

ARMSTRONG STOKES & CLAYTON LIMITED

Civil & Structural Engineering Consultants



Proposed Local Services

Northampton Road

Brixworth

Northamptonshire

Flood Risk Assessment & Drainage Strategy Report

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1.0 INTRODUCTION

- 1.1 This Flood Risk Assessment (FRA) & Drainage Strategy Report has been produced by Armstrong Stokes and Clayton Limited in support of a planning application with respect to a proposed development consisting of local services, a spa & wellness centre, and 16 semi-detached affordable homes all on land to the west of Northampton Road, Brixworth, Northamptonshire.
- 1.2 This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG), and in consultation with West Northamptonshire Council, Northamptonshire County Council (NCC) Lead Local Flood Authority (LLFA), the Environment Agency and Anglian Water Limited.

2.0 PLANNING POLICY

National

- 2.1 The NPPF and PPG provide national planning guidance on the management of flood risk in respect to new development.
- 2.2 Paragraph 159 of the NPPF document states *‘Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.’*
- 2.3 For the purposes of applying the NPPF, PPG states *‘flood risk is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources’.*
- 2.4 For the purposes of applying the NPPF, PPG states *‘areas at risk from all sources of flooding are included. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the Environment Agency has notified the local planning authority as having critical drainage problems’.*
- 2.5 PPG states that the key objectives of a site specific FRA is to establish;
- *whether a proposed development is likely to be affected by current or future flooding from any source;*
 - *whether it will increase flood risk elsewhere;*
 - *whether the measures proposed to deal with these effects and risks are appropriate;*
 - *the evidence for the local planning authority to apply (if necessary) the Sequential Test, and;*
 - *whether the development will be safe and pass the Exception Test, if applicable.*

2.6 PPG also refers to a FRA being appropriate to the scale, nature and location of the development and be credible and fit for purpose. A site specific FRA should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a SFRA for the area, and the interactive flood risk maps available on the Environment Agency's web site.

Local

2.7 The administrative area of West Northamptonshire Council is covered by the joint West Northamptonshire Level 1 SFRA, dated December 2017. This document provides further, more local guidance in respect of flood risk and surface water management. This FRA has been prepared with reference to the SFRA.

3.0 EXISTING SITE

General

- 3.1 The application site has a developable area of circa 2.8 ha situated on land to the west of Northampton Road and to the southern portion of the urbanisation of Brixworth. The site falls under the jurisdiction of West Northamptonshire Council as planning authority and Northamptonshire County Council (NCC) as Lead Local Flood Authority (LLFA). The planning application involves the development of local services, which will include various commercial / office enterprises and EV charging facilities, a spa & wellness centre, and 16 semi-detached affordable homes, all with associated landscaping, gardens, access / service roads and car parking.
- 3.2 The development site is classified as Greenfield in its nature, and currently comprises of agricultural land situated to the west of Northampton Road. The development site is bounded to the west and north by Merry Tom Lane, with Northampton Road to the east and Brixworth Cricket Club to the south, with Brixworth Tennis Club beyond. The proposed development land currently forms part of the Brixworth Castle redevelopment. An OS based location plan identifying the application site is included within **Appendix A**.

Levels

- 3.3 A topographical survey of the site has not been made available, however, from examination of OS mapping the site generally falls from north to south ranging between 120.00m AOD to 116.00m AOD approximately.

Drainage

- 3.4 A copy of the public sewer records has been sourced from Anglian Water (AW) Limited. The records confirm that there are no public sewers within the vicinity of the application site. However, the records do confirm that the nearest public foul asset exists circa 300m to the north of the application site, which is a high pressure rising main located within Northampton Road at the junction with The

Ashway, which flows in a northerly direction along Northampton Road. The rising main then turns west along Froxhill Crescent, where it ultimately discharges to the gravity network at MH4101, located at the crown of the hill in close proximity to property No. 51 Froxhill Crescent. The nearest public gravity foul asset is a 150mm diameter foul sewer situated to the west of Far Brook junction with The Ashway, some 400m north of the site. Ultimately, the local public foul sewer network outfalls at Brixworth Sewerage Works, which is circa 2.2 km to the northwest of the site. The sewerage works is accessed from Station Road, Brixworth. A copy of the sewer records is included within **Appendix B**.

- 3.5 In addition, it is evident that a main sewer network exists within the residential development associated with Hornbeam Row located to the east of the site, beyond Northampton Road. The Hornbeam Row development is accessed from Blackthorn Crescent, which in turn is accessed from Northampton Road 100m north of the site. The development drainage consists of gravity sewers and pressurised rising mains, with supporting foul pump station. AW have confirmed that the sewers associated with this development have a Section 104 classification, confirming that the sewers are approved for adoption in accordance with the Water Industry Act 1991, but have yet to be fully vested with the water authority. The sewers are therefore currently private, within the control of a 3rd party. This includes the associated foul pump station, which is situated on the eastern side of Northampton Road
- 3.6 With the application site being Greenfield, there is no positive drainage system associated with the site.

4.0 POTENTIAL SOURCES OF FLOODING

Fluvial / Tidal Flooding

- 4.1 The nearest potential primary source of fluvial / tidal flooding is represented by the Brampton Branch of the River Nene, and an upstream unnamed watercourse. The Brampton Branch is situated approx. 1.5 km to the west, with the unnamed watercourse circa 0.5 km westwards of the application site. The Brampton Branch has 'Main River' status, whilst the unnamed watercourse is classified as an 'Ordinary' watercourse.
- 4.2 An extract of the Environment Agency's on-line flood mapping is shown in Figure 1 below. The dark blue areas represent Flood Zone 3, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The light blue areas represent Flood Zone 2, land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year. All remaining areas are classified as Flood Zone 1, land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.
- 4.3 The site is indicated on the flood mapping extract in *Figure 1*, confirming that it lies within Flood Zone 1.

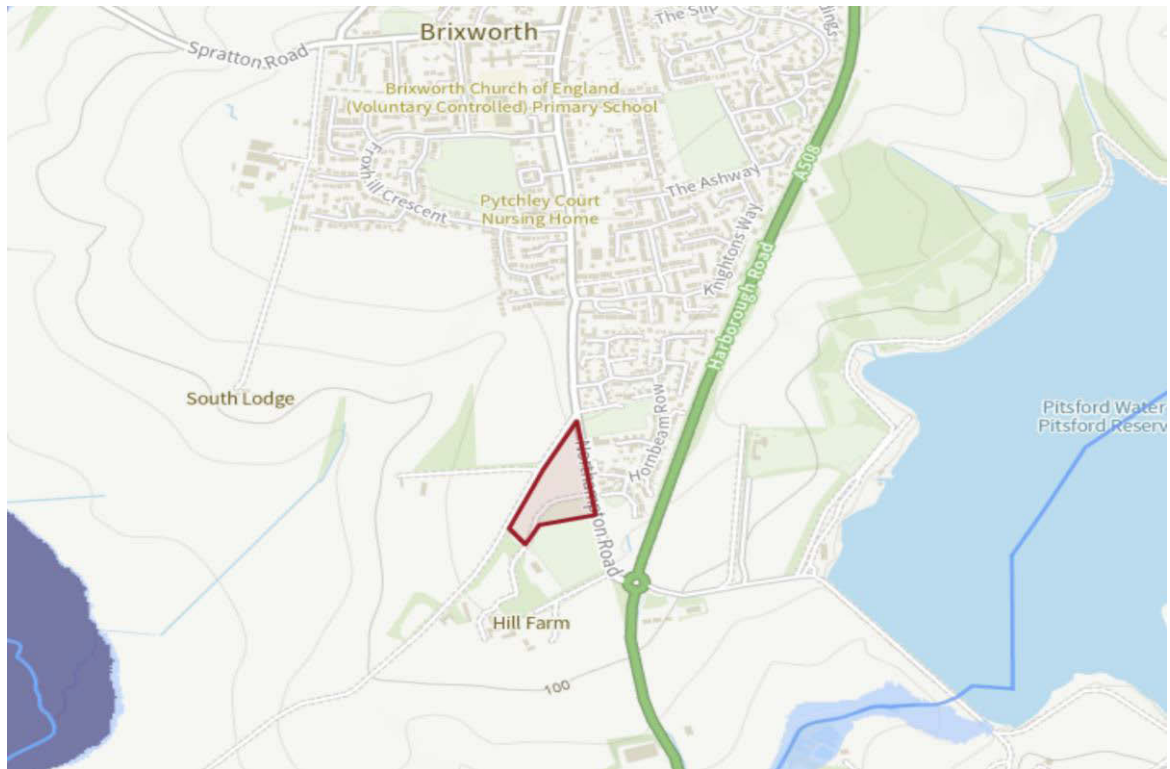


Figure 1 – Environment Agency Floodplain Mapping Extract

- 4.4 As the site is indicated as lying within Flood Zone 1, modelled flood level data has not been sourced from the Environment Agency.
- 4.5 The SFRA does not make any reference to historical flooding events associated with the application site or within the vicinity of the site.

Groundwater

- 4.6 Groundwater flooding is highly variable and dependant on localised ground conditions.
- 4.7 The SFRA does not identify groundwater flooding and there is no record of groundwater flooding associated with or in the vicinity of the site. Thus, groundwater flooding is not considered a significant risk within this locality.
- 4.8 We are not aware of any anecdotal evidence to suggest that the site is particularly susceptible to groundwater flooding.

4.9 The site is not located within an Environment Agency Groundwater Source Protection Zone (SPZ).

Overland / Surface Water Flows (Pluvial)

4.10 We are not aware of any evidence to suggest that the site has been subject to flooding via this source.

4.11 The Environment Agency on-line surface water flood data indicates that the site is not at risk of surface water flooding. *Figure 2* below highlights the very low risk of surface water flooding to the application site.

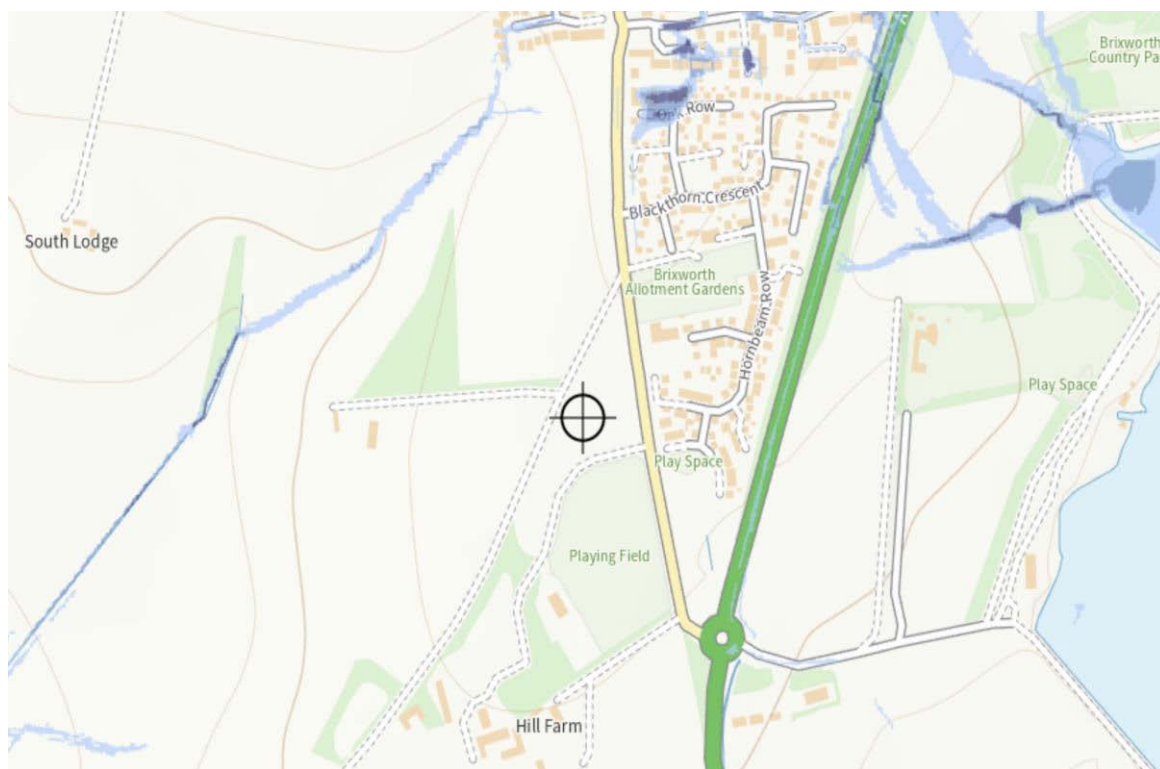


Figure 2 – Environment Agency Surface Water Flood Mapping Extract

4.12 The SFRA does not identify any records of surface water flooding on or within the vicinity of the site.

Existing Sewers

4.13 The SFRA does not identify that the development or surrounding area is at risk from sewer flooding.

- 4.14 We are not aware of any evidence of flooding problems affecting the development or surrounding area associated with the local public sewer network or any nearby private drainage networks.

Reservoirs, Canals & Other Artificial Sources

- 4.15 Pitsford Reservoir is located 0.6 km to the east of the application site. Due to the managed nature of the reservoir, it is not considered to pose a flood risk to the site. This is confirmed by the EA on-line data, which highlights that the site is not at risk of flooding from reservoirs.

5.0 PROPOSED DEVELOPMENT

General

- 5.1 The planning application seeks the development of local services, which will include various commercial / office enterprises and EV charging facilities, a spa & wellness centre, and 16 semi-detached affordable homes, all with associated landscaping, gardens, access / service roads and car parking.
- 5.2 A scheme layout plan illustrating the development proposals can be seen at **Appendix C**.

Levels

- 5.3 The proposed finished development levels have yet to be finalised, however, it is expected that they will generally reflect the existing prevailing topography with an additional 150mm, whilst there may be some localised lowering and raising of levels to suit access and boundary thresholds.

Foul Drainage

- 5.4 The proposed development will generate the following peak foul flow rates based on each primary use: -
- Local Services, with a total gross floor area equating to 1,700.0m², based on 300 litres / day / 100m² will equate to a peak discharge @ 6DWF + 20% of 0.425 l/s.
 - Spa & Wellness Centre, with a total gross floor area equating to circa 1,500.0m², based on 300 litres / day / 100m² will equate to a peak discharge @ 6DWF + 20% of 0.375 l/s.

Thus, the total maximum peak foul discharge from the non-residential commercial development is 0.8 l/s (0.425 + 0.375).

- 16 Residential Affordable Homes @ 4000 l/unit/day will provide a peak foul discharge rate of 0.74 l/s.
- 5.5 Thus, the discharge from the commercial and residential uses will therefore result in a total peak foul discharge from the application site of 1.54 l/s.
- 5.6 It is proposed to discharge foul flows to the existing public sewer network by means of a Section 98 requisition of the Water Industry Act 1991.
- 5.7 This may result in the requirement for an on-site pump station to discharge flows to the requisitioned outfall.
- 5.8 At this stage it is expected that the on-site foul drainage system will not be offered to AW for adoption under Section 104 of the Water Industry Act 1991, and thus will be designed and constructed in accordance with Part H of the current Building Regulations. The drainage system will be maintained in perpetuity by the Title holder(s) of the development. It should be noted however, that a S104 adoption could be investigated at the detailed design stage.
- 5.9 Within **Appendix D** is a copy of a Foul Drainage Scoping report, which assesses the developments foul drainage options, with a recommendation to pursue a S98 outfall at this juncture.

Surface Water Drainage

- 5.10 A sustainable surface water drainage strategy that does not increase discharge rates and therefore does not increase the risk of flooding to other areas should be provided in accordance with the NPPF and the SFRA. Furthermore, the surface water drainage strategy should actively seek to reduce positive discharge levels via the use of SuDS wherever possible.
- 5.11 To establish the surface water strategy for the development the following assessment of outfall options, in order of priority, should be considered in accordance with the CIRIA C753 SuDS Manual:

- *Into the Ground (Infiltration)*
- *to a Surface Water Body*
- *to a Surface Water Sewer, Highway Drain, or another Drainage System*
- *to a Combined Sewer.*

5.12 *Into the Ground (Infiltration)* – In-situ testing has confirmed that the natural underlying Northampton Sand Formation consists of good infiltration characteristics, and thus soakaway testing has been undertaken to determine the level of porosity available. Within **Appendix E** is a copy of the BRE365 in-situ infiltration testing undertaken in October 2023. It is evident from the test results that the existing formation characteristics will permit infiltration of surface water run-off, with the results varying from 1.11×10^{-5} m/s to 3.14×10^{-3} m/s.

5.13 *To a Surface Water Body* – There is no watercourse within the site. The nearest water bodies / rivers highlighted within para. 4.1, are situated to the west of the red line boundary.

5.14 *To a Surface Water Sewer, Highway Drain, or another Drainage System* – There are no known surface water sewers within the vicinity of the site.

5.15 *To a Combined Sewer* – There are no known combined water sewers within the vicinity of the site.

5.16 With consideration of the above SuDS hierarchy, and that the natural formation will allow infiltration of surface water run-off, an infiltration SuDS basin is to be promoted as the primary method for surface water disposal from the development, supported by other SuDS features such as permeable paving.

5.17 On this basis, preliminary attenuation calculations have been undertaken utilising the Micro Drainage software suite to initially assess the likely maximum size of the SuDS basin and volume required. For this exercise the contributing impermeable area is focused on building roofs, access / service roads and yard areas. The car park and pedestrian areas are excluded from the SuDS basin contributing area as these will drain via infiltration through a permeable paving structure.

Thus, a summary of the design criteria for the SuDS basin is as follows: -

- Contributing Imp. Area – 1.0 ha (roofs, access / service roads & yards)
- Design Event – 1 in 100 year (plus a 40% allowance for climate change)
- Infiltration Rate – 3.92×10^{-5} m/s (the lowest recorded rate from TP06, TP08 & TP09 in the location of the SuDS feature).
- SuDS Basin Depth – 1.3m (1.0m effective + 0.3m freeboard).

5.18 A copy of the calculation output is included within **Appendix F**. In summary, a total storage volume of 489.5m³ will be required, which can be accommodated within a structure with an overall plan area of 894.5m². The development layout makes allowance for a SuDS basin located centrally within the site.

5.19 At the detailed design stage, the proposed drainage system for the site should be designed to not surcharge in a 1 year storm, not flood in a 30 year storm, and for all flooding to remain within the site boundary for the 100 year + 40% climate change event. It is proposed however, that the drainage system will be designed to accommodate the 100 year + 40% climate change event without surface flooding, and in the unlikely event this does occur, site levels will be designed to take overland flows away from the buildings and directed towards the SuDS basin and landscaped areas.

5.20 Exceedance flows for events in excess of the 100 year + 40% climate change event will be illustrated at the detailed design stage, with overland flood routing taken away from properties towards the SuDS basin and landscaped areas.

5.21 As previously highlighted it is proposed to construct the car park and pedestrian areas utilising permeable paving, which will pass flows through the surface course and underlying storage media to the natural formation. The permeable paving storage media will consist of a large aggregate stone base with a minimum 30% void content and constructed to a depth of circa 500mm. The depth will be finalised at the detailed design stage with consideration of the bearing capacity of the natural formation. Permeable paving finishes should be constructed with a fall towards either the SuDS basin, landscaping, or positively hard standing drained areas.

- 5.22 Whilst the application site does not lie within a groundwater SPZ, the proposed surface water drainage system should be designed in accordance with all relevant Environment Agency Pollution Prevention Guidance (PPG). Run-off from roof areas is classified as uncontaminated and therefore requires no treatment. The use of permeable paving will provide a suitable treatment train for run-off from car parking and pedestrian areas, with trapped gullies offering protection for other hard paved areas prior to discharge to the SuDS basin, which will provide a high-level opportunity for water quality enhancement whilst encouraging biodiversity with the appropriate planting.
- 5.23 At this stage it is expected that the surface water drainage network will be not offered to AW for adoption under Section 104 of the Water Industry Act 1991, and thus will be designed and constructed in accordance with Part H of the current Building Regulations, with the infiltration SuDS basin in accordance with CIRIA C753 SuDS Manual. It should be noted however, that a S104 adoption could be investigated at the detailed design stage.
- 5.24 On the basis that the SuDS basin and permeable paving will be maintained in perpetuity by the Title holder(s) of the development, a copy of a SuDS Maintenance Statement is included within **Appendix G**.

6.0 VULNERABILITY & COMPATIBILITY

General

- 6.1 In accordance with Annex 3: Flood Risk Vulnerability Classification, contained within the NPPF, residential usage (Class C3) is classified as 'more vulnerable' development, with commercial and office use (Class E) classified as 'less vulnerable' use.
- 6.2 In accordance with Table 2: Flood Risk Vulnerability and Flood Zone 'Incompatibility', contained within the PPG, 'more vulnerable' and 'less vulnerable' developments are appropriate for location within Flood Zone 1.

Sequential Test

- 6.3 Paragraph 162 of the NPPF states *'The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The SFRA will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.'*
- 6.4 In this instance, the site is considered to be sequentially acceptable as the proposed development will be located within Flood Zone 1.

Exception Test

- 6.5 In accordance with Table 2: Flood Risk Vulnerability and Flood Zone 'Incompatibility', contained within the PPG, the Exception Test is not required in this instance.
- 6.6 Whilst the Exception Test is not required, it should be noted that this FRA demonstrates that, in accordance with paragraphs 164 and 165 of the NPPF, the proposed development will be safe for its lifetime, taking account of the

vulnerability of its users. It also demonstrates that there will be no increase in flood risk to other areas.

7.0 ASSESSMENT OF FLOOD IMPACT

Fluvial / Tidal Flooding

- 7.1 The proposed development will be located within Flood Zone 1 and therefore at the lowest risk of fluvial / tidal flooding.
- 7.2 We are not aware of any historical records or anecdotal evidence to suggest that the site has been affected by flooding via this source.

Groundwater

- 7.3 We are not aware of any evidence to suggest that the site is susceptible to groundwater flooding.
- 7.4 In the absence of any historical records or anecdotal evidence to suggest otherwise, the risk of groundwater flooding to the proposed development is therefore considered to be low.

Overland / Surface Water Flows (Pluvial)

- 7.5 We are not aware of any records or anecdotal evidence to suggest that the development will be subject to flooding from overland / surface water flows.
- 7.6 The overall risk of overland / surface water flooding to the proposed development is therefore considered to be low.

Existing Sewers

- 7.7 We are not aware of any records or anecdotal evidence to suggest that the development will be subject to flooding resulting from deficiencies with the existing public or any private drainage networks.
- 7.8 The risk of flooding to the proposed development from this source is therefore considered to be low.

Proposed Drainage

- 7.9 It is proposed to discharge foul flows from the development to the existing public foul sewer network via a requisitioned outfall sewer in accordance with a Section 98 of the Water Industry Act 1991. As the site is currently Greenfield the proposals will be an increase to the public sewer network, however on the basis that AW confirms sufficient capacity is available on the public sewer network, or appropriate mitigation measures are carried out as necessary, there will be no increase in flood risk to other areas from this source.
- 7.10 An infiltration based sustainable surface water drainage system, with storage provided within a SuDS basin and the stone media situated below permeable paved areas, will provide a reduction in run-off in the post development scenario in low and high order events when compared to the existing site. Thus, it is considered that the risk of flooding to the development or other areas via this source is low.

Reservoirs, Canals & Other Artificial Sources

- 7.11 The artificial source within the locality is not considered to pose a flood risk to the application site due to the managed nature of the source.

8.0 CONCLUSIONS & RECOMMENDATIONS

General

- 8.1 With consideration of all the information available, including that contained within the SFRA, the risk of flooding to the proposed development from all sources is considered to be low.
- 8.2 The drainage and flood risk strategy conforms to all the relevant national guidance.

Mitigation Measures

- 8.3 As the proposed development will be located within Flood Zone 1, it will not displace floodwater in the 1 in 100 year event. No floodwater storage mitigation measures are therefore proposed.
- 8.4 The implementation of an infiltration based sustainable surface water drainage strategy, as outlined within Section 5 of this report, will ensure that there is a reduction in flood risk to surrounding areas resulting from the disposal of surface water run-off in the post development scenario.
- 8.5 Based on the current Environment Agency indicative flood mapping, it is evident that a safe dry route of access / egress in the 1 in 100 year event will be available from the development.

Residual Flood Risk

- 8.6 Whilst flood risk can never be entirely eliminated, it is considered that the residual flood risk to the development from all sources is low.
- 8.7 There will be no increase in the residual flood risk to other areas as a result of the development proposals.