

Draft Supplementary Guidance 18

Planning, development and flood risk





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Planning, Development and Flood Risk

“Development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere should not be permitted” (SPP 2010)

The purpose of this SG is to draw attention to matters, including national policy and guidance, relevant to the consideration of proposals for development in areas and on sites where flooding is a known or predicted hazard. The SG relates specifically to PP7 and Pols. 24 and 25, and also to PP4, Pol.21 and PP16, but developments brought forward relative to any policy must be screened for flooding and other water management issues.

Introduction

The purposes of this Supplementary Guidance are:-

- to ensure that owners, occupiers and would-be developers of land and property in areas potentially at risk of flooding are fully aware of the context in which development and planning decisions are to be made – by themselves and by the Council;
- to raise awareness of the new requirement for the Council to support sustainable flood management;
- to promote the preparation of Flood Risk Assessments (FRAs) and Drainage Impact Assessments (DIAs) by developers when considering site options and when designing new development; and
- to promote the adoption of Sustainable Drainage Systems (SuDS) for on-site water management and site drainage, designed in accordance with the findings of the above assessments, in order to assist flood attenuation;
- to raise awareness of the related risks to development of water – generated erosion and landslips.



- Water management is a key consideration in planning for new development because:-
- Floods can be life-threatening, damaging and expensive – avoidance of actual and potential inundation areas is always the preferred option for new development;
- Climate change and other factors are increasing the likelihood of flooding, both in terms of areas affected and the severity of events; the Flood Risk Management (Scotland) Act 2009 provides a new legislative framework for responding to hazards and risks;
- The River Basin Management Plans look for the water environment to be enhanced, and at minimum maintained; sustainable flood management offers opportunities to combine flood attenuation with other improvements.

Flooding is part of the natural water cycle. Flood defences and drainage works may reduce inundation in some areas, but only by transferring the water elsewhere. National planning policy is clear that this is unacceptable if it places other properties at risk. Stirling is fortunate in that few occupied properties lie in regularly flooded areas, but significant areas of the city and some other towns and villages are at risk if flood events continue to increase in severity.

Extensive floods mainly occur when rivers 'reclaim' natural flood plains that have been built over. While there may still, exceptionally, be good and sufficient reasons to build on flood plains, the long-term aim must be to avoid them and take opportunities to return them to their natural role.

Floods are, however, not confined to flood plains. Intense rainfall and storm run-off often causes localised flooding if it exceeds the ability of the ground to absorb water. Some of the most damaging flooding events occur when localised heavy rainfall overwhelms a 'hard' urban catchment or a small steep catchment, where the watercourse is small and/or culverted and perhaps has not been regarded as a potential source of trouble. High water levels and intense rainfall events will also affect drains and sewers. Floods involving polluted water are particularly damaging to the



environment and distressing for those affected, and increase clear-up costs. Floods may be accompanied by loss of soil, erosion and landslips, and of course property damage.

Assessing an area or site for its suitability for development or change of use must take these factors into account.

By altering contours and introducing impermeable surfaces, development changes the characteristics of the catchment in which it is located. By careful design the run-off from a developed site can approximate to what it was before. A Sustainable Drainage System (SuDS) seeks to retain rainfall run-off on a site, by facilitating infiltration and/or providing space for open on-site storage, and by slowing overground flows, thereby reducing flood peaks and pressure on the capacity of piped drainage and combined sewerage networks. Additional benefits can include pollution mitigation through filtration and biological action, creation of wetland landscape features, and wildlife habitat creation.

Where proposed developments are located within those parts of water catchments that are identified by SEPA as Potentially Vulnerable Areas (Flood Risk Management (Scotland) Act), early consultation with the Council's Flood Officers will be required. Where appropriate, site drainage and other measures should be designed so as to contribute to sustainable flood management and the reduction of flood risk throughout the catchment – even if the new development is itself outwith the floodplain and not obviously at risk from other potential sources of flooding (see PP7).





Flood Hazard and Risk: Who does what?

While there is no single authority charged with predicting, issuing warnings and planning for floods, or dealing with their consequences, SEPA is, following the Flood Risk Management (Scotland) Act, confirmed in many of these roles, alone or in partnership with other 'responsible authorities', including the Councils.

- As a general rule, landowners have the responsibility of flood prevention and land drainage. Reservoir owners have a strict liability for flooding caused by failure of dams. SEPA are now the responsible authority for ensuring safety standards for reservoir dams.
- Applicants for planning permission and developers should ascertain whether there is a likelihood of flooding, assess the risk in consultation with the appropriate bodies, and design accordingly; they should adopt sustainable drainage systems (SuDS) for site drainage.
- The Council, is a Responsible Authority, under the 2009 Act, in relation to preparation and implementation of flood risk management plans and promotion of sustainable flood management. The Council has two dedicated Flood Officers, based within the Roads service, who are involved in improving the Council's information base on flooding issues, mapping areas at risk, etc., and will be closely involved in flood risk management planning, cooperation with neighbouring Councils, etc., as the 2009 Act responsibilities come fully into place. The Council also has an Emergency Planning Officer who liaises with the other emergency services in dealing with protection of people and property during and in the aftermath of flood events.
- As Planning Authority the Council will steer development away from areas of known flood risk and ensure that any development which is (exceptionally) necessary in flood-prone areas is carried out responsibly and with least adverse external effects. Planning policy supports SuDS on all development sites.
- As Building Standards Authority, the Council is responsible for enforcing technical construction standards designed to minimise harmful effects upon buildings and their users caused by ground water and floodwater, and for approving site drainage installations.



- As Roads Authority the Council deals with flooding on public roads, and maintains public bridges and culverts. As indicated the Council's Flood Officers are based in the Roads service.
- The Scottish Environment Protection Agency (SEPA) advises Planning Authorities on drainage and flooding matters, holds a database of relevant information, and maintains a web-based flood risk map. It maintains river flow gauging stations and operates the 'Floodline' Flood Warning service giving general flood alerts for the whole of Scotland, and a number of local flood warning schemes. If the Council propose to grant planning permission for a development contrary to advice from SEPA, the Scottish Ministers must be notified, and may direct that permission be withheld. The Agency advocates adoption of SuDS for site drainage wherever possible. SEPA is the lead Agency for the preparation of the Flood Risk Management Plans, and for the River Basin Management Plans (which may have implications for flood attenuation measures and works).

<http://www.sepa.org.uk/flooding.aspx>

- Scottish Water may also provide advice, and is concerned with flooding and drainage insofar as these may affect sewerage systems and pollution of watercourses, and with the design and maintenance of SuDS schemes. Following the Water Environment & Water Services (Scotland) Act 2003, many SuDS features, if designed to appropriate standards, will be vested in Scottish Water for long term maintenance.

http://www.scottishwater.co.uk/portal/page/portal/SWE_PGP_COMMERCIAL/SWE_PGE_COMMERCIAL

More information is available on the Council's web-site :

http://www.stirling.gov.uk/index/stirling/flooding/flood_report-responsibilities.htm

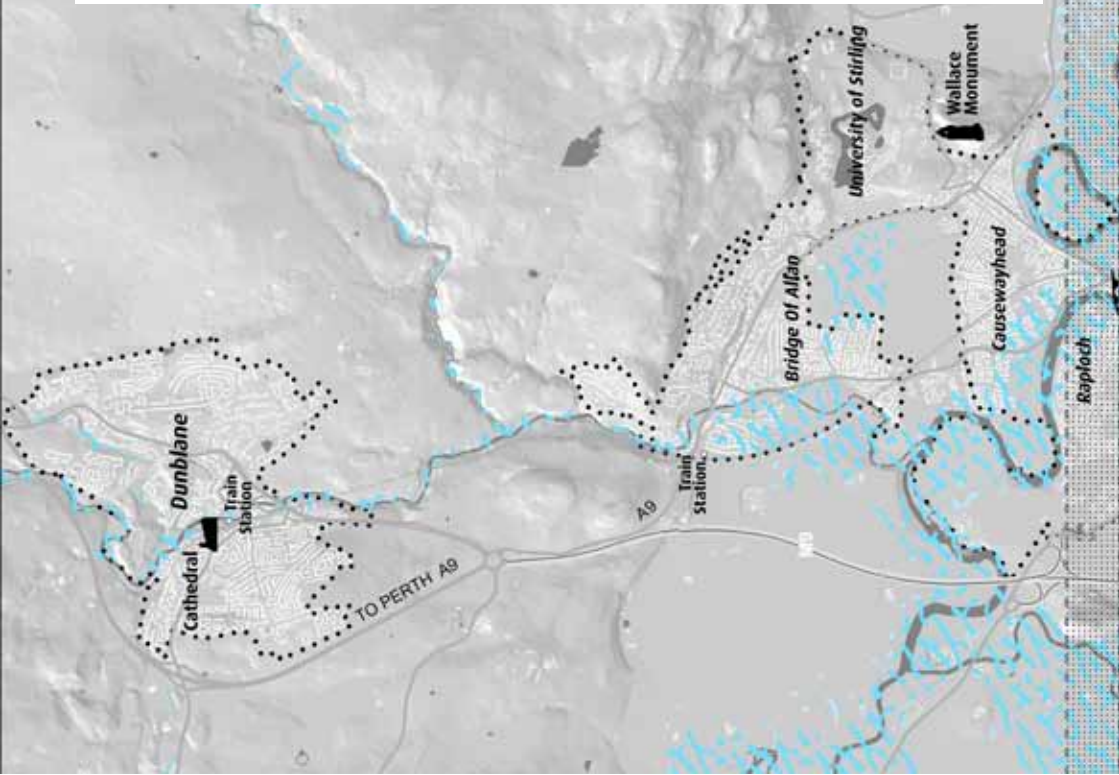
and in the Scottish Government guidance on Sustainable Flood Management entitled The Flood Risk Management (Scotland) Act 2009: Delivering Sustainable Flood Risk Management <http://www.scotland.gov.uk/Publications/2011/06/15150211/0>





Planning policies and advice: Caution, Consultation and Investigation

In order to judge whether site-specific flood risk assessment is required in connection with any development proposal the Council will rely on the most up to date flood mapping available. This may be the national SEPA mapping (http://www.sepa.org.uk/flooding/flood_map.aspx), the Council's own commissioned flood studies (<http://www.stirling.gov.uk/index/stirling/flooding/floodingmap.htm>), or investigation/modelling undertaken on behalf of the applicant. If the latter, the Council's Flood Officers and SEPA will be requested to comment on the methodology and results. SEPA will also be consulted if a proposal seeks to rely on a flood risk assessment carried out at an earlier date.





Development on flood plains

Reference to flood risk mapping will clearly show that some areas of existing long-established building – including residential areas in Stirling and some other communities – are now predicted to be liable to flooding in the event of the 1 in 200 year flood or worse occurring. Occupiers of houses and other property in these areas will be aware of the situation through communications about flood warning schemes. It is currently considered unreasonable to apply a strict ‘no development’ policy in these areas. Minor alterations and extensions to buildings, including domestic extensions, will generally still be permitted (where planning permission is necessary), as will replacement of buildings (e.g. following fire damage). However the Council will be required to take a precautionary approach in relation to any proposals that might increase the numbers of people in flood plain areas (see Pol.24). The cumulative effects of introducing more hard surfacing into these areas will also be taken into consideration. Proposals of a scale impacting upon the ‘storage’ capacity of the flood plain are unlikely to be approved.

The policy on new housing in the countryside (Pol.14) allows for the demolition and relocation of individual dwellings that have suffered inundation and where measures to prevent repeated flooding cannot reasonably be implemented. The Council does not currently operate such a policy with regard to urbanised areas. Future reviews of this Plan will examine the feasibility of such an approach to reducing risk and restoring flood plain functions.

(i) **Flood risk assessments** should be:

- carried out by the developer;
- of a scope appropriate to the site and to the nature of the proposal; and
- submitted to the planning authority, who will forward details to the Flood Officers and/or SEPA for their comments, as appropriate.



Where evidence of past flooding, or the topography or the available flood risk mapping suggest the likelihood or possibility of flooding, a hydrological study will be required to determine potential flood levels and the statistical probability of major flood events (i.e. a Flood Risk Assessment – FRA). Such studies should take reasonable cognisance of predicted climate change effects by adding 20% to design flows.

A simple FRA should include the following:

1. Location plan
 - Appropriate scale including geographical features
 - Identify all water courses and any other bodies of water in vicinity
 - Include drainage outfalls and where necessary refer to operational arrangements throughout report
2. Plan of site – show levels prior to and post development
3. Detailed indication, if appropriate, of local flood alleviation measures including performance and state of maintenance
4. An assessment of all potential sources of flooding – fluvial, tidal, pluvial, and groundwater.
5. Site plan of existing information showing extent and depth of flood events / flood predictions
 - Information can be photographic, anecdotal, survey results, model estimates
6. Plan and description of any structures / environmental factors which may affect local hydraulics
 - Includes bridges, culverts, screens, pipes or ducts crossing watercourse, collapsing channels, overgrown banks, likelihood to choke with debris



Fluvial FRA (river/burn)

1. Catchment analysis of surface water to 1:200 return event plus climate change
 - Use historic and recorded data where possible

Where appropriate

- Include assessment of watercourse, peak flow and water levels at / near development site
 - Include assessment of the extent of 1:200 flood on predevelopment site
2. Proposals to deal with assessed flooding post development with allowance for climate change
 - Establish appropriate level of freeboard above maximum assessed flood level and where appropriate allowance for increased runoff (freeboard minimum 600mm floor level and minimum 300mm garden level)
 3. Assessment of post development effects on watercourse peak flow and water level – determine potential for causing flooding on-site and elsewhere
 4. Compensatory or mitigation measures proposals should be submitted where assessed potential of flooding increases post development. See SPP 2010 re land-raising
 5. Concluding / summary statement on post development flooding

Tidal FRA

1. Analysis of 1:200 return flood level using historic and recorded data where possible plus climate change
 - Include allowance for storm surge above 1:200 return level
 - Where appropriate assess pre development tidal level and extent for 1:200
2. Proposals to deal with assessed tidal flooding post development with allowance for climate change
 - Establish appropriate level of freeboard above maximum assessed flood level including climate change (which includes sea level rise and increased storm surges) and where appropriate allowance for increased runoff (Freeboard minimum 600mm floor level and minimum 300mm garden level)
3. Assess effects of post development proposals on adjacent land / properties
4. Concluding / summary statement



Flood Modelling

Any modelling study should produce a report that addresses the following requirements:

1. Statement of objectives – clear explanation of what is being modelled, the objectives of the modelling and include details of required model output
2. Justification of model – demonstrate model is suitable for the study and include examples of previous applications to similar circumstances
3. Technical description of model – model history and published articles. Include expertise of model users
4. Data must be clearly defined
5. Data collection – all data collection and measurement techniques should be quoted inclusive of expected errors. Raw data and details of instrumentation and calibration should be available on request
6. Model Calibration – has to be calibrated against full dataset representative of range of conditions being modelled. Model coefficients and procedures used to optimise calibration must be clearly stated
7. Model validation – independent datasets must be used for validation tests. Validation tests and analysis of errors within model must be undertaken for key variables required from modelling study
8. Sensitivity analysis – must be presented to demonstrate effect on key output parameters resulting from variation of input data and controlling assumptions
9. Quality assurance – demonstrate model has been subject to an evaluation procedure that establishes suitability of the model for relevant tasks
10. Auditable – ensure there is a clear account of modelling exercise that can be inspected by appropriate auditors
11. Reporting – clear description of the model. Include underlying principles and implicit / explicit assumptions. Additionally a clear summary of output, likely errors, sensitivity, bias and implications of these on study objectives and conclusions

If the risk is confirmed and significant, planning permission will not be forthcoming. If the risk identified is more marginal the Council, in consultation with SEPA and others, may judge that the flood threat can be managed and that development is acceptable provided



that certain precautions are embodied in the scheme. (Further precautions may include the addition of a safety margin ('freeboard') to predicted flood levels, with buildings and accesses restricted to above this level).

The nature of the proposed development will influence the Council's consideration. In certain cases, pre-existing flood barriers, raised floor levels or other measures may render flooding an acceptable risk. However, for developments intended for, say, elderly or infirm users, the risks are different in nature and less likely to be acceptable.

As a guideline, the risk levels set out in SPP (2010) paragraph/table 204 are considered appropriate to exclude particular forms of development proposals from areas affected.

Scottish Planning Policy extract:

"204. To provide a basis for planning decision making relating to flood risk, the following risk framework divides flood risk into three categories and outlines an appropriate planning response. The calculated probability of a flood occurring should be regarded as a best estimate and not a precise forecast. The annual probabilities referred to in the framework below relate to the land at the time a planning application is made or a development plan is prepared. In applying the risk framework, developers and planning authorities should also take into account:

- the characteristics of the site,
- the use and design of the proposed development,
- the size of the area likely to flood,
- depth of water, likely flow rate and path, rate of rise and duration,
- existing flood prevention measures - extent, standard and maintenance regime,
- the allowance for freeboard,
- cumulative effects of development, especially the loss of flood storage capacity,
- cross boundary effects and the need for consultation with adjacent authorities,
- effects of a flood on access including by emergency services,
- effects of a flood on proposed open spaces including gardens, and
- the extent to which the development, its materials and construction are designed to be water resistant.



RISK FRAMEWORK

Little or No Risk - annual probability of watercourse, tidal or coastal flooding is less than 0.1% (1:1000)

- No constraints due to watercourse, tidal or coastal flooding.

Low to Medium Risk Area - annual probability of watercourse, tidal or coastal flooding in the range 0.1% - 0.5% (1:1000 - 1:200)

- These areas will be suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%) or where the nature of the development or local circumstances indicate heightened risk. Water resistant materials and construction may be required depending on the flood risk assessment. Subject to operational requirements, including response times, these areas are generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc. Where such infrastructure must be located in these areas or is being substantially extended it should be capable of remaining operational and accessible during extreme flooding events.

Medium to High Risk - annual probability of watercourse, tidal or coastal flooding greater than 0.5% (1:200)

- Generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc., schools, care homes, ground-based electrical and telecommunications equipment unless subject to an appropriate long term flood risk management strategy. The policy for development on functional flood plains applies. Land raising may be acceptable.
- If built development is permitted, appropriate measures to manage flood risk will be required and the loss of flood storage capacity mitigated to produce a neutral or better outcome.
- Within built up areas, medium to high risk areas may be suitable for residential, institutional, commercial and industrial development provided flood prevention



measures to the appropriate standard already exist, are under construction or are planned as part of a long term development strategy. In allocating sites, preference should be given to those areas already defended to required standards. Water resistant materials and construction should be used where appropriate.

- In undeveloped and sparsely developed areas, medium to high risk areas are generally not suitable for additional development. Exceptions may arise if a location is essential for operational reasons, e.g. for navigation and water based recreation uses, agriculture, transport or some utilities infrastructure and an alternative lower risk location is not achievable. Such infrastructure should be designed and constructed to remain operational during floods. These areas may also be suitable for some recreation, sport, amenity and nature conservation uses provided adequate evacuation procedures are in place. Job-related accommodation (e.g. caretakers and operational staff) may be acceptable. New caravan and camping sites should not be located in these areas. If built development is permitted, measures to manage flood risk are likely to be required and the loss of flood storage capacity minimised. Water resistant materials and construction should be used where appropriate.”

Developments adversely affecting riparian wildlife habitats, watercourse morphology, etc, may also contravene other Development Plan, River Basin Management Plan and biodiversity policies. Public bodies now have a duty to promote biodiversity in the exercise of their functions, including planning. SEPA operate the Controlled Activities Regulations (CAR) licensing system and will advise whether additional permissions may be required. http://www.sepa.org.uk/water/water_regulation/regimes.aspx

Lack of sufficient submitted or requested information as to flood risk, ecological impact, or the potential secondary effects of flood prevention measures may be reasons for refusal of planning permission.



(ii) Drainage Impact Assessments:

The Council encourages submission of a drainage strategy or impact assessment accompanying relevant planning applications. Pre-application discussion with the Planning service and/or Flood Officers should clarify whether a strategy is necessary. Generally proposals leading to significant areas of roofs, roads and hard surfacing, particularly on greenfield sites, will qualify. Most changes of use and Householder applications will not. However, any scale of built development will need special attention to drainage measures if there is no public sewerage infrastructure for surface water; and may do so if a receiving watercourse for runoff or treated water is of low capacity or otherwise constrained (e.g. is of nature conservation value). Drainage strategies should be prepared in consultation with the Council (Planning, Roads and Building Control), Scottish Water and SEPA. (Also Scottish Natural Heritage if it is proposed to discharge water to a river that is a designated SSSI or Special Area of Conservation).

(iii) Site Planning: Sustainable Drainage Systems (SuDS)

Site drainage should be designed on sustainable drainage principles. SuDS deals with surface water and provides pollution control and flow attenuation by slowing down runoff and allowing water to soak away or collect temporarily in ponds and swales, thereby improving the capacity of existing piped drainage 'downstream', lessening the contribution of surface run-off to potential flooding elsewhere and reducing carriage of suspended solids and other pollutants to watercourses.

Sites vary in their suitability for such drainage, according to soil permeability, gradients, the potential presence of contamination, etc. Size of site and scale of development may also constrain the options, but even on a urban sites and single house plots the use of sub-surface storage and permeable surfaces to intercept run-off is likely to be beneficial.

Water management on and around new development is both a problem and an opportunity. Sensitive design of SuDS elements on the broader scale can provide opportunities for imaginative landscape and planting treatments and wildlife habitat creation. (See CIRIA SUDS design manual for Scotland and Northern Ireland; and



Sustainable Drainage Systems, 2004). The Council will be supportive of SuDS schemes that are designed to take advantage of pre-existing or new 'green corridors' and so contribute to the objectives of the 'Green Network' (see SG02). All parties should meet together to agree broad principles with the applicant before submission of an application (see SG16).

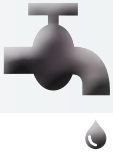
The SuDS approach requires a considerable degree of initial site investigation. There is a definable balance between the scale of the development – insofar as it consists of buildings and other hard surfaces – and the capacity of the site, the associated SuDS features and the downstream catchment to absorb run-off without increasing flood risk or pollution. The 'developable area' of a site, established by this iterative process, may be less than would at first appear. The land used for SuDS may be within landscaped amenity areas but will be in addition to other functional open space, such as play areas on a housing site. Some reduction in the area devoted to SuDS may be achievable by employing 'green roofs' over all or part of the development (see PP6).

Where SuDS features are not vested in Scottish Water the Council will wish to be satisfied that sound long-term management arrangements are in place when approving such schemes (Section 75 Agreements may be used).

(iv) Site planning - Culverted watercourses

Localised flooding is often caused by debris blocking drainage lines. Culverted watercourses and drains are particularly prone to blockage (e.g. at 'trash screens'); they represent loss of potential wildlife habitat; and may create safety problems. Natural streams are more amenable to sustainable flood management and of greater amenity and ecological value (see Pol.25). Developers may be granted exemption from CAR fees if the works being carried out represent an environmental improvement (see http://www.sepa.org.uk/about_us/charging_schemes/current_charging_schemes.aspx).

Alteration of stream courses or channel characteristics, potentially adversely affecting water flow, is difficult to monitor or influence if carried out as part of private landscaping or garden design. The Council will not normally favour streams being culverted, or featuring within or as boundaries to house curtilages in new developments. Communally



maintained riparian corridors will be preferred, providing linkages in Green Corridors/ Networks and potentially allowing for improved accessibility on foot and by bicycle.

(v) Site planning: erosion

When considering and designing for water management on development sites, the possibility of erosion should be assessed and allowed for. Soil erosion will reduce the capacity of SuDS features. Cut and fill operations to create level plots for building, or the creation of mounds and embankments to support roads, footpaths, etc., or as new landscape features can create artificially steep slopes that are potentially unstable when waterlogged and so prone to slumping and gully erosion. Unintentional creation of potential surface flow routes for storm water and abrupt transitions from hard to soft surfaces can also provide circumstances where erosion can commence.

Disclaimer:

If, having considered all relevant information regarding flooding, the Council decides to approve a development (with or without conditions), such approval does not imply absence of risk. Climate change and other factors may change the parameters of flood risk models over time. Owners and subsequent occupiers will still retain liability for any consequences of future flood events. In these circumstances, developers should bear in mind that insurers are extremely concerned about the cost of flood damage and may be reluctant to provide domestic cover where the probability of flooding is greater than 0.5% in any year (i.e. a 200 year return period). Individual insurers and mortgage lenders may have their own flood risk databases and criteria.



Contacts:

Flood risk and new development, Planning Permission
Economy, Planning & Regulation, Stirling Council, Viewforth, Stirling, FK8 2ET (0845 277 7000)
e-mail: planning@stirling.gov.uk

Flooding affecting existing properties, public roads, general information about flood risk, flood alleviation schemes
Flood Officers (as above)

Watercourse maintenance (flood alleviation)
(as above) (Rural: 01786 – 443552; Urban: 443526)

Flood warnings and emergencies
Scottish Environment Protection Agency (SEPA) 'Floodline' (0845 – 988 – 1188)
www.sepa.org.uk/flooding/floodline/index.htm

Emergency Planning Officer, Stirling Council, Viewforth, Stirling, FK8 2ET (01786 – 443186)
e-mail: brightd@stirling.gov.uk

Flood risk data and assessments
SEPA, 7 Whitefriars Crescent, Perth, PH2 0PA (01738 – 627989)

Discharge consents (if required), SuDS, Pollution Prevention Guidelines
SEPA, Bremner House, The Castle Business Park, Stirling, FK9 4TF (01786 – 452595)

Drainage – technical approval, SuDS
Scottish Water, Developer Services, 419 Balmore Road, Possilpark, Glasgow, G22 6NU
(for design of sewerage or SuDS)
Scottish Water, Fairmilehead, 55 Buckstone Terrace, Edinburgh, EH10 6XH (infrastructure capacity & constraints enquiries) www.scottishwater.co.uk



Building Standards, Stirling Council, Viewforth, Stirling, FK8 2ET (01786 442828) http://www.stirling.gov.uk/index/services/building_standards/bc-contact.htm

Construction Industry Research & Information Association (CIRIA), 6 Storey's Gate, London, SW1P 3AU (020 – 7222 – 8891) & www.ciria.org.uk

Insurance

Association of British Insurers, 51 Gresham Street, London, EC2V 7HQ (0207 – 600 - 3333)

Ecological assessment & Habitat creation

Scottish Natural Heritage (SNH), Beta Centre, Innovation Park, Stirling, FK9 4NF (01786 - 450362)

www.sepa.org.uk/guidance/HEI

Biodiversity Officer, Stirling Council, Viewforth, Stirling, FK8 2ET (01786 – 442768)

Also see e.g. SEPA (Habitat Enhancement Initiative), Watercourses in the Community

Further Information

Please contact:

Economy, Planning and Regulation
Planning Services
Stirling Council
Viewforth
Stirling
FK8 2ET

Telephone: 01786 442515

E-mail: planning@stirling.gov.uk

If you need help or this information
supplied in an alternative format
please call 0845 277 700.

