

10.0 WATER, HYDROLOGY AND DRAINAGE

10.1 INTRODUCTION AND METHODOLOGY

10.1.1 This Chapter assesses the effects of the Project on water resources and drainage. In particular, it considers the potential effects of the Project upon surface water and the potential for flooding. Consideration is also given to the quality of surface water. Groundwater quality, which is associated with ground conditions, is discussed in **Chapter 11: Land Contamination**.

10.1.2 The Chapter describes the methods used to assess the baseline conditions currently existing at the Site and surroundings, the potential direct and indirect effects of both construction and the completed Project on water resources, hydrology and drainage, the mitigation measures required to prevent, reduce or offset the effects, and the residual effects.

10.1.3 The Chapter, written by Waterman Transport & Development Limited (WTDL) summarises a **Flood Risk Assessment (FRA)** which has been prepared by WTDL and is presented in **Appendix 10A**. Information relating to geology and hydro-geology is presented in **Chapter 11: Land Contamination**.

Baseline Data Collection and Sources

10.1.4 The baseline conditions of the Site and surroundings were established through the following:-

- A Site visit to examine the local water features and topography of the area, to identify potential flood flow routes within the Site, and to confirm details of the current conditions of Site drainage;
- A review of the Ordnance Survey and LiDAR data (refer to **Appendix A of Appendix 10A**);
- Inspection of the EA's Flood Zone maps and consultation with the EA to obtain all information which they hold that would be of relevance to the FRA;
- Consultation with Blaby District Council to establish flooding history at the Site and any other relevant information;
- Consultation with the local Flood Warden to establish flooding history in the vicinity; and
- A review of published BGS mapping and previous on-site investigations (refer to **Chapter 11: Land Contamination**).

Flood Risk

10.1.5 A **FRA** was undertaken by WTDL in accordance with the requirements of **Planning Policy Statement 25 (PPS25)**. The **FRA** considered all sources of potential flooding including tidal, fluvial, groundwater and pluvial sources. The full **FRA** can be found at **Appendix 10A**.

Surface Water Drainage

- 10.1.6 **PPS25** requires that the rate of surface water discharge from any developed site should be no greater than the existing rate, taking into account climate change for the lifetime of the Project. Further details are enclosed within **Appendix 10A**.

Hydrology

- 10.1.7 The assessment of potential impacts on water quality during the construction phase was based on an understanding of existing ground conditions identified using geological and hydro-geological data from site investigations and professional judgement based on experience from similar developments.

Significance Criteria

- 10.1.8 In accordance with EIA methodologies, the relative significance of surface water and flood risk prior to mitigation and after mitigation (residual effects) was determined. The assessment of potential and residual effects used the scale of significance presented in **Table 10a** below.

Table 10a: Significance Criteria for Water, Hydrology and Drainage

Significance Criteria	Description of Criteria
Substantial beneficial	<ul style="list-style-type: none"> Significant local scale / moderate to significant regional scale reduction in flood risk. Major permanent improvement in water quality leading to upward reclassification of water quality according to national criteria.
Moderate beneficial	<ul style="list-style-type: none"> Moderate local scale reduction in flood risk. Minor permanent improvement to the water quality but not leading to upward reclassification of water quality according to national criteria.
Minor beneficial	<ul style="list-style-type: none"> Minor local scale reduction in localised flood risk. Minor temporary local scale improvement to the quality of surface water resources.
Negligible	<ul style="list-style-type: none"> Development would result in no appreciable impact on flood risk. No appreciable impact on surface water resources.
Minor adverse	<ul style="list-style-type: none"> A slightly increased risk of flooding and minor local scale change in groundwater flow. Moderate temporary local scale reduction in the quality of surface water, reversible with time.
Moderate adverse	<ul style="list-style-type: none"> Minor to moderate local scale increase in flood risk. Severe temporary flooding or change to flow characteristics of watercourses. Minor to moderate local scale change in flow of groundwater. Severe temporary reduction or minor permanent reduction in

Significance Criteria	Description of Criteria
Substantial adverse	<p>the quality of the surface water resource that does not affect the classification of water quality according to national criteria.</p> <ul style="list-style-type: none"> Moderate to severe increase in flood risk. Permanent flooding or change to flow characteristics of watercourses. Moderate to severe local scale change in flow of groundwater underneath the Site and/ or modest changes in off-site groundwater flow. Permanent reduction in the quality of the surface water resource that causes downward reclassification of water quality according to national criteria.

10.2 PLANNING CONTEXT

Legislation

Water Resources Act, 1991 and Land Drainage Act, 1991

10.2.1 The **Water Resources Act** (Ref.10.1) and **Land Drainage Act** (Ref.10.2) relate to the control of the water environment. Aspects which are relevant to the Project include provisions concerning land drainage, the flood defence functions of the Environment Agency (EA) and the prevention of water pollution.

10.2.2 In order to discharge surface water runoff to a main river or tidal water, land drainage consent is required for the outfall.

10.2.3 The **Land Drainage Act** sets out the responsibilities and powers of the National Rivers Authority (now the EA), Internal Drainage Boards, Local Authorities and riparian landowners. Under the Act, the EA and Local Authorities have discretionary powers of management and maintenance for Main Rivers and Ordinary Watercourses respectively. However, it is the riparian owner, i.e. the landowner through which the watercourse flows, who is ultimately responsible for its maintenance.

10.2.4 The **Water Resources Act** also controls discharges to watercourses to prevent pollution entering any controlled waters, and to prevent matter entering inland waters so as to cause or aggravate pollution by impeding the flow.

Flood and Water Management Act, 2010

10.2.5 The **Flood and Water Management Act** (2010) (Ref.10.3) removes the automatic right of connection into public sewers and places the onus on the Local Planning Authority to adopt Sustainable Drainage Systems (SuDS). This legislation will fully come into force once secondary legislation is published next year.

National Planning Policy

Planning Policy Statement (PPS25): Development and Flood Risk, 2010

- 10.2.6 **PPS25** (Ref.10.4) sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is located in areas of high flood risk, **PPS25** aims to make such development safe, without increasing flood risk elsewhere and where possible, reduce flood risk overall.
- 10.2.7 **PPS25** considers all forms of flooding and highlights the requirement for developers to assess the risk of flooding, both at the site and resultant from the site. This assessment should be appropriate to the nature and scale of the development proposed and the risks involved.
- 10.2.8 **PPS25** reinforces previous policy guidance in respect of locating development proposals in less onerous flood zones. **PPS25** advocates the use of the risk based sequential test, in which new development is directed towards the areas of lowest probability of flooding, which are identified by Flood Zones, as follows:-
- **Flood Zone 1:** Low probability of flooding (less than 1 in 1000 annual probability of river or sea flooding in any year);
 - **Flood Zone 2:** Medium probability of flooding (between a 1 in 100 and 1 in 1000 annual probability of river flooding and between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year);
 - **Flood Zone 3a:** High probability (1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any year); and
 - **Flood Zone 3b:** The functional floodplain (where water is stored in times of flood, including water conveyance routes, annual probability of 1 in 20 or greater in any given year or designed to flood in a 1 in 1000 flood).
- 10.2.9 In addition, **PPS25** attempts to match the sensitivity level of a development proposal to a flood risk level. For example, more sensitive developments, like hospitals, should not be permitted in areas at high risk of flooding, although leisure and tourism developments may be allowed.
- 10.2.10 **PPS25** also provides advice on the definition of a functional floodplain and the allowance for the potential effects of climate change on development. Accordingly, **PPS25** recommends a precautionary increase in flood flows of 10% by 2025 and 20% from 2025 to 2115 in rivers, with rainfall intensities gradually increasing by between 5% and 30% from now until 2115.
- 10.2.11 **PPS25** further reinforces the Government's commitment to SuDS.

Regional Planning Policy

East Midlands Regional Plan, 2009

- 10.2.12 The **East Midlands Regional Plan (EMRP)** (Ref.10.5), published in March 2009, provides a broad development strategy for the East Midlands up to 2026.
- 10.2.13 The Regional Core Objective aims to ensure that sustainable development is achieved within the East Midlands. Policy 1, part j, aims to reduce the impacts of climate change, in particular the risk of flooding and the decline of water quality and resources. The **EMRP** states that this would be achieved in part through providing SuDS and managing flood water. Policy 2 strengthens this by stating that resilience should be provided for the future impacts of climate change.
- 10.2.14 Regarding SuDS, the **EMRP** states that the Local Planning Authority should ensure that any uncertainties over the adoption and future maintenance of such features are resolved early in the planning process.
- 10.2.15 Policy 35 specifically considers the regional approach to managing flood risk. This states that Local Development Frameworks and other relevant documentation should take into account the potential effects of climate change on flooding and land drainage. In particular this should:-
- Be informed by **Strategic Flood Risk Assessments (SFRAs)** in order to evaluate actual flood risk;
 - Include policies which prevent inappropriate development either in, or where there would be an adverse impact on fluvial floodplains;
 - Deliver a programme of flood management schemes that also maximise biodiversity, provide townscape enhancement and other public benefits; and
 - Require sustainable drainage in all new developments where feasible.
- 10.2.16 The **EMRP** notes that Local Planning Authorities should take into account **PPS25**, including the application of the sequential approach and where appropriate the exception test.
- 10.2.17 A Regional Flood Risk Appraisal was undertaken for the area to inform the **EMRP**. This concluded that although flood risk is a significant factor in some areas, adoption of a range of appropriate flood management policies and mitigation measures would enable development to take place in a sustainable manner. This document recommended that where a **SFRA** has been prepared, this should be the principle reference document when considering appropriate land designations and new developments.

Local Planning Policy

Strategic Flood Risk Assessment, 2007

- 10.2.18 The Joint **Strategic Flood Risk Assessment (SFRA)** (Ref.10.6) which includes Blaby District Council aims to provide sufficient information for the application of the Sequential and Exception Tests. Flood risk is assessed on a broad scale utilising existing information, which allows authorities to prepare appropriate flood risk policies within their specific area.

- 10.2.19 The majority of the Site is delineated within the report as a potential development site. With specific regard to the Site the **SFRA** states that there is the potential for fluvial flooding associated with a tributary of the Lubbesthorpe Brook. Furthermore, surface water runoff could be of significance due to the wet clay soil, and the potential for groundwater flooding should be considered. However the **SFRA** states that there are no historic flooding records for the Site itself.
- 10.2.20 The underlying geology is noted as limestone and shale, and the soil of low permeability comprising silts and clays. With regard to the suitability of SuDS, the **SFRA** advises that the impermeable nature of the subsoil would tend to discount infiltration techniques. Consideration should alternatively be given to attenuating surface water runoff generated from the Site.

Core Strategy Submission Version, 2009

- 10.2.21 A key environmental objective of the **Core Strategy** (Ref.10.7) is to minimise the risk of flooding to property, infrastructure and people, and ensure high resilience to the effects of climate change.
- 10.2.22 **Policy 20: Flooding and Climate Change Related Hazards** states that all new development should take into account the impact of climate change, water conservation, drainage and flood risk. Development will not be permitted in areas of high risk, and new developments should incorporate SuDS to control surface water runoff.
- 10.2.23 The Council intends to support measures proposed by the EA to reduce flood risk such as increasing the quality and quantity of the floodplain, defending areas at risk of flooding, and mitigating the effects.

Surface Water Management Plan

- 10.2.24 Leicester City Council is currently developing a **Surface Water Management Plan (SWMP)** to manage the risk of pluvial flooding resultant from extreme rainfall events. Once produced this will update the **SFRA** prepared for the centre of Leicester (which does not currently cover the Site), and is due to be completed between March and September 2011.

10.3 BASELINE CONDITIONS

Topography

- 10.3.1 The Site comprises two separate areas which are bisected by the M69. These are namely the Sustainable Urban Extension (SUE) to the north of the M69 and the Strategic Employment Site (SES) to the south. Based on Ordnance Survey mapping and LiDAR (aerial survey) data the SUE falls in a south easterly direction from approximately 107m AOD to 67m AOD. The SES falls in a north easterly direction from approximately 101m AOD to 67m AOD. The existing layout of the Site and its topography are shown in **Appendix A of the FRA (Appendix 10A)**.

Geology

- 10.3.2 The GroundSure Geolnsight report undertaken in relation to the Site (Ref.10.8) identifies Clay, Silt, Sand and Gravel within the Superficial Deposits beneath the Site. The bedrock beneath this generally consists of Mudstone and Sandstone.
- 10.3.3 Borehole records contained within the Minerals Assessment (document 6) undertaken by David L Walker (Ref.10.9) confirm these results, showing generally red-brown clay beneath the Site, with areas of silty and sandy clay.
- 10.3.4 Shallow trial pits were undertaken across the Site by Land Research Associates (Ref.10.10) to a maximum depth of 1.2m. These show that the upper soils generally consist of Clay and Sandy Clay Loam.

Hydrogeology

- 10.3.5 According to the EA's Groundwater Maps the Site is not located within a Source Protection Zone.
- 10.3.6 However, the superficial deposits in the vicinity of the on-site watercourses are classified as Secondary A and Secondary B Aquifers, which were previously classified as Minor and Non Aquifers respectively. The Minor Aquifer denotes permeable layers capable of supporting water supplies at a local scale, which in some cases can form an important base flow to rivers. The bedrock beneath the Site is generally classified as a Secondary B Aquifer, with areas in the north classified as a Secondary A Aquifer.

Hydrology

- 10.3.7 There are five ordinary watercourses which run through the Site, four located in the SUE and one in the SES, which all flow in an easterly direction. The nearest Main River is the Lubbesthorpe Brook which is located approximately 700m to the east. All watercourses and drainage ditches on-site drain to the Lubbesthorpe Brook, which flows into the River Soar approximately 2km east of the Site.

Existing Drainage

- 10.3.8 The Site is generally soft landscaped in the existing situation, encompassing agricultural fields, with some existing farm buildings and infrastructure. There are no public sewers serving the existing on-site developments, and any existing drainage infrastructure would therefore be privately owned. The extent and location of any such infrastructure is currently unknown. However, there is a public foul sewer 300mm in diameter located in the north-east of the Site (as seen in **Appendix E** of the **FRA**) which serves the residential development to the north. This sewer drains in an easterly direction and passes under the M1.

Flood Risk

- 10.3.9 The EA have confirmed that the majority of the Site lies within Flood Zone 1, and is therefore considered to be at a low risk of tidal and fluvial flooding (less than 1 in 1000 year chance). The area to the immediate north of the M69 however, through which a

tributary of the Lubbesthorpe Brook passes, is denoted as lying within Flood Zones 2 and 3, indicating a medium to high risk of flooding (1000 year or greater chance of river flooding), as shown in **Figure 3** of **Appendix 10A**.

- 10.3.10 The EA have carried out hydraulic modelling of some lengths of the watercourses in the SUE and have derived the 1 in 100 year flood levels. However, their associated floodplains have not yet been mapped. In lieu of this, the Areas Susceptible to Surface Water Flooding (ASTSWF) mapping, which has been approved by the EA, has been utilised for the purposes of this assessment (**Figure 5** of **Appendix 10A**). This shows a slightly larger flood extent in comparison to the Flood Zone Map, with floodplains associated with all four watercourses in the SUE.
- 10.3.11 There is no flood extent associated with the watercourse in the SES according to the ASTSWF mapping, however as required by the EA this watercourse has been modelled by WTDL using TuFLOW hydraulic modelling software.
- 10.3.12 Modelling results (shown in **Figure 7** of the **FRA**) show that water spills out of bank adjacent to Fox Covert and flows in an easterly direction. A second smaller spill occurs adjacent to Gorse Spinney. This flows north, combining with the Fox Covert flow and continues north before being routed east along the M69, beyond the application boundary. It should be noted that the depth of water is less than 200mm from both the Fox Covert and Gorse Spinney spills during the 1 in 100 + 20% flow scenario.
- 10.3.13 The EA have advised of historic flooding at the intersection of Lubbesthorpe Brook and Lubbesthorpe Road (located approximately 800m to the east of the Site beyond the M1) in 2001, 2005, 2006 and 2008, at least two of which caused 1 in 100 year event, and some are at risk during lesser events. Blaby District Council hold similar records, stating that historic flooding has occurred to approximately 50 properties after extreme rainfall events.
- 10.3.14 Topographically the SUE falls towards the southeast and as a result pluvial (surface water) flows would emanate from the north and west of the Site. There is an existing housing development located to the north of the Site. Severn Trent Water sewer records (as seen in **Appendix E** of the **FRA**) show that there are adopted sewers within this area which drain to a balancing pond. It is therefore assumed that any surface water runoff from this area would be adequately controlled through on-site networks and would not impact the Site.
- 10.3.15 Land to the west of the Site generally comprises agricultural land and it is expected that positive drainage networks are minimal. However, flows emanating from this area would be intercepted by Beggars Lane before reaching the Site. It appears that overland flows from this direction would not overtop the camber of the road and would instead be directed in a southerly direction past the western boundary of the Site. The risk of pluvial flooding is therefore considered low.
- 10.3.16 The Groundwater maps on the EA website note that bedrock beneath the Site is generally classified as a non-aquifer. Superficial deposits located in the vicinity of the on-site watercourses are noted as a minor aquifer. However, due to the presence of clay beneath the Site it is not expected that groundwater would be of issue at the Site, as in general, clay is not capable of retaining water. Furthermore, this impermeable stratum would act as

an aquiclude, ensuring that groundwater flows could not rise to the surface. The risk of groundwater flooding is therefore considered to be low.

10.4 PROJECT DESIGN

10.4.1 The Project, as described in **Chapter 2: Development Proposals**, has been developed to take into account issues of flood risk and drainage. The main aspects included within the scheme as a result of the baseline conditions and subsequent consultation with the EA are:-

- Location of the development parcels outside the flood extent to ensure that the Project does not displace any flood waters, or cause flooding to the development itself;
- SuDS features to attenuate surface water runoff from the Project. These have similarly been located outside of the flood extent to ensure that at all times the required storage volume is available;
- Maximisation of attenuation ponds to enhance ecological benefits at the Site. The ponds have been located offline from the existing watercourses to minimise any changes to the existing hydrology;
- Location of SuDS, as far as practical, away from the Scheduled Monument (SM) to minimise any potential impact to this protected area.

Potential Effects

10.4.2 The potential effects resultant from the Project regarding flood risk and drainage have been identified as part of the design process and are set out below:-

- Inappropriate ground raising or built development within the floodplain could reduce the available flood storage, resulting in a moderate adverse effect on the risk of flooding downstream;
- The inclusion of additional hard landscaping on a predominantly Greenfield site could result in a moderate adverse effect, due to an increase in surface water runoff. This could also increase flood risk downstream;
- A minor to moderate adverse effect on water quality could result if runoff is not appropriately controlled during construction. There could be a risk of release of inappropriately stored or handled hazardous materials, accidental spills or suspended sediments in surface water runoff being released into the local hydrological system, and infiltrated into groundwater. If surface water runoff is not controlled post development, polluted waters could also enter the watercourses on-site during operation of the Project;
- There is a foul sewer running through the northern portion of the Site. A moderate adverse impact could result if this system is damaged and flows were interrupted during construction or operation of the Project.

Mitigation

Fluvial Flood Risk

- 10.4.3 As noted above there is an existing fluvial floodplain on-site, associated with the tributaries of the Lubbesthorpe Brook. Construction workers would be made aware of the potential for on-site flooding during general construction procedures and health and safety training. During periods of long duration or high intensity rainfall, contractors would be advised to be vigilant of the watercourses, to avoid any potential adverse impacts. At all times, equipment would remain outside of the identified flood extent to avoid displacing flows if flooding was to occur.
- 10.4.4 As seen in the development proposals, all plots in the SUE have been located outside of the flood extent to avoid displacing flood flows. Additionally, no ground raising would be undertaken within the identified floodplain within the SUE.
- 10.4.5 Bunding is required within the existing modelled floodplain in the SES for visual and noise attenuation purposes. However, floodplain compensation has been undertaken (shown in **Figure 7 of Appendix 10A**) which demonstrates that it is possible to develop in this area of the Site without adversely impacting on flood risk downstream.
- 10.4.6 Additionally, as there is a history of downstream flooding, it is proposed by the applicant to transfer an off-site area of land adjacent to Lubbesthorpe Road to be used for flood storage, as part of an EA flood alleviation scheme (identified in **Figure 2 of Appendix 10A**). Once implemented this would reduce off-site flood risk downstream, including those properties in Lubbesthorpe Road and Watergate Lane.

Surface Water Runoff

- 10.4.7 In line with PPS25, surface water runoff from the Site would be restricted to the existing Greenfield rate. A Quick Storage Estimate undertaken using WinDES, included within **Appendix F of the FRA (Appendix 10A)**, shows that a total of approximately 68,272m³ of storage would be required to restrict flows to the appropriate rate up to the 1% AEP (1 in 100 year) event, taking climate change into account for the lifetime of the Project.
- 10.4.8 It has been demonstrated in the **FRA (Appendix 10A)** that this volume can be provided through the use of balancing ponds located throughout the Project, and would ensure that flows do not increase over the existing situation.

Water Quality

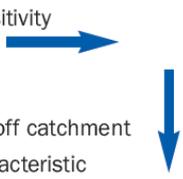
- 10.4.9 Surface water runoff originating from the Site during the construction phase would be controlled, and if necessary released to the local watercourses via sediment traps and oil interceptors, to be detailed in the site-specific Code for Construction Practice Environmental Management Plan (CoCP).
- 10.4.10 The CoCP would be adhered to throughout the construction works, to manage and reduce their potential adverse impacts on surface water quality.

- 10.4.11 The CoCP would include measures to ensure that surface water runoff is carefully controlled and discharged. Runoff that might contain contaminants, such as sediments or oil, would first pass through settlement tanks to remove suspended solids and then through oil interceptors, before discharging into the watercourses. The silt trapping facilities and oil interceptors would require regular inspection and maintenance. Records of the inspections and maintenance works would be kept.

- 10.4.12 Construction of the drainage system would be designed and managed to comply with **BS6031:2009 'The British Standard Code of Practice for Earthworks'** (Ref.10.11), which details methods that should be considered for the general control of drainage on construction sites. Contractors would also be required to take full account of the requirements of Pollution Prevention Guidance notes published by the EA.

- 10.4.13 The CoCP would include measures to ensure that all liquids and solids of a potentially hazardous nature (e.g. diesel fuel, oils and solvents) would be stored on impermeable surfaces with bunding. In accordance with **The Control of Pollution (Oil Storage) (England) Regulations 2001** (Ref.10.12), which came fully into force in 2005, any tanks storing more than 200 litres of oil would have secondary bunding specified as a minimum of 110% of the volume of the largest tank within the bund.

- 10.4.14 Once constructed, surface water resultant from the Project would pass through the appropriate number of treatment train components as set out in CIRIA guidance (Ref.10.13) and seen below, prior to being released into the local watercourses. These would include swales, permeable paving and oil interceptors, if necessary.

Receiving water sensitivity 	Low	Medium	High
Runoff catchment characteristic			
Roofs only	1	1	1
Residential roads, parking areas, commercial zones	2	2	2
Refuse collection/ industrial areas/ loading bays/lorry parks/highways	3	3	3

Source: CIRIA C697

10.5 ASSESSMENT OF EFFECTS

Fluvial Flood Risk

- 10.5.1 If the procedures outlined above are appropriately implemented, construction of the Project would have a **negligible** effect on flood risk.
- 10.5.2 The completed Project would not impact upon flood risk and it is concluded that the proposed Project would result in a **negligible** effect.
- 10.5.3 When implemented the EA flood alleviation scheme adjacent to Lubbesthorpe Road would have a **minor beneficial** effect.

Foul Drainage

- 10.5.4 If works are undertaken in consultation with Severn Trent Water, it is anticipated that construction of the Project would have a **negligible** effect on this existing infrastructure.
- 10.5.5 The proposed Project would afford protection to the existing foul sewer within the Site, and would ensure that flows are maintained as per the existing situation. With regard to this, the Project would have a **negligible** effect on the existing infrastructure on-site.

Surface Water Runoff

- 10.5.6 The phasing of construction would take into account the requirement to attenuate increased flows from hard standing areas, and the drainage infrastructure would be installed early in the construction programme to ensure that the appropriate level of attenuation is achieved. Consequently, the Project would have a **negligible** effect on the rate of surface water runoff.
- 10.5.7 The Project proposes the inclusion of large scale balancing ponds and source control measures within the plots to attenuate surface water runoff from the Site.
- 10.5.8 Through the appropriate attenuation of surface water runoff post-development, ensuring that discharge is restricted to the existing Greenfield rate, the Project would have a **negligible** effect on surface water runoff. When taking account of the predicted increase in rainfall intensity due to climate change over the lifetime of the Project, the Site would have a **minor beneficial** effect and would reduce the risk of flooding both at the Site and elsewhere.

Water Quality

- 10.5.9 Provided a CoCP is implemented, there would be a **negligible** effect on the quality of water within the on-site tributaries of the Lubbesthorpe Brook from surface water runoff originating on the construction Site.
- 10.5.10 The appropriate number of surface water treatment trains would be incorporated in line with CIRIA guidance as part of the completed Project. As a result there would be a **negligible** effect on the water quality of the local watercourses.

Cumulative Effects

10.5.11 It is not considered that there would be any cumulative effects regarding the proposed Sustainable Urban Extensions at Barwell and Earl Shilton located within Hinckley and Bosworth Borough. These sites do not lie upstream of the Project and are not linked hydraulically. Therefore, cumulative effects have not been further considered within this Chapter.

10.6 STATEMENT OF EFFECTS

10.6.1 A summary of the findings within this Chapter are provided below in **Table 10b**.

Table 10b: Summary Table

Issue	Potential Effect	Mitigation Measures	Residual Effects
Construction			
Flood Risk	Minor Adverse	Store equipment outside of flood extent	Negligible
Foul Drainage	Moderate Adverse	Appropriate easement and protection to sewer	Negligible
Surface Water Runoff	Moderate Adverse	Phasing to take heed of attenuation requirement	Negligible
Water Quality	Minor to Moderate Adverse	Adhere to Code for Construction Practice	Negligible
Operation			
Flood Risk	Moderate Adverse	Floodplain compensation in SES	Negligible
		EA flood alleviation scheme	Minor Beneficial
Foul Drainage	Moderate Adverse	N/A – Construction phase	Negligible
Surface Water Runoff	Moderate Adverse	Attenuation to limit discharge to the Greenfield rate, including for the impacts of climate change	Minor Beneficial
Water Quality	Minor to	SuDS and treatment	Negligible

**Moderate
Adverse**

trains to provide water
quality benefits

REFERENCES

- 10.1 HMSO, 1991. *Water Resources Act*
- 10.2 HMSO, 1991. *Land Drainage Act*
- 10.3 HMSO, 2010. *Flood and Water Management Act*
- 10.4 Communities and Local Government, 2010. *Planning Policy Statement 25: Development and Flood Risk*
- 10.5 Communities and Local Government, 2009. *East Midlands Regional Plan*
- 10.6 Hinckley and Bosworth Borough Council, Blaby District Council and Oadby & Wigston Borough Council, 2007. *Joint Strategic Flood Risk Assessment*
- 10.7 Blaby District Council, 2009. *Local Development Framework Core Strategy Submission Version*
- 10.8 GroundSure, April 2010. *GroundSure GeolInsight report*
- 10.9 DL Walker, January 2011. *Assessment for Mineral Potential, Underlying Land at the Proposed Lubbesthorpe Settlement, Leicester*
- 10.10 Land Research Associates, December 2009. *Soil Resources and Agricultural Use and Quality of Land North of Enderby, Leicestershire*
- 10.11 BSI, 2009. *BSI Standards Publication, Code of Practice for Earthworks, BS 6031:2009*
- 10.12 HMSO, 2001. *The Control of Pollution (Oil Storage) (England) Regulations*
- 10.13 CIRIA, 2007. *CIRIA C697The SUDS manual*