

11.0 Water Environment

11.1 Introduction

This chapter assesses the likely significant effects of the Proposed Development on the Water Environment. In particular, the likely significant effects on hydrology, flood risk and drainage during construction and within the operational phase of the Proposed Development.

This chapter has been prepared by Stantec. It is supported by a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) that are contained within *Appendices 11.1* and *11.2* respectively. The documents contain more specific detail on the hydrology, flood risk and drainage upon which this chapter is based.

Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The reviewers who assisted in the preparation of this chapter are all experienced engineers and members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

The preparation of this chapter has been led by Richard Laker (BSc MSc). Richard is a Principal Consultant with Stantec and has worked in environmental consultancy for over 10 years, including in the preparation of Environmental Statements. It has been reviewed by Richard Fisher who is a chartered member of CIWEM and has over 25 years experience.

The chapter is accompanied by the following appendices.

Appendices	Title
Appendix 11.1	Flood Risk Assessment
Appendix 11.2	Surface Water Drainage Strategy
Appendix 11.3	Policy Context, Legislation, Guidance and Standards

11.2 Scoping, Consultation and Overview of Potential Effects

11.2.1 Scoping and Consultation

Local stakeholders have been consulted to acquire local/site-specific information on flood risk, to confirm design criteria/principles and agree the methodology for the technical assessments/analysis required to inform the FRA and SWDS that support this chapter (*Appendix 11.1* and *Appendix 11.2*).

Stakeholders consulted by the Applicant include:

- the Environment Agency (EA);
- Hampshire County Council (HCC); and
- Southern Water.

Copies of the correspondence and meeting notes of the Applicant's consultation with local stakeholders are included in the FRA (in *Appendix 11.1*) and further details regarding the matters identified, discussed and agreed with certain stakeholders are summarised in *Table 11.1* below.

Table 11.1 – Applicant Correspondence with consultees			
Consultee	Date	Comments	Actions
EA	Pre-application meeting 30 th March 2023.	Consultation with the EA was undertaken in advance of the model build in order to request additional data required by Stantec to undertake the fluvial and pluvial hydraulic modelling exercise and to agree the modelling approach. It was agreed that the model would be submitted to the EA for review when FRA was submitted and that the review would take approximately 8 weeks.	Design requirements relating to sequential approach, finished floor levels etc. fed into indicative site layout.
Hampshire County Council (HCC) Lead Local Flood Authority (LLFA)	Pre-application consultation response 17 th January 2023.	<p>The main points from the pre-application letter are:</p> <ul style="list-style-type: none"> • Groundwater monitoring should be undertaken in the winter months to show that any proposed infiltration features will be at least one metre above the highest groundwater levels. • Drainage systems should be designed for the 1 in 100 year storm event plus a peak rainfall allowance, and half drain times should be assessed. • Should infiltration be unviable as a strategy, attenuation of runoff with a restricted discharge to a watercourse or surface water sewer may be acceptable. An assessment of greenfield runoff rates should be made for the existing site, and any proposed discharges off site should be restricted to Qbar or should not exceed the equivalent greenfield rates for storms up to the 1 in 100 year event plus a climate change allowance for peak rainfall. • Urban creep, flood exceedance flow routes and allowable flooded extents should be provided for all drainage strategies, along with maintenance information. • HCC is responsible for issuing Ordinary Watercourse Consents. These consents assess the flood risk of proposed changes (both permanent and temporary) to ordinary watercourses and are a legal requirement of such work. 	<p>Data on existing watercourses taken into account in assessment.</p> <p>Surface water drainage strategy informed by consultation.</p> <p>Design requirements relating to watercourse crossings fed into masterplanning and road crossing design process.</p>

Southern Water (SW)	Pre-application enquiry – Level 1 Capacity Check Enquiry, dated 21 st April 2023.	<p>The main points from the pre-application letter are:</p> <ul style="list-style-type: none"> • There is currently inadequate capacity within the foul sewerage network to accommodate a foul flow of 18.96 l/s for the above development at manhole references SU73072302, SU74072301 and SU74071201. • The nearest point where capacity is currently available is at Budds Farm Havant WTW which is located approximately 3 Km Southwest of the proposed development site. • There is adequate capacity within the foul sewerage network to accommodate a foul flow of 0.45 l/s for the above development at manhole references SU74071201 and SU73072302. 	Design requirements fed into masterplanning design process.
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This chapter first presents an overview of its assessment methodology (*Section 11.3*). The methods that have been employed to obtain the baseline information, subsequent assessment of their sensitivity/value and impacts on these are presented. The chapter then presents a summary of the baseline conditions at the Site and surrounding areas outside the red line Site Boundary (*Section 11.4*), as appropriate.

The chapter then considers the potential significant adverse or beneficial environmental effects (*Section 11.5*) arising from the Proposed Development on hydrology, flood risk, and drainage, and the potential significant adverse or beneficial effects from construction and post-completion activities, taking into account the mitigation already designed into the scheme as set out in the provided two Parameter Plans.

Appropriate additional avoidance, mitigation or compensation measures necessary to reduce these effects to an acceptable level are identified, and the significance of any residual effects are finally assessed. The residual effects are further considered cumulatively with those of other identified schemes (as set out in *Section 11.6 and 11.7*).

The chapter concludes with consideration of the cumulative effects of the Proposed Development (*Section 11.8*). It is considered that the Proposed Development will be categorised as ‘nil detriment’ in terms of drainage and flood risk related impacts and the cumulative effects of development in the local area (including potential interactive effects from the Proposed Development) are negligible.

11.3 Assessment Methodology

11.3.1 Scope

This Chapter:

- Provides a summary of relevant legislation and planning policies against which the Proposed Development will be considered;
- Describes the existing hydrological environment;

- Describes the existing surface water drainage infrastructure;
- Provides an overview of:
 - 2025 Existing Baseline Stage;
 - 2028-2038 Construction (up to Completion) Stage;
 - 2038 onwards [for at least 100 years] Operational (Post-Completion) Stage.
- Provides details of the mitigation measures required to prevent, reduce, or offset the impacts of the Proposed Development on flood risk and drainage.

In line with guidance provided by the EA, allowances for climate change are included as part of the FRA and SWDS for the Proposed Development.

Climate change allowances applied to the hydraulic modelling (fluvial and surface water (pluvial)) and SWDS cover the period 2070 to 2115 (the '2080s' epoch - <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>), therefore any mitigation measures must incorporate climate change to cover this period.

Following the completion of construction in 2038, the Proposed Development will be fully occupied and include mitigation measures covering the period 2070 to 2115, in excess of 2050. Hence, the year 2100 is used for the Post-Completion Stage.

Further details are provided below on the study area, data sources, and the assessment approach for this ES chapter.

11.3.2 Relevant Policy, Legislation, Guidance and Standards

An overview of planning policies, legislation, guidance and standards that are relevant to the assessment is included in *Appendix 11.3*.

11.3.3 Study Area

The Study Area for this chapter is the Site and the land immediately surrounding it (outside of the red line Site Boundary). A plan of the Site is included in the FRA (*Appendix 11.1*) that supports this chapter. The Proposed Development must not increase flood risk to the surrounding land (outside red line Site Boundary), in particular areas which are not currently at risk of flooding or increasing the risk (e.g., increasing frequency or depth of flooding) for areas which are already at risk.

Flood risk to both internal (within red line Site Boundary) and external (outside red line Site Boundary) receptors is assessed.

For internal receptors, this chapter provides information on the degree of flood hazard and hence the degree of flood risk. In the case of external receptors, flood hazard and hence flood risk during the design events is not evaluated. Instead, the potential for the Proposed Development to qualitatively increase or decrease flood risk at external receptors is assessed so that targeted measures to ensure a qualitative reduction can subsequently be taken, if necessary.

11.3.4 Baseline Data sources

This chapter has been prepared with reference to the following sources of flood risk information:

- EA online flood mapping (<https://flood-map-for-planning.service.gov.uk>);
- Partnership for South Hampshire Level 1 Strategic Flood Risk Assessment, Part 1 Main Report, Report (Version 6), February 2024;
- Partnership for South Hampshire Strategic Flood Risk Assessment, Part 4 – Havant Borough Council, Final Report (Version 3), June 2024;
- Havant Borough Council (HBC) Strategic Housing and Economic Land Availability Assessment (SHELAA), December 2024;
- Hampshire County Council (HCC) Preliminary Flood Risk Assessment (PFRA) (2011).
- Hampshire County Council (HCC) Hampshire Groundwater Management Plan (GMP) (2013);
- Hampshire County Council (HCC) Local Flood and Water Management Strategy (2020);
- Hampshire County Council (HCC) Hampshire Catchment Prioritisation – Lavant Catchment Management Plan (2023).
- CIRIA Sustainable Drainage Systems (SuDS) Manual.

As specified in Chapter 1, a formal EIA Scoping Request has not been submitted to HBC; however, several meetings and workshops have been held with HBC and HCC, see Chapter 2.

11.3.5 Assessment Approach

For the FRA (*Appendix 11.1*), four principal activities have been undertaken as part of the assessment process:

1. Desk-study review;
2. Stakeholder consultation;
3. Hydraulic modelling; and,
4. Assessment of surface water drainage regime.

Existing studies/documents have been reviewed to assist with characterising the baseline water environment and to identify the best available data to be taken forward to inform the assessment.

Consultation with statutory consultees (see *Section 11.2*) has been undertaken to identify and collate data in respect of the baseline water environment, define the scope of investigation/technical work required to inform the FRA, SWDS and this ES chapter, agree assessment methodologies and the design principles to be applied to ensure compliance with the policy, legislation and guidance summarised below.

11.3.6 Significance criteria

For the purposes of this chapter, an assessment of the likely significance of an effect has been made firstly by considering the sensitivity of receptors (i.e. a receptor's importance and ability to tolerate and recover from change) and, secondly, by considering the likely magnitude of the effect (i.e. the effect's spatial extent and duration). By combining sensitivity and magnitude, the likely significance of the effect can be established. Where likely significant negative effects are identified, mitigation measures can be proposed to reduce the significance.

The sensitivity of a receptor is characterised by its ability to tolerate and recover from changes in the environment as well as its importance to society (i.e. protection under a statutory designation or economic value). *Table 11.2* below shows the criteria used to determine receptor sensitivity.

DMRB guidance note LA 104 'Environmental assessment and monitoring' sets out generic criteria for determining receptor sensitivity and the magnitude of the impact; these are replicated in *Table 11.2* and *11.3* below.

Table 11.2 – Sensitivity Typical Descriptors		
Sensitivity/ Value of a Receptor	Description criteria	Examples of receptors
Very High	Nationally significant attribute of high importance	<p>Watercourse having a WFD classification shown in a RBMP and $Q_{95} \geq 1.0 \text{ m}^3/\text{s}$</p> <p>Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EU legislation.</p> <p>Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation.</p> <p>Groundwater locally supports GWDTE</p> <p>Source Protection Zone (SPZ) Zone 1</p> <p>NPPF flood risk vulnerability "Essential infrastructure" or "highly vulnerable" development</p>
High	Locally significant attribute of high importance	<p>Watercourse having a WFD classification shown in a RBMP and $Q_{95} < 1.0 \text{ m}^3/\text{s}$.</p> <p>Species protected under EU or UK wildlife legislation</p> <p>NPPF Flood Risk Vulnerability Classification "More Vulnerable"</p> <p>Groundwater supports a GWDTE</p> <p>Site located within a Groundwater Source Protection Zone 2 (SPZ) inner or outer protection zone (Zone 2)</p> <p>Principal aquifer providing locally important resource; or supporting a river ecosystem.</p> <p>NPPF Flood Risk Vulnerability Classification "More Vulnerable"</p>

Medium	Of moderate quality and rarity	<p>Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001m³/s</p> <p>NPPF Flood Risk Vulnerability Classification “Less Vulnerable”</p> <p>Aquifer providing water for agricultural or industrial use with limited connection to surface water</p> <p>Site located within a Groundwater Source Protection Zone (SPZ) inner or outer protection zone (Zone 3)</p> <p>NPPF Flood Risk Vulnerability Classification “Less Vulnerable”</p>
Low	Lower quality	<p>Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001m³/s</p> <p>Unproductive aquifer status</p> <p>NPPF Flood Risk Vulnerability Classification “Water Compatible”</p>

Table 11.3 provides an indication of potential impacts and their magnitude. These may be reported as either ‘beneficial’ or ‘adverse’. The list is not exhaustive and is intended as a guide.

Table 11.3 – Magnitude Typical Descriptions			
Magnitude	Criteria	Typical Example	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface Water	<p>Failure of both acute-soluble and chronic sediment related pollutants in HEWRAT and compliance failure with EQS values.</p> <p>Calculated risk of pollution from a spillage ≥2% annually (spillage assessment).</p> <p>Loss or extensive change to a fishery.</p> <p>Loss of regionally important public water supply.</p> <p>Loss or extensive change to a designated nature conservation site.</p> <p>Reduction in water body WFD classification.</p>
		Groundwater	<p>Loss of, or extensive change to, an aquifer.</p> <p>Loss of regionally important water supply.</p> <p>Potential high risk of pollution to groundwater from routine runoff - risk score >250 (Groundwater quality and runoff assessment).</p> <p>Calculated risk of pollution from spillages ≥2% annually (Spillage assessment).</p> <p>Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies.</p> <p>Reduction in water body WFD classification.</p> <p>Loss or significant damage to major structures through subsidence or similar effects.</p>
		Flood Risk	Increase in peak flood level (>100mm)

Moderate adverse	Results in effects on integrity of attribute, or loss of part of attribute	Surface Water	<p>Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values.</p> <p>Calculated risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually.</p> <p>Partial loss in productivity of a fishery.</p> <p>Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.</p> <p>Contribution to reduction in water body WFD classification.</p>
		Groundwater	<p>Partial loss or change to an aquifer.</p> <p>Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies.</p> <p>Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250.</p> <p>Calculated risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually.</p> <p>Partial loss of the integrity of GWDTE.</p> <p>Contribution to reduction in water body WFD classification.</p> <p>Damage to major structures through subsidence or similar effects or loss of minor structures.</p>
		Flood Risk	Increase in peak flood level ($> 50\text{mm}$).
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface Water	<p>Failure of either acute soluble or chronic sediment related pollutants in HEWRAT.</p> <p>Calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually.</p> <p>Minor effects on water supplies.</p>
		Groundwater	<p>Potential low risk of pollution to groundwater from routine runoff - risk score < 150</p> <p>Calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually</p> <p>Minor effects on an aquifer, GWDTEs, abstractions and structures</p>
		Flood Risk	Increase in peak flood level ($> 10\text{mm}$)
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The proposed project is unlikely to affect the integrity of the water environment	
		Surface Water	<p>No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants).</p> <p>Risk of pollution from spillages $< 0.5\%$.</p>
		Groundwater	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages $< 0.5\%$.
		Flood Risk	Negligible change to peak flood level ($\leq \pm 10\text{mm}$).

Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of a negative effect occurring	Surface Water	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
		Flood Risk	Creation of flood storage and decrease in peak flood level (> 10mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface Water	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). Contribution to improvement in water body WFD classification.
		Groundwater	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Flood Risk	Creation of flood storage and decrease in peak flood level1 (>50mm).
Major beneficial	Results in major improvement of attribute quality	Surface Water	Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
		Groundwater	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
		Flood Risk	Creation of flood storage and decrease in peak flood level (> 100mm).

No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
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The likely significance of an effect is derived based upon the sensitivity of the receptor and the magnitude of the change. The significance of the effect is then determined using the matrix presented at *Table 11.4*. The DMRB standard states that where the significance table “includes two significance categories, evidence should be provided to support the reporting of a single significance category.”

The DMRB standard also noted that “the approach to assigning significance of effect relies on reasoned argument, the professional judgement of competent experts and using effective consultation to ensure the advice and views of relevant stakeholders are taken into account”.

Table 11.4 – Significance Matrix (based on DMRB LA 104 Table 3.8.1)					
Sensitivity	Magnitude				
	No Change	Negligible	Minor	Moderate	Major
Very High	Neutral	Minor	Moderate or Substantial	Substantial or Very Substantial	Very Substantial
High	Neutral	Minor	Minor or Moderate	Moderate or Substantial	Large or Very Substantial
Medium	Neutral	Neutral or Minor	Minor	Moderate	Moderate or Substantial
Low	Neutral	Neutral or Minor	Neutral or Minor	Minor	Minor or Moderate
Negligible	Neutral	Neutral	Neutral or Minor	Neutral or Minor	Minor

In order to provide a consistent approach and as there is no statutory definition of significance, *Table 11.5* below translates the DMRB significance matrix shown in *Table 11.4* into the same terminology used across the rest of the ES.

Table 11.5 – Significance Matrix (based on rest of ES)					
Sensitivity	Magnitude				
	No Change	Negligible	Minor	Moderate	Major
Very High	Negligible	Minor	Substantial or Moderate	Substantial	Substantial
High	Negligible	Minor	Moderate or Minor	Substantial or Moderate	Substantial
Medium	Negligible	Minor or Negligible	Minor	Moderate	Substantial or Moderate
Low	Negligible	Minor or Negligible	Minor or Negligible	Minor	Moderate or Minor
Negligible	Negligible	Negligible	Minor or Negligible	Minor or Negligible	Minor

The likely significance of an effect can be negligible, beneficial or adverse. The significance of an effect should also be assessed based on the likelihood of an impact occurring (using a scale of certain, likely or unlikely) and the confidence in the accuracy of the assessment.

Temporary impacts are considered to occur in the construction phase (2028-2038) and permanent impacts in the post-completion (2038) operational phase (albeit that the impact may first occur during construction e.g. change of surface material).

The likely significance of residual impacts (i.e. the environment impacts that remain after the incorporation of mitigation measures) has been assessed through consideration of their magnitude, duration and nature (i.e. reversible or irreversible) and also the geographic context (e.g. highly localised or widespread).

Specific descriptions of the significance criteria for adverse and beneficial effects is set out in *Table 11.6*. For EIA purposes and in accordance with DMRB guidance, residual effects of moderate significance or greater are considered to be 'significant' and require mitigation.

Table 11.6 – Significance Categories and Typical Descriptors		
	Significance	Typical Description
Significant	Substantial	These effects are likely to be important at a local or borough scale and may become material considerations in the decision-making process.
	Moderate	Effects at this level can be considered to be material decision-making factors. These effects, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Not Significant	Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.
	Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. Such effects should not be considered by the decision-maker.

11.3.7 Assumptions and Limitations

The principal assumptions and limitations of this Chapter are as follows:

- It is assumed that data provided by third parties is accurate;
- It is assumed that any effects on resources and receptors located further than 250m from the Site boundary are negligible, recognising that if an impact inside the Study Area is identified, the impact may extend beyond the Study Area;
- It is assumed that, following the implementation of the SWDS and FRA recommendations, the Proposed Development will have no significant adverse effect on flood risk; and
- It is assumed that no major large scale dewatering works will be required during construction, as it is assumed that any dewatering of temporary excavations or over-pumping for diversion works will be sufficiently minor and small scale that it does not require an abstraction licence.

11.4 Baseline Conditions

This section outlines the current (2025) baseline conditions for the Site.

In terms of future baseline, in the event that no development comes forward on the site, runoff from the site will continue to drain overland into the receiving watercourses.

The hydrological regime may change as a result of the predicted impacts of climate change. The 'Flood Risk Assessments: climate change allowances' (May, 2022) document provides guidance on the allowances that should be made for the impacts of climate change on river flow, rainfall intensity and sea level rise. Peak fluvial flows and rainfall leading to surface water runoff are predicted to increase as a result of climate change.

The baseline hydraulic modelling study has accounted for future climate change in line with EA climate change allowances (May, 2022), as follows:

- Fluvial
 - 25% (Central) increases in the 1 in 100 Annual Probability (AP) flow;
 - 36% (Higher) increases in the 1 in 100 AP flow;
- Surface Water (Pluvial)
 - 40% (Upper End) in the 1 in 30 AP flow; and,
 - 45% (Upper End) in the 1 in 100 AP flow.

The fluvial and surface water (pluvial) hydraulic modelling results are included within the hydraulic modelling report (Appendix D of the FRA (*Appendix 11.1*)).

11.4.1 Current Baseline

Surface Water Bodies

The scheme is potentially influenced by a number of field drains and ordinary watercourses which lie within the catchment of either the West Brook or the Nore Farm Stream, as follows:

- The West Brook appears to pass under Horndean Road to the north-east of the site and then runs along the eastern Site boundary. It is designated as an EA 'Main River' immediately adjacent to and then south of West Brook View, where there is an area of the floodplain that has been lowered to provide floodplain storage in the south-east corner of the site (the 'West Brook Flood Alleviation Scheme (FAS)').

To the south of the site, the West Brook passes under the A27 and railways and then is largely culverted through Emsworth before discharging in Emsworth Pond and continues to flow south into Emsworth Mill Pond and subsequently into the Emsworth Channel, part of the tidal Chichester Harbour.

- The Nore Farm Stream rises in the site along the western boundary adjacent to Daffodil Way and the Stride Centre. It is classified as an 'ordinary watercourse' where it follows the western boundary of the site before turning east and passing under the A27 and railway where it is then designated as an EA 'Main River'. The watercourse passes along the western boundary of Emsworth, partially in culvert, before discharging into Nore Rithe.

The site is located between the larger river catchments of the River Ems, located approximately 0.75km to the east of the site, and the Lavant Stream, located approximately 1.15km to the west of the site, both of which are classified as EA 'Main Rivers'.

Both the West Brook and the Nore Farm Stream lie within the Western Streams Operational Catchment and neither watercourse has been classified under the Water Framework Directive (WFD) contained within the South East River Basin Management Plan (RBMP).

Groundwater

The British Geological Survey (BGS) Geology of Britain Viewer suggests that the site lies on bedrock of London Clay Formation, comprising clay, silt and sand, which is designated by the EA as an 'Unproductive' aquifer.

There are superficial deposits recorded across the majority of the site, comprising either River Terrace deposits, or Head deposits. The River Terrace Deposits are designated by the EA as a 'Secondary A' aquifer, and are located in southern and central parts of the site. Head deposits of clay, silt, sand & gravel are designated as a 'Secondary (undifferentiated)' aquifer, and are located along the corridor of the West Brook and in northern parts of the site.

A ground investigation was undertaken by Endeavour Drilling on behalf of Stantec, with a report produced in January 2024 (extract in *Appendix 11.1*). The report confirmed the following:

- The site was predominantly overlain by clayey head deposits at shallow depths before reaching gravel head deposits.
- Infiltration testing was undertaken across the site. This indicated that the clayey head deposits would not be suitable for shallow infiltration features but that the gravel head deposits layers below yielded fast infiltration rates.
- Groundwater monitoring was undertaken between August and December 2023 to determine seasonal high groundwater levels on site. In August 2023 groundwater levels varied between 1.05m and 4.00m below ground level (bgl), but by November 2023 these were between 0.16m and 1.33m bgl.

The UK Soil Observatory (UKSO) online 'Soilscapes for England and Wales' viewer indicates that the soils on site comprise the following:

- Northern parts of the site: "Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils" (Soilscapes 18);
- North-western parts of the site: "Freely draining slightly acid loamy soils" (Soilscapes 6); and
- The majority of the site (central and southern parts): "Loamy soils with naturally high groundwater" (Soilscapes 22).

Based on the Cranfield University online 'Soilscapes' website, the majority of the site is unclassified with the exception of the southern part of the site which lies within Soilcape 20 'Loamy and clayey floodplain soils with natural high groundwater'.

The north-western part of the Site is located within Zone I – Subsurface Activity Source Protection Zone (SPZ).

Fluvial and Tidal Flood Risk

The EA publishes flood mapping on the internet (<https://flood-map-for-planning.service.gov.uk>).

The Flood Zone map provides an initial indication of the extent of flooding, ignoring the presence of defences. The Flood Zones are defined in Table 1 of the NPPF PPG ('Flood Risk and Coastal Change' section) as follows:

- Flood Zone 1 'Low Probability' – Land at less than 1 in 1000 (0.1%) AP of river or sea flooding;
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1.0%) and 1 in 1000 (0.1%) AP of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) AP of sea flooding;
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1.0%) or greater AP of river flooding, or 1 in 200 (0.5%) or greater AP of sea flooding.

An extract from the current (2021) EA Flood Map for Planning is shown in Figure 5.1 of the FRA (*Appendix 11.1*).

The majority of the site lies within Flood Zone 1, at 'Low' probability of river and sea flooding, and the areas of higher fluvial flood risk are limited to areas to the west and south of the site, with associated areas in Flood Zones 2 and 3 along the unnamed tributary to Nore Farm Stream. There is also an area of Flood Zone 2 and 3 associated with West Brook FAS to the east of the site.

The EA provided a update to the online Flood Map for Planning mapping service in March 2025 which utilises outputs from the updated National Flood Risk Assessment ('NaFRA2') outputs, for river/sea flooding as well as surface water. This national scale modelling exercise utilises improved national data and higher resolution mapping than previous iterations, providing an enhanced level of information where no local 'detailed' hydraulic modelling is available. However, as a national scale assessment the mapping is not typically considered robust for a site-specific assessment and Stantec has therefore completed a hydraulic modelling exercise to assess both fluvial and surface water (pluvial) flood risk at the Site.

Details of the hydraulic modelling are provided in a separate report (Ref. 332310755, Rev A, 29/11/23) within Appendix C of the FRA (*Appendix 11.1*), but a brief summary is provided below:

- Development of a 1D-2D hydraulic model and a site-specific model using the industry standard TUFLOW-ESTRY software packages to assess fluvial flood risk and surface water flood risk respectively.
- The fluvial hydraulic model was run for the 1 in 30 AP, 1 in 100 AP and 1 in 1,000 AP present day annual probability events and the 1 in 100 AP with 25% and 36% climate change allowances for the summer storm.
- The results demonstrate that the majority of the site is outside the area impacted by flooding. Where there are significant overland flow routes across the site these are less than 0.15m in depth.
- The comparison between the modelled extents and the Flood Zones (based on the EA mapping at time of modelling, and those provided in the SFRA) demonstrates that both modelled flood extents at the West Brook and Nore Farm Stream are smaller than the equivalent Flood Zones.

- The Nore Farm Stream flow route that runs in a south-easterly direction to the A27 is significantly reduced in flood extent. In the case of the West Brook, the modelled extents are only slightly reduced.
- The model results show that for both the model developed in this study and the EA Flood Zones for the 1 in 100 AP event that there is flooding at the Nore Farm Stream upstream of the A27 and along the West Brook within the Flood Storage area. However, the flow path running in a south westerly direction from the Nore Farm Stream to the A27 is not present.
- The modelled extents are larger than the EA Flood Zones in the centre of the site at Southleigh Road and Horndean Road. This is due to the Flood Zones not taking into account the smaller watercourses and ditches on site within the existing modelling studies and therefore the modelled results can be considered more accurate due to the use of site specific data.
- In extreme events, such as the 1 in 1,000 AP event, flood flows associated with the modified watercourses in the central and south-western parts of the site do not remain in bank, but follow natural overland flow routes, dictated by existing topography.

Information contained in the Partnership for South Hampshire (PfSH) Strategic Flood Risk Assessment (SFRA); Part 4 – Havant Borough Council, Final Report (Version 3), released in June 2024, has been reviewed as part of this study. Figure 13 and Appendix B SFRA mapping contains details on current and future tidal/coastal flood risk and Flood Zones. The mapping confirms that the site lies wholly within Flood Zone 1 'Low Probability' from tidal flooding in both the current and future scenarios.

Surface Water Flood Risk

The EA 'Risk of Flooding from Surface Water' ('RoFSW') mapping shows where areas could be potentially susceptible to surface water flooding in an extreme rainfall event. The latest mapping assesses flooding resulting from severe rainfall events based on the following three scenarios:

- 1 in 30 (3.3%) AP rainfall event ('High' risk);
- 1 in 100 (1%) AP rainfall event ('Medium' risk);
- 1 in 1000 (0.1%) AP rainfall event ('Low' risk).
- Land at less than 1 in 1000 (0.1%) AP of flooding is considered to be 'Very Low' risk of flooding.

The EA's RoFSW mapping indicates that the majority of the scheme is located in areas at 'very low' risk of surface water flooding. However, there are some isolated areas of 'High', 'Medium' and 'Low' risk across the site as follows:

- Isolated low spots across the site associated with low-lying localised topographical depressions;
- In the north-west parcel of land with a flow route running north to south as well as an area of flooding in the south-west corner;
- A flow route running through the centre of the site from Southleigh Road, through Southleigh Farm and running east towards the West Brook; and,

- An area of surface water ponding along the southern site boundary along the unnamed tributary of Nore Farm Stream, located upstream of the A27.

The baseline (existing) surface water (pluvial) flood risk on and adjacent to the site have been assessed in more detail as part of the Stantec baseline hydraulic modelling exercise. Details of the hydraulic modelling are provided in a separate report (Ref. 332310755, Rev A, 29/11/23) within Appendix C of the FRA (*Appendix 11.1*), but a brief summary is provided below:

- The model has been run for a range of present day and climate change scenarios. The events assessed are:
 - 1 in 30 AP;
 - 1 in 30 AP plus 40%;
 - 1 in 100 AP;
 - 1 in 100 AP plus 45%;
 - 1 in 1000 AP
- The comparison was made between the modelled extents and the EA RoFSW 1 in 100 AP event; note these are based on the previous iteration of the RoFSW (i.e. pre-January 2025 update) as these were the applicable reference data when the modelling was being undertaken. This indicates that the modelled extents show a smaller flood extent in the central area of the site with no flow route running north-west to south-east from a field drain, south of Southleigh Road. Similarly to the fluvial scenario, in extreme rainfall events flood flows in the central and south-western parts of the site follow natural overland flow routes, dictated by existing topography, rather than the existing watercourse channels.
- The results demonstrate that the majority of the main flow routes on site are less than 0.15m deep. There are some areas with flood depths greater than 0.15m within the site boundary including upstream of the A27 near the Nore Farm Stream, in the central area of the site near Southleigh Road, in the northeast of the site where Southleigh Road joins Horndean Road and the northern parcel in the south west corner.
- There is an increase in flood extent for the Nore Farm Stream flow route and the West Brook food extent is not aligned with the RoFSW extent. In the northern parcel there is a larger extent in the southwest with no ponding in the centre of the northern parcel.
- Throughout the site there are areas of ponding not shown in the RoFSW extent. This can be explained by the RoFSW mapping using a broad scale modelling grid, where the channel capacity is not well represented and does not directly represent culvert and bridge structures. In the case of the West Brook, the modelled extents do not match the RoFSW map as this extent predates the construction of the FAS.
- The model results from this study are considered more representative of the flood risk than the published EA surface water mapping, as this model is more detailed including the use of site-specific data for both the hydrological assessment and hydraulic model build.

Surface Water Quality

There are no Water Framework Directive (WFD) designated surface water bodies within the red line boundary.

The Site, including West Brook and Nore Farm Stream watercourses, are all located immediately upstream of the 'Chichester Harbour Water Body', which lies within the Western Streams Transitional and Coastal (TraC) Operational Catchment. Chichester Harbour Water Body is defined as a 'Transitional Water', it is 'heavily modified', is currently (Cycle 3) classified

as having a 'Moderate' Ecological status (for both 2019 & 2022) and 'Fail' Chemical status in 2019, as defined by the EA.

The Site is located between the larger river catchments of the River Ems, located approximately 0.75km to the east of the Site, and the Lavant Stream, located approximately 1.15km to the west of the Site, both of which are classified as EA 'Main Rivers'.

The reach of the River Ems (Ems Water Body) east of the Site is currently (Cycle 3) classified as having a 'Poor' Ecological status (for both 2019 & 2022) and 'Fail' Chemical status in 2019, as defined by the EA.

The reach of the Lavant Stream (Lavant (Hants) Water Body) west of the Site is currently (Cycle 3) classified as having a 'Poor' Ecological status (for both 2019 & 2022) and 'Fail' Chemical status in 2019, as defined by the EA.

Groundwater Quality

There are no Water Framework Directive (WFD) designated groundwater bodies within the red line boundary.

The nearest groundwater body is located south of the Site within Emsworth and comprises the 'South Hants Lambeth Group Water Body', which lies within the 'South East GW' Management Catchment. South Hants Lambeth Group Water Body (ID: GB40702G503700) is currently (Cycle 3) classified as having an overall 'Good' status, as defined by the EA.

11.5 Embedded and Standard Mitigation Measures

11.5.1 Construction Phase

The Construction Environmental Management Plan (CEMP) will outline how the construction phase will avoid, minimise or mitigate effects on the environment and surrounding area and will cover a range of topics including geology and soils.

The CEMP will include (but not limited to) the 'Site Specific Environmental Actions', as per Section 6 of the Framework CEMP in *Appendix 4.1*.

Flood Risk

No significant residual effects upon surface water bodies or with respect to groundwater, flood risk or drainage are anticipated on Site or outside the red line Site Boundary due to the employment of the mitigation measures to be included in the CEMP.

All Proposed Development, excluding the ordinary watercourse primary street network crossings, will be located outside of the post-development maximum floodplain extent of the 1 in 1,000 annual probability events.

A narrow overland flow route in the south-western part of the site, overtopping the left bank of the Nore Farm Stream, is proposed to be mitigated through fixing the channel left bank levels to a minimum level of 13.1mAOD and widening a section of the channel by 0.5m on the site side (retaining the same bank slope), to ensure there is significant surplus channel capacity to allow for the small increase in in-channel flow. Sensitivity testing demonstrates that mitigating this flow route has a local reduction (up to 70mm) in flood levels in the Nore Farm

Stream, with no increase in flooding. Critically, no change in flood level is encountered in the area of flooding upstream of the A27 (where the overland flow route rejoins) or beyond the site.

The ordinary watercourse crossings will involve works along the watercourses in Flood Zone 3. Appropriate site management (CEMP) and flood evacuation (Flood Warning Plan) will be provided, as required.

Land drainage consents would be required for any crossings associated within the primary street network affecting the ordinary watercourses on Site.

A Flood Warning Plan and site management procedures in the CEMP (i.e. ensure no storing of plant or materials in Flood Zone 3 etc.) will be provided to construction workers.

Surface Water Drainage

Construction of any SuDS features should occur before construction of the Proposed Development parcel they are designed to serve, in order to mitigate fluvial flooding impacts for the construction of the Site. Alternatively, temporary works (surface water storage) could be installed as mitigation if this is not possible. Site management procedures in the CEMP would also mitigate any impacts.

The CEMP will include a suitable temporary drainage scheme to control surface water runoff during the Proposed Development construction phase, including provision for the installation of drainage and attenuation outfalls before construction of buildings and site infrastructure. This is to manage surface water runoff generated during Proposed Development construction so as not to increase flood risk downstream (outside the red line Site Boundary). The scheme will be designed to manage surface water effectively on Site. The scheme will also include measures for managing silt that may be generated during the Proposed Development construction activities (including wheel-washing, should it be required).

Once constructed, the SuDS attenuation features on Site will reduce the surface water runoff during the later phases of Proposed Development construction work.

Surface Water and Groundwater Quality

The construction phase of the Site up to 2038 has the potential to increase the amount of soil particulates that could be mobilised by surface water flows which could decrease the water quality of receiving watercourses etc, both on Site and outside the red line Site Boundary.

The presence of plant and other construction material on Site, including fuels/ hydrocarbons, also represent a potential source of contamination.

Proposed Development construction work, including cleaning, would also increase the likelihood of surface water contaminants becoming mobilised and entering the ordinary watercourses or existing surface water drainage features on Site and outside the red line Site Boundary.

A CEMP will be created for the Proposed Development, with instructions as to the management and mitigation of on-site water quality impacts in the construction phase. This will include measures to mitigate against risk to ground and surface waters from contaminated surface water runoff arising from general construction activities and the operation of construction vehicles (including wheel-washing should it be required). In addition, measures

will be put in place to manage the migration of contaminants present on Site during earthworks. Such measures may include the appropriate use of temporary bunding and settlement ponds to allow for isolation and on-site treatment of any sediment laden or contaminated water prior to discharge to the receiving watercourses.

Details of potential temporary works on Site to prevent surface water runoff entering the ordinary watercourses may also be included in the CEMP for the construction phase, if considered appropriate.

11.5.2 Occupation Phase

The post-completion stage is based on the provided Parameter Plans and includes partial occupation from 2029 of the Proposed Development dwellings, primary school and local centre, with full occupation from 2038 onwards for at least 100 years.

Flood Risk

All Proposed Development, excluding the ordinary watercourse primary street network crossings, will be located outside of the post-development maximum floodplain extent of the 1 in 1,000 annual probability events.

The flood extents of the ordinary watercourses that will need to be crossed will remain in-channel up to and including the 1 in 1,000 annual probability event. The Proposed Development primary street network will determine the locational requirements for any culverting of the ordinary watercourses. The culverts will be sized to convey the 1 in 100 AP + 25% climate change allowance flood event. As such, the conveyance of the existing channel will not be detrimentally affected, and flood risk will not increase on-site or off-site (outside the red line Site Boundary) as a result of these proposals.

The EA requires Finished Floor Levels (FFLs) be set at or above the 1 in 100 AP plus climate change modelled flood level plus 600mm freeboard.

Finished floor levels (FFLs) for all parcels will also be raised a minimum of 150mm above existing ground levels and contoured to fall away from building thresholds to mitigate against any residual risk of groundwater, surface water or exceedance of SuDS features during 'extreme' events.

Subject to the location of parcels and proximity to the reference floodplain, FFLs will therefore be raised to minimum of 600mm above the 1 in 100 AP plus climate change flood level, or a minimum 150mm above surrounding ground – whichever is higher.

Access and egress via the primary street/vehicular access into the development (from Southleigh Road - to the west) will be located wholly within Flood Zone 1 at levels above the 1 in 1,000 AP event and thus have access to land entirely outside of the floodplain. There would be no requirement for occupants to enter flooded areas and so they would be entirely safe with dry access maintained.

At the detailed design stage, channel restoration and re-naturalisation options will be further explored in order to manage post-development overland flow routes. This will provide flood mitigation in addition to improvements and wider connection for landscape and ecology, restoring the surface water network to a more natural state whilst reducing flood risk to receptors both on and off site. More specifically, opportunities and options will consider two-

stage channels, improved channel morphology & sinuosity, and other ‘soft’ engineering or nature-based solutions, delivering multiple benefits.

Surface Water Drainage and Water Quality

A strategy for the surface water drainage on Site has been developed as detailed in the SWDS in *Appendix 11.2*. The key principles of the strategy are in accordance with stakeholder and policy requirements. These are:

- Surface water runoff will be restricted to 3.0l/s per hectare development for all return periods up to and including the 1 in 100 year rainfall event plus climate change;
- Surface water attenuation will be provided to accommodate the 1 in 100 year plus a 45% allowance for climate change rainfall event (in accordance with local policy requirements);
- An appropriate level of water quality treatment measures to be included in accordance with the SuDS treatment train outlined in CIRIA C735.

The drainage strategy is based on serving the Site and the Proposed Development plots which will outfall to the attenuation features before ultimately outfalling to the ordinary watercourses on Site, as per the existing watercourse flow regime.

Attenuation for the main components of the Proposed Development will be provided within large attenuation ponds. These are designed to provide habitat, amenity and ecological benefits in addition to pollution control and attenuation functions they will fulfil as part of the surface water management strategy.

The outline strategy demonstrates that a suitable scheme can be accommodated within the concept Masterplan layout and confirms sufficient storage can be provided on Site to attenuate surface water runoff up to the 1 in 100 annual probability plus 45% allowance for climate change storm event. This has been confirmed through modelling within InfoDrainage.

In line with the NPPF, PPG and key stakeholder principles, the SWDS demonstrates that a suitable drainage scheme can be developed for the Proposed Development on Site that meets national and local planning policy requirements. The scheme does not have a detrimental impact on flood risk at the Site or on flows and levels within surrounding watercourses. The final scheme will be developed in the context of the parameters plan, ecology and landscaping considerations and other scheme constraints and aspirations.

11.6 Assessment of Environmental Impacts

11.6.1 Construction Phase

The construction phase includes any demolition/site preparation, groundworks and general construction activities associated with the scheme, up to 2038. The following potential impacts of the scheme have been identified on the water environment and flood risk:

Fluvial and Tidal Flood Risk

Any temporary construction works in the floodplain associated with crossings over watercourses could cause an impact whereby the available preferential flood flow routes are

reduced or removed, which could increase the risk of flooding upstream or downstream of the scheme (outside the red line planning application boundary).

Further to this, temporary construction activities in the floodplain could impact on construction workers and site users and therefore the effect is considered to be **temporary moderate adverse** and of **moderate adverse** significance to existing properties upstream/downstream of the scheme during construction.

With embedded mitigation measures in place, the effect is considered to be **temporary negligible adverse** and of **minor adverse** significance to existing properties upstream/downstream of the scheme during construction.

Proposals to modify part of the Nore Farm Stream in the south-western part of the site, through fixing the channel left bank levels and widening a section of the channel by 0.5m on the site side, are shown to locally reduce flood levels by up to 70mm and result in no change beyond the site. As such, the effect is considered to be **permanent moderate beneficial** and of **minor beneficial** significance to fluvial flooding over the Site during construction.

Surface Water Bodies and Drainage

During construction of the scheme, the impermeable area of the Site will increase without mitigation. This has the potential to increase the likelihood of surface water flooding within the Site or outside the red line planning application boundary until the permanent drainage system is operational. This is considered to be a **temporary moderate adverse** effect and of **moderate adverse** significance.

With embedded mitigation measures in place, the effect is considered to be **temporary negligible adverse** and of **minor adverse** significance.

Surface Water Quality

Without mitigation the scheme construction phase is likely to affect the water quality of the watercourses on Site and outside the red line planning application boundary, through mobilisation of silts, contaminants and creation of new pathways during the excavation and the earthworks, as well as through a pollution incident. This is considered to be a **temporary moderate adverse** effect and of **moderate adverse** significance.

With embedded mitigation measures in place, the effect is considered to be **temporary negligible adverse** and of **minor adverse** significance.

Groundwater Quality

Without mitigation, the construction phase is likely to affect groundwater flows beneath the Site through mobilisation of contaminants and creation of new pathways during the excavation and the earthworks or through a pollution incident. The effect is considered to be temporary during the construction phase but will affect the groundwater regime permanently if mitigation measures are not put in place and therefore the effect is considered to be **permanently moderate adverse** and of **moderate adverse** significance.

With embedded mitigation measures in place, the effect is considered to be **permanently negligible adverse** and of **minor adverse** significance.

Table 11.7 - Summary of Impact Assessment – Construction Phase						
Receptor	Sensitivity/ Importance/ Value	Description of Impact	Embedded & Standard Mitigation Measures	Magnitude of Effect	Type of Effect	Significance of Effect
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Works in the floodplain could impact preferential flood flow routes and increase the risk of flooding.	CEMP/ Flood warning and evacuation plan and temporary works to control construction impacts.	Negligible Adverse	Temporary	Minor Adverse
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Channel improvements to Nore Farm Stream to enhance capacity and mitigate overland flow route in extreme flood events	Channel widening and fixing of bank levels	Moderate Beneficial	Permanent	Minor Beneficial
Impact on surface water flooding	High	Impermeable area will increase which may increase surface water flooding until the permanent drainage system is operational.	CEMP/ Flood warning and evacuation plan and temporary works to control construction impacts.	Negligible Adverse	Temporary	Minor Adverse
Impact on surface water quality	Medium	Construction is likely to affect water quality through mobilisation of silts, contaminants and creation of new pathways through excavation, earthworks, and a pollution incident.	Pollution and control measures in CEMP to control construction impacts.	Negligible Adverse	Temporary	Minor Adverse
Impact on groundwater quality	Medium	Construction is likely to affect groundwater flows through mobilisation of contaminants, creation of new pathways during the excavation and earthworks, or a pollution incident.	Pollution and control measures in CEMP to control construction impacts.	Negligible Adverse	Permanent	Minor Adverse

11.6.2 Occupation Phase

The operational (post-completion) stage is based on the provided plans and includes full occupation of the scheme from 2038 onwards for at least 100 years. The following potential impacts of the scheme have been identified on the water environment:

Fluvial and Tidal Flood Risk

Without mitigation, any works in the floodplain associated with the crossings over each of the watercourses, could obstruct or reduce preferential flood flow routes, increasing the risk of flooding upstream or downstream of the Site (outside the red line planning application boundary) and as such there is a likely **permanent moderate adverse** effect and of **moderate adverse** significance to existing properties upstream/downstream of the Site (outside the red line planning application boundary).

With embedded mitigation measures in place, the effect is considered to be **permanent negligible adverse** and of **minor adverse** significance to existing properties upstream/downstream of the Site.

Proposals to modify part of the Nore Farm Stream in the south-western part of the site, through fixing the channel left bank levels and widening a section of the channel by 0.5m on the site side, are shown to locally reduce flood levels by up to 70mm and result in no change beyond the site. As such, the effect is considered to be **permanent moderate beneficial** and of **moderate beneficial** significance to fluvial flooding to Site occupants during operation (the significance having increased from the construction phase equivalent due to the presence of occupants over the site).

Surface Water Flooding and Drainage

The scheme will result in a significant change in the amount of impermeable surfacing across the Site. This could, without mitigation, result in an increase in surface water runoff entering the receiving watercourses, and potentially adversely affecting the surface water flood risk in the area or increasing flows in the receiving systems, and therefore affecting flood risk on the Site or outside the red line planning application boundary. This is considered to be a **permanent moderate adverse** effect and of **moderate adverse** significance.

With embedded mitigation measures in place, the effect is considered to be **permanent negligible adverse** and of **minor adverse** significance.

Surface Water and Groundwater Quality

The drainage from the scheme is likely to contain contaminants from vehicles such as hydrocarbons, rubber and paint. After heavy rainfall, these contaminants could likely have a **permanent moderate adverse** effect and of **moderate adverse** significance on water quality within the receiving watercourses and groundwater both on Site and outside the red line planning application boundary.

With embedded mitigation measures in place, the effect is considered to be **permanently negligible adverse** and of **minor adverse** significance.

Table 11.8 - Summary of Impact Assessment – Occupation Phase						
Receptor	Sensitivity/ Importance/ Value	Description of Impact	Embedded & Standard Mitigation Measures	Magnitude of Effect	Type of Effect	Significance of Effect
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Any works in the floodplain could obstruct or reduce preferential flood flow routes, increasing the risk of flooding upstream or downstream of the Site.	Development outside floodplain and SuDS to mitigate rainfall runoff into channel and reduce flood risk. Watercourse crossings culverts to convey the 1 in 100 AP + 25% climate change allowance. Channel improvements and re-naturalisation of modified watercourses.	Negligible Adverse	Permanent	Minor Adverse
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Channel improvements to Nore Farm Stream to enhance capacity and mitigate overland flow route in extreme flood events	Channel widening and fixing of bank levels	Moderate Beneficial	Permanent	Moderate Beneficial
Impact on Surface Water Flooding	High	The scheme will increase the amount of impermeable surfacing which could increase surface water runoff entering the receiving watercourses.	SuDS to reduce surface water discharge to greenfield or lower rates.	Negligible Adverse	Permanent	Minor Adverse
Impact on surface water and groundwater quality	Medium	Drainage is likely to contain contaminants from vehicles such as hydro-carbons, rubber and paint, mobilised after heavy rainfall, impacting water quality within the receiving watercourses and groundwater on Site	SuDS incorporate treatment storage to remove contaminants and reduce the likelihood of them reaching receiving waterbodies.	Negligible Adverse	Permanent	Minor Adverse

11.7 Additional Mitigation Measures

No additional mitigation measures are proposed.

11.8 Residual Impact Assessment

11.8.1 Construction Phase

As no additional mitigation measures are proposed, the residual effects are as set out in *Section 11.6*.

11.8.2 Occupation Phase

As no additional mitigation measures are proposed, the residual effects are as set out in *Section 11.6*.

11.9 Cumulative Impact Assessment

The projects presented in *Chapter 2, Table 2.3*, have been considered in conjunction with the Proposed Development to assess the cumulative effects of development in the local area.

In accordance with national policy, other committed development schemes within the area will be required to incorporate measures to ensure that additional development does not have an adverse impact on flood risk or drainage, to both internal (on site) and external (off site) receptors. On this basis, these schemes will not increase flood risk to external receptors and therefore other developments.

It is considered that due to the nature of the developments considered and/or their distance from the Site, the likely cumulative effects resulting from these are **negligible**. This also includes potential interactive effects from dwellings currently completed or being constructed as part of the Proposed Development, which are also **negligible**.

The Proposed Development will be categorised as 'nil detriment' in terms of drainage and flood risk related impacts. On this basis, there will be no cumulative effects within the local area (outside the red line Site Boundary) and catchments of West Brook or Nore Farm Stream.

11.10 Summary

The effects identified are summarised in *Table 11.9* below:

Table 11.9 – Summary of effects				
Potential Effect	Sensitivity/ Importance/ Value	Mitigation measure	Magnitude of residual effect	Significance of residual effect
Construction Stage				
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	CEMP/ Flood warning and evacuation plan and temporary works to control construction impacts.	Temporary Negligible Adverse	Minor Adverse
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Channel improvements to Nore Farm Stream to enhance capacity and mitigate overland flow route in extreme flood events	Permanent Moderate Beneficial	Minor Beneficial
Impact on surface water flooding	High	CEMP/ Flood warning and evacuation plan and temporary works to control construction impacts.	Temporary Negligible Adverse	Minor Adverse
Impact on surface water quality	Medium	Pollution and control measures in CEMP to control construction impacts.	Temporary Negligible Adverse	Minor Adverse
Impact on groundwater quality	Medium	Pollution and control measures in CEMP to control construction impacts.	Permanent Negligible Adverse	Minor Adverse
Occupation Stage				
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Development outside floodplain and SuDS to mitigate rainfall runoff into channel and reduce flood risk. Watercourse crossings culverts to convey the 1 in 100 AP + 25% climate change allowance. Channel improvements and re-naturalisation of modified watercourses	Permanent Negligible Adverse	Minor Adverse
Impact on Fluvial Flooding – Ordinary Watercourses	Medium	Channel improvements to Nore Farm Stream to enhance capacity and mitigate overland flow route in extreme flood events	Permanent Moderate Beneficial	Moderate Beneficial
Impact on surface water flooding	High	SuDS to reduce surface water discharge to greenfield or lower rates.	Permanent Negligible Adverse	Minor Adverse
Impact on surface water and groundwater quality	Medium	SuDS incorporate treatment storage to remove contaminants and reduce the likelihood of them reaching receiving waterbodies.	Permanent Negligible Adverse	Minor Adverse