

Planning Policy Wales

Technical Advice Note

15: DEVELOPMENT AND FLOOD RISK



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

July 2004

This document is one of a series of Technical Advice Notes (TANs) which supplement "Planning Policy Wales".

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Planning Policy Wales

**Technical Advice Note 15
Development and Flood Risk**

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Contents

	Paragraph Number
Introduction	1
Background	2
Aim of the TAN	3
Development advice maps	4
Nature of development or land use	5
Justifying the location of built development	6
Assessing flooding consequences	7
Surface water run-off from new development	8
Summary of policy requirements	9
Action through Development Plans	10
Development Control	11
Appendix 1 - Assessing Flooding Consequences	
A. Objectives of the Assessment	
B. Assessing Flooding Consequences	
C. Acceptability Criteria for Flooding Consequences	
D. Awareness of Flooding Consequences	
E. Technical Requirements for Assessing Flooding Consequences	
Appendix 2 - Flooding and Climate Change	
Appendix 3 – The Environment Agency	
Appendix 4 – Sustainable Drainage Systems	
Appendix 5 – Some Relevant Statutory and Non-Statutory Plans	
Appendix 6 - Warning Notices/Signs at Caravan and Camping Sites and Other Development at Risk of Flooding	

1 Introduction

1.1 This planning advice note should be read in conjunction with Planning Policy Wales, 2002. Planning Policy Wales (PPW) and technical advice notes and circulars should be taken into account by local planning authorities in Wales in the preparation of development plans. They may be material to decisions on individual planning applications and will be taken into account by the National Assembly for Wales and Inspectors in the determination of appeals and called-in planning applications.

1.2 This TAN provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding. It advises on development and flood risk as this relates to sustainability principles (section 2.2 PPW), and provides a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed.

1.3 Information on the development advice maps accompanying the TAN will be available from local planning offices. A hard copy of a relevant map can be viewed at local libraries or obtained from the Welsh Assembly Government Planning Division.

2 Background

2.1 Flooding of rivers and coastal waters is a natural process which plays an important role in shaping the environment. However, as a natural phenomenon it is very difficult to predict, and although floods occur relatively infrequently the consequences can be very significant. Flooding can place lives at risk, cause considerable personal trauma, result in extensive damage to property, often amounting to millions of pounds, and severely disrupt communications, business and commerce.

2.2 Historically, the topography of Wales has generally resulted in transport infrastructure and development being concentrated on valley floors, lowland areas and in the coastal fringes. A large proportion of the Welsh population is located within urban centres along the coastal plain in North and South Wales, particularly Cardiff, Swansea and Newport and the coastal settlements of North Wales. The precautionary framework outlined in this TAN allows flooding issues to be accorded appropriate consideration whilst recognising that development will continue to be necessary in these areas.

2.3 Overall, some 140,000 properties in Wales (12% of the total housing stock) are thought to be at risk from flooding by rivers or the sea. During the flooding events of October and November 2000 more than 1,900 properties were affected in Wales (*Flooding in Wales, Environment Agency Wales, March 2001*). The experience of recent years suggests that the incidence of problems due to flooding may be increasing, both in frequency and in scale. This arises partly from changes in river hydrology and human activity, and also from changes in land management and the increase in development in areas susceptible to flooding.

Even without these factors, the incidence and extent of both river and coastal flooding is expected to increase with time as a consequence of climate change. Therefore, we must plan new development sensitively, and begin to do so now, with climate change in mind.

Climate Change

2.4 There is mounting evidence that the global climate is changing as a result of human activity. At present there are gaps in our understanding with respect to how a changing climate will affect areas already vulnerable to flooding, although it is expected to increase risk significantly over time.

2.5 The latest Climate Change scenarios for the United Kingdom 2002 produced for the UK Climate Impacts Programme (UKCIP), show how the climate of the UK is already changing, and how this will become more pronounced over the coming decades. These predict that by the 2080's winter precipitation may increase by up to 30%. Heavy winter precipitation is likely to become more frequent, with the precipitation intensities that are currently experienced around once every two years becoming possibly between 5% and 20% higher. Relative sea levels will continue to rise around most of the UK's shoreline, and with this extreme sea levels will be experienced more frequently.

2.6 Although the future of climate change is not certain, the latest scenarios add to the already compelling evidence that some degree of climate change is inevitable in the future. As described in the Welsh Assembly Government's report *Climate Change Wales Learning to Live Differently (2002)*, the impacts of climate change will be wide-ranging, particularly those resulting from extreme weather events such as floods and droughts, which are often the most damaging and costly. Planning authorities and developers are directed to the UK Climate Impacts Programme (UKCIP) for the latest information with regard to climate change. The Environment Agency will be able to advise planning authorities and developers on the implications of the UKCIP as part of fulfilling the planning requirements outlined in this TAN. See appendix 2 for background information.

2.7 The potential frequency and cost of floods throughout the UK, both coastal and inland, has been a concern of the insurance industry for some time. Whilst insurance enables householders and businesses to minimise the cost of damage arising out of unforeseen events that may affect property, the industry is concerned that a number of factors are combining to make floods more frequent, widespread and more costly. This has caused insurers to review their position on the provision of flood cover to UK property owners. Further details on the position of the industry can be found on the Association of British Insurers website at www.abi.org.uk.

2.8 The affordability of flood cover, and the associated costs of coping with flooding consequences, reinforces the overall principle of avoiding development in areas where the consequences of flooding will be unacceptable.

2.9 Developers are advised to seek the views of insurers at an early stage, and insurers themselves may wish to make appropriate representations about

proposals for the location of new development during the preparation of development plans. Planning authorities should be aware of the general concerns of insurers and the possible implications. They may wish to consult their own insurers to ensure that flood defence or mitigation measures are likely to satisfy the requirements of insurers. Generally, the Environment Agency will assist by providing advice on the detailed flood risk assessment and acceptability of flooding consequences, taking into account the risks to people and property.

Sustainable Development

2.10 The Assembly has a duty, under section 121 of the Government of Wales Act, to promote sustainable development in the exercise of its functions. The planning system has a key role to play in the delivery of sustainable development by providing for homes, infrastructure, investment and jobs in a way which is consistent with sustainable development principles (section 2.2 PPW). In doing so it must provide development which is sustainable in the long term and not create a legacy of problems for future generations.

2.11 Managing flooding is an important part of contributing towards achieving sustainable development. Relevant sustainable development considerations from the flooding perspective include:-

- Guiding development to locations at little or no risk from river, tidal or coastal flooding or from run off arising from development in any location;
- Bearing in mind that government resources for flood and coastal defence are directed at reducing risks for existing development and are not available to provide defences in anticipation of future development;
- Managing the consequences of flooding where development can be justified and the consequences are considered acceptable in reference to section 7 and appendix 1;
- Making provision for future changes in flood risk, for example taking account of climate change, where they can be anticipated;
- Bearing in mind measures within Catchment Flood Management Plans or Shoreline Management Plans to restore substantial functionality and/or natural heritage benefits of flood plains through the removal of inappropriate existing built development.

3 Aim of the TAN

3.1 The general approach of PPW, supported by the TAN, is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is, in order of preference, to:-

- Direct new development away from those areas which are at high risk of flooding.

- Where development has to be considered in high risk areas (zone C) only those developments which can be justified on the basis of the tests outlined in section 6 and section 7 are located within such areas.

3.2 The operation of the precautionary framework is governed by:-

- A development advice map containing three zones (A, B and C with subdivision into C1 and C2) which should be used to trigger the appropriate planning tests in relation to sections 6 and 7 and appendix 1.
- Definitions of vulnerable development and advice on permissible uses in relation to the location of development and the consequences of flooding.

3.3 The precautionary framework should be used for both forward planning and development control purposes.

Roles and responsibilities

3.4 The planning authority will need to be satisfied that a proposal is justified and that the consequences of flooding are acceptable. Where the risks of, and consequences of, flooding cannot be managed to an acceptable level then developing in these areas shall be avoided irrespective of justification under section 6. Developers will need to provide information to demonstrate that their proposal satisfies the tests contained in the TAN.

3.5 The Environment Agency should assist the planning authority in coming to their decision by providing expert advice on the flooding consequences assessment and the acceptability of the flooding consequences in terms of the risks to people and property. The Environment Agency should make available data and expertise to assist developers in undertaking flood consequences assessment and, where appropriate, advise on any necessary mitigation measures. (see appendix 3).

4 Development advice maps

4.1 The development advice maps are based on the best available information considered sufficient to determine when flood risk issues need to be taken into account in planning future development. Three development advice zones are described on the maps, to which are attributed different planning actions.

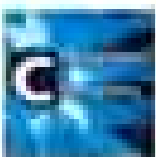
4.2 The maps are based on Environment Agency's extreme flood outlines (zone C) and the British Geological Survey (BGS) drift data (zone B). Figure 1 describes the composition and use of these zones to control and manage development.

Figure 1

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

4.3 While robust for triggering the application of the tests (for both forward planning and decision making) at the present time it is inevitable that information will be improved and refined over time. It is expected that the development advice maps will remain in place for 3 years, unless the Assembly Government is informed by the Environment Agency with regard to significant change. Future versions of the maps would then be issued as numbered and dated copies which will supersede earlier versions. It will always be good practice to consult the Environment Agency as a first step when considering development in zone C.

Illustration of Zone C across Wales



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5 Nature of development or land use

5.1 Particular flooding consequences may not be acceptable for particular types of development. For example, allowing residential development in areas which are subject to high risks of flooding can result in a traumatic impact on people's lives. The precautionary framework identifies the vulnerability of different land uses to flooding, and for this purpose, development has been subdivided into three categories in figure 2.

Figure 2

Development category	Types
Emergency services	hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood
Highly vulnerable development	all residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites

5.2 The Emergency Services category describes facilities which need to be operational and accessible at all times. Highly vulnerable development describes development where the ability of occupants to decide on whether they wish to accept the risks to life and property associated with flooding, or be able to manage the consequences of such a risk, is limited. It also includes those industrial uses where there would be an attendant risk to the public and the water environment should the site be inundated. Less vulnerable development describes development where the ability of occupants to decide on whether they wish to accept such risks is greater than that in the highly vulnerable category. The vulnerability attributed to a mixed use proposal will be defined by the most vulnerable use.

5.3 There are uses which are considered to be exceptions to the general rule, and have not been classified above, because they are required in a fluvial, tidal or coastal location by virtue of their nature. These include boatyards, marinas, essential works required at mooring basins, and development associated with canals. They will not be subject to the first part of the justification test in section 6 but will be subject to the acceptability of consequences part of the test

as outlined in section 7 and the requirements of appendix 1. Further consideration is given to minor development in section 11.

6 Justifying the location of development

6.1 Much urban development in Wales has taken place alongside rivers and in the coastal plain. It is therefore inevitable, despite the overall aim to avoid flood risk areas, that some existing development will be vulnerable to flooding and fall within zone C. Some flexibility is necessary to enable the risks of flooding to be addressed whilst recognising the negative economic and social consequences if policy were to preclude investment in existing urban areas, and the benefits of reusing previously developed land. Further development in such areas, whilst possibly benefiting from some protection, will not be free from risk and could in some cases exacerbate the consequences of a flood event for existing development and therefore a balanced judgement is required.

6.2 New development should be directed away from zone C and towards suitable land in zone A, otherwise to zone B, where river or coastal flooding will be less of an issue. In zone C the tests outlined in sections 6 and 7 will be applied, recognising, however, that highly vulnerable development and Emergency Services in zone C2 should not be permitted. All other new development should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location. Development, including transport infrastructure, will only be justified if it can be demonstrated that:-

- i. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement¹; **or**,
- ii Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

- iii It concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); and,
- iv The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

7 Assessing flooding consequences

7.1 If a development proposal in zone C1, or in C2 if it is defined as being of low vulnerability, meets the test outlined in section 6, the justification will be in the knowledge that those developments will flood and will need to be planned accordingly. This section will apply in zone C, and those parts of zone B where flooding has been identified as a material consideration to allow for localised problems.

¹ Regeneration initiatives will be comprehensive, multi-approach and form part of an integrated suite of initiatives which have been subject to public consultation. Local authority strategy will be the development plan for the area (deposit version as minimum).

7.2 Whether a development should proceed or not will depend upon whether the consequences of flooding of that development can be managed down to a level which is acceptable for the nature/type of development being proposed, including its effects on existing development. It would certainly not be sensible for people to live in areas subject to flooding (even in two storey buildings) where timely flood warnings cannot be provided and where safe access/egress cannot be achieved.

7.3 Where development is justified the assessment can be used to establish whether suitable mitigation measures can be incorporated within the design to ensure that development is as safe as possible and there is:

- minimal risk to life;
- minimal disruption to people living and working in the area,
- minimal potential damage to property;
- minimal impact of the proposed development on flood risk generally; and,
- minimal disruption to natural heritage.

7.4 Therefore, before deciding whether a development can take place an assessment, which examines the likely mechanisms that cause the flooding, and the consequences on the development of those floods, must be undertaken, which is appropriate to the size and scale of the proposed development. Further advice can be found in appendix 1.

7.5 Planning authorities should recognise that the presence of protection measures does not eliminate risk completely and that certain developments are more vulnerable than others. Land protected by defences will be extremely vulnerable in the event of overtopping or breach because of the speed of flooding in such circumstances. The Environment Agency will advise the planning authority on the consequences of flooding for the type and nature of proposal and this should enable the planning authority to arrive at a judgement on the acceptability of the flooding consequences. Where development is allowed, developers must put plans/measures in place to manage those consequences. Such measures must be capable of being implemented at the appropriate stage as part of the development and, where necessary, long term maintenance must be provided for.

7.6 Planning and building standards have a complementary role in flood management and the use of flood damage resistant and mitigation measures will be required as part of ensuring that consequences of flooding are acceptable. Simple design features, such as raising floor levels, while ensuring that appropriate access is maintained for disabled people, or keeping electrical circuits above levels likely to be affected by flooding, can enable buildings to resist and cope with flooding better. In areas where inundation may be rapid, such as immediately behind sea walls, or in steep river catchments, mitigation of this kind is likely to be more difficult and on its own unlikely to result in acceptable flooding consequences. More information on preparing for flooding can be found in the DTLR document *Preparing for Floods (2002)* and from the publications of the Association of British Insurers.

7.7 The effect of flooding on water or sewerage infrastructure could have catastrophic effects on public health and the environment by resulting in the contamination of potable water, or the mixing of sewerage with flood water. Flood water could enter the public sewerage systems with little control and the combination of sewerage and flood water would affect properties and the environment. The consequences assessment should consider access and egress, for example, if a statutory undertaker is not able to access its apparatus during a flood then this will prolong the time before remediation could occur.

7.8 Development proposals on or adjacent to land that may be affected by contamination can have implications for water quality during times of flood. Where such sites are inundated there is an attendant risk that certain contaminants may be mobilised and could pose a threat to surface waters or leach into ground waters. In addition, where the development involves, for example, the storage/use of oils, fuels or chemicals, an industrial process or the storage or handling of waste materials, there is a risk to the water environment should the site be inundated. These factors should be taken into account in reaching a decision by forming part of an assessment required in accordance with section 7 and appendix 1

8 Surface water run-off from new development

8.1 All types of land use change will impact on the natural hydrological cycle in one way or another and flooding is not confined to flood plains, as heavy rain falling on waterlogged ground can cause localised flooding almost anywhere. In all zones, development should not increase the risk of flooding elsewhere. Run-off from developments in these areas can, if not properly controlled, result in flooding at other locations and significantly alter the frequency and extent of floods further down the catchment. In many instances this will be determined by local knowledge and where such concerns are suspected planning authorities should consult the relevant competent authority on a case by case basis, who will determine what, if any, attenuation is to be required.

Consultation may be required with one, or more, of the following organisations with regard to surface water:

- Highway Authorities: highway surface water, for example highway culverts, roadside drains, swales
- Land Drainage Authorities, including IDB's, Riparian owners or Environment Agency: for example agricultural run-off, ditches, streams and main rivers
- Sewerage Undertakers: for example roofs and yard water from domestic curtilage

8.2 Built development, such as roads, pavements, and roofing, tends to increase the surface area of impermeable ground, thus reducing percolation and increasing rapid surface run-off. This has the effect of reducing the time it takes for precipitation to enter the watercourse and consequently increasing the peak discharge. SuDs can perform an important role in managing run-off from a site and should be implemented, wherever they will be effective, in all new development proposals, irrespective of the zone in which they are located.

8.3 Development in one part of a catchment may increase run-off and hence flood risk elsewhere, therefore, the aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce run-off where possible. It is accepted that there may be practical difficulties in achieving this aim.

8.4 Sustainable Drainage Systems (SuDs) offer a variety of engineering solutions, both soft and hard, that can be employed to manage surface water run-off. For example, a combination of techniques incorporating both wet and dry balancing ponds, soakaways and swales can lower flood risk by reducing the quantity of surface water run off and delaying its discharge to watercourses. Such systems can also provide habitat and amenity enhancements and passive treatment to improve water quality prior to discharge. It should be noted, however, that options which involve increasing infiltration will have limited effectiveness on sites underlain by high groundwater tables and/or very low permeability terrain.

8.5 Information with regard to the appropriate mechanisms for considering SuDs is contained in the *'Interim Code of Practice for Sustainable Drainage Systems'* (2004) developed by the National Suds Working Group. Planning authorities may consider imposing a condition requiring developers to examine the SuDS option and provide the planning authority with details and options. If it is demonstrated that SuDS could work on a site, and subject to the appropriate agreements being in place with regard to adoption, then the planning authority would require SuDS to be implemented. Developers will need to give good reason why SuDS could not be implemented. If a conventional drainage system does not improve the status quo or has a negative impact then this can be a valid reason for refusal.

8.6 Consideration must also be given to maintaining the effectiveness of any drainage system, including pipes. Systems must be able to cope with severe rainfall/snowmelt events and provision must be made for long term maintenance and renewal. Where necessary, conditions attached to permissions and /or agreements can be used to secure these objectives. See appendix 4 for further information.

9 Summary of Policy Requirements

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
A	Emergency services Highly vulnerable development Less vulnerable development Other	<ul style="list-style-type: none"> Justification test not applicable Refer to surface water requirements 	<ul style="list-style-type: none"> No increase in flooding elsewhere 	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere.
B	Emergency services Highly vulnerable development	<ul style="list-style-type: none"> If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. Refer to surface water requirements 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Occupiers aware of flood risk Escape/evacuation routes present Effective flood warning provided Flood emergency plans and procedures Flood resistant design No increase in flooding elsewhere <ul style="list-style-type: none"> Acceptable consequences for nature of use Occupiers aware of flood risk Escape/evacuation routes present Effective flood warning provided Flood emergency plans and procedures No increase in flooding elsewhere 	Generally suitable for most forms of development. Assessments, where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
	Less vulnerable development		<ul style="list-style-type: none"> ▪ Occupiers aware of flood risk ▪ No increase in flooding elsewhere 	
	Other	<ul style="list-style-type: none"> ▪ Refer to surface water requirements 	<ul style="list-style-type: none"> ▪ No increase in flooding elsewhere 	
CI	Emergency services Highly vulnerable development Less vulnerable development	<ul style="list-style-type: none"> ▪ Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements 	<ul style="list-style-type: none"> ▪ Acceptable consequences for nature of use ▪ Flood defences adequate ▪ Agreement for construction and maintenance costs secured ▪ Occupiers aware of flood risk ▪ Escape/evacuation routes present ▪ Effective flood warning provided ▪ Flood emergency plans and procedures ▪ Flood resistant design ▪ No increase in flooding elsewhere 	Plan allocations and applications for all development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	<ul style="list-style-type: none"> ▪ Application of acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements 	<ul style="list-style-type: none"> ▪ Acceptable consequences for nature of use ▪ Occupiers aware of flood risk ▪ Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal ▪ No increase in flooding elsewhere 	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1.

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
C2	Emergency services Highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable development are not considered to be acceptable. Plan allocations should not be made for such development and planning applications not proposed.		
	Less vulnerable development	<ul style="list-style-type: none"> ▪ Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements 	<ul style="list-style-type: none"> ▪ Acceptable consequences for nature of use ▪ Flood defences adequate ▪ Agreement for construction and maintenance costs secured ▪ Occupiers aware of flood risk ▪ Escape/evacuation routes present ▪ Effective flood warning provided ▪ Flood emergency plans and procedures ▪ Flood resistant design ▪ No increase in flooding elsewhere 	<p>Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.</p>
	Other	<ul style="list-style-type: none"> ▪ Application of acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements 	<ul style="list-style-type: none"> ▪ Acceptable consequences for nature of use ▪ Occupiers aware of flood risk ▪ Effective flood warning provided ▪ No increase in flooding elsewhere 	<p>Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix</p>

10 Action through Development Plans

10.1 The Town and Country Planning Act 1990 (to be replaced by the Planning and Compulsory Purchase Act on Commencement of the Act in September 2005), as amended by the Local Government (Wales) Act 1994, requires each planning authority in Wales to prepare a Development Plan for its area. Development Plans provide the strategic locational guidance for development, and the detailed site specific policies and identification of proposals for development.

10.2 The extent of both river and coastal flooding in Wales is such that flooding is often of sub-regional significance, particularly since what happens in one part of a river catchment will often have effects on other parts some distance away. Local planning authorities, in preparing their Development Plans, should consult with neighbouring authorities on the issue of flooding. The Assembly Government would expect that the Environment Agency and developers exchange and share flooding data with the aim of continually increasing the availability and quality of information and understanding of flooding issues. The Assembly Government is committed to looking for a way forward in terms of assisting with strategic assessments and attributing priority through the production of Catchment Flood Defence Management Plans.

10.3 Appropriate land management can help to reduce flood risk. The option of managed coastal alignment and floodplain restoration may be considered as a means of reducing future flood risk and protecting and enhancing natural heritage. This will apply particularly in areas within zone C where existing development cannot be sustained in the face of increasing flood risk, or in sparsely developed areas where this offers a more cost effective and sustainable solution than building new defences. Planning authorities will need to consider the specific objectives and requirements of Catchment Flood Management Plans and Shoreline Management Plans for their area. See appendix 5 for background information.

10.4 Planning authorities should use the development advice maps to identify whether flooding is a strategic issue and hence likely to influence the overall strategy of the development plan. The key characteristics of the plan, in social, economic and environmental terms should be identified as part of sustainability appraisal. Where flooding is a strategic issue that significantly constrains development options, local authorities should use the precautionary framework as part of considering sustainability options and, where necessary, set out the positive steps which have been taken to promote development in zones A and B. In this sense, flood risk will be a material factor in the formulation of specific policies and allocation of sites.

10.5 Where appropriate the Plan should include site specific policies and proposals for development and flood risk. Allocations should only be made in zone C if it can be justified that a development/use has to be located there in accordance with section 6 and if the consequences of locating development are acceptable, in accordance with section 7 and appendix 1. Local planning authorities will need to fully explain and justify the reasons for allocating a site within zone C in the relevant reasoned justification for the allocation. Alternately

this may be achieved by including zone C on the proposals map, if appropriate. A proposed allocation should not be made if the consequences of a flooding event cannot be effectively managed.

10.6 Where the local planning authority wishes to allocate a site, and can justify such an allocation, the local planning authority will need to undertake a broad level assessment of the consequences of flooding occurring on that site, in consultation with the Environment Agency. This assessment should demonstrate that the consequences of flooding have been understood and are capable of being managed in an acceptable way. Where such local information has been produced then this should be reflected in the plan.

10.7 If the consequences are considered acceptable in accordance with section 7 and appendix 1, the resulting allocation will include annotation of flooding as a constraint for the individual site on the proposals map and specify the policy requirements which pertain to the development of that site. This will include making it clear that in taking forward the allocation a developer will need to undertake detailed technical assessment in accordance with appendix 1, to ensure that the nature of the proposed development is acceptable, that it is suitably designed to cope with the risk of flooding, and that any funding and maintenance provision is appropriate.

10.8 Sites in zone C2 should not be allocated for highly vulnerable development in accordance with the advice set out in paragraph 6.2. Allocations for other built development should be justifiable under sections 6 and 7 and appendix 1.

10.9 In accordance with paragraph 4.26 of Unitary Development Plans Wales local planning authorities should consider the TAN to constitute new information and immediately review any existing planned allocations for development falling within zones C1 and C2 based on the advice set out in this guidance. Where adopted plans contain allocations, then it is considered reasonable for planning authorities to require development proposals to plan for the consequences of flooding.

10.10 When considering allocations in zone B, local planning authorities should consult the Environment Agency to ascertain whether flooding raises a significant constraint in terms of land use. It is not expected that an assessment of the consequences be undertaken at the plan preparation stage but should flooding be considered an issue then policies outlining the appropriate requirements should be included in the plan, in accordance with sections 6 and 7 and appendix 1.

10.11 Recognising that flood risk should be an integral part of all land use decisions, plans must include policies which promote the use in appropriate locations of sustainable drainage systems to control surface water as near to its source as possible, in accordance with paragraphs 8.1 – 8.6. Plans should advise early consultation with the relevant drainage authority to achieve the best possible outcome and ensure that any systems can be subsequently adopted by the relevant body.

11 Development Control

11.1 The susceptibility of land to flooding will be a material consideration in deciding a planning application. For proposals located in zone C developers will need to demonstrate, to the satisfaction of the planning authority, that the development can be justified in that location (section 6) and that the consequences associated with flooding are acceptable, with reference section 7 and appendix 1. Where a site falls partially within zone C it will be a matter for the planning authority to judge whether to apply section 6, although it is probable that an assessment in accordance with section 7 and appendix 1 will be required. The Environment Agency will assist planning authorities in coming to their decision on whether the consequences of flooding are acceptable, in terms of the risks to people and property. In all other zones where flooding is identified as a material consideration section 7 will be applicable.

11.2 For zone C an assessment in accordance with appendix 1 should be submitted with the planning application. Where insufficient information is provided in the assessment to enable the Environment Agency to advise on the consequences of flooding, the planning authority should use its powers to request further information, which may lead to delay in determination. Where requested information is not forthcoming this may constitute a reason for refusal. Such assessments will require detailed hydrological investigations to identify the likely sources and mechanism of flooding as well as assessment of the consequences of a flooding event for the development proposed and the immediate vicinity. Such assessments should be carried out by a suitably qualified competent person and inform the process of detailed design and the selection of mitigation measures.

11.3 The TAN constitutes new information and may affect applications for renewal of planning consent, reserved matters or detailed consents. It is considered perfectly reasonable for planning authorities to require all development permitted in zone C, including those already granted outline permission or where renewal of planning consent is sought, to plan for the consequences of flooding. In the light of new information in this TAN, in some instances, highly vulnerable uses may not be considered acceptable in accordance with section 7 and appendix 1.

Pre-application discussions

11.4 The risk of flooding will always be a material consideration in zone C. However, it should be remembered that flooding may be an issue in zones B and A. In preparing proposals for development, applicants should discuss with the planning authority the requirements they will be expected to meet to satisfy the authority, in light of the advice in the TAN.

11.5 Developers should approach the Environment Agency for advice on the potential consequences of flooding to their proposed development before undertaking assessment of flooding consequences. The Environment Agency will provide advice on the scope of the assessment needed commensurate with the nature and scale of the proposed development and make available relevant

information. Details of the technical requirements can be found in appendix 1. Tripartite discussions between the applicant, the local planning authority, the Environment Agency/the appropriate drainage body are encouraged as best practice.

Consultation

11.6 When a planning authority receives an application, which is within zone C, or in some cases in zone B, they should undertake appropriate internal consultation in relation to their own flood defence responsibilities as well as consulting the Environment Agency. Where appropriate, standing advice should also be considered. Planning authorities should also, where relevant, consult with Internal Drainage Boards on developments within internal drainage districts and outside where it would have an impact in them.

11.7 The Environment Agency, or any other relevant authorities, should provide detailed advice to the planning authority on the findings and conclusions of the assessment of flood consequences, including the impact on flooding elsewhere or the impact of flood alleviation works on other property or natural heritage. Where the planning authority is minded to go against the advice of the Environment Agency, it should inform the Agency prior to granting consent allowing sufficient time for further representations to be made, to ensure consequences can be managed acceptably.

11.8 The supplementary reports accompanying the application, and other subsequent and relevant information should be made publicly available as part of the determination of the application and if requested, such information should be made available for legal searches.

11.9 Where run-off considerations are likely to be significant, planning authorities should undertake appropriate consultation. This will include appropriate internal consultation in relation to their drainage responsibilities, the Environment Agency, Internal Drainage Boards, the sewerage undertaker and, where relevant, any navigation authority. They will be able to advise on the capacity of existing drainage systems, the feasibility and desirability of using SuDS and the impacts of discharges to watercourses. The ability of such systems to be adopted as part of a highway drainage or surface water drainage scheme should also be considered.

Developer Contributions

11.10 Application of the advice contained in sections 6 and 7 may, in some circumstances, result in development being permitted which requires the provision of flood defence and mitigation. However, developers cannot normally call on public resources to provide defences for their proposed development where they are not already programmed for the protection of existing development. This will mean that developers should bear the costs of necessary mitigation, construction and long term maintenance. Publicly funded measures should be directed towards protecting existing properties. Planning authorities should, where necessary, require developers to enter into an agreement under

Section 106 of the Town and Country Planning Act 1990 to ensure that the defences can be provided, that the developer carries out any necessary works and that future maintenance commitments are met. It will probably be appropriate to vest the resulting defences, which have been constructed to the operating authority's satisfaction, in the operating authority, with a dedicated commuted sum to cover maintenance for 30 years. After that time, it would be reasonable to regard the defences as a public asset which should be maintained from the public purse.

11.11 Where such works would provide a wider benefit, the funding provided by the developer may be proportional to the benefits to him. In such cases, a reasonable allocation might be for the developer to fund the provision of the defences, which are then vested in and maintained by the operating authority. A "Grampian" type condition may be used where it can be guaranteed that the whole scheme would be funded and constructed prior to development proceeding. Advice on the use of conditions in planning permissions and planning obligations is set out in WO Circulars 35/95 and 13/97 respectively.

11.12 The planning authority, having taken advice from the Environment Agency and any other relevant operating authority, will need to be satisfied that the defences can be provided and will determine what contribution from the developer is required. Unless a planning authority is satisfied that the developer will be subject to an effective obligation to provide the necessary contribution, the application should be refused.

11.13 The developer must make adequate provision for the future maintenance of surface water drainage systems. This may take the form of commuted sums, adoption agreements or by the creation of a management company.

Environmental Impact Assessment (EIA)

11.14 Planning permission is required for new coast protection works and to improve existing works. Coast protection works (other than the maintenance or reconstruction of existing works) fall within schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 and EIA may well be required before planning permission can be determined. Where coast protection works are likely to have a significant effect on a site covered under the Conservation (Natural Habitats, &c.) Regulations 1994, "appropriate assessment" will be required.

11.15 If the works are below mean high water springs, a licence is required from the Assembly under the provisions of the Food and Environmental Protection Act 1995. In considering whether to issue a licence regard will be given to the need to protect the marine environment, amongst other things. Also, all capital works must be approved irrespective of whether grant aid is being provided.

11.16 For flood defence/relief works, local planning authorities will need to determine whether EIA is required under planning regulations. The preservation, wherever possible, of natural flood defence structures, for example sand dunes, should always be an option for consideration and integrated with the delivery of other benefits in the context of Integrated Coastal Zone Management (ICZM).

11.17 In addition, land drainage improvements permitted under the Town and Country Planning (General Permitted Development) Order 1995, as amended, may require EIA under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. Developers should contact the planning authority as early as possible to determine whether EIA is needed and, if so, what it should cover.

11.18 Flood risk may be an element to be considered as part of developments for which an environment statement is required, and if so, will form part of the EIA. This is likely to occur where the impact of development on flood risk will effect designated conservation sites or compromise river and shoreline management options or biodiversity action plans. These circumstances are not exhaustive and developers should contact the planning authority to determine whether EIA is required. Further advice on EIA is contained in WO Circular 11/99 and section 4.3 of PPW.

Applications for Individual Householders

11.19 Applications for minor extensions or alterations should not raise significant issues unless they are likely to have a direct and adverse effect on a watercourse or its flood defences, would impede access to flood defence and management facilities or where the cumulative impact of such developments could have a significant effect on flood storage capacity or flood flows. In such cases there will be no requirement to justify the location of development but if such minor works are likely to have an adverse effect then the full consequences of a development will need to be appreciated and assessment undertaken commensurate with the scale and nature of development. Where extensions or alterations are likely to have a direct and adverse effect, authorities should consider making an Article 4 Direction under the Town and Country Planning (General Permitted Development) Order 1995, as amended, to require an application for planning permission so that full consideration can be given to these impacts.

Change of Use

11.20 In many cases planning permission will be required for development where flood risk is a material consideration. However, there may be instances where changes of use, permitted under the Town and Country Planning (Use Classes) Order 1987, as amended, could result in a change from a low vulnerability use to a high vulnerability use and therefore the consequences of flooding may be unacceptable in zone C. In such circumstances a flooding consequences assessment commensurate with the scale and nature of the proposal will be required.

Public open space, recreation and agriculture

11.21 Proposals for public open space, outdoor recreational uses and agricultural developments, are likely to be acceptable in all areas where there is a risk of flooding. However, ancillary buildings or structures required for these uses, which are subject to prior approval, may not be acceptable in accordance with section 7.

Therefore, as with all other uses, the application of section 7 will be relevant where flooding is a risk to ensure that the consequences of flooding are considered acceptable and are capable of being effectively managed. The Environment Agency will advise on the requirements of appendix 1 as far as these are required in relation to the scale and nature of the proposal.

Caravan and Camping Sites

11.22 Caravan, camping and other temporary occupancy sites give rise to special problems in relation to flooding. They have often been located on coastal or riverside sites which are susceptible to flooding. The instability of caravans places their occupants, and others, at special risk and it may be difficult to operate an effective flood warning system. Such development should be refused in zone C2, as should proposed changes of use to residential mobile homes or permanent housing and only be considered in zone C1 following application of the tests in section 6, 7 and appendix 1.

11.23 Where permission is granted for caravan/camping sites or other temporary holiday accommodation, a planning condition should require the erection of suitable warning notices to inform people entering the site and the preparation of effective warning and evacuation plans. Enforcement action should be taken if such signs become out of date, to ensure that effective warning notices are always present. Advice on the way that such matters might be approached is given in appendix 6. It is strongly recommended that sites licensed under the Caravan Sites and Control of Development Act 1960, which do not require planning permission, should have similar warnings and plans. Caravanning and camping organisations should liaise with the local planning authority and the Environment Agency about any flooding constraints which might apply and the arrangements for notifying users of the warning systems and evacuation procedures. See appendix 6.

Canals and other artificial water bodies

11.24 Canals, as inland waterways, operate differently to rivers and other watercourses as defined under the Land Drainage Act 1991. While some will fall within river or coastal flood risk areas, canals generally have a limited number of feeders, which are often controlled so that they can be diverted away from the canal at times of flood. Sluices are controlled to discharge excess water from the canal during periods of high inflow to ensure that water levels do not exceed the freeboard and overtop to flood adjacent land. Canals also have some ability to store water before it is discharged, attenuating flood peaks and reducing the potential for flooding. In some cases, canals cross river catchment boundaries, and water could be accepted in one catchment and discharged in another. British Waterways (and other canal owners) should be consulted in the vicinity of canals, feeders and streams which are fed from canal overflow structures, such as weirs and sluices.

11.25 The implications for development in the vicinity of canals and other artificial water bodies are twofold. Firstly, since the concept of a flood plain is not applicable, waterside development or redevelopment of previously developed land may not face the same flood-risk constraints as development alongside a river. Canals may therefore retain their potential to act as catalysts for urban and rural regeneration. Secondly, where developments propose to drain into a canal, and the canal is hence part of the local drainage system, due consideration should be given to the level and impact this drainage would have on the canal's ability to store water. The use of sustainable drainage systems is one way of overcoming concerns about the impact of development on the canal's ability to handle flood water. However, authorities considering development in the vicinity of canals should not overlook their own capacity to cause localised flooding, for example where overflow channels fail to operate or where canal embankments fail or are breached. Dams and reservoirs pose a similar potential for possibly large-scale flooding. A precautionary approach should be adopted at vulnerable locations and the precautionary methodology applied in consultation with the canal operator or dam/reservoir owner.

Assessing Flooding Consequences

A1.1 This appendix explains how the potential consequences of a flooding event should be assessed within the context of this technical advice note. It also provides guidance on the technical requirements for undertaking such an assessment. **The first step in undertaking an assessment must be for developers to consult the Environment Agency about the objectives of the assessment.**

A) Objectives of the assessment

A1.2 The prime objective of an assessment is to develop a full appreciation of:

- The consequences of flooding on the development
- The consequences (i.e. the overall impacts) of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1%.
- The assessment can be used to establish whether appropriate mitigation measures can be incorporated within the design of the development to ensure that development minimises risk to life, damage to property and disruption to people living and working on the site or elsewhere in the floodplain.

B) Assessing flooding consequences

A1.3 To assess the flooding consequences of a development the mechanisms likely to cause flooding must first be fully understood. This will involve identifying the sources of floodwater, understanding how floodwater enters and flows across the site, assessing how high floodwaters will reach and how quickly they rise and fall. Where sites need to be modified (e.g. ground raising) the extent of these modifications will need to be assessed before the impacts of and the consequences on the development can be fully determined.

A1.4 Before embarking on an assessment it is important to recognise that levels of confidence in our estimation of extreme flood events are generally not high. Extreme flood events can occur at any time but are generally rare. While information on new events is now collected systematically this has not always been the case and our historic records are often limited. Such estimates that we have are also likely to be affected significantly by global warming and climate change. The high public and private costs of flooding require a precautionary approach which acknowledges the uncertainty of current forecasts. It is important that these uncertainties are acknowledged and taken fully into account to ensure that decisions are made in a sensible and pragmatic manner.

A1.5 A proposed development must provide a safe and secure living and/or working environment throughout its life. To achieve this those living and/or

working on the site must, as far as is practical, have an appreciation of the dangers of doing so and an awareness of the measures/procedures in place to manage those dangers. To appreciate those dangers a simple and easily understood description of the flooding consequences for a particular site needs to be prepared. For each development, and under a range of extreme events from the threshold to that flood having a probability of occurrence of 0.1%, an assessment should include clear and simple descriptions of the following:

- The likely mechanisms of flooding
- The likely sources of flooding
- The depths of flooding throughout the site
- The speed of inundation of the site
- The rate of rise of floodwaters throughout the site.
- Velocities of floodwaters across the site
- Overland flood routes
- The effects on access and egress and infrastructure, for example public sewer outfalls, combined sewer overflows, surface water sewers and effluent discharge pipes from waste water treatment works
- The impacts of the development on natural heritage
- The impact of the development in terms of flood risk on neighbouring properties and elsewhere on the flood plain.

A1.6 When assessing the consequences of flooding associated with a proposed development it is important to recognise that during extreme flood events the landscape often changes physically. Rivers can change their course, trees can be uprooted and along with other debris can be swept down the river systems. Such debris can sometimes cause a damming effect on bridges, hedgerows, fence-lines and at the entrance to culverts. While this may in itself cause flooding upstream it can also lead to surge flows when those hedgerows, fence-lines or bridges give way under the pressure of the retained flood water. Therefore, although this is usually a matter for pragmatic judgement, consideration should be given to the possibility of flooding caused by blockage and particular attention given to the flooding consequences of such blockage on the development.

A1.7 Where areas are defended by existing flood defences particular consideration should also be given to the structural adequacy of the defences in terms of their ability not only to contain flows within the river channel but also to withstand overtopping during extreme events. Flood defences can fail/breach under overtopping conditions and such failure can result in rapid inundation of the flood plain. The adequacy of existing flood defences must therefore be carefully considered under a range of flood conditions, particularly those which cause overtopping of the defences, and to include that flood with a probability of occurrence of 0.1%. Where breach scenarios exist consideration should be given to the adoption of a suitably sized buffer zone within which no

development should be allowed. In coastal areas wave and tidal erosion can rapidly remove areas of high ground protecting lower lying areas behind, and low lying coastal lands should always be regarded as being at some risk from flooding.

A1.8 Where development would be at risk from flooding, the developer will need to indicate what measures would be taken to ensure the flooding consequences are managed to acceptable levels. Where such measures are possible, conditions, or preferably a section 106 obligation, should be used to require the implementation of such measures.

A1.9 While assessing the dangers from flooding particular attention should be paid to the impact of the development on flood risk elsewhere on the flood plain. While it may not always be possible to effectively manage these dangers it is anticipated that it will generally involve both the construction of engineering works together with the provision of flood warnings and emergency plans for the site. In such cases it is expected that any necessary engineering works would be provided directly by the developer while the provision of flood warnings and/or emergency plans/activities would be provided by public bodies (i.e. Environment Agency and Local Authorities) albeit at the developer's expense

A1.10 Assessing the flooding consequences can be a complex, technically challenging and expensive undertaking. Given its importance in terms of supporting the planning decision and underpinning the design of measures aimed at safeguarding the users of the development it must be undertaken by a suitably qualified person carrying an appropriate professional indemnity.

C) Acceptability criteria for flooding consequences

A1.11 Any new development on the flood plain will generally result in additional risks. The main criteria for deciding whether such a development is acceptable will depend on whether those factors can be effectively managed. The Environment Agency will advise the planning authority on the consequences of flooding for the type and nature of proposal and this should enable the planning authority to arrive at a judgement on the acceptability of the flooding consequences.

A1.12 To satisfy these criteria a site should only be considered for development if the following conditions can be satisfied;

- Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a probability of occurrence of 0.1%)
- The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with the Environment Agency.
- The developer must ensure that future occupiers of development are aware of the flooding risks and consequences
- Effective flood warnings are provided at the site

- Escape/evacuation routes are shown by the developer to be operational under all conditions
- Flood emergency plans and procedures produced by the developer must be in place
- The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from the floodwaters
- Development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood.
- No flooding elsewhere

A1.13 Responsibility for satisfying the above criteria primarily will be the developer. The Environment Agency will provide advice to the developer to assist him in satisfying the criteria. The Environment Agency will advise the planning authority whether the criteria have been satisfied.

A1.14 In addition to the above general conditions there are particular flooding consequences which may not be considered acceptable for particular types of development. For instance in view of the traumatic impact of flooding on people's personal lives it is not sensible to allow residential development in areas which flood frequently. Environment Agency advice to planning authorities suggests that development should be designed to be flood free during the 1% fluvial flood (i.e. that fluvial flood with a 100 to 1 chance of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event). There is therefore a frequency threshold of flooding below which flooding of development should not be allowed. The following table, which should not be regarded as prescriptive, provides indicative guidance as to what that frequency threshold could be for different types of development described in terms of annual probability of occurrence.

Type of Development	Threshold Frequency (Years)	
	Fluvial	Tidal
Residential	1%	0.5%
Commercial/Retail	1%	0.5%
Industrial	1%	0.5%
Emergency Services	0.1%	0.1%
General Infrastructure	1%	0.5%

A1.15 Beyond the threshold frequency proposed development would be expected to flood under extreme conditions. However even with adequate mitigation measures in place it may still not be sensible to allow particular development to take place. For instance it would not be sensible for developments to be built in areas where the velocity and depth of floodwaters was such that structural damage was possible or that people could be swept away by the flood. Similarly it would not be sensible for single storey residential development to be sited where the depth of flooding would exceed heights of 0.6metres (ie the height of a bed or a cot). The following table, which should not be regarded as prescriptive provides indicative guidance on what is considered tolerable conditions for different types of developments.

Type of development	Maximum depth of flooding (mm)	Maximum rate of rise of floodwaters (m/hr)	Maximum speed of inundation of flood risk area (hrs)	Maximum velocity of floodwaters (metres/sec)
	Property Access			Property Access
Residential (habitable rooms)	600 600	0.1	4	0.15 0.3
Commercial & Retail	600 600	0.3	2	0.15 0.3
Industrial	1000 1000	0.3	2	0.3 0.45
Emergency Services	450 600	0.1	4	0.15 0.3
General Infrastructure	600 600	0.3	2	0.3 0.3

NOTE. The above figures are indicative and reflect conditions in which, given the presence of adequate warnings and preparation, appropriately equipped personnel could undertake emergency activities. However they are not definitive. Each site must therefore be considered individually and a judgement taken in the context of the particular circumstances which could prevail at that site.

D) Awareness of flooding consequences

A1.16 Where development is allowed in flood risk areas local planning authorities should impose conditions that require the incorporation of physical features at flood defence locations that will draw attention to the flood risk. For instance, this could include indicating estimated extreme flood levels or escape routes and advertising details of current flood warning arrangements and emergency plans/procedures as far as such measures comply with WO circular 35/95.

E) Technical requirements for assessing flooding consequences

A1.17 The detail and technical complexity of an assessment will reflect the scale and potential significance of the development. **The Environment Agency should be consulted about and will advise on the level of assessment required as part of allocating a site and putting forward a development proposal.** As a minimum, assessments should include 1, 2, 6, 9, 12, 13, 16, 17

1. A location plan identifying all possible sources of flooding including overtopping of existing defences.. The plan should be presented at an appropriate scale and should includes geographical features, street names and identifies all watercourses or other bodies of water in the vicinity. This should include drainage outfalls and, if necessary, cross-refer to their operational arrangements in the body of the report.
2. A plan of the site showing existing levels related to Ordnance Datum, both current and following the proposed development. Proposed development levels may well be only indicative at this stage.
3. A more detailed indication, if appropriate, of flood alleviation measures already in place, their state of maintenance and their sustainability throughout the life of the development. This will also include an assessment of the performance of those defences under extreme overtopping conditions with particular attention being given to their susceptibility to breach and the flooding consequences on the development of doing so. The defended area dataset provided as part of this document will indicate the existence of formal flood defences/measures. It is however the responsibility of the promoter of the development to make contact with the owners of the structures and determine their detail.
4. A plan of the area showing accesses/evacuation routes from the proposed development site giving existing levels relative to Ordnance Datum.
5. An assessment of the source of potential flooding - rivers, tidal, coastal, groundwater, surface flow or any combination of these to include estimates of extreme flood flows from the threshold to the probable maximum flood.
6. A plan of the site showing any existing information on extent and depth of flood events or on flood predictions. Information may be anecdotal, photographic, survey results or model estimates. The events should be identified with date/time, source of the data and supporting information provided on

rainfall and/or return period, or probability of occurrence of the flood or storm surge event, or combination. Recorded data are particularly valuable and, if available, should be highlighted along with evidence of any observed trends in flood occurrence. Any changes that have taken place since the last event should be identified.

7. A plan and description of any structures which may influence local hydraulics. This will include bridges, pipes/ducts crossing the watercourse, culverts, screens, embankments or walls, overgrown or collapsing channels. This will also include an assessment of the likelihood of such structures to choke with debris and the flooding consequences of this on the development.
8. An assessment of the probabilities and any observed trends and the extent and depth of floods for the location and in the catchment context and, if appropriate, routes and speed of water flow. At this stage best estimates, based on the most up-to-date findings, should also be made of climate change impacts on probabilities. The assessment should ensure that the development meets an acceptable standard of flood defence for the design life of the development.
9. Cross-sections of the site showing proposed finished floor levels or road levels, or other relevant levels relative to the source of flooding, and to anticipated water levels and associated probabilities.
10. An assessment of the likely rate or speed with which flooding might occur, the order in which various parts of the location or site might flood, the likely duration of flood events and the economic, social and environmental consequences/impacts of flooding.
11. An assessment of the implications of any drains or sewers, existing or proposed, on the site during flood events. The methodology for assessment must be clearly stated.
12. An estimate of the volume of water that would be displaced from the site for various flood levels following development of the site and of the run-off likely to be generated from the development
13. An assessment of the likely impact of any displaced water on neighbouring or other locations which might be affected subsequent to development. This should address the potential for change of the flooding regime both upstream and downstream of the site due to ground raising or flood embankments.
14. An assessment of the potential impact of any development on fluvial or coastal morphology and the likely longer-term stability and sustainability.
15. Because of the uncertainties in flood estimation and expected climate change impacts, hydrological analysis of flood flows and definition of defence standards should include the allowances for increased flows and sea-level rise provided in the latest project appraisal guidance.

16. An assessment of the residual risks after the construction of any necessary defences. Consideration should always be given to the behaviour of any new or modified defences in extreme events greater than those for which they are designed and information should be provided on the consideration given to minimising risks to life in such circumstances.

17. The report should include a clear and comprehensive summary describing the following in simple terms:

- All potential sources of flooding to include potential blockages and breaching of defences
- Under the range of scenarios considered
 - ◆ How flooding of site would develop
 - ◆ How quickly floodwaters would rise across the site with particular reference to property and access/evacuation routes.
 - ◆ How fast floodwaters would move across the site with particular reference to property and access/evacuation routes.
- How the proposed development would impact on flood risk elsewhere in the catchment.
- What conditions should be imposed on the development to ensure no additional risk to life and minimal damage and disruption to people and property and the natural environment. This should include reference to the need for flood warnings, emergency plans, escape routes and the general design of the development.

Useful references

DTLR (2002) Preparing for Floods: Interim guidance for improving the flood resistance of domestic and small business properties. Department for Transport, Local Government and the Regions. February 2002 www.odpm.gov.uk

www.abi.org.uk

Flooding and Climate Change

A2.1 Flooding occurs when the amount of water arriving on land from rainfall, snow melt, surface flow, flow in watercourses or inundation by the sea exceeds the capacity of the land to discharge that water by infiltration, surface flow, piped drainage or surface watercourses.

A2.2 The principle cause of river flooding is excessive rainfall or snow melt within a limited period. The effects are particularly exacerbated when the ground is already saturated or channels become blocked. Inundation by the sea is largely due to combinations of high tide, storm surge or wave activity but may also be associated with structural failure of defences. Some areas are subject to the combined effects of both fluvial and tidal impacts.

A2.3 While floods are primarily caused by high rainfall, the areas affected and the extent of flooding are influenced by other factors. These can be physical factors such as a large catchment relative to the size of the watercourse draining it or sediment movement that has changed river cross-sections and affected flood levels. Other factors which affect the impact of a flooding event may include:-

- the growth of built development in catchments and other changes in land use (for example agricultural and forestry) which increase the rate and volume of run-off;
- the lack of maintenance of flood defence systems, watercourses, culverts, including the flood relief areas around them and road gullies, particularly where this leads to channel blockage;
- canalisation, modification and diversion of rivers and watercourses, which increase the rate of flow and decrease the time taken for water to travel within a catchment; and,
- the building of structures (e.g. embankments) which restrict water flows over historical flood plains and create additional flood risks upstream and downstream.

Impacts of climate change

A2.4 The rise in sea level will change the frequency of occurrence of high water levels. There may also be secondary impacts such as changes in wave height due to increased water depths, as well as predicted changes in the frequency, duration and severity of storm events. It should be recognised however that while sea level rise and climate change could have a significant impact on flooding consequences for existing flood zones, current information suggests that the actual extent of such areas at risk are not expected to increase significantly.

A2.5 The UK Climate Impacts Programme scenarios forecast that Wales in 2080 will be, on average, 1.1°C to 2.9°C warmer than the current temperature. Work is

now being undertaken by the UK Climate Impacts Programme (UKCIP), to update the UK climate change scenarios in light of the findings of the Intergovernmental Panel on Climate Change. It is likely that the temperature predictions will be revised upwards and we also believe that there will be:

- more frequent storms;
- sea level rise;
- increased rainfall and greater inflow to estuaries and the sea;
- changes of rainfall pattern during the year - wetter winters and drier summers; and
- increased evapotranspiration.

A2.6 One of the most likely effects to which Wales will have to adapt in the future is sea level rise. Current projections estimate that around the Welsh coast, increases will be in the range of 25 to 30 cm by 2050, slightly more in the south than the north. An allowance of 5 mm per annum over the life of a scheme is now built into all new coastal defences where appropriate, or otherwise the defences are constructed to enable increases in height to be incorporated in the future.

A2.7 The Welsh coastline is also expected to be subject to increased storminess. As well as increasing the risk of flooding of low-lying areas, such events will increase the rates of erosion of the higher ground. This will be especially so where the coastline is composed of softer materials.

A2.8 While there are predictions of increases in rainfall over winter months, the effect on extreme weather conditions that lead to flooding is uncertain. However, initial research for the Severn catchment suggests that increases of peak flow of up to 20% for a given return period could be experienced within 50 years. These are preliminary findings and further work is required but they give added weight to policy which avoids placing additional assets behind existing defences, maintains current defences where they are justified and adopts robust and sustainable solutions where defences are to be replaced. Recent work also suggest that there is some evidence of an apparent increase in more intense winter rainfall events in the UK since the 1960's. These are likely to contribute to increases in flooding, which is in line with the general expectation of a more extreme hydrological cycle with climate change. It should also be remembered that each catchment will respond differently depending on its size and characteristics.

Useful References

www.wales.gov.uk/climatechange
www.ukcip.org.uk

Welsh Assembly Government (2001) Climate Change Wales Learning to Live Differently, Welsh Assembly Government

Welsh Assembly Government and Welsh Local Government Association (2002) Community Leadership and Climate Change: Guidance for Chief Executives of Welsh Local Authorities

The Environment Agency

A) Flood defence powers and duties

A3.1 The Environment Agency is required to exercise a general supervision over flood defence matters. It has operational powers to build and maintain flood defences on main rivers and sea defence works and has powers to establish flood warning schemes. For other watercourses, the statutory powers to maintain or improve existing works, or to construct new works, lie with local authorities except where there are Internal Drainage Boards.

A3.2 The powers exercised by the Environment Agency, local authorities and drainage boards are permissive and do not release riparian owners from any obligation to which they were subject by reasons of tenure, custom, prescription or otherwise before the commencement of the relevant legislation.

A3.3 In discharging their functions, drainage bodies¹ are concerned with:

- the natural catchment areas of watercourses and rivers;
- the channels occupied by rivers and watercourses during times of normal flow;
- flood plains and washlands which accommodate water during periods of flood; and
- coastal flood plains, that is land at risk from flooding from the sea or tidal lengths of rivers, whether or not protected by sea defences.

A3.4 The Environment Agency has statutory powers to control the erection of structures in, over or under main rivers. Internal Drainage Boards and the Environment Agency have statutory powers to control obstructions and culverts etc on any watercourse and in certain instances along the banks of watercourses.

A3.5 Drainage bodies have statutory powers to require works to be undertaken to maintain the flow of watercourses. In addition the Environment Agency has a duty to 'further conservation' in the exercise of its duties, and seeks to highlight the risk to development on floodplains by installing flood warning schemes as a matter of course. It is vital to recognise that all the statutory powers are limited.

B) Development Control

A3.6 Flooding is one of several material considerations (unstable land and contamination are others) where the applicant and occupier accept there is a degree of risk. The local planning authority's responsibility is to have regard to that risk in determining the planning application. This does not affect the liability position of developers or owners while planning authorities must act reasonably in reaching decisions on planning applications. In particular, local planning authorities should avoid any indication that their approval of an application

¹ A drainage body is the Environment Agency, an Internal Drainage Board, or any body having power to make or maintain works for the drainage of land.

implies the absence of flood risk, rather they should make it clear that in coming to their decision they have accepted the consequences of flooding.

A3.7 In respect of development and flooding, the Environment Agency has two roles in considering development proposals. First, it has to consider how development would affect rivers, and existing and new flood defence operations, taking account of conservation interests in the area likely to be affected. Not all flood defences are owned or maintained by the Environment Agency. Railtrack, British Waterways, highway authorities and riparian owners also control embankments which may serve as flood defences.

A3.8 Secondly, the Environment Agency will advise on how proposed development would itself affect flood risk by providing a broad assessment of the potential flooding effects, and of the scope for engineering works to alleviate it.

A3.9 More specifically, as part of pre application discussions the Environment Agency will make available information to assist developers in complying with the requirements in the TAN.

A3.10 When consulted the Environment Agency will, for example:

- indicate what further information is needed before the consequences of flooding can be assessed sufficiently to decide the application, bearing in mind the level of understanding required for proposing allocations as part of plan preparation and the scale and nature of a proposal in terms of a planning application;
- provide detailed advice on the flood consequences assessment accompanying a proposed allocation or planning application, so in order to assist the planning authority in coming to its judgement on the acceptability of consequences;
- indicate that the consequences of any flooding can be overcome by alleviation works and suggest conditions;
- suggest conditions to ensure access to watercourses, particularly to permit future maintenance;
- point out the need for works affecting watercourses to comply with Environment Agency requirements;
- object to the proposed development where the consequences of a flood event cannot be acceptably managed in terms of the risk to people and property, and natural heritage.

Sustainable Drainage Systems

A4.1 Flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites through the use of **sustainable drainage systems (SUDS)**. This should be complementary to the control of development within the floodplain.

A4.2 The disposal of surface water has long been a material consideration for local planning authorities in determining individual land-use planning proposals. Development reduces surface permeability by replacing vegetated ground with roofs and paved areas and through compaction of other areas by vehicular movements. This reduces the amount of water infiltrating into the ground and increases surface run-off.

A4.3 Any built-up area, therefore, needs to be drained to remove excess water. Traditionally this has been done using underground pipe systems designed for quantity, to convey water away as quickly as possible and thus prevent flooding locally. This increases the speed of run-off and can change the flooding regime of the catchment.

A4.4 The alteration of natural flow patterns in terms of increases in both the total quantity and peak flows of run-off through the extension of built development can lead to problems elsewhere within the river catchment, particularly flooding downstream. Increased flow rates can also cause erosion and damage stream and streamside habitats. Water quality issues are also important because pollutants from built up areas are washed into rivers or groundwater, harming fish and wildlife and being difficult to clean up.

A4.5 Because traditional drainage systems are designed to carry water away quickly without treatment, they cannot easily control poor runoff quality. They may also contribute to the problem where they feed into combined sewers of limited capacity and increase discharges to watercourses from combined sewer overflows. Amenity issues, such as water resources, community facilities, landscaping potential and the provision of wildlife habitats have largely been ignored in past planning and design of drainage systems. Continuing to drain built up areas without taking these wider issues into consideration is not a sustainable long-term option.

What are sustainable drainage systems?

A4.6 Sustainable drainage systems use techniques to control surface water run-off as close to its origin as possible, before it enters a watercourse. This involves moving away from traditional piped drainage systems to engineering solutions that mimic natural drainage processes.

A4.7 A wide range of sustainable drainage options is available, from which promoters, designers, developers, planners, drainage specialists and civil engineers may choose in preference to piped drainage systems, including:

- preventive measures - eg rain-water recycling, good-practice design and maintenance;
- filter strips and swales – vegetated landscape features with smooth surfaces and a gentle downhill gradient to drain water evenly off impermeable surfaces, mimicking natural drainage patterns;
- filter drains and permeable and porous pavements – permeable surfaces to allow rainwater and run-off to infiltrate into permeable material placed below ground to store water prior to discharge;
- infiltration devices - below-ground or surface structures to drain water directly into the ground (soakaways, infiltration trenches, swales with infiltration and infiltration basins), which may be used at source or the run-off may be conveyed to the infiltration area in a pipe or swale; and
- basins and ponds – structures designed to hold water when it rains; basins are free from water in dry weather, ponds contain water at all times and are designed to hold more when it rains; examples include retention basins, balancing/attenuation ponds, flood storage reservoirs, lagoons, retention ponds and wetlands/reed beds.

A4.8 Local planning authorities and developers should seek advice from the Environment Agency, highways authorities and sewerage undertakers on the techniques available for sustainable drainage and their suitability for proposed development or redevelopment in specific locations.

Benefits of and constraints on sustainable drainage systems

A4.9 Sustainable drainage systems can help reduce the environmental impact of development. Their use provides a significant contribution towards more sustainable development since they:

- manage environmental impacts at source, rather than downstream;
- manage water run-off rates, reducing the impact of urbanisation on flooding;
- protect or enhance water quality;
- are sympathetic to the environmental setting and the needs of the local community;
- provide opportunities to create habitats for wildlife in urban watercourses;
- can encourage natural groundwater recharge (where appropriate); and
- can protect water resources through recycling

A4.10 Although the benefits of sustainable drainage systems are secured principally at the river-catchment scale, their early consideration at all levels of the planning and development process can lead to opportunities for more imaginative and attractive developments. Surface water management using sustainable drainage systems can be implemented at all scales. It may start with

prevention or good housekeeping measures and soakaways for individual premises and progress through the use of infiltration devices, tank storage or small basins for larger sites to basins and wetlands at the sub-regional scale. At any level, it can help to reduce the need for investment in flood management and protection works by mitigating the intrinsic additional flood risk that new development might otherwise generate. The use of sustainable drainage systems can in some circumstances allow development to proceed that would otherwise be refused because of the increased flood risk caused by run-off.

A4.11 While there are clear benefits to the use of sustainable drainage systems, there are also some constraints on the choice of system. The surface structures that may be needed can take more space than conventional systems. It is often possible, however, for them to be integrated into the surrounding land use, eg in public open space or road verges.

A4.12 Limitations to infiltration devices occur where:

- the soil is not very permeable;
- the water table is shallow;
- the groundwater under the site may be put at risk; or
- infiltration of water into the ground, particularly if concentrated in a limited area, could adversely affect ground stability.

A4.13 For example, infiltration from particular types of development may be prohibited in groundwater protection zones or be subject to the need for investigation and appropriate additional treatment prior to discharge. Selection and design of infiltration systems needs to take account of the Environment Agency's Policy and practice for the protection of groundwater, together with groundwater protection zone maps and groundwater vulnerability maps.

A4.14 Particular care is needed in designing sustainable drainage systems with appropriate capacity to handle run-off at their location. Contingency measures may be required to ensure that problems are not made worse when the intensity and/or duration of rainfall, and hence the quantity of run-off exceeds that for which the system was designed. This constraint applies equally to conventional drainage systems. In extreme events, sustainable drainage systems may, like other drainage systems, be overwhelmed in that they will only deal with the rainfall event for which they are designed. They will assist, however, in reducing the initial impact of extreme events.

Implementation of sustainable drainage systems

A4.15 Any perception that sustainable drainage systems are something new, and that the techniques are untried, is unfounded. There are numerous examples both in Britain and overseas of such systems being used successfully. These have required planners, developers, engineers, and architects to look at development in a more sustainable and imaginative way. While their use has not previously been the norm in the planning of development, the growing recognition of the impact

of built development on run-off characteristics and the increasing emphasis on sustainable development will require that consideration be given to the use of drainage systems which control water as near its source as possible.

A4.16 Additional effort is often required at the conception and detailed stages of designing sustainable drainage systems. However, there is growing evidence that reduced implementation costs, as well as the general benefits of reduced overall flood risks and better control of pollution from urban run-off, more than compensate for this. Consideration of the following issues early in the planning and design stages is essential:

- integration of sustainable drainage systems into the overall site concept and layout;
- the need for investigation and subsequent remediation of contaminated land;
- agreements on adoption, maintenance and operation of the systems; and
- the need for monitoring long-term performance.

Promotion of sustainable drainage systems

A4.17 The planning system can further the use of sustainable drainage systems by:

- incorporating favourable strategic or local policies within development plans;
- persuading developers to adopt sustainable drainage systems wherever practicable, as part of all future development, if necessary through the use of appropriate planning conditions or by planning agreements; and
- developing joint strategies with the sewerage undertakers and the Environment Agency to further encourage the use of sustainable drainage systems.

Useful References

National SuDs Working Group (2004) Interim Code of Practice for Sustainable Drainage Systems (www.ciria.org/suds)

The Wales Suds Group can be found at Sudswales.com

Other useful documents can be found at www.ciria.org/suds

Some Relevant Statutory and Non-Statutory Plans

A5.1 Since about 1990, there have been a number of initiatives in regard to non-statutory plans dealing, in particular with coastal issues. Many of these contain policies and proposals that have land-use planning implications. It is important that these are integrated where possible with the statutory development plan and that they are taken into account when deciding planning applications. Local planning authorities should be aware of these developments and be involved where necessary. The various bodies who are responsible for producing such plans may also be useful sources of advice and guidance.

Shoreline management plans

A5.2 Shoreline management plans (SMPs) are prepared by coastal defence authorities (the Environment Agency and maritime local authorities) acting individually or as part of coastal groups. SMPs set out a strategy for sustainable coastal defence within coastal sediment cells, taking account of natural coastal processes and human and other environmental influences and needs. A SMP should set objectives for the future management of the shoreline based on predictions of the likely future evolution of the coast and knowledge of coastal processes within the cell and should inform and be informed by the statutory planning process. The methodology involves assessment of a range of strategic coastal defence options and identification of a preferred approach for sections of coast (management units) within the plan area. The generic options for such sections of coast, all of which include monitoring to assess their effectiveness and how appropriate they continue to be, are:

- Do nothing;
- Hold the existing defence line by maintaining or changing the standard of protection;
- Advance the existing defence line; and
- Retreat the existing defence line (managed retreat or realignment).

A5.3 The choice of a preferred option is critical to future planning decisions relating to the coastal flood plain. Development plan policies, proposals maps and decisions therefore all need to take account of SMPs. Where the preferred option is either non-intervention or retreat, planning policies should strongly discourage further development in low-lying areas behind present shorelines. Additional development in such areas could unnecessarily commit flood defence authorities to expensive and unsustainable policies, which may in turn adversely affect biodiversity or other areas of the coast.

A5.4 SMPs are further developed through coastal strategies for their implementation within management units and where appropriate by scheme design and construction. The first generation of SMPs for the Welsh coastline are now substantially complete and plans are in place to commence work on the update of these plans.

Catchment flood management plans

A5.5 WO (now WAG) and the Environment Agency are developing an initiative for catchment area studies that will lead to the production of catchment flood management plans. These will provide a vehicle for considering holistic approaches to flood management at a catchment scale. CFMPs relationship to the planning system should be similar to that for shoreline management plans.

A5.6 The Environment Agency produces a range of technical plans for managing different aspects of the water environment. **Catchment abstraction management strategies** set out Agency policies for the licensing of water abstraction. **Salmon action plans** and **Fisheries action plans** relate to the management of salmonid and other fisheries. The Agency also publishes **Local Environment Agency Plans** (LEAPs) on a catchment basis to integrate the range of its functions and present issues to a more general audience. In respect of the water environment, this includes water quality, flood defence, fisheries, recreation, conservation and navigation.

A5.7 The plans consider the various interests of users and develop a long-term vision and medium-term strategies and actions through consultations with local communities and organisations, highlighting key issues and developing practical solutions. The main aim is to assess the problems and opportunities resulting from catchment pressures, activities and users and to propose action to optimise the overall future well-being of the environment. The Agency published its “Environmental Vision” in 2001. In considering how to deliver its ‘vision’ for the next 20 years the Agency has replaced LEAPs as part of its 5 year plan “Making it Happen”. This addresses the outstanding priority LEAP actions and identifies a set of targets and resources which the Agency considers will enable it to track progress against the strategic targets in its vision document. Local contributions will be developed which will support and contribute to the delivery of Agency priorities.

Water Level Management Plans

A5.8 These are prepared by operating authorities in accordance with the WO (now WAG) procedural guides. The *Code of Practice on Environmental Procedures for Flood Defence Operating Authorities* states that these plans provide a means by which the water level requirement for a range of activities in a particular area, including agriculture, flood defence and conservation, can be balanced and integrated. They should also provide opportunities for the adoption of a strategic approach to the management of flood defence and land drainage within a hydrological unit and should, therefore, be the central component of any local operational plan. Priority has been given to preparing plans on sites of international importance (SACs, SPAs and Ramsar sites) and SSSIs.

River basin management plans

A5.9 Article 13 of the EC Water Framework Directive (2000/60/EC) places a duty on member states to ensure that a comprehensive river basin management plan is produced and updated every 6 years for each river basin district. The first set of

plans must be published by December 2009, having consulted on a draft plan at least one year beforehand. The purpose of the plan is to set out the objectives for the water bodies within the river basin district and to explain in broad terms how they are to be achieved. The plans can include a register of any more detailed programmes and management strategies that have been prepared for each river basin district. The non-statutory plans already referred to will provide a solid foundation for delivering some of the action required by the Directive.

Community strategies

A5.10 Local authorities have a statutory duty to prepare Community strategies to promote the economic, environmental and social well-being of their area, taking into account guidance issued by the Assembly. Community strategies are intended to provide an over-arching framework, integrating the plans and programmes of local authorities and other local bodies working towards an agreed vision and establishing clarity of roles and responsibilities. Many community planning partnerships will recognise flood risk as a local public safety issue, to be addressed sustainably and on a whole-catchment basis, through the management of land drainage and land use. High-level sustainable development messages in Community strategies should support the development of appropriate flood-risk management policies in development plans.

Other relevant plans

A5.11 Other plans that may be relevant to the consideration of development and flood risk include:

- Biodiversity Action Plans. The United Kingdom Biodiversity Action Plan was published in January 1994 in response to Article 6A of the United Nations Convention on Biological Diversity 1992. 463 Action Plans have been published which identify objectives, targets and actions needed to ensure the favourable status of key species. Local Biodiversity Action Plans have been produced for each local planning authority area in partnership with relevant bodies to support the implementation of the UK BAP. The National Assembly for Wales has also published, under Section 74 Countryside and Rights of Way (CROW) Act 2000, a list of species and habitat types that it considers are of principal importance for the purpose of conserving biological diversity. A number of key species and habitats covered by such plans affect river and coastal floodplains.
- Nature Conservation Management Plans. These include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Wetlands protected under the RAMSAR Convention. Special Areas of Conservation are part of the European Natura 2000 network of sites designated under the Conservation (Natural Habitats, &c.) Regulations 1994. The remainders of the network consists/will consist of sites classified as Special Protection Areas under the EC Birds Directive. Approximately 66% of the Welsh coastline has been submitted to the EC as candidate SACs or has been classified as SPA, as well as a significant number of terrestrial cSACs and SPAs. Although RAMSAR sites do not have the same level of protection as

Natura 2000 sites it is Government policy to afford them the same level of protection as European sites. A list of all these sites can be found at (www.jncc.gov.uk/idt./default.htm). Whilst management plans for the features for which these sites have been designated/proposed are being prepared by the Countryside Council for Wales in consultation with relevant partners, any programmed works that may affect a European Natura 2000 site may require an Appropriate Assessment under the Conservation (Natural Habitats, &c.) Regulations 1994 to assess the implications for the site. Advice should be sought from the Countryside Council for Wales.

- Integrated Coastal Zone Management Plans are prepared by a variety of organisations, often in the form of a coastal forum. They are aimed at encouraging the sustainable management of all aspects of the human use of the coast. A number of such plans have formed part of an EU demonstration project on integrated coastal zone management.
- Agenda 21 Plans are prepared by local authorities under Agenda 21 of the Declaration of the UN Summit on the Environment (Rio de Janeiro 1992) to promulgate local action in support of the global environment.

A number of other plans may be relevant to consideration of development and flood risk, including the management plans for National Parks and Areas of Outstanding Natural Beauty and various non-statutory local authority plans such as those relating to tourism and recreation.

Warning Notices/Signs At Caravan And Camping Sites and Other Development at Risk of Flooding

A6.1 All landowners are responsible for protecting their property against flooding. If it constitutes a place of work, they may also incur duties under the Health and Safety at Work etc Act 1974. Where the public is invited or allowed to enter land or premises, owners and occupiers may also incur liabilities under the Occupiers' Liabilities Acts. Any owner of property within an area of flood risk should, therefore, be aware of the degree of risk and its extent and take appropriate action in regard to warnings and emergency procedures.

Caravan and camping sites

A6.2 Caravan and camping sites give rise to particular problems because of the special risks to occupants at times of flooding. Because of the attractions of a riverside or coastal location, such sites are often located in areas with a high risk of flooding where protection works may be impractical or uneconomic. Site owners within an area of flood risk should seek advice based on the information held by the Environment Agency on the risks posed to those sites, namely on:

- the likelihood of flooding;
- the extent and likely depth of flooding;
- the flow rates which may be expected;
- the advance warning of flooding they could expect to receive: and
- routes for safe access and egress in the event of flood.

A6.3 Site owners should then consult the local authority, police and fire service, on the emergency procedures that should be put in place. On the basis of this advice they should prepare safe and effective plans for action to be taken in the event of a flood at the site and ensure that any person who resides in a caravan or tent on that site is informed of:

- the degree of risk; and
- the action to be taken in the event of a flood.

A6.4 Where a caravan or tent is brought on to a caravan or camping site for private short-term use, this information should be drawn to the attention of the person occupying it on arrival or registration. Where caravans or tents are situated at a caravan or camping site for long-term rental or occupation, the information should form part of the documentation relating to the occupation of the site or pitch. A fixed sign should also be displayed permanently at each entrance to the site giving this information. Such signs should be kept up-to-date if the information changes and where signs are out of date enforcement action should be taken.

A6.5 Where planning permission is granted or a licence to operate is issued for caravan and camping sites, any part of which is in an area of flood risk, a condition should be attached requiring the provision of flood risk information to all persons occupying pitches on the site and the erection of suitable permanent warning notices. In the case of sites that are already permitted or licensed, or those for which no licence or planning permission is required, owners are strongly advised to follow the principles described above in respect of their consideration of flood risk issues.

Hotels, hostels and guest houses

A6.6 Owners of hotels, hostels or guesthouses in areas at risk of flooding, should also seek advice on the basis of information held by the Environment Agency on the flood risk to their premises. They should also establish the emergency procedures to be followed in the event of a flood and provide this information to each person temporarily resident at their premises. This should be done both on registration on arrival and by displaying notices on or beside the door of each unit of sleeping accommodation.

Other development in areas of flood risk

A6.7 Employers and owners with premises in areas of flood risk have a duty under the Health and Safety at Work etc Act 1974 to ensure, as far as is reasonably practical, that their premises are maintained in such a way that employees and people using their premises can carry out their work without endangering their own health and safety or the health and safety of others. In some circumstances, this may require them to establish within the health and safety document suitable emergency procedures for any risks to their employees and other persons on their premises, including flooding. This is particularly important where sites are designed to attract the public, especially young children and old people (health centres, leisure centres, theme parks etc) or where large numbers of people may be expected to be present (eg shopping and recreational areas). In furtherance of this they should seek similar advice on the basis of information held by the Environment Agency on the risks of flooding to their premises and post appropriate notices on site.