Flood Risk Assessment

Project Hydrus

AWE

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Planning and Development

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1 Introduction

1.1. RPS Planning and Development Ltd is a part of the RPS Group Plc (RPS), and has been commissioned to undertake a Flood Risk Assessment (FRA) for the proposed redevelopment of a part of the Atomic Weapons Establishment (AWE) site in Aldermaston, Berkshire. The detailed planning permission is being sought for a project called 'Hydrus', hereafter referred to as the proposed development. This FRA has been completed in accordance with the advice of the Environment Agency and in accordance with Planning Policy Statement 25 (PPS25), the planning guidance in England on Development and Flood Risk.

1.2. PPS25 advises of the requirement for an FRA for any of the following cases:

a) Any site that is located within the Environment Agency designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);

b) For non-residential development that is located within Flood Zone 1 (low probability), where the site is in excess of 1ha, or has a development floor space in excess of 1000m^2; and

c) For residential development that is located within Flood Zone 1 (low probability) where the site area is greater than 0.5ha or the development comprises more than 10 residential units.

1.3. The Development Site is a non-residential development that is located within Flood Zone 1, with an area in excess of 1ha and also a development floor space in excess of 1000m^2. An FRA for the proposed development is therefore required to accompany the planning application. The main focus of the FRA will be on surface water drainage, although other sources of flooding will be considered.

1.4. The FRA will consider the existing surface water runoff characteristics and assess the likely alterations to these as a consequence of the proposed development. Mitigation measures will be outlined for any adverse impacts on surface water runoff rates and routes, including a surface water drainage strategy. This drainage strategy will aim to incorporate

sustainable measures where practicable. The surface water drainage strategy will ensure that flood risk from surface water runoff resulting from the proposed development will not be increased either in the local area or within the surrounding catchment.

2 Site Situation

Background

2.1. AWE Aldermaston is approximately 15km south-west of Reading on the Berkshire and Hampshire border. The proposed development is located at the northern end of AWE Aldermaston and centred at National Grid Reference SU 1500N 2700E, as Figure 1 shows. The total Development Site occupies an area of 14.03ha and comprises two parcels of land, as Figure 2 shows. The main parcel is to the north-east and encompasses the proposed operational site area and the temporary area for use during construction – including the Central Area Construction Enclave (CACE) and the construction access. A second parcel comprises temporary use of the West End Construction Enclave (WECE) to the west. The WECE and CACE have already been approved under previous planning applications – most notably HEFF and NOA. The FRA therefore solely focuses upon the proposed Development Site, as shown on Figure 2.

Baseline Description

2.2. To the north of the Development Site is Cwm Road, which follows the perimeter of the AWE northern site boundary. Land adjacent to the northern boundary falls within Aldermaston Court and is listed on the Register of Historic Parks and Gardens. The Manor House within Aldermaston Court is a Grade II* Listed building used as a hotel and conference centre about 300m beyond the AWE boundary.

2.3. The Development Site is roughly trapezoidal in shape and was formerly occupied by buildings. Following the demolition works, the Development Site now comprises predominantly level cleared land generally covered by crushed stone / concrete with areas of grassland and individual or groups of trees. For the purposes of this assessment, it is assumed that the Development Site is greenfield – this will therefore offer considerable betterment when assessing the runoff of surface waters.

Proposed Development

2.4. The proposed development is within a Nuclear Licensed Site, as designated by the Health and Safety Executive under the Nuclear Installations Act 1965 (as amended). The location and setting of the AWE site is shown in Figure 1, whilst the Development Site is shown in Figure 2.

2.5. For the purposes of this assessment, the pre-developed site is considered to be a land area that has been cleared and therefore greenfield and extends to an area of 6.47ha. The layout of the Development Site during the construction stage is shown in Appendix 1 (Figure 7) and the layout of the Development Site during the operational stage is shown in Appendix 1 (Figure 8). The surface water drainage strategy in the proposed development for the construction and operational stage will be implemented in a number of stepped phases, as described in Appendix 1.

2.6. The proposed operational development will comprise six main components which together will provide a hydrodynamics research and development facility. In time, this facility will replace the existing facility – although the two facilities are expected to run in tandem for a number of years. The proposed development will comprise:

- An Operations Building with a gross external area (GEA) footprint of 9,630m^2 providing floor space of up to 14,082m^2 with ancillary features including an internal hardened structure and an external lightning protection system (LPS);
- A Support Building with a footprint of up to 2,227m^2 GEA, providing floor space up to 2,517m^2 for administrative and welfare facilities;
- A Substation with a footprint of 216m^2;
- A Sustainable Drainage System (SuDS) comprising swales, below ground storage and a detention basin with associated flow restrictions;
- External works and landscape strategy proposals including access and circulation routes, lighting, grassed mounds, hedgerows, shrub and tree planting, and a living sedum 'green' roof to the Support Building and the Electrical Substation; and
- A permanent water borehole with an associated head works chamber constructed under Permitted Development rights.

West Berkshire District SFRA

2.7. Information from the West Berkshire Strategic Flood Risk Assessment (SFRA) has been included in Appendix 3. These show that there are no historical flood incidences (from local knowledge) on the Development Site (Figure A1) and that there are no recorded flood incidents on the Development Site (Figure A2). A fluvial flood risk overview is also given (Figure D1), with this showing the Development Site to be outside Flood Zone 2 and 3 and in Flood Zone 1.

Climate Change

2.8. PPS25 provides details on climate change allowances when assessing flood risk, with this informed by the development lifetime. A 10% increase in rainfall intensity has been made for the construction stage and a 20% increase in rainfall intensity has been made for the operational stage. The 20% increase for climate change is commensurate with a development design life up to 2085.

Catchment Hydrology

2.9. AWE Aldermaston is located approximately 2km from the River Kennet, which is classified as a main river. Two tributaries of the River Kennet rise from an area close to the northern boundary of AWE Aldermaston and flow northwards.

Local Hydrology

2.10. There are no main watercourses within the Development Site, although there is a small surface water ditch that crosses the southern part of the operational site, as shown in Appendix 1 (Figure 5). This ditch is culverted for the most part, although it is open at a section towards the centre of the Development Site. There are contributions of water to this ditch from a 3.7ha area of the Development Site, and additional contribution from a 5.8ha upstream catchment area.

2.11. The majority of surface water runoff drains to Fish Pond, to the north-east of the Development Site, through either the 300mm diameter culvert or by overland flow. Surface water runoff from the Development Site drains into this open ditch and is then drained to the Fish Pond. The Fish Pond

discharges via a feeder stream to Fisherman's Brook, which subsequently discharges to the River Kennet.

2.12. A small section of the Development Site to the south-west drains towards a separate 150mm diameter culverted ditch located to the west of the Development Site, with this draining to the Dog Kennel outfall further to the north. Surface waters from the Development Site can drain to this ditch, although based on the topography of the Development Site and the linear infiltration ditches (French drains) that surround the Development Site, the flows of water are considered to be minimal.

2.13. There are linear infiltration ditches (French drains) around the perimeter of the Development Site fitted with 150mm diameter slotted piping that are also used for the conveyance and infiltration of surface waters, as shown in Appendix 1 (Figure 5). In addition, there is a linear infiltration ditch (French drain) along the length of Cwm Road to the north of the Development Site, and another linear infiltration trench (French drain) along the length of North Way and Viaduct Way to the south of the Development Site. There are also lengths of linear infiltration ditch (French drain) to the east of the Development Site.

Development and Flood Risk

2.14. The Environment Agency delimits land areas based on the risk of fluvial or tidal flooding, with Flood Zone 1 an area of low risk (annual flood probability is less than 0.1%); Flood Zone 2 an area of medium risk (annual flood probability is between 0.1% and 1%); and Flood Zone 3a an area of high risk (annual flood probability is more than 1%). Flood Zone 3b is the Functional Floodplain, and comprises the floodplain area where water preferentially flows or is stored in times of flood (where annual flood probability is approximately 5% or greater).

2.15. The flood vulnerability of different types of development and land-use are considered when assessing the risk in flood zones. Five vulnerability classifications are defined: Essential Infrastructure; Highly Vulnerable; More Vulnerable; Less Vulnerable; and Water-Compatible Development. The Development Site is located in Flood Zone 1. Flood Zone 1 is an area of low risk from river or sea flooding, and is considered to be appropriate for all vulnerability classifications.

Geology

2.16. The geology at AWE Aldermaston has been characterised in the Ground Conditions Technical Report produced by RPS Group (2009), with the key findings summarised below.

2.17. The geology of the Development Site was determined from published geological information for the Reading area and a review of available geological logs within and adjacent the Development Site. The local geological sequence is summarised in Table 1.

Unit / Formation	Description	Likely Thickness (m)
Top Soil	See below	Ranges from absent to 0.4m
Made Ground	See below	Ranges from absent to 1.9m
Silchester Gravels (formerly Plateau Gravels)	Dense, orange-brown sand and gravel with variable sand, silt and clay matrix	Ranges from absent to 3.7m
Bagshot Formation / Transition Zone	Orange-brown grading to dark-grey sand, fine to medium grained with silt and clay laminae	Ranges from 0.2m to greater than 17.1m
London Clay	Firm and stiff dark bluish and grey clay, variably silty, with beds of sand and silt and flint pebble seams; variably glauconitic and shelly	Base not intercepted (maximum thickness encountered was 66.7m)
Lambeth Group	Comprises Harwich, Reading and Upnor Formations – typically sand and clay	Not penetrated
Upper Chalk	Soft white nodular chalk with flint seams	Not penetrated

Table 1 – Geological Sequence Underlying the Development Site

2.18. The description and likely thickness information that is given in Table 1 was taken from geological logs for intrusive locations, as detailed in the Ground Conditions Technical Report (RPS Group, 2009), with the unit formations on the Development Site described in more detail below.

Topsoil: encountered in 70% of the boreholes in the vicinity of the Development Site area, and is most common in the central and southern areas of the Development Site.

Made Ground: found in 47% of the boreholes across the Development Site, and comprised a variable matrix of sand, gravel and clay mixed with brick fragments, flint, asphalt, concrete and tarmacadum.

Silchester Gravel: an unconsolidated sand and gravel deposit, typically clayey flint gravel on the Development Site. This commonly includes an upper surface of gravely clay in the wider area, although this horizon is

restricted to only five of the forty-three boreholes on the Development Site. The remainder is typically sandy clayey gravel.

Bagshot Formation: encountered in all of the forty-three boreholes on the Development Site, and typically firm to stiff orange mottled grey and gravelly sandy clay and described as damp/wet in 11 of the boreholes. Nineteen of the boreholes describe a Transitional Zone, with this described as a grey slightly sandy clay.

London Clay: underlies the surface deposits across the wider area, and at the Development Site is typically stiff bluish-grey clay with layers of sand and silt and is described as being wet or damp in five of the boreholes. 63% of the boreholes penetrate the London Clay, with a considerable thickness expected beneath the Development Site.

Hydrogeology

2.19. The hydrogeology at AWE Aldermaston has been characterised in the Ground Conditions Technical Report produced by RPS Group (2009), with the key findings summarised below.

2.20. The granular Silchester Gravel is classified by the Environment Agency as a minor aquifer of high leaching potential, indicating that it cannot support large abstractions but may constitute a locally important water resource. The Bagshot Formation is also classified as a minor aquifer of intermediate leaching potential. The London Clay is considered to be a non-aquifer, with limited potential to transmit water. The London Clay represents the effective hydraulic base to the overlying minor aquifer. The Upper Chalk is classed as a major aquifer, and is of regional and national importance in terms of water supply.

2.21. Groundwater has historically been identified in both the Silchester Gravels and Bagshot Formation. Furthermore, these aquifer units have been shown to have similar groundwater levels that respond quickly and in a similar manner, suggesting a high degree of hydraulic continuity between both units, and are therefore considered to form a single aquifer, despite the hydraulic distinction.

2.22. The low permeability London Clay constitutes the effective hydraulic base to the overlying minor aquifer, although the exact base of the aquifer is

dependent on properties of the Bagshot Formation that are transitional with the London Clay. The Silchester Gravel can be considered a shallow unconfined granular aquifer unit that has a high degree of hydraulic continuity with more granular, upper parts of the Bagshot Formation.

2.23. Over the wider area, groundwater flow in the shallow unconfined aquifer generally follows the subdued topography, diverging away from a groundwater high in the vicinity of the south-western corner of AWE Aldermaston, and ultimately flowing towards the River Kennet and associated tributaries.

2.24. Groundwater level data for the Silchester Gravel and Bagshot Formation on the Development Site is summarised in the Ground Conditions Technical Report produced by RPS Group (2009). The predominant direction of groundwater flow in the shallow aquifer is to the east, with levels that decline from approximately 98.0m AOD in the west to 96.6m AOD in the east. The water table is generally situated at a shallow depth below the ground surface of between 1.4m and 3.1m below ground level. These results are similar to those used in the design of the surface water drainage strategy, as summarised in Appendix 1, with groundwater levels generally in the region of 0.5m to 2m below existing ground levels, as discussed in Section 4 and summarised in Appendix 1. Due to the shallow depth of the groundwater table, soakaways are not generally considered to be appropriate, as described in the section on hydrogeology below. The exception to this is with the welfare accommodation during construction, where some infiltration of surface waters has been allowed for.

2.25. Water levels have been obtained for a number of boreholes completed within the London Clay, and are approximately 5m lower than the groundwater level seen in the overlying shallow perched aquifer.

2.26. Transfer of water between the shallow perched minor aquifer and the underlying Chalk major aquifer is considered negligible what with the presence of between 55m and 100m of intervening low permeability London Clay deposits.

Topography

2.27. Ground levels across the main area of the Development Site are shown in Figure 3, with these levels varying between approximately 97m and 101m

AOD. Ground levels are highest in the south-west of the Development Site at a level of around 101m, and decrease to the east and south-east to a level of around 97m. There is a slight increase in ground levels from the lower lying land in the south to a level of 98.5m. Ground levels to the north-west and north of the Development Site do not vary by much, and are around 100m, before decreasing to the north-east of the Development Site. As shown by the contours of the Development Site topography in Figure 3, surface water runoff across the Development Site will predominantly be in an easterly and south-easterly direction.

Soil Infiltration Rates

2.28. Soil infiltration testing requires trenches to be dug to representative depths, with these filled with water and the time for the level to fall from 75% to 25% then recorded. Permeability is the ability of a sediment or soil to transmit fluid through pores and cracks, and is usually reported in metres per second (m/s).

2.29. Soil infiltration testing of the Development Site has been carried out in the upper soil profile, as summarised in the Ground Conditions Technical Report produced by RPS Group (2009). This determined an infiltration rate for drainage design purposes of $2.0E^{-5}$ m/sec – on the lower end of the range for good drainage. This infiltration rate is also used in the design of the surface water drainage strategy, as discussed in Section 4 and summarised in Appendix 1.

3 Flood Risk Assessment

Fluvial and Tidal Flooding

3.1. The Environment Agency flood map (Appendix 2) shows that the Development Site is located outside of the extents of the 1 in 100-year (Flood Zone 3) and 1 in 1000-year (Flood Zone 2) annual probability floodplains. The Development Site is located in Flood Zone 1. Flood Zone 1 is an area of low risk from river or sea flooding, and is considered to be appropriate for all vulnerability classifications.

Non-Main Rivers and Drainage Ditches

3.2. A culverted ditch crosses the southern part of the Development Site, with this an open ditch towards the centre of the Development Site. There has been no history of flooding on the Development Site from the ditch, with it flowing in a culvert for the most part and discharging to local ponds. Despite this, an assessment of the ditch using Infoworks modelling has been completed by AWE. The purpose of the assessment was two-fold – firstly to determine the off-site and on-site catchment of the ditch and secondly to determine the flows in the ditch and the possible flood risk to the Development Site and surrounds.

3.3. The Infoworks modelling shows a large part of the Development Site to the south and south-east (3.7ha) to be a part of the catchment that drains towards the ditch. The catchment of the ditch upstream of the Development Site is an additional 5.8ha in area. The assessment therefore estimates the catchment area of this watercourse as it leaves the Development Site to be approximately 9.5ha. This catchment cannot therefore be identified on the Flood Estimation Handbook (FEH) database, which only delineates catchment areas greater than 50ha.

3.4. This upstream catchment is made up of narrow access roads, buildings and soft landscape. Drainage of this upstream catchment is via a piped system that discharges to the culverted ditch. The surface water runoff assessment in the next section gives more information on the upstream catchment to the ditch, and how the flows from this have been

accommodated in the surface water drainage strategy for the proposed development.

3.5. The assessment of the upstream catchment considered the 1 in 100-year event (plus 20% for climate change) for a range of durations, and demonstrated that the upstream catchment of the ditch does not pose a flood risk to the Development Site. The assessment identified that there were off-site areas in the upstream catchment (see Figure 5 in Appendix 1) and downstream of the Development Site that had very localised existing flooding during short-term high-intensity duration events typical of this type of urban drainage system. Such flooding events do not currently lead to any detrimental impacts. However, in agreement with the Environment Agency, the assessment of flood risk from these sources has been undertaken as part of the FRA.

3.6. The surface water drainage strategy described in the Section 4 of this FRA includes a number of features, including a detention basin for the attenuation of surface water runoff from the Development Site. The upstream ditch that crosses the Development Site also flows through this detention basin. In order to avoid an on-site risk from surface water flooding or an increased risk in surface water flooding elsewhere in the catchment, it was necessary to ensure that the surface water runoff draining from the Development Site to the detention basin was not restricted by an increased flow in waters to the detention basin from the upstream catchment. A bypass channel was therefore included in the drainage design for routing excess waters from the upstream catchment so that they bypass the detention basin, and connecting back to the ditch downstream of the Development Site. The bypass channel uses a weir and vortex flow control devices to control the flow of waters from the upstream catchment. The scheme has been designed after consultation with the Environment Agency. The modelling completed for the surface water drainage strategy demonstrates that there is no increased flood risk to the Development Site and surrounds. The existing very minor localised flooding that is shown to occur in the upstream catchment during short-term high-intensity duration events will continue at similar levels as present without any adverse effects. There will be betterment to the existing minor flooding downstream of the Development Site, as waters released from the detention basin will now be at a controlled rate.

Pluvial Flooding from Overland Flow

3.7. Pluvial flooding is a result of overland flow following a rainfall event, before the runoff enters a watercourse or sewer. This form of flooding is usually associated with high intensity rainfall but can also occur with lower intensity longer duration events where the ground is saturated, frozen, developed or has a low permeability. The flood risk relates to both the conveyance of waters to the Development Site by overland flow from areas that are outside the Development Site and also by overland flow from areas within the Development Site itself. This overland flow could then create a flood risk to the Development Site by ponding in depressions in the topography.

3.8. AWE Aldermaston is elevated compared to its surrounds, with land levels in the north of the facility decreasing in a north-westwards direction. As such, pluvial flooding associated with overland flow from off-site areas and ponding of waters is not considered to be an issue. Pluvial flooding generated from on-site areas is a separate issue, with the topography of the Development Site described in Paragraph 2.27. This indicates that surface water runoff across the Development Site will principally be in an easterly and south-easterly direction. The south-easterly part of the Development Site is to be used for swales and a detention basin, and is therefore an appropriate land use. Waters from overland flow would collect in the detention basin, where they would be released from the Development Site in a controlled manner to the Fish Pond to the north-east of the Development Site. An assessment of pluvial flooding from on-site areas has been completed, with this analysis included in Appendix 1 and a summary of the work given in Section 4 of this FRA.

3.9. Based on correspondence with AWE, there are no historical records of pluvial flooding on the Development Site. The existing drainage infrastructure, including the location of the Fish Pond to the east of the Development Site, would prevent a sizeable ponding of waters and hence negate the risk. However, the proposed development of the site would increase the amount of impermeable area, and increase the rate and volume of surface water runoff. This would require a suitable surface water drainage strategy for the Development Site, with this outlined in Section 4.

Infrastructural Flooding

3.10. Infrastructural flooding is where sewerage systems are completely overwhelmed to cause flooding, and may occur alone or be combined with other flood sources (e.g. fluvial or pluvial). All developments could be potentially affected by infrastructural flooding. It is common in urban areas where it is often the result of inadequate or poorly designed surface water drainage systems, through increased loading to the system through alterations in rainfall patterns or increases in the coverage of urbanised areas, or as a result of a failure or blockage in the sewerage system.

3.11. There is a culverted ditch in the southern part of the Development Site, with other ditches in the surrounding area, as indicated between Paragraph 2.10 to 2.13. Aside from short sections of pipe that connect to these ditches, there is no existing surface water sewerage infrastructure over the Development Site. There are linear infiltration ditches (French drains) around parts of the northern, southern and eastern areas. In addition, there is a foul water and trade waste sewer that runs from west to east across the southern part of the Development Site. There is no history or concern of infrastructural flooding associated with these sewers. As mentioned previously, modelling of the culverted ditches has concluded that they do not pose a flood risk to the Development Site.

Groundwater Flooding

3.12. Description of geology and hydrogeology are given in Paragraphs 2.16 to 2.18 and 2.19 to 2.26 respectively, with further information summarised in the Ground Conditions Technical Report produced by RPS Group (2009). The predominant direction of groundwater flow in the shallow aquifer is to the east, with levels that decline from approximately 98.0m AOD in the west to 96.6m AOD in the east. The water table is generally situated at a shallow depth below the ground surface, as described in the section on hydrogeology. Groundwater is understood to discharge to springs and local off-site watercourses. There are no historical records of groundwater flooding on the Development Site; hence groundwater flooding is not considered to be an issue.

4 Surface Water Runoff Assessment

Background

4.1. Based on the guidance in PPS25, an appropriate surface water drainage strategy should be outlined for the proposed development of the site. This is to ensure that surface water runoff from the proposed development does not exceed existing runoff rates and volumes, thus ensuring that there are no detrimental impacts to flooding or degradation to receiving drainage systems both in the local area and also elsewhere in the surrounding catchment.

4.2. The surface water drainage strategy for the construction stage and operational stage of the proposed development included consultation with the Environment Agency. The design of the surface water drainage strategy was completed using Microdrainage, a drainage industry accepted design package. A description of the surface water drainage strategy and summary of the design work that was completed is given below, with further detail given in Appendix 1.

4.3. The surface water drainage strategy outlines a scheme for the construction stage, with this scheme then developed for the operational stage. The surface water drainage strategy outlines measures that allow for the attenuation, conveyance, infiltration and release of surface water from the Development Site according to an allowable rate and route. The surface water drainage strategy aims to incorporate sustainable principles, but also aims to include features that provide a point of source attenuation control. In addition, measures to protect surface water quality from an adverse impact are included. There is a ditch that currently passes through the Development Site. The surface water drainage strategy during the construction and operational stage has been designed to accommodate the upstream catchment of this ditch. The surface water drainage strategy allows this ditch to continue to drain through the Development Site without having a detrimental impact on flood risk.

Surface Water Drainage Strategy Design

4.4. A summary of the surface water drainage strategy for the proposed development during the construction stage and operational stage is given below. The surface water drainage strategy for the construction stage and for the operational stage are summarised in Appendix 1 (Figures 10 and 11 respectively). Further detail of the surface water drainage strategy is given in Appendix 1.

4.5. The surface water drainage strategy, which incorporates a number of sustainable drainage features, forms an integral part of the operational Development Site. The surface water drainage strategy is based on the existing ditch on the Development Site, with the sustainable drainage features established during the construction works.

4.6. Operational surface water drainage will comprise two distinct regimes; drainage to swales and drainage to buried attenuation. These will both discharge into a detention basin before final discharge into the existing culverted ditch leading to the Fish Ponds.

4.7. The Support Building and associated drainage will drain to an eastern swale, whilst the Substation, associated roads and landscape areas will drain to a western swale. In addition to the water attenuation and treatment functions, the swales will form part of the comprehensive landscape scheme to provide enhanced amenity whilst providing potential wildlife habitats. The Operations Building, road drainage and parking area will drain to buried attenuation beneath the access road. All flows will pass through a hydrodynamic separator before entering the detention basin, to capture any silts or residual oils.

4.8. Proposed oil and delivery storage areas will be bunded to contain any accidental spillage, and will be drained through full retention petrochemical interceptors in accordance with the Environment Agency's Pollution Prevention Guidelines 3 (PPG 3). Petrochemical bypass interceptors will also be located wherever there is a risk of contamination of surface water such as parking areas, again in accordance with PPG 3. The linear infiltration ditches (French drains) around the perimeter of the Development Site will remain and will be used for the drainage of the landscaped areas only.

Dewatering and Excavation

4.9. There is a need to complete dewatering works during the construction stage, prior to the excavation of material. These works are described in the surface water drainage strategy in Appendix 1, although are briefly summarised below. The dewatering works are necessary so as to enable the excavation of materials for the construction of the proposed development. The dewatering works will encircle the proposed development with sheet piling driven into the London Clay, thus hydraulically isolating the internal areas from the outer area. Dewatering will then take three forms: wellpoints will be situated within the sheet pile perimeter to lower groundwater levels; ejector wells will be situated within the excavation to lower porewater pressure; and sump pumps within the perimeter to remove any surface waters and minor groundwater seepages.

Construction Stage

4.10. For the purposes of this assessment, the pre-developed site is considered to be a land area that has been cleared and therefore greenfield. The Development Site layout at the construction stage is detailed in Appendix 1 (Figure 7) and the surface water drainage strategy in Appendix 1 (Figure 10). The Development Site comprises all land uses normal for a major construction project such as office accommodation, welfare facilities, open storage, laydown, fabrication, construction vehicle and plant refuelling. Surface finishes are largely dictated by the use to which the various sub-areas within the construction site will be put. In general, surfaces will be permeable except where there is greater risk of pollution, for example; construction vehicle parking, vehicle and plant refuelling and washout and wheel wash areas. It is possible that permeable laydown areas could become impermeable with the passage of time and trafficking by construction plant, so a network of herringbone filter drains are also provided to ensure these areas do not pond.

4.11. The proposed drainage scheme for the construction stage contains a number of SuDS features, including a detention basin, swales, cut-off ditches and a granular infiltration blanket under the contractor's area. The SuDS control measures in the proposed drainage scheme include vortex flow control devices, full retention oil separators, hydrodynamic separators for silt and penstocks (pollution control valves). The more traditional

elements of drainage include piped drainage and filter drains with catch pits / manholes. A detailed schematic of the drainage scheme is given in Appendix 1 (Diagram 1).

Operational Stage

4.12. The Development Site layout at the operational stage is detailed in Appendix 1 (Figure 8) and the surface water drainage strategy in Appendix 1 (Figure 11). There are three buildings in the proposed development (Operations Building, Support Building and Substation), also with commercial vehicle waiting / delivery areas and service roads.

4.13. The proposed drainage scheme for the operational stage contains a number of SuDS features, including a detention basin, swales, cut-off ditches and unlined detention basin and swales. The SuDS control measures in the proposed drainage scheme include vortex flow control devices, orifices, bypass and full retention oil separators, hydrodynamic separators; and penstocks (pollution control valves). The more traditional elements of drainage include piped drainage with catch pits / manholes, road gullies and kerb and slot drain systems. A detailed schematic of the drainage scheme is given in Appendix 1 (Diagram 1). A detailed schematic of the drainage scheme is given in Appendix 1 (Diagram 2).

4.14. The main features of the drainage scheme largely remain the same from the construction stage through to the operational stage. However, the volume of buried attenuation measures with restricted outflow will be constructed in stages as the hard surfaces of the floor slabs for the building are constructed. Also, the infiltration area under the site cabins is likely to remain in part after construction, with the remainder removed in areas where tree planting is proposed – these infiltration areas do not form a part of the operational stage surface water drainage strategy.

Design Compliance.

4.15. This section demonstrates that the proposed drainage scheme is compliant with the AWE SuDS Principles Document and with PPS25. The analysis has been carried out using Microdrainage software, with these calculations included in Appendix 1. The design takes account of an upstream catchment, with a Qbar flow (the mean annual peak rate run-off

for the Greenfield site) maintained through the existing ditch in the detention basin. The outflow from the detention basin will be limited to the combined Qbar flow from the upstream catchment and the Development Site by means of a vortex control device.

Flood Protection – Levels of Service

4.16. The levels of flood protection service that are required for the proposed development are in accordance with the AWE SuDS Principles document. The analysis carried out used Microdrainage software and included a climate change factor of 10% for the construction stage and 20% for the operational stage, as described in more detail in Appendix 1.

4.17. The management of flood exceedance impact criteria is also met because only acceptable flooding is predicted on a 1 in 100-year event, with all flows contained. The modelling of network nodes showed a worst flood volume of 12.3m³, with this within the allowance of 25m³ per node according to "WaPUG" standards. The total flood volume across the network for this event is 59m³.

4.18. The management of flood exceedance impact criteria is also met in considering the results from a 1 in 200-year storm. The modelling of network nodes showed that three nodes exceeded a flood volume of 25m³. However, these three nodes are all located in roads, which will contain and channel the flow towards low points on the site and away from the buildings. The analysis showed that the maximum flood volume for the worst node is 43m³ and the total flood volume across the network for this event is 280m³.

4.19. The design of the surface water drainage strategy is therefore compliant with the required flood protection levels of service in accordance with PPS25.

Interception Storage

4.20. Interception storage of the first 5mm of rainfall will be provided in the bases of swales and the detention basin for the construction stage and the operational stage. Compliance is achieved through the provision of a total volume of 147m^3 of interception storage, as summarised in Appendix 1.

Attenuation Storage

4.21. The analysis indicates that the flow from the Development Site needs to be restricted to Qbar, and thus the permitted peak flow from the Development Site is 10.8l/s (equating to 2.92l/s/ha for the 3.7ha area of the Development Site within the catchment of the ditch). Permitted peak flows based on Qbar from the upstream catchment are 17.1l/s (equating to 2.95l/s/ha for the 5.8ha area of the upstream catchment), and these are added to the flows from the Development Site to set the flow rate for the vortex control device from the detention basin.

4.22. The surface water drainage strategy summarised in Appendix 1 has been designed to meet the above flow criteria. The surface water drainage strategy has been provided for the construction stage and operational stage of the proposed development. The analysis shows that the attenuation storage provided in the surface water drainage strategy results in predicted peak flows that are at or below the permitted peak flows in all cases, and so compliance is achieved.

Long Term Storage

4.23. The requirement for long term storage is that at least 900m3 of water is stored with a 1 in 100-year 6-hour duration storm event, and that the peak discharge rate from the detention basin would be 34.5l/s. Where separate long term storage cannot be provided, the discharge from the Development Site should be limited to a maximum rate of Qbar or to 2 l/s/ha, whichever is the greater.

4.24. Based on site constraints and with a review of the benefits of actually including long term storage in the proposed development, long term storage for the Development Site cannot be provided, as described in more detail in Appendix 1. The discharge rate based on a rate of 2l/s/ha would be 7.8l/s for the 3.9ha Development Site. Instead, the discharge rate from the detention basin is to be controlled to Qbar (10.8l/s), as this is greater than the 2l/s/ha rate, with this rate achieved through the use of a vortex control devices.

Infiltration

4.25. Infiltration tests have been undertaken within the Development Site. The analysis comments on the potential for infiltration of surface water to ground. Whilst results appear in some cases to be satisfactory to support the design of infiltration drainage, groundwater levels are shallow such that the infiltration devices will not have a satisfactory freeboard above the groundwater level at all times of the year, as commented on in Appendix 1. As a result, there is a serious risk that infiltration can not be relied upon to work reliably or predictably. It was agreed that infiltration drainage will not be taken into account in assessing the volumes of water discharged off site in the operational stage, although some areas of infiltration drainage will be provided.

4.26. During the construction stage of the proposed development, the contractors area will drain to a permeable sub-base layer 400mm thick which will contain the surface water run-off and allow it to infiltrate, although all other hard areas are provided piped drainage collector systems. During the operational stage of the proposed development, although no infiltration is taken into account in assessing volumes of run-off being discharged, the bases of the swales and detention basin are not being lined so that benefit from infiltration can be gained – although this benefit has not been quantified.

Operation and Maintenance

4.27. The SuDS features in the surface water drainage strategy have been designed in line with the AWE SuDS Principles Document and there are no features that require unusual operation or maintenance. It is of note that the detention basin vortex control device structure would be submerged and inaccessible for significant storms, including the 1 in 100-year storm. For this reason, an additional drain down pipe has been incorporated that will connect to the upstream catchment bypass drain system. This will be controlled with a penstock device on the discharge into a manhole. The manhole is outside the area of the 96.5m AOD water level for the basin and will be accessible by foot. This drain down would only need to be operated should the vortex control device or screen become blocked and it would be possible to lock the penstock closed to

ensure that it is only operated for maintenance purposes following a blockage incident.

Treatment Train

4.28. A treatment train approach to drainage systems for the proposed development has been adopted where possible, and was designed with reference to the AWE SuDS Principles document. This has been used to determine whether the construction stage and the operational stage are compliant, with more detail given in Appendix 1.

Amenity and Ecology

4.29. Swales and a detention basin have been used primarily throughout the design of the surface water drainage strategy. The existing ditch is also being retained with a managed greenfield flow to ensure the ecological benefit of this is maintained during dry weather. While detention basins offer the potential for increased amenity, the ecological benefit of swales and detention basins is perhaps more apparent with the different species of plant and vegetation that are able to colonize wetland and grassed areas. The swales and detention basin have been designed in series where possible so that the depth and shape of the swales and basin can vary, providing a more aesthetic environment, but more importantly, the water quality process of swales and basin in series results in a much better effluent quality and creates different communities of species. In addition, the base of the detention basin will be sculpted to form three individual shallow basins which meets infiltration storage volume requirements, and will also provide additional stages in the treatment train. The high level of maintenance employed on this site will ensure that the best possible value is gained from the improvements in both amenity and ecology.

Green Roofs

4.30. The three roofs on the Support Building, and the roof of the Substation, will all be extensive green roofs. These will bring the benefits of improved microclimate by absorption of solar radiation, stabilisation of the building temperature through mass, and improved rainwater management through delayed rainfall run off, contributing to a sustainable drainage solution.

The planting on the roofs would also increase biodiversity across the Development Site.

4.31. The green roofs will be of a proprietary single ply roof waterproofing system, topped with an aggregate / lightweight growing medium. The roofs will be planted with closely grown low plants able to withstand frost and drought, with low nutrient requirements and a high capacity for regeneration, enabling them to survive adverse weather conditions.

4.32. The green roof planting would be completed either in a pre-grown mat system, rolled out onto the substrate to give an 'instant' green roof, or established through a combination of plug planting with hydro-seeding. The roofs are designed to be limited access, with a yearly inspection to check flashing and drainage outlets and twice yearly visits for the removal of any unwanted plants.

Dewatering and Excavation Works

4.33. The dewatering and excavation works that are required during the construction stage will generate a volume of water that will need to be released from the Development Site in a manner that is safe and that does not increase the risk of flooding both locally and elsewhere in the catchment. The strategy for the release of these waters is described in more detail in Appendix 1, and will utilise the surface water drainage strategy for the construction phase. The technical note confirms that the surface water drainage strategy design is sufficient to accommodate the worst case construction and operation stage design, including the construction dewatering and excavation works.

Summary of Surface Water Drainage Strategy

4.34. Sustainable drainage is the practice of controlling surface water runoff as close to its origin as possible, before it is discharged to a watercourse or sewer. This involves moving away from more traditional piped systems and towards more sustainable solutions that seek to mimic the natural drainage regime. Sustainable drainage techniques have many benefits such as reducing flood risk, improving water quality, encouraging groundwater recharge and providing amenity and wildlife benefits. Based on this, a surface water drainage strategy should aim to meet all of these

criteria, adopting a hierarchical approach to the selection of the most appropriate drainage features. The most sustainable strategy would include features such as living roofs, ponds, filter strips and swales and infiltration devices; whereas the least sustainable features would include tanked systems and oversized pipes. Further guidance is given in "SuDS – A Practical Guide" by the Environment Agency – Thames Region.

4.35. The proposed development includes a surface water drainage strategy that can be summarised as follows:

- A primary attenuation facility for surface water runoff within a detention pond, with waters conveyed to it by swales.
- A restriction to the outfall from the Development Site to Qbar for all events.
- No flooding of the Development Site up to 1 in 30-year event and no flooding of buildings up to 1 in 100-year event – including climate change factor of 10% for construction stage and 20% for operational stage – with this complying with the surface water drainage strategy design requirements.
- Management of flood exceedance up to 1 in 200-year event, with waters channelled away from buildings and contained on low areas of the Development Site – with this complaint with the required level of flood protection service.
- The surface water drainage strategy for the Development Site incorporates a number of sustainable features for the attenuation of waters, including swales and a detention basin. Additional attenuation is provided beneath hard-standing areas, with this offering a point source control for surface water. The proposed development also includes a green roof on the Support Building.
- Although ground water levels are close to the surface of the Development Site and consequently formal drainage to ground is limited, infiltration of surface waters has been maximised wherever possible.

- These drainage features are in line with the SuDS hierarchy, with the selection of a number of sustainable drainage features that not only reduce flood risk, but also improve water quality, provide amenity and wildlife benefits – and encourage groundwater recharge where possible.

Dewatering and Excavation

4.36. The dewatering and excavation works are a specific component of the construction stage, and are detailed in the surface water drainage strategy in Appendix 1. This confirms that the proposed surface water drainage strategy design is sufficient for worst case construction and operation stage design including the construction dewatering and excavation works.

5 Conclusions

5.1. The Development Site is located in the north of AWE Aldermaston, Berkshire. The Development Site was formerly occupied by buildings and associated infrastructure which have now been demolished. For the purposes of this assessment, the Development Site is assumed to be greenfield. The proposed development delivers a hydrodynamics research and development facility which includes an Operations Building, Support Building, Substation, and associated landscaped and construction related facilities.

5.2. The proposed development is considered to be in a suitable location under the guidelines in PPS25 on flood risk vulnerability and compatibility, as this is a non-residential development located within Flood Zone 1. The risk of fluvial and/or tidal flooding to the Development Site is therefore of a low probability. Other forms of flood risk to the Development Site have been considered, including infrastructural, groundwater and pluvial. Although the risk from these were considered to be low, the proposed development could have an adverse affect on the surface water runoff regime and consequently an increase in the risk of flooding from surface water runoff in the local area and/or the surrounding catchment.

5.3. During the construction stage, surface water drainage of the Development Site will incorporate a detention basin, swales and cut-off ditches, also with a granular infiltration blanket under the construction establishment area. The surface water drainage strategy will also use more traditional drainage features, including piped drainage and filter drains with catch pits / manholes. The surface water drainage strategy will be controlled through the use of vortex control devices, full retention oil separators, downstream defenders (hydrodynamic separators); and penstocks (pollution control valves). The surface water drainage strategy in the operational stage of the proposed development will be based on that established during the construction stage. The main difference would be the abandonment of the infiltration blanket under the construction establishment area, although there would be some infiltration potential in the unlined detention basin and swales. In addition, the volume of buried attenuation measures with

restricted outflow will be constructed in stages as the hard surfaces of the floor slabs for the building are constructed.

5.4. The levels of flood protection service that are required for the proposed development are in accordance with the AWE SuDS Principles document. An analysis using Microdrainage software was completed, with this including a climate change factor of 10% for the construction stage and 20% for the operational stage. This analysis considered the levels of flood protection service from interception storage, attenuation storage, long term storage and infiltration, as summarised in Appendix 1. This also considered the operation and maintenance of the surface water drainage strategy, the treatment train and the amenity and ecological benefits, including the green roof.

5.5. The principles that have been outlined for the construction and operational stage of the proposed development are considered to be suitable for the Development Site and appropriate to mitigate the increased rate and volume of surface water runoff.

5.6. Based on the findings reported in this FRA and the supporting appendices, the Proposed Development is considered to be compliant with the guidelines outlined in PPS25.

A3

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided.

This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contamination on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert.

Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting.

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation including ground conditions/contaminants, drainage, design & planning/amenity negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features, accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

Notes:

NORTH

KEY

AWE Aldermaston

Application Site Boundary

Revisions:	Date:	Amendment:	Name:	Checked:

For guidance only. Do not scale off this drawing

1:20 -	0	200mm	400mm	600mm	800mm	1000
1:100-	0	1m	2m	3m	4m	5m
1:50 -	0		1m		2m	
1:5 -	0		100mm		200mm	

RPS Design

NORTH

KEY

AWE Aldermaston

Application Site Boundary

Revisions: Date: Amendment: Name: Checked:

For guidance only. Do not scale off this drawing

1:20 - 0 200mm 400mm 600mm 800mm 1000
1:100- 0 1m 2m 3m 4m 5m
1:50 - 0 1m 2m
1:5 - 0 100mm 200mm

RPS Design

Hydrus Site

Cwm Road

A340

A340
(Paices Hill) Gate

Manor House
Hotel

Hydrus
Site

Cwm Road

Central Area Construction
Enclave (CACE)

Griffin Road

A340

West End

West End
Construction
Enclave (WECE)

KEY:

- AWE Aldermaston
- Application Site Boundary
- Hydrus
- WECE (West End Construction Enclave) Temporary planning consent granted as part of NOA Application
- CACE (Central Area Construction Enclave) Temporary planning consent granted as part of HEFF Application
- A340 (Paices Hill) Gate Full planning consent granted
- Established internal road
- Borehole Headworks Permitted Development Planning consent not required
- Points of access/egress

Client: **AWE**

Project: **PROJECT HYDRUS**

Client: **AWE**

Project: **PROJECT HYDRUS**

Title: **APPLICATION SITE RED LINE BOUNDARY**

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Codes of Practice, Construction (Design & Management) Regulations, Party Wall Act, etc., for or not specifically stated on this drawing. This drawing must be read with and checked against all relevant Engineers and Architects drawings and all other specialist documentation provided.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. Any suspect or fluid ground, contaminates on or within the ground, should be further investigated by a suitable expert.

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation inducting ground conditions / contaminants, drainage, design & planning / density negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features, accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

Do not scale. Work to given dimensions only.

Notes:

SURVEY KEY

AV	AIR VALVE	IR	IRON RAIL
BL	BOLLARD	KO	KERB OUTLET
BM	BENCH MARK	LB	LETTER BOX
BO	BOREHOLE	LC	LAMP COLUMN
BS	BUS STOP SIGN	LL	LANDYLAP
BT	BRITISH TELECOM COVER	MH	MANHOLE
B/W	BARBED WIRE	MK	MARKER POST
CB	CONTROL BOX	MW	MONITORING WELL
CCTV	CLOSED CIRCUIT TV	NP	NAME PLATE
CL	COVER LEVEL	P	POST
CI	CORRUGATED IRON	PM	PARKING METER
CL	CHAIN LINK	P/R	POST AND RAIL
CONC	CONCRETE	P/W	POST AND WIRE
CPS	CONCRETE PAVING SLABS	RM	ROAD MARKS TV
COL	COLUMN	RS	ROAD SIGN
C/B	CLOSE BOARDED	RWP	RAIN WATER PIPE
CP	CONCRETE PAVING	SC	STOP COCK
CP	CONCRETE PANEL	SF	STOP IT LEVEL
CTV	CAMILE TV	SP	SIGN POST
D	TRUNK DIAMETER	S/R	STEEL RAILING
DP	DOWN PIPE	ST	STUMP
DPC	DAMP PROOF COURSE	SV	SCOUR VALVE
EB	ELECTRICITY BOX	SW	SURFACE WATER
EC	ELECTRICITY COVER	TAC	TACTILE PAVING
EP	ELECTRICITY POLE	TCB	TELEPHONE CALL BOX
ER	EARTH ROD	TL	TRAFFIC LIGHT
FC	FINISHED FLOOR LEVEL	TLC	TELEPHONE SERVICE COVER
FH	FIRE HYDRANT	TP	TELEPHONE POLE
FW	FOUL WATER	TW	TOP OF WALL LEVEL
GA	GAS GOVERNOR	VC	UNABLE TO LIFT
GM	GAS METER	VL	UNABLE TO VALVE COVER
GP	GATE POST	VP	VENT PIPE
GV	GAS VALVE	WCL	WINDOW CILL LEVEL
GY	GULLY	WHL	WINDOW HEAD LEVEL
H	INSPECTION COVER	WL	WATER LEVEL
IL	INVERT LEVEL	WM	WATER METER
INV	DITCH INVERT LEVEL	WM	WIRE MESH
		WO	WASH OUT VALVE

1) UNDERGROUND DRAINAGE INFORMATION HAS BEEN MEASURED FROM SURFACE INSPECTION ONLY AND SHOULD BE CONFIRMED BY SPECIALISTS IF CRITICAL.

2) TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CONFIRMED BY SPECIALISTS IF CRITICAL.

3) SURVEY GRID RELATED TO PSF GRID SUPPLIED BY AWE GIS DEPT.

4) LEVELS RELATED TO OS DATUM USING CONTROL SUPPLIED BY AWE GIS DEPT.

5) NORTH ARROW APPROXIMATE ONLY.

Station	Easting	Northing	Level
AN0003	9704.965	4451.356	99.841
AN0005	9648.767	4512.187	99.310
ANP01	9658.845	4301.416	101.925
H2	9969.135	4551.883	99.457
H3	9686.417	4342.745	100.398
H4	9615.947	4324.956	100.141
H5	9638.734	4427.077	99.249
H6	9698.249	4512.338	99.413
H7	9776.323	4471.863	99.845
H41	9677.528	4321.109	97.441

Revisions: Date: Amendment: Name: Checked

For guidance only. Do not scale off this drawing

1:20 0 20mm 40mm 60mm 80mm 100mm 120mm 140mm 160mm 180mm 200mm 220mm 240mm 260mm 280mm 300mm 320mm 340mm 360mm 380mm 400mm 420mm 440mm 460mm 480mm 500mm

1:100 0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

1:5 0 100mm 200mm 300mm 400mm 500mm

TO SCALE @ A0

RPS

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Client: **AWE**

Project: **PROJECT HYDRUS**

Title: **POST DEMOLITION TOPOGRAPHICAL SURVEY**

Status: Checked: **PDG**

Drawn: **AHP** Date: **NOV 08** Scale: **1:500**

Drawing Ref:

Job No: **BES0118** Drg No: **03** Rev: **A**

Architects Engineers Surveyors
Landscape Architects Services Consultants

Appendix 1

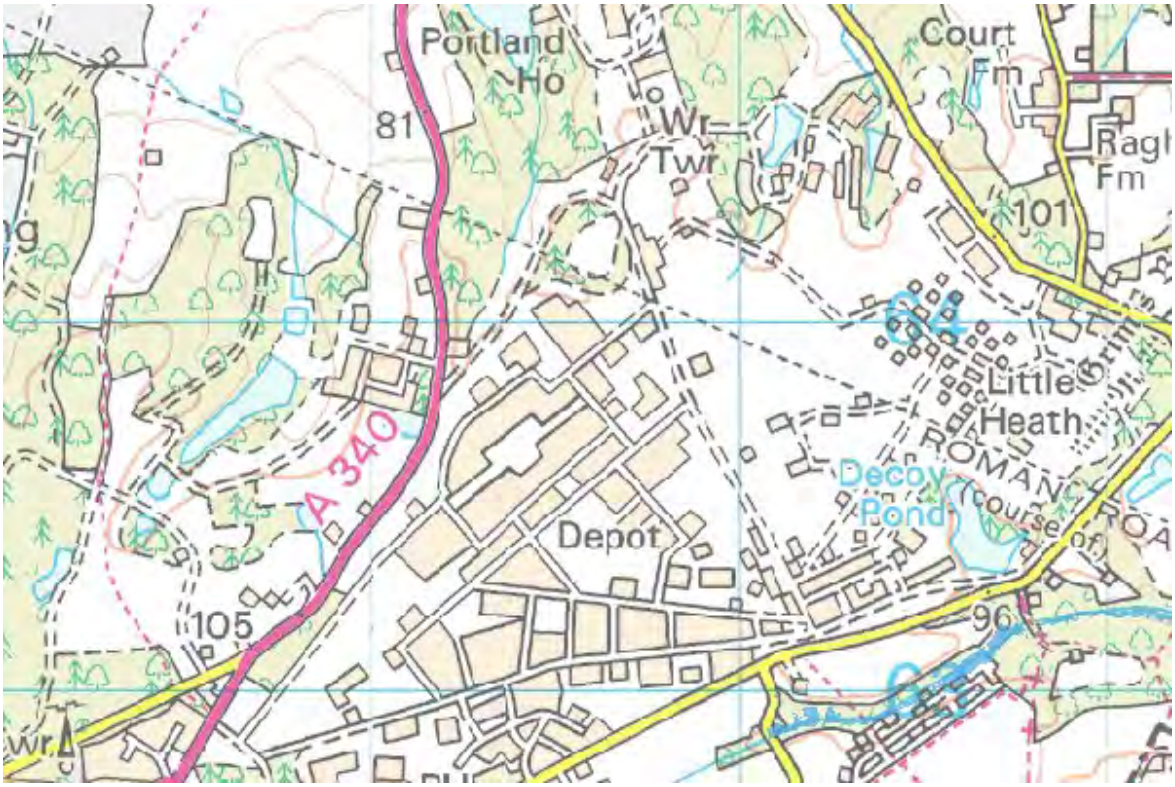
SuDS Detail Design Submission

(see separate document)

Appendix 2

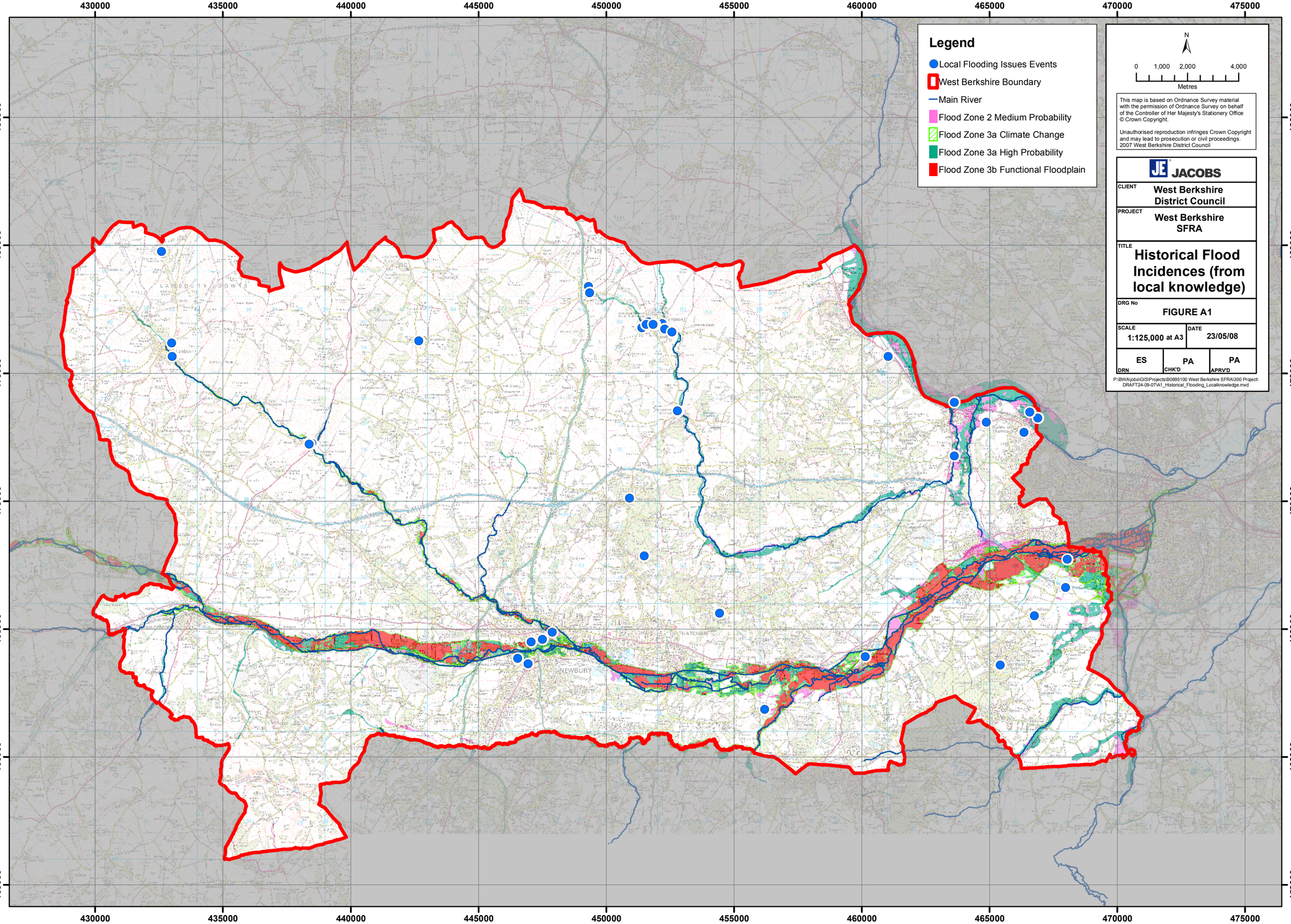
Environment Agency Flood Map

Flood Map from Environment Agency Website



Appendix 3

Information from West Berkshire District SFRA


430000
435000
440000
445000
450000
455000
460000
465000
470000
475000
188000
183000
178000
173000
168000
163000
158000
Legend
Local Flooding Issues Events
West Berkshire Boundary
Main River
Flood Zone 2 Medium Probability
Flood Zone 3a Climate Change
Flood Zone 3a High Probability
Flood Zone 3b Functional Floodplain
N
0 1,000 2,000 4,000
Metres
This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown Copyright.
Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. 2007 West Berkshire District Council
JACOBS
CLIENT
West Berkshire District Council
PROJECT
West Berkshire SFRA
TITLE
Historical Flood Incidences (from local knowledge)
DRG No
FIGURE A1
SCALE
1:125,000 at A3
DATE
23/05/08
DRN
ES
CHK'D
PA
APRV'D
PA
P:\BWA\jobs\GIS\Projects\B0695100 West Berkshire SFRA\300 Project\DRAFT24-09-07\A1_Historical_Flooding_Localknowledge.mxd
NEWBURY
THATCHAM
DIDCOT
WANTAGE

425000 430000 435000 440000 445000 450000 455000 460000 465000 470000

188000 183000 178000 173000 168000 163000 158000

Legend

- West Berkshire District Council Boundary
- Recorded Flood Events
- West Berkshire Flood Event Outlines

N

0 900 1,800 3,600

Metres

PLEASE NOTE - The inclusion of any site on this map does not imply that development is supported.

JACOBS

CLIENT	West Berkshire District Council
PROJECT	West Berkshire SFRA
TITLE	**Recorded Flood Events**
DRG No	FIGURE A2
SCALE	1:125,000 at A3
DATE	24/09/07
DRN	EN
CHK'D	PA
APRV'D	PA

P:\BWA\jobs\GIS\Projects\West Berkshire SFRA\300 Project\A2_Recorded_Flood_Events.mxd

425000 430000 435000 440000 445000 450000 455000 460000 465000 470000

188000 183000 178000 173000 168000 163000 158000

Legend

- West Berkshire Boundary
- Main River
- Flood Zone 2 Medium Probability
- Flood Zone 3a Climate Change
- Flood Zone 3a High Probability
- Flood Zone 3b Functional Floodplain

N

0 1,000 2,000 4,000

Metres

JACOBS

CLIENT: West Berkshire District Council

PROJECT: West Berkshire SFRA

TITLE: **Fluvial Flood Risk Overview**

DRG No: FIGURE D1

SCALE: 1:125,000 at A3

DATE: 22/05/08

DRN	CHK'D	APRV'D
ES	PA	PA

P:\BWA\jobs\GIS\Projects\West Berkshire SFRA\300 Project\D1_Overall_Flood_Risk_Overview.mxd

Appendix J – Table of Contents

Introduction

1. This section provides a brief overview of the strategy and policy context relevant to flood risk in West Berkshire. The success of the SFRA is heavily dependent upon the Council's ability to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning decisions and development control conditions (ref.: Section 6.4). A framework of national and regional policy is in place, providing guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish robust policies that will further ensure future sustainability with respect to flood risk.

National Planning Policy

Overview

2. National planning policy is set out in a number of Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGs). The Government is currently reviewing all PPGs with revised advice being set out in a PPS and, where necessary, accompanying best practice guidance.

3. PPSs and PPGs cover a full range of planning issues drawing on the central issue of sustainable development. Central themes include the re-use of 'deliverable' previously developed land, promoting economic growth, including the intention to steer inappropriate development away from areas at risk of flooding. Under paragraph 4.24 of 'PPS12: Local Development Frameworks' it is a requirement of Regional Assemblies and Local Authorities to ensure their Regional Spatial Strategies (RSS) or Local Development Frameworks (LDFs) are in conformity with the guidance in PPSs and PPGs. The regional and local policy context for SFRAs is set out in the next section.

Planning Policy Statement (PPS) 25: Development and Flood Risk

4. Planning Policy Statement 25 (PPS25) was published in December 2006, and underpins the process by which local planning authorities are to account for flood risk as an integral part of the planning process. The overarching principles set out by PPS25 for the management of flood risk at a planning authority level are encapsulated in Paragraph 6 of the document:

"Regional planning bodies (RPBs) and local planning authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:

Appraising risk

- *identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;*
- *preparing Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal of their plans;*

Managing risk

- *framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;*
- *only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;*

Reducing risk

- *safeguarding land from development that is required for current and future flood management, e.g. conveyance and storage of flood water, and flood defences;*
- *reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SuDS);*
- *using opportunities offered by new development to reduce the causes and impacts of flooding, e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SuDS; recreating functional floodplain; and setting back defences;*

A partnership approach

- *working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously; and*
- *ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning."*

5. These broad key planning objectives effectively set the scope for the specific outcomes of the SFRA process. The SFRA in turn then informs planning and development control decisions to ensure that the objectives set out above can be achieved.

6. The guidance in PPS25 also indicates that Sustainability Appraisals should be informed by the SFRA for their area. Under the Town and Country Planning (Local Development) (England) Regulations 2004, a Sustainability Appraisal (SA) is required for all Local Development Documents (LDDs) which form part of Local Development Frameworks (LDFs). The purpose of SA is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans. The Regulations stipulate that SAs of LDFs should meet the requirements of the Strategic Environmental Assessment (SEA) Directive.

7. It is important to emphasise that PPS25 is not applied in isolation as part of the planning process. The formulation of Council policy and the allocation of land for future development must also meet the requirements of other planning policy statements, including (for example) PPS3: Housing and PPS1: Delivering Sustainable Development (Climate Change Annex).

8. Clearly a careful balance must be sought, and the SFRA aims to assist in this process through the provision of a clear and robust evidence base upon which informed decisions can be made.

Development and Flood Risk: A 'Living Draft' Practice Guide Companion to PPS25

9. In February 2007 the companion guide was published as a consultation paper[1]. This document provides additional guidance on the principles set out in PPS25, which should be considered by West Berkshire Council when preparing its LDF.

Planning Policy Statement: Planning & Climate Change (Supplement to PPS1)

10. PPS1: Delivering Sustainable Development "*sets out the overarching planning policies on the delivery of sustainable development through the planning system"*. The PPS1 Supplement: Planning & Climate Change *"sets out how spatial planning should contribute to reducing emissions and stabilising climate change (mitigation), and take into account the unavoidable consequences (adaptation)"*.

11. The supplementary guidance provides clear considerations for local planning authorities when allocating land for future development. These are summarised below:

- *the location and whether there is, or the potential for, a realistic choice of access by means other than the private car and for opportunities to service the site through sustainable transport;*
- *the capacity of existing and potential infrastructure (including for energy supply, waste management, water and sewerage, and community infrastructure such as schools and hospitals) to service the site or area in ways consistent with cutting carbon emissions and successfully adapting to likely changes in the local climate;*
- *the ability to build and sustain socially cohesive communities with appropriate community infrastructure so as to avoid social exclusion, having regard to the full range of local environmental impacts that could arise as a result of likely changes to the climate;*
- *the effect of development on biodiversity and the capacity for adaptation, having regard to likely changes in the local climate;*
- *the contribution to be made from existing and new opportunities for open space to urban cooling; and*
- *known physical and environmental constraints on the development of land such as sea level rises, flood risk and stability, and take a precautionary approach to increases in risk that could arise as a result of likely changes to the climate*

12. The latter provides a critical link into PPS25 and the SFRA process, highlighting the importance of understanding (and responding to) the potential increases in flood risk that may occur within West Berkshire as a result of climate change, from all sources.

[1] Communities and Local Government (2007) Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' A Consultation Paper

Regional Planning Policy

Regional Planning Guidance for the South East (RPG9)[2]

13. Regional Planning Guidance for the South East (RPG9) published in March 2001 is the adopted regional spatial strategy and was written to cover the period up to 2016.

14. Policy INF1 states that "development should be guided away from areas at risk or likely to be at risk in the future from flooding, or where it would increase the risk of flood damage elsewhere". Although this does not go quite as far as PPS25, it does follow similar principles. The policy continues by stating that "existing flood defences should be protected where they continue to be relevant". Similar statements are found in PPS25.

The South East Plan[3]

15. Under the Planning and Compulsory Purchase Act 2004, RPG9 is to be replaced by a new Regional Spatial Strategy (RSS), entitled the South East Plan. The South East Plan has been prepared by the South East England Regional Assembly (SEERA), and sets out the vision for the South East for the next 20 years until 2026. The Examination in Public was carried out in spring 2007, and the inspectors' report was published by the Government Office for the South East on 29 August 2007. The document is expected to be adopted around Autumn 2008.

16. Of most relevance to flooding in the South East Plan is policy NRM3 which states that authorities should follow the sequential approach to development in flood risk areas. The policy also states that in Flood Zones 2 and 3, or areas with past groundwater flooding, or where flood risk would increase elsewhere, development that is deemed inappropriate should not be permitted or allocated, unless there are exceptional circumstances. In addition, the policy notes that SFRAs should be prepared, and that existing flood defences should be protected from development. The use of SuDS is also encouraged.

17. Policy CC2 states that the South East region should adapt to the risks and opportunities presented by climate change through a number of measures, which include measures relating to flooding. The policy states that: strategic development should be guided to locations offering greater protection from impacts such as flooding; SuDS should be incorporated into new buildings; flood storage capacity should be increased; and the most should be made of opportunities and options for sustainable flood management.

18. One of the main objectives of the plan for achieving sustainable development, noted in the integrated regional framework (IRF), relates to flood risk. IRF objective 2 is "to reduce the risk of flooding and the resulting detriment to public wellbeing, the economy and environment". This is a strategic policy, and it shows that SEERA considers flooding to be an important issue, and it is highlighted as one of the region's key environmental challenges.

19. The need to increase flood storage capacity is highlighted by policy NRM1: sustainable water resources, groundwater and river water quality management. The policy suggests encouraging winter water storage reservoirs, and other sustainable farming practices which diffuse runoff and increase flood storage capacity.

[2] Government Office for the South East, Government Office for East of England, Government Office for London (2001) Regional Planning Guidance for the South East (RPG9)

[3] South East Regional Assembly (2006) The South East Plan: A Clear Vision for the South East, Draft Plan for submission to Government

SE Plan Panel Report

20. Of particular relevance to flooding issues in West Berkshire, the SE Plan Panel Report has recommended that Policy NRM1 should be amended to cover Sustainable Water Resources and Groundwater only and that a new policy (NRM1a) should be created to deal with Sustainable River Water Management. Additionally, the Panel suggests that Policy (NRM1) should include a commitment from the Regional Assembly to work with the Government, the EA, Ofwat and regional stakeholders to ensure the delivery of the water efficiency savings that are necessary for implementing the draft Regional Spatial Strategy (RSS) and to include clarification of BREEAM standards and SUDS.

21. Further recommendations include changes to Policy NRM3 and supporting text to reflect more fully the advice and priorities in PPS25, including expanding on the role of SFRAs.

22. Housing delivery targets for the District are also affected. The Panel Report recommends that an additional 7,500 dwellings should be added to the housing provision for West Berkshire, resulting in a total of 18,000 homes. This is equivalent to an average of 850 dwellings per annum (dpa).

The Berkshire Structure Plan 2001-2016

23. The Structure Plan, covering the period up to 2016, was adopted by the Berkshire Unitary Authorities' Joint Strategic Planning Unit in July 2005. Under the provisions of the Planning and Compulsory Purchase Act 2004 it will eventually be replaced by the statutory Regional Spatial Strategy (the South East Plan). In the meantime the Structure Plan Policies are 'saved' for a period of 3 years from the date of adoption and will continue to form part of the Development Plan until it is superseded by the South East Plan.

24. The Structure Plan policies were based on the advice given in PPG25[4] which has now been superseded by PPS 25.

25. Policy EN6 'Prevention of Flooding' states that:

- Development proposals will avoid adding to flood risk, either within the development site or elsewhere, and that measures to employ sustainable drainage solutions will be encouraged.
- The policy also states that FRAs should be carried out and that a sequential approach should be taken.

26. It goes on to say that new development in the functional flood plain will only be permitted in exceptional circumstances and will be limited to essential infrastructure.

27. The supporting text in paragraphs 5.22-5.24 refer to flooding stating that 'flood risk is likely to increase in the future due to climate change' adding that ' it is important that the potential flood risk arising from new development and redevelopment of existing built up areas is assessed against not just the immediately surrounding areas but the whole catchment'.

Local Planning Policy

Adopted West Berkshire District Local Plan

28. The adopted West Berkshire District Local Plan was adopted on 14 June 2002, setting out the Council's policies and proposals for development and land use in the District over the plan period up until 2006.

29. Under the Planning and Compulsory Purchase Act 2004 all Local Plan policies were 'saved' until 27 September 2007, unless expressly replaced by 'new' policies. The Council applied

[4] PPG25 Development and Flood Risk

to the Secretary of State with a list of policies to be saved and deemed essential, until such time that a Core Strategy or relevant Development Plan Document is adopted to replace them through the Local Development Framework. Saved policies must reflect the principles of Local Development Frameworks; to be consistent with current national policy, and/or to not be feasible or desirable to replace them by 27 September 2007.

30. In September 2007 the Secretary of State agreed with the Council that ENV.10 'River Flood Plain Areas' and ENV.11 'Surface Water Run Off' are not saved. These policies were based on the advice of PPG25 which has now been superseded by PPS25 which sets out in detail the national planning policy for development and flood risk. In addition to PPS25, the adopted Quality Design – West Berkshire Supplementary Planning Document provides guidance on drainage and runoff.

Emerging Local Planning Policy

West Berkshire's Local Development Framework

31. West Berkshire Council is currently preparing its Local Development Framework, as required under the Planning and Compulsory Purchase Act 2004. The Local Development Framework will replace the existing Adopted Local Plan and be used for land use development decisions. The Local Development Scheme (LDS) sets out which Local Development Document's (LDDs) the Council will prepare as part of its LDF. The Council has already commenced work on their Core Strategy DPD which sets out the vision, aims and strategy for spatial development in the District up to at least 2026.

32. The current LDS (June 2007) states that the following LDDs will be prepared:

- West Berkshire Planning Strategy (Core Strategy DPD)
- Site Allocations DPD
- Newbury Town Centre Plan DPD
- Rural Communities and the Countryside DPD
- The Wharf, Newbury SPD
- Underwood Road Shopping Centre, Calcot SPD