Chapter 8: Drainage and Flood Risk

Land off Duke's Park, Woodbridge

ENVIRONMENTAL STATEMENT

November 2015

8.1 INTRODUCTION

8.1.1 This chapter assess the existing and proposed drainage associated with the development at Land off Duke's Park, Woodbridge.

8.1.2 The aim of the flood risk and drainage chapter is to define the surrounding hydrological and pre-development surface water drainage regime and to assess the site-specific solution for the control of surface water generated by the proposed development. The future flood risk and mitigation are also considered. The surface water discharge from the site ultimately outfalls into the Deben Estuary, which is an area of outstanding ecological importance resulting in International, European and National designations (Ramsar, SPA, SSSI and part of the Suffolk area of outstanding natural beauty – AONB). Therefore, pollution and flow control proposals are considered in detail.

8.1.3 Initial impacts would arise from the site preparation and construction work, although these effects would be temporary. Permanent changes to the drainage infrastructure and primarily to the surface water regime would arise from the operation of the development.

8.2 ASSESSMENT METHODOLOGY

Planning Context and Guidance Documentation

8.2.1 Relevant policy and guidance has been considered in this assessment of drainage at the site. The range of guidance documents used are:

- National Planning Policy Framework – Flood Risk Guidance 2012 (this document has superseded Planning Policy Statement 25 (PPS 25);
- Suffolk Coastal District Council and Waveney District Council Strategic Flood Risk Assessment;
- Deben Estuary Partnership (DEP);
- The Deben Estuary Plan;
- East Suffolk Catchment Flood Management Plan;
- Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems produced by the Department for Environment, Food and Rural Affairs;
- Ciria Guidance Note C697;
- Pollution Prevention Guidelines 3;
- Sewers for Adoption (7th Edition); and
- Part H – Building Regulations.

Consultation and Preliminary Investigations

8.2.2 The appropriate Statutory Consultees and private bodies holding influence and control over drainage issues have been identified and approached throughout the scheme development. Their considered responses have been collated and their requirements adopted within the resulting reports.

8.2.3 Sewer records have been obtained from Anglian Water (AW), and the existing surface water networks have been reviewed.

8.2.4 Consultation has also been undertaken with the Environment Agency (EA) and the Lead Local Flood Authority (Suffolk Coastal District Council) to ascertain the current condition regarding the unnamed watercourse that flows through the site and the existing surface water runoff from the pre-developed site.

8.2.5 A review of the Hydrock Phase 1 Desk Study has been completed with specific focus on the geotechnical and hydro-geological data. The results of permeability testing on the site have also been considered.

8.2.6 Topographical data has been used to determine the landform of the existing site. This has been used to determine the most appropriate strategy for surface water discharge from the site.

8.2.7 Historical maps have been consulted to identify any previous water feature known to be located in and around the site, and their direction of flows.

Assessment Criteria

8.2.8 The sensitivity of the water environment is determined by the assessment of the baseline environment on and around the site. The following Table 8.1 sets out this consideration.

Table 8.1: Site Sensitivity

Sensitivity	**Surface Water**
High	Surface watercourses with high sensitivity and quality. Watercourses with national or international designation.
Medium	Surface watercourses with very good surface water quality, utilised for abstraction purposes or supporting high biodiversity. Watercourse with high amenity value.
Low	Surface watercourses with good water quality possibly utilised for abstraction.
Negligible	Local Land Drain and culverts.

8.2.9 The assessment of the scale and magnitude of the potential impacts considers the baseline conditions with the extent of a change as a result of the proposed development. The consideration of magnitude is set out in the following Table 8.2.

Table 8.2: Magnitude of Impact

Magnitude of Impact	Surface Water
Large	Substantial increase in discharge rates in excess of the watercourse capacity, major changes to the water course hydrology, form, characteristics or chemistry. Significant risk of hydrocarbons and chemicals discharging to watercourse.
Medium	Results in a medium level of change in character such as an increase in discharge rate but within the channel capacity, major changes to the water course hydrology, form, characteristics or chemistry. Reduction in water quality on or off site within a Class A or B designated system to levels above the relevant guidance.
Small	Results in minor impact on character. Slight to moderate increase in discharge rate. Slight changes to the watercourse hydrology, form characteristics or chemistry. Includes all short-term effects. Minor risk of hydrocarbons and chemicals discharging to watercourse.
Negligible	No change in the discharge rate, hydrology, characteristics or watercourse form. Discharge to local surface water/land drains but no significant loss in quality.

Significance

8.2.10 The significance of effects identified is assessed by considering the sensitivity of the receptor along with the predicted magnitude of effect. This is shown in the following Table 8.3.

Table 8.3: Sensitivity of Receptor

Table of Assessment of Significance Sensitivity of Receptor	Magnitude of Impact			
	Large	**Medium**	**Small**	**Negligible**
High	Highly Significant	Significant	Moderately Significant	Slightly Significant
Medium	Significant	Significant	Moderately Significant	Slightly Significant
Low	Moderately Significant	Moderately Significant	Slightly Significant	Slightly Significant
Negligible	Slightly Significant	Slightly Significant	Slightly Significant	Not Significant

8.3 BASELINE CONDITIONS

Site Topography and Ground Conditions

8.3.1 A site specific topographical survey indicates that the site slopes towards the south east. The site elevation is approximately 30.0m AOD in the north of the site and 8.0m AOD in the south east of the site. The north of the site has a steeper topography.

8.3.2 The site is underlain by the Kesgrave Catchment Subgroup which is comprised of fluvial gravels. This is underlain by the Crag Formation which is comprised of shelly sands. The Thames Group is also present which is comprised of silty clay/mudstone. The clays and sands of the Woolwich and Reading Beds Formation are also present, as is Upper Chalk.

Surface Water (Hydrology)

8.3.3 The site has an unnamed watercourse that issues from the east of the site and runs south. The River Fynn flows from 500m west of the site to Martlesham Creek, approximately 500m south east of the site. This creek forms the confluence of the River Fynn and River Deben which ultimately flow into the North Sea approximately 12km south of the site.

8.3.4 The Environment Agency flood maps indicate that the site is located in Flood Zone 1 and at low risk of fluvial flooding.

8.3.5 The overland flow would naturally route towards the nearest watercourse, with the exact route taken being defined by the local topography. The site slopes towards the southeast and the unnamed watercourse; it is likely that any surface water will flow into this watercourse which ultimately flows into the Deben Estuary.

8.3.6 The Environment Agency surface water floodplain map indicates that the site is predominantly at very low risk of surface water flooding. However, there is an area at medium/high risk of surface water flooding associated with the unnamed watercourse. A 5m easement either side of this will ensure the risk of surface water flooding to the developable area is low.

8.3.7 Although the EA information suggests that the site is at low risk of groundwater flooding, shallow groundwater was encountered during the infiltration tests. Provided foundations can be constructed at times when groundwater is suitably low (or can be controlled through dewatering) and designed such that the damp proof membrane level is raised sufficiently above expected peak groundwater levels, then the risk from this source is considered to be low.

8.3.8 Flooding from other sources including tidal, sewers and artificial sources have been considered with the Flood Risk Assessment but are not deemed to be a potential flood risk.

Surface Water Drainage

8.3.9 The site current slopes towards the existing onsite unnamed watercourse. Therefore any surface water runoff from the site currently flows towards this unnamed watercourse. This conveys water into Martlesham Creek, which then flows into the River Deben and ultimately the Deben Estuary. The results of the infiltration testing indicate that there is a shallow groundwater table within the sands that underlie the site, therefore only a limited amount of runoff infiltrates at present.

8.4 PREDICTED CONSTRUCTION EFFECTS

8.4.1 Construction activities are likely to comprise the large scale disturbance of soil, including topsoil and subsoil stripping, stockpiling of stripped material, heavy plant and vehicular movements, dewatering and foundation, superstructure and infrastructure construction.

8.4.2 Such construction activities could result in increased surface water release and runoff as a result of the removal of surface vegetation and topsoil, and an increase in hard standing areas for the site compound and temporary car parking. The scouring effects of water would pick up soil particles and transport them in suspension. If this was allowed to drain directly into the unnamed watercourse, and no mitigation measures were included, it would eventually reach the Deben Estuary and would have the potential to cause siltation and thus having a moderately significant adverse effect on water quality.

8.4.3 Organic enrichment can reduce the availability of food for birds by increasing growth of algal mats on the intertidal areas. It can also cause a reduction in water clarity, thereby reducing the visibility of prey items. Therefore, the bird species are moderately sensitive to changes in nutrient levels.

8.4.4 Leakage and spillage of oils etc. from construction plant, although unlikely, could occur and cause local contamination of ground, groundwater and surface water. In addition, construction fuel tanks could leak or accidentally discharge, potentially causing significant environmental impacts to watercourses, local wildlife and habitats.

8.4.5 Other pollution sources could be associated with the construction compound where inappropriate handling and storage of construction materials such as solvents, curing agents, paints, cement and chemicals could result in release of such substances into the unnamed watercourse and ultimately the Deben Estuary. This could cause significant harm to existing wildlife, that are classified as internally important populations of regularly occurring Annex 1 species and internationally important populations of regularly occurring migratory species. However, this is prior to mitigation measures being implemented.

8.5 PREDICTED OPERATIONAL EFFECTS

Surface Water Runoff

8.5.1 Development of the application site will lead to a change in the current land surface characteristics by creating large areas of impervious and semi-pervious surfaces. The main effect will be to increase surface water runoff, while reducing infiltration of water to groundwater and lateral flow. This could have the potential to lower groundwater levels and affect surface water features within hydraulic continuity of the groundwater, thereby affecting water levels in the unnamed watercourse. This is considered to have a significant adverse impact. However, this is prior to mitigation measures being implemented.

8.5.2 An increase in impervious surfaces will increase the volume and peak flows discharging into the watercourses and thus increase the risk of flooding downstream. This could cause erosion and damage to the natural intertidal mudflat communities and saltmarsh communities that make up the Deben Estuary. This is considered to have a significant adverse impact. However, this is prior to mitigation measures being implemented.

8.5.3 The increase in impervious areas will increase the volume of pollutants discharged into the watercourses. Surface contamination resulting from spillages and leakage of fuels from vehicles could be mobilised by surface water drainage and, if not adequately managed, enter and

contaminate the surface water system. The bird populations that inhabit the Deben Estuary require a functional estuary which is capable of supporting intertidal habitat for feeding and roosting. One of the most important factors related to this is the water quality necessary to maintain intertidal plant and animal communities. Therefore this is considered to have a significant adverse impact. However, this is prior to mitigation measures being implemented.

8.6 MITIGATION PROPOSALS

General Construction Activities

8.6.1 Measures will be taken during construction to ensure that silt ridden surface water runoff does not directly enter the onsite watercourse, where it can be conveyed to the Deben Estuary. Good construction site management will ensure that surface water is collected by temporary site drainage leading to silt trips before being discharged to the unnamed watercourse. Soil quality will be maximised and erosion minimised by managed soil stripping tied into the construction programme.

8.6.2 Saturated soil requiring drying prior to disposal or reuse on site will be temporarily stockpiled in allocated drained areas. Bunding and a filter drain system with a series of catchpits will prevent erosion and contamination to the local watercourses.

8.6.3 Site management method statements will incorporate emergency procedures for dealing with accidental leakage and spillage. Site management will include the storage of fuel for construction plan on bunded, impervious surfaces. Washing down of vehicles and storage of surplus, potentially contaminated water and construction materials will take place in designated areas.

8.6.4 The contractor has a statutory duty and contractual obligation to ensure that the construction works do not cause or permit pollution. As such, the following regulations will apply to this site:

- Water Resources Act 1991;
- The Salmon and Freshwater Act 1975;
- Land Drainage Act 1991; and
- Pollution Prevention Guidelines 3 (PPG 3).

8.6.5 Under section 85 of the Water Resources Act 1991, it is an offence to discharge poisonous, noxious or polluting material into any controlled waters, which include any watercourse or underground aquifers.

8.6.6 The above construction mitigation measures will be implemented through a Construction Environmental Management Plan (CEMP), the provision of which can be controlled through condition on a planning permission. Therefore the impact of construction activities is considered to be not significant.

Operational Activities

8.6.7 It is proposed to manage the surface water on site in a sustainable manner, with the general principal to ensure that the surface water discharge rate is equal to the runoff prior to development. This is in line with the new NPPF standard guidance to reduce the flood risk on the site itself and elsewhere, taking climate change into account.

8.6.8 Due to the increase in impermeable areas from the pre-development situation, the SuDS management train approach will be incorporated. Prevention measures will be the initial means

of retaining the runoff. Infiltration is not a potential option for the site, however swales may still be included in the final design to slow the rate of runoff to the downstream network. The main form of attenuation will then take the form of detention basins that connect directly into the unnamed watercourse on the site. These basins will account for the additional surface water runoff generated by the site and prevent water levels rising in the watercourse network for the extreme events. Some removal of pollutants would also occur in a detention basin by filtration through vegetated soils.

8.6.9 Surface water runoff from the roof and external areas will be directed to the below ground gravity network. This water is considered to be generally clean and with limited contamination, and may be discharged directly to the new drainage infrastructure and SuDS Facilities. Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps or by the use of Sustainable Drainage techniques.

8.6.10 Runoff will then enter the onsite detention basins and outfall to the unnamed watercourse restricted to greenfield runoff rates as agreed with the Environment Agency.

8.6.11 The proposed drainage layout will be designed in accordance with Sewers for Adoption 7th Edition (SfA). SuDS Guidance will be taken from Ciria C697.

8.6.12 Although natural lateral flow via the groundwater table would be reduced by the introduction of impermeable and semi-permeable surface coverings, maximising the areas of the Sustainable Urban Drainage System (SUDS) attenuation devices around the site will compensate for this. As the surface water discharge to the surrounding watercourses is not going to be increased, there will be little effect on the associated habitats in close proximity as a result of the rate of surface water discharge.

8.6.13 To contend with the large storage volumes required within the development; EA, Ciria and British Standards guidance advises that a SUDS be incorporated into the site, to not only act as attenuation but also, where possible, to retain the first 10mm of rainfall, which contain the highest quantity of pollutants.

8.6.14 The result on the drainage network as a result of these mitigation measures is considered to be not significant.

8.7 RESIDUAL IMPACTS

Construction

8.7.1 Impacts during the construction stage will be addressed through incorporating the mitigation features identified in section 8.6. No significant impacts are predicted.

Operational

8.7.2 A gravity drainage network will serve the development and the design will ensure self-cleaning. Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps or by the use of Sustainable Drainage techniques. Silt levels will require monitoring to ensure continuous efficient operation. There remains a slightly significant residual impact.

8.7.3 The surface water runoff to the unnamed watercourse and ultimately the Deben Estuary will be kept the same as pre-development and thus will not increase flood risk to adjoining land. The SuDS proposed within the development itself will accommodate all increased runoff created by

the increase in impervious paving and roofs, with hydrobrakes restricting the outflow into the existing unnamed watercourse.

8.7.4 All new drainage infrastructure will require regular maintenance in line with an approved maintenance strategy. This is to prevent blockages and build-up of silts that could cause damage to the downstream Deben Estuary.

8.8 CUMULATIVE EFFECTS

8.8.1 There are six proposed development sites in close proximity to the proposed development, namely Land North of Woods Lane, Woodbridge Football Club, Land to Rear of Cedar House, Land South of Main Road Martlesham, Adastral Park and East Anglian Offshore Wind One Underground Cabling. Any surface water discharge from these developments will outfall into the River Deben and ultimately the Deben Estuary. The predicted construction and operational effects for these developments are the same as for the proposed development. Therefore, provided the same mitigation measures detailed above are applied to the other developments the results are considered to be not significant.

8.9 SUMMARY

8.9.1 The surface water drainage infrastructure has been assessed to determine a site-specific post-development solution. Current site information and data, consultation with regulatory bodies and a review of national guidance have enabled a detailed assessment to be prepared.

8.9.2 Baseline conditions have found that the existing greenfield site discharges into the existing onsite watercourse, which flows into Martlesham Creek, then the River Deben and ultimately the Deben Estuary.

8.9.3 The Environment Agency indicative floodplain maps have identified the site as located in Flood Zone 1 (low risk probability). The site is also at low risk of flooding from tidal, sewers and artificial sources. There is an area shown as being at medium/high risk of surface water flooding associated with the onsite watercourse, a 5m easement either side of this watercourse will ensure that the risk to the developable area is low. Although the EA information suggests that the site is at low risk of groundwater flooding, shallow groundwater was encountered during the infiltration tests. Provided foundations can be constructed at times when groundwater is suitable low (or can be controlled through dewatering) and designed such that the damp proof membrane level is raised sufficiently above expected peak groundwater levels, then the risk from this source is considered to be low. To meet the requirements of *NPPF* a full flood risk assessment has been prepared.

8.9.4 Impacts from the construction and operational activities relate primarily to the increased surface water runoff from the proposed development, due to the larger impervious areas created by the houses, driveways and internal roads. This will also increase the volume of possible pollutants entering the drainage network and scouring the surface of the local watercourse network, including the Deben Estuary. The worst case scenario is an escalated risk of flooding and pollution to the downstream catchment. However, detailed assessment has found that by including onsite Sustainable Drainage Systems (SuDS), including detention basins, as well as trapped gullies and channels with silt traps, will assist in retaining the runoff of pollutants from the site. As a result the residual impact is reduced from "significant" to "slightly significant".