties
- £850,000 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 |

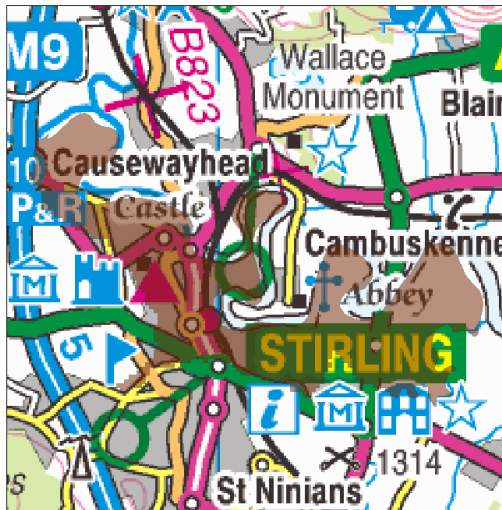
Actions

Stirling (Raploch and Riverside) (Potentially Vulnerable Area 09/07)

| Local Plan District | Local authority | Main catchment |
|---------------------|------------------|------------------|
| Forth | Stirling Council | Stirling coastal |

Background

This Potentially Vulnerable Area is 6km² and is part of the Stirling catchment (shown below). The area covers the south bank of the lower River Forth where it meets the Firth of Forth and includes the urban areas of Riverside and Raploch. The interaction between river and coastal flooding where the River Forth meets the Firth of Forth is an important factor in the south of Stirling.



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The majority of damages in this Potentially Vulnerable Area are caused by river flooding.

There are approximately 730 residential properties and 80 non-residential properties at risk of flooding. The Annual Average Damages are approximately £850,000.

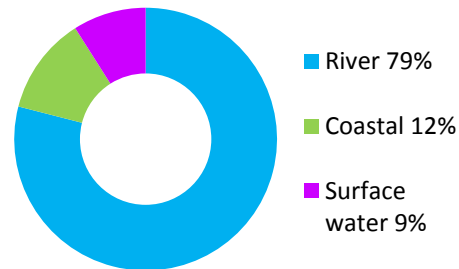


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the River Forth to Stirling. The highest risk of surface water flooding is also in Stirling.

The risk of flooding to people, 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 residential properties followed by damages to vehicles and roads. 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.

| | 1 in 10 High likelihood | 1 in 200 Medium likelihood | 1 in 1000 Low likelihood |
|---|--|--|---|
| Residential properties (total 4,400) | 60 | 730 | 1,000 |
| Non-residential properties (total 1,600) | 10 | 80 | 120 |
| People | 130 | 1,600 | 2,200 |
| Community facilities | 0 | 0 | <10 Educational buildings |
| Utilities | 0 | <10 | 20 |
| Transport links (excluding minor roads) | 3 A roads, 1 B road at 13 locations 1 Railway route at 1 location: Dunblane to Stirling | 3 A roads, 1 B road at 23 locations 1 Railway route at 1 location: Dunblane to Stirling | 3 A roads, 1 B road at 33 locations 1 Railway route at 5 locations: Dunblane to Stirling |
| Environmental designated areas (km ²) | 0.1 | 0.1 | 0.1 |
| Designated cultural heritage sites | 4 | 4 | 5 |
| Agricultural land (km ²) | 0.9 | 1.4 | 1.8 |

Table 1: Summary of flooding impacts

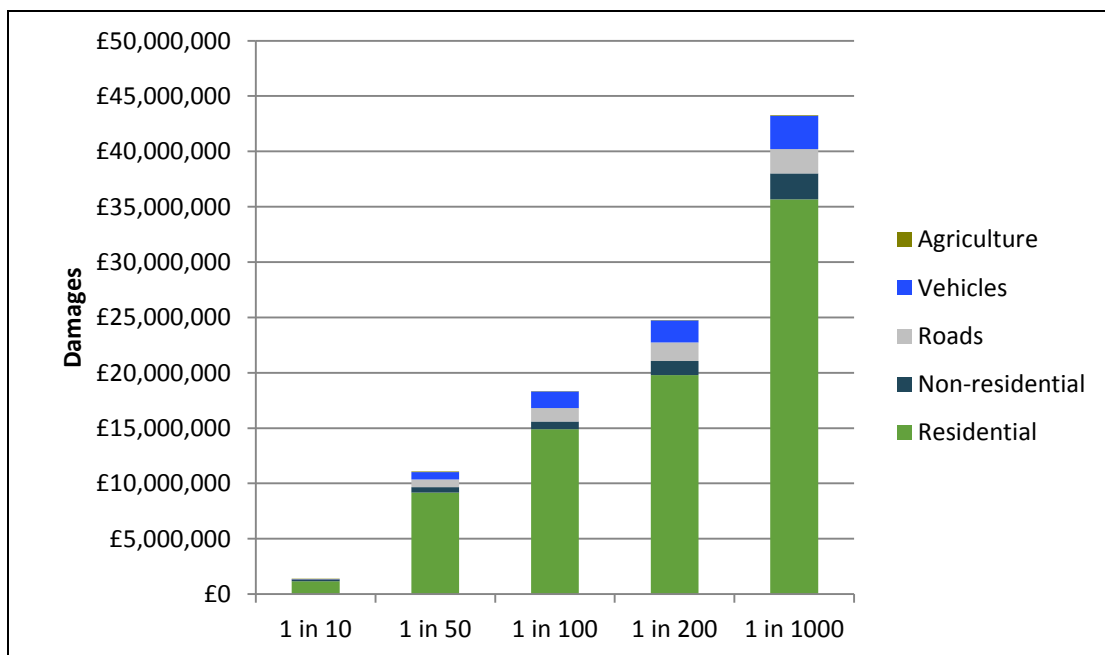


Figure 2: Damages by flood likelihood

History of flooding

The following significant floods have been recorded in this area:

- 14 December 2006: Flooding from the River Forth in Stirling affected properties and roads in Riverside and resulted in an emergency respite centre being set up. The highest river level recorded at the SEPA gauging station on the River Forth at Craigforth was in December 2006, where the river level reached 3.97m above normal levels.
- January 1993: Properties and roads in Riverside and Bridgehaugh were flooded and residents rescued from flats at Abbeymill.
- 1908: Significant flooding in Stirling area (Riverside and Bridgehaugh).

Objectives to manage flooding in Potentially Vulnerable Area 09/07

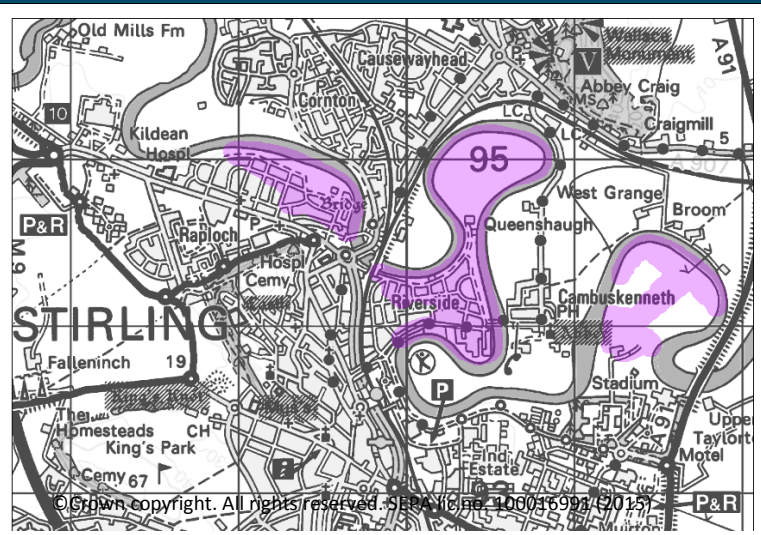
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target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

Reduce economic damages to residential and non-residential properties and risk to people in Stirling, Riverside and Raploch caused by flooding from the River Forth

Indicators:

- 1,500 people
- £560,000 Annual Average Damages from residential properties
- £19,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 9021, 9022

| Target area | Objective | ID | Indicators within PVA |
|--|---|------|---|
| Stirling and Bridge of Allan | Reduce economic damages and number of residential properties at risk of surface water flooding in Stirling and Bridge of Allan where practical | 9016 | * See note below |
| Applies across Forth Local Plan District | Avoid an overall increase in flood risk | 9001 | <ul style="list-style-type: none"> • 730 residential properties • £850,000 Annual Average Damages |
| Applies across Forth Local Plan District | Reduce overall flood risk | 9032 | <ul style="list-style-type: none"> • 730 residential properties • £850,000 Annual Average Damages |
| Applies across Forth 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 09/07 there are 40 residential properties at risk and Annual Average Damages of £75,000.

Actions to manage flooding in Potentially Vulnerable Area 09/07

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 Stirling (Raploch and Riverside) 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 (90140006) | | |
| Objective (ID): | Reduce economic damages to residential and non-residential properties and risk to people in Stirling, Riverside and Raploch caused by flooding from the River Forth (9021, 9022) | | |
| Delivery lead: | Stirling Council | | |
| Priority: | National: | Within local authority: | |
| | 40 of 42 | 2 of 3 | |
| Status: | Under development | Indicative delivery: | 2016-2021 |
| Description: | A flood protection scheme has been proposed for Stirling. The scheme would consist of flood embankments and would provide a 1 in 200 year standard of protection. The scheme has a low benefit-cost ratio, but has been identified as the only option for Stirling. Part of this proposed flood protection scheme is located in PVA 09/05. The benefits and impacts have been assessed for the whole scheme. | | |
| Potential impacts | | | |
| Economic: | The proposed scheme has estimated damages avoided £17.7 million and an estimated benefit cost ratio of 0.69 (Riverside); 0.57 (Raploch); 0.39 (Cornton, Causewayhead); 0.03 (North Cornton). | | |
| 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. In addition there are three utilities and one railway line 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. | | |

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|-----------------------|---|
| Environmental: | Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. The proposed flood protection study is located on the Upper Forth Estuary (water body ID 200437). The physical condition of this stretch of estuary is identified by SEPA to be at less than good status. Future works could improve the condition of the estuary or degrade it. Opportunities to improve the condition of the estuary should be considered by coordinating with river basin management planning. 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 River Teith Special Area of Conservation and Firth of Forth 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 and battlefields. |
|-----------------------|---|

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|------------------------|--|----------------------|------------------|
| Action (ID): | SURFACE WATER PLAN/STUDY (90160018) | | |
| Objective (ID): | Reduce economic damages and number of residential properties at risk of surface water flooding in Stirling and Bridge of Allan where practical (9016) | | |
| Delivery lead: | Stirling Council | | |
| Status: | Ongoing | Indicative delivery: | 2016-2027 |
| Description: | The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives. | | |

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|------------------------|---|----------------------|------------------|
| Action (ID): | SURFACE WATER PLAN/STUDY (90160019) | | |
| Objective (ID): | Reduce economic damages and number of residential properties at risk of surface water flooding in Stirling and Bridge of Allan where practical (9016) | | |
| 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. | | |

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|------------------------|--|----------------------|------------------|
| Action (ID): | STRATEGIC MAPPING AND MODELLING (90320019) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| 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. | | |

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|------------------------|--|----------------------|----------------|
| Action (ID): | MAINTAIN FLOOD WARNING (90320030) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| Delivery lead: | SEPA | | |
| Status: | Existing | Indicative delivery: | Ongoing |
| Description: | Continue to maintain the Riverside and Cambuskenneth, Bridgehaugh and Raploch flood warning areas which cover the River Forth and are part of the Stirling river flood warning scheme. | | |

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|------------------------|--|----------------------|----------------|
| Action (ID): | FLOOD FORECASTING (90320009) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| 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. | | |

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|------------------------|---|----------------------|----------------|
| Action (ID): | SELF HELP (90320011) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| 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. | | |

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|------------------------|---|----------------------|----------------|
| Action (ID): | AWARENESS RAISING (90320013) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| 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. | | |

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|------------------------|---|----------------------|----------------|
| Action (ID): | MAINTENANCE (90320007) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| Delivery lead: | Stirling 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. | | |

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|------------------------|---|----------------------|----------------|
| Action (ID): | EMERGENCY PLANS/RESPONSE (90320014) | | |
| Objective (ID): | Reduce overall flood risk (9032) | | |
| 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> | | |

| | | | |
|------------------------|---|----------------------|----------------|
| Action (ID): | PLANNING POLICIES (90010001) | | |
| Objective (ID): | Avoid an overall increase in flood risk (9001) Reduce overall flood risk (9032) | | |
| Delivery lead: | Planning authority | | |
| Status: | Existing | Indicative delivery: | Ongoing |
| Description: | <p>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.</p> | | |