



**Revised Planning Policy  
Statement 15**

**‘Planning and Flood Risk’**

**September 2014**

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## Preamble

The Department has a statutory duty, laid down in Article 3 of the Planning (Northern Ireland) Order 1991, to formulate and co-ordinate policy for securing the orderly and consistent development of land and for the planning of that development. The Department is required to ensure such policy is in general conformity with the Regional Development Strategy.

The Department's planning policies are normally issued through Planning Policy Statements (PPS) and PPS 1 'General Principles' advises that:

*"Planning Policy Statements set out the policies of the Department on particular aspects of land-use planning and apply to the whole of Northern Ireland. Their contents will be taken into account in preparing development plans and are also material to decisions on individual planning applications and appeals."*

This Planning Policy Statement, revised PPS 15 'Planning and Flood Risk' sets out the Department's draft planning policies to minimise and manage flood risk to people, property and the environment. It embodies the government's commitment to sustainable development and the conservation of biodiversity. It adopts a precautionary approach to development and the use of land that takes account of climate change and emerging information relating to flood risk through the implementation of the EU Floods Directive in Northern Ireland and the implementation of sustainable drainage systems. The revised PPS is supportive to the safety and wellbeing of people.

**The policies of this Statement will supersede the existing PPS 15, published in June 2006.**

**The policies of this Statement will also take precedence over the provisions of existing development plans in relation to flood risk.**

**The policies in this Statement will be applied by the Department and subsequently by Councils upon the transfer of planning functions. This PPS will inform the emerging Strategic Planning Policy Statement (SPPS) which in turn will provide a strategic planning framework for Councils in bringing forward local development plans.**

The PPS has been subjected to an equality impact screening exercise in line with the statutory obligation contained in Section 75 of the Northern Ireland Act 1998. The outcome of this exercise indicates that it is unlikely to have significant adverse implications for equality of opportunity or community relations.

Nothing in this document should be read as a commitment that public resources will be provided for any specific project. All proposals for expenditure by the Department are subject to economic appraisal and will also have to be considered having regard to the overall availability of resources.

## 1.0 Introduction

### Background to Flood Risk in Northern Ireland

- 1.1 Flooding is a natural phenomenon that cannot be entirely prevented. There are four main sources of flooding. Flooding from rivers or fluvial flooding occurs when the channel capacity is exceeded and flood waters overtop the river banks. Coastal flooding occurs when inundation of land takes place due to a combination of high tides, wave action and storm surge. Surface water or pluvial flooding occurs as a result of high intensity rainfall which can overwhelm drainage systems or cause water to collect in low lying areas. Finally, flooding from impounded water bodies such as reservoirs and dams can arise as a result of overtopping or failure of the impounding structure which in turn may result in a sudden uncontrolled release of flood water into downstream areas.
- 1.2 The effects of flooding on human activity are wide ranging. Floods have the potential to cause fatalities and injury, displacement of people, pollution and health risk, loss of drinking water, damage to buildings and the environment and to severely compromise economic activities. If not properly managed, flooding to property will also impact on property prices, the ability to get a mortgage agreement and the availability of affordable property insurance.
- 1.3 There is widespread potential in Northern Ireland for localised flooding. Significant flood events have occurred in the recent past. A description of these and some major historical flood events is contained in the Preliminary Flood Risk Assessment (PFRA) published by Rivers Agency (DARD) in December 2011. The PFRA estimates that 46000 or 5% of properties in Northern Ireland are located within fluvial and coastal floodplains. Approximately 15500 of these properties are estimated to be protected by flood defences or culvert systems. In

addition it is estimated that around 20000 or some 2.5% of properties are at risk of surface water flooding, albeit that many of these properties are already at risk of flooding from fluvial or coastal flooding.

- 1.4 Climate change predictions of rising global temperatures will be accompanied by sea level rise, an increase in overall winter precipitation and an increase in intensity and duration of extreme rainfall events. This, along with other factors such as the ongoing development of impermeable surfaces in urban areas, removal of vegetation and loss of open space, will, if continued, greatly increase the incidence of surface water flooding.
- 1.5 The significant increase in the incidence of flood events across Europe and the associated impacts led to the adoption by the European Parliament of the Floods Directive (“The Assessment and Management of Flood Risk”) in October 2007. The Directive sets out a holistic, catchment based approach to manage flood risk in a sustainable way based on the impact all sources of flooding have on human health, the environment, cultural heritage and economic activity. The ongoing implementation of the Directive in Northern Ireland, by Rivers Agency (DARD) as the competent authority, has resulted in a significant improvement in the body of flood information now available. Accordingly, our understanding and ability to predict flood risk is continually improving.
- 1.6 The Directive confirms that development and other man-made changes to the environment can exacerbate the consequences of flooding. Accordingly, one of the Directive’s outcome measures relates to flood prevention. The land use planning system therefore plays an important role in flood risk management insofar as it has a significant bearing on where development takes place and as a consequence can prevent or restrict new development in flood prone areas. In addition to prevention, the land use planning system has a role in regulating new development in existing built up areas so as to afford protection to

people and property where this is considered appropriate and commensurate with the flood risk.

- 1.7 There is also growing awareness of the potential role of the planning system in natural flood risk management at catchment scale and also in local flood adaptation such as facilitating sustainable drainage in new development and redevelopment schemes.
  
- 1.8 This revised PPS 15 is focused on the role of the land use planning system in the management of flood risk. It has been brought forward in line with a commitment to review the policy within 5 years in order to take account of emerging information relating to flood risk and climate change and also experience in the implementation of flood risk policy. The primary aim of the revised PPS 15 remains: **“to prevent future development that may be at risk from flooding or that may increase the risk of flooding elsewhere”**.

## 2.0 Policy Context

### Regional Development Strategy

- 2.1 The Regional Development Strategy 2035 (RDS) is the spatial strategy of the Executive. It aims to provide long term policy direction with a strategic spatial perspective to facilitate and guide the public and private sectors in investment and other decision making.
- 2.2 The RDS recognises that climate change is increasingly seen as one of the most serious problems facing the world and that Northern Ireland has its part to play in preparing for and adapting to climate change
- 2.3 A number of specific measures are highlighted and these include:
- Employment land should avoid, where possible, areas at risk from flooding (RG 1).
  - The redevelopment of land for urban and rural renaissance should avoid, where possible, areas that are at risk from flooding (RG 7).
  - Housing growth should be managed so that it mitigates the risk of flooding by avoiding those areas known to be at risk (RG 8).
  - Minimising development in areas at risk from flooding - a precautionary approach to development in areas of flood risk should be exercised using the latest flood risk information that is available (RG 9).
  - Promoting a more sustainable approach to flood risk management, including encouraging the greater use of Sustainable Drainage Systems (SuDS) (RG 12).

## Implications of Climate Change for Northern Ireland

### Key message

*Climate change is one of Northern Ireland's foremost environmental, social and economic challenges. It is vitally important to ensure that our new and existing infrastructure is as resilient as possible to all potential impacts. This includes being able to adapt to both gradual climate change as well as the increased risk of extreme weather events such as flooding.*

- 2.4 The Cross-Departmental Working Group on Climate Change, which was established by the Executive in February 2011, under the chairmanship of the Environment Minister, aims to review cross-departmental action on climate change on an annual basis, ensure delivery of the greenhouse gas (CHG) emissions reduction target set out in the Programme for Government and prepare and deliver a cross-departmental adaptation programme on climate change.
- 2.5 The Climate Change Risk Assessment (CCRA) for Northern Ireland published in January 2012, identified a range of climate risks across 11 sectors including Agriculture, Biodiversity and Ecosystem Services, Built Environment, Business including Tourism, Industry and Services, Energy, Forestry, Floods & Coastal Erosion, Health, Marine and Fisheries, Transport and Water. The Assessment indicates that increase in flooding and coastal erosion affecting people, properties (including built heritage) and infrastructure and coastal squeeze and coastal erosion affecting beaches, intertidal areas, grazing marshes etc. are potentially significant threats for Northern Ireland from a changing climate.
- 2.6 A cross departmental Northern Ireland Climate Change Adaptation Programme (Adaptation Programme) was published in January 2014. It provides Government's response to the risks identified in the Climate Change Risk Assessment for Northern Ireland report.

- 2.7 The Adaptation Programme promotes action under four primary areas: water, flooding, agriculture / forestry and natural environment. A number of actions and activities have been identified by all departments, which aim to reduce the impact of climate change through awareness, integrating adaptation into key policy areas and building and improving the evidence base.

## **The Water Framework Directive**

- 2.8 The EC Water Framework Directive (WFD) came into force in December 2000. The WFD introduced a new holistic approach to the management of water quality and established a set of common principles for the protection and improvement of the water environment, including all inland and coastal waters. The Directive requires that the status of all inland and coastal waters are protected from deterioration and where necessary and practicable, that water bodies are restored to “good status” by 2015 or alternatively within the 6 year cycles of 2021 or 2027. In accordance with the Directive, plans were published by NIEA in 2009 for the three river basin districts in Northern Ireland. River basin planning takes an integrated approach to the protection, improvement and sustainable use of the water environment. A programme of measures to deliver the objectives of each Plan has been drawn up which involves linkages with other key policy areas such as agriculture, biodiversity, tourism, recreation and flood protection.
- 2.9 The programme of measures will have implications for decision-making in the development sector in relation to supporting the WFD objectives and delivering sustainable development. Given the linkages between development, water quality and flooding and the synergy between the WFD and the Floods Directive; the requirements of both Directives will inform the spatial planning process to ensure that the long term improvements required under the directives are taken into account.

## **The EU Floods Directive**

- 2.10 The European Directive on the Assessment and Management of Flood Risks came into force in November 2007 and was transposed into local legislation by The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. DARD has been identified as the Competent Authority for the delivery of the EU Floods Directive in Northern Ireland with the day to day functions expedited by River Agency.
- 2.11 Key milestones towards the implementation of the Floods Directive include the following:
- Publication of the Strategic Flood Maps for Northern Ireland in November 2008. These maps identify the predicted fluvial and coastal floodplains for present day and as predicted to take account of anticipated climate change.
  - Publication of the Strategic Surface Water Flood Map in December 2011. This map updated the Strategic Flood Map by adding a new layer on surface water flooding.
  - Publication of the Preliminary Flood Risk Assessment (PFRA) in December 2011. The PFRA identifies geographical areas within Northern Ireland which are at significant flood risk.
  - Detailed Flood Hazard and Risk Maps for 20 areas at significant risk and for an additional 49 areas of further study were published in June 2014.
- 2.12 Flood Risk Management Plans (FRMPs) are due to be published by December 2015. The FRMPs will apply to each of the three main River Basin Districts in Northern Ireland, namely North Eastern, Neagh-Bann and North Western. As two of the River Basins are also partially within the Republic of Ireland, a cross border implementation group has been set up to ensure a uniformity of approach between the two jurisdictions. The plans are required to set out objectives, measures and action plans for managing the flood risk within each River Basin / Catchment

area.

2.13 The FRMPs focus on 3 main themes, as follows:

#### **PREVENTION**

- The avoidance of, where possible, new development in areas of flood risk,
- Promoting appropriate land use, agriculture and forestry practices.

#### **PROTECTION**

- Structural and non-structural measures to reduce the likelihood and impact of floods.

#### **PREPAREDNESS**

- Flood warning,
- Flood emergency planning. A Local Resilience Forum has been established for Belfast with other areas to follow,
- Informing the public about flood risk and what to do in the event of a flood to their property,
- Adapting existing property to the risk of flooding.

### **Implementation of Stormwater Management**

2.14 In September 2011, Northern Ireland Environment Agency (NIEA) published the document “Managing Stormwater – A Strategy for Promoting the Use of Sustainable Drainage Systems (SuDS) within Northern Ireland.” The recommendations of this Strategy have been endorsed by the Northern Ireland Executive and an inter-departmental / agency Stormwater Management Group (SMG) has been established to facilitate implementation. The fundamental aim of the SMG is to develop a more integrated and catchment based approach to sustainable drainage that will deliver a variety of sustainable benefits, including flood risk benefits. Further detail on sustainable drainage is contained in Annex C.

2.15 The policies and guidance in the PPS are consistent with the key aims of the SMG.<sup>1</sup>

### **Reservoir Bill for Northern Ireland**

2.16 It is anticipated that a Reservoirs Bill, will be enacted in 2014/15. The legislation will introduce a risk based approach to the management of the potential flood risk from controlled reservoirs and will have implications for the planning process. The legislation will apply to all reservoirs with a capacity greater than 10 000 cubic metres above the natural level of any part of the surrounding land.

### **Proposed Floods Bill for Northern Ireland**

2.17 The development of a new Floods Bill for Northern Ireland is due to be progressed. The Bill will provide a wider range of duties and powers for the effective delivery of Flood Risk Management. These include –

- flood risk management strategy;
- clearer structures and responsibilities for all bodies that have a role in FRM;
- a requirement to share data and information;
- co operation and integration for emergency response and surface water management;
- regulation on the adaptation of sustainable drainage systems;
- building control for flood resistance and resilience construction measures;
- Access to land for the purpose of inspection, the construction, maintenance and removal of infrastructure.

### **Long Term Water Strategy (Draft)**

2.18 The draft Long Term Water Strategy (LTWS) was published by the

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<sup>1</sup> Refer to paragraph C18 of Annex C for further details

Department for Regional Development (DRD) in June 2014. When the final Strategy is published it will present a clear framework for action which will facilitate a range of initiatives aimed at delivering a sustainable water sector in Northern Ireland.

### **Other Government Strategies**

2.19 The policies in the Statement are consistent with the guiding principles of sustainable development expressed in the 'Everyone's Involved – Sustainable Development Strategy' for Northern Ireland, published in 2010. In addition, they take cognisance of strategic objectives identified in the Strategy including: climate change, promoting sustainable land management and managing development in ways that contribute to creating a better environment.

## 3.0 Policy Objectives

3.1 The main objectives of this statement are to:

- seek to prevent inappropriate new development in areas known to be at risk of flooding, or that may increase the flood risk elsewhere;
- ensure that the most up to date information on flood risk is taken into account when determining planning applications and zoning / designating land for development in development plans;
- adopt a precautionary approach<sup>2</sup> to the identification of land for development through the development plan process and the determination of development proposals, in those areas susceptible to flooding where there is a lack of precise information on present day flood risk or future uncertainties associated with flood estimation, climate change predictions and scientific evidence;
- manage development in ways that are proportionate and appropriate to the 4 main sources of flood risk present in Northern Ireland, ie fluvial, coastal, surface water and water impoundment (reservoir) breach or failure;
- seek to protect development that is permitted within flood risk areas by ensuring that adequate and appropriate measures are employed to mitigate and manage the flood risks to the development and elsewhere;
- support the retention and restoration of natural flood plains and natural watercourses as a form of flood alleviation and an important environmental and social resource, and ensure that this is recognised in the decision making process;
- promote sustainable development through encouraging the use of sustainable drainage for new developments and redevelopment / regeneration schemes;
- promote public awareness of flood risk and the flood risk information that is available and of relevance to undertaking development;
- promote an integrated and sustainable approach, both locally and at catchment scale, to the management of development and flood risk which contributes to:
  - the safety and wellbeing of everyone;
  - the prudent and efficient use of economic resources; and

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<sup>2</sup> Refer to Glossary for definition

- the conservation and enhancement of the natural environment and biodiversity;
- the conservation of archaeology and the built heritage.

## **4.0 The Role of Development Plans**

- 4.1 Development plans set out how future development will be accommodated in the plan area over the plan period within the overarching strategic framework provided by the Regional Development Strategy (RDS). Currently these are prepared by the Department's local area planning offices but it is intended that development plan preparation will fall to local government upon the broader transfer of planning functions. Development plans have a significant bearing on the location and form of development and it is anticipated that their influence in this regard will increase with the introduction of a plan led system as part of broader planning reform.
- 4.2 The preparation of a development plan provides a key opportunity for the planning authority to consider how best to plan for and facilitate sustainable patterns of development in the plan area in accordance with the broader sustainability objectives of the RDS and the Northern Ireland Sustainable Development Strategy. Flood risk management is one important aspect of sustainable development as flooding has far reaching and long term implications for society, the economy and the environment.

### **Flood Risk Management Role of Development Plans**

- 4.3 The role of development plans in taking account of flood risk management considerations has assumed greater significance in recent years as a result of the implementation of the European Union (EU) Floods Directive in Northern Ireland. The Directive considers a catchment wide approach to flood risk management and promotes sustainability practices, which includes the retention and restoration of natural floodplains as valuable flood storage areas. The Directive addresses the main sources of flooding and promotes a joined up approach amongst organisations that can influence and contribute effectively to flood risk management. The local development plan, as a key land use planning tool for influencing spatial patterns and types of development, therefore has a key role in the implementation of this joined up approach to flood risk management.

- 4.4 Development plans need to take account of the potential risks from all sources of flooding over the plan period and beyond as this is likely to influence decisions on such matters as the zoning of land for various uses including residential or economic development. Development Plans should avoid zoning sites for development in flood risk areas. Outside of such areas it may still be appropriate for the Plan to mitigate against the risk of possible flooding, for example, by requiring susceptible areas within development sites to be retained as open space or indicating where the use of water resistant materials and forms of construction will be considered necessary.
- 4.5 Flood risk may also be an important consideration in the definition of settlement limits and in the designation of new settlements.
- 4.6 In addition, development plans may also need to consider the potential implications of flood risks beyond the Plan area. This may be necessary where:
- a) development in locations beyond the Plan area has the potential to impact upon flood risk within the Plan area; or
  - b) Plan proposals could cause or increase the potential for flood risk in locations beyond the Plan area.

### **Consultation and Communication**

- 4.7 In discharging all of these functions relating to flood risk management, local development plans need to make the necessary linkages with and to be informed by the existing and emerging body of information in relation to flood risk management that is being delivered as part of the implementation of the EU Floods Directive in Northern Ireland and referred to in paragraphs 2.10 to 2.12.
- 4.8 The multi-layered Strategic Flood Maps, available on the "nidirect" website <http://www.dardni.gov.uk/riversagency/index/rivers/flood-maps-ni.htm> provide information on flood defences; historical flood events and predicted extreme flood events for Surface Water, River and Coastal flooding.

- 4.9 There should also be consultation with Rivers Agency from an early stage on strategic issues relating to flood risk management throughout the Plan area and beyond. Ongoing consultation with Rivers Agency and other relevant agencies in regard to detailed Plan proposals, for example housing zonings, will also be necessary; particularly where flood risk is identified from the available information as a potential issue.
- 4.10 The strategic flood risk information and advice provided by Rivers Agency at development plan preparation stage will take account of the latest information on flood risk. This will not only include the present day predictive flood risk associated with flooding from various sources, but also historical records of flooding and the predictive flood risk in the future, associated with climate change.

#### **Application of the Precautionary Approach through Development Plans**

- 4.11 Development Plans will apply a precautionary approach to development in areas that may be subject to flood risk presently or in the future as a result of climate change predictions. Consequently, development plans will not bring forward sites or zone land that may be susceptible to flooding, or that would increase the likelihood of flooding elsewhere, now or in the future, unless in exceptional circumstances. Where, exceptionally, a new plan brings forward such a site, it will explain the rationale and set out the measures necessary to manage or mitigate the risk.
- 4.12 As part of the precautionary approach, the planning authority may also need to review extant development plans with a view to addressing flood risk issues which may only have been identified relatively recently as a result of the emerging flood risk information. This may be necessary, for example, where undeveloped land previously zoned for development is now known to be located in a flood plain. In such circumstances and providing the flood risk cannot be properly managed through the development management system, a formal amendment to the Plan may need to be considered.

## Application of a Sustainable Approach to Flood Management through Development Plans

4.13 Development plans have a role to play in furthering a more sustainable approach to flood management. This includes a number of measures such as:-

- Flood avoidance through the careful selection of housing and economics zonings;
- identifying flood plains and safeguarding them from development likely to impact upon their flood storage and conveyancing capacity;
- identifying and safeguarding from development areas of storm exceedance; and
- promoting sustainable drainage schemes. (SuDS)

4.14 Floodplains and other land important for flood storage or conveyance or sustainable drainage, within or adjacent to settlements can often form important strategic networks of green and / or blue spaces commonly referred to as green infrastructure<sup>3</sup>. These areas are often important in terms of biodiversity providing meadowlands and wildlife corridors. They can also be used for leisure and recreational purposes. Therefore the safeguarding of these areas not only offers economic benefits by avoiding flood risk but also delivers benefits in terms of health, social wellbeing and the environment.

4.15 Development plans can reduce flood risk to vulnerable development (existing or proposed) through planning for storm exceedance. For example, within a site zoned for housing or economic development, the plan may, if appropriate, designate areas within or close to the site that could preferentially flood during extreme weather events, thereby reducing or avoiding flood risk to buildings whilst at the same time enhancing biodiversity.

4.16 Development plans can support the use of SuDS as the preferred option for surface water drainage in the Plan area. For example, measures such as the

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<sup>3</sup> Green infrastructure is defined by the European Commission as “the use of ecosystems, green spaces, and water in strategic land use planning to deliver environmental and quality of life benefits.

use of permeable paving for the developable area of a zoned site could be provided for through the stipulation of a key site requirement. Annex C provides further guidance on sustainable drainage systems which ought to be considered. The Department supports a multi-disciplined approach to plan making with planners working with engineers, environmentalists and the community to formulate solutions to flooding problems. When formulating development plans, planning authorities will have a statutory duty to consult with the Stormwater Management Group, or other body that may ultimately be assigned authority in this regard through future legislation..

### **Strategic Environmental Assessment**

- 4.17 The Environmental Assessment of Plans and Programmes Regulations (NI) 2004 require that development plans be subject to Strategic Environmental Assessment (SEA). Where SEA identifies and describes the likely significant effects of the draft plan on natural drainage systems, it may be necessary for the environmental report to acknowledge and evaluate impacts that extend beyond the geographical boundaries of the plan.
- 4.18 The Planning Act (NI) 2015 requires development plans to be subjected to a sustainability appraisal which will incorporate consideration of the environmental effects of the development plan as identified by the SEA, and also its wider social and economic effects. Failure to address flood risk as outlined shall be viewed as resulting in negative social and economic impacts as well as environmental.

## 5.0 Development Management Considerations

### Flood Risk as a Material Consideration in determining Planning Applications

- 5.1 The susceptibility of all land to flooding is a material consideration in the determination of planning applications. New development may be directly at risk from flooding from a number of sources and / or may increase the risk elsewhere. The consequences for occupiers in such cases, both in terms of personal safety and damage to property, can be serious. Further information on the impact of flooding is contained in Annex B. Where a flood risk is known to exist, the planning authority will pay particular regard to these considerations when determining planning applications. **It should be noted however that the responsibility of the planning authority in this respect does not affect the liability position of developers or owners in respect of the application site or other land.**

### Pre-Application Stage

- 5.2 The onus rests on the developer/applicant to identify and assess the potential for flood risk to their proposed development by referring to the Strategic Flood Map. Information and guidance is available on the Rivers Agency website at [www.dardni.gov.uk/index/strategic-flood-maps.htm](http://www.dardni.gov.uk/index/strategic-flood-maps.htm). Where flooding is identified as a potential development constraint and it is considered within the policy that there may be no justification for the development to proceed then the applicant should give consideration to an alternative site, and discuss with planners at pre-application stage, as necessary. For developments, where flooding or drainage is identified as a potential development constraint, and it is considered that the risks can be managed in accordance with the policy, then early consultation with the planning authority through a pre application discussion is advisable. Should a formal application be submitted, the applicant is required to make reference to relevant published flood risk information as well as any locally known flood risks that may have implications for development on the site.

## **Determination of Planning Applications – Information & Consultation**

- 5.3** All planning applications, including those for the renewal of planning permission, will be determined with reference to the most up to date flood risk information available to the planning authority. This information will be available through the ongoing implementation of the EU Floods Directive in Northern Ireland. The flood risk information and advice will also take account of the latest information on climate change, existing drainage issues, evolving information and research on sustainable drainage options and the availability of more detailed flood hazard and risk maps. This information is important in facilitating the assessment of flood risk over the lifetime of the proposed development.
- 5.4** The planning authority will consult Rivers Agency on planning applications in a number of circumstances, where it appears, on the basis of prevailing information, that flood risk or inadequate drainage infrastructure is a material consideration in the determination of the development proposal. In the case of surface water flooding further consultation with other responsible bodies such as Northern Ireland Water, DRD Transport NI and NIEA may also be required. The purpose of the consultation will vary according to the circumstances, but will often involve seeking advice on the nature and extent of the flood risks and the scope for management and mitigation of the flood risk where appropriate. The outcome of the consultation may require the developer/applicant to carry out a Flood Risk Assessment or Drainage Assessment for the proposed development to facilitate further assessment of the proposal.
- 5.5** DARD Rivers Agency (and other organisations such as NI Water and / or DRD Transport NI in regard to surface water flooding) will normally be consulted in the following circumstances:
- where, exceptionally, development is considered appropriate within fluvial or coastal floodplains,

- where a proposed development is located in an area where there is a known history of surface water flooding,
- where a proposal is of a size or nature that could significantly increase surface water run-off,<sup>4</sup>
- where a proposal is likely to impact on a watercourse or existing or planned flood defences or other flood control structures,
- where a proposal (such as culverting) is likely to involve the alteration or diversion of a watercourse,
- where a proposal is located within a flood inundation area associated with a reservoir or other impounding structure,
- Where a proposed development is likely to increase the risk of flooding to other development or environmental assets (natural and built heritage).

### **Proposals for Alteration or Extension of Buildings**

**5.6** Generally, applications to extend or alter individual buildings are unlikely to increase flood risk elsewhere and therefore consultation with Rivers Agency is largely unnecessary. However it is still the responsibility of the developer/applicant to construct in a manner that minimises the flood risk to the development. The need to consult Rivers Agency may still arise in a number of circumstances, for example: where a proposal impacts upon a watercourse or flood defence structure; a change of use of the building that will result in significant intensification of use; or where the location or design of the development has implications for the safe evacuation of people in a flood.

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<sup>4</sup> Thresholds requiring a drainage assessment are set out in Policy FLD 3

## **Permitted Development**

- 5.7** For larger developments (ie those that require an assessment of flood risk or drainage), it may be necessary to consider the removal of permitted development rights<sup>5</sup>. This may also be appropriate in a number of other circumstances; for example where run-off has the potential to adversely affect a sensitive area<sup>6</sup> or where permitted development such as infilling for agricultural purposes, culverting or other drainage works is likely to increase flood risk elsewhere.

## **Environmental Impact Assessment**

- 5.8** For certain types of project an Environmental Assessment determination will be made under the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012. In such cases the planning authority, if flood risk issues are identified, will require flood risk assessment and drainage assessment to be addressed in the Environmental Statement.

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<sup>5</sup> As prescribed by The Planning (General Development) Order (Northern Ireland) 1993 and subsequent amendments

<sup>6</sup> Sensitive areas will include areas within, or upstream of, a conservation site designated under national or international legislation, for example Areas of Special Scientific Interest.

## **6.0 Planning Policies**

**In exercise of its responsibility for planning control in Northern Ireland the Department assesses development proposals against all planning policies and other material considerations that are relevant to it.**

**The planning policies of this Statement must therefore be read together and in conjunction with the relevant contents of the Department's development plans and other planning policy publications, including the Regional Development Strategy. The Department will also have regard to the contents of published supplementary planning guidance documents.**

**The following policies set out the main planning considerations that the Department and future planning authorities will take into account in assessing proposals for development that may be at risk of flooding or that have implications for flooding elsewhere.**

**The provisions of these policies will prevail unless there are other overriding policy or material considerations that outweigh them and justify a contrary decision.**

## **Policy FLD 1 Development in Fluvial (River) and Coastal Flood Plains**

Development will not be permitted within the 1 in 100 year fluvial flood plain (AEP<sup>7</sup> of 1%) or the 1 in 200 year coastal flood plain (AEP of 0.5%) unless the applicant can demonstrate that the proposal constitutes an exception to the policy.

Where the principle of development is accepted by the planning authority through meeting the 'Exceptions Test', as set out below under the Exceptions heading, the applicant is required to submit a Flood Risk Assessment for all proposals. Planning permission will only be granted if the Flood Risk Assessment demonstrates that:

- a) All sources of flood risk to and from the proposed development have been identified; and
- b) There are adequate measures to manage and mitigate any increase in flood risk arising from the development.

### **Exceptions**

#### **Defended Areas**

- a) Development of previously developed land protected by flood defences that are confirmed by DARD, as the competent authority, as structurally adequate and provide a minimum standard of 1 in 100 year fluvial or 1 in 200 year coastal flood protection.
  - Due to the residual flood risk there will be a presumption against development where proposals include essential infrastructure, storage of hazardous substances, bespoke accommodation for vulnerable groups or development located close to flood defences.
  - Proposals involving significant intensification of use will be considered on their individual merits and will be informed by the Flood Risk Assessment.

#### **Undefended Areas**

- b) New development within settlements in the coastal floodplain where the land is raised (through infilling), to an acceptable level above the flood plain and subject to meeting all of the following criteria:
  - The proposal is not dependent on the provision of new coastal flood defences or likely to require such protection as a result

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<sup>7</sup> Refer to Glossary

of anticipated climate change;

- The site is not in an area likely to be at risk from coastal erosion or land instability and the proposed development will not significantly increase such risks in the locality;
- The elevation of development above the flood plain will not unduly disrupt the provision and ongoing delivery of essential services, including access, power, water and sewerage.

c) Replacement of an existing building.

- Proposals that include essential infrastructure or bespoke accommodation for vulnerable groups or that involve significant intensification of use will not be acceptable.

d) Development for agricultural use, transport and utilities infrastructure, which for operational reasons has to be located within the flood plain.

e) Water compatible development such as for boat mooring, navigation and water based recreational use, which for operational reasons has to be located within the flood plain.

f) The use of land for sport and outdoor recreation, amenity open space or for nature conservation purposes, including ancillary buildings. This exception does not include playgrounds for children.

g) The extraction of mineral deposits and necessary ancillary development.

#### **Development Proposals of Overriding Regional or Sub-Regional Economic Importance**

A development proposal within the floodplain that does not constitute an exception to the policy may be permitted where it is deemed to be of overriding regional or sub regional economic importance and meets both of the following criteria:

- Demonstration of exceptional benefit to the regional or sub-regional economy;
- Demonstration that the proposal requires a location within the flood plain and justification of why possible alternative sites outside the flood plain are unsuitable.

Where the principle of development is established through meeting the above criteria, the planning authority will steer the development to

**those sites at lowest flood risk. The applicant is required to submit a Flood Risk Assessment for all proposals**

### **Minor Development**

**Minor development<sup>8</sup> will be acceptable within defended and undefended flood plains subject to a satisfactory flood risk assessment<sup>9</sup>.**

### **Flood Protection / Management Measures**

**The following flood protection and management measures proposed as part of the planning application, in order to facilitate development within flood plains, will not be acceptable:**

- **new hard engineered or earthen bank flood defences;**
- **flood compensation storage works;**
- **land raising (infilling) to elevate a site above the flood level within the undefended fluvial flood plain.**

## **Justification and Amplification**

6.1 Flood plains store and convey water during times of flood. These functions are important in the wider flood management system. New development within a flood plain will not only be at risk of flooding itself but it will add to the risk of flooding elsewhere. The cumulative effect of piecemeal development within a flood plain can also redirect flows and will also undermine its natural function in accommodating and attenuating flood water. Accordingly, to minimise flood risk and help maintain their natural function it is necessary to avoid development within flood plains wherever possible.

### ***Definition of a Flood Plain***

6.2 A river or fluvial flood plain is a generally flat area adjacent to a river where water flows in time of flooding or would flow but for the presence of flood defences. For planning purposes, taking into account climate change predictions based on available scientific evidence, the design limits of flood plains are currently defined as follows:

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<sup>8</sup> As defined in the Glossary

<sup>9</sup> The need for a Flood Risk Assessment for residential extensions and alterations will be determined on a case by case basis

- River (Fluvial) Flood Plain – the extent of a flood event with a 1 in 100 year probability (or 1% annual probability) of exceeding the peak floodwater level.

A coastal flood plain is a generally flat area adjacent to the shoreline where water flows in time of flooding, attributed to the combination of high tide levels, surge, wave action and sea level rise or would flow but for the presence of coastal flood defences.

- Coastal (Tidal) Flood Plain – the extent of a flood event with a 1 in 200 year probability (or 0.5% annual probability) of exceeding the peak floodwater level.

6.3 While there is a lower annual probability of flooding within coastal flood plains compared with river flood plains, the effect of rapid inundation by fast flowing sea water presents a greater risk to life, hence planning policy for development in both cases is broadly similar.

6.4 Estuarine flooding can originate from a combination of both river and coastal sources. In such areas the policy will apply to the greatest flood risk, normally the higher flood level and greater area of flood inundation.

6.5 DARD Rivers Agency advises the planning authority on the extent of river and coastal flood plains in Northern Ireland. Current information on flooded areas, including the definition of present day river and coastal flood plains and those which take account of climate change predictions, is available on the Strategic Flood Maps for Northern Ireland, available on the "indirect" Website <http://www.dardni.gov.uk/index/rivers/flood-maps-ni.htm>

6.6 This information is being regularly updated as more detailed flood hazard and risk maps are prepared as required by the EU Floods Directive. The extent of flood plains may therefore change over time in response to any updated flood risk maps that may be published in line with the implementation of the Floods Directive in Northern Ireland.

### ***Defended Areas***

- 6.7 A '*Defended Area*' is that part of the flood plain where flooding would normally occur except for the presence of flood defences. The location of the flood defences and the areas benefiting from their protection are shown on the Strategic Flood Maps for Northern Ireland, available on the Rivers Agency website. [Strategic Flood Maps](#).
- 6.8 Previously developed land protected by existing flood defences, either cored earthen flood banks or hard engineered walls, constructed to the appropriate standard and height<sup>10</sup>, will generally be considered acceptable for development.
- 6.9 The flood risk within a defended area cannot be entirely eliminated. Flood defences are designed to protect land from a specific height of flood water such as a 100 year fluvial or 200 year coastal flood event. The possibility of a flood greater than this occurring and overtopping the defences (the residual flood risk) will always remain. Another risk arises through the potential for structural collapse and breaching of the defences which could result in sudden and rapid inundation of flood water. There is also potential for back drainage systems to become overwhelmed as they are unable to discharge effectively when water levels remain high during flood conditions. In all such circumstances flood water within defended areas is likely to become trapped by the defences, resulting in longer term impacts and may require evacuation and pumping or other engineering solutions to remove.
- 6.10 Because of these flood risks the policy places restrictions on the location of development relative to flood defences. The policy also restricts certain types of development for which the consequences of a flood event could be serious, either in terms of the direct threat to vulnerable groups, or the secondary impacts on the general population arising through damage or disruption to essential infrastructure or pollution.

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<sup>10</sup> The height of a flood defence to top level should include an allowance for freeboard. This is normally between 300mm – 600mm above the design flood level to accommodate factors such as wave action, storm surge and climate change.

- 6.11 Development close to flood defences will be resisted as such land will often be low lying and therefore the most susceptible to flooding. Also, it may need to be available for temporary flood storage in a flood event. Before progressing proposals in proximity to flood defences, developers are advised to seek guidance from Rivers Agency on acceptable separation distances.
- 6.12 Vulnerable groups would generally include the young, old and infirm. Flood warning and evacuation procedures may be difficult to implement for people with disabilities or those whose mobility is otherwise impaired, therefore their risks of injury or fatality are somewhat greater than for the general population. Accordingly, because of the residual flood risk, the policy operates a presumption against permission being granted for development associated with vulnerable groups. This includes facilities such as children's nurseries, schools, residential care / nursing homes, sheltered housing and hospitals. This list is not exhaustive.
- 6.13 Development proposals for essential infrastructure, such as for emergency services / emergency depots, power supply and telecommunications will be resisted because access and uninterrupted operation cannot be guaranteed in locations where there is a residual flood risk.
- 6.14 Development likely to give rise to significant levels of environmental pollution in the event of damage caused by flooding will be discouraged because of the residual flood risk in defended areas. Therefore proposals for development associated with the storage of hazardous substances, fuel storage depots, sewage treatment works or other development likely to give rise to environmental pollution in the event of flooding will only be granted planning permission where it is demonstrated that an alternative lower risk location is not available and that adequate provision is made for pollution containment so as to prevent a pollution incident in the event of flooding.
- 6.15 Development involving a significant intensification of use, such as the conversion of a single dwelling unit to a number of apartments, would be liable to expose more people to the residual flood risk in defended areas. However,

whilst such development is not desirable in the context of flood risk, this factor must be balanced against other material considerations, including the provisions of other Planning Policy Statements that may tend to favour higher density development in urban areas. Accordingly, the planning authority will determine each application on its individual merits taking account of the scope for mitigation of the residual flood risk.

6.16 There will be a presumption against development of green field sites in defended areas. As well as exposing more people and property to the residual flood risk, this form of development could remove valuable flood storage should the defences overtop or breach.

### ***Undefended Areas***

6.17 An '*Undefended Area*' is an area within the flood plain that is not protected by flood defences. This applies to the vast majority of fluvial and coastal flood plains. Undefended areas are at much higher flood risk than defended areas, although the flooded areas are usually more predictable and flood water usually recedes more quickly.

6.18 Any built development will cause piecemeal reduction of the flood plain and potentially remove valuable flood storage area, which may cause or exacerbate flooding elsewhere. Development also has the potential to impair the conveyance function of the flood plain and its ecological integrity. For these reasons, and also the need to limit exposure of people and property to flood risk, built development and infrastructure works, particularly on green field sites, will normally not be permitted.

6.19 However, it is recognised that in certain cases, development or infrastructure has to be in such locations, as alternative lower flood risk sites would be neither practical nor available. Exceptions to the policy are therefore set out for a range of development types, including for example, agricultural development, minerals development and transport or utilities infrastructure. In regard to agricultural and minerals development, this exception will only apply where the

unit is located wholly in the flood plain or where the use of other land outside the flood plain would not be feasible and available.

6.20 The policy provides opportunity for new development in the undefended coastal flood plain on the basis that infilling and land raising to an appropriate level above the flood plain will have a negligible effect on the extent of the coastal flood plain, now or in the future, taking account of anticipated climate change. Accordingly, such development will not result in additional flood risk elsewhere in the coastal flood plain. In order to minimise the potential incidence of coastal erosion to the development (or elsewhere as a result of it), particularly in areas of 'soft' coastline, the exception applies only within settlements where a built footprint will have already been established.

6.21 Replacement of an existing building may be considered on the basis that this should not normally result in any material increase in the flood risk to the development or elsewhere. The adoption of suitable flood proofing measures through resistance and resilience construction (Annex E) will normally be expected. However the replacement of a building to provide bespoke accommodation allowing for the introduction of vulnerable groups to the flood risk area is unacceptable. Similarly, replacement of a building to accommodate essential infrastructure will be unacceptable as continual access and egress for operational activities will no longer be possible when the area has been cut off during a flood event. Finally, a replacement proposal which involves significant intensification of use, for example through increasing the existing footprint or change of use, will be resisted if this would have the effect of introducing more people to a high flood risk area.

6.22 The policy allows for the provision of areas for amenity open space, sports, outdoor recreation and nature conservation purposes on the basis that such areas are not generally occupied and are unlikely to incur major damage as a result of flood inundation. Children's playgrounds are not included in this exception to the policy as such proposals would have the effect of exposing a vulnerable group to flood risk. Ancillary development such as changing facilities and job-related accommodation for caretakers and staff may be acceptable where justified by the flood risk assessment.

- 6.23 Even though these areas are intermittently occupied, proposals will be required to demonstrate mitigation providing for adequate flood warning procedures and safe means of evacuation from the site. Open space areas in the undefended flood plain should be suitably contoured to avoid ponding and to allow for the quick recession of flood water. The use of synthetic sports surfaces will not be permitted where this would increase the flood risk to the site or elsewhere. It should also be noted that such materials are prone to damage through flooding.
- 6.24 Where a proposal for residential development includes land adjacent to or partially within a flood plain, it will normally be acceptable to utilise the flood plain land for public open space associated with the housing. This will only be acceptable where there is no infilling of the open space and suitable mitigation measures such as signage are in place to facilitate safe access and egress.

***Development Proposals of Overriding Regional or Sub-Regional Economic Importance***

- 6.25 While most economic development is best located outside of flood plains, it is accepted that certain projects because of their nature, size or site specific requirements, may require a site that happens to fall within a flood plain. In such circumstances the policy allows for development that is demonstrated to be of significant regional or sub- regional economic importance. Normally, such a proposal will be expected to demonstrate its particular contribution to the regional economy. However, a proposal may also be considered acceptable if it is of significant sub-regional economic importance, for example, in providing employment for a substantial number of people living in one or more district council areas.
- 6.26 In regard to such proposals, developers must justify the need for a location within the flood plain. As part of this process, there will be a requirement to demonstrate that a thorough search for sites outside the flood plain has been undertaken and to justify why these are considered unsuitable. Subject to the principle of development in the flood plain being accepted by the planning authority, the developer will be prompted to identify a suitable site in the least

vulnerable parts of the flood plain. The development of greenfield sites in the undefended fluvial flood plain will rarely be acceptable as these areas pose the greatest flood risk.

### ***Flood Management and Mitigation Measures***

- 6.27 Where, by exception or overriding need, built development is acceptable in principle in the flood plain, then a Flood Risk Assessment (FRA) is required. This must demonstrate measures that shall be taken to manage and mitigate the identified risks. These measures will be proportionate to the flood risk and generally will be more rigorous in undefended areas than in defended areas where the flood risk (residual) is lesser. Details and methodology relating to the FRA are outlined in Annex D. Information on flood proofing, resistance and resilience techniques is contained in Annex E.
- 6.28 The policy specifies certain types of flood mitigation measures which are not normally considered acceptable in flood plains. Infilling or land raising within the undefended fluvial flood plain is not considered acceptable because the loss of flood storage area may well cause or exacerbate flooding elsewhere. Flood compensation storage involves the replacement of flood plain land lost through infilling for development, with compensatory land at the same level and in a close location. This compensatory land is provided through excavation. Due to the cumulative effect and unknown implications associated with infilling and excavation, flood compensatory storage in itself is not considered as justification for development in a flood plain. However, in exceptional circumstances where infilling may be permitted to facilitate the provision of key infrastructure, such as a road embankment, flood compensatory storage may be acceptable as a flood mitigation measure.
- 6.29 New hard engineered or cored earthen bank flood defences, publically funded and constructed, are seen as a necessary and acceptable flood mitigation method to protect existing property that is **already** in the flood plain and is liable to repeated flooding and resulting damage. However new hard engineered or earthen bank flood defences, proposed by the applicant, will not be seen as justification to allow development in the flood plain to proceed. This is because

the defences will remove valuable flood storage from the flood plain, which may put other locations at increased flood risk, and also introduce people to an area where the threat of residual flooding by overtopping or collapse will always remain.

6.30 As indicated in paragraph 6.20, infilling within the **undefended coastal flood plain** will be considered as an acceptable flood mitigation measure as the loss of storage area will have a negligible effect on the extent of the coastal flood plain. However, development relying on infilling or raising of land will need to address other factors such as a suitable freeboard and safe access and egress to the site which may limit sites to those areas of lower risk close to the extremities of the flood plain.

## **Policy FLD 2 Protection of Flood Defence and Drainage Infrastructure**

**The planning authority will not permit development that would impede the operational effectiveness of flood defence and drainage infrastructure or hinder access to enable their maintenance.**

### **Justification and Amplification**

- 6.31 Flood defence and drainage infrastructure are critical in providing a level of flood protection to people and property and adequate land drainage.
- 6.32 Where a new development proposal is located beside a flood defence, control structure or watercourse it is essential that an adjacent working strip is retained to facilitate future maintenance by Rivers Agency, other statutory undertaker or the riparian landowners. The working strip should have a minimum width of 5 metres, but up to 10 metres where considered necessary, and be provided with clear access and egress at all times. The retention of a working strip along watercourses will have added benefits, including general amenity, enhanced biodiversity and increased control over water pollution, the latter assisting in the implementation of the Water Framework Directive.
- 6.33 There is a general presumption against the erection of buildings or other structures over the line of a culverted watercourse in order to facilitate replacement, maintenance or other necessary operations.

## **Policy FLD 3**

### **Development and Surface Water (Pluvial) Flood Risk Outside Flood Plains**

**A Drainage Assessment will be required for all development proposals that exceed any of the following thresholds:**

- **A residential development comprising of 10 or more dwelling units**
- **A development site in excess of 1 hectare**
- **A change of use involving new buildings and / or hardsurfacing exceeding 1000 square metres in area.**

**A Drainage Assessment will also be required for any development proposal, except for minor development<sup>11</sup>, where:**

- **The proposed development is located in an area where there is evidence of a history of surface water flooding.**
- **Surface water run-off from the development may adversely impact upon other development or features of importance to nature conservation, archaeology or the built heritage.**

**Such development will be permitted where it is demonstrated through the Drainage Assessment that adequate measures will be put in place so as to effectively mitigate the flood risk to the proposed development and from the development elsewhere.**

**Where a Drainage Assessment is not required but there is potential for surface water flooding as indicated by the surface water layer of the Strategic Flood Map, it is the developer's responsibility to assess the flood risk and drainage impact and to mitigate the risk to the development and any impacts beyond the site.**

**Where the proposed development is also located within a fluvial or coastal flood plain, then Policy FLD 1 will take precedence.**

## **Justification and Amplification**

6.34 Pluvial or surface water flooding occurs as a result of high intensity rainfall which overwhelms natural or man-made drainage systems resulting in water flowing overland and ponding in depressions in the ground. It is a particular

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<sup>11</sup>See Glossary for definition

problem in urban areas which are often dominated by non-permeable surfaces (eg roofs, roads and car parks). Such development inhibits the natural run-off process, often by removing opportunities for surface water storage and restricting infiltration of water into the ground. Surface water runoff and flooding has increased steadily with the expansion of urban areas, the infilling of green spaces and the cumulative effects of minor development such as house extensions and the paving of gardens to provide for patios and car parking.

6.35 All of these factors have combined to intensify surface water runoff and place additional pressures on the drainage network, particularly during prolonged periods of high intensity rainfall. It is not uncommon for drainage systems to be overwhelmed during such rainfall events, particularly where blockages occur. The problem is exacerbated in many areas by an outdated drainage infrastructure that has not been upgraded to cope with the rate of development. However, even modern urban drainage systems are designed only to cope with a 1 in 30 year (3.3% AEP) rainfall event while older parts of the network will invariably be operating to a much lower standard.

6.36 Damage from pluvial flooding has been a major factor in recent significant flood events in Northern Ireland. In the 2007 and 2008 flood events it is estimated that 84% and 60% of the respective total economic damages were attributable to this source. Although generally localised, this type of flooding may be extended in duration through water being trapped in low lying areas, thus causing more damage to property and greater hardship to the people affected. A flood event caused by an artificial drainage system surcharge can also pose public health risks through foul water contamination.

6.37 The Strategic Flood Map was updated in December 2011 to include information on surface water flood risk. The new surface water layer is a strategic level assessment and only gives an indication of the likelihood of pluvial flooding. Nevertheless, the map indicates that approximately 20,000 or 2.5% of the properties in Northern Ireland are sited in an area that is shown to be at risk of flooding from a 1 in 200 year (0.5% AEP) pluvial event greater

than 300 mm deep, albeit that many of these properties would already be at risk from fluvial and / or coastal flooding. As a consequence of the predicted increase in the frequency and intensity of extreme rainfall events due to climate change, urban areas are susceptible to an increasing risk of this type of flooding.

- 6.38 The approach adopted in PPS 15 to the management of development likely to be at risk from surface water flooding is to facilitate development provided that the drainage assessment demonstrates that the flood risk can be effectively controlled and mitigated and that it will not create greater potential for surface water flooding elsewhere. However, adequate control and mitigation may prove difficult and expensive in locations where there is a history of recurrent flooding and in such circumstances it would be prudent for the developer to consider an alternative site.
- 6.39 In carrying out the drainage assessment, the developer should give consideration to the use of sustainable drainage systems (SuDS) as the preferred drainage solution. These systems manage surface water at or close to source. Sustainable drainage techniques will include water storage (eg ponds), swales, wetlands and groundwater infiltration. It is recommended that these techniques are used in combination to secure maximum benefit. More detailed information on the general application of SuDS is contained in Annex C.
- 6.40 In assessing the need for a drainage assessment the planning authority may consult with Rivers Agency or other relevant government departments<sup>12</sup> and non departmental public bodies. This may be necessary in order to establish whether there is evidence of a history of surface water flooding at a particular location. Consultation will also be carried out as necessary in appraising the drainage assessment. This is necessary not only to assess the adequacy of the proposed control and mitigation measures in the context of the policy, but also to afford the opportunity for such bodies to assess the impact of the measures upon their infrastructure. Where a proposal is acceptable, the

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<sup>12</sup> The Surface Water Roles and Responsibilities Report, December 2011, sets out current arrangements for the management of surface water flooding between various government departments and statutory agencies.

planning authority will need to be satisfied that suitable arrangements are in place in regard to the long term management and maintenance of the infrastructure on which mitigation depends.

- 6.41 Identification of areas where there is a history of surface water flooding can be derived from the flood map historical layer available on the Rivers Agency Website, Strategic Flood Maps, or by contacting Rivers Agency staff for further information or clarity. The Strategic Flood Map will also assist developers in identifying broad locations where surface water flooding could be a potential problem.
- 6.42 Even in circumstances where a drainage assessment is not required by the policy it remains the responsibility of the applicant (or suitably qualified person with demonstrable experience in flood risk assessments ) to assess the flood risk and drainage impact of the proposed development and to mitigate the risk to their development and that beyond the site. An informative to this effect will normally be attached to planning approvals, where relevant.

## **Policy FLD 4 Artificial Modification of Watercourses**

**The planning authority will only permit the artificial modification of a watercourse, including culverting or canalisation operations, in either of the following exceptional circumstances:**

- **Where the culverting of short length of a watercourse is necessary to provide access to a development site or part thereof;**
- **Where it can be demonstrated that a specific length of watercourse needs to be culverted for engineering reasons and that there are no reasonable or practicable alternative courses of action.**

### **Justification and Amplification**

6.43 Culverting and / or canalisation of watercourses, whether undertaken as an operation in its own right, or as works associated with the development of land usually requires planning permission.

6.44 Some culverting operations may constitute permitted development as set out under the provisions of the Planning (General Development) Order (Northern Ireland) 1993 and subsequent amendments. In some cases it may be necessary to remove permitted development rights where culverting is likely to increase flood risk elsewhere.

6.45 Any artificial modification of a watercourse as part of a flood alleviation or drainage infrastructure scheme carried out by a public body in pursuance of its statutory responsibilities will normally be exempt from planning permission. However approvals may still be required from the relevant authority.

6.46 Where culverting is proposed for other than development purposes, for example a change in agricultural use, then approval may also have to be sought from other relevant authorities. It is important to be aware that such

written consents do not constitute planning permission to undertake culverting or canalisation activities. Such an operation carried out without planning permission is a breach of planning control which could result in enforcement action to undertake remedial action.

- 6.47 If part of a watercourse is already culverted prior to the commencement of any development, this does not necessarily mean that it can automatically be lengthened or upgraded to meet the site discharge requirements. Each application will be assessed on its own merits.
- 6.48 The artificial modification of watercourses is likely to have impacts which run contrary to the objectives of sustainable development as embodied in the Water Framework Directive, the Floods Directive and the Northern Ireland Sustainable Development Strategy.
- 6.49 Culverting and canalisation are generally considered to be environmentally unsustainable as such operations can adversely impact upon visual amenity in the built environment and can damage or impair the landscape quality, ecological integrity and biodiversity of watercourses. Culverting creates barriers to the passage of fish, while the higher flow velocities generated cause the unnatural movement of sediment, increased erosion downstream and hinder the future recovery of the watercourse.
- 6.50 Whilst culverting may in some instances alleviate local flood risk, it can increase flood risk downstream by the accumulation of higher flows. The installation of protective grilles at culvert inlets may reduce the incidence of blockages within the culvert, but can often become blocked themselves and cause flooding as a result of a high intensity rainfall event or lack of maintenance. Culverting therefore does not completely remove the potential for local flooding.
- 6.51 All new development should aim to be in harmony with the water environment. Good layout and design should promote the retention of open watercourses as a central amenity feature, although re-alignment or diversion to enhance the quality of the site layout will normally be acceptable where there are no

overriding environmental concerns. Consistent with the requirements of PPS 7 'Quality Residential Environments'; incorporating watercourses into the open space requirements for new residential development will be preferred to locating them to the rear of properties where they are difficult to maintain or can become dumping grounds contributing to flood risk.

Where possible the removal of culverts and the re-introduction of the natural watercourse should be encouraged.

- 6.52 The adoption of sustainable drainage solutions (SuDS) for the disposal of stormwater may be a much more sustainable alternative than culverting or other options involving the artificial modification of watercourses. The use of SuDS source control solutions such as ponds and swales and their integration into new development schemes as amenity features will therefore be encouraged. Such solutions, by negating increased site discharges will reduce the need for flood alleviation / culverting works downstream and any associated maintenance.
- 6.53 It is acknowledged that in exceptional circumstances, culverting of a section of a watercourse may be unavoidable. This may apply where there are insurmountable inherent structural problems such as slope stability and land slippage. However, even in such circumstances, other solutions such as bank reinforcement, gabion wall construction and underpinning should be considered first, as they will usually have lesser long term environmental / ecological impacts. Similarly, where there are health and safety concerns arising from open access to watercourses or hazardous riverbanks, the construction of solid barriers such as fencing, or planting of 'soft' landscape barriers, should be considered as alternatives to culverting.
- 6.54 Culverting of short lengths of the watercourse (usually less than 10m) is acceptable to enable access to and from the development as required. The site design should aim to keep the number of crossings to a minimum.

## **Policy FLD 5 Development in Proximity to Reservoirs<sup>13</sup>**

### **New development**

**New development will only be permitted within the potential flood inundation area of a “controlled reservoir”<sup>14</sup> as shown on the Strategic Flood Map, if:**

- the applicant can demonstrate that the condition, management and maintenance regime of the reservoir is appropriate to provide sufficient assurance regarding reservoir safety, so as to enable the development to proceed;**
- the application is accompanied by a Flood Risk Assessment which demonstrates:**
  - 1. an assessment of the downstream flood risk in the event of:**
    - a controlled release of water**
    - an uncontrolled release of water due to reservoir failure**
    - a change in flow paths as a result of the proposed development**

**and**

- 2. that there are suitable measures to manage and mitigate the identified flood risk, including details of emergency evacuation procedures**

### **Replacement Buildings**

**A proposal for the replacement of an existing building within the potential flood inundation area downstream of a controlled reservoir must be accompanied by a Flood Risk Assessment. Planning permission will be granted provided it is demonstrated that there is no**

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<sup>13</sup> Policy FLD 5 applies to Reservoirs, Dams and other impounding structures as defined by the forthcoming Reservoirs legislation.

<sup>14</sup> Reservoirs with an individual or combined capacity greater than 10,000 cubic metres above the natural level of any part of the surrounding land

**material increase in the flood risk to the development or elsewhere.**

### **All Development**

**There will be a presumption against development within the potential flood inundation area for proposals that include:**

- **essential infrastructure;**
- **storage of hazardous substances;**
- **bespoke accommodation for vulnerable groups;**

**and for any development located in areas where the Flood Risk Assessment indicates potential for an unacceptable combination of depth and velocity.**

### **Justification and Amplification**

6.55 Water impounding structures such as reservoirs or dams constitute a potential source of flood risk that can have serious consequences. Flooding of downstream areas within what is known as the area of inundation may ensue if the structure fails or is overtopped. Downstream flooding may also arise from the controlled release of water from the reservoir, for example via spillways during periods of high flows due to weather conditions. This is normal practice to avoid capacity exceedance and overtopping.

6.56 In any of these circumstances there is potential for rapid inundation of downstream areas and response times to flooding are likely to be short. This is especially the case where failure of reservoir structures triggers land slips resulting in a sudden uncontrolled release of water.

### **The Reservoirs Bill for Northern Ireland<sup>15</sup>**

6.57 The Reservoirs Bill is intended to address the flood risk from reservoirs, including impoundments. The legislation will provide greater protection for people, property and critical infrastructure from the risk of flooding through the management and regulation of controlled reservoirs.

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<sup>15</sup> The Reservoirs Bill is currently in draft with a view to commencing the legislation in 2014/15.

- 6.58 It is intended that the legislation will provide for a risk based and proportionate approach for the management of controlled reservoirs. A Register of Reservoirs within Northern Ireland will indicate the risk category of such reservoirs as 'high', 'medium' or 'low' risk, according to the potential differential impacts on human life, economic activity, the environment and cultural heritage in the inundation areas. Reservoirs designated as 'high' risk will be subject to more rigorous standards of control and ongoing maintenance than those included in lower risk categories.
- 6.59 New development will have cost implications for the reservoir manager and the developer where structural improvement works are required to bring the impounding structure to the required standard. There are also likely to be ongoing maintenance costs to be borne by one or both parties. The funding of such costs is a private matter between the developer and the reservoir manager.

### **Planning Considerations**

- 6.60 Development within the flood inundation area of a reservoir can only be justified where the condition, management and maintenance regime of the reservoir are appropriate to provide assurance regarding reservoir safety. Accordingly, the policy requires that planning permission for new development can only be granted subject to such assurance. In this regard, the planning application must be accompanied by certification from a person with demonstrable experience in flood risk management, which will then require to be appraised by Rivers Agency, as the responsible body for the management of reservoir flood risk.
- 6.61 There will be a presumption against development in areas where the Flood Risk Assessment indicates that there is a likelihood of an unacceptable combination of depth and velocity. In many situations this may be in locations close to the reservoir impoundment, where, in the event of a reservoir flood event, such areas may be subjected to flood waves that have very short lead in times with greater water depths and higher velocities than elsewhere within the flood inundation area.

- 6.62 Due to the risk of rapid inundation in the event of reservoir flooding and the limitations of certain vulnerable groups to react promptly to flood warning and evacuation procedures, the policy operates a presumption against bespoke development for vulnerable groups within reservoir flood inundation areas.
- 6.63 Any proposed development for essential infrastructure, such as for emergency services / depots, transport or utilities and also development for the storage of hazardous substances will need to demonstrate in the Flood Risk Assessment that no alternative viable sites or routes are available and that they can remain operational at times of flooding or can demonstrate appropriate contingency planning.
- 6.64 The replacement of a building within a flood inundation area will generally be acceptable as in most cases this ought not to affect the potential future flood risk area. Where the Flood Risk Assessment indicates that the site is located in an area susceptible to an unacceptable combination of depth and velocity, replacement opportunities located elsewhere should be considered and discussed with the planning authority.

### **Flood Risk Assessment**

- 6.65 A Flood Risk Assessment will be required for all development proposals, except for minor development, within the potential flood inundation areas of controlled reservoirs. This must address the controlled and uncontrolled release of flood water from the reservoir and should normally include a map showing flow paths, depths and velocities of the flood water. The Flood Risk Assessment should also provide for an emergency evacuation plan that can demonstrate the safe access and egress for emergency services and people during times of flooding. The detail required in the Flood Risk Assessment will be proportionate to the flood risk.
- 6.66 Even in circumstances where an impounding structure does not fall within the policy it remains the responsibility of the applicant (or suitably qualified person with demonstrable experience in flood risk management) to consider and

assess the flood risk and drainage impact of the proposed development and to mitigate the risk to the development and that beyond the site.

## Annex A: Impacts of Climate Change

- A1 The most recent climate change predictions up to 2100 date from 2009 and have been estimated by the United Kingdom Climate Projections (UKCP 09). These predictions update and replace those of UKCIP 02 and UKCIP 98. They are based on anticipated change to climate variables such as precipitation, temperature, wind speed and sea level rise and take account of different scenarios concerning varying levels of greenhouse gas emissions over the period.
- A2 UKCP09 indicates an increased preponderance of hotter drier summers and warmer wetter winters, coupled with increased frequency of extreme weather occurrences such as heatwaves, dry spells, heavy rain and flooding. Some of the key findings from the Climate Change Projections estimate that by the 2050's Northern Ireland will have:
- An increase in winter mean temperature of approximately 1.7 °C;
  - An increase in summer mean temperature of approximately 2.2°C;
  - Changes in winter mean precipitation of approximately +9%;
  - Changes in summer mean precipitation of approximately -12%;
- and
- Sea level rise for Belfast of 14.5cm above the 1990 sea level.
- A3 Whilst flood risk is generally expected to increase in response to climate change, there is uncertainty surrounding the flood risks that particular areas of Northern Ireland face both today and in the future. This uncertainty applies both to the degree of climate change that will occur, and the implications this will have for rainfall patterns, and the permeability of the land.
- A4 Flood risk is also driven by non-climate change factors. In this context the ongoing expansion of urban areas will increase flood risk as the loss of natural permeable ground and its replacement with impermeable surfaces leads to faster surface run-off into watercourses in the event of heavy rainfall.

- A5 The key challenge for flood risk management is that the effect of these drivers (and more specifically changes in these) on the risk of flooding is not certain, with no clear evidence linking changes in these factors to given changes in flooding levels in particular areas. As a result, there are many potential future levels of flood risk that could be realised, with no clear consensus over which levels of flood risk are more likely than others.
- A6 The most recent assessment of the potential local impacts of climate change is the Northern Ireland Climate Change Risk Assessment (CCRA).<sup>16</sup> This identifies, for different sectors such as agriculture, health, transport, business and the natural environment, the risks and opportunities likely to ensue through climate change. The report informed the Northern Ireland climate Change Adaption Programme, published in January 2014, which will identifies priorities for action and appropriate sustainable adaptation measures that will be required to minimise risks to the economy, environment and society.
- A7 Climate change adaptation is about dealing sustainably with the consequences of a changing climate, adapting to those impacts and reducing exposure to the risk of damage. It is also about developing the capacity to cope with unavoidable damage and taking advantage of any new opportunities that arise. Sustainable adaptation with regard to flood risk will include a combination of a number of the following measures : -
- a. Updating climate change flood maps to inform future development proposals.
  - b. Strengthening planning policy so as to minimise development in flood prone areas
  - c. Improving the resilience of existing flood defence/drainage infrastructure
  - d. Upgrading of storm and drainage culverts and managing exceedance

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<sup>16</sup> [http://www.doeni.gov.uk/climate\\_change\\_risk\\_assessment\\_ni\\_2012.pdf](http://www.doeni.gov.uk/climate_change_risk_assessment_ni_2012.pdf)

- e. Introducing SuDS solutions to complement traditional drainage solutions.
- f. Better preparation and flood proofing for those properties that are at increased flood risk including those which may have had no previous flood history.
- g. Improved flood warning systems and emergency call out procedures.

Further information is available online:

Nationally:-

<http://ukclimateprojections.defra.gov.uk>:

Local:-

[http://www.doeni.gov.uk/index/protect\\_the\\_environment/climate\\_change.htm](http://www.doeni.gov.uk/index/protect_the_environment/climate_change.htm)

## **Annex B: Impact of Flooding on People and Property**

### **Introduction**

- B1 The effects of flooding can impact on a wide range of human activities and interests, the most obvious being the health and well being of people directly caught up in flood events and the damage caused to property by inundation of flood water.
- B2 Related socio-economic impacts can also affect the well-being of the wider community. These may range from loss of homes and personal possessions, to the disruption of key infrastructure and services and the local economy, the loss of business confidence and damage to cultural heritage and the environment. Additionally, repeated flooding of properties is likely to impact on property prices, the ability to get a mortgage agreement and the availability of affordable property insurance.
- B3 When considering new development in flood risk areas it is important to understand all the impacts that the flooding may bring, direct and indirect impacts, tangible and intangible losses and the immediate and long term damage and disruption.
- B4 The multiple impacts of inappropriate development in flood risk areas means that government may be compelled at a later stage to provide hard-engineered flood defences. This invariably involves significant costs which may not be affordable.

### **The Impact on Health and Well Being**

- B5 Loss of life from drowning or physical injury arising from being swept away by floodwater is very rare in Northern Ireland. However, there is growing concern about the potential adverse health effects associated with the trauma of a flood event. Living in a damp and dirty environment that such events cause

and the anxiety that living in an area liable to flooding can create are increasingly recognized. Table 1 highlights the possible health implications flooding can have.

**Table 1: Health Implications of Flooding**

**Direct Effects**

<b>Causes</b>	<b>Health Implications</b>
Stream flow velocity; topographic land features; absence of warning; rapid speed of flood onset; deep floodwaters; landslides; risk behaviour; fast flowing waters carrying debris.	Drowning Injuries
Contact with water	Respiratory diseases; shock; hypothermia; cardiac arrest.
Contact with polluted waters	Wound infections; dermatitis; conjunctivitis; gastrointestinal illnesses; ear, nose and throat infections; possible serious waterborne disease.
Increase in physical and emotional stress	Increase of susceptibility to psychosocial disturbances and cardiovascular incidences

**Indirect Effects**

<b>Causes</b>	<b>Health Implications</b>
Damage to water supply systems; sewage and sewage disposal damage; insufficient water supply	Possible waterborne infections (e.g. enterogenic E coli, shigella; hepatitis A; leptosperiosis)
Disruption to transport systems	Food shortages; disruption of emergency services.
Underground services disruption; contamination from waste sites; release of chemicals, oil, petrol storage etc.	Potential acute or chronic effects from chemical pollution.
Standing waters; heavy rainfall, expanded range of vector (disease carrying organism – especially insects) habitats	Vector borne diseases.
Rodent migration	Possible diseases caused by rodents.
Disruption of social networks; loss of property, jobs and family members/ friends	Possible psychosocial disturbance
Post flood clean up activities	Electrocutions; other injuries
Damage to or disruption of health services	Decreases in standard of or insufficient access to health care

*Source: Floods: Climate Change and Adaptation Strategies for Human Health (WHO 2002)*

## The Impact on Property

B6 The severity of damage to buildings is often dependent on the depth and duration of the flood event. Table 2 illustrates flood damage to a typical residential property. Flood proofing of property is addressed in Annex E.

**Table 2: Flood Damage to a Typical Residential Property**

Depth of Flood	Damage to Building	Damage to Services/ fittings	Loss of Personal Possessions
Below ground level	Minimal damage to main building. Flood water enters basements, cellars and under floor voids. Possible erosion under foundations.	Damage to electrical sockets and other services. Carpets in basements and cellars may need replaced	Possessions and furniture in basements and cellars damaged.
Up to half a metre above ground floor level (GFL)	Damages to internal finishes, plaster, wall coverings etc. Floors and walls become saturated requiring cleaning and drying. Flooring may require replacement. Damage to external and internal doors, skirting, etc.	Damage to electricity meter and fuse-box. Damage to gas meter, low level boilers and telephone services. Carpets and floor covering may need replaced. Kitchen units and electrical appliances may need replaced	Damage to furniture and electrical goods. Damage to small personal possessions. Food in low cupboards contaminated
More than half a metre above GFL.	Increased damage to walls. Possible structural damage	Damage to higher units, electrical services and appliances	Damage to personal possessions

Source: *Preparing for Floods (DTLR, 2002)*

## Implications on Property Insurance

B7 Flood insurance in Northern Ireland has recently been provided for under the Statement of Principles (SoP) which was a temporary agreement between the insurance industry represented by the Association of British Insurers (ABI) and the Northern Ireland Assembly. The SoP ensured that with certain conditions in place that private flood insurance remained widely available as a standard feature of domestic property insurance and where possible at an affordable price. However the SoP expired in June 2013. The government and the insurance industry are currently working on a new approach which through

a financial arrangement will ensure that flood insurance will remain widely available to all. Nevertheless, the accessibility of affordable insurance should be an important consideration for those proposing new development or purchasing property within flood risk areas. Property insurance premiums will be proportionate to the flood risk and the application of flood mitigation measures such as flood proofing of buildings and the establishment of “self help” procedures in preparation for flood emergencies. Developers should always consider alternative site locations outside the flood risk area. However, where the principle of development within a flood risk area has been established, the developer should liaise with the insurance industry at an early stage so as to ascertain if the proposed means of mitigation of the flood risk is sufficient to enable affordable flood insurance to be made available for subsequent property owners and tenants.

### **Impact on the Environment**

B8 River and coastal flood plains are valuable ecological resources which provide habitat for a wide range of plants and animals, many of which are rare. A number of the priority habitats identified in the Northern Ireland Biodiversity Strategy are associated with floodplains. In addition, flood plains are often important landscape assets and the location of features of the archaeological and built heritage. Flood events can damage ecosystems, habitats, archaeological / built heritage assets and landscape features, and development can exacerbate such damage. The natural regulation of floodwater limits ecological damage caused by flooding, while pondage areas provide for the trapping and deposition of sediments and recycling of the nutrients from run-off.

### **Conclusion**

B9 Human activity can therefore have a significant impact in increasing flood risk and new development that is constructed without regard to flood risk may serve only to endanger life, increase property and environmental damage and require wasteful expenditure on remedial works.

## **Annex C: Sustainable Drainage**

### **Development and Drainage**

- C1 Development inevitably results in hard, impermeable surfaces such as roofs, roads, footpaths and parking areas which traditionally drain surface water to pipes and sewers and thence to rivers. With development, the area of green space decreases and the volume and velocity of drainage water from the development site increases. Our existing engineered drainage network serving Northern Ireland is under considerable capacity pressures. Sustainable drainage offers a solution to support future development while avoiding increased pressure on the existing infrastructure. The use of sustainable drainage (SuDS), particularly for new developments, will provide drainage solutions while not adding more pressure to the existing drainage network.
- C2 Taking into consideration the latest research findings on climate change, which predicts more frequent and higher intensity rainfall events, it is imperative that the increased flood risk, particularly in urban and built up areas, is properly managed. Sustainable drainage is a key element in future climate change adaptation planning.
- C3 Traditionally, drainage has involved the installation of underground pipes to convey water away as quickly as possible. Although this approach may prevent local flooding it can simply transfer flood risk to other parts of the catchment. Piped drainage systems can become overwhelmed during prolonged periods of high intensity rainfall, particularly where drainage bottlenecks occur in urban centres. Additional water quality problems will occur where surface water and sewage are transported in the same pipes and flooding occurs.
- C4 Currently there is an automatic right for developers to connect surface water run-off to a surface or combined public sewer. When accompanied by ongoing urban development and the projected changes to rainfall patterns resulting from climate change, the climate change predictions, if realised, will

significantly increase both the volume and flow rate of storm water, thus increasing the risk of flooding in the future. An alternative approach widely used in other parts of the United Kingdom and European Union to address these problems involves the embedding of sustainable drainage measures into new development through the planning system. The current uptake of sustainable drainage solutions for new development within Northern Ireland is estimated to be below 5%.

## **Sustainable Drainage Systems**

C5 Careful design and incorporation of SuDS into new development or redevelopment schemes will deliver effective drainage while at the same time avoiding increased flood risk downstream. Sustainable drainage effectively delivers on the three 'pillars' that define the concept, ie water quantity, water quality and amenity / biodiversity, as depicted below:

### Water Quantity

Manage rainfall to mimic natural drainage

- Reduce run-off rates
- Reduce additional run-off volumes and frequencies
- Encourage natural groundwater recharge
- Reduce the impact of short duration intense storm events, in particular helping to reduce the impact of 'out of sewer' flood / pollution events

### Water Quality

Minimise adverse impacts on water quality

- Reduce pollution and protect the quality of receiving waters
- Prevent direct discharge of spillage -, SuDS used at the construction stage for a development is considered as 'best practice'
- Reduce the volume of surface waste runoff to sewers and so reduce storm overflows

### Amenity and Biodiversity

- Contribute to the amenity and aesthetic value of the development and the wider environs
- Provide habitat for wildlife and enhance biodiversity

## **Sustainable Stormwater Management Techniques**

C6 There is a wide range of sustainable drainage techniques available to developers,<sup>17</sup> which can be applied, individually or in combination. A combination of techniques will deliver the best results – for example, a housing development where downpipes are fitted with water butts, the driveways use permeable paving, all connecting to conveyance swales, which in turn are linked to a pond or wetland area. This combination of drainage techniques is known as a ‘treatment train’.

## **Benefits of Sustainable Drainage**

C7 Whilst the focus in PPS 15 is on flood risk management benefits, it should be noted that sustainable drainage offers a wide range of environmental, economic and social benefits.

### **C8 Flood Risk Management Benefits**

With climate change predictions for more extreme rainfall events, sustainable drainage systems will provide more drainage capacity and will incorporate a design capacity considerably greater than traditional pipes. Accordingly, they offer greater flood protection. The main flood risk management benefits are outlined below:

- SuDS reduce peak flows through the use of appropriate sustainable drainage techniques and will reduce the impact of localised surface water flooding;
- The reduction of peak flows from new development sites incorporating SuDS means that less stormwater will discharge to downstream drainage networks or watercourses, thereby reducing flood risk;
- Effective sustainable drainage systems can reduce the demand for and cost of flood emergency response and preparedness procedures;

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<sup>17</sup> **British Standards Institution Publication BS 8582:2013**  
*Code of practice for surface water management for development sites*  
Published November 2013.

- Sustainable drainage promotes a joined up approach to flood risk management as it requires input from a range of responsible bodies (eg the flood risk management authority, local councils, the land use planning authority, statutory undertakers) and a wide variety of disciplines (engineers, planners, architects / designers, hydrologists, water quality expertise and ecologists).

#### C9 Environmental Benefits

While the flood risk element of the disposal of surface water and the impact on human health and safety has long been a material consideration in the determination of planning applications; environmental considerations such as amenity, ecology and water resource issues have historically had limited influence on drainage system design and the determination of development decisions. However, the EC Water Framework Directive now requires urban diffuse pollution to be regulated through the implementation of the Directive. This means that continuing to drain built up areas without taking due account of wider environmental impacts, particularly on water quality, is no longer an option.

#### C10 Sustainable drainage provides opportunity for the realisation of a number of environmental benefits. These include:

- Improved water quality. This can be delivered in a number of ways, including: (a) natural treatment provided within the SuDS component – for example by filtering drainage thus reducing the level of sediment discharging to watercourses; (b) absorbing of nutrients by plants growing within the SuDS system; and (c) reduced volumes within the combined piped sewerage systems will mean fewer spills of storm sewage to watercourses.
- Increased capacity for water storage through retention of storm water, for example in basins, ponds and water butts provides opportunities for this water to be reused. This in turn creates potential for households and businesses to reduce their consumption of potable water;

- Conservation of biodiversity and ecology will be supported through the incorporation of SuDS features such as ponds and wetlands;
- A well designed SuDS system can connect into and support the existing drains and waterways located beyond the development site, thus extending biodiversity via new nature corridors.

## C11 Economic Benefits

Economic benefits likely to accrue from sustainable drainage include the following:

- The increased application of on-site sustainable drainage solutions by the developer will mean that less investment will be required in the provision and maintenance of traditional piped infrastructure. This should reduce costs for infrastructure providers such as DRD Transport NI, DARD Rivers Agency and Northern Ireland Water and also the need to seek cost recovery from the developer;
- The removal of storm water from combined sewerage systems will reduce the running costs of sewage treatment works and costs associated with pollution of watercourses;
- Developer savings can accrue through the combination and integration of sustainable drainage with open space provision, particularly on residential sites where the latter is usually required for amenity reasons<sup>18</sup>;
- Developer costs associated with designing and installing a sustainable drainage system are invariably less than with a traditional piped system;
- The retention of stormwater as a consequence of sustainable drainage may offer scope for rainwater harvesting and the reuse of this water can result in economic benefits. Considerations such as long term water resource security and improved water supply efficiency are assuming greater economic importance in the face of continually increasing demands upon water resources;

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<sup>18</sup> PPS 8 states 10% of the total site area as a normal expectation for open space provision in new residential development with this proportion rising to 15% for developments in excess of 300 units or 15 hectares.

- Buildings overlooking water features generally command higher than average premiums;
- Although difficult to quantify, the benefits to societal health and well being (see below) associated with sustainable drainage, particularly within urban areas, are likely to reduce public expenditure in such sectors as health and social services.

#### C12 Social / Amenity Benefits

Sustainable drainage also offers scope for the realisation of significant social, recreational and health / quality of life benefits. Examples include the following:

- The potential of some elements, such as swales, basins, ponds and wetlands to contribute to the provision and integration of 'green infrastructure'<sup>19</sup> within the urban fabric helps to deliver the quality of life benefits associated with green infrastructure;
- The potential use of some elements, such as ponds, for active and passive recreational purposes and educational purposes;
- Improved water quality generally will benefit public health and enhance the enjoyment of water based recreational activities such as angling;
- The risks to those suffering from respiratory conditions, notably asthma, resulting from air pollution, have been shown to reduce through the chemical effect of certain sustainable drainage systems in trapping pollutants. Such benefits are particularly realised in large urban areas where levels of air pollution are usually highest.

#### **Feasibility and Design Considerations**

C13 There are a number of considerations which may influence the choice and design of sustainable drainage solutions for specific sites. These include the following, although the list is not exhaustive:

- The surface structures that may be needed can use more space than conventional systems, although it is usually possible for them to be

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<sup>19</sup> Defined on page 20

integrated into the surrounding land use, for example in public open space or road verges;

- Infiltration may not be possible or is likely to be restricted in a number of circumstances; for example, if the permeability of the soil is limited, or the water table is high, or the land is contaminated or where there is ground instability. However, in all such situations, alternative SuDS solutions are usually available;
- Safety and access considerations associated with surface water will always need to be considered as part of the overall design of the development in general and surface water SuDS features in particular, so as to minimise risks.

### **Sustainable Drainage and the Planning Process**

C14 Currently, the option of using sustainable drainage to help offset flooding risk or as a more sustainable option to traditional piped drainage is not integral to the planning process. However, legislation is currently being considered within government which will support the implementation of sustainable drainage.

C15 Notwithstanding the current legislative position, development proposals that facilitate sustainable drainage while meeting broader planning objectives or requirements will usually be considered favourably by the planning authority. It is recognised for example that sustainable drainage offers much potential for providing amenity open space and enhancing quality in residential environments. The planning authority will therefore encourage early engagement with the developer and also between the developer and other relevant agencies and disciplines (eg architects, drainage engineers, landscape architects, ecologists). This will inform the planning and design of a sustainable drainage system that is suitable for the particular characteristics of the site and its surroundings. It will also influence the layout of the site and identify the potential for the drainage system to deliver planning and environmental benefits. Other considerations such as safety issues and long term operation and maintenance arrangements are also best addressed at an early stage.

## The Future for Sustainable Drainage in Northern Ireland

- C16 In regard to the implementation of sustainable drainage, progress in Northern Ireland lags behind the other UK jurisdictions where legislation<sup>20</sup> is in place that makes SuDS a requirement for most new development schemes and designates specific bodies with statutory responsibility for approval and oversight of the SuDS elements.
- C17 In Northern Ireland no such legislation is currently in place. However, it is government intention that sustainable drainage practices will ultimately be implemented as an integral part of the development process wherever possible. In September 2011 an inter-departmental / agency working party chaired by the Northern Ireland Environment Agency (NIEA) published the final version of “Managing Stormwater – A Strategy for Promoting the Use of Sustainable Drainage Systems (SuDS) within Northern Ireland”. This report, which has been endorsed by the Assembly Environment Committee, promotes the use of SuDS as the preferred drainage option for new development. It also advocates the retrofitting of SuDS through joint action by DARD Rivers Agency, NI Water and DRD Transport NI, on those existing surface water drainage schemes which have a significant adverse effect on the environment, where this is practicable and economically viable.
- C18 In June 2011 the Stormwater Management Group (SMG) was set up to implement the recommendations published in the Strategy document. Similar to the initial working party, this group has representation from all relevant government departments and agencies. Key deliverables identified by the SMG to deliver implementation by 2017 are as follows:
- **Implementation strategy** for sustainable drainage in Northern Ireland;
  - **Legislation** which will enforce sustainable drainage
  - **Technical guidance** for the most effective sustainable drainage systems;

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<sup>20</sup> The Water Environment (Controlled Activities) (Scotland) Regulations 2011  
The Flood and Water Management Bill (England and Wales) 2012

- **Approval Body** which will assess and approve sustainable drainage proposals for new and retrofit schemes. This body will work closely with the planning authority;
- **New Companies** will be created to service the new sustainable drainage systems, creating new jobs.

C19 It is anticipated that the ultimate delivery of sustainable drainage in Northern Ireland along these lines will enable the planning authority to require the use of such systems as part of most development proposals. From the planning perspective, it is imperative that a responsible approval body is in place, either to facilitate meaningful consultation on the sustainable drainage aspects of development proposals or itself to adjudicate on the merits of submitted proposals. Also important are the intended new service companies, as planning permission will not be granted without appropriate guarantees on the management and maintenance of sustainable drainage arrangements so as to ensure they will function effectively over the life of the proposed development.

# Annex D: Assessing Flood Risk and Drainage Impact

## Introduction

- D1 Proposals that accord with the policies set out in PPS 15 must be accompanied, depending on the sources of flooding, by a Flood Risk Assessment (FRA) and / or a Drainage Assessment (DA). The detail of the Assessment should be proportionate to the scale and nature of the proposed development and the risks involved. The applicant should appoint a suitable qualified and competent professional to carry out the assessment. This Annex provides guidance on relevant considerations and information requirements concerning both types of assessment.
- D2 A FRA must consider the flood risk from all sources of flooding where the proposed development is located within or in proximity to the fluvial (river) flood plain, the coastal flood plain or the flood inundation area of a reservoir. It should then identify measures that can be adopted to control and mitigate the flooding to the development or elsewhere as a result of the development. The main sources of flooding<sup>21</sup> (under the implementation of the EU Floods Directive in Northern Ireland) are:
- **Fluvial** – flooding from watercourses, either natural or man-made and either open or culverted. Such flooding is normally caused when channel or culvert capacity is exceeded and water flows out-of-bank onto the natural flood plain.
  - **Coastal** – flooding from the sea when water levels exceed the normal tidal range and flood onto low lying areas along the coastline.
  - **Pluvial** – flooding which results from excessive rainfall, generating overland flow that overwhelms existing drainage systems and / or collects in low lying areas.

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<sup>21</sup> Infrastructure failure should also be considered as a potential source of flooding, which may occur as a result of a blockage or collapse within a watermain, culvert or sewer system.

- **Reservoirs** – flooding which occurs to the surrounding area as a result of reservoir failure, overtopping or the controlled release of water via spillways during periods of high flows.

D3 A Drainage Assessment should consider the flood risk mainly from pluvial flooding where the proposed development is located beyond the fluvial and / or coastal flood plain or a reservoir flood inundation area. It should then identify measures that can be adopted to control and mitigate the risk of flooding to the development or elsewhere as a result of it and include for the safe disposal of surface water runoff from the site.

#### **When is a Flood Risk Assessment required?**

D4 When a more accurate definition of the Flood Plain and Extents is needed

Due to the nature of the Strategic Flood Map for Northern Ireland the geographical extent of predicted flood areas cannot be precisely defined. In some cases reservoir inundation maps may not be available. A FRA to determine a more accurate extent of flooding is therefore necessary for development proposals located in proximity to the margins of the predicted flood plain, irrespective of whether the site lies just outside or just inside (wholly or partially) the extent as depicted on the Strategic Flood Map. In these circumstances it is sufficient for the FRA to identify the sources of flooding and the resulting flood extents. For some sites the applicant may be able to demonstrate through a combination of local knowledge, photographs of historic flood events or a level survey that the site or part of the site lies outside the flood plain and would be suitable for development from a flood risk aspect. For other sites, a more detailed river model may be required. Preliminary discussion with Rivers Agency is advisable to ascertain the type of information required. Should the outcome of this exercise confirm that the development site or part thereof lies within the flood plain, then the applicant should consider a more suitable alternative location.

D5 When the proposed development is within the (fluvial / coastal flood plain / reservoir flood inundation area) and is otherwise acceptable under the policy

In circumstances where the proposed development is acceptable in principle under the policy, for example where it constitutes an exception to policy FLD1; PPS 15 still requires a FRA to be submitted to the planning authority as part of the planning application, so as to ensure the identification of all sources of flooding, the resulting flood extents and the means by which flooding is to be controlled and mitigated. A FRA should not be undertaken when a proposal is clearly unacceptable in principle under the policy as this will invariably result in nugatory work and expense on the part of the developer.

### **What information should be in a Flood Risk Assessment?**

#### **D6 When a more accurate definition of the Flood Plain and Extents is needed**

For this purpose, the FRA will typically be required to contain the following information:

- A location plan to a suitable scale, which clearly illustrates geographical features and identifies the catchment, watercourses in the vicinity and the built development;
- A site plan (and where appropriate, cross sections) showing existing levels related to Ordnance Datum Belfast), existing structures, watercourses in or bounding the site, internal site drainage and drainage outfalls;
- Data on historical flooding events, including photographs and media reports, supported by information on rainfall, flood return periods and the probability of storm surge occurrences, where appropriate. Evidence on trends in flood occurrences and changes in the local environment since the last event is particularly valuable;
- A plan of the site showing the extent of the predicted Q100 / Q200 flood plain, and / or in the case of a reservoir, the extent of the predicted flood inundation area. This may require a local hydraulic model based on the topographical information, historical flood events and the assessment of design flow discharges at the site using industry standard methodologies.

D7 When the proposed development is within the fluvial / coastal flood plain<sup>22</sup>

The FRA in these circumstances will typically be required to contain the following information relating to the Assessment of the Flood Risk:

- A location plan as detailed under paragraph D6;
- A site plan (and where appropriate, cross sections) showing pre-development and post-development levels related to Ordnance Datum Belfast, existing structures, development proposals, watercourses in or bounding the site, internal site drainage and drainage outfalls;
- Details of any existing or proposed flood alleviation measures or flood defence structures that may influence the site including information on their structural condition, level of protection and maintenance regime;
- The identification of all sources of flooding pre and post- development;
- An assessment of the hydraulic capacity and structural integrity of all drains and sewers within or bounding the site. The methodologies for assessment must be clearly identified;
- Data on historical flooding events accompanied by supporting information as detailed under paragraph D6;
- A plan of the site showing the extent of the predicted Q100 / Q200 flood plain and / or in the case of a reservoir, the extent of the predicted flood inundation area. This will involve the production of hydraulic models requiring longitudinal / cross sections of the watercourse and the site, assessment of flood discharges using industry standard methodologies, and the inclusion of information such as finished floor levels, access road and car park levels, estimated flood water levels, flood depths and velocities and associated probability of flooding;
- A plan and description of features which may influence local hydraulics. For example, bridges, pipes or ducts crossing watercourses, culverts, embankments and walls;
- An assessment of the likely speed of potential flooding, the sequence in which various parts of the site may flood, the likely duration of a flood event, the potential consequences of a flood event, the depth and velocity of flood water;

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<sup>22</sup> Refer to FLD 5 J&A for guidance on FRA associated with development in proximity to reservoirs

- Where appropriate, the likely impact of any displaced water or increased run-off from the development site should be estimated and the consequences for neighbouring or other locations assessed.

D8 Where the proposed development is located within the fluvial / coastal flood plain (or reservoir flood inundation area), the FRA will also be required to provide details of flood control and mitigation measures as well as safety procedures that will address the flood risks identified. The following considerations may be relevant:

**D9 Flood Control Measures**

- Infrastructure and drainage design where it may be possible to limit the flow and duration of flood water to the proposed development by diversion of flow paths, culvert upgrading and introduction of control structures such as sluices, weirs and sealed manholes;
- Management of residual flood risk through keeping development a safe distance away from flood defence structures and introducing sacrificial flood storage areas at the rear of defences;
- Suitable maintenance and management procedures;
- Ground water control and pumping.

**D10 Flood Mitigation Measures**

- Site design and layout such as siting built development so as to avoid areas of the site liable to flooding and flood flowpaths;
- Raising finished floor levels of new buildings;
- Coastal infilling / land raising;
- Flood resistant and resilient construction (refer to Annex E)

**D11 Safety Procedures**

- Flood and weather warning systems;
- Clear communication lines between those at flood risk and those with flood risk responsibilities;

- Emergency evacuation plans and procedures including safe access and egress for emergency rescue services;
- Capacity and procedures for the rapid movement of furniture and goods to locations outwith of the flood risk area;
- Safe shutdown of electrical supply for domestic and industrial use;
- Pollution control procedures.

### **Flood Risk Assessment – General Considerations**

D12 While it will be necessary to consider all the factors identified above, the detail necessary is likely to vary from case to case, depending on local conditions and the scale and type of development proposed.

D13 Because of the uncertainties inherent in flood estimation and expected climate change impacts, the application of the precautionary approach to hydrological analysis of flood flows and the determination of flood event return periods requires any assessment of flood risk to incorporate the necessary allowances for increased rainfall, storminess and sea level rise specified in current UK research and guidance.

D14 All FRAs should acknowledge that there are no circumstances in which the risk of flooding can be removed entirely. In defended areas therefore consideration should always be given to the potential impacts of extreme events on defences, the residual risks and the minimising of risks to life and property in such events.

### **When is a Drainage Assessment required?**

D15 Policy FLD 3 of PPS 15 requires a Drainage Assessment to be submitted to the planning authority along with the planning application, for development proposals located outside the fluvial and / or coastal flood plain, in any of the following circumstances:

- Where the proposed development exceeds the thresholds specified in the policy, for example 10 or more new dwellings;
- Where run-off from the development may adversely impact upon other development or features of importance to nature conservation, archaeology or the built heritage;
- Where there is evidence of a history of surface water flooding.

D16 The Drainage Assessment, as well as addressing surface water flooding, may also need to identify control measures for storm water discharge from the site. The use of sustainable drainage systems to manage and limit site discharges to pre-development run-off rates is encouraged.

### **What information should be in a Drainage Assessment?**

- D17 A Drainage Assessment will typically be required to contain the following information relating to the assessment of surface water flood risk:
- A location plan as detailed under paragraph D6;
  - A site plan as detailed under paragraph D7;
  - Confirmation as to whether the proposed development is to be located on previously developed land (that may have minimal impact on the existing drainage network);
  - Indication as to whether the local area has past flooding problems, which may limit site discharge to the local drainage and watercourses to pre-development run-off rates;
  - Identification of likely overland flow paths including depth, velocities, timing and sequence of inundation;
  - An assessment of hydraulic capacity and structural integrity of all drains and sewers within or bounding the site, which may result in out of sewer flooding. The methodologies for assessment must be clearly identified;
  - Data on historical flood events accompanied by supporting information as detailed in paragraph D6;

- The likely impact of any displaced water or increased run-off from the development site should be estimated and the consequences for neighbouring or other locations assessed.

### **Flood Control Measures**

- Internal drainage design, including rehabilitation of existing sewers and suitable discharge points to the local drainage and watercourse system that will encourage the safe disposal of storm water run off away from the site and other neighbouring areas.
- On site SuDS solutions such as flood infiltration and storage that will alleviate the flooding and encourage the slow release of storm water to the local drainage and watercourse system.
- Where the upgrading / use of local drainage networks for additional extreme flows is not possible, designing for exceedence by including sacrificial flood storage areas, such as amenity areas, car parks, roads and pathways into the drainage design.
- Suitable maintenance and management procedures.

### **Flood Mitigation Measures**

- Site design and layout to include infilling, ground re-profiling, raising of finished floor levels (FFL) and landscaping.
- Flood resistance and resilience construction, ( Annex E) where raising the building is not possible.
- Ground water control and waterproofing for basement areas.

### **Safety Procedures**

- Safe emergency access and egress routes to safe areas.

### **Supplementary Information in regard to site discharge to the local drainage network and/or watercourses**

D 18 In addition to planning requirements, developers will also need to ensure that the following requirements are met:

- An initial application should be made to the local Rivers Agency office for consent to discharge storm water under Schedule 6 of the Drainage (NI) Order 1973. An application form for discharge consent can be obtained at the web address below.

[http://www.dardni.gov.uk/riversagency/sch6\\_application\\_form-2](http://www.dardni.gov.uk/riversagency/sch6_application_form-2)

The completed application form should be sent to the relevant Area Office. If it is proposed to discharge storm water into an NI Water system then a Pre-Development Enquiry should be made and if a simple solution cannot be identified then a Network Capacity Check should be carried out.

- Details of how runoff from the site will be controlled and safely disposed of supported by relevant correspondence from Rivers Agency and/or Northern Ireland Water.
- It is the responsibility of the developer to satisfy the appropriate authorities that the internal site drainage complies with the appropriate legislation and includes for exceedence (refer to CIRIA document C635).

## **Annex E: Flood Proofing - Resistance & Resilience Construction**

- E1 The primary aim of planning policy on flood risk is to avoid new development in areas known to be at risk of flooding. However in certain cases, development within areas of flood risk may still proceed, for example where a proposal is deemed to be of overriding regional importance or is accepted as an exception to the policy for development in flood plains. Outside of flood plains, development within areas of surface water flood risk may be permitted subject to a satisfactory drainage assessment. In all such cases, consideration should be given to assessing and managing the flood risk through the adaptation of suitable flood proofing measures. For new development, permanent solutions which incorporate flood proofing into the structure of the building, such as by raised floor levels and impermeable walls will be preferred to other temporary measures. Below ground occupancy and basements should be avoided.
- E2 The Building Regulations do not currently impose mandatory requirements for flood resistance or resilience construction for either new or existing buildings in flood risk areas. This position is under review and will be given consideration as part of a proposed Floods Bill for NI. In the interim, practical guidance to developers is available in technical guidance booklet C, which gives some relevant information on safe access and egress at times of flooding, the use of non-return valves for sewer flooding and the intrusion of groundwater through walls and floors.

### **Flood Proofing**

- E3 There are a number of routes by which flood water can enter a property. The most common ways are through door openings, patios and windows. Water can also find its way through air bricks on exposed walls, under foundations and through gaps in floors. Less obvious ways are via drains and pipes as the pressure created by flooding can reverse the flow and cause water to back-up and enter the property through sinks, toilets and washing machines etc.

- E4 However there are a number of measures available to prevent or limit the damage and disruption caused through flooding. Buildings can be flood proofed through the use of “**flood resistance**” and/or “**flood resilient**” measures.
- E5 **Flood resistance** is a term that refers to preventing or minimising flood water from entering a building. There are two types of methods available:-
- E6 **Passive resistance** is where the flood mitigation is permanently in place. This is generally more feasible in new developments where the property is designed so that flood water is excluded from the building during flood events. Such mitigation methods are usually expensive as they will require structural modifications to the building. Recommended methods are:-

#### Raised Floor Levels

Finished floor levels of the building are designed to be above the design flood level. The levels will also include an additional height to accommodate a suitable freeboard. Driveways, paths and entrances to allow for access need to be designed accordingly.

#### Deeper Foundations

This may be appropriate in permeable types of ground, such as sand and gravels, where high ground water and flood water is able, under pressure, to infiltrate into the property from below the foundation level. Cut off trenches and toe walls to deeper impermeable clay / rock ground to block flow paths may also be considered.

#### Tanking of Internal Floors and Basement Walls

This measure may be used to prevent flood water or high groundwater entering the building. It involves the use of solid concrete walls and floors, which are then sealed with waterproof membranes / sheets. Solid floors have the added advantage that with their extra weight they are able to cope better with the uplift pressures from the flood water.

### Water Resistant Walls

The building structure is designed using flood resistant materials that are able to reduce or stop the infiltration of water through the external walls. Solid walls can be constructed instead of cavity walls. Engineering bricks are preferred to concrete / aircrete bricks as they have lower water absorption rates. External joints and rendering can be designed to be more water repellent. Rigid insulation can be applied to cavity walls and internal walls can use cement based renders with a high lime content. Standard gypsum plasterboard which disintegrates when it becomes wet should be avoided.

### Sealed Doors and Windows

Entrances and openings can be designed with raised thresholds. Water resistant PVC type material, which can provide better seals can replace traditional wooden frames, which can become warped. Shatterproof / double glazed windows should be considered as these are more liable to remain intact when exposed to a depth of flood water or floating debris.

### Non Return Valves and Covers

Flaps can be fitted to the end and junctions of drainage and sewage pipes to stop any water flowing back into the building. Manhole covers can also be sealed by being bolted down and air vents can be fitted with specialised water resistant covers.

- E7 **Active resistance** – involves the use of temporary flood mitigation measures and requires an effective flood warning system or a neighbourhood alert scheme to allow for a reasonable lead in time in order to have the mitigation in place. Stand alone temporary and demountable defences are not normally considered appropriate for new developments due to the likelihood of them not being in place on time, being damaged by flood debris or the potential for being breached or overtopped. The main advantage of these temporary arrangements is that they would normally be less expensive than the more permanent solutions and are more practical and suitable for buildings already within the floodplain. Recommended methods are:-

### Demountable Flood Guards

These guards or gates are made of suitable flood resistant material and are fitted across boundary fences, doors and windows by bolting or dropping into pre-prepared slots or channels incorporated into the framework of the structure. They are then removed soon after the flood recedes.

### Temporary Flood Defences

This solution is sometimes adopted to provide protection for commercial properties such as shops and restaurants where a service or an ongoing activity may still be required outside the building. They can also be employed as a necessary short term measure that may precede a more permanent flood defence structure.

### Sand Bags or Flood Sacks

This is the cheapest form of measure and is more suitable in emergency response situations, such as surface water flooding where there is little to no warning, the water is at a shallow depth and the exact flood path cannot be predicted. The sandbags can be stored in a suitable nearby location or left along previous flood paths on a temporary basis. The flood sacks have the added advantage that they are light and can be easily stored and transported. They expand and fill voids once they come into contact with water.

- E8 **Flood Resilience** involves designing or adapting a property so that although flood water is able to enter the building, very little or no permanent damage is caused through the use of water resistant and replaceable sacrificial materials. Structural integrity is also maintained and normal service can resume fairly rapidly after the flood has receded and clean up has taken place. This method is not usually that suitable for new property. Recommended methods are:-

### Pipes and Services

Electrical wiring can be dropped down from the first floor / roof level and by ensuring that all fuse boxes and electrical sockets are kept at least 1.5m

above the floor level. This would also apply to gas, oil and water supplies so as to avoid pulled joints and leaks, which can lead to contamination and pollution.

#### Raising Fabrics and Appliances

Televisions, fridges and cookers can be placed on plinths at raised levels. Machinery and office equipment should also be raised. Castor type sofas and the use of movable rugs instead of fixed carpets are better options in regard to flood resilience.

#### Fixtures and Fittings

Popular methods in kitchens and downstairs bathrooms are to use durable water resistant materials such as stainless steel units and plastic skirting boards. Vinyl and tiled floors are preferred to wooden or chipboard floors.

#### Valuables and Memorabilia

Any valuables such as ornaments, pictures and photographs can be placed on high mounted shelves. Smaller furniture can be positioned in such a way that it can be easily transferred to upstairs levels.

- E9 Guidance and further detail on the use of flood resistance and resilience construction can be found at the following websites:-

[http://www.ciria.org.uk/flooding/flood\\_performance.htm](http://www.ciria.org.uk/flooding/flood_performance.htm) “Improving the Flood Performance of New Buildings, Flood Resilience Construction”

<http://www.nidirect.gov.uk/flooding-in-your-area> Flooding in your area nidirect

<http://www.scotland.gov.uk/Publications/2004/08/19805/41597> Scottish Government’s publication “Design Guidance on Flood Damage to Buildings”

- E10 The applicant will need to demonstrate a sound understanding of these methodologies and their application as proposed mitigation measures within the submitted Flood Risk Assessment / Drainage Assessment.

**E11 Notwithstanding the various flood proofing measures that may be available to manage and mitigate flood risk, it is stressed that the practice of flood avoidance, by locating new buildings and infrastructure outside the flood risk area, is the most effective means of managing the flood risk. Alternative sites should always be considered.**

## Glossary

<b>AEP</b>	Annual Exceedance Probability – The annual probability of a flood exceeding the peak floodwater level.
<b>Culvert</b>	a structure with integral sides, soffit and invert, including a pipe that contains a watercourse as it passes through a beneath a road, railway, building, embankment etc, or below ground.
<b>Catchment</b>	the area drained, either naturally or with artificial assistance, by a watercourse, including all drainage channels, tributaries, floodplains, estuaries and areas of water storage
<b>Coastal Flooding</b>	flooding from sea water, often arising through storm surge
<b>Drainage Assessment</b>	a statement of the drainage issues relevant to a development proposal and the measures to provide the appropriate standard of drainage. The detail of the assessment will be proportionate to the nature of the proposal. (It may also be called a Drainage Impact Assessment).
<b>Drainage Infrastructure</b>	equipment such as culverts, weirs and sluices provided to facilitate drainage
<b>Flood Defence</b>	a structure or works designed to prevent the inundation of land and property from watercourses and/or the sea. Such defences may take the form of floodwalls or embankments or the management of water levels through drainage works.
<b>Flood Hazard</b>	the features of flooding which have harmful impacts on people, property or the environment (such as the depth of water, speed of flow, rate of onset, duration, water quality etc).
<b>Floodplain</b>	the generally flat areas adjacent to a watercourse or the sea where water flows in time of flood or would flow but for the presence of flood defences. The limits of the floodplain are defined by the peak water level of an appropriate return period event.
<b>Flood Risk</b>	the statistical probability of an event occurring combined with the scale of the potential consequences of that event.
<b>Flood Risk / Inundation Areas</b>	areas susceptible to flooding from the 4 main sources, ie rivers, the sea, surface water and reservoirs

<b>Flood Storage</b>	an area, usually within floodplain where water is stored in time of flood.
<b>Fluvial Flooding</b>	flooding from a river or other watercourse.
<b>Freeboard</b>	a height added to the predicted level of flood to take account of waves or turbulence and the uncertainty in estimating the probability of flooding.
<b>Groundwater</b>	water below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
<b>Minor Development</b>	<p>non residential extensions (Industrial/Commercial/Leisure etc) with a footprint less than 150 sq metres</p> <p><i>Alterations:</i> development that does not increase the size of buildings, eg alterations to external finishes</p> <p><i>'Householder' development:</i> eg sheds, garages, games rooms etc within the curtilage of the existing dwelling in addition to extensions to the existing dwelling. This excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of a dwelling house into flats.</p>
<b>Precautionary Approach</b>	the approach to be used in the assessment of flood risk which requires that lack of full scientific certainty, shall not be used to assume flood hazard or risk does not exist, or as a reason for postponing cost-effective measures to avoid or manage flood risk.
<b>Pluvial Flooding</b>	usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer. The intensity of rainfall can be such that the run-off totally overwhelms surface water and underground drainage systems.
<b>Reservoir</b>	reservoirs, dams and other impounding structures, to be defined by the forthcoming Reservoirs legislation
<b>Residual Risk</b>	the risk which remains after all risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures can only reduce risk, not eliminate it.
<b>Resilience</b>	sometimes known as 'wet-proofing', resilience relates to how a building is constructed in such a way that, although flood water may enter the building, its impact is minimised, structural integrity is maintained, and repair, drying & cleaning and subsequent re-occupation are facilitated

<b>Resistance</b>	sometimes known as 'dry-proofing', this relates to how a building is constructed to prevent flood water entering the building or damaging its fabric.
<b>River Basin</b>	see <i>catchment</i> .
<b>Run-off</b>	that proportion of rainfall which is not absorbed into the ground and finds its way, by surface water drainage systems or overland flow, into watercourses and eventually discharges into the sea.
<b>Storm surge</b>	the increase in sea level caused by the combined effects of low atmospheric pressure, wind and a high tide.
<b>Stormwater</b>	Surface water in abnormal quantities resulting from heavy falls of rain or snow. Stormwater that does not infiltrate into the ground becomes surface runoff.
<b>Sustainable Drainage Systems (SuDS)</b>	a form of drainage that aims to control run-off as close to its source as possible using a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques such as stormwater networks.
<b>Watercourse</b>	a river, stream, canal, ditch, culvert and surface water drainage systems. (Water mains and sewers are not included in this definition).