

11 HYDROLOGY AND FLOOD RISK

11.1 Introduction

11.1.1 This chapter describes the existing surface water drainage of the site and places it in context with the existing catchment and ground conditions. The potential surface water drainage effects are considered and the mitigation measures to be incorporated as part of the development are explained in the Flood Risk Assessment in *Appendix 11.1*

Scope

11.1.2 The assessment considers the surface water drainage of the site taking into account the hydrology of the area, the consequential flood risk and the effect on water quality.

11.2 Planning Policy

11.2.1 National policy on flood risk is set out in PPS25 which requires that flood risk should be considered in the planning and development process in order to reduce any future flood damage to property and loss of life. This emphasises the importance of managing and reducing flood risk in the land use development and planning process by taking account of flood risk and the impacts of climate change.

11.2.2 PPS25 requires all development proposals in Zones 2 and 3 to be accompanied by a FRA, which should include:

- the vulnerability to flooding from other sources as well as from river and sea flooding;
- the vulnerability to flooding over the lifetime of the development;
- the potential to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water run-off, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property; and
- a demonstration that residual risks of flooding after existing and proposed flood management and mitigation measures are taken into account, including flood defences, flood resilient and resistant design, escape/evacuation, effective flood warning and emergency planning, are acceptable.

11.2.3 PPS25 requires that a FRA should be submitted with a planning application to determine the risks of flooding at a development site or the likely impact on neighbouring sites. As such a FRA is an essential element in the overall assessment of the economic viability of the development as well as its acceptability in planning terms. The detail and complexity of a FRA will depend on the scale of the development and potential significance of flood risk but

should address the requirements provided in Appendix E of PPS25

- 11.2.4 PPG9 dealing with Nature Conservation seeks to ensure the conservation of the abundance and diversity of British wildlife and its habitats. This is relevant to the water quality of watercourses.
- 11.2.5 In a local context, Policy 8.1 of the adopted Local Plan, in supporting appropriate development, includes various criteria, one of which is that development avoids harm to water quality. Policy UT1 of the emerging Local Plan restates the principles of development in the Water Park and Policy 6 deals with the water environment. It states that surface water run-off should, as far as practicable, be treated at source on all new developments and that development will not be permitted which would harm the water environment or would result in the pollution of watercourses or groundwater. Policy 6 also states development will not be permitted which is within areas at risk from flooding unless appropriate flood protection and compensation schemes can be provided

11.3 Methodology

- 11.3.1 The assessment is a desk top study based on an examination of Ordnance Survey plans, a detailed topographic survey of the site, analysis based on the technique set out in the Flood Estimation Handbook, an ISIS hydraulic model of the river Coln, an examination of data held by the Environment Agency, complemented by site visits and examination of photographic records and other documentation held by the landowners

Baseline data

- 11.3.2 Forming the southern boundary to Lake 104 and Lake 103a is the course of Court's Brook, a drainage channel that rises to the east of Fairford and drains eastwards to Whelford Road, where it crosses under the road to run broadly parallel to London Road and to the south of the Coln Park Lake (Lake 125) and Thornhill Lake (Lake 126) and to the north of Bowmoor Lake (Lake 114) before joining the River Coln near Inglesham.
- 11.3.3 A further drainage channel flows along the northern side of the A417, London Road before crossing under the road near Claydon Pike and joining Court's Brook on the north eastern edge of Bowmoor Lake (Lake 114). These two watercourses form the natural drainage for the site.
- 11.3.4 The catchment area of the River Coln upstream of the site has been derived using the methodology set out in the Flood Estimation Handbook.
- 11.3.5 Following the extraction of gravel, the topography of the site has altered. As a consequent the

natural rise in the ground forming the boundary to the floodplain of the River Coln as identified on the plan of the indicative floodplain has been removed with the result that a more extensive area is now identified at risk from flooding albeit with lesser impact.

- 11.3.6 In the autumn of 2004, the Environment Agency published new style Flood Maps which in respect to the site acknowledges the changes made to the topography as a result of gravel extraction. An extract from the flood map is reproduced as *Fig 11.1 Hydrology*.
- 11.3.7 The underlying geology of the area is shown on the British Geological Survey's 1:50,000 scale mapping (Sheet 252). This shows the site to comprise First Terrace deposits, mainly gravels now worked out, of the Pleistocene and Recent Periods, overlying Oxford Clay of the Upper Jurassic Period. Typically the thickness of the layer of sands and gravels is around 5 metres, overlain by soils of the Badsey 2 association.
- 11.3.8 In conjunction with the archaeological investigations reported in the previous Environmental Statement, the trial trenching has provided an opportunity to examine the ground conditions. It confirms virtually the entire site has been worked for the sand and gravel reserves with margins around Lake 104 comprising made-up and disturbed ground.
- 11.3.9 The hydrogeology of the area is detailed on the Environment Agency's Groundwater Vulnerability maps. This classifies the ground beneath the site as a non-aquifer and as such there is no risk to groundwater.

Assessment

Hydrology

- 11.3.10 Gravel bearing land has a high natural water table, typically less than 2 metres below ground level which is exposed when gravel is excavated. It is understood Lake 103, Lake 103A and part of what is now Lake 104 were dug 'wet', that is to say using a dragline excavator digging below the water table. The bulk of Lake 104 was dug dry by dewatering using pumps. The worked out gravel pits have subsequently filled following the cessation of extraction. There is currently no outlet from Lakes 103 and 104 to control the water level.

Drainage

- 11.3.11 The development will increase the impermeable surface area of the site by virtue of the new roads, hardstandings and areas of roofing to be constructed which will lead to an increase in the rate of run-off.

Flood Risk

- 11.3.12 The site lies adjacent to Court's Brook and part of the site is in the floodplain of the River Coln. A plan showing the indicative floodplain based on the Section 105 mapping prepared by the Environment Agency and deposited with the local planning authority is reproduced on the Hydrology Plan.

Water Quality

- 11.3.13 Following the cessation of gravel extraction, Lakes 104, 103 and 103a have been actively used for fishing activities. The water quality is high. The Environment Agency maintains water quality records for the River Coln. The stretch between Fairford Mill and Dudgrove Stream near Inglesham, has been measured in terms of three determinants of organic pollution; the biochemical oxygen demand, the level of ammonia and the level of dissolved oxygen. Using the Environment Agency's General Quality Assessment method for classifying water quality, the results for 2002 show Grade A, 'very good'. No records are available for Court's Brook and the watercourse lying to the north of the A417, London Road.

Predicted Effects

- 11.3.14 During the construction phase the proposed earthworks are likely to result in disturbance to the water bodies. Following construction, the increased impermeable area will lead to an increase in the rate of surface water run-off.
- 11.3.15 The use of sustainable drainage systems (SUDs) in new developments to control surface water run-off and enhance water quality is encouraged within PPS25. In accordance with the interim code of practice for sustainable drainage systems, the Environment Agency requires the rate of run-off into a watercourse from a developed site to be no greater than the undeveloped rate of run-off for the same rainfall event.
- 11.3.16 It is intended that the site will be served by a network of surface water drains collecting surface water run-off from the new roads, hardstandings and areas of roofing with disposal to infiltration trenches and soakaways. It is recognised that there is a risk that surface water run-off can become polluted mainly from deposits on the road surface and hardstandings used by vehicles. Whilst the level of pollution is low, the effects can be mitigated by the use of sustainable drainage systems.
- 11.3.17 In terms of flood risk, the proximity of the site to the floodplain increases the risk that the development may be affected. It is proposed that the majority of the built development will be on land outside the previously identified floodplain and parts of the site will be remodelled by

a cut and fill exercise to maintain the same area of water. A separate flood risk assessment has been carried out and used to inform this chapter of the Environmental Statement.

Mitigation

- 11.3.18 In terms of surface water run-off, sustainable drainage systems can be used to reduce the rate of run-off and improve water quality, albeit the risk of pollution is low from the type of development proposed.
- 11.3.19 In terms of flood risk, steps can be taken to minimise risk by adopting minimum floor levels, avoiding the impedance of overland flow routes and improving drainage channels.
- 11.3.20 It has been agreed with the Environmental Agency to formalise the flow arrangements for the Lakes to maintain water levels. This will be achieved by means of functional weirs.

11.4 Summary

Residual Impacts

- 11.4.1 The proposed development will involve the reshaping of part of Lake 104 and the creation of new areas of water; however the overall floodplain volume will be retained. As a result, following completion of the development, there should be no residual impacts to hydrology, flood risk and water quality.