OXFORDSHIRE
STRATEGIC RAIL FREIGHT INTERCHANGE

Preliminary Environmental Information (Work in Progress) Report (PEIR)

Draft Environmental Statement

Chapter 9: Water Environment (including flood-risk, drainage and water quality)

On behalf of
Oxfordshire Railfreight Limited

Prepared by BWB Consulting
May 2022

CONTENTS

9.1 INTRODUCTION

9.1.1 This draft chapter has been produced for the purposes of consultation and seeks to assess the potential effect of the Proposed Development on the water environment, including flood risk, drainage, water quality, water supply, and surface and foul water sewerage capacity. Being 'preliminary' in nature, it includes an initial assessment of the potential cumulative effect of the Proposed Development on the water environment, using the information available at the time of writing. It should therefore be noted that chapter includes data gaps to be completed at a later date, and the level of detail available varies somewhat across this draft ES chapter. For example, some of the baseline has been informed to date by desk studies and some by *insitu* assessment, but this approach still allows a clear indication of the likely significant effects to inform the consultation. Additional surveys are being undertaken as part of the ongoing EIA and these will help inform the technical assessments presented in the final ES in due course.

9.1.2 The chapter considers the effect of the Proposed Development upon the Application Site and surrounding area in relation to existing baseline conditions and relevant legislation and national, regional, and local planning policy.

9.1.3 It provides a description of the methods used in the assessment. This is followed by a description of the relevant baseline conditions of the Proposed Development and a provisional assessment of the likely environmental effects of the Proposed Development during the construction works and once it is completed and operational. Mitigation measures are identified and/or proposed, where appropriate, to avoid, reduce or offset any significant adverse effects identified, together with the nature and significance of any likely residual effects.

9.1.4 The information presented here has been drafted by qualified technical specialists, working to a model structure, described below.

9.1.5 This chapter is accompanied by the following appendices

- Appendix 9.1: Water Environment Glossary of Terms

9.2 ASSESSMENT SCOPE AND METHODOLOGY

9.2.1 The focus of this Chapter is on providing sufficient preliminary information on the likely significant effects of the proposals, so as to facilitate and inform the consultation process. Whilst the focus is on the more important significant effects, in identifying these, the preliminary assessments review a much wider range of potential impacts and effects.

Consultation

EIA Scoping Opinion

9.2.2 An application for an EIA Scoping Opinion was submitted to the Secretary of State in June 2021. A Scoping Opinion from the Planning Inspectorate, on behalf of the Secretary of State, was provided in July 2021.

9.2.3 Table 9.1 summarises the Planning Inspectorate's comments received in relation to the water environment, and how these comments have been considered in the draft chapter.

Table 9.1: Advice in the Secretary of State's EIA Scoping Opinion concerning the assessment of the water environment (July 2021)

PINS ID	Subject	Comments	Response
4.7.2	Spatial Scope	The Scoping Report focuses largely on the 'Main Site'. The scope of the assessment should consider the potential for significant effects to occur from all areas of the redline boundary for the Proposed Development. This is the area the Applicant refers to as 'the Application site'.	This draft chapter has assessed the whole of the Application Site not only the 'Main Site'.
4.7.3	Direct effects on watercourses	The description of the development does not mention how the existing watercourses present within the redline boundary will be affected by construction or operation of the Proposed Development. The layout presented in drawing 8308-L-23 in the Scoping Report indicates that infrastructure would be built directly over sections of the Gagle, Ashgrove and Padbury Brooks and shows the Middleton Stoney relief road corridor bisecting the Gagle Brook. The ES should therefore scope in the potential for significant effects on the flow, water quality and morphology of these watercourses in addition to consideration of surface water quality effects during demolition, construction and operational phases of the Proposed Development. Where culverting is proposed to a	This draft chapter includes assessment of the effect of the Proposed Development on these watercourses.

		main river or ordinary watercourse, this should be discussed with the Lead Local Flood Authority and / or the Environment Agency. The potential for significant effects from shading where culverting is proposed should also be scoped into the assessment.	
4.7.4	Temporal scope of the assessment	The Scoping Report has not defined the temporal scope of the assessment. The Inspectorate considers that effects on the water environment should be considered for both construction and operation of the Proposed Development.	This draft chapter considers the effects for both construction and operation phases.
4.7.5	Water dependent ecological sites and SSSIs	The Scoping Report correctly notes there are two SSSIs situated (in part) within the redline boundary of the Proposed Development. The Inspectorate considers that the ES should also determine whether pathways exist for potential effects to occur on protected or water dependent ecological sites outside of the redline boundary.	The Study Area for this draft Chapter has been extended outside of the redline boundary.
4.7.6	Significance of effects	The ES should clearly set out which effects, determined through the use of the matrix provided, are considered to be 'significant' and 'not significant'.	The matrix provided in Table 9.7 will be used to determine those effects considered to be 'significant' and 'not significant'.
4.7.7	Sensitivity and magnitude of effect criteria	The sensitivity and magnitude of effect criteria should be reviewed to ensure they consider the potential additional effects on watercourses referred to in the Inspectorates comments (ID 4.7.3 and 4.7.5).	Sensitivity and magnitude have been reviewed and are considered to cover the additional effects on the watercourses referred to in the Inspectorate's comments.
4.78	Study area	The ES should review and update the study area proposed for the water assessment in light of the Inspectorate's comments in ID 4.7.3 and 4.7.5. The study area for the assessment should be supported in the ES by appropriately scaled, clearly legible figures.	The Study Area for this draft Chapter has been extended outside of the redline boundary and is supported by appropriate figures.

Environment Agency (EA)

9.2.4 The EA was consulted by the Applicant in July 2021 to determine what information it held on flood risk for the Application Site. The EA confirmed it does not hold any detailed hydraulic modelling information for the Ordinary Watercourses in the Study Area.

9.2.5 The EA were further consulted in November 2021 to determine if they would require input into, and review of, the hydraulic modelling of the Ordinary Watercourses. No response has been received to date.

Oxfordshire County Council (OCC)

9.2.6 OCC, as the Lead Local Flood Authority ('LLFA') for this area, was consulted by the Applicant in July 2021 to ascertain what information, relevant to flood risk, the Council holds. OCC's response confirmed they do not hold any of the information requested and are not aware of any records of past flooding within the Application Site and the Study Area.

OCC (Highways)

9.2.7 OCC Highways was consulted by the Applicant in July 2021 to determine what information it held on hydraulic structures (culverts and bridges) in the vicinity of the Application Site. The request to OCC Highways was forwarded to National Highways (NH).

National Highways

9.2.8 NH (formally Highways England) was consulted by the Applicant in July 2021 to determine what information it held on structures crossing beneath the stretch of the M40 in the vicinity of the J10 Highway Improvements and Ardley Bypass.

9.2.9 A response was received that provided plans of culverts and drainage assets, where available. Where suitable, the information provided by NH has been used to inform the hydraulic modelling and will be used to inform a Flood Risk Assessment (FRA) and Sustainable Drainage Strategy (SDS).

Local Planning Authority (LPA): Cherwell District Council (CDC)

9.2.10 CDC was consulted by the Applicant in July 2021 to determine what information on flood risk and drainage they hold which may support the assessment. With the exception of Strategic Flood Risk Assessments (SRFA) and Water Cycle Studies (WCS), the LPA does not hold any information pertinent to the Application Site.

Further detail of the SFRA and WCS is provided in the *Policy Context* section of this draft Chapter.

9.2.11 A discussion was also held with a representative of the Council on 22 July 2021 in which the Council provided background to the watercourses and catchments in the vicinity of the Application Site.

Thames Water (TW)

9.2.12 TW was consulted by the Applicant in September 2021 to obtain latest sewer records. A Pre-Development Enquiry has also been submitted to understand the capacity of the local sewer network to receive foul flows from the Proposed Development. Discussions are ongoing with TW regarding foul flows.

Anglian Water (AW)

9.2.13 AW have been contacted to obtain latest sewer records. A Pre-Development Enquiry has also been submitted to understand the capacity of the local sewer network to receive foul water flows from the Proposed Development. Discussions are ongoing with AW regarding foul flows.

Network Rail

9.2.14 Network Rail was consulted by the Applicant in July 2021 to determine what information they held on structures crossing beneath the railway line in the vicinity of the Application Site. Network Rail responded with information on culverts and drainage systems for the Study Area. Where relevant, this information has been used to support the hydraulic modelling and will be used to inform the FRA and SDS.

Canal and River Trust (CRT)

9.2.15 The CRT have confirmed that, following review of the Scoping Opinion, the Proposed Development is unlikely to have any effect on their waterway (the Oxford Canal).

Definition of Study Area

9.2.16 The 'Study Area' is defined as the Application Site boundary plus an additional 1km buffer. The 1km buffer provides coverage of potential other significant receptors that exist beyond the Application Site, as well as cumulative schemes, which will also be included within this chapter. These receptors include flood risk and drainage pathways between the Application Site and potential receptors such as the Ashgrove

Brook, Gagle Brook, Padbury Brook, the sewerage system and groundwater. The Study Area is shown in Figure 9.1.

9.2.17 However, it should be recognised that the Environment Agency (EA) assesses surface water and groundwater quality at a river catchment level. Therefore, when considering a potential for effect on downstream water quality, the potential for effects at a river catchment level, rather than limited to a 1km radius have also been considered in this draft chapter.

Surveys

9.2.18 Baseline characterisation has been established through both desktop study and hydraulic modelling, including:

- Desk-based studies comprising;
- identification of existing catchment pressures (e.g., point source and diffuse pollution issues) based on review of the EA's online catchment data explorer;
- identification of any flood risks, typically associated with fluvial and surface water sources at this location. This has been informed by consultation with the EA as well as further site-specific hydraulic modelling.
- review of soil, geological and hydrogeological information as described in more detail in *Draft Chapter 11: Ground Conditions*.
- review of surface water hydrology, including water features and surface water drainage in the vicinity of the Application Site based on EA geo-spatial data, location mapping and Ordnance Survey mapping.
- A watercourse survey was undertaken by BWB Consulting Ltd (2021) to support the hydraulic modelling. Surveys of watercourse cross sections including open channel and structures were undertaken to EA standards. The survey included the Padbury Brook where it crosses the Application Site and the Gagle and Ashgrove Brooks. Hydraulic flood modelling of the Padbury and Gaggle Brooks for the baseline scenario has been completed. Modelling of the Proposed Development is ongoing at the time of writing.
- Where access was not available during the watercourse survey due to landownership constraints or vegetation that prevented access, the EA's 2m Composite Light Detection and Ranging ('LiDAR') 2020 dataset has been used to supplement the survey.
- In addition to the above, the assessment has also used a topographical survey of the Main Site (undertaken by Greenhatch Group, 2021). This topographical survey within the Main Site is used to support the hydraulic modelling.

Assessment Sources

9.2.19 This draft chapter has been informed by the following additional sources of information:

- Third party data sets, and
- Information provided as part of the consultation responses (‘outlined in ‘Consultation’ section above).

9.2.20 The data sources that have informed the assessment of impact are summarised in Table 9.2.

Table 9.2: Data Sources

Source	Dataset
gov.uk Open Data	Flood Map for Planning Flood Risk from Surface Water mapping Reservoir inundation mapping Source Protection Zones Thames River Basin Management Plan
Environment Agency	Abstraction licence strategy (Catchment Abstraction Management Strategy) (CAMS) Catchment Data explorer
British Geological Survey	1:50,000 digital geology mapping (superficial and bedrock)
MAGIC Website	Designated sites Aquifer designations Nitrate vulnerable zones
Lead Local Flood Authorities / Local Authorities	Surface water flood management plans (SWMPs) Strategic Flood Risk Assessments Records of local flood history

9.2.21 The advice entitled *Flood Risk Assessments: Climate Change Allowances* (EA, 2016, updated 2021)[1] has been used to determine the potential future baseline in terms of fluvial flood risk. This guidance has also been used to inform the surface water drainage designs.

Establishing baseline conditions

9.2.22 The most common source of flooding is when water levels in rivers rise and overtop their banks ('fluvial' flooding). Fluvial, or riverine, flooding occurs when excessive rainfall over an extended period of time causes a river to exceed its capacity. It can also be caused by heavy snow melt and ice jams. The damage from a river flood can be widespread as the overflow affects smaller rivers downstream, often causing dams and dikes to break and swamp nearby areas.

[1] Flood risk assessments: climate change allowances, Environment Agency (2021)

9.2.23 There are two main types of fluvial flooding:

- Overbank flooding occurs when water rises and flows over the edges of a river or stream. This is the most common and can occur in any size channel — from small streams to large rivers; and

- Flash flooding is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

9.2.24 A 'pluvial', or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. One of the most common misconceptions about flood risk is that one must be located near a body of water to be at risk.

9.2.25 There are two common types of pluvial flooding:

- Intense rain saturates an urban drainage system. The system becomes overwhelmed and water flows out into streets and nearby structures; and

- Run-off or flowing water from rain falling on hillsides that are unable to absorb the water. Hillsides with recent forest fires are notorious sources of pluvial floods, as are suburban communities on hillsides.

9.2.26 This assessment considers both fluvial and pluvial effects. It does not consider the effects of 'coastal' (or 'surge' flooding) given the lack of the site's proximity and hydrological connectivity to the coastline.

9.2.27 The existing and likely future environmental conditions in the absence of the Proposed Development are known as 'baseline conditions'. This draft chapter includes a description of the current (baseline) environmental conditions. The baseline conditions at the Application Site and within the Study Area form the basis of the assessment, enabling the likely significant environmental effects to be identified through a comparison with the baseline conditions. The information set-out above is used to determine the baseline characteristics.

Scope of Assessment

9.2.28 The scope of this chapter has been developed with regard to consultation with relevant statutory and non- statutory consultees (including via ES Scoping responses) and is detailed in Table 9.3 and Table 9.4.

Table 9.3: Issues Considered in the Assessment

Issue	Potential Effects
Construction Phase (including Demolition): Water Environment	
Geomorphology	Sediment from construction areas washed off into watercourses increasing turbidity and impacting on morphology.
	Change in drainage strategy altering flows to receiving watercourses affecting geomorphology.
Groundwater Resources	Spillage at surface impacting the quality of groundwater resources.
Water Quality	Contaminated runoff or spillage from construction areas impacting surface water.
	Change in drainage strategy altering flows to receiving watercourses affecting water quality.
Flood Risk	Temporary storage of materials reduces the volume of floodplain storage increasing flood risk.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by construction works, or due to increased compaction of ground or increase in impermeable area.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk.
Surface Water Drainage	Discharges from construction activities leading to increased flows to the surface water network increasing the risk of flooding from the surface water drainage.
	Sediment from construction areas washed off into surface water drainage causing blockage and flooding.
Wastewater	Increased flows during construction due to additional workers discharging to the wastewater network.
Water Supply	Increased demand on existing water supply/water resources to support construction activities.
Operational Phase: Water Environment	
Geomorphology	Potential effects due to realignment:of two limbs of the upper reaches of the Ashgrove Brook: disruption of quantity and dynamics of flow and sediment supply due to changes in bed and bank form, channel planform, cross-section and gradients.
Water Quality	Runoff from increased impermeable areas increasing sediment loading in watercourses.
Groundwater Resources	Spillage at surface impacting the quality of groundwater resources.
Flood Risk	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to existing, or creation of new, channel structures (eg culverts) reduces capacity and increases flood risk.
	Changes in drainage strategy – increased runoff leading to an increase in flood risk.
	Increased fluvial flood risk due to loss of floodplain storage arising from elements of Project within the floodplain.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by the Proposed Development, or due to increased impermeable area.

Surface Water Drainage	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to highways resulting in increased surface water runoff increasing flood risk.
Wastewater	Additional treated effluent impacting surface water quality if appropriate wastewater collection and treatment is not provided.
	Increased discharges to the existing foul sewerage system leading to flooding if insufficient capacity is available.
Water Supply	Increase in potable water demand, requiring new infrastructure and affecting sustainability of supply from local water resource zone.

Table 9.4: Issues Scoped out of the Assessment

Issue	Justification
Tidal/coastal flood risk	The Application Site is approximately 111 km north-east of the nearest coastline and therefore is not at tidal/coastal flood risk.
Groundwater impact on public water supply	There are no public water supply boreholes in the Study Area and the nearest Source Protection Zone for public supply boreholes is over 17 km away.

Geomorphology and Water Quality

9.2.29 The potential geomorphological and water quality impacts of the Proposed Development and flood risk mitigation components will be assessed as part of a Water Framework Directive (WFD) Assessment which will be used to inform the ES in due course. The baseline assessment will be indicative of the current condition of the watercourses. The sensitivity of each watercourse to impacts is based on the water body status published on the EA's Catchment data explorer website for Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. This publishes data on the status of each water body, as required by the River Basin Management Plan.

Groundwater

9.2.30 Groundwater impacts have been evaluated based on desk study information, including historic Ground Investigation (GI) surveys for this draft chapter. Site specific GI surveys will be used to inform the ES in due course.

9.2.31 The risk from groundwater flooding will be included in the FRA that will be used to inform the ES in due course.

Flood Risk and Surface Water Drainage

9.2.32 A site-specific fluvial hydraulic modelling has been developed by BWB Consulting, in partnership with the EA, the results of which have been used to define the baseline. The Proposed Development will be modelled by adding it to the baseline version of

the hydraulic model and re-running the model. Findings of the final assessment will be reported in the FRA that will be in an appendix to the ES.

Wastewater

9.2.33 The potential impacts on wastewater infrastructure will be assessed as part of the foul water drainage strategy. Discussions with sewerage companies are ongoing.

Identifying likely significant effects

9.2.34 The approach to assessment has incorporated the use of identified assessment years to allow for preliminary evaluation of the likely effects during the phased construction process and during the operation of the Proposed Development. The final ES will include confirmed (intended) phasing information.

9.2.35 For some of the assessment years, construction activities would occur alongside early operation, and phased construction and this has been taken into account in the assessments.

9.2.36 This draft chapter provides a preliminary view on the likely significant effects which will be refined during the ongoing EIA and iterative scheme development process.

9.2.37 This section provides details of the methodology for the assessment process. The approach takes into account both the sensitivity of receptors affected and the magnitude of the likely impact in determining the significance of the effect.

Determining Effect Significance

Determining Sensitivity of Receptors

9.2.38 The sensitivity of the resource or features being assessed is to be defined according to the definitions of receptor sensitivity in Table 9.5 and considers the quality, rarity and sensitivity of the resource changing. The definitions in Table 9.5 are consistent with Table 3.70 of DMRB LA113 – Road Drainage and the Water Environment.

Table 9.5: Definition of receptor sensitivity

Sensitivity	Typical Criteria	Typical Examples	
Very High	Nationally significant attribute of high importance	Surface Water	Receiving watercourse classified as High status / potential under the WFD. Site protected under European Union (EU) or UK wildlife legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI)). Species

			protected under EU or UK wildlife legislation.
		Groundwater	Principal aquifer providing a regionally important recourse and/or supporting a site protected under EU and UK legislation. Groundwater Source Protection Zone (GSPZ) inner or outer protection zone (Zone 1).
		Flood risk	Vulnerability Classification “Essential Infrastructure” or “Highly Vulnerable”. Flood Zone 3b.
High	Locally significant attribute of high importance	Surface Water	Receiving watercourse classified as High status / potential under the WFD. Species protected under EU or UK wildlife legislation.
		Groundwater	Principal aquifer providing locally important resource of supporting a river ecosystem. GSPZ 2. EA current groundwater quantitative and chemical qualities defined as Good.
		Flood risk	Vulnerability Classification “More Vulnerable”. Flood Zone 3.
Medium	Attribute with moderate quality and rarity	Surface Water	Receiving watercourse classified as Good or Moderate Ecological status / potential under WFD.
		Groundwater	Aquifer providing water for agricultural or industrial use with limited connection to surface water (Secondary A aquifer) GSPZ 2.
		Flood Risk	Vulnerability Classification “Less Vulnerable”. Flood Zone 2.
Low	Lower quality attribute	Surface Water	Receiving watercourse classified as Poor Ecological status / potential under WFD.
		Groundwater	Unproductive strata.
		Flood Risk	Vulnerability Classification “Water Compatible”. Flood Zone 1.

Magnitude of Impact

9.2.39 Impacts are identified as the physical changes to the environment attributable to the Proposed Development. The magnitude of the impact has been described using the criteria defined in Table 9.6.

9.2.40 Impacts have been described as beneficial or adverse, and the potential magnitude of this impact rated from major to negligible / no change. The magnitude and criteria is consistent with that set out in Table 3.71 of the DMRB LA113 – Road Drainage and the Water Environment.

9.2.41 Impacts have been divided into those occurring during the construction phase and those occurring during operation.

9.2.42 The impacts related to land take have been assessed as part of the construction process within the year that the impact would occur. These impacts could be considered either temporary or permanent depending on whether the land would be restored following completion of the construction phase.

Table 9.6: Magnitude of Impacts

Magnitude	Criteria	Potential Impact
Major (adverse)	Results in a loss of attribute and/or quality and integrity of the attribute.	Reduction in WFD classification or comprised ability to achieve targets. High risk of aquifer contamination. High potential for change in groundwater quantity and/or aquifer recharge. Loss of floodplain without compensation. Threat to individuals or potential loss of life from flooding. Increased flood risk to existing properties. Comprised ability of existing drainage infrastructure.
Moderate (adverse)	Results in effect on integrity of the attribute, or loss of part of the attribute.	Reduction in WFD Quality element without affecting overall status. Medium risk of aquifer contamination. Medium potential for reduction in groundwater quantity and/or aquifer recharge. Increased residual flooding frequency. Increase in flood risk to third party land (undeveloped). Increase in flood frequency to existing drainage infrastructure.
Minor (adverse)	Results in some measurable change in the	Low risk of aquifer contamination from accidents/spillages.

	attribute's quality or vulnerability.	Low potential for reduction in groundwater quantity and/or aquifer recharge. Increased flood risk within Study Area.
Negligible (neutral / not significant)	Results in an effect on the attribute, but of insufficient magnitude to affect the use or integrity.	Little to no effect on WFD quality elements. Little to no potential of contamination from accidents/spillages. Little to no potential effect on groundwater quantity and/or aquifer recharge. No change to floodplain extent or flood frequency. No increase in risk from additional structures or flood defences.
Minor (beneficial	Results in some beneficial effect on the attribute or a reduced risk of a negative effect occurring.	Contribution towards WFD quality element without changing status. Reduction in point and/or diffuse pollution sources. Potential improvement in groundwater quality and/or aquifer recharge.
Moderate (beneficial)	Results in a moderate improvement of the attribute's quality.	Measured improvement in WFD quality element. Confirmed removal of point and/or diffuse pollution sources. Removal or termination of abstraction from groundwater/ aquifer. Reduced flood risk to undeveloped third-party land. Reduced residual flood risk from blockage to existing structure or flood defence. Reduced flood risk from existing drainage infrastructure.
Major (beneficial)	Results in a major improvement of the attribute's quality.	Increase in overall WFD classification and/or resilience applied against future changes. Reduced flood risk to existing properties. Strategic management of flood risk issues. Significant removal of various pollution sources.

No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Determining the Significance of Effect

9.2.43 Effect is the term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by considering both the magnitude of the impact and the sensitivity of the receptor affected.

9.2.44 The magnitude of an impact does not generally directly translate into significance of effect. For example, a significant effect may arise as a result of a relatively modest impact on a resource of national value, or a large impact on a resource of local value. In broad terms, therefore, the significance of the effect can depend on both the impact magnitude and the sensitivity or importance of the receptor.

9.2.45 Table 9.7 sets out the general approach proposed to inform the assessment of significance based on the sensitivity of the receptor and the magnitude of impact. Where a range of significance levels are presented, the final assessment for each effect is based upon expert judgement.

9.2.46 In all cases, the evaluation of receptor sensitivity or value, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

9.2.47 For the purpose of undertaking the assessment, effects determined to be of moderate significance or greater are considered significant in EIA terms.

Table 9.7: Determination of significant effects for the water environment

Magnitude	**Receptor Value / Sensitivity**			
	Very High	**High**	**Medium**	**Low**
Major	Very Large	Large or Very Large	Moderate or Large	Slight or Moderate
Moderate	Large or Very Large	Moderate or Large	Moderate	Slight
Minor	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight
No Change	Neutral	Neutral	Neutral	Neutral

9.2.48 A description of the significance levels, as set out in Table 3.7 of the DMRB LA104 – Environmental assessment and monitoring, is as follows:

- Very Large: Effects at this level are material in the decision-making process.
- Large: Effects at this level are likely to be material in the decision-making process.

- Moderate: Effects at this level can be considered to be material decision-making factors.
- Slight: Effects at this level are not material in the decision-making process.
- Neutral: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Demolition and construction

9.2.49 The identification of potential significant effects during the demolition and construction phase is based on a review of the presence of potential receptors, a qualitative assessment of the sensitivity of the receptor and an assessment of the potential pathways for effects and magnitude of likely change.

Operational Development

9.2.50 The methodology for demolition and construction is also applied to the identification of potential significant effects during the operational phase. This will be informed by hydraulic modelling, undertaken in order to assess the flood risk more accurately and to inform the design of the Proposed Development, and associated mitigation strategies, in order to minimise any increase in flood risk to both off-site receptors and to the Proposed Development itself and its potential occupants.

Duration of Effect

9.2.51 Identified effects can have differing durations. These have been defined as:

- Short-term (temporary): temporary effects related to a specific construction event of no more than a year duration – such as the construction of an individual building or a specific element of infrastructure such as a section of road.
- Medium-term (temporary and permanent): this covers the construction phase, where some elements of the development are operational whilst others are still under construction.
- Long-term (permanent): permanent effects arising from the operation of the OxSRFI or from the permanent presence or removal of physical features.

Mitigation, Monitoring and Enhancement Measures

9.2.52 Where significant effects are identified, a description of any feature of the Proposed Development, or mitigation measures envisaged in order to avoid, prevent or reduce or, if possible, offset any likely significant adverse effects on the water environment will be provided in this chapter when finalised.

9.2.53 The development of mitigation measures is part of the iterative EIA process. Therefore, measures are under consideration throughout the EIA process in response to the findings of initial assessments.

9.2.54 However, the Proposed Development will include a range of 'embedded' measures designed to reduce or prevent significant adverse environmental effects arising. In some cases, these measures may result in enhancement of current environmental conditions or help alleviate existing issues. The assessment of effects within this draft chapter takes into account all measures that currently form part of the Proposed Development.

9.2.55 These measures will be refined further through the EIA process and in response to consultation, and if other elements of the proposed development evolve, prior to preparation of the final ES.

9.2.56 The assessment included in this draft chapter consider the following mitigation types:

- measures included as part of the Project design (embedded mitigation), including measures required as a result of legislative requirements or standard good practice; and
- measures proposed to avoid effects occurring or to minimise environmental effects, such as measures to control light spillage (sometimes referred to as additional/further or secondary mitigation).

9.2.57 As the EIA process progresses, further work in relation to mitigation measures will be undertaken and this will inform the design of the Proposed Development. This will be reflected in the final ES Chapter.

Cumulative and Inter-related Effects

9.2.58 Cumulative effects with other proposed developments will be assessed as part of the EIA process. This will include consideration of whether the Proposed Development, when considered together with other committed and planned developments, may result in any greater effects on a receptor than the effects of the Proposed Development alone. The list of developments to be considered is to be agreed with the Local Authority and will inform the final ES Chapter.

Next Steps

9.2.59 This draft Chapter provides a preliminary view on the likely significant effects and the appropriate methodologies to assess and address those effects. The environmental assessment is ongoing and, therefore, the development of the Proposed Development design and appropriate mitigation, monitoring and enhancement measures will be refined alongside the continued assessment and taking into account the consultation responses received.

9.2.60 The findings will be reported in the ES Chapter when finalised.

Limitations and Assumptions

9.2.61 There is some degree of inherent uncertainty within the assessment process. In all cases, where uncertainty exists, or where difficulties have been encountered, this has been identified, together with details of the measures that have been taken to reduce uncertainty as far as reasonably practicable. As the assessment process progresses, the degree of uncertainty is anticipated to reduce.

9.2.62 The EIA process to date has been undertaken based on the description set out in Chapter 2: Project Description.

9.2.63 This draft chapter is based on available data from the EA and British Geological Survey (BGS). The accuracy of this information has not been verified. The EA data used to inform this Chapter is understood to be the latest available data.

9.2.64 EA 2m LiDAR composite data has been used as part of the hydraulic modelling assessment. There are accuracy limitations associated with the use of LiDAR data, including a 150mm vertical accuracy across each 1m cell.

9.2.65 The Government's Flood Map for Planning does not include all the watercourses in the vicinity of the Application Site. As such, hydraulic modelling, of the baseline scenario, has been undertaken to fill this data gap. Modelling of the Proposed Development is ongoing.

9.2.66 Care has been taken to ensure that the hydraulic modelling software selected is appropriate for the assessment, taking into account good practice and guidance.

9.2.67 Additional inherent uncertainties and limitations are associated with conducting a hydrological assessment and hydraulic modelling exercise which have been used to assess the baseline flood risk to the Proposed Development. These limitations will be documented as part of a Hydraulic Modelling Report.

9.2.68 The level of understanding will be consolidated and advanced through further work, including a Highways Agency Water Risk Assessment ('HAWRAT'), FRA, SDS and WFD Assessment which will be included as appendices to the ES.

9.2.69 There will always be some element of uncertainty regarding future trends in environmental conditions and climate. The assessments made have been based on the most up to date information available at the time of assessment, including information available from the UK Climate Projections project and on published documents such as the UK Climate Change Risk Assessment 2019.

9.3 POLICY CONTEXT

9.3.1 The following summarises planning and environmental legislation, policies and guidance which are considered relevant to the water environment in relation to the Proposed Development, and accordingly have been referenced and consulted in the preparation of this draft chapter.

National Policy Statement for National Networks (2014)

9.3.2 The Department of Transport National Policy Statement for National Networks[2] sets out the need for, and Government policies for, nationally significant infrastructure rail and road projects for England. The sections relevant to this chapter are Climate Change Adaption (paragraphs 4.36-4.47), Flood Risk (paragraphs 5.90-5.115) and Water Quality and Resources (paragraphs 5.219-5.231). The requirements set out include:

Climate Change Adaption

- Development should take into account the potential impacts of climate change using the latest UK Climate Projects available at the time and ensure any environment statement that is prepared identifies appropriate mitigation or adaption measures (paragraph 4.42)

Flood Risk

- Applicants should undertake an FRA which should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account (paragraphs 5.92 and 5.93)
- For construction work which has drainage implications, approval for the project's drainage system will form part of any development consent issued by the Secretary of State. The Secretary of State will therefore need to be satisfied that the proposed drainage system complies with any National Standards (paragraph 5.100)

Water Quality and Resources

- Where a development is subject to EIA and the development is likely to have significant adverse effects on the water environment, the applicant should ascertain the existing status of, and carry out an assessment of the impacts of the proposed project on water quality, water resources and physical characteristics as part of the environmental statement (paragraph 5.221)

[2] National Policy Statement for National Networks, Department for Transport (December 2014)

- The proposal has had regard to the River Basin Management Plans and the requirements of the Water Framework Directive (paragraph 5.226).

The Water Resources Act 1991

9.3.3 The Water Resources Act[3] relates to the control of the water environment. The main aspects of the Act which are relevant to the Proposed Development include provisions concerning land drainage, flood mitigation and controlling discharges to watercourses to prevent water pollution. It also outlines the functions and responsibility of the EA in regulating the water environment.

Flood and Water Management Act 2010

9.3.4 The Flood and Water Management Act[4] takes forward some proposals from the UK government's report 'Future Water, Making Space for Water' and the government's Response to Sir Michael Pitt's Review of the summer 2007 floods.

9.3.5 The Act gives the EA the strategic overview of management of flood risk in England. It gives upper tier local authorities in England responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas.

9.3.6 Local flood authorities, district councils, internal drainage boards and highways authorities have a duty to aim to contribute towards sustainable development.

National Planning Policy Framework 2021

9.3.7 The NPPF[5] sets out the Government's national policies on various aspects of land use planning, including flood risk.

9.3.8 With regards to the water environment, the NPPF requires development to be located in areas of lower flood risk where possible and stresses the importance of preventing increases in flood risk to the wider catchment.

9.3.9 The NPPF sets out a sequential, risk-based approach to the location of development, considering all sources of flood risk and the current and future effects of climate change, so as to avoid, where possible, flood risk to people and property.

9.3.10 The NPPF is accompanied by National Planning Practice Guidance (PPG)[6]. The PPG relevant to surface water and flood risk is Flood Risk and Coastal Change, which sets out the vulnerability and suitability of different land uses to flood risk.

[3] The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009
[4] Flood and Water Management Act (2010)
[5] National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2021)
[6] National Planning Practice Guidance: Flood Risk and Coastal Change, Ministry of Housing, Communities and Local Government (2014)

CIRIA Document C753: The SuDS Manual (2015)

9.3.11 The CIRIA SuDS Manual[7] provides guidance regarding planning, design, construction and maintenance of Sustainable Drainage Systems (SuDS) to aid with the effective implementation within both new and existing developments.

Design Manual for Roads and Bridges LA 113 (Road Drainage and the Water Environment) (2020)

9.3.12 The Highways Agency's DMRB[8] gives guidance on the assessment and management of the impacts that road projects may have on the water environment. These include possible impacts on the quality of water bodies and on the existing hydrology of the catchment(s) through which roads pass. The Standard may also be applied to existing roads, where appropriate.

Water Framework Directive (2000)

9.3.13 The WFD[9] is an important mechanism for assessing and managing the water environment in the EU, through a six-yearly cycle of planning and implementing measures to protect and improve the water environment. Following the UK decision to leave the EU, the EU WFD has been revoked and replaced in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[10].

9.3.14 The assessment and protection of waterbodies is undertaken by implementing River Basin Management Plans (RBMP). In general terms, there is an onus on developers to protect and, if possible, enhance waterbodies close to proposed developments. Eleven River Basin Districts have been identified in England and Wales, of which the Study Area falls within the Thames River Basin District and Anglian River Basin District. The Regulations include a requirement for surface water bodies to achieve 'good' status with respect to ecology and water chemistry by 2021. Progress is monitored by the EA in its role as the 'competent authority'.

9.3.15 The current RBMPs relevant to the Study Area are the Thames RBMP 2015 – 2021[11] and the Anglian RBMP 2015 – 2021[12]. The latest versions of the RBMPs, undertaken by Defra and the EA, include an assessment of river basin characteristics, a review

[7] CIRIA C753 The SuDS Manual, B. Woods Ballard, S. Wilson, H. Udale-Clarke, S. Illman, T. Scott, R. Ashley. R. Kellagher (2015)
[8] Design Manual for Roads and Bridges LA 113 Road Drainage and the Water Environment. Highways England (March 2020)
[9] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy
[10] UK Statutory Instruments: 2017 No. 4.7: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
[11] Thames River Basin District River Basin Management Plan, Defra and Environment Agency (2015)
[12] Anglian River Basin District River Basin Management Plan, Defra and Environment Agency (2015)

of the impact of human activities, statuses of water bodies and economic analysis of water use and progress since the first plans were published in 2009.

Flood Risk Assessments: Climate Change Allowances (2016, updated 2021)

9.3.16 Predicted future change in peak river flows caused by climate change are provided by the EA within their online guidance 'Flood Risk Assessments: Climate Change Allowances', with a range of projections applied to a series of 'Management Catchments' within regionalised 'River Basin Districts'. Within each Management Catchment, allowances are provided for different epochs and allowance categories. When determining the appropriate allowance for use in an assessment the Flood Zone classification, flood risk vulnerability and the anticipated lifespan of the Proposed Development should be considered.

Preliminary Flood Risk Assessment (2011, reviewed 2017))

9.3.17 The OCC Preliminary Flood Risk Assessment (PFRA)[13] is an assessment, undertaken by OCC, of floods that have taken place in the past and floods that could take place in the future. It considers flooding from surface water runoff, groundwater and ordinary watercourses. The PFRA seeks to assess past and future flood risk and identify areas at significant flood risk. The PFRA was reviewed in 2017 and concluded no change to the assessment was required.

Local Flood Risk Management Strategy (published date unknown)

9.3.18 The OCC Local Flood Risk Management Strategy (LFRMS)[14] was prepared by OCC to help understand and manage flood risk in Oxfordshire. The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so floods can be better managed. The LFRMS also aims to promote sustainable development and environmental protection. An update of the strategy is expected in 2022 and will be taken into account if available prior to completion of the final assessment.

Oxfordshire Strategic Water Cycle Study – Phase 1 Scoping (2021)

9.3.19 The Oxfordshire Strategic Water Cycle Study (WCS) Phase 1[15] was prepared by a consortium of councils in Oxfordshire to provide evidence to support the Oxfordshire Plan 2050. The WCS covers Oxfordshire and raises awareness with regards to the implications of development on the wider water environment and water and wastewater infrastructure. It considers the cumulative impact of development and the opportunities for strategic level policies as well as providing information to inform wider infrastructure planning.

[13] Preliminary Flood Risk Assessment, Oxfordshire County Council (2011)
[14] Local Flood Risk Management Strategy, Oxfordshire County Council (published date unknown)
[15] Oxfordshire Strategic Water Cycle Study – Phase 1 Scoping, JBA Consulting (July 2021)

Cherwell Water Cycle Study (2017)

9.3.20 The Cherwell Water Cycle Study[16] was prepared by CDC as part of the evidence base for the Partial Review of the adopted Local Plan. The WCS covers Cherwell District and aims to help guide development towards the most appropriate locations, with respect to water infrastructure and the water environment. The WCS assessed proposed future development with regards to water supply capacity, wastewater capacity and environmental capacity.

Strategic Flood Risk Assessments (2009 and 2017)

9.3.21 A Strategic Flood Risk Assessment (SFRA) is a study conducted by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future.

9.3.22 The Cherwell and West Oxfordshire Level 1 SFRA, including Minerals and Waste Site Allocations[17] was prepared for the CDC and West Oxfordshire Councils in 2009. The purpose of the SFRA was to provide an assessment of flood risk from all sources within the two local authority areas.

9.3.23 The Cherwell Level 1 SFRA[18], published in May 2017, provides an update to the 2009 SFRA, considering changes to legislative and planning policy, and new and revised datasets in Cherwell District.

9.3.24 The Cherwell Level 2 SFRA[19], also published in May 2017, provides supplementary information to the Level 1 Update to inform CDC on specific flood risk issues and the suitability of eight potential strategic development sites put forward by CDC.

Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire (2021)

9.3.25 The OCC Local Standards and Guidance[20] is intended to assist development in the design of surface water drainage systems, and to support Local Planning Authorities in considering drainage proposals for new developments within Oxfordshire.

9.3.26 The document sets out the standards that are applied by the LLFA for new development proposals in Oxfordshire. It provides Oxfordshire-specific information on the planning, design and delivery of surface water drainage and aims to ensure

[16] Cherwell Water Cycle Study, Cherwell District Council (November 2017)
[17] Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment including Minerals and Waste Site Allocations, Scott Wilson (April 2009)
[18] Cherwell Level 1 Strategic Flood Risk Assessment Update, AECOM (May 2017)
[19] Cherwell Level 2 Strategic Flood Risk Assessment, AECOM (May 2017)
[20] Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire, Oxfordshire County Council (December 2021)

that all new developments in the county are designed to mitigate and adapt to the effects of climate change.

Adopted Cherwell Local Plan 2011-2031 (2015 / 2016)

9.3.27 The CDC Adopted Local Plan21 contains strategic planning policies for development and the use of land within Cherwell District. The key relevant policies from the Local Plan in relation to the water environment, comprise:

- Policy ESD 6: Sustainable Flood Risk Management: sets out the sequential approach to development location and requirements for FRAs.
- Policy ESD 7: Sustainable Drainage Systems: sets out requirements for SuDS.
- Policy ESD 8: Water Resources: sets out how water quality should be maintained and enhanced to avoid adverse effects of development on the water environment.

Water Resources Management Plan (2020)

9.3.28 The Water Resources Management Plan (WRMP)[22], prepared by Thames Water (TW), is a long-term assessment of the likely demand and supply of potable water within the TW supply region. The document also includes an outline of plans to balance supply and demand, whilst meeting environmental obligations and climate change uncertainty.

9.4 BASELINE CONDITIONS

9.4.1 The following outlines the existing water environment conditions within the Study Area.

Hydrology

9.4.2 The Main Site comprises a tributary of the Gagle Brook, (known for the purposes of this study as the Ashgrove Brook) formed of two channels in the north-western portion of the Main Site close to the boundary with the Upper Heyford Airfield. To the north, a tributary of the Padbury Brook flows eastwards. It includes several ponds located in close proximity to Ashgrove Farm. A number of drainage ditches and small ponds are also present within the Main Site and across the Study Area as a whole. These discharge to the Gagle Brook, via Ashgrove Brook.

[21] Adopted Cherwell Local Plan 2011 – 2031 (Part 1), Cherwell District Council (2015 / 2016)
[22] Water Resource Management Plan, Thames Water (April 2020)

9.4.3 The majority of the Main Site, the Middleton Stoney Relief Road, the Ardley Bypass, and the Heyford Park Link are located within the Gagle Brook catchment. The Ashgrove Brook flows in a generally southerly direction through the site and discharges to the Gagle Brook to the north-east of Middleton Stoney. Drainage from the Upper Heyford Airfield outfalls into the upper reaches of the Ashgrove Brook, on the Main Site.

9.4.4 The Gagle Brook crosses beneath the railway line close to the eastern limit of the Main Site, flowing south-westwards across the south-eastern corners of the site to the north-east of Middleton Stoney in the vicinity of the Middleton Stoney Relief Road, before flowing beneath the M40 to the south of the B4030. The Gagle Brook eventually discharges to the River Cherwell downstream of the Main Site.

9.4.5 The Gagle Brook and Ashgrove Brook lie within the Thames River Basin District.

9.4.6 Beyond the limits of the Main Site, the area crossed by the J10 Highway Improvements comprises the Padbury Brook catchment. The Padbury Brook ultimately discharges to the River Great Ouse, downstream of the Proposed Development and lies within the Anglian River Basin District.

9.4.7 Existing highways are typically drained into Highways Authority or National Highways assets before discharging to the local watercourse network.

Flood Risk

Fluvial

Analysis of Third-Party Data

9.4.8 With reference to the Government's 'Flood Map for Planning', the majority of the Main Site lies within Flood Zone 1 ('low' probability of flooding). Flood Zone 1 is defined in the NPPF as land having a less than 1 in 1,000 annual probability of fluvial or tidal flooding. However, the Flood Map for Planning does not take account of watercourses with a catchment area of less than 3km^2, which is the case for the Gagle Brook and Ashgrove Brook within the Main Site. As such, the Flood Map for Planning is not considered to be fully representative of flood risk in these areas.

9.4.9 The Flood Map for Planning shows the J10 Highways Improvements, and the Middleton Stoney Relief Road, will cross through areas of relatively higher risk of flooding - Flood Zone 2 and Flood Zone 3 - associated with the Padbury Brook (J10 Highway Improvements) and Ashgrove and Gagle Brooks (Middleton Stoney Relief Road). Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of fluvial flooding, or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding and considered to be of 'medium' risk. Flood Zone 3 is defined in the NPPF as land having a 1 in 100 or greater annual probability of fluvial

flooding, or a 1 in 200 or greater annual probability of tidal flooding and considered to be of 'high' risk.

Results of Detailed Survey

9.4.10 To address the lack of representation of the Gagle and Ashgrove Brooks upper reaches in the Flood Map for Planning, and to understand the current level of risk from the Padbury, Ashgrove and Gagle Brook more accurately, baseline modelling of the watercourses has been undertaken. The results from this modelling, shown in Figure 9.2, indicate the risks of flooding on and in the vicinity of the Site prior to any development. Table 9.8 demonstrates how the modelled flood extents equate to Flood Zones in the Flood Map for Planning, and the level of risk associated with them.

Table 9.8: Determination of significant effects for the water environment

Modelled Flood Extent	Flood Zone Equivalent	Level of Risk
1 in 20-year	Flood Zone 3b	High
1 in 100-year	Flood Zone 3a	Medium
1 in 1000-year	Flood Zone 2	Low

9.4.11 The modelling for the Ashgrove Brook shows flow in the Brook remains mostly in-channel (does not overtop the banks) in all flood extents, with the main exception being the Main Site where flows are shown to overtop the banks upstream of Ashgrove Farm and to back up behind Camp Road in all modelled flood events.

9.4.12 The Gagle Brook remains in-channel as it flows through the Middleton Stoney Relief Road portion of the Application Site.

9.4.13 The modelling for the Padbury Brook shows maximum water levels remain below top of bank where it flows east-wards through the north-eastern tip of the Main Site and through the J10 Highway Improvements.

Surface Water

9.4.14 Figure 9.3 of this draft chapter shows the Government's Flood Risk from Surface Water Map for the Proposed Development. This shows the potential flooding which could occur when rainwater does not drain away through the normal drainage systems or soak into the ground.

9.4.15 The mapping identifies the majority of the Main Site to be at very low risk of surface water flooding, with some areas of higher risk associated with the channels of the Ashgrove and Gagle Brooks. The pluvial flood risk to the J10 Highway Improvements portion of the Proposed Development shows a large area of low surface water flood risk to the west of the M40. However, the mapping is not believed to be representative of risk in this area as it is associated with the Padbury Brook and does

not accurately account for the culvert under the M40 embankment. The hydraulic modelling of the Padbury Brook provides a better representation of risk in this area.

9.4.16 The majority of the Proposed Development is currently undeveloped and, therefore, not believed to be served by a surface water drainage system, with rainfall currently assumed to infiltrate into the ground where geological and hydrogeological conditions allow and then run-off at surface level once the infiltration capacity of the ground has been exceeded. Any run-off currently generated is directed to existing on-site and nearby surface waterbodies and into the Ashgrove, Gagle and Padbury Brooks.

9.4.17 Existing developments or other uses within the Application Site, and the existing highways (specifically the M40, A43, B430, B4030, Ardley Road, Middleton Road, Somerton Road, and other minor unnamed roads), are served by surface water drainage systems (i.e. with specific infrastructure in place to convey and or store surface water).

Canals and Reservoirs

9.4.18 The nearest canal to the Proposed Development is the Oxford Canal, located approximately 3km to the west of the Main Site. This distance and the intervening topography are such that the Proposed Development is not considered to be at risk from flooding from the canal, nor is it expected to cause any detriment to the water quality in the canal.

9.4.19 Based on the government's reservoir inundation mapping[23], the Proposed Development is located entirely outside of the area predicted to be at risk in the event of a reservoir failure in both the dry day and wet day scenarios.

Groundwater

9.4.20 The majority of the Application Site is underlain by bedrock of the White Limestone Formation with some small pockets of Forest Marble Formation and Rutland Formation. Localised superficial deposits comprising Head and Alluvium are aligned along watercourses.

9.4.21 The EA classifies the White Limestone Formation and Forest Marble Formation as a Principal Aquifer and the Rutland Formation as Secondary (B) Aquifer.

9.4.22 The Alluvium deposits are classed as Principal Aquifer and the Head deposits are classed as Secondary Undifferentiated Aquifer.

9.4.23 According to the EA Catchment Data Explorer website, the majority of the Proposed Development is located within the Tackley Jurassic groundwater operational catchment (Water Body ID: GB40601G603100), with the exception of the far northern

[23] Environment Agency (November 2021): Risk of Flooding from Reservoirs - Maximum Flood Extent (Web Mapping Service)

portion of the Proposed Development which is located within the Upper Bedford Ouse Oolite Principal 1 groundwater operational catchment (Water Body ID: GB40501G402300). The groundwater operational catchments are shown in Figure 9.5.

9.4.24 Groundwater is considered to be in hydraulic continuity with the surface water features on the site. It generally flows towards the south east. However, there may be some localised flow towards the railway cutting in the north, and the streams at the base of valleys in the south.

9.4.25 No records of groundwater flooding in the study area have been found.

Foul Water

9.4.26 The Proposed Development is located within TW's sewerage area, with the exception of parts of the Ardley Bypass and J10 Highway Improvements which fall within Anglian Water's sewerage area. The majority of the Application Site is undeveloped and is not believed to currently be served by a positive foul water drainage system.

9.4.27 An assessment of foul water will be undertaken within the Sustainable Drainage Strategy (SDS) report that will be appended to, and used to inform, the ES in due course. This will include consideration of:

- Quantity: consultation will be sought with TW and AW to identify any potential infrastructure capacity issues. The potential effect of the Proposed Development on available treatment capacity will then be assessed, and mitigation measures proposed, if necessary.

- Quality: the standard of available foul water treatment infrastructure will be confirmed via consultation with TW and AW. The effect of the Proposed Development will then be ascertained, and mitigation measures outlined, if necessary.

Potable Water Supply

9.4.28 Potable water is supplied to the area by TW. The EA's Water Stressed Areas – Final Classification 2021[24] classifies the Thames region as having a 'serious' degree of 'water stress'.

9.4.29 The Main Site includes an underground reservoir served by a number of water mains.

[24] Water Stressed Areas – final classification 2021, Environment Agency (July 2021)

Designations

9.4.30 According to the Catchment Data Explorer the Langford Brook (Bicester to Ray including Gagle Brook) catchment has a WFD overall water body quality classification of 'Poor' (2019), with an ecological status of 'Poor' and a 'Fail' chemical status. The catchment has an objective of achieving 'Poor' overall status in 2027. Agricultural and rural land management, and pollution from the water industry are the key issues preventing improvement in status.

9.4.31 The Padbury Brook catchment has a WFD overall water body quality classification of 'Moderate' (2019), with an ecological status of 'Moderate' and a 'Fail' chemical status. The catchment has an objective of achieving 'Moderate' overall status in 2027. As with the Langford Brook (Bicester to Ray including Gagle Brook) catchment, agricultural and rural land management, and pollution from the water industry are the key issues preventing improvement in status

9.4.32 According to the Government's Catchment Data website the aquifer underlying the majority of the site (Tackley Jurassic) is classified as 'Good' Overall WFD status (2019). The far northern portion of the site is underlain by the Upper Bedford Ouse Oolite Principal 1 aquifer which has a 'Poor' Overall WFD status (2019).

9.4.33 There are no active licenced potable groundwater abstractions on or within 1km of the Proposed Development. None of the Application Site is located in a Groundwater Source Protection Zone.

9.4.34 According to Defra's MAGIC website, no Drinking Water Safeguard Zones (Groundwater) were identified within the Study Area. A small area in the north-west of the Main Site is within a Drinking Water Protected Area (Surface Water), as is the J10 Highway Improvements and the Middleton Stoney Relief Road.

9.4.35 Two SSSIs are located within / immediately adjacent to the Main Site; Ardley Cutting and Quarry SSSI and Ardley Trackways SSSI.

9.4.36 The Ardley Cutting and Quarry SSSI is located parallel to a portion of the north boundary of the Main Site, along the railway line. The Ardley Trackways SSSI is located within a portion of the Main Site and Middleton Stoney Relief Road, east of the B430 within the neighbouring limestone quarry site.

9.4.37 The SSSIs are predominantly designated on the basis of geological interest. However, the Ardley Cutting and Quarry SSSI is partially designated on the basis of biological interest related, in part, to the presence of wetland habitats. The wetland

habitat portion of the Ardley Cutting and Quarry SSSI is located to the immediate north of the north-western Main Site boundary, beyond the railway line.

9.4.38 There are no other SSSIs within 1km of the Proposed Development.

Future Baseline

9.4.39 Fluvial and surface water flooding may increase due to the expected increase in frequency and intensity of extreme rainfall events as a consequence of climate change.

9.4.40 The hydraulic modelling includes simulations to account for the potential effects of climate change (Figure 9.4). To estimate the potential future baseline floodplain under a range of scenarios, the Central, Higher Central and Upper End climate change allowance for the 2080s (2070 to 2115), as set out in the EA's advice entitled *Flood Risk Assessments: Climate Change Allowances*, have been applied to the 1 in 100-year flood flows.

9.4.41 The modelling shows the Padbury and Gagle Brooks remain in bank through the Application Site when accounting for increased flows due to climate change. The Ashgrove Brook future baseline shows a slight increase when compared to the current baseline, with increases in the flood extent around Camp Road.

9.4.42 Climate change will be considered as part of the drainage strategy for the Proposed Development with the drainage system designed to ensure there is no increase in the rate of runoff discharged from the Application Site. In line with the EA's advice entitled *Flood Risk Assessments: Climate Change Allowances,* and OCC's *Local Standards and Guidance for Surface Water Drainage on Major development in Oxfordshire*, the system will be designed to the 1 in 100-year rainfall event plus a 40% allowance for climate change.

9.4.43 The potential effect of climate change will be considered as part of the FRA and SDS and this chapter when finalised.

Summary of Receptors and Sensitivity

9.4.44 The potential receptors are shown in Figure 9.5 and their sensitivity in terms of flood risk, surface water, drainage and groundwater are described below in Table 9.9. The receptors identified remain valid for both the existing and future baseline.

Table 9.9: Potential sensitivity of receptors

Receptor	Type of Effect	Sensitivity (Value)	Reason for Sensitivity
Gagle Brook / Ashgrove Brook	Flood Risk	High	Flood Zones 1, 2 and 3
	Water Quality	Low	Overall Poor WFD Status
Padbury Brook	Flood Risk	Low	Flood Zone 1

	Water Quality	Medium	Overall Moderate WFD Status
Groundwater	Water Quality – Tackley Jurassic	High	Principal Aquifer
	Water Quality – Upper Bedford Ouse Oolite	High	Principal Aquifer
	Groundwater operational catchment – Tackley Jurassic	High	Good WFD Status
	Groundwater operational catchment – Upper Bedford Ouse Oolite	Low	Poor WFD Status
Construction Workers	Flood Risk	High	Risk to human health
Site Users	Flood Risk	High	Risk to human health
Downstream receptors (e.g., Middleton Stoney)	Flood Risk	High	Risk to human health
Public Sewer Network*	Flood Risk	TBC	TBC
	Resource Availability	TBC	TBC
Potable Water Network*	Resource Availability	TBC	TBC
Ardley Cutting and Quarry SSSI	Water Quality	High	Part designated due to presence of wetland habitats

* Wastewater and potable water is to be confirmed whilst consultation with water and sewerage companies is ongoing.

9.5 ASSESSMENT OF LIKELY EFFECTS (Preliminary)

9.5.1 This section provides an initial assessment of any likely significant environmental effects of the Proposed Development on the basis that no mitigation measures are in place additional to features that that are inherently embedded within the design of the Proposed Development.

9.5.2 For the purposes of this assessment the following embedded mitigation features and measures already designed into or proposed as part of the Proposed Development have been included:

- Provision of SuDS and drainage attenuation features, informed by the SDS, within the landscaping both on the Main Site and within highways corridors, and within future development plots on the Main Site.
- Realignment of two limbs of the upper reaches of the Ashgrove Brook; these two limbs receive flow from the airfield. By realigning the upper reaches

around and within the Proposed Development, it will maintain this flow route whilst mitigating against flood risk as well as avoiding the need for culverting.

Construction Phase

9.5.3 The effects associated with the construction phase of the Proposed Development are considered to be direct, temporary and short to medium term duration. The potential effects, prior to mitigation are outlined below.

Flood Risk

9.5.4 Hydraulic modelling has been completed for the baseline scenario and shows the Main Site is located predominantly in Flood Zone 1 and outside of the 1 in 1000-year baseline modelled flood extents. There are small extents of Flood Zones 2 and 3 around Camp Road which are associated with the Ashgrove Brook (not a Main River). Hydraulic modelling suggests the increase in the baseline flood risk as a result of climate change is negligible.

9.5.5 Hydraulic modelling is being undertaken (not yet completed) to assess any potential effects of the scheme, inform the design of the Proposed Development to ensure the realignment of the upper reaches of Ashgrove Brook has no subsequent increase in risk both on site and downstream, both now and in the future when taking climate change into account. Subsequently, the effect of fluvial flood risk on construction workers and human health is considered slight due to a negligible magnitude effect on a high sensitivity receptor.

9.5.6 Any construction activities such as mounding of materials and placement of other structures within areas identified as being at risk of flooding could result in a loss of floodplain storage and / or the alteration of overland flow characteristics and / or routes, prior to mitigation. The effect of an increase in flood risk (major magnitude) on downstream receptors (high sensitivity receptor) is considered large adverse, prior to mitigation.

Surface Water

9.5.7 Most of the Proposed Development is shown to be at very low risk of surface water flooding. There are several surface water flow paths within the Main Site which are associated with the Ashgrove Brook, existing drainage infrastructure and other topographic depressions which function as pathways for flow. The surface water extents associated with the Ashgrove Brook are not expected to cause a considerable risk to workers during the construction phase as the modelled floodplain largely remains in bank. Access and egress routes to the Main Site are shown to be at very low risk of surface water flooding. Therefore, the effect of pluvial flood risk on construction workers is slight due to a negligible magnitude effect on a high sensitivity receptor.

9.5.8 Construction activities can lead to the pollution of receiving waters. Activities that might generate effects include the demolition of existing structures, earth stripping, stockpiling, excavation, construction plant movements and hauls, refuelling, equipment maintenance, storage of materials and chemicals and the generation, storage and disposal of waste materials.

9.5.9 Suspended solids are one of the most common causes of water pollution from construction sites. They emanate from excavations, exposed ground or stock piles, plant and wheel washing, build-up of dust and mud on roads, or pumping of contaminated surface waters and groundwater accumulated on the Main Site. Extreme rainfall events could exacerbate runoff rates and the mobilisation of suspended solids has the potential to affect ecological habitats, block watercourses and alter flow regimes. Additionally, suspended solids from construction work, particularly from intrusive earthworks for foundations and sewers, could create pathways to local groundwater.

9.5.10 The effect of suspended sediments (moderate magnitude effect) on the Ashgrove, Gagle and Padbury Brooks (low and medium sensitivity receptor) is assessed as short term slight to moderate adverse. The Ardley Cutting and Quarry SSSI is located downstream of the site. The significance of the effect of the release of sediment (moderate effect magnitude) into the Padbury Brook on the SSSI (high sensitivity receptor) is considered to be large adverse.

9.5.11 The uncontrolled release of substances such as solvents, cleaning agents, paints and other chemicals, liquids or solids could lead to further pollution. These could become a hazard if used in the construction process or stored on the Main Site. These substances can be of high toxicity (moderate effect magnitude), thereby having a slight to moderate adverse effect on the Ashgrove, Gagle and Padbury Brooks (low and medium sensitivity receptors) prior to mitigation. The significance of the effect of the release of toxic substances (moderate effect magnitude) into the Padbury Brook on the SSSI (high sensitivity receptor) is considered to be large adverse in the absence of mitigation measures.

9.5.12 Concrete production taking place on the Application Site or introduced by ready-mix lorries could cause small particulates to settle in the surrounding area. Wastewater from the batching plant or washing down of lorries/mixing areas could cause particulates to runoff into watercourses. Without mitigation, the potential effect of this source of pollutant (moderate effect magnitude) on the Ashgrove, Gagle and Padbury Brooks (low and medium sensitivity receptors) is considered a slight to moderate adverse effect. The potential effect on the Ardley Cutting and Quarry SSSI (high sensitivity receptor) is considered large adverse, without mitigation.

9.5.13 The above effects on surface water quality as a result of decreased runoff quality and the introduction of machinery, vehicles and substances may also lead to decreased quality of Tackley Jurassic groundwater operational catchment and Upper Ouse Oolite groundwater operational catchment. Without mitigation, the potential effect of

these pollutants (moderate effect magnitude) on the groundwater quality (high and low sensitivity receptors) is considered large or moderate adverse and slight adverse respectively.

Foul Water

9.5.14 There will be increased pressure on the local foul water network due to the temporary presence of construction workers and associated welfare facilities. Further information is required before the significance of the effect can be determined.

Potable Water

9.5.15 There will be an increased demand on the local water supply because of construction activities and the presence of construction workers. Further information is required before the significance of the effect can be determined.

Operational Phase

9.5.16 The effects associated with the operation phase of the Proposed Development are considered to be direct, permanent and medium to long term in length. The effects including embedded mitigation, but prior to consideration of any additional mitigation measures, are described below.

Flood Risk

9.5.17 The Proposed Development includes diversion of the upper reaches of the Ashgrove Brook within the Main Site. The channel of these diversions will be designed to convey the necessary flood flows, including an allowance for climate change. The effect of the diversion on flood risk will be slight due to a negligible magnitude effect on a high sensitivity receptor

9.5.18 The flood flows of the watercourses within the Application Site are generally contained to within very close proximity to the channel. Any new crossings of these watercourses will be designed in such a way to ensure there is no significant displacement of floodplain or increase in flood risk beyond the Application Site. Therefore, the effect of increased flood risk as a result of new crossings, such as the Middleton Stoney Relief Road, is assessed as slight as a result of a negligible magnitude effect on a high sensitivity receptor.

9.5.19 The Proposed Development designs will take account of the need to balance flood risk by allowing fluvial flows to move through the Main Site in such a way that conveyance is not significantly impeded either now or in the future as the result of climate change. Hydraulic modelling of the Proposed Development will be completed to determine the extent and depth of flooding at the Main Site, Middleton Stoney Relief Road and J10 Highway Improvements during a 100 year plus climate change event. This will also ensure flood risk is not increased to existing landowners downstream.

9.5.20 Therefore, the effect of flood risk, including for the effect of climate change, on occupants and users of the Main Site, as well as existing land users and owners downstream, is considered to be slight, as a result of a negligible magnitude effect on high sensitivity receptors.

Surface Water

9.5.21 The Main Site, Ardley Bypass, Heyford Park Link and the Middleton Stoney Relief Road have potential to introduce a significant area of impermeable surfaces onto a currently greenfield area. This has the potential to increase surface water runoff through reduced infiltration within the Proposed Development as well as increased discharge into receiving watercourses such as the Padbury Brook. However, the attenuation of flood water due to the SuDS measures included within the drainage design of the Proposed Development restricts the volume of water entering the watercourses from the Main Site, Ardley Bypass, Heyford Park Link and the Middleton Stoney Relief Road during a flood event. The drainage design will also account for future increases in likely rainfall as a result of climate change. Therefore, the effect of surface water flood risk (negligible effect magnitude) on site users (high sensitivity receptor), existing land users (high sensitivity receptors) and the Ashgrove and Gagle Brooks (High sensitivity receptor) is slight, and the Padbury Brook (low sensitivity receptor) is neutral or slight.

9.5.22 Once in use, pollutants associated with run-off from the Main Site, Ardley Bypass, Heyford Park Link and the Middleton Stoney Relief Road have the potential to effect detrimentally upon the quality of water (moderate effect magnitude) in the Ashgrove and Gagle Brooks (low sensitivity receptors) from direct runoff. Contamination in the operational phase is most likely to be caused by increased vehicle usage. The effect on the Ashgrove and Gagle Brooks is considered to be slight adverse without mitigation.

Foul Water

9.5.23 There will be increased foul water flows to the local foul water network because of the Proposed Development. Further information is required before the significance of the effect can be determined and will inform this chapter when finalised.

Potable Water Supply

9.5.24 The increase in water demand as a result of the Proposed Development could lead to an effect on the capacity of the local public water supply. Further information is required before the significance of the effect can be determined and will inform this chapter when finalised.

9.6 MITIGATION AND RESIDUAL EFFECTS

Mitigation

9.6.1 This section assesses what additional measures, beyond the mitigation measures embedded within the Proposed Development design, are required to address the likely significant effects.

Construction Phase

9.6.2 Construction effects will be mitigated through a range of measures which would be secured through the Construction Environmental Management Plan (CEMP) including measures to limit and control temporary effects on hydrology and flood-risk during construction phases. Any mitigation proposed for the CEMP may be subject to change but will be reviewed and later defined as the EIA process advances.

Flood Risk

9.6.3 The Application Site is predominantly at low risk of flooding from fluvial and pluvial sources. Latest best practice guidance on working near watercourses will be outlined in the CEMP.

Surface Water

9.6.4 The CEMP will outline methods and monitoring requirements to prevent effects on the water environment as a result of the construction phase. Example measures to be included within the outline CEMP will be later defined as the EIA process advances.

9.6.5 The measures set out in the CEMP will also provide mitigation for any effect on groundwater quality.

Foul water

9.6.6 TW and AW are being consulted to understand suitable connection points for foul water during the temporary construction phase.

Potable water supply

9.6.7 TW are being consulted to understand the effects of the increased demand for water supply as a result of the construction phase.

Operational stage

Surface Water

9.6.8 The Proposed Development's facilities management team would be responsible for cleaning and maintenance of proposed oil interceptors which would mitigate against the potential effect of contaminated surface runoff entering the drainage system. A maintenance schedule for the proposed SuDS measures would also be prepared such that the effectiveness of the proposed stages of water quality treatment remains for the lifetime of the Proposed Development.

Foul water

9.6.9 Any mitigation measures and residual effects will be identified as part of ongoing discussions with TW and AW and reviewed and later defined as the EIA process advances.

Potable water

9.6.10 Any mitigation measures and residual effects associated with increased demand for potable water will be reviewed and later defined as the EIA process advances.

Residual Effects

Construction

9.6.11 An appropriate CEMP implemented during the construction phase would prevent significant adverse effects on the Water Environment. Adherence to an appropriate CEMP will ensure that there are only negligible effects of the Proposed Development on all receptors during the construction phase, resulting in a neutral or slight significance.

Operation

9.6.12 Any potential effects likely to arise as part of the operational phase would be neutral or slight in nature once mitigation has been incorporated into the Proposed Development as the mitigation will ensure there are only negligible effects of the Proposed Development on all receptors during the operation phase.

9.6.13 There may be slight beneficial effects in the form of a reduced risk of flooding in more extreme events because of reduced rates of discharge from the Main Site into local watercourses and as a result of the drainage strategy; this will be later defined as the EIA process advances.

9.6.14 There will also be slight beneficial effects to water quality due to the change of use from agricultural which is currently a key issue preventing the Langford Brook

(Bicester to Ray, including Gagle Brook) and Padbury Brook catchments reaching Good WFD status.

Climate Change

9.6.15 The effect of climate change has been considered throughout this assessment. The mitigation embedded within the design of the Proposed Development (drainage strategy, diversion of watercourse) will follow national and local guidance and will account for the future effects of climate change. As such the effect of climate change on the fluvial flood risk to the Proposed Development is considered neutral or slight.

9.6.16 Additionally, reduced rates of discharge because of the drainage strategy may provide downstream benefits in the form of reduced flood risk. As such, the effect of climate change on surface water flood risk is considered to be neutral or slight beneficial.

Human Health

9.6.17 The effect on human health has been considered throughout this assessment. The mitigation proposed for the construction phase of the Proposed Development will ensure the effect of the Proposed Development on flood risk to the health and safety of construction workers, site users and downstream receptors, and subsequently on human health, will be neutral. Proposed measures to be included in the CEMP include, but are not limited to, measures to prevent potential contaminants entering waterbodies, proposals to avoid mobilisation of sediments into waterbodies, and working practices to protect construction workers working near waterbodies.

9.6.18 The mitigation embedded within the design for the Proposed Development during operation circumstances include but are not limited to at the time of writing, implementation of a drainage strategy and realignment of the upper reaches of the Ashgrove Brook. These measures will ensure that both employees or visitors and sensitive receptors (local businesses and residential dwellings) in the local vicinity are protected from adverse health impacts such as flooding. This includes future trends including climatological changes.

9.7 CUMULATIVE EFFECTS

9.7.1 Any committed developments, or emerging proposals, are subject to the same local and national guidance as the Proposed Development. It is assumed that mitigation measures will be undertaken to the same standard and as such there should not be any additional cumulative effects on the water environment and therefore no need for cumulative mitigation measures, even where committed developments are close by and share receptors with the Proposed Development.

9.7.2 Therefore, the cumulative effect if existing, permitted or emerging schemes, such as the neighbouring Upper Heyford development of the airfield, are approved and

delivered would be neutral or slight due to the mitigation measures the schemes will incorporate.

9.8 SUMMARY AND CONCLUSIONS

9.8.1 This draft chapter has provided an interim assessment of the effects of the construction and operation of the Proposed Development on surface water and flood risk.

9.8.2 The level of understanding and detail of the assessment in this draft chapter will be consolidated through further work to support the ES, including a Highways Agency Water Risk Assessment (HAWRAT), Flood Risk Assessment (FRA), Sustainable Drainage Statement (SDS) and Water Framework Directive (WFD) Assessment. An updated chapter will be prepared and available for the Stage 2 consultation.

Likely Significant Effects

9.8.3 An assessment of the significance of the effects was undertaken based on the DMRB which has been adapted for this assessment. The sensitivity of each resource and the magnitude of the effect have been considered as part of the assessment. Effects of moderate significance or above are considered to be significant.

9.8.4 The likely significant effects accounting for embedded mitigation, but prior to consideration of any additional mitigation measures have been considered. Embedded mitigation includes a surface water drainage strategy to ensure surface water will be managed appropriately to ensure that the rate of surface water arising from the Proposed Development is not increased and water quality is not compromised.

9.8.5 Likewise, the realignment of the upper reaches of the Ashgrove Brook is also embedded within the design of the Proposed Development.

Construction

9.8.6 Without mitigation the construction phase is considered to have slight to large adverse effects on the Water Environment as a result of decreased water quality, increased pollution potential and alterations to existing ecological conditions.

Operation

9.8.7 The operation phase of the Proposed Development is expected to have neutral to slight adverse effects on the Water Environment as a result of increased pollution potential, the possibility of increased downstream flood risk and alterations to existing ecological conditions.

Additional Mitigation and Residual Risks

9.8.8 To ensure the Proposed Development has only neutral or slight (not significant) effects on the Water Environment during the construction phase, an appropriate CEMP will be implemented.

9.8.9 To ensure the Proposed Development has only neutral or slight (not significant) effects, and to maximise any opportunities to deliver beneficial effects on surface water quality and flood risk (both within the Main Site and for downstream receptors), appropriate facilities management and maintenance of SuDS features will be implemented.

9.8.10 Mitigation measures to ensure capacity for the Proposed Development within the local foul water network are subject to confirmation with TW and AW. Where required, implementation of appropriate mitigation measures will ensure the Proposed Development has only neutral (not significant) effects on the local foul water network.

Conclusions

9.8.11 Based on the available information at this stage, and following implementation of appropriate mitigation measures, the effects of the Proposed Development on the Water Environment are considered to be neutral or slight (not significant).

9.8.12 Table 9.10 provides a preliminary draft summary of effects, mitigation and residual effects. As described at the outset of this draft Chapter, additional surveys are being undertaken as part of the ongoing environmental impact assessment and these will help inform the technical assessments presented in the final ES in due course.

Table 9.10: Preliminary summary of Effects, Mitigation and Residual Effects (to be updated in due course)

Receptor	Description of Effect	Sensitivity	Magnitude of Effect	Significance of Effects	Mitigation Measures	Residual Effects
Construction						
Ashgrove Brook / Gagle Brook	Reduced water quality, pollution or spillages	Low	Moderate	Slight adverse	Construction Environmental Management Plan	Neutral
Padbury Brook	Reduced water quality, pollution or spillages	Medium	Moderate	Slight adverse	Construction Environmental Management Plan	Neutral or Slight
Groundwater operational catchment – Tackley Jurassic	Reduced water quality, pollution or spillages	High	Moderate	Moderate or large	Construction Environmental Management Plan	Slight
Groundwater operational catchment – Upper Bedford Ouse Oolite	Reduced water quality, pollution or spillages	Low	Moderate	Slight	Construction Environmental Management Plan	Neutral or slight
Construction Workers	Flood risk	High	Negligible	Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy and diversion of the upper reaches of the Ashgrove Brook	n/a
Site Users	Flood risk	High	Negligible	Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy and diversion of the upper reaches of the Ashgrove Brook	n/a

Receptor	Description of Effect	Sensitivity	Magnitude of Effect	Significance of Effects	Mitigation Measures	Residual Effects
Downstream Receptors	Increased flow as a result of loss of floodplain storage due to construction activities	High	Major	Large adverse	Construction Environmental Management Plan	Neutral or slight
Public Sewer Network	Increased demand	TBC				
Potable Water Network	Increased demand	TBC				
Ardley Cutting and Quarry SSSI	Reduced water quality, pollution or spillages	High	Moderate	Large adverse	Construction Environmental Management Plan	Neutral or slight
Operation						
Ashgrove Brook / Gagle Brook	Increased flood risk due to increase in impermeable areas	High	Negligible	Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy and diversion of the upper reaches of the Ashgrove Brook.	Slight beneficial due to reduced risk of flooding due to reduced rates of discharge from the Main Site.
Padbury Brook	Increased flood risk due to increase in impermeable areas	Low	Negligible	Neutral or Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy.	n/a

Receptor	Description of Effect	Sensitivity	Magnitude of Effect	Significance of Effects	Mitigation Measures	Residual Effects
Ashgrove Brook / Gagle Brook	Reduced water quality, pollution or spillages	Low	Moderate	Slight adverse	Facilities management, above ground attenuation, maintenance schedule for SuDS measures	Slight beneficial due to change of land use from agricultural.
Site Users	Flood risk	High	Negligible	Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy and diversion of the upper reaches of the Ashgrove Brook	Slight beneficial due to reduced risk of flooding due to reduced rates of discharge from the Main Site.
Downstream Receptors	Flood risk	High	Negligible	Slight	Embedded mitigation features and measures already designed into or proposed as part of the Proposed Development, including a drainage strategy and diversion of the upper reaches of the Ashgrove Brook	Slight beneficial due to reduced risk of flooding due to reduced rates of discharge from the Main Site.
Public Sewer Network	Increased demand	TBC				
Potable Water Network	Increased demand	TBC				
Cumulative and In-combination						

Receptor	Description of Effect	Sensitivity	Magnitude of Effect	Significance of Effects	Mitigation Measures	Residual Effects
Application Site and Surrounding Receptors	Cumulative Effect of Proposed Schemes	High	Major	Large Adverse	Subject to the same local and national guidance and the Proposed Development. No cumulative mitigation measures are expected to be necessary	Neutral