

11 WATER RESOURCES

11.1 INTRODUCTION

11.1.1 This chapter describes the context, both physically and regulatory, of the Application Site in terms of water resources, and identifies the potential effects that the Proposed Development may have.

11.1.2 This chapter considers the effects on flood risk, drainage (surface water and foul water sewerage), water quality (watercourses and groundwater) and water supply. The content of this chapter references and builds upon the Flood Risk Assessment and Drainage Strategy prepared for the Proposed Development (**Appendix 11.1**).

11.1.3 This chapter should be read in conjunction with Chapters 3 and 4 of the Environmental Statement (ES) which give details of the Application Site, Proposed Development and construction works.

11.2 ASSESSMENT APPROACH

Methodology

11.2.1 The following information sources have been used to inform the assessments undertaken for the Application Site and Proposed Development:

- Coventry Water Cycle Study;
- Publicly available information from the British Geological Survey online mapping resource;
- Publicly available web-based information from the Environment Agency;
- Publicly available information from the DEFRA Multi-Agency Geographic Information for the Countryside (MAGIC) website; and
- Atkins Flood Risk Assessment and Drainage Strategy, December 2018.

11.2.2 The effect on each of the below headings as a result of the Proposed Development is assessed within this chapter (i.e. fluvial flood risk, surface water flood risk, surface water drainage, foul water drainage, watercourse water quality, groundwater water quality and water supply).

Flood Risk

11.2.3 This section outlines the various methodologies used to assess the risk of flooding from the key sources of flooding identified as having a potential effect on the Proposed Development and the surrounding area. The Flood Risk Assessment and Drainage Strategy identified that fluvial and surface water flooding required specific consideration. All other sources of flooding (tidal, groundwater, sewer and artificial sources) are considered to have a negligible to low risk of occurrence hence have not been assessed further.

Fluvial

11.2.4 The effect of fluvial flooding on the Application Site has been assessed using the Environment Agency Flood Map as included in the Flood Risk Assessment (**Appendix 11.1**). Downstream effects resulting from the Proposed Development have been established through site inspections, capacity calculations and consultation with Warwickshire County Council.

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Surface Water

- 11.2.5 The effect of surface water flooding associated with the Application Site and the Proposed Development has been assessed using the Environment Agency surface water flood maps, as included in the Flood Risk Assessment (**Appendix 11.1**). The flood flow paths through the Application Site have been determined and any off-site areas reliant on these identified. The existing ground levels around the Application Site have been compared against the surface water flow paths and existing flooded areas to determine where adverse changes in flood risk could occur.

Foul Water Sewerage

- 11.2.6 The effect of the Proposed Development on sewer flooding has been established through consultation with Severn Trent Water. A Developer Enquiry has been submitted and a response received.

Surface Water Drainage

- 11.2.7 The effect of the Proposed Development on surface water drainage has been assessed in consultation with Severn Trent Water and the Lead Local Flood Authority (LLFA), Coventry City Council (CCC). A Developer Enquiry has been submitted to Severn Trent Water to establish the effect of development run-off entering the public surface water sewerage system. The LLFA has provided guidance in terms of the requirements of surface water discharges from the Proposed Development into local watercourses.

Water Quality

Watercourses

- 11.2.8 The effect of the Proposed Development on watercourse water quality has been limited to that resulting from the surface water that will directly enter the watercourse from the Proposed Development. The assessment is based on the predicted performance of the SuDS and other devices included within the drainage system for the purposes of water quality control.

Groundwater

- 11.2.9 The effect of the Proposed Development on groundwater quality has been established using Environment Agency data in conjunction with the predicted performance of the SuDS and other devices included within the drainage system for the purposes of water quality control.

Water Supply

- 11.2.10 The effect of the Proposed Development on water supply has been established based on the Coventry Water Cycle Study.

Assessment of Significance

- 11.2.11 The magnitude of a specific potential effect will be assessed using the criteria set out in **Table 11.1**. The sensitivity of a specific receptor will be determined using the criteria shown in **Table 11.2**. The significance of an environmental effect is determined by the interaction of magnitude and sensitivity, whereby the effects can be beneficial or adverse. The effect significance matrix is shown in **Table 11.3**.

Table 11.1 Methodology for assessing magnitude

Magnitude of Effect	Criteria for Assessing Effect	Examples
Major	Total loss or major/substantial alteration to key elements/ features of the baseline (pre-development) conditions such that the post-development character/composition/ attributes will be fundamentally changed.	Change in risk resulting in a change of more than one Flood Zone (e.g. 1-3; 3-1). Additional or fewer properties flooded internally. Failure of utility service affecting a wide area. Increase or decrease in groundwater qualitative or quantitative WFD status. Pollution or loss of potable source of abstraction.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/composition/attributes of the baseline will be materially changed.	Change in risk resulting in a change of a single Flood Zone (e.g. 1-2, 2-3). Existing internally flooded properties flooded to a greater or lesser depth. Additional or fewer properties flooded externally. Change in performance of utility service affecting a wider area. Increase or decrease in the yield or quality of an aquifer, but insufficient to change its WFD classification.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.	Change in risk but insufficient to change the Flood Zone. Existing external flooding increased or decreased but no change in properties affected. Localised change in performance of a utility service affecting the immediate area surrounding the Site. Localised change in water quality immediately adjacent to the Site. Reversible change in the yield or quality of an aquifer, but insufficient to change its WFD classification.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.	No/minimal change in flood risk. No/minimal change in utility performance. No/minimal change in water quality. No significant effect on the economic value of the feature. No change to the integrity of an aquifer.

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Table 11.2 Methodology for determining receptor sensitivity

Sensitivity	Characteristics of Receptor	Examples
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance, with very limited potential for substitution.	Existing residential properties. Principal Aquifer with public water supply abstractions. Site is within Inner or Outer Source Protection Zones (SPZ 1 to 2). WFD classification 'High'. Site protected/designated under EC or UK habitat legislation (SAC, SPA, SSSI, Water Protection Zone (WPZ), Ramsar site, salmonid) Water/Species protected by EC legislation.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high quality and rarity on regional scale or medium quality and rarity on regional or national scale, with limited potential for substitution.	Principal aquifer providing locally important resource or supporting river ecosystem. Site is within a Catchment SPZ (SPZ 3). Secondary A aquifer with limited water supply abstractions for industrial or agricultural use. Site is within Inner or Outer SPZ (SPZ 1 to 2). WFD classification 'Good'. Local sewerage systems. Water supply networks.
Low	The receptor/resource is tolerant of change or is of medium quality and rarity on regional scale or low quality and rarity on national scale, with limited potential for substitution.	WFD classification 'Moderate'. Secondary Aquifer with limited water supply abstractions for industrial or agricultural use. SPZ3 (total catchment). Highway areas.

Table 11.3 Effect significance matrix

Magnitude	Sensitivity		
	High	Moderate	Low
Major	Major Adverse/beneficial	Major – Moderate Adverse/beneficial	Moderate – Minor Adverse/beneficial
Moderate	Major – Moderate Adverse/beneficial	Moderate – Minor Adverse/beneficial	Minor Adverse/beneficial
Minor	Moderate – Minor Adverse/beneficial	Minor Adverse/Beneficial	Minor – Negligible Adverse/beneficial
Negligible	Negligible	Negligible	Negligible

11.2.12 A significant effect is defined as having a Moderate or greater significance.

Legislative and Policy Framework

11.2.13 The planning policy and legislation relevant to the Proposed Development are set out in **Table 11.4**.

Table 11.4 Policy and guidance overview

Scale	Policy Document	Key Considerations for the Scheme
National	National Planning Policy Framework	Sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow with a view to achieving sustainable development.
	Planning Practice Guidance	Sets out the general approach to the management of flood risk associated with development in terms of assessing, avoiding, managing and mitigating flood risk. Development is directed towards areas of lowest flood risk through the use of the Sequential and Exception Tests defined in the Guidance. The definitions of each Flood Zone are provided in conjunction with details of the development types considered compatible with each. The requirement for sustainable drainage systems (SuDS) to be incorporated into developments is included.
	Non-statutory Technical Standards for Sustainable Drainage Systems	Defines the high-level operating and performance parameters that should be achieved by SuDS.
	Water Framework Directive (2000/60/EC)	High level framework for the protection and improvement of waterbodies in terms of water quality. This dictates the baseline quality of the waterbodies within and adjacent to the Site.
	Land Drainage Acts 1991 & 1994	Defines the responsibilities of riparian owners and other regulatory authorities. The high-level principles for the management of surface water are also set out.
Local	Coventry Local Plan 2016	Policy EM4 Flood Risk Management: Defines how developments must ensure that they are not at risk of flooding or adversely affect flood risk in other areas. Policy EM5 Sustainable Drainage Systems (SuDS): Establishes the principles for the inclusion of SuDS within a development including maximum discharge rates and maintenance arrangements.
	Coventry City Council Strategic Flood Risk Assessment	Provides an overview of flooding issues within the Coventry area.

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Scale	Policy Document	Key Considerations for the Scheme
		Information relating to required standards of protection and flood risk management are provided.
	Coventry City Council Preliminary Flood Risk Assessment	Identifies areas that have flooded in the past and those that are considered susceptible to flooding in the future from a range of different sources.
	Coventry Water Cycle Study 2015	Provides information relating to the availability of waste water treatment and water supply capacity within the city for different future development scenarios.
	Coventry City Council Surface Water Management Plan	Defines the long-term strategy for the management and reduction of surface water flood risk within the city
	Coventry City Council Local Flood Risk Management Strategy	Presents the strategy for managing flood risk, how and when specific measures will be implemented, assessment processes, funding arrangements and associated environmental issues.
	Flood Risk Management & Drainage – Planning Standing Advice	Provides high level performance parameters for surface water drainage strategies to ensure management of flood risk throughout the city and inclusion of allowances for climate change.

Scoping Criteria

- 11.2.14 As discussed in Chapter 2, a formal request for a Scoping Opinion from CCC was requested, which was duly received with comments from relevant consultees such as North Warwickshire Borough Council, Natural England and Coventry City Council Drainage team. The issues raised are summarised in Table 2.1 of Chapter 2. Following this and further discussions with CCC, the Environment Agency, Severn Trent Water and Warwickshire County Council, the scope of the assessment includes the following for both the construction and operational phases of the Proposed Development:
- Flood risk associated with fluvial and surface water sources.
 - The effect on surface and foul water drainage.
 - The water quality implications on watercourses and groundwater.
 - The effect on water supply.

Extent of Study Area

- 11.2.15 The study area associated with this assessment comprises the Application Site and the land immediately beyond it to a distance of 250m. This is due to potential interaction with surface water run-off from land to the south-west and the watercourse that will ultimately receive surface water from Proposed Development.

Limitations to the Assessment

- 11.2.16 The following limitations and assumptions apply to the assessment methodologies described above:
- Assumptions have been extrapolated for the whole of the Application Site based on the data available.
 - The assessment of water levels and rainfall are all based on statistical analysis of historic records to predict the potential severity of future events. If conditions in the future do not match the assumptions upon which the statistical analysis is based, there could be some variance between the predicted and actual levels at some point in the future.
 - The assessment of groundwater flood risk is based on a limited number of observations across the Application Site.
 - Appropriate information relating to groundwater quality that is comparable with the performance data for SuDS and other water quality control devices is not available. Due to this, a qualitative approach has been taken to the assessment of water quality.
 - The information contained within this assessment is based on the relevant and available information identified at the time of writing. This information does not indicate that baseline conditions are likely to change before the commencement of construction. The baseline provided here is considered appropriate for the assessment.

11.3 BASELINE CONDITIONS**Site Description and Context**

- 11.3.1 Chapter 3 of the ES sets out a general description of the Site and notes that the Site lies within Flood Zone 1 in relation to fluvial flooding and there are a number of ditches and small watercourses within and adjacent to the Site, including a pond in the centre of the Site which is surrounded by associated vegetation. More detailed discipline specific information is discussed below.

Baseline Survey Information**Flood Risk**

- 11.3.2 The Flood Risk Assessment (**Appendix 11.1**) identifies that the principal sources of flood risk potentially affecting and affected by the Proposed Development are fluvial and surface water. The risk of flooding from tidal, groundwater, sewers and artificial sources is considered low.

Fluvial

- 11.3.3 The Application Site, according to the Environment Agency Flood Map, is located wholly within Flood Zone 1 (low risk) in terms of fluvial flooding. There are a number of ditches and small watercourses within and adjacent to the Application Site that are too small to feature on the Flood Map by may still have associated floodplains, albeit small.
- 11.3.4 There are two watercourses downstream of the Application Site, both of which are un-named, that convey water from the Application Site and Bennetts Road North into the Breach Brook to the east, and ultimately the River Sowe. One of these watercourses originates from close to the northern corner of the Application Site. The second starts adjacent to Keresley Newland Primary Academy and forms the outfall from a surface water sewer that flows from Bennetts Road North.

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Surface Water

- 11.3.5 A number of areas within and adjacent to the Application Site have been identified as being potentially at risk of surface water flooding. The flooding within the Application Site generally follows the site topography with flows concentrated into a shallow valley feature that falls towards Bennetts Road North. Bennetts Road North and Howat Road to the east, downstream of the Application Site, are also shown as being at risk of surface water flooding.
- 11.3.6 Due to local topography, the Application Site receives run-off from land to the west. Currently this flow is intercepted by the existing drainage ditches that are present within the Application Site before being routed to an outfall or the existing central pond.

DrainageSurface Water

- 11.3.7 The Application Site in its current undeveloped condition does not contain any positive, piped surface water drainage systems. Surface water run-off either infiltrates into the ground or is intercepted by a number of ditches running along field boundaries. These convey the flows either off the Application Site into adjacent watercourses or an existing pond in the centre of the Site. Runoff from the south-western section of the Application Site currently drains into a pond within Thompsons Farm before discharging into a ditch running east along Thompsons Lane.
- 11.3.8 Public surface water sewers are located within Thompsons Lane and Bennetts Road North. The sewers run east along Thompsons Lane before turning north to flow along Bennetts Road North. Adjacent to the access to Keresley Newland Primary Academy school, the sewer again turns to flow in an easterly direction. It runs at the rear of properties fronting onto Howats Road before discharging into an unnamed watercourse which continues to flow in an easterly direction. The surface water sewers have a diameter of up to 225mm within Thompsons Lane increasing to 300mm diameter along Bennetts Road North. At its outfall into the unnamed watercourse, the sewer has a diameter of 600mm.

Foul Water

- 11.3.9 The only foul water sewers within the boundary of the Application Site are associated with the Hollies and Thompsons Cottage located on the Bennetts Road North frontage. These sewers enter the Application for a short distance before leaving again to flow into the public sewers within Bennetts Road North.
- 11.3.10 There are public combined sewers present within Bennetts Road North and Thompsons Lane. These have a diameter of 225mm and flow towards a 300mm diameter public foul water sewer that runs in an easterly beneath the rear gardens of properties on the northern side of Howat Road. There are also further foul water sewers with diameters between 150mm and 225mm that also discharge into this sewer. Severn Trent Water has advised that there are known capacity issues affecting the local foul water sewerage system.
- 11.3.11 Foul water flows are ultimately conveyed to Finham Wastewater Treatment Works (WwTW) for treatment. The available treatment capacity at Finham WwTW is currently subject to investigation by Severn Trent Water.

Water QualityWatercourses

- 11.3.12 According to Environment Agency data, the water quality of watercourses adjacent to and downstream of the Application Site is currently poor ecologically and good chemically. The poor ecological quality is attributed to diffuse pollution associated with agricultural activities, in particular, livestock, and domestic septic tanks.

Groundwater

- 11.3.13 The underlying groundwater is also classified as being poor quality both chemically and quantitatively. This status is due to high levels of abstraction and agricultural activities, in particular poor management of nutrients and pesticides.

Water Supply

- 11.3.14 The Water Cycle Study states that water supply capacity within the Coventry area is limited by environmental constraints. Taking into account the forecast development in the area, without intervention, the security of water supply would be at risk.
- 11.3.15 Severn Trent Water have advised that there are capacity constraints within the local water supply network.

11.4 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS**Construction**Flood RiskFluvial

- 11.4.1 As the whole of the Application Site is located within Flood Zone 1, construction activities will not result in any changes to floodplains that could have off-site implications that would adversely affect existing properties. Construction activities have the potential to affect the existing culverts that are present downstream of the Application Site as a result of mobilising sediment and other debris that could result in these becoming blocked. Should this occur simultaneously with a period of high flows within the watercourse, there is a risk that flows that should be contained within the watercourse will overtop the culvert and may result in flooding of adjacent properties in the vicinity of Bennetts Road North.
- 11.4.2 Any flooding that occurs would only remain while the culvert is blocked and any effects remediated with the property returned to its original condition. On this basis, the pre-mitigation effect of construction activities on fluvial flood risk is considered to potentially be moderate in magnitude on a high sensitivity receptor, potentially resulting in a temporary Major-Moderate Adverse effect.

Surface Water

- 11.4.3 There are a number of existing surface water overland flow routes present within the boundary of the Application Site. Additionally, surface water enters the Application Site from higher land to the west. Construction activities have the potential to disrupt these existing flow paths by either blocking or diverting them. This could result in flooding of land beyond the site boundary if water is not allowed to flow onto the Application Site. Uncontrolled diversion of flow paths, or the creation of new flow

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paths, as a result of earthworks operations could result in off-site areas and/or properties that have not flooded in the past being flooded.

- 11.4.4 The land upstream of the Application Site is currently undeveloped hence accumulation of water here would not affect residential properties. Diversion of existing or creation of new flow paths has the potential to have a more significant effect as residential properties are more likely to be affected. On this basis, the pre-mitigation effect of construction activities on surface water flood risk is considered to potentially be moderate in magnitude on a high sensitivity receptor, potentially resulting in a temporary Major-Moderate Adverse effect.

Drainage

Surface Water

- 11.4.5 Construction activities have the potential to disrupt the existing surface water drainage system comprising a number of ditches running along field boundaries. If works result in a loss of connectivity to an outfall or other parts of the drainage network, water accumulation could occur with an eventual consequence of sections overflowing. The water would then flow over the ground surface in a similar manner to surface water flooding.
- 11.4.6 The topography of the Application Site is such that surface water flows could be directed towards Bennetts Road North, Thompsons Lane via Thompsons Farm or its northern corner. There are existing residential properties present in all of these locations hence there is a risk that flooding could occur. It is anticipated that, due to the volumes of water involved, any flooding would affect external areas only.
- 11.4.7 Construction activities have the potential to mobilise silt and other materials that may be washed into downstream drainage systems. These materials may settle out and progressively accumulate within pipework and channels leading to a gradual reduction in flow capacity. Over time this may result in blockages that could cause flooding if water accumulates upstream. The effect of this flooding is dependent on its location; however, it is anticipated that primarily external areas would be affected.
- 11.4.8 On the basis of the above, the pre-mitigation effect of construction activities on surface water drainage is considered to potentially be minor in magnitude on a high sensitivity receptor, potentially resulting in a temporary Moderate-Minor Adverse effect.

Foul Water

- 11.4.9 During construction, foul water flows from the construction compound are anticipated to be low. It is anticipated that initially, before the permanent foul water connection from the Proposed Development is constructed, foul water flows will be stored and periodically removed from the Application Site by tanker. Once the connection has been constructed, this may be used for foul water flows from the site compound; however, these will continue to be very low.
- 11.4.10 As such, the effect on capacity within the local foul water sewerage system during construction is considered to be Negligible.
- 11.4.11 Construction activities have the potential to damage and/or block the existing foul water sewers within the Application Site serving The Hollies and Thompsons Cottage. The effects could be either structural damage due to trafficking by construction plant or ingress of debris. These effects could result in either partial or complete blockage

of the sewers causing a temporary disruption to foul water drainage from these properties.

- 11.4.12 As a result of the consequences of these effects on residential properties, the pre-mitigation effect of construction activities on existing foul water sewers within the Application Site is considered to potentially be minor in magnitude on a high sensitivity receptor, potentially resulting in a Moderate-Minor Adverse effect.

Water Quality

Watercourses

- 11.4.13 The primary effects from construction activities on the Application Site on local watercourses relate to the potential for sediment, construction materials, chemicals and fuel being washed into the channel. Earthworks operations which disturb the ground surface increase the risk of sediment being generated, particularly during periods of heavy rain. Loose material will be mobilised by surface run-off and conveyed, following the topography of the Application Site, towards the watercourses. Sediment entering a watercourse has a visual effect, presents a risk to fish and other wildlife, and, when it settles can impact on fish spawning areas and river morphology. The effect of sediment entering the watercourse will diminish with distance from the Application Site as the suspended material settles out of the flow.
- 11.4.14 Construction materials and chemicals present a risk to water quality within watercourses particularly if they are soluble or capable of being suspended in the water. The materials would need to be washed into the watercourse during a period of heavy rain or, if left in a floodplain area, by floodwater during a flood event. These may have similar effects to sediment and, additionally, could be toxic to wildlife within the watercourse depending on the materials released. The extents of the area downstream of the Application Site that could be affected are greater, particularly if soluble materials are involved that will not drop out of suspension.
- 11.4.15 Any fuels entering the watercourses are likely to originate from accidental spills during plant refuelling operations or from leaking equipment. The fuel has the potential to flow over the ground surface to enter the watercourse; this process would be accelerated by any rainfall or floodwater that could wash the fuel into the channel. Within the watercourse, the fuel will create a visible sheen on the surface and be toxic to wildlife. As fuel is insoluble, the effect has the potential to affect a significant distance downstream. It should be noted, that the volume of fuel that could be released in the event of a spill, is likely to be relatively small which will reduce the potential downstream effect.
- 11.4.16 On the basis of the above, the pre-mitigation effect of construction activities on local watercourses is considered to potentially be moderate in magnitude on a low sensitivity receptor, potentially resulting in a temporary Minor Adverse effect.

Groundwater

- 11.4.17 While the permeability of the ground within the Application Site has been shown to be comparatively low, a pathway is still potentially present for pollutants to reach groundwater. During construction, when the ground surface is disturbed, this pathway may be more efficient and offer less restriction to the passage of pollutants. Possible pollutants include construction-related chemicals and fuels that could soak into the ground. The risk to groundwater quality from chemicals is primarily associated with the relatively localised areas where these are stored and used. Spillages within storage areas, during plant refuelling activities and leaks from plant

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are the primary means by which fuels could come into contact with the ground and hence have a potential effect on groundwater quality.

- 11.4.18 The volumes of chemicals and fuels that could be released are relatively small; however, once these reach the groundwater they are very difficult to remove and could reside in a dilute form for a considerable period of time. It should be noted that the limited permeability of the ground will restrict the rate and quantity of pollutants that can reach the groundwater. On this basis, the pre-mitigation effect of construction activities on groundwater quality is considered to potentially be moderate in magnitude on a low sensitivity receptor, potentially resulting in a permanent Minor Adverse effect.

Water Supply

- 11.4.19 During construction, demand for potable water for construction activities is anticipated to be minimal. A potable water supply will be required for any site compound to service the welfare facilities; however, due to its small scale this will not represent a significant effect. On this basis, the effect on water supply during the construction phase is considered to be Negligible.

Operation

Flood Risk

Fluvial

- 11.4.20 The Proposed Development is located wholly within Flood Zone 1 hence will not affect any existing floodplains in terms of changes in available storage volume.
- 11.4.21 Local watercourses will be the eventual outfall for all surface water discharged from the Proposed Development. The Proposed Development will increase the impermeable area within the Application Site hence the volume and rate of water that enters the local watercourses would be increased. This will increase flood risk downstream, potentially exacerbating existing flooding issues and creating new areas affected by flooding. This may adversely affect properties, particularly as some may flood internally, and land downstream of the Application Site.
- 11.4.22 Due to the sensitivity of the potential receptors (high) and the consequences of the potential effect (major), the pre-mitigation potential effect of the Proposed Development on fluvial flood risk is considered to be permanent Major Adverse.

Surface Water

- 11.4.23 The increased impermeable area that will be present within the Application Site as a result of the Proposed Development will generate additional surface run-off as the area available for infiltration into the ground will be reduced. The run-off will tend to follow the falls of the ground and flow in an easterly direction towards Bennetts Road North and the properties adjoining the Application Site. The paved areas within the Proposed Development offer less resistance to the movement of run-off hence water will flow towards the existing properties at a greater rate than it does under current conditions. This will increase the risk of surface water flooding at these properties.
- 11.4.24 The ground profile of the Application Site is such that, while run-off volumes will increase, much of the run-off will be directed into an area where it will be contained within the Application Site with only a reduced volume crossing the boundary to directly affect properties. As a consequence, only external flooding of properties is considered likely. On this basis, the pre-mitigation effect of the Proposed

Development on surface water flood risk is considered to potentially be moderate in magnitude on a high sensitivity receptor, potentially resulting in a permanent Major-Moderate Adverse effect.

Drainage

Surface Water

- 11.4.25 The part of the Proposed Development will discharge surface water flows into the public surface water drainage system within Thompsons Lane and Bennetts Road North. Due to the impermeable area that the Proposed Development will introduce onto the Application Site, the flow rates and volumes entering the existing surface water drainage system will increase. There is a risk that this will exceed the available capacity within the system and could result in flooding occurring further downstream.
- 11.4.26 The downstream surface water drainage system runs within areas of public highway and close to residential properties. These could both be affected by any water that escapes from the surface water drainage system if the capacity of the pipework is exceeded. Any resultant flooding is expected to be external; however, a risk remains of internal flooding of any low-lying buildings.
- 11.4.27 The surface water drainage flows from the Application Site into the pond within Thompsons Farm are expected to be reduced as a result of a direct outfall into Thompsons Lane being used. This is expected to be beneficial in terms of controlling flood risk originating from this pond.
- 11.4.28 As a consequence, the pre-mitigation effect of the Proposed Development on surface water drainage is considered to potentially be major in magnitude on a high sensitivity receptor, potentially resulting in be permanent Major Adverse effect.

Foul Water

- 11.4.29 The Proposed Development will generate additional foul water flows which will be discharged into the local foul water sewerage system. It is known that there are existing capacity issues within this system; therefore, the additional flows could result in sewer surcharging or, in extreme cases, flooding. The location of potential surcharging or flooding could be remote from the Proposed Development and could affect residential properties.
- 11.4.30 On the basis of the above, the pre-mitigation effect of the Proposed Development on the local foul water sewerage system is considered to potentially be moderate in magnitude on a high sensitivity receptor, potentially resulting in a permanent Major-Moderate Adverse effect.
- 11.4.31 The additional foul water flows could also exceed the available headroom at Finham WwTW. This may lead to exceedance of discharge consent parameters and possible downstream pollution in the River Sowe if the capacity of treatment processes is exceeded. The River Sowe at the location of the outfall from Finham WwTW is currently assessed as being of Moderate quality (Water Framework Directive) with sewage discharges identified as a reason for this classification. A reduction in the quality of treated effluent from the WwTW is likely to contribute towards a further reduction in quality.
- 11.4.32 On this basis, the pre-mitigation effect of the Proposed Development on waste water treatment capacity is considered to potentially be moderate in magnitude on a moderate sensitivity receptor, potentially resulting in a permanent Moderate-Minor Adverse effect.

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- 11.4.33 The Proposed Development will introduce potential sources of pollution onto the Application Site that are not currently present. These include highways and carparking areas that will be connected to the proposed surface water drainage system. Run-off will discharge into local watercourses.
- 11.4.34 The surface water drainage system will comprise a combination of pipework and open channels, with a number of storage areas. It will enable the flows to reach the receiving watercourses more quickly than run-off from the Application Site currently could hence there is less opportunity for any pollutants to be filtered out by the overland flow process. As a consequence, there is a risk that pollutants will be able to enter the watercourses and degrade water quality within them.
- 11.4.35 As a consequence, the pre-mitigation effect of the Proposed Development on water quality within watercourses is considered to potentially be moderate in magnitude on a low sensitivity receptor, potentially resulting in be permanent Minor Adverse effect.

Groundwater

- 11.4.36 As stated above, the Proposed Development introduces sources of pollution onto the Application Site that are currently not present. The ground conditions have been shown to be of limited permeability which will limit the extent to which pollutants can enter the underlying groundwater; however, some limited infiltration is still possible via the various storage areas and ditches proposed within the Proposed Development. Therefore, any pollution from highway and carparking areas could potentially slowly infiltrate into the ground and adversely affect groundwater quality.
- 11.4.37 On this basis, the pre-mitigation effect of the Proposed Development on groundwater quality is considered to potentially be minor in magnitude on a low sensitivity receptor, potentially resulting in a permanent Minor-Negligible Adverse effect.

Water Supply

- 11.4.38 The increased population on the Application Site as a result of the Proposed Development will place increased demands on the local water supply network. As there are known capacity issues within the local network, this could have implications for supply pressure in the immediate area and place greater demands on water treatment and storage infrastructure elsewhere.
- 11.4.39 As a consequence, the pre-mitigation effect of the Proposed Development on water supply is considered to potentially be moderate in magnitude on a moderate sensitivity receptor, potentially resulting in a Moderate-Minor Adverse effect.

11.5 MITIGATION, ENHANCEMENT AND RESIDUAL EFFECTS**Mitigation by Design**Flood RiskFluvial

- 11.5.1 The mitigation measures that will be incorporated into the design of the Proposed Development in order to address the identified adverse effects on fluvial flood risk comprise new storage features and flow controls. These will be located at each surface water outfall and will limit the maximum flow rate from the Proposed Development to the existing greenfield average annual flow rate less 20%. The maximum rate applies to all rainfall events up to and including the 1 in 100-year +40% climate change event. This represents a betterment when compared to the existing situation.

Surface water

- 11.5.2 The Proposed Development will incorporate a positive surface water drainage system that will intercept run-off generated by roofs and hardstanding areas beyond conveying it to an outfall. Run-off will be captured using a combination of gullies, open channels and storage features. This will ensure that run-off does not leave the Application Site in an uncontrolled manner and cause flooding of land and property beyond the boundary. The surface water drainage system will be designed to remain effective for all rainfall events up to and including at least the 1 in 100-year +40% event.

DrainageSurface Water

- 11.5.3 The potential overloading of existing surface water drainage systems as a result of the Proposed Development will be mitigated within the design in the same manner as fluvial flood risk is managed. This is described in paragraph 11.5.2 above.

Foul Water

- 11.5.4 Mitigation measures to address the effects of the Proposed Development on the existing foul water sewerage system cannot be incorporated by design. The measures are described in paragraph 11.5.16 below.

Water QualityWatercourses

- 11.5.5 As required by the Environment Agency and Lead Local Flood Authority, the Proposed Development will incorporate sustainable drainage (SuDS) features within the design of the proposed surface water drainage system. These will provide a water treatment function in addition to storage, amenity and biodiversity benefits. All surface run-off from the Proposed Development will pass through a number of SuDS features. These have been selected to achieve the required degree of water treatment necessary for discharge to a watercourse downstream. This will mitigate the potential effect of the Proposed Development on watercourse water quality.

Water Resources

Groundwater

- 11.5.6 In order to mitigate the potential effects of polluted run-off from the Proposed Development entering the groundwater, the pollutants must be intercepted and removed prior to infiltration taking place. The proposed surface water drainage system serving the Proposed Development will incorporate SuDS and other measures for intercepting and treating polluted run-off.
- 11.5.7 Run-off from paved areas can be filtered through permeable paving or passed through trapped gullies to remove pollutants. For higher risk areas, interceptors can be used before the water is released into parts of the drainage system where infiltration is possible.

Water Supply

- 11.5.8 The Proposed Development can incorporate measures to reduce water use such as low flush toilets, water butts, water efficient appliances and shower heads and lower flow taps. These will contribute towards a reduction in the overall water demand of the Proposed Development.

Additional MitigationFlood RiskFluvial

- 11.5.9 In order to manage the effects on fluvial flood risk during construction, the Contractor must implement measures to prevent silt and other debris from being washed into channels and culverts downstream where they could cause blockages. In parallel, regular inspections of the downstream watercourses and structures should be undertaken to check for accumulations of material. Where an issue is identified, works would be undertaken to remove it and restore full flow capacity.
- 11.5.10 These works will be incorporated into the Construction Environment Management Plan (CEMP).

Surface water

- 11.5.11 The effects on surface water flood risk resulting from construction activities can be mitigated through careful planning of earthworks operations to ensure that existing flow routes are maintained or safely diverted, and that new flow paths towards sensitive areas are not created. As necessary, temporary ditches and bunds could be used to intercept and re-direct surface water flows to prevent them from exacerbating existing surface water flooding.
- 11.5.12 The measures will be documented within the CEMP.

DrainageSurface Water

- 11.5.13 Careful planning of the construction sequence to ensure continuity or adequate diversion of existing surface water drainage routes will enable surface water drainage within the Application Site to continue operating. This will ensure that off-site areas are protected from uncontrolled flows.

11.5.14 The Contractor must ensure that measures are implemented to remove silt and other debris from surface water leaving the Application Site in order to prevent downstream accumulations. This may involve the use of straw bales for filtration or silt removal plant. In addition, inspection of downstream pipework to identify and resolve any potential blockages will be undertaken on a regular basis.

11.5.15 These works will be included in the CEMP.

Foul Water

11.5.16 Severn Trent Water will undertake the necessary off-site capacity upgrade works within the local sewerage network and, if required, at Finham WwTW. The nature and scale of the works is not currently known and is subject to a modelling exercise to be completed by Severn Trent Water.

11.5.17 In order to mitigate the risk of potential adverse effects on the existing foul water sewer within the Application Site during construction, the contractor will ensure that this is located prior to works commencing. The sewer will be protected from damage during earthworks operations by careful planning of activities. If it is necessary for plant to cross the line of the sewer, designated crossing points will be defined with measures put in place to prevent excessive loading of the pipe. A regime of regular inspections will also be implemented to check for internal damage or debris ingress. As necessary, remedial works will be undertaken to ensure uninterrupted operation of the sewer.

Water Quality

Watercourses

11.5.18 The effect of sediment resulting from construction activities can be mitigated through the use of measures to limit run-off and intercept suspended sediment. This may involve the construction of temporary ditches and bunds to intercept and redirect run-off, and the formation of basins to provide an opportunity of sediment to settle out. Other methods may include the use of straw bales to provide filtration of flows and using specialist settlement tanks to treat accumulated water before it is discharged into the local watercourses. The choice of technique used will be dependent on the construction sequence and planning by the Contractor.

11.5.19 Construction materials and chemicals should not be stored within areas potentially at risk of surface water flooding. Any potentially toxic materials should be contained in bunded areas to limit the risk of a spill or other contact with water that might convey them to a watercourse.

11.5.20 Fuel for small and large plant must be stored in bunded tanks to reduce the risk of a spill. All refuelling activities for mobile plant must take place in designated, controlled areas where spills can be contained. For plant that is less likely to be frequently moved, such as pumps, spill kits will be carried by the operatives undertaking the refuelling operation to ensure that any spillage can be contained. All plant must be well maintained to reduce the risk of leaks and drip trays used underneath any pumps or similar equipment. Appropriately sized spill kits to contain the full volume of the potential spill will be available to contain any accidental fuel releases.

11.5.21 These measures will be incorporated into the CEMP.

Water Resources

Groundwater

- 11.5.22 In order to mitigate the effect of construction chemicals on groundwater quality, these should be contained in bunded areas to limit the risk of a spill. Procedures should be established to minimise the risk of spills in areas where these are used, and to manage any spills including the removal of any contaminated soil.
- 11.5.23 Similarly, fuel for plant must be stored in bunded tanks to reduce the risk of a spill. All refuelling activities for mobile plant must take place in designated, controlled areas where spills can be contained. For plant that is less likely to be frequently moved, such as pumps, spill kits will be carried by the operatives undertaking the refuelling operation to ensure that any spillage can be contained. All plant must be well maintained to reduce the risk of leaks and drip trays used underneath any pumps or similar equipment. Appropriately sized spill kits to contain the full volume of the potential spill will be available to contain any accidental fuel releases.
- 11.5.24 These measures will be included in the CEMP.

Water Supply

- 11.5.25 Severn Trent Water will undertake the necessary off-site water supply network capacity upgrade works. The nature and scale of the works is not currently known and is subject to a modelling exercise to be completed by Severn Trent Water.

Table 11.5 Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
1	Surface water storage and flow controls to limit the maximum flow rate discharged into downstream watercourses to the existing annual average rate less 20%.	X		
2	Measures to prevent silt and debris from being deposited in watercourses, culverts and other downstream pipework. Inspection regime with reactive works to remove accumulated material.			X
3	Positive surface water drainage system incorporating sustainable drainage features.	X		
4	Careful planning of earthworks to avoid creation of new surface water flow paths, unintended diversion of existing flow paths or areas where water can accumulate.			X
5	Off-site sewerage system and WwTW capacity improvements undertaken by Severn Trent Water.			X
6	Protection and regular inspection of the existing foul water sewer present within the Application Site.			X
7	Bunded storage of construction-related chemicals and fuels.			X
8	Designated re-fuelling areas for mobile plant. Drip trays used. Spill kits available.			X
9	Inclusion of water use reduction measures.	X		
10	Off-site water supply network capacity improvements undertaken by Severn Trent Water.			X

Enhancements

- 11.5.26 The Proposed Development does not incorporate any enhancements relating to water resources.

Residual Effects**Flood Risk****Fluvial**

- 11.5.27 The mitigation measures relating to the effect of construction activities on fluvial flood risk would address the effects identified; however, their effectiveness is wholly reliant on construction operatives complying with associated method statements and procedures. There is a risk that this does not occur hence the effects may be reduced but not fully mitigated. The proposed mitigation reduces the magnitude of the effects on the high sensitivity receptors to minor. On this basis, the post-mitigation effect of construction activities on fluvial flood risk reduces to temporary Moderate-Minor Adverse.
- 11.5.28 The proposed surface water drainage system serving the Proposed Development will ensure that the maximum discharge rate into the downstream watercourses does not exceed the existing annual average run-off rate less 20% for all rainfall events up to and including the 1 in 100-year plus 40% climate change event. This represents a betterment in terms of downstream flood risk when compared to the existing situation as the discharge rates for more extreme rainfall events will be reduced.
- 11.5.29 If a more significant rainfall event were to occur, beyond the design parameters for the drainage system, discharge flow rates would continue to be attenuated within the capacity of the flow control hence there will not be a sudden increase in downstream fluvial flood risk.
- 11.5.30 These proposed mitigation measures are expected to improve the situation for downstream high sensitivity receptors, when compared to the baseline situation to a minor degree. On this basis, the post-mitigation effect of the Proposed Development on fluvial flood risk will be Minor Beneficial.

Surface Water

- 11.5.31 The proposed mitigation measures will address the effects of construction activities on surface water flood risk; however, their effectiveness is wholly reliant on construction operatives complying with associated method statements and procedures. There is a risk that this does not occur hence the effects may not be fully mitigated. The consequential magnitude of the effects, post-mitigation, on high sensitivity receptors is minor. On this basis, the post-mitigation effect of construction activities on surface water flood risk reduces from temporary Major-Moderate Adverse to temporary Moderate-Minor Adverse.
- 11.5.32 The proposed surface water drainage system serving the Proposed Development will be designed to accommodate flows from rainfall events up to and including the 1 in 100-year +40% event. A more extreme event may result in parts of the system overflowing; however, it is likely that other sections will be able to intercept the flows before they can escape from the Proposed Development and worsen surface water flood risk. The proposed mitigation measures will reduce the magnitude of the effect on high sensitivity receptors to negligible. On this basis, the post-mitigation effect of the Proposed Development on surface water flood risk will be Negligible.

Water Resources

DrainageSurface Water

- 11.5.33 The proposed mitigation measures will address the potential construction effects on the surface water drainage system. As the effectiveness of the measures is dependent on regular inspections and appropriate remedial action to address issues identified by construction operatives, there is a risk that this may not be undertaken. This could lead to a progressive degradation of system performance. As a consequence, while the likelihood of an effect is reduced, the magnitude of the potential effect on high sensitivity receptors remains as minor. Therefore, the post-mitigation effect of construction activities on surface water drainage is unchanged as temporary Moderate-Minor Adverse.
- 11.5.34 The inclusion of a positive surface water drainage system within the Proposed Development will ensure that all run-off from the Proposed Development is intercepted and appropriately managed. The effect on downstream systems will be mitigated by storage and flow controls thereby ensuring that the receiving drainage is not inundated and is able to continue operating in its existing manner with an increased likelihood of surcharging or possible flooding.
- 11.5.35 These mitigation measures reduce the magnitude of the effect on high sensitivity receptors to negligible. As a consequence, the post-mitigation effect of the Proposed Development on surface water drainage reduces from Major Adverse to Negligible.

Foul Water

- 11.5.36 As the pre-mitigation effect of construction activities on the local foul water sewerage system is Negligible, the residual effect is also Negligible.
- 11.5.37 The mitigation measures proposed to protect the existing foul water sewers within the Application Site during construction will be effective. However, as the effectiveness of the measures is largely dependent on adherence to procedures by construction operatives, there is a risk that the full mitigation may not be applied. This could lead to damage to the sewers, albeit that the risk is likely to be reduced; therefore, the magnitude of the effect will remain as minor. On this basis, the post-mitigation effect of construction activities on foul water drainage remains unchanged at temporary Moderate-Minor Adverse.
- 11.5.38 The proposed off-site capacity improvement works that Severn Trent Water will undertake will ensure that the local foul water sewerage system is able to accommodate foul water flows from the Proposed Development. This allows the magnitude of the potential effect on high sensitivity receptors to be reduced to negligible. Therefore, the post-mitigation effect of the Proposed Development on the local foul water sewerage system reduces from Major-Moderate Adverse to Negligible.
- 11.5.39 Similarly, if required, Severn Trent Water will undertake any capacity improvement works at Finham WwTW to ensure that foul water flows from the Proposed Development do not overload existing treatment processes. As a consequence, the mitigation measures reduce magnitude of the potential effects to negligible for a moderate sensitivity receptor. This will reduce the post-mitigation effect of the Proposed Development on Finham WwTW from Moderate-Minor Adverse to Negligible.

Water QualityWatercourses

- 11.5.40 The mitigation measures proposed to address the potential construction effects on water quality in the downstream watercourses are effective but subject to the correct implementation of procedures by construction operatives. As a consequence, there is a risk that these are not followed and a pollution event occurs. It is likely that this will be of lesser significance than the pre-mitigation state; however, an adverse effect could still occur. This is considered to potentially cause a minor effect on a low sensitivity receptor. On this basis, the post-mitigation effect of construction activities on watercourse water quality reduces from temporary Minor Adverse to temporary Minor-Negligible Adverse.
- 11.5.41 The proposed mitigation measures will be effective in protecting the downstream watercourses from pollution originating from the Proposed Development. There is a risk that a significant pollution event, such as a fuel spill, could occur that would overwhelm the treatment capacity of the SuDS features and hence contaminated water could still enter the watercourses. The nature of the proposed surface water drainage system is such that it would provide a number of opportunities to contain the pollution; however, the risk of a degree of downstream water quality degradation remains. The proposed mitigation measures enable the magnitude of the potential effect to be reduced to minor for a low sensitivity receptor. Therefore, the post-mitigation effect of the Proposed Development of watercourse water quality reduces from permanent Minor Adverse to temporary Minor-Negligible Adverse.

Groundwater

- 11.5.42 Once the mitigation measures proposed to address the potential construction effects on groundwater quality are implemented, the effects will be effectively managed; however, this is subject to the correct implementation of procedures by construction operatives. There is a risk that these might not be followed and hence a pollution event could still occur with a consequential adverse effect. It is anticipated that any effect would have a reduced significance due to the effect of any mitigation that is in place. The proposed mitigation measures enable the magnitude of the potential effect to be reduced to minor for a low sensitivity receptor. On this basis, the post-mitigation effect of construction activities on groundwater water quality reduces from permanent Minor-Adverse to permanent Minor-Negligible Adverse.
- 11.5.43 The implementation of SuDS, particularly permeable paving, and trapped gullies within the Proposed Development will be effective in terms of preventing polluted run-off from reaching areas where infiltration could occur. There is a possibility of an accidental pollution incident that could result in a volume of pollutants exceeding that which the drainage system can remove before infiltration occurs. There are opportunities within the surface water system to contain any pollutants before they can progress too far downstream thereby limiting the amount of infiltration that could occur. However, there is still a risk that groundwater quality could still be adversely affected under some conditions.
- 11.5.44 While the proposed mitigation measures will reduce the risk, the magnitude of the effect remains as minor. Therefore, it is concluded that the post-mitigation impact of the Proposed Development remains unchanged at permanent Minor-Negligible Adverse.

Water Resources

Water Supply

- 11.5.45 Construction activities are considered to have a Negligible effect on capacity within the local water supply network hence no mitigation is required and the effect remains Negligible.
- 11.5.46 Water consumption reduction measures in conjunction with the reinforcement works to be undertaken by Severn Trent Water that are required to provide the necessary capacity to serve the Proposed Development will enable the magnitude of the effect on the water supply network, a high sensitivity receptor, to be reduced to negligible; therefore, the post-mitigation effect of the Proposed Development on water supply reduces from Moderate-Minor Adverse to Negligible.

11.6 CUMULATIVE AND IN-COMBINATION EFFECTS

- 11.6.1 Chapter 2 sets out the schemes which could potentially result in additional cumulative effects, in particular the remainder of the strategic allocation which surrounds the Site, and should be referred to. Consideration to the schemes noted in Chapter 2 have been considered in the below cumulative assessment.

Flood RiskFluvial

- 11.6.2 The Application Site drains via a different watercourse catchment to the other schemes hence the cumulative effect is considered to be Negligible for both the construction and operation phase.

Surface Water

- 11.6.3 The surface water flooding identified within and surrounding the Application Site is independent of that associated with the other schemes. As a consequence the cumulative effect, during both construction and operation, is considered to be Negligible.

DrainageSurface Water

- 11.6.4 The surface water drainage systems that the Application Site and the Proposed Development rely upon are separate to those associated with the other schemes. Therefore, the cumulative effect on surface water drainage during both construction and operation is considered to be Negligible.

Foul Water

- 11.6.5 The Proposed Development and each of the other schemes will discharge foul water flows into the public sewerage system draining to Finham WWTW. The additional development will increase flows within the system with the potential effect of increased surcharging of pipework and, in extreme cases, possible flooding. The location of these potential effects is not known at this stage. The resultant pre-mitigation cumulative effect on the foul water sewerage system is considered to potentially be Major-Moderate Adverse.
- 11.6.6 Finhaw WwTW will also receive additional flows which could result in overloading of treatment processes with a risk of downstream pollution and/or discharge consent

non-compliance. As a consequence, the pre-mitigation cumulative effect on Finham WwTW is considered to potentially be Moderate-Minor Adverse.

- 11.6.7 However, Severn Trent Water will undertake upgrade works necessary to mitigate the effect that the Proposed Development and the other schemes will have on the foul water sewerage system and Finham WwTW. These works will provide the capacity necessary for all parts of the system to operate without adverse effects. This will allow the cumulative effect to be reduced to Negligible.

Water Quality

Watercourses

- 11.6.8 The Application Site and Proposed Development are located in a separate watercourse catchment to the other sites. This means that effects on water quality cannot combine to create a cumulative effect. On this basis, the cumulative effect, during both construction and operation, is considered to be Negligible.

Groundwater

- 11.6.9 The Application Site and the sites of the other schemes all lie above the same underlying aquifer; therefore, there is potential for any pollutants from the Proposed Development and other schemes to combine and the effect to increase. As a consequence, the pre-mitigation cumulative effect during both construction and operation is considered to potentially be Minor Adverse.
- 11.6.10 However, it is assumed that each of the other schemes will implement best practice measures in the same manner as the Proposed Development to mitigate the effect on groundwater quality. On this basis, the post-mitigation cumulative effect on groundwater quality during both construction and operation will be Negligible.

Water Supply

- 11.6.11 The Proposed Development and the other sites will be served from the same water distribution network. Severn Trent Water has advised that there are known capacity issues within the system. The combined demand for water for the new dwellings has the potential to reduce water pressures in the local network affecting supplies to the wider area. As a consequence, the pre-mitigation cumulative effect on water supply is considered to potentially be Moderate-Minor Adverse.
- 11.6.12 Severn Trent Water will be undertaking capacity upgrade works within the local distribution network to ensure an adequate water supply for the Proposed Development and the other sites. In addition, it is assumed that the other sites, together with the Proposed Development, will incorporate measures to improve water efficiency and reduce water demand. These mitigation measures mean that the post-mitigation cumulative effect on water supply is Negligible.

Water Resources

11.7 SUMMARY**Introduction**

- 11.7.1 The assessment considered the effect of the Proposed Development on water resources both during construction and subsequent operation. The specific matters assessed included fluvial and surface water flood risk, surface and foul water drainage, watercourse and groundwater quality and water supply.
- 11.7.2 The assessment was based on the Flood Risk Assessment together with information obtained from publicly available documents, such as the Coventry Water Cycle Study, and on-line data sources.

Baseline Conditions**Flood Risk**

- 11.7.3 The Application Site is located wholly within Flood Zone 1 (low risk) in terms of fluvial flooding. There are a number of small watercourses and drainage ditches within and adjacent to the Application Site; however, these are too small to have a defined Flood Zone. There are two unnamed watercourses downstream of the Application Site that ultimately receive run-off from it via public surface water sewers. These are both tributaries of the Breach Brook which is located further to the east.
- 11.7.4 A number of areas both within and adjacent to the Application Site, specifically Bennetts Road North and Howat Road, have been identified as being potentially at risk of surface water flooding. The surface water flooding within the Application Site is concentrated by the ground profile into a corridor that falls in a north-easterly direction towards Bennetts Road North. The Application Site receives surface water run-off from higher land to the west. This is primarily intercepted by existing ditches.

Drainage

- 11.7.5 There is currently no piped surface water drainage system within the Application Site. All surface water drainage is provided by a network of ditches along field boundaries. A short length of foul water drainage pipework serving Thompsons Cottage and The Hollies runs within the Application Site before discharging into a public foul water sewer within Bennetts Road North.
- 11.7.6 There are public surface and foul water sewers present within adjacent roads. A number of the surface water sewers provide an outfall for run-off from some parts of the Application Site and convey it to watercourses a short distance downstream.
- 11.7.7 Severn Trent Water has advised that there are known capacity issues affecting the local foul water drainage system. All foul water flows from the area including the Application Site are drained to Finham Wastewater Treatment Works (WwTW). The available capacity at Finham WwTW is currently being investigated by Severn Trent Water.

Water Quality

- 11.7.8 The quality of the watercourses adjacent to and downstream of the Application Site is moderate. There are current issues relating to pollution caused by agricultural activities and domestic septic tanks that are affecting water quality.

- 11.7.9 The groundwater underlying the Application Site is of low quality and is restricted in quantity. These conditions are caused by high levels of abstraction and agricultural activities.

Water Supply

- 11.7.10 Water supply capacity within the Coventry area is limited by environmental constraints. In addition, Severn Trent Water has advised that there are some capacity issues within the supply network local to the Application Site.

Likely Significant Effects

Flood Risk

Fluvial

- 11.7.11 During construction, the Proposed Development will not have an effect on watercourse floodplains. Earthworks may increase the amount of sediment that could be washed downstream from the Application Site with the consequence that culverts and other structures could become partially or fully blocked. This could increase flood risk and have a significant effect on properties adjacent to the watercourses.
- 11.7.12 In terms of surface water flood risk during construction, there is a risk that existing flow paths may be diverted, new routes created or blockages formed resulting in new areas flooding or worsening of existing flooding. This could have a significant effect on properties that bound the Application Site.
- 11.7.13 Once the Proposed Development is completed, the increased flow rates resulting from the increased impermeable area present on the Application will increase downstream fluvial and surface water flood risk. This could have a significant effect on properties close to the watercourses and those adjacent to the Proposed Development.

Drainage

- 11.7.14 Construction activities have the potential to disrupt the existing field drain network that currently provides surface water drainage for the Application Site. This could result in ditches overtopping and the creation of flow paths that may cause flooding in off-site areas affecting existing properties. This could be exacerbated by increased mobilisation of silt that could result in the blockage of downstream surface water pipework. For these reasons, this effect is considered to be significant.
- 11.7.15 The increase in surface water flow rates generated by the Proposed Development would result in downstream surface water sewers becoming overloaded. This is considered a significant effect as it could cause existing off-site properties to experience flooding.
- 11.7.16 During construction, the effect on the public foul water drainage system will be negligible as the flow rates generated by the construction compound will be very low. It is possible that the existing foul water sewer within the Application Site serving Thompsons Cottage and The Hollies could be damaged by construction activities. As this could result in a loss of foul water drainage for these properties, this is considered to be a significant effect.
- 11.7.17 The Proposed Development will introduce additional flows into the local foul water drainage system for treatment at Finham WwTW. The effect of this is anticipated to be significant as it could result in pipework becoming overloaded and flood risk

Water Resources

increasing. Furthermore, Finham WwTW may not have sufficient process capacity to accommodate the additional flows so polluted water could be discharged.

Water Quality

Watercourses

- 11.7.18 Construction activities on the Application Site have the potential to mobilise sediment and introduce construction materials and chemicals, and fuels onto the site, all of which could be washed into the downstream watercourses. The likely effects on the visual appearance of the watercourses and on biodiversity are potentially significant. These chemicals and fuels could also infiltrate into the ground and enter groundwater; however, the low permeability of the ground reduces the risk of this occurring and the effect is insignificant.
- 11.7.19 The Proposed Development will introduce new pollution sources onto the Application Site, principally related to vehicles. Highway and parking areas are the primary sources of pollution which could comprise fuels and oils, and solid matter such as brake dust. These could be conveyed quickly via the surface water drainage system serving the Proposed Development into the downstream watercourses. The effect of these pollutants is considered to be significant. The risk of these pollutants being able to infiltrate and reach groundwater is considered to be low and the likely effect insignificant as a result of the low permeability of the ground.

Water Supply

- 11.7.20 Construction activities will have a negligible effect on water supplies while works are being undertaken. The only water consumed will be from the site compound.
- 11.7.21 The Proposed Development increases the population and consequently the water demand that must be met by the local distribution network. Due to the existing capacity issues that are present within the network, this could result in low water pressures in the local area. As a result of the number of properties that this could affect, the effect is considered to be significant.

Mitigation and Enhancement

Flood Risk

- 11.7.22 The effect of construction activities on fluvial flood risk will be managed through the use of site procedures to limit the mobilisation of sediment and other debris. This will be supported by an inspection regime to identify potential blockages before they become a problem. Similarly, surface water flood risk will be managed through careful planning of earthworks operations to prevent adverse changes to flow paths. Adherence to these procedures will enable the potential effects to be considered insignificant.
- 11.7.23 The Proposed Development will include a surface water drainage system to intercept run-off and limit the flow rates released into the downstream watercourses to the existing annual average rate less 20% for all rainfall events up to and including at least the 1 in 100-year +40% rainfall event. This prevents uncontrolled flows leaving the site and, as the flow rates will be lower than the existing rates, a reduction in downstream fluvial and surface water flood risk can be expected; therefore, the effect of the Proposed Development on flood risk becomes negligible.

DrainageSurface Water

- 11.7.24 The effect of construction activities on surface water drainage will be managed in a similar manner to fluvial and surface water flood risk during construction. Measures will be implemented to protect the foul water drainage within the Application Site from damage. The use of specific procedures in conjunction with an inspection regime will allow the effect to be considered insignificant.
- 11.7.25 The proposed flow control and storage measures incorporated into the surface water drainage system that will serve the Proposed Development will enable the effect on downstream surface water systems to be considered negligible. Maximum discharge flow rates will be reduced below existing rates hence downstream pipework will not be overloaded.
- 11.7.26 In order to provide sufficient foul water sewer capacity for the Proposed Development, Severn Trent Water will undertake capacity improvement works. Similarly, if necessary, Finham WwTW will also be upgraded to ensure that it can treat the anticipated flows. The consequence will be that the effect on foul water drainage will be negligible.

Water QualityWatercourses

- 11.7.27 The effect of construction activities on watercourse and groundwater quality will be rendered insignificant through the use of defined procedures and containment of potential pollutants, such as fuels. These will prevent contaminants from reaching pathways by which they can enter the watercourse and ensure measures are in place to manage any accidental releases. As a consequence, the effect will be insignificant.
- 11.7.28 The inclusion of sustainable drainage features within the surface water drainage system will provide treatment to run-off from potentially polluting areas passing through them. For areas where there is a greater risk of pollution levels, interceptors will be used to capture pollutants. These measures will mean that the effect of the Proposed Development on watercourse and groundwater water quality will be insignificant.

Water Supply

- 11.7.29 As the water demand during construction will be minimal, the effect of construction activities on water supply will be negligible.
- 11.7.30 The use of water consumption reduction measures such as low flush toilets, water butts, water efficient appliances and shower heads, and lower flow taps will reduce the overall water demand of the Proposed Development. Severn Trent Water will also undertake capacity reinforcement works on the local water distribution network. As a consequence, the effect of the Proposed Development on water supply will also be negligible.

Conclusion

- 11.7.31 The effects of construction activities on the Application Site and the operation of the Proposed Development on the water environment, once the identified mitigation measures have been implemented, will be insignificant or negligible.

Water Resources

Table 11.6 Summary of Effects, Mitigation and Residual Effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
Fluvial flood risk	Increased flooding due to culvert blockages.	Temporary Indirect	High	Moderate	Local	Major-Moderate Adverse	Measures to intercept and prevent deposition of material. Inspection regime.	Moderate-Minor Adverse
Surface water flood risk	Accumulation of surface water, diversion of existing or creation of new flow paths resulting in flooding of residential properties.	Temporary Direct	High	Moderate	Local	Major-Moderate Adverse	Careful planning of earthworks to prevent the unintended creation, diversion or blockage of flow paths.	Moderate-Minor Adverse
Surface water drainage	Disruption and/or blockage of the existing surface water drainage system increasing the risk of flooding beyond the Application Site boundary.	Temporary Indirect	High	Minor	Local	Moderate-Minor Adverse	Measures to intercept and prevent deposition of material. Inspection regime.	Moderate-Minor Adverse
Foul water drainage	Additional flows in the local foul	Permanent Direct	Moderate	Negligible	Local	Negligible	None	Negligible

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
	water sewerage system.							
Foul water drainage	Potential damage to existing private foul water sewers within the Application Site.	Temporary Direct	High	Minor	Local	Moderate-Minor Adverse	Pipe protection measures. Defined crossing points. Inspection regime.	Moderate-Minor Adverse
Watercourse water quality	Pollution due to construction-related chemicals and fuel spills.	Temporary Direct	Low	Moderate	Borough/District	Minor Adverse	Sediment traps. Materials and chemicals stored away from surface water flow paths. Designated refuelling areas, well maintained plant, use of drip trays and deployment of spill kits.	Minor-Negligible Adverse
Groundwater water quality	Pollution due to construction-related chemicals and fuel spills.	Permanent Direct	Low	Moderate	Borough/District	Minor Adverse	Chemicals stored in bunded areas. Designated refuelling areas, well maintained plant, use of drip trays and deployment of spill kits.	Minor-Negligible Adverse

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Water supply	Water demand during construction	Temporary Direct	Moderate	Negligible	Borough/District	Negligible	None	Negligible
Operation								
Fluvial flood risk	Increased volume of run-off entering local watercourses and increasing flood risk.	Permanent Direct	High	Major	Local	Major Adverse	Storage and flow controls at each outfall to limit maximum flow rates to existing rates less 20% for all events up to the 1 in 100-year +40% event.	Minor Beneficial
Surface water flood risk	Increased run-off volume and rate due to increased impermeable area potentially affecting adjacent properties.	Permanent Direct	High	Moderate	Local	Major-Moderate Adverse	Inclusion of a positive surface water drainage system to intercept run-off from roof and hardstanding areas.	Negligible
Surface water drainage	Potential overloading of existing surface water drainage systems.	Permanent Direct	High	Major	Local	Major Adverse	Storage and flow controls at each outfall to limit maximum flow rates to existing rates less 20% for all events up to the	Negligible

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
							1 in 100-year +40% event.	
Foul water drainage	Overloading of the existing foul water sewerage system with increased risk of surcharging and/or flooding.	Permanent Indirect	High	Moderate	Borough/District	Major-Moderate Adverse	Off-site sewerage system capacity improvements undertaken by Severn Trent Water.	Negligible
Foul water drainage	Potential exceedance of available capacity at Finham WwTW leading to discharge consent non-compliance and possible pollution incidents.	Permanent Indirect	Moderate	Moderate	Borough/District	Moderate-Minor Adverse	WwTW capacity improvements undertaken by Severn Trent Water.	Negligible
Watercourse water quality	Pollution due to contaminated run-off from hardstanding areas.	Permanent Direct	Low	Moderate	Borough/District	Minor Adverse	Use of SuDS within the surface water drainage system to provide water quality benefits.	Minor-Negligible Adverse
Groundwater quality	Limited risk of contamination of groundwater due to polluted run-	Permanent Direct	Low	Minor	Borough/District	Minor-Negligible Adverse	Use of SuDS within the surface water drainage system to	Minor-Negligible Adverse

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
	off entering storage areas.						remove pollutants before infiltration can occur.	
Water supply	Increased water demand leading to potential low supply pressure and increased loading on treatment and supply infrastructure.	Permanent Direct	Moderate	Moderate	Borough/District	Moderate-Minor Adverse	Inclusion of measures to reduce water use within the Proposed Development. Off-site supply network capacity improvements undertaken by Severn Trent Water.	Negligible
Cumulative and In-combination								
Fluvial flood risk	None	-	High	Negligible	Local	Negligible	None	Negligible
Surface water flood risk	None	-	High	Negligible	Local	Negligible	None	Negligible
Surface water drainage	None	-	High	Negligible	Local	Negligible	None	Negligible
Foul water drainage	Increased flows within the public foul water sewerage system with potential for	Permanent Indirect	High	Moderate	Borough/District	Major-Moderate Adverse	Off-site sewerage system capacity improvements undertaken by	Negligible

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
	surcharging and flooding.						Severn Trent Water.	
Foul water drainage	Potential exceedance of available capacity at Finham WwTW leading to discharge consent non-compliance and possible pollution incidents.	Permanent Indirect	Moderate	Moderate	Borough/District	Moderate-Minor Adverse	WwTW capacity improvements undertaken by Severn Trent Water.	Negligible
Watercourse water quality	None	-	Low	Negligible	Borough/District	Negligible	None	Negligible
Groundwater water quality	Limited risk of contamination of groundwater due to polluted run-off infiltrating into the ground.	Permanent Direct	Low	Moderate	Borough/District	Minor Adverse	Chemicals stored in bunded areas. Designated refuelling areas, well maintained plant, use of drip trays and deployment of spill kits. Use of SuDS within the surface water drainage system to remove pollutants	Negligible

ENVIRONMENTAL STATEMENT

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
							before infiltration can occur.	
Water supply	Increased water demand leading to potential low supply pressure and increased loading on treatment and supply infrastructure.	Permanent Direct	Moderate	Moderate	Borough/District	Moderate-Minor Adverse	Inclusion of measures to reduce water use within the Proposed Development. Off-site supply network capacity improvements undertaken by Severn Trent Water.	Negligible