9.0 Flood Risk and Drainage

9.1 Introduction

9.1.1 This chapter presents the approach and findings of the assessment of the hydrology and flooding effects of the Proposed Development. The chapter sets out the methodology followed in undertaking the assessment, and provides a review of the baseline features and resources of the proposed development site and surrounding area. The chapter presents the results of the assessment of the impacts of the Proposed Development on the baseline features and resources in order to determine the magnitude of impact and significance of effects. Mitigation measures are proposed to minimise the impacts of the proposed development during both the construction and operational phases of the scheme. The expected residual effects of the proposals are then stated.

9.1.2 This chapter has been prepared by Mr Christopher Yalden BSc IEng MICE, flood risk and drainage engineer at Awcock Ward Partnership Ltd.

9.2 Methodology and Scope

Policy Background

9.2.1 Tables 9.1 and 9.2, below, set out the relevant planning legislation and policy guidance in relation to this assessment chapter.

Table 9.1 Legislative Framework and National Policy Guidance

Name of Document	Policy No.	Summary
Water Resources Act 1991	N/A	This Act sets out the regulatory controls and restrictions that provide protection to the water environment through controls on abstraction, impounding and discharges as well as identifying water quality and drought provisions
Water Industry Act 1991	N/A	This Act consolidates enactments relating to the supply of water and the provision of sewerage services
Land Drainage Act 1991	N/A	This Act consolidates enactments relating to internal drainage boards and the functions of these boards and of local authorities in relation to land drainage. Internal Drainage Boards (IDB) exercise a general supervision over all matters relating to the drainage of land within their district and they have powers to perform duties imposed on them within the Act
Land Drainage Act 1994	N/A	This Act adds new environmental duties to the Land Drainage Act 1991. It places a duty on the IDB and local authorities to further the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest; and to take into account any effect which the proposals would have on the beauty or amenity of any rural or urban area or on any such flora, fauna or features
Environment Act 1995	N/A	This Act established basic terms of reference for the Environment Agency (EA). The principal aim of the EA is to protect or enhance the environment. The EA also exercises a general supervision over all matters relating to flood defence. The Act provides the EA with a duty to take action as it considers necessary to conserve, redistribute or otherwise augment water resources in England and Wales and to secure the proper use of water resources in England and Wales
Water Act 2003	N/A	This Act amends the Water Resources Act 1991 and the Water Industry Act 1991 to formalise the Government's commitment to the sustainable management and use of water resources
The Water Environment (Water Framework Directive) (England & Wales) Regulations, 2003	N/A	These regulations establish a framework for protecting the water environment, with the aim of achieving chemical and ecological water quality targets by 2015
Building Regulations (Part G), March 2010	N/A	Changes have been made to these regulations to include targets for reducing water consumption
Flood and Water Management Act April 2010	N/A	An act to make provision about water, including provision about the management of risks in connection with flooding and coastal erosion.

Name of Document	Policy No.	Summary
National Planning Policy Framework (NPPF)	Section 10, Point 99	Local Plans should take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape
National Planning Policy Framework (NPPF)	Section 10, Point 100	Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. It also states that Local plans should be supported by Strategic Flood Risk Assessments and policies developed to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies. Local plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change
National Planning Policy Framework (NPPF)	Section 11, Point 109	The planning system should contribute to and enhance the natural and local environment by: – Preventing both new and existing development from contributing to or being put at an unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or instability; and – Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.
National Planning Policy Framework (NPPF)	Section 11, Point 120	To prevent unacceptable risks from pollution planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination, responsibility for securing a safe development rests with the developer and/or landowner.

Table 9.2 Additional Policy and other relevant guidance

Name of Document	Policy No.	Summary
Environment Agency Pollution Prevention Guidelines (PPG)	PPG1 (pre 2007)	'General Guide to the Prevention of Pollution'
Environment Agency Pollution Prevention Guidelines (PPG)	PPG5 (October 2007)	'Works or Maintenance in or Near Water'
Environment Agency Pollution Prevention Guidelines (PPG)	PPG6 (pre 2007)	'Working at Construction and Demolition Sites'
Environment Agency Pollution Prevention Guidelines (PPG)	PPG21 (March 2009)	'Incident Response Planning'
CIRIA 753, 2015: The SuDS Manual	N/A	This document provides best practice guidance on the planning, design, construction, operation and maintenance of Sustainable Drainage Systems (SUDS) to facilitate their effective implementation within developments
EA, 2009. Flood Risk Standing Advice for England	N/A	This advice reflects the policy contained in PPS25 and provides standard information on whether a development is suitable with regards to flood risk
CIRIA, 2001. Guidance C532	N/A	Control of Pollution from Construction Sites

Scoping Assessment Stage

9.2.2 To scope out any site specific or catchment specific flood risk or drainage requirements we have engaged with various parties.

9.2.3 We have liaised with Michael Holm, the Environment Agency's (EA) Sustainable Places Officer and Gary Cleaver, Dorset County Council's (DCC) Flood Risk and Coastal Engineer, to identify any site specific or catchment specific constraints which might influence the proposed drainage strategy and management of surface water runoff. This includes obtaining the latest available flood data from the EA to ensure the development proposals do not conflict with areas at risk of flooding.

9.2.4 We have also consulted with Julie Hawkins, Gillingham Town Council's Planning Committee Clerk (and Community Flood Warden) over existing flooding issues in the study area and further downstream in the River Lodden and Stour catchment. There are clearly a number of pinch points which suffer from localised flooding, but the mitigation measures and surface water runoff attenuation proposals being promoted by this development will ensure that the observed historic flooding will not be exacerbated as a result of the proposed development and where possible, will be reduced.

Assessment Methodology

9.2.5 The scope of this assessment includes the following:

- Identification of any local policies regarding flooding, hydrology and drainage;
- Review of available baseline information on existing surface and groundwater quality and the availability of water resources;
- Summary of the key findings of the supporting documents (i.e. Flood Risk Assessment and Drainage Strategy, prepared to support the outline Planning Application);
- Identification of the main impacts on the proposed scheme during the construction and operation phases, to include:

Construction Phase

- Potential risk of contamination of surface and groundwater; and,
- Effect of Increased Surface Water Run-off.

Operation Phase

- Potential contamination of ground and surface water;
- Increased Surface Water Runoff;
- Reduced Groundwater Recharge;
- Increased Water Usage Demand; and
- Increased Foul Drainage.

- Where necessary, recommend appropriate mitigation measures to minimise potential impact on hydrology and drainage.

Receptor Sensitivity

9.2.6 The criteria for assessing receptor sensitivity has been outlined within Table 9.3.

Table 9.3 Criteria for Assessing Receptor Sensitivity

Sensitivity	Criteria	Example Criteria
Very High	Attribute has a high quality and rarity on a regional or national scale	Water Framework Directive (WFD) Class 'High'. Site protected/designated under EC or UK habitat legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI), Drinking Water Protection Zone (DWPZ), Ramsar site, and Freshwater Fishery/Shellfish Water) Flood Zone 3b (Functional Floodplain) area at risk from a flood event less than or equal to the 1 in 20 year event EC Bathing Waters Directive Beach class – 'Higher' classification.
High	Attribute has a high quality and rarity on a local scale	Water Framework Directive (WFD) Class 'Good'. Main river >10m wide. Major Cyprinid Fishery (commercial). Watercourse that supports species protected under EC or UK habitat legislation but is not a designated site. Flood Zone 3a (High probability) area at high risk from a river flood event less than or equal to the 1 in 100 year event. EC Bathing Waters Directive Beach class – 'Minimum' classification.
Medium	Attribute has a medium quality and rarity on local scale	Water Framework Directive (WFD) Class 'Moderate'. Minor Cyprinid Fishery (commercial). Main river <10m wide. Ordinary watercourse >5m wide. Flood Zone 2 (Medium probability) area at medium risk from a river flood event between the 1 in 100 and 1 in 1000 year. event. Counties that have imposed "in drought" conditions in the past 10 years namely; Lincolnshire, Cambridgeshire, Hampshire, West Sussex, East Sussex, Kent, London, Surrey, Berkshire, Hertfordshire, Buckinghamshire, Oxfordshire, Bedfordshire, Northamptonshire, West Norfolk, East Gloucestershire and Yorkshire.
Low	Attribute has a low quality and rarity on local scale.	WFD Class 'Poor'. No fishery of any type. Unclassified field drain which is therefore likely to be <5m wide. Flood Zone 1 (Low probability) area at low risk from a river or sea flood event greater than the 1 in 100 year. EC Bathing Waters Directive Beach class– Fail. Counties that have not imposed "in drought" conditions in the past 10 years.

Assessing the Magnitude of change on Flood Risk and Drainage, Surface Water Quality and Water Demand

9.2.7 The magnitude of change is judged on the consequences of the impact. The criteria for assessing magnitude of change is broadly summarised by Table 9.4.

Table 9.4 Criteria for Assessing Magnitude of Change

Impact magnitude	Example Criteria
Substantial negative	A pollution incident or release during construction or operation of a development likely to result in a major pollution incident. Substantial change (reduction) in the water body's existing failing physico chemical elements and the addition of new failing chemical elements resulting in a substantial change in current WFD physico chemical status. Therefore substantially increased pressure in meeting target status. A substantial adverse change in hydromorphological characteristics of the water feature which would affect the water body's existing WFD ecological status. Project conflicts with the delivery of more than one RBMP mitigation measures on a WFD water body. Loss or extensive change to a fishery. Building 'vulnerable development' in Flood Zone 3b on the site. Direct loss of Flood Zone 3b on site and indirect increase in flood risk elsewhere. Exceeds minimum current Building Regulations Standards for water use (legally non compliant).
Moderate negative	A pollution incident or release during construction or operation of a development likely to result in a moderate or minor pollution incident. Moderate change (reduction) in the water body's physico chemical elements resulting in a moderate change in current WFD physico chemical status. Therefore moderately increased pressure in meeting target status. A moderate change in hydromorphological characteristics of the water feature which would affect the water body's existing WFD ecological status. Project conflicts with the delivery of one RBMP mitigation measure on a WFD water body. Partial loss in productivity of a fishery. Building 'vulnerable development' in Flood Zone 3a on the site. Direct loss of Flood Zone 3a on site and indirect increase in flood risk elsewhere. Water demand during construction on most large construction projects is expected to be moderate negative. Meets minimum current Building Regulations Standards for water use.
Slight negative	Small reduction in water quality. Reduction in the water body's chemical elements but insufficient to change the current WFD chemical status. Therefore only slight increased pressure in meeting target WFD chemical status. A slight change in the hydromorphological characteristics but insufficient to change the current WFD ecological status. Building 'vulnerable development' in Flood Zone 2 on the site. Direct loss of Flood Zone 2 on site and indirect increase in flood risk elsewhere. Meets Code for Sustainable Homes Level 3 for water use. Water demand for non-residential buildings (BREEAM standard for non-residential buildings requirement) – water efficiency measures would help to achieve a Very Good rating (assuming 1 credit achieved for a water use between 4.5 and 5.5 m^3/per person/year). Water demand during construction on most small construction projects is expected to be slight negative.
Negligible	Very low levels of pollution from discharges insufficient to significantly affect water quality. Very low risk of pollution from accidental spillages. No discernible change in the water body's chemical elements. Therefore, no discernible change to WFD chemical status of waterbody. No discernible movement towards or away from the target WFD chemical status. No discernible cause and effect between the project and RBMP mitigation measures. No discernible loss of flood zone (i.e. this would involve only land take/structures within Zone 1). Meets Code for Sustainable Homes Level 4-6 for water use or similar (note: water neutrality results in no impact). Water demand for non-residential buildings (BREEAM standard for non-residential buildings requirement) – water efficiency measures would help to achieve an Excellent rating (assuming 2 credits achieved for a water use between 1.5 and 4.4 m^3/per person/year).
Slight positive	Improvement in the water body's physico chemical elements but insufficient to change the current WFD chemical status. Therefore a slight improvement towards meeting target WFD chemical status. Direct net gain of Flood Zone 2 on site and indirect decrease in flood risk elsewhere.
Moderate positive	Moderate change (improvement) in the water body's physico chemical elements resulting in a moderate positive change in current WFD chemical status. A moderate positive change in hydromorphological characteristics of the water feature which would affect the water body's existing WFD ecological status. Therefore substantially decreased pressure in meeting WFD ecological target status as a result of the proposal (but this might not result in the water body's designation being removed from the Heavily Modified Waterbody category). Direct net gain of Flood Zone 3a on site and indirect decrease in flood risk elsewhere.
Substantial positive	Substantial change (improvement) in the water body's existing failing physico chemical elements. A substantial beneficial change in hydromorphological characteristics of the water feature which would affect the water body's existing WFD ecological status. Therefore substantially decreased pressure in meeting WFD ecological target status as a result of the proposal(s) (possibly resulting in the waterbody losing its 'Heavily Modified Waterbody' designation). Direct net gain of Flood Zone 3b on site and indirect decrease in flood risk elsewhere.

Effect Significance

9.2.8 Descriptions of the four significance categories are provided in Table 9.5.

9.2.9 The level of significance of each impact is determined by combining the impact magnitude with the sensitivity of the receptor and the effect is identified as shown within Table 9.6.

9.2.10 In terms of this assessment for flood risk and drainage impacts, a level of significance of intermediate or greater is defined as being significant.

Table 9.5 Significance Criteria Descriptions

Significance of effect descriptor	Definition
Major	These effects will represent the *critical factors in the decision-making process* (along with other topic effects in a similar category). These effects are generally associated with sites or features that are of high quality and rarity on a regional or national scale that are likely to suffer a most damaging impact and loss of resource integrity. These effects are generally associated with potential for either major impact magnitude on features of very high, high or medium importance; or moderate impact magnitude on features of very high or high importance. This is where the proposal would result in degradation of the water environment because it results in predicted significant adverse effect on at least one attribute. Major effects can potentially arise due to a number of less significant effects resulting in a larger cumulative effect. These effects are *significant effects* in the terms of the EIA Regulations 2011.
Intermediate	Due to the scale of the change predicted on features these effects can be considered to be *important and material in the decision-making process*, but are not likely to be *critical or very important* decision-making factors. These effects are generally associated with potential for major impact magnitudes on features of low importance; or moderate impact magnitude on features of high or medium importance; or minor impact magnitude on features of very high or high importance. This is generally where the proposal may result in the degradation of the water environment because it results in predicted moderate adverse effect on at least one attribute. Moderate effects can potentially arise due to a number of less significant effects resulting in a larger cumulative effect. These effects are *significant effects* in the terms of the EIA Regulations 2011.
Minor	Effects at this level are *limited importance and immaterial in the decision-making* process. Where the proposal may result in a degradation of the water environment because it results in a predicted slight effect on one or more attributes. These effects are *not significant* in the terms of the EIA Regulations 2011.
Neutral	No change in the baseline condition. This means effects are beneath levels of scientific detection or human concern/perception, or are detectable / perceived within the normal bounds of natural variation. Where the impact of the proposal is neutral, because it results in no appreciable effect, either positive or negative, on the identified attribute. Neutral effects can arise where consented discharges operate within consented parameters. These effects are *not significant* in the terms of the EIA Regulations 2011.

Table 9.6 Estimating the Significance of Potential Effects

		Magnitude of Impact			
		Substantial magnitude	Moderate magnitude	Slight magnitude	Negligible magnitude
Sensitivity of Receptor	Very High	Major	Major	Intermediate	Neutral
	High	Major	Intermediate	Intermediate	Neutral
	Medium	Major	Intermediate	Minor	Neutral
	Low	Intermediate	Minor	Neutral	Neutral

9.3 Baseline Environment

Existing Baseline

Site Review

9.3.1 The southern extension is split into two catchments on either side of Shaftesbury Road (B3081). The Park Farm site lies on the east of the road with the remaining three sites on the western side of the road. The Fern Brook is located on the northern edge of Park Farm. The River Lodden is located at the northern boundary of Ham Farm and Newhouse Farm and on the southern boundary of Lodden Lakes. Generally, the site topography of each site falls towards the respective watercourse feature.

Park Farm

9.3.2 A topographic survey has been undertaken and indicates that generally the site falls in a north-easterly direction towards the Fern Brook, located at the northern boundary of the site. The site falls from a high point located at the southern boundary of around 82.5m AOD to a low point at approximately 71.0m AOD located in the north western corner of the site.

9.3.3 The field in the south west corner of the site however falls in a westerly direction from the high point of around 82.5m to a low point of approximately 81.3m.

Ham Farm

9.3.4 A topographic survey has been undertaken and indicates that this site has a high point of approximately 82.8m AOD located in the centre of the eastern part of the site. The majority of the site falls in a westerly

direction away from this point, towards the River Lodden which lies at the northern boundary of the site at approximately 69.0m – 70.5m AOD.

Newhouse Farm

9.3.5 A full topographic survey has not been undertaken on this site, only the north eastern corner of the site has been surveyed, however a desk top study has identified that as expected the site falls in a north westerly direction towards the River Lodden.

9.3.6 A low point of the site is located along the centre of the site (north to south), the topographic survey and OS mapping outline a ditch running northwards along this low point toward the River Lodden.

Lodden Lakes

9.3.7 The Lodden Lakes site falls in a south easterly direction towards the south eastern boundary of the site and the River Lodden.

Geology and Hydrogeology

Park Farm

9.3.8 A Ground Investigation, including BRE 365 compliant soakaway testing, was undertaken by Ruddlesden Geotechnical Ltd for Park Farm in March 2010.

9.3.9 The report concluded that "the ground has particularly low permeability and is not favourable for the adoption of soakaway drainage".

Ham Farm, Newhouse Farm and Lodden Lakes

9.3.10 A Ground Investigation, including BRE 365 compliant soakaway testing, was undertaken by Ruddlesden Geotechnical Ltd for the remainder of the Southern Extension in August 2014.

9.3.11 Similarly, the report for the remainder of the southern extension concluded that "the ground has low permeability and is unsuitable for the use of soakaway drainage".

9.3.12 All of the sites within the Southern Extension have underlying ground conditions which are not conducive toward the use of soakaways.

9.3.13 The contamination risk assessment shows that there is no contamination across the majority of the site with an area of polyaromatic hydrocarbons at one location.

9.3.14 There are a series of Secondary (A) – Permeable Layer and Secondary – Undifferentiated Layer Aquifers within the Superficial Geology of the site. The bedrock deposits are unproductive with negligible significance for water supply or river base flow.

9.3.15 The Groundsure Report (see Chapter 9 Appendix 9.1) indicates that there are no groundwater abstraction licenses within 2000m of the proposed site.

9.3.16 The EA website indicates that the site is not located within a designated Source Protection Zone (SPZ).

Hydrology

9.3.17 Surface water features identified at the site have been outlined within Table 9.7 below;

Table 9.7 Summary of Surface Water Features

River Name	River Type	Direction
Motcombe Stream / Fern Brook	Primary River	On Site
-	Primary River	On Site
River Lodden	Primary River	On Site
River Lodden	Culvert	On Site
-	Secondary River	On Site

Discharge Consents

9.3.18 The relevant Groundsure report found no records of Red List Discharge consents or List 1 Dangerous Substances Inventory Sites within 500m of the site.

Landfill Sites & Pollution Incidents

9.3.19 There are no existing landfill sites within 1000m of the site.

9.3.20 Table 9.8 below outlines the Environment Agency Recorded Pollution Incidents within 500m of the site:

Table 9.8 Summary of Environment Agency Recorded Pollution Incidents

Water Impact	Year	Pollutant	Distance	Direction
Category 3 (Minor)	2003	Sewage Materials	0m	On Site
Category 3 (Minor)	2003	Biodegradable Materials & Wastes	24m	W
Category 3 (Minor)	2003	Sewage Materials	75m	W
Category 2 (Significant)	2004	Agricultural Materials & Wastes	102m	W
Category 4 (No Impact)	2003	Inert Materials & Wastes	258m	W

Water Impact	Year	Pollutant	Distance	Direction
Category 4 (No Impact)	2001	Agricultural Materials & Wastes	290m	NE
Category 3 (Minor)	2003	Oils & Fuel	325m	N
Category 3 (Minor)	2002	Inert Materials & Wastes	325m	N
Category 3 (Minor)	2002	Inert Materials & Wastes	332m	NE
Category 3 (Minor)	2002	Other Pollutant	337m	W
Category 4 (No Impact)	2001	Contaminated Water	364m	W
Category 3 (Minor)	2003	Organic Chemicals/Products	411m	NW
Category 3 (Minor)	2002	Sewage Materials	491m	W

9.3.21 Table 9.8 shows there have been no pollution incidents in the last 13 years within 500m of the site.

Flood Risk & Surface Water Drainage

Fluvial Flooding

9.3.22 The AWP Flood Risk Assessment (FRA) identifies that the developable areas of each site across the southern extension will be kept within the 'Flood Zone 1 – Low Risk' areas to ensure any new development is not at risk of flooding in up to the 1 in 1000 year return period.

9.3.23 All areas within the application boundary which are shown to be at risk of flooding (Flood Zones 2 and 3) will be retained as existing, or upgraded for amenity, sports or public open space use.

Flooding from Surface Water

9.3.24 the EA's 'Flooding from Surface Water' mapping is based on LIDAR data and indicates the typical conveyance routes of surface water runoff. The mapping indicates that the majority of the site is not susceptible to surface water flooding from overland sources.

9.3.25 For most areas at risk of flooding from surface water, the primary source of flooding is due to runoff generated by the site catchment itself, which would be dealt with through the implementation of a positive drainage regime at each site. Notwithstanding this, the existing ordinary watercourse which passes through the southern boundary of the Ham Farm site and through centre of the Newhouse Farm site must be retained and incorporated into green space within the development, with new additional discharges.

Potable Water Supply

9.3.26 The Water Act 2003 requires water companies to produce 'Water Resources Management Plans' which provide a realistic strategy plan for monitoring water resources and indicate how a water company intends to maintain the balance between supply and demand for water over the next 25 years.

Future Baseline

9.3.27 It is anticipated that, should the proposed development not take place at the site, the baseline water quality, flood risk and drainage conditions described above would remain largely unchanged. However, considering the potential effects of climate change, it is likely that any uncontrolled surface run-off from the site will increase in the future.

Sensitive Receptors

9.3.28 A number of sensitive receptors have been identified within the vicinity of the site. Based on the available baseline data the sensitivity of these receptors is outlined below:

- Surface water – considered to be 'high' sensitivity receptors due to the proximity of these features to the proposed development;
- Groundwater – Given that there are no licensed groundwater abstraction sites within 2000m of the site, this receptor is considered to be of a 'low' sensitivity;
- Residential properties – considered to be a 'high' sensitivity receptor given the large number of dwellings that are located downstream of the development site;
- Sewerage infrastructure – considered to be 'high' sensitivity given that suitable points of connectivity within the existing sewerage network have not yet been identified.
- Potable water supplies – considered to be 'medium' sensitivity given that the site will generate greater demand on the existing potable network.

9.4 Mitigation, Compensation and Enhancement Measures

9.4.1 This section outlines the mitigation measures that are proposed to be implemented alongside the scheme.

Construction Phase

<u>Potential Contamination of Surface and Groundwater</u>

9.4.2 A Construction Environmental Management Plan (CEMP) for the proposed development will contain measures to manage and control all ground works, including management of wastewater and the storage of fuel and chemicals. The CEMP will detail the procedures and methods that are to be followed by the construction workforce in order to minimise the potential effects of construction on the site on groundwater and surface water features.

9.4.3 The CEMP will be developed and agreed with NDDC, the Environment Agency and other regulators/consultees, as required, prior to the commencement of the construction activities. Contractors working on the site will be then be required to comply with the CEMP.

9.4.4 All construction activities will be undertaken in accordance with the EA Pollution Prevention Guidelines (PPG) and, in particular;

- PPG 1 'General Guide on the Prevention of Pollution';
- PPG 2 'Above Ground Oil Storage Tanks';
- PPG 5: 'Works and Maintenance in or near water';
- PPG 6 'Working at Construction and Demolition Sites'; and
- PPG 8 'Safe storage and disposal of used oils'.

9.4.5 Fuel, oil and chemicals will be stored in secondary containment and located a minimum of 10m from a watercourse or 50m from a well or borehole. The secondary containment system must provide storage of at least 110% of the tank's maximum capacity and ensure that any valves, filters, sight gauges, vent pipes or other ancillary equipment are also situated within the secondary containment system and arranged so that any discharges are contained.

9.4.6 Construction vehicles will be regularly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. Other activities associated with the use of construction vehicles (such as washdown facilities) will be appropriately managed to contain contaminants and regulate the release of water back into the natural environment. In addition, designated haul routes around the site should be implemented to minimise disturbance of soil and the subsequent effects of sedimentation on ground and surface waters within the vicinity of the application site.

9.4.7 Surface runoff from the various points of construction within the site will be managed by the appropriate use of temporary bunding and detention basins, where necessary, to ensure the protection of water quality and the underlying aquifer from sediment load and contaminants. Detention basins are beneficial in that they allow for isolation and on-site treatment of sediment laden or chemically contaminated surface runoff before it is released to the natural aquatic environment / sewerage network.

9.4.8 The careful management of pollutant sources, (e.g. storage of fuel from construction vehicles), the construction of the temporary surface water drainage network and adherence to best practice guidelines as part of the CEMP will enable the potential impact of contamination on surface and groundwater to be effectively managed, reduced and / or eliminated.

9.4.9 To mitigate potential impacts associated with the dewatering of excavations consideration should be given CIRIA 515: Groundwater Control – Design and Practice.

9.4.10 The water pumped or abstracted during a groundwater control operation (i.e. dewatering of excavations) is legally classified as 'trade effluent' and as such, a discharge consent will be required from the Environment Agency if the water is to be discharged to the receiving watercourse. Discharge consents set maximum limits for suspended solids within discharged water and as such control measures may need to be in place to ensure that these limits are not exceeded.

9.4.11 It is anticipated that any groundwater encountered during excavation works will be pumped to a temporary surface water drainage network. The drainage network will act as a series of detention basins allowing sediment to settle out prior to discharge.

9.4.12 Further detailed measures will be outlined within the CEMP that will be developed and agreed with NDDC, the Environment Agency and other regulators/consultees, as required, prior to the commencement of the construction activities. Contractors working on the site will be then be required to comply with the CEMP.

Increased Surface Water Run-off

9.4.13 A temporary surface water drainage network including appropriately sized detention basins will provide on-site attenuation for surface water flows during construction activities, thereby reducing on site and downstream flood risk during construction. Surface run-off should be disposed of appropriately, either tankered off-site or discharged following agreement with the appropriate authority.

Operation Phase

Potential Contamination of Surface and Groundwater

9.4.14 Any surface water discharges from private and communal car parking areas and high risk areas (i.e. major highway junctions) should incorporate appropriate pollution control measures (i.e. trapped gullies, manholes with catch pits etc.) to minimise the risk of polluted surface water runoff entering the adjacent watercourse and underlying aquifer. The proposed development will utilise SuDS in the form of grass lined detention basins and ponds. The use of these features will help to reduce the potential impact of point source pollution incidents and can help improve the quality of surface water discharges by allowing the removal of suspended matter prior to discharge.

9.4.15 SuDS features that cater for surface runoff solely from adopted highway areas will become the responsibility of the adopting authority and would be expected to be covered as part of an S38 agreement. SuDS features within non-adopted areas will remain private and where located on plot would become the responsibility of the individual homeowner, or otherwise a management company would be appointed for the maintenance of communal features.

9.4.16 The incorporation of the aforementioned mitigation measures will serve to attenuate and improve the quality of surface water runoff from the site minimising the risk of contaminants such as hydrocarbons and silts entering surrounding surface water courses and underlying groundwater.

Increased Surface Water Runoff

9.4.17 A surface water strategy has been developed to ensure that surface water runoff can be attenuated on site for up to the 1 in 100 year + 40% (climate change) rainfall event.

9.4.18 The surface water drainage strategy will comprise a network of:

- Adoptable and non-adoptable underground pipework;
- Detention basins;
- Hydraulic controls; and
- Overland exceedance measures.

9.4.19 Roof water from houses will be collected from downpipes and gutters and transferred to a new private surface water network which in turn will route flows to a new adoptable network.

9.4.20 Runoff from the adopted highway will be intercepted by trapped gullies and transferred to the new adoptable surface water network, which will route all storm water flows through the development, prior to discharge to detention basins.

9.4.21 Additionally, Long Term Storage (LTS) has been incorporated into the proposals to provide mitigation against the increased volumes of runoff post development. The incorporation of LTS provides additional betterment with respect to rates of runoff during the higher frequency storm events.

9.4.22 The restricted discharge from detention basins should be directed to either the Fern Brook (for Park Farm) or otherwise the River Lodden. Discharges to the ordinary watercourse which passes through Ham Farm and New House Farm will not be accepted as they could generate an increased risk of flooding from surface water.

Increased Water Usage Demand

9.4.23 Wessex Water has prepared a Water Resources Management Plan which identifies how they intend to maintain the balance between supply and demand for water over the next 25 years. In calculating the water demand estimates the Water Resources Management Plan takes into consideration the potential growth in housing in the supply area over the 25 year period.

9.4.24 Notwithstanding this, the proposed development will seek to minimise potable water consumption throughout the development. Opportunities to implement water conservation measures across the development to conserve water resources will be given at the detailed design stage and may include measures such as water metering, dual flush toilets and the provision of water recycling.

Increased Foul Drainage

9.4.25 It is expected that works will be funded to install necessary infrastructure and enhance capacity if required.

9.5 Likely Significant Environmental Effects of the Scheme

Construction Phase Effects

Potential Contamination of Surface and Groundwater

9.5.1 There is the potential for contamination of surface water runoff from construction activities, which could subsequently enter the surrounding surface water features. Such activities that could give rise to the potential for run-off at the site to be contaminated with heavy metals, hydrocarbons, suspended solids and construction materials include;

- The operation of construction vehicles;
- General construction and demolition activities and the storage of associated fuels and chemicals; and,
- The siting and operation of site construction compound and the construction of proposed site roads.

9.5.2 If untreated surface water runoff is discharged from the site, this could impact on the chemical and biological quality of the downstream watercourses. The movement of plant and machinery has the potential to damage soil stability, e.g. creating 'water logged' conditions during wet weather and dust during dry periods. This, as well as the stockpiling of spoil and other construction materials, has the potential to increase sedimentation on-site and in downstream watercourses. Such movements can be expected across the site, but can be controlled by the provision of designated haulage routes and tracks for use by construction vehicles, and appropriate phasing of the development.

9.5.3 The storage of the construction materials and hazardous substances (e.g. diesel) has the potential to impact on surface and groundwater quality if appropriate control / mitigation measures are not adopted.

9.5.4 The proposed development will require earthworks to be undertaken including: top soil stripping and stockpiling; trench excavations (including for the installation of gas supply, water supply, surface water and foul water sewerage infrastructure), and installation of building foundations. These activities have the potential to increase the quantity of suspended solids (dusts and particulates) in surface water run-off on the site.

9.5.5 It should be noted that under powers given to the Environment Agency in the Anti-Pollution Regulations 1999, the Agency is able to stop construction activities at any time, should a significant risk be posed to the environment.

9.5.6 The sensitivity of surface water is 'high' and the magnitude of impact, following mitigation, is 'negligible'. Therefore, there is likely to be a **neutral** effect on surface water following the implementation of appropriate mitigation measures.

9.5.7 The sensitivity of groundwater is 'low' and the magnitude of impact, following mitigation, is 'negligible'. Therefore, there is likely to be a **neutral** effect on groundwater following the implementation of appropriate mitigation measures.

Effect of Increased Surface Water Run-off

9.5.8 Construction activities such as top soil stripping, the clearance of vegetation and vehicles movements are likely to result in soil compaction and ultimately less water being attenuated on site by vegetation and within the unsaturated soil matrix. Therefore, the volume and rate of surface water run-off may increase posing a localised flood risk on site. In addition, increasing the volume and rate of surface water run-off from the site could potentially increase the downstream flood risk, if not appropriately mitigated.

9.5.9 The EA's indicative flood plain maps indicate that the development areas of the site are located within 'Flood Zone 1 – Low Risk' from fluvial flooding. As such, construction activities are unlikely to be affected by flooding on site.

9.5.10 The sensitivity of the downstream residential receptors is considered to be 'high' and the magnitude of impact, following mitigation, is 'negligible'. Therefore, there is likely to be a **neutral** effect on downstream residential receptors following the implementation of appropriate mitigation measures.

Operation Phase Effects

Potential Contamination of Surface and Groundwater

9.5.11 Contamination of surface water run-off and groundwater may lead to a deterioration of water quality in water receptors beneath and in the vicinity of the proposed development. Potential sources of surface and groundwater contamination during operation of the proposed development are anticipated to be minimal and limited to the following:

- Oil residues and sediments from vehicles using internal / access roads and car parking areas within the Site; and
- Wastewater (sewage effluent, water from sinks, showers and other domestic uses) from occupation of the residential and commercial premises; and

9.5.12 It is considered that the nature of the proposed development represents a relatively low risk in terms of the potential for water pollution, given that storage and movement of hazardous materials and / or substances is not likely to be a frequent occurrence.

9.5.13 The sensitivity of surface water is considered to be 'high' and the magnitude of impact, following mitigation, is 'negligible'. Therefore, there is likely to be a **neutral** effect on surface water following the implementation of mitigation measures.

9.5.14 The sensitivity of groundwater beneath the site is considered to be 'low' and the magnitude of impact, following mitigation, is 'negligible'. Therefore, there is likely to be a **neutral** effect on groundwater following the implementation of mitigation measures.

Increased Surface Water Runoff

9.5.15 The change of land use to accommodate the development and the associated increase in impermeable areas will result in an increase in the volume and rate of surface water runoff. This increased volume and rate of runoff will be managed through appropriate on-site attenuation and discharge control, with long-term storage. The proposed developments will also include allowance for the maximum predicted effects of climate change, which will offer betterment over undeveloped conditions.

9.5.16 The sensitivity of the downstream receptors is considered to be 'high' and the magnitude of impact, following mitigation, is 'slight' benefit. Therefore, there is likely to be an **intermediate** positive effect from surface water runoff, considered to be **significant,** following the implementation of appropriate mitigation measures.

Reduced Groundwater Recharge

9.5.17 The site is underlain by aquifers as described above and set out in detail in the associated Groundsure report. Although the proposed development will most likely result in an increase in hardstanding across the site the ground conditions across the site are already lacking in permeability.

9.5.18 The sensitivity of groundwater is 'low' and the magnitude of impact, is 'slight'. Therefore, there is likely to be a **neutral** effect on groundwater recharge due to the development.

Increased Water Usage Demand

9.5.19 The proposed development site will result in an increase in potable water demand. In addition, landscaped areas of the proposed development are likely to require watering during certain times of the year.

9.5.20 The sensitivity of the water supply is 'medium', and the magnitude of change is 'slight'. Therefore, there is likely to be a **minor** effect on water usage demand following the implementation of appropriate mitigation measures.

Increased foul drainage

9.5.21 The foul sewage output from the site will increase from that of current levels.

9.5.22 The sensitivity of the foul drainage sewerage network to increases in foul drainage from the site is 'high' and the magnitude of change, following mitigation, will be 'negligible', given that enhanced capacity will be built in to the adopted networks, if required. Therefore, there is likely to be **neutral** effect on the foul drainage and sewerage network.

9.6 Assessment Summary and Likely Significant Residual Environmental Effects

Residual Effects

9.6.1 During the construction phase, appropriate mitigation measures can be implemented to prevent any residual adverse environmental effects.

9.6.2 During the operation phase, the management of storm water runoff, with long-term storage provision and climate change allowances, will offer a positive significant residual effect on the environment and downstream catchment.

Summary

9.6.3 This assessment has been undertaken to determine the potential impacts of the proposed development on hydrology and flood risk. The potential impacts that were assessed included potential risk of contamination of the nearby watercourses, the potential risk of contamination of surface and groundwater; the effect of increased surface water run-off; reduced groundwater recharge; increased water usage demand and increased foul water discharge.

9.6.4 During the construction phase of the development a CEMP will be prepared that will outline standard best practice techniques to mitigate the potential impacts of physical (e.g. sediments) and chemical (e.g. hydrocarbons) contamination on surface and groundwater receptors.

9.6.5 The implementation of a Sustainable Drainage System (SuDS) in the form of strategically located detention basins will mitigate the potential impacts associated with increased surface water run-off. The use of SuDS and appropriate discharge locations will also ensure there are no residual adverse impacts associated with the drainage regime, during either the construction or operational phases.

9.6.6 Water efficiency measures will be implemented to reduce the volume of water required during the occupation of the proposed development and therefore minimise the amount of wastewater that is produced.

9.6.7 On all issues the assessment demonstrates that, following mitigation, any impacts are, at worst, are neutral. However, during the operational phase the development will offer a significant benefit in terms of surface water runoff.

9.6.8 Future planning applications at this site must implement the mitigation measures expressed by this chapter and should further address any site specific/localised flood issues through consultation with Gillingham Town Council.

9.6.9 It is considered that the development proposals are acceptable in hydrology and flood risk terms, and that there are no water resource or flood risk related reasons that should prevent planning permission being granted.

Table 9.9 Assessment Summary and Residual Environmental Effects (Water Resources and Flood Risk)

Summary Description	Sensitivity Of Receptor(s)	Proposed Mitigation	Magnitude of Impact	Significance of Potential Effects
Potential risk of contamination of surface and groundwater **(Construction Phase)**	Surface Water (high) Groundwater (low)	CEMP	Negligible Negligible	Neutral Neutral
Increased Surface Water Run-off **(Construction Phase)**	Downstream receptors (high)	Temporary Network	Negligible	Neutral
Potential contamination of ground and surface water **(Operation Phase)**	Surface Water (high) Groundwater (low)	Pollution Control Measures	Negligible Negligible	Neutral Neutral
Increased Surface Water Runoff **(Operation Phase)**	Downstream receptors (high)	Surface water strategy Pipework Detention basins	Slight Benefit	Intermediate Benefit (Significant)
Reduced Groundwater Recharge **(Operation Phase)**	Groundwater (low)	N/A	Slight Adverse	Neutral
Increased Water Usage Demand **(Operation Phase)**	Potable water supplies (medium)	Water Resources Management Plan Water conservation measures	Slight Adverse	Minor Adverse
Increased Foul Drainage **(Operation Phase)**	Sewerage infrastructure (high)	Work to expand capacity, if required	Negligible	Neutral