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LAND TO THE WEST OF HATFIELD

Environmental Statement – Chapter 13: Water Resources, Flood Risk and Drainage

Arlington Business Parks GP Limited

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13 WATER RESOURCES, FLOOD RISK AND DRAINAGE

13.1 INTRODUCTION

The existing undeveloped site is currently soft landscaped and covered in grass – there are no drained hard landscaped areas at present or any form of land drainage.

The topography of the site is such that there is a fall from the northeast towards the southwest for the northern part of the site, southwest towards south east for the middle part and southwest towards east for the southern part of the site.

The current Hatfield Business Park development has a park wide infrastructure foul and surface water drainage system that was implemented as part of the redevelopment of the historic Hatfield Aerodrome site during the late 1990's early 2000's.

This drainage system has been designed to cater for all future plot developments at the business park and has previously been signed-off and approved by the local authority and The Environment Agency.

The existing surface water system generally comprises of a network of oversized sewers located beneath the main infrastructure spine roads to the business park.

The surface water sewer sizes range between 1350 – 2400mm in diameter and provide the necessary attenuation volume required to limit discharge rates from the park to Greenfield run-off rates.

Flows from the sewers are discharged to the Ellenbrook receiving watercourse and are controlled / limited by an existing storm water pumping station.

13.2 METHODOLOGY

The assessment of the potential for environmental impact associated with the water environment has been undertaken in accordance with relevant statutory guidance. Baseline conditions have been established through undertaking a desk study. These methods used to establish the baseline conditions are discussed later in this Chapter.

13.2.1 Legislation and Planning Policy Guidance

This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to flood risk and hydrology in the context of the proposed site development. A summary of the relevant legislation and policies, the requirements of these policies and the response has been provided in Table 13.1 below.

Table 13.1 – Summary of Relevant Legislation and Policies

Policy / Legislation	Requirements
National Planning Policy Framework (NPPF)	NPPF sets out Government policy on development and flood risk. Its aim are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.
The Water Framework Directive (2000)	The Directive provides a framework for the protection of surface water, estuaries, coastal water and groundwater. The objectives of the Directive are to enhance the status, and prevent further deterioration, of aquatic ecosystems, promote the sustainable use of water, reduce pollution or water (especially by 'priority' and 'priority hazardous' substances) and ensure progressive reduction of groundwater pollution. Among the main features of the Directive are that all inland and coastal waters within defined river basin districts must reach at least good status by 2015.
The Flood and Water Management Act 2010	The Flood and Water Management Act 2010 provides better, more comprehensive management of flood risk for people, homes and businesses. It also helps tackle bad debt in the water industry, improve the affordability of water bills for certain groups and individuals, and help ensure continuity of water supplies to the consumer. The Flood and Water Management Act encourages the use of sustainable drainage in new developments and re-developments.
The Water Resources Act 1991, as amended by the Water Act 2003 and Water Act 2014.	The Water Resources Act 1991 (WRA) replaced the corresponding sections of the Water Act 1989. The WRA sets out the responsibilities of the Environment Agency in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The WRA regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater's.

The Groundwater (England and Wales) Regs 2009	The Groundwater Regulations are an environmental protection measure that complete transposition of the Groundwater Directive (80/68/EEC) and provide enhanced protection for groundwater. Under the Regulations, the Environment Agency has responsibility for the enforcement of the Regulations and decisions of their scope and effect.

13.2.2 Assessment Process

The methods used to establish the baseline conditions include:

- A review of information on surface water quality, details of pollution incidents from the Environment Agency
- Information obtained from historic correspondences and statutory consultations with the Environment Agency
- A Flood Risk Assessment has been carried out to identify potential sources of flood risk in relation to the proposed development
- A Conceptual Drainage Strategy Model has been carried out using Windes and modelling software to provide a preliminary assessment of the existing runoff rates from the site and proposed discharges from the developed site
- A review of the potential cumulative effect on the water environment considering known projects in the vicinity
- Information obtained from correspondence and consultations with Thames Water on the wastewater and potable water networks.

13.2.3 Assessment of Impact Significance

The degree of effect is determined from the interaction of impact magnitude and the sensitivity of identified receptors. This method comprises the following stages:

- Identify resources or receptors and determine their value importance or sensitivity (high, medium, low, negligible).
- Identify impacts affecting any identified environmental sources as receptors and determine their magnitude (large, medium, small, negligible).
- Determine the degree of the effect (very substantial, substantial, moderate, slight, negligible)
- Determine whether the effect is significant. Effects that are moderate or above are considered to be significant in EIA terms.

The overall baseline conditions have been assigned a value/importance based upon criteria derived from the TOR assessment criteria and contained within Table 13.2.

Table 13.2: Receptor Sensitivity

Typical Description of the Receptor	High	Medium	Low	Negligible
	Water body of high ecological status			
	Protected areas, including designated bathing waters, shellfish waters, salmonid and fish stretches, sensitive areas (eutrophic and nitrate), water dependent Natura 2000 sites (SAC's and SPA's) and drinking water protected areas			
	Water body of high amenity value, including areas of bathing and where water immersion sports are regularly practiced			
	Designated groundwater aquifer, abstraction point or well source protection zone			
		Water body of 'good' ecological status[1] and / or non-public water supply or cyprinid fishery		
		Water body of nature conservation importance at the national or regional level or a moderately sensitive aquatic or marine ecosystem e.g. SSSI or SNCI		
		Water body of moderate amenity value incl. public parks, boating, popular footpaths adjacent to watercourses or watercourses running through housing developments / town centres		
			Water body of 'moderate' ecological status. Minor, high quality aquifer, a groundwater or surface source in close proximity to a source protection zone or abstraction point	
			Non-statutory wetlands. Water body or particular local cultural / social / educational interest	
			Minor, low quality aquifer. Water body of low amenity value with only casual access e.g. long a road or bridge in a rural area	
				Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area

		Water body of 'poor' or 'bad' ecological status[1]

The magnitude of changes caused during the operational and construction phases of the development are qualitatively described, based on the description detailed in Table 13.3.

Table 13.3: Magnitude of Change

Typical description of the change predicted	High	Medium	Small	Negligible
	Wholesale changes to water course channel, route, hydrology or hydrodynamics. Changes to site resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns. Major changes to the water chemistry or ecology			
		Some fundamental changes to the water course. Hydrology or hydrodynamics. Changes to site resulting in an increase in runoff within system capacity. Moderate changes to erosion and sedimentation patterns. Moderate changes to the water chemistry of surface runoff and groundwater		
			Minor changes to the water course, hydrology or hydrodynamics. Changes to site resulting in slight increase in runoff well within the drainage system capacity. Minor changes to erosion and sedimentation patterns. Minor changes to the water chemistry.	
				Very minor change in water course, hydrology, hydrodynamics, erosion and sedimentation patterns and water chemistry

Impact significance has been defined based on the interaction between the sensitivity of the affected receptor and the magnitude of change, as summarised in the Table 13.3.

Table 13.3: Significance of Impact

Magnitude / Scale of change	Sensitivity of receptor: High	Medium	Small	Negligible
Large	Very Substantial			
Medium	Substantial	Moderate		
Small			Slight	
Negligible				Negligible

Degrees of Effect

The following text sets out the degrees of effect based on professional judgement.

Very Substantial:

Wholesale change to watercourse, water chemistry, erosion and sedimentation characteristics within areas protected for their environmental importance or significance as water supply sources.

Substantial:

Wholesale or fundamental changes to water bodies, which are not water supply sources, but of good quality. Wholesale and/or moderate changes to associated erosion/sedimentation patterns and water chemistry. Also, moderate changes to watercourse, water chemistry, erosion and sedimentation characteristics within the areas protected for the environmental importance or significant as water supply sources.

Moderate:

Wholesale and/or fundamental changes to water bodies of average quality, and features of local interest. Also minor changes to important water bodies such as those in areas protected for their environment significance, water bodies of good quality, and both water supply and non-water supply sources.

Slight:

Small changes to water bodies of local interest or of average water quality.

Not significant:

No change to water bodies or poor quality and artificial watercourses.

13.3 BASELINE CONDITIONS

The main sources of information that have been used to define the baseline conditions are summarized in Table 13.4.

Table 13.4: Data Sources

Baseline Topic	Data Source
Site Drainage Layout	Site Plans
Natural Surface Water Features	OS Maps Historical Maps Topographic Surveys
Terrestrial Water Quality	Environment Agency – on line data sets
Pollution Incidents	Environment Agency – on line data sets
Flood Risk	Environment Agency – on line flood map and previous studies

13.3.1 Topography

The topography of the site is such that there is a fall from the northeast towards the southwest for the northern part of the site, southwest towards south east for the middle part and southwest towards east for the southern part of the site.

In terms of surface water features, the site currently has the Ellen Brook Watercourse running along its eastern boundary.

From investigation of the Environment Agency floodplain maps as well as SFRA report carried out by JBA consulting in December 2015 it appears that the most of existing/proposed site are not within a recognized floodplain area and as such are categorized as in Flood Zone 1 (<90% of the site).

However, northern site area, by the existing watercourse, is within floodplain area and is categorized as in Flood Zone 2 and 3. 9% of the site area is covered by Flood Zone 2 and <5% of the site is covered by Flood Zone 3. The majority of the site is shown to be located within Flood Zone 1, therefore, the Exception Test will not be required and existing levels will be maintained unchanged.

13.3.2 Water Quality

There is no known water quality data for the surface water features within the application boundary.

13.3.3 Fluvial Flooding

The Environment Agency samples for river quality along various rivers and canals throughout England and analyses their chemistry, biology, nitrate and phosphate content. There are however no monitoring points in the immediate vicinity of the site.

River quality, is set to improve under measures set out in River Basin Management Plans, drawn up for river basin districts across England and Wales under the Water Framework Directive. River Basin Management Plans are plans for protecting and improving the water environment.

The Water Framework Directive (WFD) requires that all inland and coastal waters within defined river basin districts must reach at least Good Status or Good Potential. The WFD requires no deterioration in the current status of the water body. It also includes an objective to 'aim to improve' any water body that is not presently at Good Status or Potential.

13.3.4 Pollution incidents

No pollution incidents have been reported within the study area.

13.3.5 Flooding

13.3.5.1 Tidal flooding

The proposed development site is located over 120 kilometres from the nearest tidal body of water. Therefore the sites are at no risk of tidal flooding.

13.3.5.2 Surface water flooding

There are no records of surface water flooding at the site.

13.3.5.3 Groundwater flooding

There is no evidence to suggest that groundwater flooding has occurred in the past and most of the superficial deposits are secondary undifferentiated aquifers and therefore are unlikely to have the capacity to cause groundwater flooding. The site is also at the highpoint of surrounding catchments. Therefore the site is at low risk of groundwater flooding.

13.3.5.4 Flooding from artificial sources

The EA Risk of Flooding from Reservoirs Online Map shows no potential hazards.

13.3.6 Climate change

It should be noted that the EA Flood Map outlines do not take into account the potential future impacts to flooding from changes in climate. It is considered that changes in the extent of inundation are negligible in well-defined floodplains with increased flows. There is very little difference between Flood Zone 2 and 3 for all the watercourses as they flow downstream due to the local topography and therefore the floodplain can be described as 'well- defined'. The effects of climate change are therefore not expected to alter the Flood Zone classification for the proposed development site considering the distance of the site from vulnerable zones.

Planning Practice Guidance suggests that peak rainfall intensity will increase and therefore to reduce the risk from surface water flooding, drainage systems will need to be designed to accommodate future increased runoff. Mitigation of this risk is addressed later in this Chapter.

13.3.7 Wastewater

Through consultation with Thames Water Limited who have advised that some off-site reinforcement work will be required to their existing drainage network.

13.3.8 Potable water

Thames Water is to be approached with regard to the new water demand requirements. This is likely to trigger an assessment / study of their existing water infrastructure network before they can advise on the necessary infrastructure enhancements to be able to supply the development.

13.3.9 Water environment features – assessment of importance

The water environment features identified to date are assessed in terms of their quality and importance in Table 13.6

Table 13.6 – Water Feature importance

Feature	Quality	Importance
Ellenbrook and associated tributary	The watercourses dilute and remove pollutants at a local scale. Ellen Brook is of moderate ecological quality and good chemical quality The watercourses are located in the study area. There are no known species that are important on a district, regional or national a scale supported by the watercourses The water quality is considered to be important on a local scale. It is not considered that water quality in the study area would impact on the River Tove.	Low
Ground water	The site is located in a Source Protection Zone.	High
Waste water	The site will require a connection into the local public sewer network to deal with foul water that is generated. There are known capacity issues with the downstream public sewer network.	High
Potable water	The existing potable water networks in the immediate vicinity of the site is known to have limited capacity.	High

13.4 ASSESSMENT OF EFFECTS

13.4.1 Construction Effects

Water resource impacts are considered in terms of impacts on water quality. The potential impacts, without mitigation, on water quality during the construction phase will arise from normal construction activity and the particular hazards of construction on an exposed site surrounded by a receptor (i.e. the Ellenbrook Brook).

These impacts potentially include storage and management of fuels and oils (and the associated potential for spillage and leaks), use of cement-based products and the potential release of sediment from stockpiles and washing of vehicles and plant. Additional hazards arising from construction activities will include accidental release of floatable material, plastic and plastic film for instance, and loss of material during storm events from surface water runoff. The watercourse receptors and groundwater have been classified as having low importance. Without mitigation measures, it is considered that this could result in medium adverse changes to the characteristics of the watercourses and groundwater and therefore the effect significance has been assessed as slight and not significant.

The development is considered to have a low flood risk at present and is classified by the Environment Agency as Zone 1/2/3. Without mitigation the increase in surface water runoff could pose flood risk to the visitors to the site, and affect flood risk to the surrounding area during construction. The receptor is classified as low importance and has a low probability of flooding. Without mitigation measures, it is considered that this could result in a medium adverse magnitude of change and therefore the effect has been assessed as slight and not significant.

During construction the potential impact on the local wastewater network is considered to be negligible/slight. Welfare facilities for construction personnel is likely to be tankered from site keeping connections to existing infrastructure to a minimum.

During construction the potential impact on the local potable water network is considered to be negligible/slight. Water usage by construction personnel will be on a low scale/demand and any water required for the construction process is likely to be tankered to site keeping connections to existing infrastructure to a minimum.

13.4.2 Operational Phase Effects

13.4.2.1 Surface Water Drainage Strategy

Within the FRA it can be seen that the proposed drainage strategy provides betterment as discharge rates are lower than the existing rates in terms of volume and peak flow. The allowance for climate change in the model input therefore means that a significant betterment can be provided. For further information and plans detailing the proposed drainage strategy refer to the FRA contained within Appendix 13.1.

The aim of the proposed surface water drainage strategy is to control the post development runoff so that the volume and peak flow rates are no greater than the pre-development rates. In order to achieve this, a drainage layout incorporating SUDS principles is proposed. SUDS features are arranged in series to form a ‘treatment train’. The ‘treatment train’ philosophy uses proposed features to systematically control runoff pollution, flow rates and volumes. This is achieved in three steps: Source Control, Conveyance Control and Discharge Control.

Table 13.7 below identifies the typical approach to recommended SUDS controls to each proposed catchment.

Table 13.7 – SUDS Approach

Source Runoff	Potential Control Methods	Conveyance Controls	Discharge Controls
Buildings	Permeable Paving	Swales Intermediate Ponds	Attenuation pond prior to discharge
Car Parks	Trapped Gullies Permeable Paving	Swales Intermediate Ponds	Attenuation pond prior to discharge
Roads	Trapped Gullies	Swales Intermediate Ponds	Attenuation pond prior to discharge

Post-construction and when the site becomes occupied, a number of activities could potentially lead to adverse effects on surface water and groundwater quality. Substances that may result in reduced water quality and therefore adverse effects on controlled waters include fuels and oils; chemicals and other substances and herbicides or pesticides resulting from field and landscaped area maintenance and light industrial processes. It is considered that this could result in medium adverse impact however the SUDS approach proposed would mitigate this and therefore the degree of effect is considered negligible and not significant.

13.4.2.2 Potable water

It is envisaged that a new supply network with offsite enhancement measures will be provided at the appropriate stage without detriment to the existing networks. With mitigation measures/network enhancements, it is considered that the degree of effect is negligible and not significant.

13.4.3 Cumulative Effects

The cumulative assessment in relation to water resources, flood risk and drainage assumes that any effects assessed to be negligible are in fact near zero and cannot contribute to wider cumulative impacts. As such they are scoped out of the cumulative impact assessment.

Impacts assessed to be minor or greater could however contribute to wider cumulative impact and these are then carried forward to more detailed assessment to determine whether they could potential impact the same receptors as other scheme locally and whether the nature and timing of those impacts could result in a significant overall effect.

Prior to the consideration of other developments locally this Chapter has concluded that the only non-negligible impacts to the water environment that could be realised as a result of the development and operation of the development are:

- pollution of shallow groundwater in the Made Ground at the site and polluted discharges to Ellenbrook and downstream sewers during the construction phase (minor); and
- migration of pollution at or near the surface to aquifers at depth beneath the site via pathways created during groundworks.

With reference to the mitigation that will be implemented, in line with the details in Section 13.5, these impacts will all be reduced to negligible. Given this, these potential effects are also scoped out of this cumulative impact assessment. It is therefore concluded that there is no potential for significant cumulative impacts on water resources, flood risk and drainage to arise as a result of the proposals even when considered alongside other development proposals locally.

Table 13.8: Summary of Unmitigated Potential Effects

Potential Impacts	Receptor	Spatial and Temporal Impact	Magnitude of Impact	Sensitivity of Receptor	Significance of Potential Effect	Mitigation Required?
Construction phase						
Spillage from pollutants, oils, fuels entering Made Ground	Groundwater within Made Ground	Local, Short Term (Adverse)	Moderate	Low	Minor	No
Cementous material entering Made Ground	Groundwater within Made Ground	Local, Long Term	Moderate	Low	Minor	No
Spillage from pollutants, oils, fuels entering Lambeth Group	Groundwater in Lambeth Group and Thanet Formation	Local, Short Term	Moderate	Medium	Moderate	Yes
Spillage from pollutants, oils, fuels entering the Chalk Group*	Groundwater in Chalk Group	Regional, Short Term	Moderate	High	Moderate	Yes
Historic Contamination in Made Ground entering the	Groundwater in Lambeth Group and Thanet Formation	Local, Short Term	Moderate	Medium	Moderate	Yes
Historic Contamination in Made Ground entering the Chalk Group*	Groundwater in Chalk Group	Regional, Short Term	Moderate	High	Moderate	Yes
Cementous material entering Lambeth	Groundwater in Lambeth Group and Thanet Formation	Local, Short Term	Moderate	Medium	Moderate	Yes
Cementous material entering the Chalk Group*	Groundwater in Chalk Group	Local, Short Term	Moderate	High	Moderate	Yes
Spillage from pollutants oils and fuels entering surface water runoff	Sewer	Local Short Term	Moderate	Low	Minor	Yes
Increase in sediment loading of surface water runoff entering sewers	Sewer	Local Short Term	Moderate	Low	Minor	Yes
Increase in historic contamination from Made Ground in surface water	Sewer	Local, Short Term	Negligible	Low	Negligible	No
Changes in flood risk due to changes in impermeable cover	Sewer and Adjacent Properties	Local, Short Term	Negligible	High	Negligible	No
Changes in foul and wastewater drainage	Sewer	Local, Short Term	Negligible	Low	Negligible	No

Operational Phase						
Historic Contamination in Made Ground entering the Lambeth Group and Thanet Formations*	Groundwater in Lambeth Group and Thanet Formation	Local, Short Term	Minor	Medium	Minor	Yes
Historic Contamination in Made Ground entering the Chalk Group*	Groundwater in Chalk Group	Regional, Short Term	Minor	High	Minor	Yes
Accretion and mobilisation of sediment from hardstanding areas into surface water runoff	Sewer	Local, Short Term	Negligible	Low	Negligible	No
Fuels and lubrication from the vehicles moving around or parked at the employment and residential areas of the operational site enter surface water runoff	Sewer	Local, Short Term	Negligible	Low	Negligible	No
Release of large quantises of contaminated surface water in	Sewer	Local Short Term	Minor	Low	Negligible	No
Increases in discharge to sewer from the site (surface and foul	Sewer and Adjacent Properties	Local, Long Term	Negligible	High	Negligible	No

13.5 MITIGATION

This section assesses the mitigation of adverse effects and the effectiveness of the proposed measures.

13.5.1 Flood Risk

Mitigation for these potential impacts will be provided by a surface water strategy plan incorporating SUDS, which is considered in more detail in the FRA. With mitigation the impacts on the identified receptor is negligible and therefore the impact significance has been assessed as negligible. It is considered that with mitigation measures the impact will remain negligible over the lifetime of the development.

13.5.2 Water Resources Construction

Mitigation for these potential impacts will be provided in the method statement will detail how these potential environmental risks will be managed. It is essential that this method statement covers all the potential impacts that could arise at this site and that no discharge of polluting material or release of sediment occurs during construction.

A method statement for the construction of the development is not yet available but should take into consideration the following key issues:

- Appropriate storage of potentially polluting materials and chemicals in accordance with the Control of Pollution (Oil Storage) Regulations.
- Creation and release of contaminated silts and sediment release into the surrounding watercourses and surface water ponds – use of measures such as cut off ditches, silt fences or impermeable membranes to prevent this
- Control of any refuelling facilities, chemical and waste storage and handling areas
- Adequate supervision of all deliveries and refuelling involving potentially polluting substances
- Delivery and refuelling areas to be located away from surface water bodies, with adequate measures in place to contain spillages at these locations
- Leaks or spillages of potentially polluting substances to be contained, collected then removed from site in an appropriate manner, e.g. use of absorbent material, bunding or booms. An emergency action plan will be formulated, which all site personnel will have read and understood
- Storage of machinery and equipment away from surface water bodies. Drip trays to be placed underneath any parts where oil / fuel may be found
- Regular servicing and inspection of vehicles used on site
- Restriction of vehicle movements within close proximity of the surface waterbodies
- Management of any dewatering required for construction of foundations
- Secure access to the site for construction personnel only, to prevent vandalism

With mitigation the impacts on the identified receptor is negligible and therefore the degree of effect significance has been assessed as negligible over the long term lifetime of the development.

13.5.3 Water Resources Post-Construction

Mitigation for the potential operational impacts will be provided by implementing a surface water drainage scheme which utilises SUDS principles. SUDS features will restrict discharge rates and runoff volumes, as well as improve water quality, providing biodiversity opportunities and amenity value.

It is also proposed that through the measures described in the drainage strategy betterment is achieved on the existing surface water runoff rates. Therefore, with mitigation the impact on the identified receptor is beneficial and therefore the degree of effect has been assessed as negligible over the long term lifetime of the development.

13.6 Residual Effects

With mitigation the new development site will be maintained at a low flood risk, providing a small beneficial change and a negligible environmental impact. The residual effects are insignificant.

The construction impact will be managed through a Construction Environmental Management Plan with method statements which will include a detailed monitoring programme, and will therefore be minimal. With this mitigation in place the magnitude of any water quality impacts will be negligible and the overall impact negligible.

The drainage system will provide treatment for the hard-standing area, which will remove solids and oil pollution. With this mitigation in place the magnitude of any post-construction water quality impacts will be negligible and the overall impact negligible.

13.7 CONCLUSIONS

It has been found through this assessment that, with the mitigation measures described above and within the FRA and drainage strategy, effect on the water environment would be negligible from this development proposal in terms of the risk and water resources. This has been assessed both during and post-construction.