
6. Flood Risk Mitigation

6.1 Introduction

The PPS 25 Sequential Test was applied to potential development areas to assess their suitability for development with respect to flood risk. Several of the development areas included areas in medium or high risk flood zones. The majority of land lay outside of the floodplain in Zone 1 (i.e. low probability of flooding from rivers) and it was recommended that these areas be prioritised for development.

Even though PPS 25 directs planned development towards Zone 1, there will be occasions where planning permission is sought in the higher flood risk zones, particularly with respect to redevelopment of brownfield sites in line with sustainability objectives. Furthermore, development in Zone 1 must still consider other flood risks, particularly secondary sources of flooding and the potential impact the development itself may have on flood risk elsewhere through its drainage and runoff.

When planning development, flood mitigation measures should be considered at an early and strategic stage to reduce and manage the flood risks associated with development.

6.2 Drainage

All planned development, whether in the floodplain or not, must consider the implications for its drainage on flood risk. In particular, this applies to development of greenfield sites, for which the significant increase in impermeable area can considerably increase runoff volumes and rates from the site. A strategic approach to the drainage of new urban areas is likely to increase the effectiveness and efficiency of the drainage and flood risk management proposals, and reduce the flood risks associated with new development.

6.2.1 Integrated Drainage Strategy

Opportunities for developing an Integrated Water or Drainage Management Strategy across development site boundaries is recommended, and ideally a catchment-led approach should be adopted. This has been recognized in the recent consultation paper by DEFRA *Making Space for Water*. Experience shows that integrated approaches often lead to a more efficient and reliable surface water management system at a comparatively lower cost because it enables a wider variety of potential flood mitigation options to be used, and a better overall design can be achieved. Integrated management of surface water has potential benefits in addition to flood risk, and can include improved water quality through the use of SuDS (see next section) and a reduction of water demand through grey water recycling / rain water harvesting. Once the preferred development area(s) have been selected, consideration should be given at an early stage to the best way to manage drainage to maximise benefits.

6.2.2 Sustainable Drainage Systems (SuDS)

PPS 25 requires that new development does not exacerbate flood risks elsewhere, which means there is a need to control drainage and runoff to ensure there are no increases in overland flow as a result of the development. Sustainable Drainage Systems (SuDS) are designed to mitigate the propensity of development to generate additional runoff. When considered at the planning stage, they can be implemented to reduce flood risk to downstream areas.

“The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site before development... so reducing the impact on receiving watercourses. This requires a reduction in the rate and volume of runoff from developments...”⁴

The ability to appropriately manage surface water from a development site should be demonstrated in any FRA. Generally the Agency expects to see SuDS prioritised as a means of controlling runoff in a FRA. SuDS are not exclusively limited to infiltration techniques, although this is the preferable means of managing runoff as it contributes to groundwater recharge. SuDS also includes storage and attenuation in ponds, tanks or oversized sewers, so long as the runoff from the site is reduced to greenfield runoff rates. Storage techniques may be necessary in preference to infiltration if there is poorly draining soil or contaminated land on the site.

To maximise benefits and minimise costs, SuDS should be incorporated from the feasibility stage of a planned development, rather than as a later add-on. SuDS can easily be incorporated into developments to provide an attractive high-quality urban environment, with no increase in off-site runoff above greenfield levels.

If necessary, the retrofitting of SuDS can be considered as a flood alleviation measure in particular problem areas of existing development. SuDS will not, however, protect an area from flooding due to upstream causes (such as overland flow from an upstream catchment or runoff from upslope developments).

As with all drainage systems, SuDS systems will only perform as well as they are designed and maintained. ‘Whole life costs’ associated with SuDS (i.e. taking into account their environmental benefit and runoff management) compare favourably with conventional urban drainage systems⁵.

6.3 Flood Resistance and Resilience

Where buildings must be located in areas with medium to high levels of flood risk, the incorporation of flood resistance and resilience at the design stage can reduce the impacts should inundation occur. Standard measures include the provision of a minimum freeboard above ground or predicted flood level, and the use of resilient fixtures and fittings within. CIRIA and the Association of British Insurers (ABI) produce guidance on suitable measures of flood protection. Flood resistance measures include:

- Buildings constructed with extra freeboard to be above the flood level;

⁴ CIRIA “Sustainable Drainage Systems” Guidance 2004

⁵ CIRIA “Sustainable Drainage Systems” Guidance 2004

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- Fitting one way valves to sewage pipes, or the use of temporary bungs;
 - Sump and pump systems to remove water from buildings faster than it enters; and
 - Temporary door or air vent flood boards to stop the entry of flood water.

Flood resilience measures include:

- Use of concrete floors rather than timber;
- Location of boilers, and electricals above the possible flood level;
- No chipboard or MDF, instead using plastic and metal alternatives; and
- Lime plaster or cement render rather than conventional gypsum plaster.

Retrofitting flooded properties during the repair procedure with these is common practice. These measures are not necessarily more expensive than conventional techniques, but will significantly reduce the damage, cost and time to repair if properties are flooded.

6.4 Future Proofing

It is important that new developments, particularly in the higher flood risk zones, are future proofed against uncertainty. Therefore it is advised that proposed flood mitigation measures associated with developments are reviewed at the detailed FRA stage, paying attention to the potential implications of future changes in climate and land use. The application of the precautionary principle and the provision of freeboard and flood resistance and resilience in buildings can mitigate future increases in flood risk at relatively low cost at the design and construction stage.

The impact of climate change on existing drainage networks should also be considered. As demonstrated in Section 4.3.5 the attenuation ponds in the Borough will not provide the same level of protection in 50 years time as they do now.

6.5 Other Measures

Measures to mitigate the risks of flooding both to and from development are not necessarily limited to those above. Depending on the specific risks relating to a site, the following investigations / options may need further consideration at the detailed FRA stage of development planning:

- Flood resistance / resilience measures specific to the potential for groundwater flooding;
- Management of surface 'run-on' (i.e. runoff entering the site from upslope areas) as part of the development's drainage strategy;
- Maintenance / improvement of watercourses, culverts, drains and sewerage networks to reduce associated flood risks.

