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Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

For the future of our environment

Guidance for planning authorities on Strategic Flood Risk Assessment

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What is a Strategic Flood Risk Assessment (SFRA)

A Strategic Flood Risk Assessment (SFRA) is a high-level, primarily map-based overview of the scope and nature of all sources of existing and future flood risk within the local development plan area. Scottish Government's Local Development Planning Guidance states that SFRAs are designed to inform the development planning process, primarily to avoid increasing overall flood risk by avoiding areas of flood hazard. The SFRA can be used during local development plan (LDP) preparation to inform choices about appropriate locations for development. SFRAs are prepared by the planning authority in consultation with SEPA.

Why prepare an SFRA

An SFRA will primarily support your LDP in responding to the spatial implications of National Planning Framework 4 (NPF4) Policy 22, strengthening resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding. In doing so the SFRA will also provide evidence to help take other NPF4 policies into account, including Policy 1 Tackling the climate and nature crises, Policy 2 Climate mitigation and adaptation, Policy 3 Biodiversity, Policy 4 Natural places, Policy 6 Forestry, woodland and trees, Policy 8 Green belts, Policy 10 Coastal development, Policy 13 Sustainable transport, Policy 18 Infrastructure first, Policy 20 Blue and green infrastructure, and Policy 21 Play, recreation and sport.

The SFRA will specifically help you to:

- Identify where flood risk exists in the plan area at the Evidence Report stage, and therefore areas where new development should be located or avoided at the Proposed Plan stage in accordance with Policy 22. The SFRA can act as a screening tool to help identify whether flood risk is fully understood, and therefore whether further and more detailed analysis of flood risk will be needed beyond the Evidence Report stage in the form of site-specific flood risk assessment (FRA). More information on this is provided below.

- Identify areas where climate change is resulting in unmanageable flood exposure, and so where alternative land use is needed, in accordance with NPF4.
- Identify where and how actions contained in the local flood risk management plan (including future flood protection schemes) affect the location of new development.
- Inform blue and green infrastructure audits and/or strategies in support of NPF4 Policy 20.
- Inform the Strategic Environmental Assessment (SEA) of the LDP.
- Provide evidence to support the LDP in taking into account other relevant NPF4 policies, to help take an integrated place-based approach to tackling the climate emergency and nature crisis, for example Policy 1 Tackling the climate and nature crisis, Policy 2 Climate mitigation and adaptation, Policy 3 Biodiversity, Policy 4 Natural places, Policy 6 Forestry, woodland and trees, Policy 8 Green belts, Policy 10 Coastal development, Policy 13 Sustainable transport, Policy 21 Play, recreation and sport, and Policy 18 Infrastructure first.

As well as informing the LDP, SFRA outputs can also be used to support a place-based approach to development and service delivery. The SFRA could be used:

- by developers, communities (including for their Local Place Plans), individual applicants and neighbouring planning authorities to better understand flood risk in the area.
- to support wider infrastructure planning and delivery
- to support local authority corporate services such as emergency planning and resilience.

When to carry out an SFRA

Scottish Government's Local Development Planning Guidance states that the Evidence Report can reference an SFRA. The guidance also states that the Evidence Report can have regard to the flood maps prepared by SEPA and must consider relevant finalised and approved flood risk management plans and river basin management plans. SEPA therefore recommends incorporating this information in an SFRA. The SFRA can also be used to inform decision-making beyond the Evidence Report stage.

Issues to consider before preparing an SFRA:

- An SFRA should be straightforward to prepare in most cases. External support may only be needed where more detailed studies are required as part of the gap analysis or where in-house GIS technical support is not available.
- Where a catchment or coastal reach includes more than one planning authority, or where a catchment-wide flood management approach exists, you may find it useful to prepare a catchment-wide SFRA rather than a planning authority-specific SFRA; existing local flood risk management partnerships can support this. However, there may be logistical challenges in coordinating where planning authorities progress their local development plans at separate times.
- Input from colleagues with expertise in flooding, planning, mapping, building standards and from other organisations such as Scottish Water and Scottish Canals may be needed. You may also wish these bodies to review the SFRA when finalised.

Keeping your SFRA up to date

Your SFRA may become out of date in time because of significant improvements in flooding data, or large flood events may alter our understanding of the hazard. The SFRA has uses beyond the Evidence Report stage of the LDP, as well as more widely outwith the LDP process, so it will be useful to keep it under review and up to date. As a minimum, SEPA advise updating at least every development plan cycle.

Using the SFRA beyond the Evidence Report

For flood risk:

After the Gate Check concludes, work should begin to prepare the Proposed Plan. This will include the development of a spatial strategy and an assessment of potential sites. The Evidence Report is to be used to help develop the Proposed Plan. Having informed the Evidence Report, the SFRA can then be used to:

- Identify where flood risk exists in the plan area, and therefore areas where new development should be located or avoided at the Proposed Plan stage in accordance with Policy 22. The SFRA can act as a screening tool to help identify whether flood risk is fully understood, and therefore whether further and more detailed analysis of flood risk will be needed beyond the Evidence Report stage in the form of site-specific flood risk assessment (FRA).[1]
- Identify areas where climate change is resulting in unmanageable flood exposure, and so where alternative land use is needed, in accordance with NPF4.
- Identify where and how actions contained in the local flood risk management plan (including future flood protection schemes) affect the location of new development.
- Inform blue and green infrastructure audits and/or strategies in line with NPF4 Policy 20.
- Inform the SEA of the LDP.

For blue and green infrastructure, including audits and/or strategies:

NPF4 introduces a step-change in the urgency to address the climate emergency (including adaptation) and the nature crisis, and a need to take a place-based, whole-system approach to shaping new places. Strategic planning for essential infrastructure that helps to manage water in a way that reduces the vulnerability of communities to existing and future flooding includes identifying land needed for flood management, water management and blue and green infrastructure, and recognises the links between them. NPF4 Policy 20 requires that LDPs should be informed by relevant, up-to-date audits and/or strategies, covering the multiple functions and benefits of blue and green infrastructure. This should be undertaken as part of an infrastructure-first approach to land use planning, which puts infrastructure considerations at the heart of placemaking (NPF4 Policy 18). Scottish Government's Development Planning Guidance advises that a blue and green infrastructure audit can reflect other relevant

[1] SEPA's primary objective in engaging with LDPs on the issue of flood risk is to minimise the number of sites allocated that are not in accordance with NPF4 policies on flooding, and so in the spirit of helping to front-load the LDP process, as well as reviewing the SFRA we will also request that the planning authority's Site Appraisal Methodology (which may also form part of the Evidence Report) includes questions/criteria related to flood risk. We will ask that the questions/criteria specify for every site that at the time of its assessment either (i) its flood risk is fully understood (which could be via the SFRA, for example a site is clearly shown to be within our outwith an area of flood risk) or (ii), if not, that a Flood Risk Assessment be undertaken at that stage to ensure that it is. This will provide certainty at as early a stage as possible in the plan preparation process for all stakeholders and will ensure that only sites that are in accordance with NPF4 are included in the Proposed Plan.

assessments such as SFRA to identify areas with an important role in flood water storage or conveyance, thus helping to deliver the requirements of Policy 20. For example, the combined information should be used to:

- Safeguard green/ blue areas identified as important for coastal protection, flood, and storm water management, and to inform the shaping of future development.
- Identify opportunities for stormwater flow separation to relieve pressures on the existing drainage infrastructure.
- Support requirements for optimum natural flood management and sustainable drainage in new developments with the aim of 0% increase in water entering the sewer system.
- Identify and safeguard 'buffer zones' around natural waterbodies to allow for flood management and to retain and enhance their function as riparian corridors and nature networks.

Using SFRA to prepare Edinburgh for a changing climate

In recent years the City of Edinburgh Council has worked in close collaboration with SEPA, Scottish Water and Nature Scot to explore the potential for blue green infrastructure within the city, with a focus on identifying projects that can showcase effective and efficient use of collective public sector resource, and in doing so, tackle the climate and nature crises.

In preparing its City Plan 2030, the Council commissioned consultants to produce a Strategic Flood Risk Assessment, which as well as informing choices about sites at potential flood risk for the local development plan, was used alongside other GIS data sets such as active travel routes and vacant and derelict sites to identify opportunities for new blue green infrastructure, helping to reduce risks from flooding, as well as pollution, high temperatures and loss of nature and wildlife, all of which are challenges associated with our future changing climate.

The outputs of this opportunity mapping were used to directly inform the City Plan and continue to have wider application outwith land use planning, such as for ongoing corporate infrastructure planning and investment.

For other aspects of NPF4:

The climate emergency and nature crisis require us to recognise the interconnected nature of issues, including flood risk, in a way that aligns with other policy priorities in NPF4. The SFRA can be used as evidence to support the delivery of other policy areas of NPF4, for example:

- Policy 1 Tackling the climate and nature crisis and Policy 2 Climate mitigation and adaptation: avoiding development in areas of flood risk is a key aspect of climate change adaptation.
- Policy 3 Biodiversity, Policy 4 Natural places, Policy 6 Forestry, woodland and trees, Policy 8 Green belts, Policy 10 Coastal development: floodplains can be key aspects of existing nature networks and provide opportunities for enhancement of these networks too.
- Policy 13 Sustainable transport and Policy 21 Play, recreation, and sport: floodplains are valuable assets that provide opportunities for the sustainable movement and activity of people.
- Policy 18 Infrastructure first: NPF4 defines flood risk management infrastructure as part of infrastructure covered by that policy. The SFRA can therefore inform consideration of existing infrastructure provision and new requirements.

Methodology

Step 1: Gather available information:

Gather all available information relating to flood risk for the development plan or catchment area. The level of detail and information requirements should be proportionate to the flood risk issues in the area in question, and some sources of data and evidence will be more useful than others. You should review the sources in Table 1, which will be updated and improved over time. More information on these sources of information can be found in Appendix One. Additional or improved sources of information in future years are likely to be:

- Improved pluvial flood hazard maps for all of Scotland.
- Updates to coastal flood hazard maps in some areas of Scotland

- New information on features that help manage flood risk, including natural features to supplement the Scottish Flood Defence Asset Database
- New flood studies, adaption plans and surface water management plans, being produced at the local level as part of local flood risk management plans.

Minimal SEPA input will be required at this stage, provided that this guidance is followed.

Step 2: Gap analysis:

Once all available information is collated, gaps in the evidence can be identified. Gaps may arise where:

- existing information is thought to be incorrect or lacking.
- there is known to be significant development pressure or the need for adaptation of an existing community at flood risk, and where site-level flood risk assessments have not successfully established the problem or reduced uncertainty.
- the flood mechanism is distant or complex.
- there are existing flood defences, and their current standard or the residual uncertainty associated with them is unknown.

As part of our engagement with planning authorities on SFRA, SEPA can help identify gaps. Planning authorities may consider that more detailed larger-scale studies or assessments are needed to fill any evidence gaps, such as additional flood modelling and mapping. Scottish Government's Local Development Planning Guidance states that where required, reasonable steps should be taken to address any gaps in evidence identified, and that the preparation and content of the Evidence Report should be proportionate. However, the regulations do not include minimum evidence requirements and it is for planning authorities to determine which gaps it would be reasonable and proportionate for them to fill at this stage. Where new flood modelling studies are considered necessary, please follow the SEPA flood modelling guidance for responsible authorities.

Step 3: Prepare the outputs:

All collated information should be presented in a primarily map-based form, ideally hosted on a GIS platform that is compatible with your other mapping tools. A brief accompanying summary report should be prepared, setting out the approach taken, the findings of any additional information prepared as part of the gap analysis, identifying any remaining gaps that need to be addressed at a later stage, and acknowledging any limitations of the analysis.
One limitation that will be common to all SFRAs is that flood risk information is ever evolving, and therefore a snapshot in time used for an SFRA will in time become out of date. SEPA recommends that this limitation should be highlighted in the summary report, and then referenced in the Evidence Report, to make this clear for all stakeholders in the plan process.

Step 4: Discuss with SEPA:

SEPA will be happy to review the summary report at this stage and advise whether we consider the SFRA to be sufficient or not. Provided that this guidance has been followed and that any evidence gaps we have highlighted in Step 2 have been identified in the summary report, it is likely that we will be content with the SFRA being a sufficient high-level overview of the scope and nature of all sources of existing and future flood risk within the local development plan area at that point in time, and therefore used to inform/be referenced in the Evidence Report. You may also wish to discuss the summary report with Scottish Water.

Table 1 Key sources of flood risk information

Source of information	Description	Where to find it
SEPA Flood Hazard Maps	Displays the land affected by coastal, fluvial, and pluvial flooding for a range of annual probabilities, including a climate change scenario.	The latest data (v2.0) was supplied to all planning authorities in 2022 as a bespoke data package compatible with authority GIS systems. The data can also be viewed on the SEPA website, and a subset of the layers can be downloaded here.
Climate Change Allowances	Provides regional uplift values for Scotland, indicating how much peak rainfall, river flows and sea levels are expected to rise – over the current understanding of flood causes – due to climate change	SEPA guidance on climate change allowances for land use planning The guidance contains links to source data and references where more detail can be found if required.
Natural Flood Management Maps	Maps indicate areas where land use change to restore nature could reduce flood risk.	SEPA FRM Map Viewer
Information on Flood Defences and Schemes	Identify areas which rely on flood schemes and defences for protection from flooding. Defences protect existing development and may not be suitable to support new development. Also identified land required for new defences which are planned, or future adaption to existing defences.	The Scottish Flood Defence Asset Database (need to be a registered user). Local Authorities will have more detailed information on their defences, including more up to date condition inspections/assessments. Where new development is supported behind schemes, additional work may be required.
Local Authority Flood Studies	Studies giving more detailed information for high-risk areas – many were carried out for potentially vulnerable areas during cycle 1 of flood risk management planning, though some pre-date that. They may	Local Authorities own the studies

	contain flood extents and information on any existing defences, more detailed that SEPA Flood Maps in most cases.	
Information on past flooding events	SEPA and many other authorities hold records on flooding that has happened in the past, which can help supplement and verify other sources of information on flooding.	Data can be obtained from SEPA on request. Local Authorities and Scottish Water have their own records that may be more detailed than the ones held by SEPA.
Local Flood Risk Management Plans and Flood Risk Management Plans	Identifies ongoing and future actions that are needed to manage flood risk, and which communities those actions planned for.	Flood Risk Management Plans available on the SEPA website. Local Flood Risk Management Plans available on local authorities' websites.
Surface Water Management Plans	Information on opportunities and actions to reduce surface water flood risk, some of which could be delivered through the development plan, as well as known drainage capacity issues.	Local Authorities
Adaptation Plans and Coastal Adaptation (Shoreline Management) Plans	Plans setting out how places will adapt to climate challenges will be increasingly produced over the coming years. They may include information on land required for future action, or land use change.	Local Authorities
Dynamic Coast	Mapped data and more detailed reports on erosion and coastal change, highlighting places where erosion alone will be a significant future challenge, and where it may increase the risk of flooding.	Dynamic Coast website
Reservoir Inundation Maps	Although the risk of reservoir inundation is generally considered to be low enough to not be considered in most planning decisions, it would be advisable for any spatial strategy, particularly for new settlements or	SEPA Controlled Reservoirs Register including inundation mapping.

	significant new development areas, to avoid places where there may be a future risk from declining assets or increased pressure due to climate change.	
Section 16 Assessment of risk from the sewer network maps	These maps largely mirror the SEPA pluvial flood hazard maps (particularly for bigger return periods), so this mapped data should only be used by local authorities for an internal sense check to identify areas of misalignment, which could be worthy of further investigation. **This data should not be published externally, due to the data sharing agreements in place, and should not feature in any published SFRA dataset.**	Local Authorities

Appendix One: Further detail on key sources of flood risk information

SEPA Flood Hazard Maps

SEPA provided all planning authorities with a planning sub-folder of mapped information on flood hazard and risk in 2014, and an update to some of the layers in 2022. This information is clipped to the authority area and includes more layers than are available on SEPA's website for view or download and so we recommend this is the best source of the data to use for SFRA. The fluvial map does not show flooding from watercourses with a catchment area less than 3km^2 though these small watercourses are a frequent cause of local flooding, particularly in urban areas. The fluvial defended area that is provided only includes formal flood protection schemes that had information readily available at the time the maps were derived. As a result, some schemes are missing, and they include no information that can inform residual risk, condition, or likely risk in the event of exceedance events. We recommend that low-probability undefended extents are used along with information on where defences exist, to identify areas where more detailed consideration of flood risk taking the scheme into account would be required, if any new development is planned in those areas.

In most coastal areas, the flood extents are currently based on still water levels only and make no allowance for the effect of waves. Most areas do not have representation of coastal structures or defences. SEPA is in the process of delivering improved flood maps regionally, phased over the next 6 years. In late 2023 improved maps will be published for the northeast coast of Scotland from Montrose to Scrabster, covering part of Angus, Aberdeenshire, Moray, and part of Highland Council areas, as well as improved maps for Orkney and the Outer Hebrides. The southeast coast from Montrose to the border with England will be the next phase but is not due to be published until 2025/26. Improvements in the southwest will be in later years. The improved maps will include representation of the effect of waves, updates to sea levels, updated climate change allowances and include the effect of defences where appropriate. The current pluvial flood maps show areas of flood risk from direct rainfall and can include useful information indicative of flooding from small watercourses less than 3km2 where no other information exists. Although in principle surface water flood risk can be managed through drainage systems, it is not always feasible to do that without increasing the risk of

surface water flooding to others as is required by Policy 22 of NPF4. If allocating areas at significant surface water/pluvial flood risk for development, there should be confidence that any issues highlighted by the flood hazard maps can be appropriately addressed, and that these areas would not be more suitable for implementing blue green infrastructure as part of the wider place approach.

Climate Change Allowances

SEPA's Future Flood Maps (part of the package of flood hazard maps covered above) provide information on how the areas at risk of river or coastal flooding in a 0.5% Annual Exceedance Probability event are expected to change due to climate change. These maps should be used as an initial screening tool to identify areas at risk of flooding for land use planning purposes. Users should be aware that the climate change uplifts used in the maps are based on different projections to those used in SEPA's guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning. The Climate Change Allowances guidance is more up to date than the future flood maps. In short, this means that for most sources of flooding, the maps use allowances that are smaller than those given in the guidance.

These differences exist because both the maps and the guidance are based on UK climate projections, which are updated regularly due to improvements both in our understanding of climate and in how well the climate can be modelled. The task of updating the national flood maps in line with changing data is significant, and so updating the mapping takes longer than updating our guidance. SEPA is committed to making the best data on climate change available and advising on how it can be applied in Scotland, and as such will continue to progress updates to flood maps and guidance when possible. We will keep the differences between our projects under review, with the long-term aim of aligning both. More information on this can be found in our explanatory note on the difference between our guidance and the future flood maps.

This difference should be considered when interpreting the future flood maps, particularly in areas close to the edge of the flood extents where additional climate change increases in flooding could cause inundation in areas not currently shown to be at risk. If any more detailed assessment of flood risk is undertaken, as part of the SFRA or at a later date, to inform more

detailed development design or layout, the most recent climate change allowances from the guidance should be used.

Natural flood management maps

The Natural Flood Management maps identify areas where there are opportunities for alteration or restoration of natural features to help manage flood risk. The maps are of a strategic nature and are primarily to support flood risk management planning decisions at the catchment level. They provide a high-level assessment of those areas within catchments and along coastlines where the implementation of the specified nature-based techniques could be most effective and merit further investigation. Five natural flood management maps have been produced: run- off reduction; floodplain storage, sediment management, estuarine surge attenuation and wave energy dissipation.

Information on Flood Defences and Schemes

The Scottish Government's Flood Defence Asset Database (SFDAD) holds a record of the flood protection schemes constructed by local authorities under relevant legislation. The database brings together a wide range of information for each of the local authority flood protection schemes, but generally the information is not kept up to date after its first inclusion in the database, and several schemes are missing – particularly those built more recently. It therefore may be a good starting point, but the information should be checked. Local Authorities will have much more detailed information on schemes that they are responsible for, and this should be included in the SFRA. Understanding where land should be protected for the ongoing function of defences, for future planned defences or defence adaptations, and what future development if any is appropriate behind defences will be key issues to explore in the SFRA. The change in NPF4 of the baseline flood scenario for planning purposes from the 0.5% AEP event to the 0.5% + climate change is significant for areas protected by flood defences, because most defences have a lower design standard of protection than that. The role of the SFRA is key in understanding if or how individual flood schemes could be taken into account when determining flood risk in an area against the planning standard required by NPF4 (0.5%+CC). If new development is to be supported, other than that set out in the four criteria of Policy 22 for developments allowed in flood risk areas, more detailed assessment of schemes will be required prior to development being planned in these locations. The SFRA is the best place to

record the understanding of flood defences where evidence has been established through this further assessment.

Dynamic Coast

Dynamic Coast is a set of online maps and datasets showing historical coastal change and projections of past erosion rates into the future. This is to identify areas that may be vulnerable to coastal erosion. The expected future rate of coastal change is identified by factoring in past erosion rates along with future sea level rise due to climate change. This is used to identify areas of the coast where, if erosion occurs, coastal flooding could get worse.

Coastal erosion, coupled with sea level rise, increases the frequency of flooding such that long term inundation will become more common very soon. Dynamic Coast shows that coastal erosion and erosion-enhanced flooding is a current threat, with the greatest number of current coastal flood-prone areas expected to be breached within this decade, rather than later in the century. Coastal erosion is expected to contribute to more frequent coastal flooding causing damage and disruption to land-owners, residents, and travel networks. It is not possible to separate erosion and coastal flooding where an eroding coast fronts or is adjacent to a low-lying area. Dynamic Coast shows where erosion of the shoreline increases the coastal flood risk via the potential to breach or remove a protective natural barrier, for example, beach or dunes.

The data in Dynamic Coast is suitable for regional-scale assessment, and should be included as a key dataset in the preparation of an LDP. It can be used, as with all flooding datasets, along with other information on the coast where it could be linked with other issues and opportunities for places. More information on Dynamic Coast can be found on the website, along with guidance which has recently been published on adapting to coastal change. Many local authorities are progressing with plans for coastal adaptation, and the LDP has a key role in delivering adaptation that should be considered at the earliest stage possible.

Reservoir inundation maps

The primary purpose of these inundation maps is to assist SEPA in assigning the risk designation to all registered reservoirs, as required by the Reservoirs (Scotland) Act 2011. Each reservoir will be assigned a high, medium, or low risk designation category depending on the impacts on receptors within the inundation zone in the extremely unlikely event of an uncontrolled release of water. Receptors include domestic properties, transport links such as ‘A’

roads and scheduled ancient monuments. The purpose of the inundation maps is only to inform the assignment of risk designations and they were not designed for other purposes, such as land use planning. A key consideration of this assessment is that it is not currently possible to assess the probability of an uncontrolled release of water from a reservoir in a manner consistent with the requirements of NPF4 for development to be free of flood risk up to the 0.5% probability (including allowance for climate change). Furthermore, the probability of failure of a reservoir structure managed under the 2011 Act is considered to be so low that it is beyond the scope of risk considered within NPF4. For more strategic spatial planning, such as siting of major new infrastructure or new towns, it may be prudent to consider reservoir inundation. We have produced a briefing note on reservoir inundation mapping and you can download the summary of the reservoir inundation mapping methodology.

Surface Water and Drainage

Drainage should be given specific consideration in the LDP, taking account of the local issues, any surface water management plans for the area and existing infrastructure. Partnership working between authorities and Scottish Water will be required to address complex issues, and the recommendations from the water resilient places policy framework should be followed. SEPA's flood hazard maps for pluvial flooding can help. Areas with critical drainage capacity issues should be identified, where development may be constrained as a result or where there is opportunity for the LDP to address problems, both for new development and existing communities. The multi-disciplinary approach is especially beneficial for addressing surface water problems in built up areas with opportunity to benefit local communities and contribute to the quality of a place. The LDP process may be a chance to progress opportunity mapping for blue green infrastructure, or to embed work already done using the LDP to deliver implementation.

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