BICESTER
TOWN CENTRE

BICESTER VILLAGE
EXTENSION

KINGSMERE
RESIDENTIAL
DEVELOPMENT

A41

BICESTER VILLAGE

TESCO

AYLESBURY

A41

J9, M40

1

2

3

4

5

6

7

8

9

10

11

A Updated Open Space - RK 28.06.17
REVISIONS

H | E | D
Hyland Edgar Driver
Landscape Architects and Urban Designers

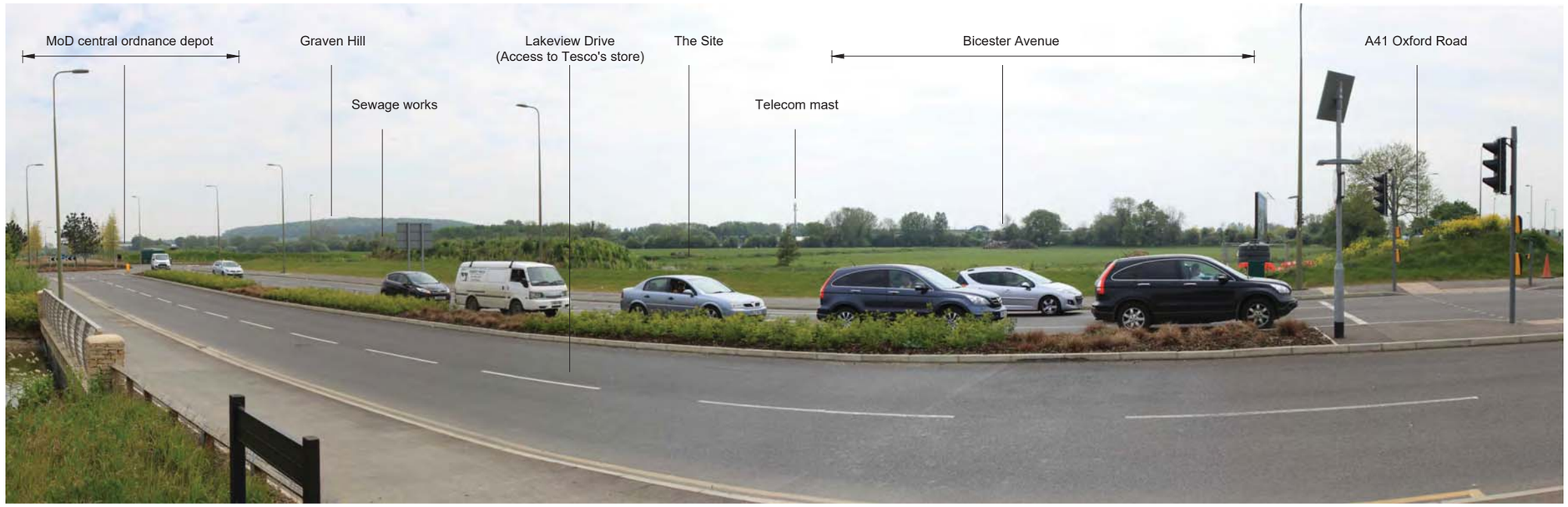
PROJECT
BICESTER OFFICE PARK
Bicester

SUBJECT
Illustrative Masterplan

DATE 28.06.17	DRAWN BY ZC
SCALE NTS @ A1	CHECKED BY IN
DRAWING NUMBER HED.1288.101	REVISION A

DRAWING STATUS

A - PRELIMINARY | B - ISSUED FOR PLANNING | C - ISSUED FOR DESIGN INFORMATION | D - ISSUED FOR TENDER
E - ISSUED FOR APPROVAL | F - ISSUED FOR CONSTRUCTION | G - AS BUILT



View Location 1 - From Lakeview Drive looking south

View Location 2 - From entrance to Kingsmere Estate looking south east

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 1 & 2

DRAWING NUMBER
HED.1288.201

REVISION
-

DATE
May 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 1 - 51.891436 N, -1.162738 W
Viewpoint 2 - 51.890931 N, -1.165335 W

AOD CAMERA HEIGHT
1.65m above ground level

CAMERA and LENS SETTINGS
Cannon EOS 500D digital camera with 18-55mm lens set at 50mm focal length

DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

View Location 3 - From the A41 Oxford Road looking north east

View Location 4 - From Whitelands Road looking east

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 3 & 4

DRAWING NUMBER
HED.1288.202

REVISION
-

DATE
May 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 3 - 51.889901 N, -1.165332 W
Viewpoint 4 - 51.888391 N, -1.191816 W

AOD CAMERA HEIGHT
1.65m above ground level

CAMERA and LENS SETTINGS
Cannon EOS 500D digital camera with 18-55mm lens set at 50mm focal length

DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

View Location 5 - From A41 overbridge looking north east

View Location 6 - From footpath 161/3 looking north east

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 5 & 6

DRAWING NUMBER
HED.1288.203

REVISION
-

DATE
May 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 5 - 51.884386 N, -1.172422W
Viewpoint 2 - 51.882374 N, -1.183790 W

AOD CAMERA HEIGHT
-

CAMERA and LENS SETTINGS
-

DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

HED.A3-2000.dwt

28 Jun, 2017 - 12:21pm W:\1288 Bicester Office Park Phase 2\HED\CAD Drawings\00 - Project Stage\00 - Sketch\HED.1288.203.dwg

View Location 7 - From statutory footpath 129/7 looking east towards the site

View Location 8 - From statutory footpath 129/6a looking south towards the site

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 7 & 8

DRAWING NUMBER
HED.1288.204

REVISION
-

DATE
May 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 7 - 51.894478 N, -1.166986 W
Viewpoint 8 - 51.893868 N, -1.154790 W

AOD CAMERA HEIGHT
-

CAMERA and LENS SETTINGS
-

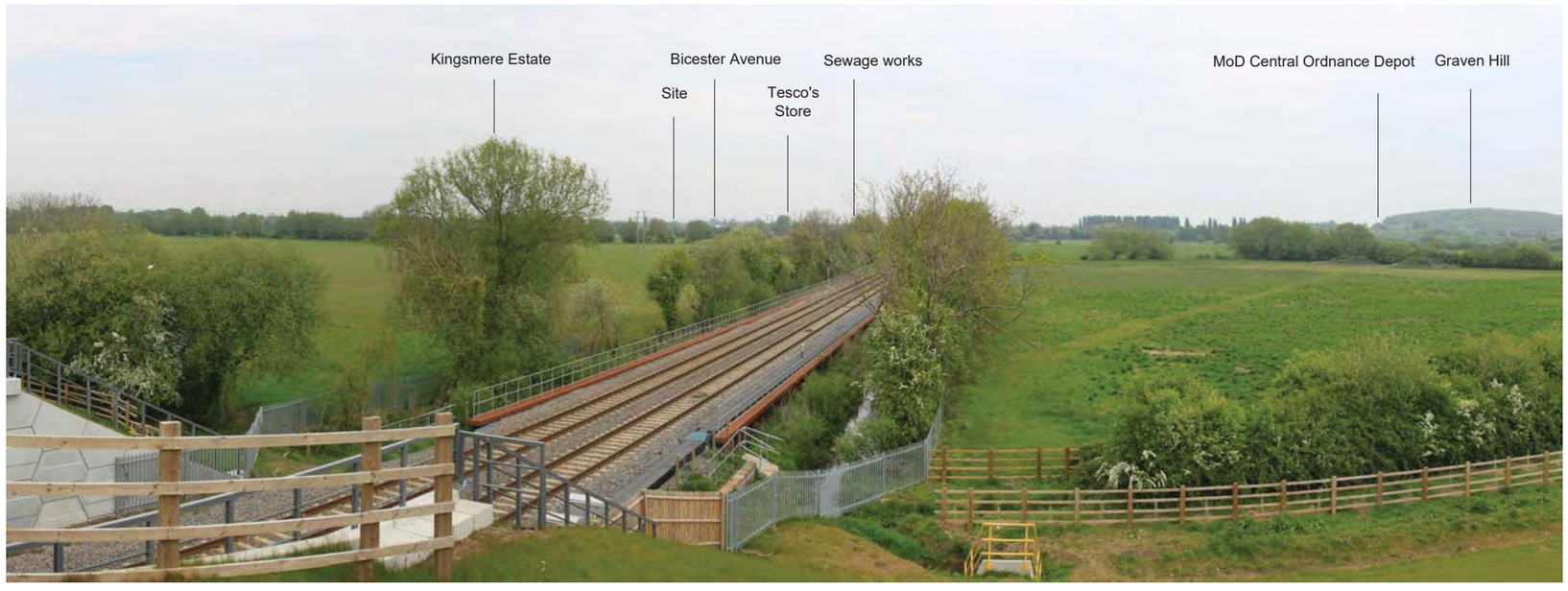
DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

View Location 9 - From statutory footpath 105/1 looking west towards the site



View Location 10 - From Langford Lane overbridge crossing main railway line looking north towards the site

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 9 and 10

DRAWING NUMBER
HED.1288.205

REVISION
-

DATE
May 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 9 - 51.882586N, -1.130105 W
Viewpoint 10 - 51.872652 N, -1.172280 W

AOD CAMERA HEIGHT
-

CAMERA and LENS SETTINGS
-

DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

View Location 11 - From northern edge of future Graven Hill residential development area.

PROJECT
Bicester Office Park Phase 2

SUBJECT
Viewpoint 11

DRAWING NUMBER
HED.1288.206

REVISION
-

DATE
August 2017

SCALE
1:1 @A3

Landscape Architects
H E D
Hyland Edgar Driver

EASTINGS & NORTHINGS COORDINATES and DIRECTION OF VIEW
Viewpoint 11 - 51.887700N, -1.152569 W

AOD CAMERA HEIGHT
-

CAMERA and LENS SETTINGS
-

DATE and TIME, WEATHER and LIGHTING CONDITIONS
-

Bicester Office Park Phase 2

Drawing Status
For Information

Revisions

ES Volume II: Technical Appendices

Appendix 12.2: Legislative and Planning Policy Context

Appendix 12.2: PLANNING POLICY AND GUIDANCE

12.1.1 This appendix describes the landscape related planning legislation and policy that are applicable to the development site, its context and to the proposed land use. The extents and locations of the relevant various planning policy designations discussed in Chapter 12 and are shown on HED.1288.001, Site Context Plan.

National Legislation

The Countryside and Rights of Way Act 2000

12.1.2 The Act provides a new right of public access on foot to areas of open land comprising mountain, moor, heath, down, and registered common land, and contains provisions for extending the right to coastal land. The 'right to roam' doesn't apply to cultivated land and therefore isn't applicable to this site.

12.1.3 The act reviews and protects statutory rights of way which are defined as paths on which the public have a legally protected right to pass and re-pass. There are a number of statutory footpaths in the vicinity of the site but none that cross the site, these will need careful consideration to ensure any impact is minimized and they are well integrated into the scheme.

National Planning Policy guidance

National Planning Policy Framework (NPPF)

12.1.4 The National Planning Policy Framework was published in March 2012 and sets out the government's planning policies for England and how these are expected to be applied.

Requiring good design

12.1.5 Section 7 of the policy looks at the design of new developments, and states that 'good design is a key aspect of sustainable development, is indivisible from good planning, and should contribute positively to making places better for people'.

12.1.6 The principles of good design in new developments are outlined as:

- High functionality that adds to the overall quality of the area for the lifetime of a development;
- The establishment of a strong sense of place and local distinctiveness, using streetscapes and buildings to create visually attractive and comfortable places to live, work and visit;
- site optimisation to accommodate development, create and sustain an appropriate mix of uses (including green and other public space) and the support of local facilities and transport networks;
- responding to local character and history to reflect the identity of local surroundings and materials, but allowing for appropriate innovation; and;
- the creation of safe and accessible environments where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion.

12.1.7 The Proposed Development will have to be mindful of these aims with a high quality architectural and public realm environment.

Conserving and enhancing the natural environment

12.1.8 Section 11 of the policy covers the protection of the wider landscape stating that the planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, geological conservation interests and soils. This policy is carried into local plan policies and give greater detail to specific context of the location of the district.

County and District Planning Policy guidance

Local Plan Policy

12.1.9 The site is within the administrative boundary of Cherwell District Council with the current forward planning policy document as Cherwell Local Plan 2011-2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016) (part 1 of 3).

12.1.10 The following designations apply to the site and have been considered within the proposals. These are identified on drawing Site Context Plan HED.1288.001.

Strategic Development: Bicester 4 – Bicester Business Park

12.1.11 Policy Bicester 4: C.65 and C.66 deals with the provision of strategic employment space to the south of Bicester Town. It identifies an area for high quality B1 office development on 29.5 ha of land to the south and east of the A41 and north of the existing Bicester Avenue Garden Centre retail park.

12.1.12 The policy sets out certain criteria for shaping the development, specifically related to the landscape and environment are:

- Open space – structured open space and planting that provide a strong landscape setting, support SUDS and improvements to the microclimate.
- A distinctive commercial development that provides a gateway into the town.
- A high quality design and finish, with careful consideration given to layout, architecture, materials, colourings and building heights to reduce overall visual impact.
- Layout that enables a high degree of integration and connectivity between new and existing development particularly the mixed use urban extension at South West Bicester to the west, the garden centre to the south, and, to the north, Bicester town centre and Bicester Village retail outlet.
- Development proposals to be accompanied and influenced by landscape/visual and heritage impact assessments.
- Adoption of a surface water management framework to reduce surface water run off to greenfield rates.
- Structural planting and landscape proposals within the site to provide for the enhancement, restoration and creation of wildlife corridors and to limit visual impact of new buildings and car parking on the existing character of the site and its surroundings, including viewpoints along the A41 to the west and north (where the road is more elevated) and along the southern boundary (important in longer distance views of the site).
- Provision of opportunities for Green infrastructure links beyond the development site to the wider town and open countryside.
- Biodiversity should be preserved and enhanced.
- The provision of public art to enhance the quality of the place, legibility and identity.

12.1.13 The whole of the application site is covered by this policy and the intention is to adhere to its requirements and exceed in the provision of a high quality office development.

Conservation Areas and Scheduled Ancient Monuments

12.1.14 This is covered by Policy ESD15; The Character of the Built and Historic Environment. And aims to secure high quality design to protect and enhance the character of the district.

12

LANDSCAPE AND VISUAL IMPACT

12.1.15 The policy aims to *"protect our Conservation Areas and other heritage assets from harmful growth…" this will be done by ensuring new development proposals are:*

- designed to deliver high quality safe, attractive, durable and healthy places to live and work in.
- delivering buildings, places and spaces that can adapt to changing social, technological, economic and environmental conditions.
- Respect the traditional pattern of routes, spaces, blocks, plots, enclosures and the form, scale and massing of buildings.

12.1.16 There are no Scheduled Ancient Monuments (SAM), Conservation Areas or Listed Buildings on or directly adjacent to the site.

12.1.17 A SAM is located approximately 650m to the south west of the boundary of the development site, and consists of the site of a Roman town. There will be no physical of visual impact on this designation.

12.1.18 A Conservation Area is located approximately 420m to the north east of the site boundary and is a Conservation Area that covers the whole of the centre of the town of Bicester. A further Conservation area for the village of Chesterton lies over a 1km to the west. Neither of these two areas will be affected physically or visually.

12.1.19 A single Listed Building is located approximately 550m to the south east of the site boundary, this is part of Langford Park Farm. There are a number of further listed buildings in the town centre of Bicester which are within the Conservation Area previously mentioned. None of the Listed Buildings would be physically affected by the proposals or be visible from the site.

Statutory Rights of Way

12.1.20 Rights of Way are legally recorded public highways across privately owned land. They are all documented on a legal record known as the Definitive Map and Statement maintained by the County Council authority.

12.1.21 There are no Public Rights of Way (PROW) that cross the development site and therefore the proposals would not directly impact on any of the local definitive Rights of Way.

12.1.22 There is only one PROW (129/6) close to the site and is shown on drawing HED.1288.005 which starts in the center of Bicester town and runs south west around the edge of Bicester Village development and then around the Kingsmere estate before changing to 161/13 and 161/2.

12.1.23 There would be views from this footpath for a short length as it comes close to the corner of the site on the A41 Oxford Road, these are discussed further in the visual section of this report.

Tree Protection Orders (TPOs)

12.1.24 Tree Preservation Order's (TPO) are created and protected under the Town and Country Planning Act 1990 and the Town and Country Planning (Tree Preservation) (England) Regulations 2012.

12.1.25 A TPO is made by a Local Planning Authority to protect specific trees or a particular area, group or woodland from deliberate damage and destruction. Felling, lopping, topping, uprooting or otherwise willful damaging of trees cannot occur without the permission of the Local Planning Authority with exceptions.

12.1.26 None of the trees on the site or adjacent to the boundary are covered by a TPO.

ES Volume II: Technical Appendices

Appendix 12.3: Assessment Methodology

Appendix 12.3 Assessment Methodology

Description of the landscape and visual baseline

Landscape baseline

12.1.1 For the purposes of this assessment the terms landscape and townscape are interchangeable e.g. landscape character assessment can be applied to the assessment of landscape character within rural, urban or coastal areas.

12.1.2 The landscape in the study area has been described using a combination of desk-based study and site survey. This has examined physical landscape elements such as vegetation and topography in addition to landscape character and its perceptual qualities.

12.1.3 Identification of the nature of the landscape receptor (sensitivity) may also form part of the baseline, particularly if external studies have been commissioned or completed by the Local Planning Authority (or Competent Authority). These studies may include evaluation of landscape value and or quality and condition.

Physical landscape

12.1.4 The topographical data has been generated from Ordnance Survey (OS) base. The location, extent and height of existing vegetation have been recorded from the OS 1:25,000 scale raster file, from Google Earth and site observation.

Landscape character

12.1.5 Landscape character describes the different types of landscape within any given area, taking account of topography, vegetation, built form, settlement patterns, land use, local materials, hydrology and other landscape and cultural/historical features. Landscape Character Assessment (NCA) is the process by which landscape character is appraised and subdivided into homogenous units.

12.1.6 The baseline for the development site and wider study area has been extensively studied at national, county and district scale, as part of national and county landscape character initiatives. The relevant studies are:

1. National Character Areas;
2. County LCAs; and
3. District LCAs.

12.1.7 As required, these existing studies have been further developed using desk-based study and site survey work carried out in accordance with the 'Landscape Character Assessment Guidelines for England and Scotland' (2002).

Landscape Value

12.1.8 This is the relative value attached to different landscapes by society. The value placed on a particular landscape may vary for different individuals within that society and value can be applied to whole landscapes, elements within it and particular aesthetic and perceptual dimensions that it provides.

12.1.9 Landscapes are valued at community, national or international levels, noting that undesignated landscapes (local or national level) do not necessarily have no value and may contain valued elements.

12.1.10 The baseline has recorded landscape value through a review of the existing landscape designations. Areas of undesignated landscape have been assessed through a combination of desk and site based study to examine a range of factors including landscape quality and condition, scenic quality, rarity, representativeness, conservation interests, recreation value, perceptual aspects and associations. The criteria used for the assessment of landscape quality is described below.

Landscape Sensitivity

12.1.11 Some local authorities have developed studies to look at landscape sensitivity as part of a wider landscape character assessment, however more generally this forms part of the assessment process.

12.1.12 Landscape sensitivity is a measure of the value of a particular landscape and its capacity to accept change resulting from a particular development type. Landscape sensitivity identifies the vulnerability of each landscape unit to change through the introduction of the new features, such as housing, or the loss of existing valued features such as mature hedgerows.

12.1.13 The GLVIA defines the sensitivity of a landscape as varying with a combination of:

1. Landscape sensitivity resulting from existing land use, the pattern and scale of the landscape/townscape;
2. Visual sensitivity resulting from visual enclosure/openness of views, and distribution of visual receptors;
3. The value placed on the landscape/townscape; and
4. The scope for mitigation, which would be in character with the existing landscape/townscape.

12.1.14 The assessment has applied these descriptors to the Study Area landscape using a criteria range of **High, Medium and Low.**

Table 4: Landscape Sensitivity Criteria

Sensitivity rating	Criteria
High	Important/highly valued (components of the) landscape or landscapes of particularly distinctive character susceptible to relatively small changes. ***Examples include the highly valued, important AONB landscapes that are of high intrinsic quality with open character and open views of the proposed development.***
Medium	Landscape of moderately valued characteristics reasonably tolerant of changes. ***Examples include locally valued, undesignated rural landscapes with some intrinsic quality and with open views of the development.***
Low	Relatively degraded or low value landscape, the nature of which is potentially tolerant of substantial change. ***Examples include brownfield land that has been subject to a history of constant change with relatively few established features.***

Landscape Quality

12.1.15 Landscape Quality is part of the assessment and follows a GLV described methodology. The GLVIA defines landscape quality as the comparative value placed on a landscape or feature relative to its location, rarity or particular attributes. It considers the visual and physical attributes of the landscape, including ecological interest and cultural/heritage associations, identifying seven categories from Exceptional (National Park/AONB) to Damaged Landscapes (Derelict Land). The criteria used in the assessment are set out in Table 5 below.

Table 5: Landscape (and Townscape) Quality Criteria.

Category	Criteria
High exceptional	Very strong landscape (urban) structure, characteristic patterns, balanced combination of landform and land cover. Appropriate management for land use and land cover. Extensive features worthy of conservation. Unique sense of place. No detracting features.
High	Strong landscape (urban) structure, characteristic patterns and balanced combination of landform and land cover. Appropriate management for land use and land cover but with potential scope to improve. Extensive features worthy of conservation. Strong sense of place. Occasional detracting features.
Good	Recognisable landscape (urban) structure, characteristic patterns and combinations of landform and land cover are still evident. Some scope to improve management for land use and land cover. Frequent features worthy of conservation. Sense of place. Some detracting features.
Ordinary	Distinguishable landscape (urban) structure, characteristic patterns of landform and land cover often masked by land use. Scope to improve management for land use and land cover. Some features worthy of conservation. Some detracting features.
Poor	Weak landscape (urban) structure, characteristic patterns of landform and land cover are often masked by land use. Lack of management and intervention has resulted in degradation. Lack of features worthy of conservation. Frequent detracting features.
Very Poor	Degraded landscape (urban) structure, characteristic patterns of landform and land cover are masked by land use. Lack of management and intervention has resulted in degradation. Lack of features worthy of conservation. Extensive detracting features.
Damaged landscapes	Damaged landscape (urban) structure. Disturbed or derelict land requires treatment. Detracting features dominate.

Visual baseline

Identification of the visual receptors

12.1.16 Baseline visual receptors have been identified using a combination of desk-based study and site survey. This has identified the following types of potential community, residential, employment and transport based receptor locations:

1. Public places e.g. playing fields, cricket club, church, school, Common Land;
2. Public Rights of Way e.g. footpaths, byways, and bridleways;
3. Residential e.g. detached, semi-detached, bungalow, terrace, apartment;
4. Workplaces e.g. business or commercial property; and
5. Transport routes e.g. classified and unclassified roads (country lanes), cycle routes.

Recording the visual baseline

12.1.17 All potential visual receptors within the study area have been considered. These key viewpoints demonstrate the wide range of potential baseline and development case views of the development site and the proposed development.

12.1.18 Views from these locations have been documented in a structured and consistent manner. This process has used written descriptions and photographs to record the visual baseline. The viewpoint photographs have been taken in accordance with the Landscape Institute Advice Note 01/11. See Appendix 3.

12.1.19 Due to the timing of the project, the visual assessment and the baseline photography have been undertaken in winter condition.

12.1.20 For this study, the assessment of the 'worst case' winter condition was made.

12.1.21 A description of the view and identification of the type, location and receptor sensitivity has been made through a site based visual assessment. This was undertaken during January 2017 by qualified and experienced landscape architects.

Visual sensitivity

12.1.22 This is another receptor attribute that, although forming part of the baseline information, is actually part of the assessment process. When determining the sensitivity of a visual receptor the following parameters are considered:

1. Location and context of the viewpoint;
2. Expectations and occupation/activity of the receptor;
3. Importance of the view; and
4. Degree of exposure to the view e.g. permanence versus transience.

12.1.23 Visual sensitivity has been assigned using the criteria given in Table 6 (below) derived from the GLVIA:

Table 6: Visual Sensitivity Criteria

Sensitivity rating	Criteria
High	Receptors with a high interest in a visual environment that contains little, or none, of the proposed development/ development type. ***Examples include leisure users of public footpaths and open space in rural areas, residents with good quality rural views, and users of nationally or regionally significant viewpoints (including the AONB).***
Medium	Receptors with a moderate interest in a visual environment that contains some views of the proposed development/development type, or 'permanent' receptors with a high interest in a visual environment which is dominated by open and often close views of the proposed development/development type. ***Examples include pedestrians and recreational motorists on minor roads and people taking part in outdoor sport or receptors in locations where there are existing views of the proposed development site.***
Low	Receptors with passing or momentary interest in a visual environment, or 'transient' receptors with a high/moderate interest in a visual environment which is dominated by open and often close views of the proposed development/development type. ***Examples include commuting motorists and people at work with existing views of the proposed development site.***

Assessment of landscape and visual effects

12.1.24 This section describes the landscape and visual assessment methodology and how it has been applied to the construction and operational phases of the proposed development.

12.1.25 The assessment methodology follows the standard GLVIA approach of assessing changes in the development case against the baseline condition.

12.1.26 Predicted effects have been identified at, or for each receptor, and the magnitude of the identified landscape and visual changes evaluated by professional judgement. The significance of these effects has been determined by the inter-relationship of nature of effect (magnitude) and the nature of receptor (sensitivity): a standard and accepted principle that is described in more detail below.

Landscape assessment

12.1.27 Landscape assessment identifies the likely scale and nature of change to individual landscape elements and characteristics, and any consequential effects on character resulting from the proposed development. Components of the landscape which have been examined in this assessment are:

1. Landscape character;
2. Landscape designations; and
3. Physical characteristics such as topography and vegetation.

12.1.28 Once a potential impact on these components has been identified, an experienced based judgement of the nature of the predicted landscape effect has been made and recorded as:

1. Beneficial or adverse.
2. Direct or indirect.
3. Temporary/permanent.
4. Short, medium or long term.
5. Local/regional/national in scale.
6. Single or cumulative.

12.1.29 The duration of effect would fall into the following categories:

1. Short term – 0-5 years e.g. partial clearance of vegetation for construction;
2. Medium term – 5-10 years e.g. loss of new hedgerows for construction but replanted;
3. Long term – 10-50 years e.g. loss of semi-mature woody vegetation for construction but replanted;
4. Permanent – 50+ years e.g. loss of vegetation where replacement vegetation would not achieve pre-construction dimensions within 50 years.

12.1.30 The next step in the process uses experience based judgement to identify the magnitude of the potential change that would result from the identified landscape impact. The magnitude of the impact is the degree of change experienced by a receptor. The magnitude of landscape effects has been described using the criteria set out in Table 7 (below).

Table 7: Magnitude of Impact on Landscape Criteria

Magnitude Rating	Criteria
Major	Major alteration (loss/enhancement) to key elements/features/ characteristics of the baseline i.e. pre-development landscape and/or introduction of elements considered to be totally uncharacteristic/characteristic when set within the attributes of the receiving landscape.
Moderate	Partial alteration (loss/enhancement) to one or more key elements/features/ characteristics of the baseline i.e. pre-development landscape and/or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape.
Minor	Minor alteration (loss/enhancement) to one or more key elements/features/ characteristics of the baseline i.e. pre-development landscape and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.
Negligible	Very minor alteration (loss/enhancement) to one or more key elements/features/characteristics of the baseline i.e. pre-development landscape and/or introduction of elements that are not uncharacteristic with the surrounding landscape.
No Change	No noticeable alteration (loss or gain) of key elements/features/ characteristics of the baseline.

12.1.31 The significance of the predicted landscape effects has then been identified using a matrix form of evaluation. The thresholds of landscape effects significance criteria have been based on the matrix provided in Table 8, which is adapted from the guidance set out in the GLVIA[1]. Effects have been assigned one of the five categories of **No Change, Negligible, Minor, Moderate or Major** considering the magnitude of the change and the ability of the receptor to accommodate the proposed change (sensitivity).

Table 8: Significance Thresholds for Landscape and Visual Effects

Magnitude of potential change to receptors	Nature of the receptor (sensitivity to proposed change)		
	Low	**Medium**	**High**
Major	Minor/ Moderate	Moderate/ Major	Major
Moderate	Minor	Moderate	Moderate/ Major
Minor	Neutral/Minor	Minor	Minor/ Moderate
Negligible	Neutral	Neutral/Minor	Neutral/Minor
No Change	Neutral	Neutral	Neutral

12.1.32 The matrix has been applied to both landscape and visual significance criteria to allow cross comparison of effects. The parameters for the significance category assigned for each identified landscape and visual effect are defined within the written assessment.

Visual assessment

12.1.33 The visual assessment has described the changes to the existing views resulting from the proposed facilities. This has used a written assessment supported by photographic analysis of the baseline views.

12.1.34 For each viewpoint an experienced based judgment of the nature of the predicted visual effect has been made and recorded as:

1. Beneficial or adverse.
2. Direct or indirect.
3. Temporary/permanent.
4. Short, medium or long term.
5. Local/regional/national in scale.
6. Single or cumulative.

12.1.35 The magnitude of the identified visual impact has been identified for receptors through a written assessment. This process used the following magnitude indicators as adapted from the GLVIA:

1. Extent – the extent of the baseline view that would be occupied by the development: full (unobstructed by vegetation, topography or intervening structures) or partial (obstructed to some extent vegetation) or glimpsed views.

[1] p139, The Institute of Environmental Assessment and Landscape Institute (2nd Edition 2002); Guidelines for Landscape and Visual Impact Assessment; Spon Press; London.

2. Proportion – what proportion of the development would be visible: full (all), most (more than 75%), half (50%), small amount (less than 25%) or none.
3. Contrast – how would the visible elements of the development relate to the remaining/adjoining features of the baseline landscape: high, medium or low levels of contrast?
4. Loss of features – what landscape features in the view would be lost/changed as a result of the proposed facilities?
5. Duration – temporary, permanent, intermittent or continuous e.g. transient (views which are normally viewed while in motion as in while travelling by train or car) and seasonal (views which will be subject to seasonal leaf cover).
6. Angle of view – direct (approximately head on), oblique (45 degrees to head on) or peripheral (greater than 45 degrees i.e. on the edge of vision).
7. Distance – measured in kilometres between the site and the receptor. View distance has been described as follows:
    a. Short 0-100m;
    b. Medium 100- 1000m;
    c. Long 1000m or more.

12.1.36 Using these indicators, an experience based judgement has been made for each visual receptor as to the degree of alteration in the baseline view that would result from the loss/change of baseline landscape elements and the introduction of the proposed facilities. The degree of alteration and the criteria used are shown in Table 9 below.

Table 9: Visual Magnitude of Impact Criteria

Category	Criteria
Major	Large scale changes that would alter the overall perception of the view.
Moderate	Changes to a view that would be readily noticeable but would not change the overall perception of the view.
Minor	Small scale visual changes that may be missed by the casual observer or receptor.
Negligible	Changes that would barely be perceptible to the naked eye.

12.1.37 The significance of the identified visual effects has then been determined by the inter-relationship of magnitude of impact and receptor sensitivity as shown in Table 8. The parameters for the significance threshold assigned for each identified landscape and visual effect have been defined within the written assessment.

Significance of the landscape and visual assessment

12.1.38 The evaluation of the individual landscape and visual effects has assigned a relative degree of impact using a range of values that is consistent within this LVIA, across all LVIA projects that Hyland Edgar Driver undertake and in accordance with recognised standard industry practice. Significance must also be defined in terms of the overall assessment. This is to identify which of the landscape and visual impacts are considered important enough to be 'likely significant impacts' of the project.

12.1.39 Neutral landscape and visual effects equate to a maintaining of the status quo and have been considered as not significant.

12.1.40 Minor (Adverse or Beneficial) Landscape and visual effects have also been considered as not significant. Such effects represent very small scale impacts on the most sensitive landscape and visual receptors and small to larger scale changes on receptors of low sensitivity e.g. noticeable visual changes (deterioration/improvement) for low sensitivity receptors such as workers on the farmers.

12.1.41 Moderate (Adverse or Beneficial) landscape and visual effects represent more noticeable changes on moderately sensitive receptors or small scale impacts on the most sensitive receptors. These have been considered significant when 'groupings' of these effects have occurred together e.g. noticeable changes to views from groups or large numbers of residential receptors.

12.1.42 Major (Adverse or Beneficial) landscape and visual effects have been considered significant even if local and relatively small in extent. Such effects generally include the total loss or alteration of the key characteristics of landscape receptors, or large scale changes to the views of higher sensitivity visual receptors e.g. larger scale noticeable changes to views from the known viewpoints in the AONB's.

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Appendix 12.4: Photography Methodology

Appendix 12.4: Photography Methodology

12.1.0 Photographs have been taken in accordance with the Landscape Institute guidelines using a Canon EOS 1000 digital camera fitted with a 28-55mm or 16-85mm zoom lens set at a defined focal length.

12.1.1 The Landscape Institute guidelines state that 'there is no single best focal length that works best under all circumstances'.

12.1.2 The photographer has therefore selected the lens focal length to provide the best balance between the detail captured and field of view for each viewpoint.

12.1.3 The camera has been fixed to a tripod at a height of 1.6m above the existing and proposed ground levels.

12.1.4 Images have been taken either as single frames or as panoramas. The panoramic images have been taken sequentially from a viewpoint at the same vertical angle as a series of images suitable for merging. A generous overlap of approximately one half between adjacent images has been provided to aid the mosaicing process.

12.1.5 From each location the following information has been recorded for the sets of images:

- Camera lens setting;
- Weather conditions;
- Date and time;
- GPS Location.

ES Volume II: Technical Appendices

Appendix 13.1: Flood Risk Assessment

BUROHAPPOLD ENGINEERING

Bicester Office Park

Flood Risk Assessment

040031

14 December 2017

Revision 03

Revision	Description	Issued by	Date	Checked
00	Draft for Comment	CJ	11/08/17	DKR
01	Final Draft for Comment	CJ	17/08/2017	DKR
02	For Planning	CJ	26/09/2017	DKR
03	For Planning, updated for 2017 topographic survey	CJ	14/12/2017	ADT

\\Srv-london03\project filing\0040031 Bicester Business Park- Planning Support\F34 Water\03 Reports\171214 CJ Flood Risk Assessment 03.docx

author	**Clare Jones**
date	**14/12/2017**
approved	**Alan Travers**
signature	[redacted]
date	**14/12/2017**

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Abbreviations

Term	Definition
AEP	Annual Exceedance Probability
EA	Environment Agency
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
mOD	Metres above Ordnance Datum
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage System

Glossary

Term	Definition
Annual Exceedance Probability (AEP)	The Probability that a storm event will be exceeded in any given year
Attenuation	A method to reduce a flood peak to prevent flooding, often utilising temporary storage, but increasing the duration of the flow
Design Flood Level	This is the level of flooding that flood defences or mitigation measures are designed against. This is typically the 1% (1 in 100) flood level with climate change allowance.
Discharge	The rate of flow of water measured in terms of volume per unit time
Flood Defence	A natural or man-made infrastructure used to prevent certain areas from inundation from flooding, and / or the provision of flood warning systems
Floodplain	Area of land adjacent to a water course which water flows or is stored during a flood event, or would otherwise be flooded in the absence of flood defences
Flood Risk	The level of risk to personal safety and damage to property resulting from flooding due to the frequency or likelihood of flood events
Flood Risk Assessment (FRA)	An assessment of the flood risks to the proposed development over its expected lifetime and the possible flood risks to the surrounding areas, assessing flood flows, flood storage capacity and runoff
Flood Warning Systems (FWS)	A system by which to warm the public of the potential of imminent flooding. This is typically linked to a flood forecasting system
Fluvial Flooding	Related or connected to a watercourse (river or stream)
Functional Floodplain	Greater than a 1 in 20 annual probability of flooding in any year
Groundwater	Water present within underground strata known as aquifers
Groundwater Flooding	Water occurring below ground in natural formations (typically rocks, gravels and sands)
Impermeable Surface	A surface that does not permit the infiltration of water and, therefore, generates surface water runoff during periods of rainfall
Mitigation	Actions taken to reduce either the probability of flooding or the consequences of flooding or a combination of the two
Red line boundary	Boundary drawn to indicate the site area on which the planning application is based
Residual Risk	The risk that remains after risk management and mitigation measures have been implemented
Return Period	The average frequency of a specified condition. An ‘n’ year event is one that occurs on average over the long term, once every ‘n’ years
Risk	Risk is the probability that an event will occur and the impact (or consequences) associated with that event
Runoff	Water flow over surfaces to the drainage system. Runoff occurs if the ground is impermeable or if permeable ground is saturated.
Strategic Flood Risk Assessment (SFRA)	An SFRA is the assessment and ‘categorisation’ of flood risk on an area-wide basis in accordance with PPS25
Surface Water Flooding	Surface water flooding occurs when the volume of water is unable to filtrate through the ground to enter drainage systems, and therefore runs quickly off land and results in localised flooding. This type of flooding is usually associated with intense rainfall.
Sustainable Drainage Systems (SuDS)	SuDS are used as a strategy to manage surface water in a sustainable manner or least damaging solution through management practices and physical structures.

1 Executive Summary

BuroHappold Engineering (BHE) has prepared this FRA on behalf of Scenic Land Developments Limited to support the Outline Planning Application for new office buildings and car parking at Bicester Office Park site. This FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and demonstrates that with the proposed mitigation measures, the development is considered safe up to the 1 in 100 flood event with allowance for climate change and does not increase flood risk elsewhere for the lifetime of the development. A summary of the key findings of the Flood Risk Assessment are provided in **Table 1-1.**

Table 1-1 Summary of the key findings

Subject	Element	Findings
Site Flood Risk	Fluvial	The majority of the site lies in Flood Zone 1. However, along the south eastern boundary, the site lies within 2, 3a and 3b. Areas along south eastern boundary are defined as 'Very low hazard', 'Danger for some' and small localised spots where it is classified as 'Danger for most'.
	Ground Water	Low risk of flooding. Further ground investigation recommended.
	Surface Water	The majority of the site is at very low risk of surface water flooding. There are areas of low to high risk of flooding associated with the drainage ditch crossing the site and low lying areas. Areas which pose a 'Danger for most' are associated with the drainage ditch. 'Very Low Hazard' and 'Danger for some' areas occur along south eastern and northern boundary.
	Sewers and Artificial Sources	Low risk of flooding
Planning Requirements	Vulnerability Classification	Office buildings are classified as 'less vulnerable', appropriate for Flood Zone 1, 2 and 3a. Car parking located in Flood Zone 3b is considered appropriate by the EA provided no ground raising.
	Sequential Test and Exception Test	As the site is allocated within the Adopted LDP, the Sequential Test is considered to have passed. An Exception Test is not required for the site.
	Sequential Approach	The Sequential Approach has been applied by locating buildings outside the 1 in 100 + 35% climate change flood extent. During detailed design, apply Sequential Approach to locate office parking to areas of lower risk of flooding.
Mitigation measures	Design Flood Event	1 in 100 year +25% climate event.
	Climate change	25% to 35% allowance
	Finished Floor Levels	Finished Floor Levels are proposed to be set at a minimum of the 1 in 100 year + 35% climate change plus 300mm freeboard.
	Safe access and egress	Safe access and egress to be provided from all buildings via Lakeview Drive at or above the 1in 100 year +35% climate change level.
	Floodplain compensation	No ground level raising within the Functional Floodplain. Ground raising permitted between the 1 in 20 year flood extent and the 1 in 100 year + 25% climate change flood extent if flood compensation provided on a level for level and volume for volume basis on site.
	Construction Phase	Contractor will need to sign up to EA's flood warning service and to locate stockpiles outside the 1 in 1000 year flood extent.
	Surface water drainage strategy	Primary infrastructure constructed on the site, sized for the Proposed Development. Discharge rates limited to greenfield rates. SuDS techniques to be implemented. Exceedance routes will need to be considered to route flood water away from the threshold of buildings.
	Residual Risk	A flood evacuation and management plan should be considered during detailed design to manage the residual risk of surface water and fluvial flooding on the site posed to both people and vehicles.

2 Introduction

2.1 Background

This site specific Flood Risk Assessment (FRA) has been prepared by BuroHappold Engineering on behalf of Scenic Land Developments Limited as part of an Outline Planning Application for the Bicester Office Park development, hereafter referred to as the 'Proposed Development'. The application is in outline with all matters reserved except for access. This assessment has been carried out in accordance with the National Planning Policy Framework (NPPF).

2.2 Site Description

The Proposed Development site is located to the south of Bicester in the Cherwell District of Oxfordshire, Ordnance Survey grid reference (NGR) SP 579 215. The site is bounded by the A41 Oxford Road to the west, the new Tesco foodstore to the north, to the east by open fields and to the south by Bicester Avenue shopping centre. A sewage treatment works is located to the south east of the site. There is an agricultural field drainage ditch that runs north/ south across the site towards the south eastern boundary. The site area is approximately 13.1ha and is currently agricultural land. **Figure 2-1** shows the location of the Proposed Development.

The Langford Brook is located approximately 180m to the south east of the Proposed Development and flows in a south westerly direction to the north of the sewage treatment works before cutting beneath the railway line. A land drain connecting into the Langford Brook is adjacent to the north east corner of the site.

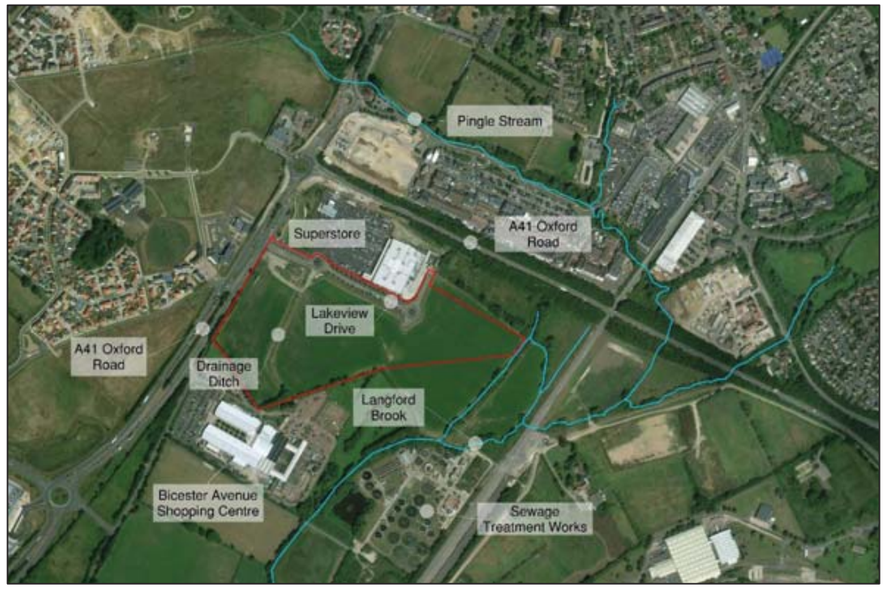

Figure 2-1: Site Location Plan with indicative red line boundary (Site Aerial received from Hyland Edgar Driver on 26/5/2017)

The site levels fall from Lakeview Drive in the north, and slope down towards the south and south east boundary of the site towards the Langford Brook. Topographical survey data from 2017 (Greenhatch Group), 2011 LiDAR (1m resolution) Digital Terrain Model[1] and As-built survey information from the superstore development (Breheny Civil engineering, 2015) are available for the site. These surveys indicate that land levels along Lakeview Road in the north of the site are typically between 66.5m AOD, increasing in the west to 67.5m AOD. Along the south of Lakeview Road, there is a 0.8m to 1.5m high bund and an area of material storage north of the drainage ditch. Land slopes downwards from the road to the south boundary where land levels vary from 66.0m AOD to 65.0m AOD and to south east where levels are typically between 64.6m AOD and 64.9m AOD. Refer to **Appendix A** for site survey information.

2.3 Proposed Development

The Proposed Development comprises between 55,000 and 60,000m^2 (gross external area) office use (B1(a) and B1(b)), parking for approximately 2,000 cars, associated highway, infrastructure and earthworks. The office park will be made up of differently sized buildings which will vary in height between two and four storeys and located with associated landscaping. **Figure 2-2** shows the Proposed Development parameters plan for the site and drawings are provided in **Appendix B**.

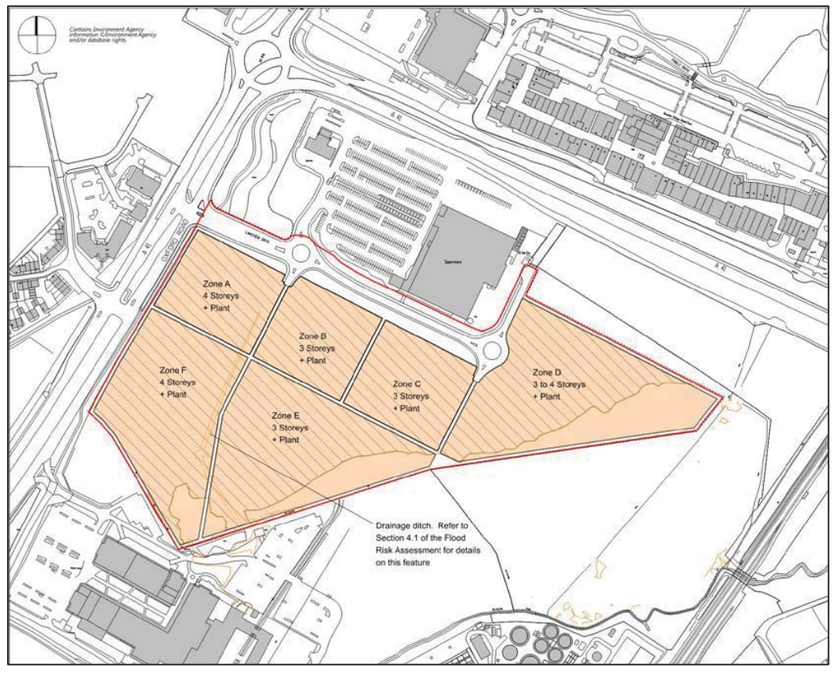

Figure 2-2: Proposed Development Parameters Plan (Drawing 1105_P_005 rev E, Bennetts Associates 30/11/17)

[1] Downloaded from http://environment.data.gov.uk . Contains Public Sector Information licenced under the Open Government Licence v3.0.

3 Planning Context

3.1 Overview

This FRA has been prepared in accordance with policies and guidance applicable to the Proposed Development outlined within the following publications:

- National Planning Policy Framework (March 2012)
- National Planning Policy Framework Planning Practice Guidance (March 2014)
- Flood Risk Assessments: climate change allowances (February 2016, updated February 2017)
- Thames Area Climate Change Allowances. Guidance for their use in flood risk assessments (January 2017)
- Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment (April 2009)
- Cherwell District Council Level 2 SFRA (March 2012)
- Oxfordshire County Council Preliminary Flood Risk Assessment Preliminary Assessment Report (June 2011)
- The Cherwell Local Plan 2011-2031. Part 1 Adopted 20 July 2015 (July 2015)

3.2 National Planning Policy Framework

3.2.1 Flood Zone Assessment

The National Planning Policy Framework[2] (NPPF) aims to avoid inappropriate development in areas at highest risk of flooding. The Planning Practice Guidance to the NPPF[3] contains a series of tables that help identify the risk of flooding to a development.

- Table 1 defines four Flood Zones based on the annual probability of river or sea flooding;
- Table 2 identifies specific land use types for each of the five flood risk vulnerability classifications (Essential Infrastructure, Highly Vulnerable, Less Vulnerable and Water Compatible Uses). For example, office buildings are classified as *less vulnerable*; and
- Table 3 identifies where development is appropriate for each flood risk vulnerability classification and whether the Exception Test is required.

The Flood Zones defined in the NPPF are as follows:

Flood Zone 1 Low probability

< 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

Flood Zone 2 Medium probability

Between 1 in 100 and 1 in 1,000 annual probability of river flooding in any year (1% - 0.1%), or

between 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year (0.5% - 0.1%).

Flood Zone 3a High probability

[2] Department for Communities and Local Government (2012). *National Planning Policy Framework*.
[3] Department for Communities and Local Government (2014). *National Planning Policy Framework Planning Practice Guidance*. [online] Available at: *https://www.gov.uk/guidance/flood-risk-and-coastal-change*. [Accessed 22 March 2017].

> 1 in 100 annual probability of river flooding in any year (>1%), or

> 1 in 200 annual probability of sea flooding in any year (>0.5%).

Flood Zone 3b Functional floodplain

> 1 in 20 annual probability of flooding in any year (5%).

The Proposed Development consists of office buildings which are classified as 'less vulnerable' in accordance with the NPPF Planning Practice Guidance and are considered appropriate for Flood Zone 1, 2 and 3a. The Environment Agency has confirmed that as the site is allocated in the Cherwell District Council Local Plan under Policy Bicester 4, car parking is considered acceptable within Flood Zone 3b. This is provided there is no ground raising within Flood Zone 3b.

3.2.2 Sequential and Exception Test

The NPPF states that *'inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere'*. The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. If this cannot be achieved, the Exception Test is required if indicated by the conditions specified in NPPF Table 3.

The Cherwell Local Development Plan (LDP) 2011-2031 Part 1 was adopted in July 2015 and re-adopted in December 2016. As the site is allocated under Policy Bicester 4 for Employment, the Sequential Test for the development is considered to be passed and justification is provided in Cherwell District Local Plan Sequential Test and Exception Test (Flooding) Document[4]. The Exception Test is not required for the Proposed Development as 'More Vulnerable' uses are not proposed on the site.

In accordance with NPPF and Policy Bicester 4 in the LDP, a Sequential Approach should be followed. The LDP policy requires *'where possible, buildings should be located away from areas at high risk of flooding but where it is necessary development should be made safe without measures increasing flood risk elsewhere[5]'*. For the Proposed Development, all the office buildings are to be located outside the 1 in 100 year + 35% climate change flood extent.

Policy Bicester 4 requires a site specific Flood Risk Assessment (FRA) to be undertaken for the Proposed Development. The Policy Bicester 4 also requires the following:

- Consideration of all sources of flooding for the site;
- 'Flood mitigation of flood risk in compliance with Policy ESD 6'[5];
- The Proposed Development should be 'safe and remain operational (where necessary)'[5];
- Consideration of the Strategic Flood Risk Assessment for the Proposed Development;
- Incorporation of Sustainable Drainage Systems (SUDs) for managing surface water on site which seek to 'reduce flood risk, reduce pollution and provide landscape and wildlife benefits'[5];
- Reduction of surface water run off to greenfield discharge rates for the Proposed Development;
- Development is not within 8m of the watercourse banks.

The following site specific FRA has been prepared to meet the Policy Bicester 4 requirements.

[4] Cherwell District Council. Sequential Test and Exception Test (Flooding) Strategic Sites (August 2012, updated October 2013).
[5] Cherwell District Council. The Cherwell Local Plan 2011- 2031. Part 1 Adopted 20 July 2015. Policy Bicester 4: Bicester Business Park. (July 2015)

3.3 Consultation

3.3.1 Environment Agency

The EA has provided BuroHappold with the following information[6] which was used to inform the assessment of flood risk to the Proposed Development:

- Flood map for planning;
- Modelled floodplain flood levels;
- Historical Flood data information;
- Flood defence information;
- Hazard Flood map;
- Bicester Flood Risk Mapping Study, Final Modelling Report (December 2009);
- Model Output data;
- Langford Brook (Bicester) & Pingle-Back-Bure 2010 ISIS-TUFLOW Model.

In addition to this, the Environment Agency has provided pre-application advice on their requirements for the Flood Risk Assessment including the approach to defining the flood extents, finished floor levels, development in Functional Floodplain and approach to floodplain compensation. In summary, the EA confirmed the following:

- The 1 in 20 year flood extent is classified as Functional Floodplain (Flood Zone 3b);
- The approach taken by BHE to define the flood extents for the 1 in 20, 1 in 100 and 1 in 1000 year using the flood levels against the topographic survey and LiDAR data was acceptable;
- Hydraulic modelling is required to define the flood levels for the 1 in 100 year + 25% and + 35% climate change scenarios required by the new 2016 climate change guidance[7]. Once defined, the same approach using the topographic survey information and where unavailable, LiDAR was acceptable to define the flood extents;
- The Design Flood Event (DFE) for the Proposed Development is the 1 in 100 year + 25% climate change allowance;
- A Sequential Approach should be taken to locating development on site. The EA advised that buildings should be located outside the 1 in 100 year + 35% climate change extent;
- Car parking within Flood Zone 3b is acceptable provided there is no ground raising;
- Minimum finished floor levels should be set at or above the DFE flood level plus 300mm freeboard. This would be for the 1 in 100 year + 25% climate change plus freeboard. However, the EA has requested that the finished floor levels are set at 1 in 100 year +35% level plus 300mm freeboard.
- Ground raising outside the Functional Floodplain is not advised but would be acceptable provided floodplain compensation is provided up to the 1 in 100 year + 25% flood extent. The need for flood compensation would need to be considered through detailed design and could be dealt with through a planning condition.

A full copy of the data received and information provided by the EA is included in **Appendix C**.

[6] Environment Agency Products 4, 5, 6 and 7
[7] Flood Risk Assessments: climate change allowances (February 2016, updated February 2017)

4 Appraisal and Management of Flood Risk

4.1 Fluvial Flooding

Fluvial flooding occurs when sustained or intense rainfall events increase the flow in rivers causing water level to rise above the level of the banks and into surrounding areas.

4.1.1 Baseline

4.1.1.1 Flood Zone Assessment

The Flood Zone map produced by the EA shows that the majority of the site lies within Flood Zone 1 which is considered at low risk of flooding. However, land along the south east boundary lies within Flood Zone 2 and 3a considered medium and high risk of flooding respectively due to the Langford Brook approximately 180m from the site. There are also localised areas of Flood Zone 3b, classified as functional floodplain which has more than a 1 in 20 annual probability of flooding in any one year.

The flood extents are defined as the following:

Flood Zone 1 Low probability

< 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

Flood Zone 2 Medium probability

Between 1 in 100 and 1 in 1,000 annual probability of river flooding in any year (1% - 0.1%), or

between 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year (0.5% - 0.1%).

Flood Zone 3a High probability

> 1 in 100 annual probability of river flooding in any year (>1%), or

> 1 in 200 annual probability of sea flooding in any year (>0.5%).

Flood Zone 3b Functional floodplain

> 1 in 20 annual probability of flooding in any year (5%).

BuroHappold Engineering has overlaid the 1 in 20, 1 in 100 and 1 in 1000 year flood extents provided as part of the Product 6 information with the red line boundary as shown in **Figure 4-1.** This indicates that the site also lies within the 1 in 20 year flood extent. The EA has confirmed that the 1 in 20 year extent is Functional Flood plain i.e. Flood Zone 3b. The EA has no records of historical flooding on the site.

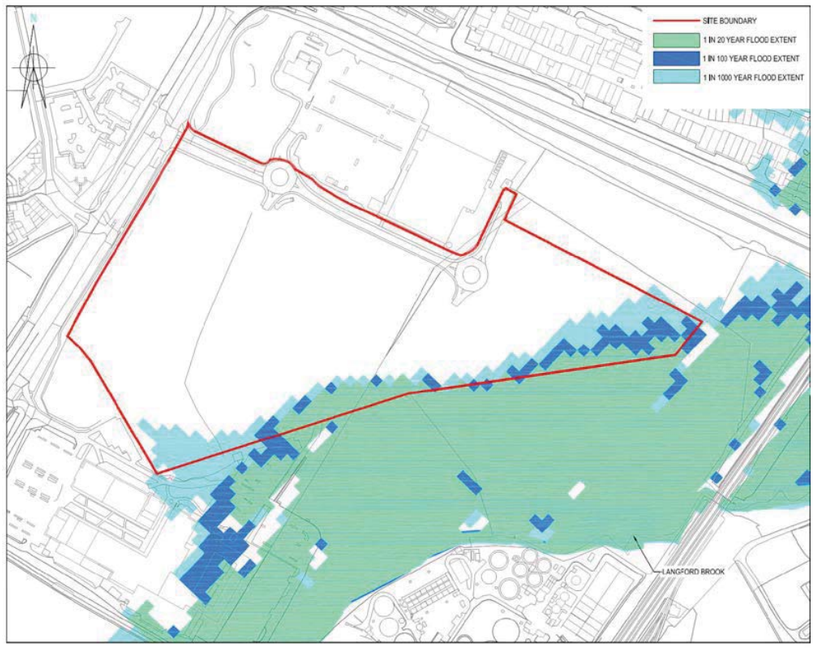

Figure 4-1 Flood Zone Extents overlaid with the red line boundary provided as part of the product 6 information from the Environment Agency on the 23rd June 2017. *(Contains Environment Agency Information © Environment Agency and/or database right).*

BHE has further defined the flood extents for the 1 in 20, 1 in 100 and 1 in 1000 year flood extents by using a combination of topographic survey information (2017) and LiDAR DTM data (2011, 1m resolution) for the site. The flood extents have been derived by the following means:

- Flood model level information has been extracted from the Langford Brook (Bicester) & Pingle-Back- Bure 2010 ISIS-TUFLOW Model for Points A to H in the floodplain. It has been assumed that the levels within the floodplain are the same as within the corresponding point in the river channel.
- Using 3D modelling software, a flood level surface for each return period event has been created by interpolating between the flood level points defined in the floodplain and the channel.
- The survey information (topographic survey or LiDAR) has been used to create a ground level surface by interpolating between the LiDAR contours/ topographic survey points.
- 3D modelling software has then been used to determine where the flood level intersects the ground level surface. The model has defined a contour for each of the flood level extents which is provided on the attached drawings.
- As topographic survey information does not cover a section south east of the site, LiDAR DTM Data (2011, 1m resolution) has been used. The flood extents have been defined by the topographic survey but where this was not available, the flood extent has been combined with the flood extent derived from LiDAR.

- Since there are differences between the levels measured during the topographic survey and the LiDAR survey, due to the respective tolerances, there were some discontinuities between the flood extent lines at the boundary between the topographic survey and LiDAR surfaces. At these locations the flood extent line has been interpolated between the flood extents on either side of the discontinuity at the point where there is the least difference between the two surveys. A drawing showing the flood extent lines is shown in **Appendix D**, with the locations where the flood extent line defined by the LiDAR and topographic survey clearly marked.

The revised flood extents are provided in **Figure 4-2** and provided in **Appendix D**. These have been used to inform the assessment of fluvial flood risk on the site and mitigation measures.

The drainage ditch that runs north/ south across the site towards the south eastern boundary functions as an agricultural field drainage feature and was originally provided on the boundary of two different land ownerships. The adjoining land has been purchased by the applicant and the ownerships amalgamated into a single agricultural operation. The owners are intending to fill in this ditch imminently and Oxfordshire County Council have confirmed that an Ordinary Watercourse Consent is not required. As it may provide a limited field drainage function, a perforated drainage pipe will be installed as a precautionary measure. It is considered that the ditch does not provide a wider drainage function.

For the purposes of this Flood Risk Assessment, the drainage ditch has been assumed to have been filled in.

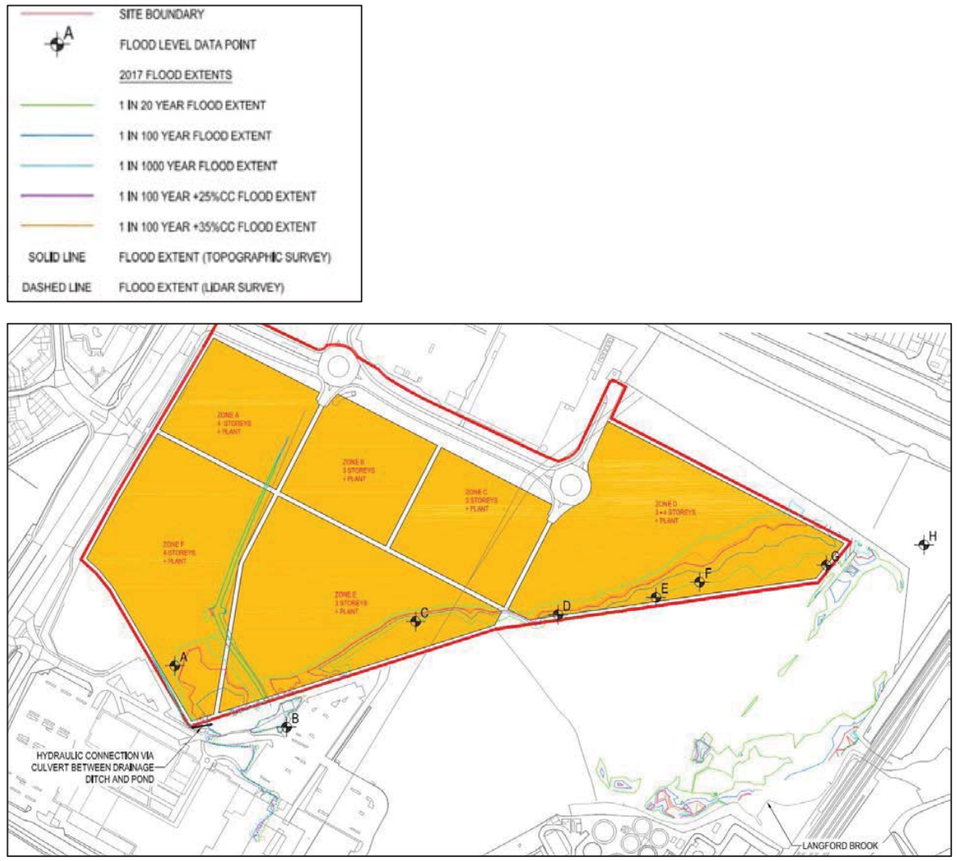

Figure 4-2– Revised Flood Zone Extents overlaid with the red line boundary *(Contains Environment Agency Information © Environment Agency and/or database right). For full copyright details, refer to the drawing in Appendix D.*

4.1.1.2 Flood Levels

The EA has provided BHE with the ISIS-TUFLOW Langford Brook (Bicester) & Pingle-Back-Bure 2010 ISIS-TUFLOW Model for the site. BHE has extracted the flood level results for points along the extent of the south eastern boundary of the site. These are provided for Points A to H in **Table 4-1**.

Table 4-1: Flood Levels extracted from the ISIS-TUFLOW within the floodplain *(Contains Environment Agency Information © Environment Agency and/or database right)*.

Point	X Co-ordinate	Y Co-ordinate	Fluvial Flood Levels (mAOD)		
			1 in 20 year	1 in 100 year	1 in 1000 year
A	457650.7	221442.2	64.63*	64.70*	64.81
B	457751.0	221387.3	64.63	64.70	64.81
C	457866.9	221481.9	64.67	64.74	64.88
D	457994.7	221488.1	64.81	64.89	65.04
E	458082.6	221503.4	64.83	64.93	65.13
F	458121.7	221517.1	64.84	64.95	65.16
G	458235.5	221532.3	64.84	64.96	65.19
H	458323.1	221550.5	65.02	65.11	65.27

* Flood levels based on point B due to flood water not reaching the point within the hydraulic model

4.1.1.3 Climate Change Allowance

Allowances for the predicted effects of climate change should be taken into account when preparing site-specific flood risk assessments. The guidance[8] published by the Environment Agency (EA) in February 2016 to support the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, sea level rise, offshore wind speeds and extreme wave heights. The recommended allowances for increases in peak river flow rate in the Thames river basin district are given in **Table 4-2**.

Table 4-2: Climate change allowances for peak river flow in the Thames river basin district (Contains Environment Agency information © Environment Agency and database right)

Allowance category	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%

The EA guidance for the use of peak river flow allowances notes that the allowance category to be used depends on the land use vulnerability and the Flood Zone in which the site is located. Since the Proposed Development includes *less vulnerable* land uses, both the central and higher central allowances should be used. Considering a 60 year design life for the Proposed Development, the central peak river flow climate change allowance is 25% and the upper end allowance is 35%.

As the Proposed Development is classified as 'Large-Major' development, a vulnerability classification of *'Less vulnerable'* and in Flood Zone 3, the EA has requested that hydraulic modelling is undertaken to determine the flood levels for 25% and 35% as these have not been modelled by the Environment Agency. This is in accordance with the Thames Area Climate Change guidance.

[8] Environment Agency, (2016). *Flood risk assessments: climate change allowances*. [online] Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances [Accessed 27th July 2017].

BHE has undertaken hydraulic modelling for these events by increasing the flow rates for the 1 in 100 year by 25% and 35% respectively. A summary of the flood level results are provided in **Table 4-3**. For further information, refer to the hydraulic modelling report provided in **Appendix E**.

Table 4-3: Flood Levels extracted from the ISIS-TUFLOW within the floodplain (Contains Environment Agency information © Environment Agency and database right)

Point	X Co-ordinate	Y Co-ordinate	Fluvial Flood Levels (mAOD)	
			1 in 100 year + 25% climate change	1 in 100 year + 35% climate change
A	457650.7	221442.2	64.74*	64.81*
B	457751.0	221387.3	64.74	64.81
C	457866.9	221481.9	64.79	64.88
D	457994.7	221488.1	64.94	65.04
E	458082.6	221503.4	65.00	65.13
F	458121.7	221517.1	65.02	65.16
G	458235.5	221532.3	65.04	65.19
H	458323.1	221550.5	65.16	65.27

* Flood levels based on point B due to flood water not reaching the point within the hydraulic model

BHE has undertaken the same process as defined in **Section 4.1.1.1** to establish the flood extent using a combination of the 2017 topographic survey and 2011 LiDAR DTM Data. These are provided in in **Figure 4-2**.

4.1.1.4 Fluvial Flood Hazard

The fluvial flood hazard map for the 1 in 100 year + 35% climate change event has been provided in **Figure 4-3**. The map shows the hazard rating across the site (defined in **Table 4-4**). This is based on the following calculation which takes into consideration velocity (v) and depth of the floodwater (d) and debris factor (DF):

$$HR = d * (v+0.5) + DF$$

Table 4-4 Flood Hazard Classifications[9]

Flood Hazard	Hazard to People Classification	
Less than 0.75	Very Low Hazard	Caution
0.75 to 1.25	Danger for some	Includes children, the elderly and the infirm
1.25 to 2.0	Danger for most	Includes the general public
More than 2.0	Danger for all	Includes the emergency services

Figure 4-3 shows that along the south eastern boundary, there are areas of that are defined at 'Very low hazard', 'Danger for some' and some small localised spots where it is classified as 'Danger for most'.

[9] HR Wallingford and Environment Agency (May 2008) Supplementary note of flood hazard ratings and thresholds for development planning and control purpose – Clarification of the Table 113.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1

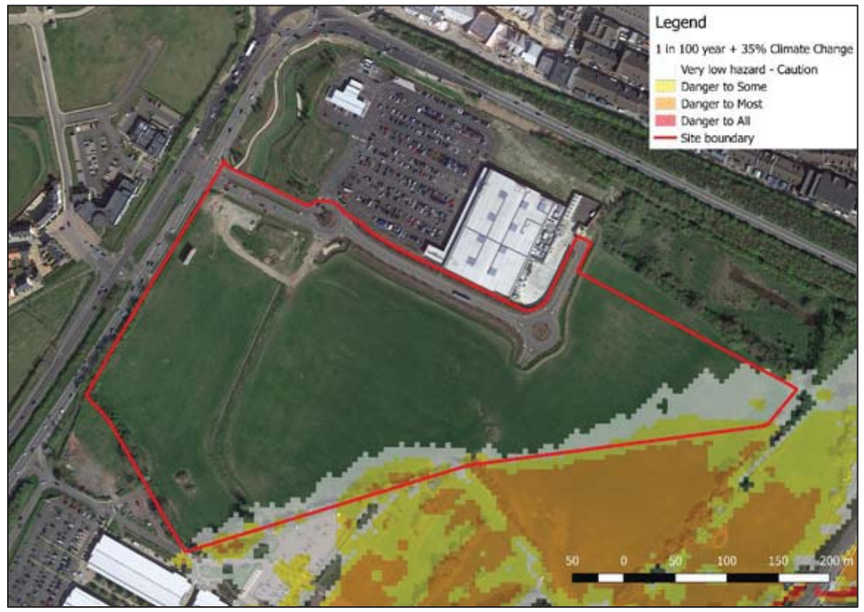

Figure 4-3 Fluvial flooding hazard map for 1 in 100 year storm event + 35% climate change *(Contains Environment Agency Information © Environment Agency and/or database right) Imagery © Google 2017, Map data © Google 2017)*

4.1.2 Proposed Development

For the Proposed Development, ground levels within the Functional Floodplain (i.e. within the 1 in 20 year flood extent) are not to be raised in accordance with NPPF guidance and the EA's pre-application advice. At grade car parking within this zone is considered acceptable by the Environment Agency provided there is no raising of ground levels.

A sequential approach should be taken to locating development on site to areas of lower risk of flooding. The office buildings are to be located outside of the 1 in 100 + 35% climate change and set with a minimum floor level. Car parking should be located, where possible, towards areas of lower risk of flooding (i.e. away from the south eastern boundary).

Finished floor levels for the office buildings are to be set at the 1 in 100 year + 35% climate change flood level with an additional 300mm freeboard.

During detailed design of the site, if ground raising is required between the 1 in 20 year flood extent and the 1 in 100 year + 25% climate change flood extent, then flood compensation will be required to be provided. This will need to be provided on a level for level and volume for volume basis on site in accordance with the Level 2 SFRA Table 5-3 guidance for the site.

4.1.2.1 Construction Phase

During the construction phase, the Contractor will need to sign up to the EA's flood warning service which covers the site and produces a construction flood and evacuation plan for managing flood risk on site during the construction phase.

During construction, stockpiles of material should not be stored within the Functional Floodplain as land raising is not permitted. It is recommended that stockpiles are located outside the 1 in 1000 year flood extent.

4.2 Flooding from Surface Water

Surface water flooding occurs when intense rainfall is unable to naturally soak into the ground due to impermeable ground covering such as concrete or tarmac, or low permeability ground conditions preventing infiltration. This excess surface water can flow through built-up areas and open space and pond in lower-lying areas causing localised flooding.

4.2.1 Baseline

The Environment Agency surface water map shows that the majority of the site is at very low risk of surface water flooding (i.e. less than 1 in 1,000 annual probability of surface water flooding in any year). **Figure 4-4** has been reproduced using the EA flood extent data. The map shows that there is an area at high risk of flooding (less than a 1 in 30 annual probability of surface water flooding) from the north to the south of the site. This corresponds to the location of the drainage ditch. The EA's model results typically show between 300 to 600mm of flooding with localised spots between 600 to 900mm for the 1 in 100 annual exceedance probability event as shown in **Figure 4-5**.

There are areas of low to medium risk of surface water flooding (between a 1 in 30 and 1 in 100 and between a 1 in 100 and 1 in 1000 annual probability respectively) adjacent to drainage ditch, along the eastern boundary and south eastern corner of the site. The predicted depths from the EA's modelling are less than 300mm for the 1 in 100 annual probability event.

The area along the northern boundary of the site shows areas of low, medium and high surface flood risk. This area has been re-configured as part of the 2015 superstore works which may not be reflected in the modelling. Depths for the 1 in 100 annual probability event are predicted as below 300mm.

Figure 4-4 Environment Agency's surface water flood extents map with indicative red line boundary. Accessed 16/8/17 (© Environment Agency copyright and/or database right 2015. All rights reserved. Some features of this map are based on digital spatial data from the Centre for Ecology & Hydrology, © NERC (CEH). Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2013. Imagery © Google 2017, Map data © Google 2017)

Figure 4-5 EA's surface water flood depth map for 1 in 100 annual probability event with indicative red line boundary. Accessed 16/8/17 (© Environment Agency copyright and/or database right 2015. All rights reserved. Some features of this map are based on digital spatial data from the Centre for Ecology & Hydrology, © NERC (CEH) and © Lead Local Flood Authorities. Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2013. Imagery © Google 2017, Map data © Google 2017)

Figure 4-6 shows that for the 1 in 100 annual probability event, the flooding in the locality of the drainage ditch has areas which pose a 'Danger for most', 'Danger for some' and areas 'Very Low Hazard – Caution'. There is also a 'Very Low Hazard – Caution' areas along the south eastern and northern boundary with localised spots of 'Danger for some' on Lakeview Drive.

Figure 4-6 Environment Agency's surface water flood hazard map for the 1 in 100 annual probability event with indicative red line boundary. Accessed 16/8/17 (© Environment Agency copyright and/or database right 2015. All rights reserved. Some features of this map are based on digital spatial data from the Centre for Ecology & Hydrology, © NERC (CEH). Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2013. Imagery © Google 2017, Map data © Google 2017)

The 2011 Preliminary Flood Risk Assessment (PFRA) Map 1 and Map 2 show no recorded surface water flood events during July 2007 and other past events. The Level 2 SFRA also reports that the EA and Cherwell District Council have no records of surface water flooding on site.

In January 2014, following a period of major winter storms which brought widespread heavy and extended rainfall to the UK, BHE undertook a site visit to Bicester. BHE observed localised surface water ponding at the then recently excavated superstore construction site to the north of the development site where the underlying soil was identified as clay with poor permeability, as well as localised ponding at lower ground level areas in the vicinity of the manhole structures and overhead power line posts near the eastern boundary. BHE estimated that the rainfall over the 16 day period from 23rd December 2013 to 7th January 2014 was equivalent to a 1 in 17 year event.

4.2.2 Proposed Development

The primary surface water drainage infrastructure to serve the Proposed Development has already been constructed as part of the primary infrastructure contract for the site. The drainage was designed to provide capacity to serve the development proposals covered by the 2007 outline planning application.

The surface water infrastructure was installed along Lakeview Drive with spurs left to facilitate drainage connections from the masterplan. A 600mm diameter surface water pipe crosses the Proposed Development site and outfalls into the drainage ditch upstream of the confluence with the Langford Brook.

The primary surface water sewer was designed with a capacity to serve the proposed 60,000m^2 B1 development. In accordance with the previously agreed drainage strategy, surface water runoff from the developed site will be limited to current 'greenfield' runoff rates and onsite storage will be required. The greenfield runoff rate will be estimated using the HR Wallingford *uksuds* tool. The sewer capacity of the constructed surface water drainage has been designed on this basis.

Attenuation measures for the developed site will be designed to accommodate the increased rainfall intensities in accordance with the climate change recommendations issued by the Environment Agency in February 2016.

The drainage system to serve the development site will incorporate the recommendations of Sustainable Drainage Systems (SuDS) good practice. The current Good Practice Guidance is contained in CIRIA Report C753 issued in 2015. This will be used to design the onsite drainage network unless superseded in the future.

In accordance with Policy Bicester 4, the site is not permitted to flood from surface water up to and including the 1 in 30 year event. Surface water flooding above this event up to a 1 in 100 year event with allowance for climate change is permitted provided it is safely contained within the site. During detailed design, exceedance routes will need to be considered to route flood water away from the threshold of buildings.

Refer to **Appendix F** for the surface water drainage strategy.

4.3 Flooding from Sewers

Flooding from sewers is typically associated with blockage, failure or overloading of the sewer network.

4.3.1 Baseline Flood Risk

The Level 2 SFRA Thames Water DG5 database map showed no recorded sewer flooding incidents within or in the vicinity of the site for the period during 2000-2010 from public foul, combined or surface water sewers. The SFRA also reported that Cherwell District were not aware of any historical incidents on the site but *'are aware of the limited sewer capacity in Bicester'*.

There are two existing combined public sewers which are to the south east of the proposed development site, parallel to the existing ditch (tributary of the Langford Brook) from Bicester village to the sewage treatment plant as shown in **Figure 4-7** taken from the 2011 BuroHappold Drainage Strategy for the Tesco Development[10]. The BHE site report from 2014 showed evidence of localised sewer flooding however, these were related to manholes outside of the site boundary as shown in **Figure 4-7**.

[10] Buro Happold 028858 Bicester Business Park Drainage Strategy (Pre Development Application for Tesco) Revision 02 (September 2011)

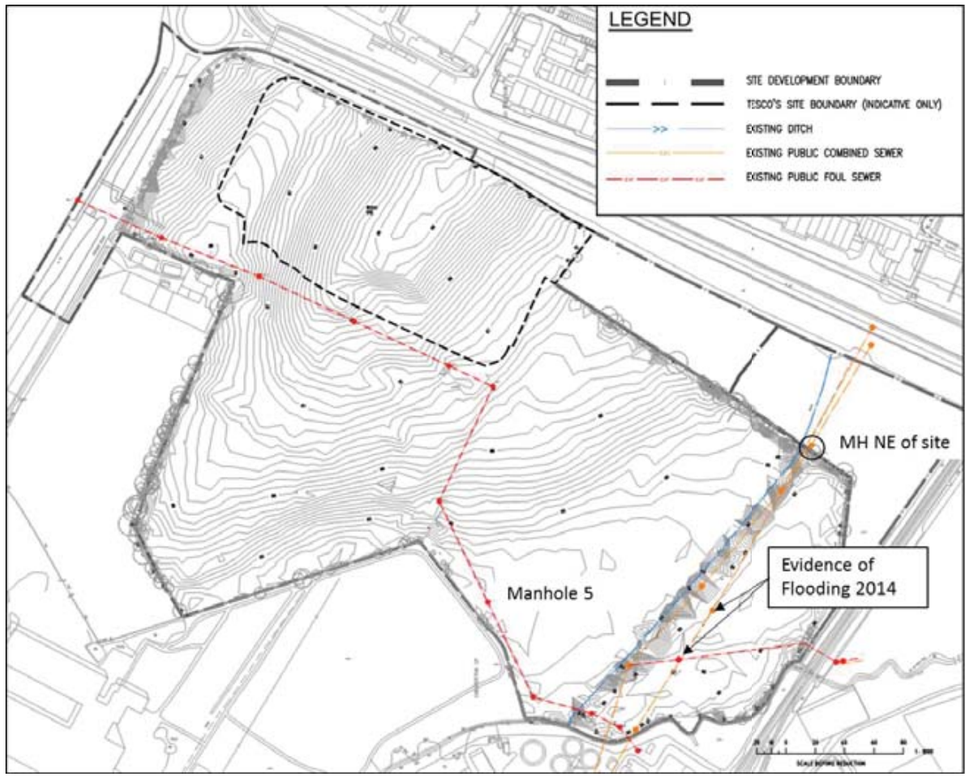

Figure 4-7 Existing Services Information from 2011 Tesco Drainage Strategy[11].

There is also an existing 600mm diameter foul sewer which crosses the site from the A41 Oxford Road east along Lakeview Drive before turning south and then south east towards the sewage treatment works. This was installed as part of the primary infrastructure works to support the Tesco foodstore and masterplan works.

In December 2014/ January 2015, it was reported that there was localised foul flooding at Manhole 5 and the two combined sewers to the south east of the site. It is understood that this was associated with an issue downstream at the sewage treatment works rather than a capacity issue.

[11] Buro Happold 028858 Bicester Business Park Drainage Strategy (Pre Development Application for Tesco) Revision 02 (September 2011)

There are no known sewer flood incidents on site however, there have been incidents of sewer flooding in the vicinity of the site due to downstream issues. During a site visit in November 2017, there was evidence of sewer flooding from the two combined sewer manholes and the manhole north east of the site (circled on **Figure 4-7**) by the presence of detritus. From a review of the topographic survey and LiDAR data in combination with a review on site, flood water from the north east manhole would likely flow along the drainage ditch to the east away from the site. We are led to believe that the offsite foul sewer flooding at MH5 was as a result of a combination of unusual events which led to surcharging rather than a pipe capacity issue. The risk of sewer flooding to the site is therefore considered low. However, further consultation will be needed with Thames Water during detailed design.

4.3.2 Proposed Development

The primary foul water drainage infrastructure to serve the proposed development has already been constructed as part of the primary infrastructure contract for the site in 2011. The drainage was installed with connection points to facilitate the future connection of the masterplan site. The flow rates from the proposed development have been estimated based on the benchmarks for B1 uses. The total flow rate from the completed development will be very low in comparison with the capacity of public sewer. It is not anticipated that there will be any flow restrictions placed on the connections by Thames Water. For further information refer to **Appendix F**.

4.4 Groundwater Flooding

Flooding from groundwater occurs when the water table in permeable rocks such as chalk and limestone rises to enter underground spaces such as basements and cellars or reaches a sufficient level to emanate from the ground surface itself. Groundwater flooding is not necessarily directly linked to a specific rainfall event and is generally of longer duration than other causes of flooding (possibly lasting for weeks or months).

4.4.1 Baseline

The Cherwell District Council Level 2 SFRA provides the Environment Agency's Area Susceptibility to Groundwater Flooding map. The map shows that the eastern half of the site lies within a 1km square which has up to 25% of its area susceptible to groundwater flooding and the western site between or equal to 25% and less than 50%.

The anticipated site geology is summarised in **Table 4-5** - Summary of Anticipated Geology. This has been determined with reference to the relevant BGS map (1:50,000 series, sheet 219, Buckingham. BGS 2002); BGS borehole logs; the Groundsure report and historic site investigation data.

Table 4-5 - Summary of Anticipated Geology

Strata	Description	Depth to top [Thickness] (m)	Aquifer status
Alluvium	Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.	GL [<3m]	Secondary
River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat.	GL [<3]	Secondary
Kellaways Formation	Siltstone and mudstone.	GL – 3 [2-3]	Unproductive

Cornbrash Formation	Limestone, medium- to fine-grained, generally and characteristically intensely bioturbated and consequently poorly bedded. Generally bluish grey when fresh, but weathers to olive or yellowish brown. (Regionally between 1 to 4m thick)	<5 [2]	Secondary
Forest Marble Formation	Silicate-mudstone, greenish grey, variably calcareous. A variety of limestone types occur, of which grey, weathering brown and flaggy, variably sandy medium to coarsely bioclastic grainstone or less commonly, packstone predominates, especially at the base. (Regionally between 2 to 7m thick).	2.5 - >5 [7]	Unproductive
White Limestone Formation	A pale grey to off-white or yellowish limestone, peloidal wackestone and packstone with subordinate ooidal and shell fragmental grainstones. (Regionally between 7 and 18m thick)	9 [base not proven]	Principle

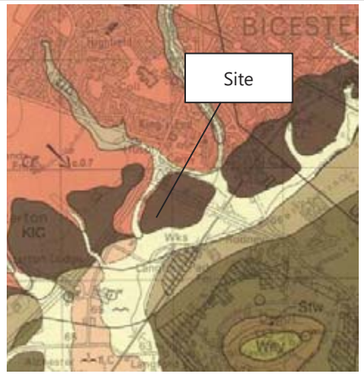

Figure 4-8 Extract of the BGS geology map for the area.

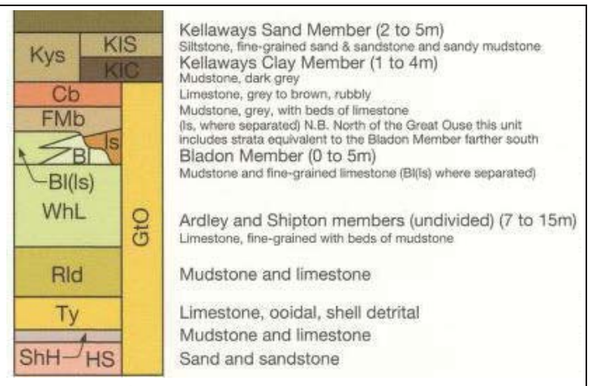

Figure 4-9 Key of the geological bedrock in the area.

Figure 4-8 shows that a band of alluvium and the Combrash Formation underlies the western part of the site at the surface. Both of these are permeable formations and are classified as Secondary Aquifers which could potentially pose a risk of groundwater flooding. However, given the permeability of the alluvium, it is likely that an increase in groundwater level in the Combrash formation, is likely to be dissipated by the alluvium towards the river.

The alluvium band extends to the Langford Brook and is likely to be in hydraulic connectivity with the river. Given that the site is elevated from the river by approximately 0.5m and groundwater takes longer to respond, the primary flooding mechanism for the site would be from water overtopping the banks of the Langford Brook. However, there is a low risk of groundwater flooding if groundwater rises and is unable to drain through the alluvium layer. This will be considered during the detailed ground investigation.

Ground investigation was undertaken on site in 2008 and 2014 for the proposed trunk sewer, access road and ornamental lake. Boreholes (BHs) BH2, BH 3 and Trial Pit (TP) TP1 shown in the site plan in **Appendix G** show that groundwater was either not encountered or was an artesian groundwater level at depth between 8.9, and 11.7m within the Forest Marble Formation. This formation is considered a confined aquifer with low permeability.

The Eastern part of the site is underlain immediately by the Kellaways Formation which is classified as an Unproductive Aquifer with the Forest Marble Formation at depth. Boreholes and Trial Pits (BH 4 and 5, TPs 2, 3, 6 and 7) showed groundwater levels were within the superficial deposits between 0.6m and 1.4m. Given the low permeability of the Kellaways Formation geology, it is considered that there is a low risk of groundwater flooding for the Eastern part of the site.

4.4.2 Proposed Development

The Proposed Development does not include development below ground level that could be affected by high ground water levels such as basement car parking. Although the risk of groundwater flooding to the Proposed Development is considered low, further ground investigation during detailed design will be undertaken and consideration through the design of foundations to minimise the impact of groundwater.

To minimise any risk from groundwater flooding during excavation of the new development, cut levels will be limited to at least 0.5m above groundwater level. Where this is not possible, dewatering and other groundwater control measures will be required. Any such groundwater control measures will also require pollution control measures in accordance with EA guidance.

4.5 Flooding from Artificial Sources

The Environment Agency map shows that there are no reservoirs located within the vicinity of the site and that the site does not lie within a breach flood flow path of a reservoir. The Preliminary Flood Risk Assessment Map 4 shows that there are no canals within the vicinity of the site and therefore the site is not at risk of canal flooding.

There is a pond to the north of the site as part of the Tesco foodstore development. This is an ornamental pond which forms part of the landscaping works and has an overflow into the drainage network. The pond is lower than the surrounding ground levels so the risk to the site resulting from breach of the pond is considered to be low.

There is also a small pond along the south east boundary of the site which forms part of the surface water drainage strategy for the garden centre. The Level 2 SFRA advises that *'LiDAR has shown that it lies at a lower elevation to the site and therefore is not considered to pose a risk of flooding from breach'*[12].

The site is therefore at low risk of flooding from artificial sources.

4.6 Other considerations

4.6.1 Safe access and egress

A safe access and egress route for the site for vehicles and pedestrians will be via Lakeview Drive which is within Flood Zone 1 to the A41 Oxford Road to the west of the site. A safe access and egress route will need to be provided at a minimum of 1 in 100 year + 35% climate change flood level from each of the office buildings.

[12] Cherwell District Council. Cherwell District Council Level 2 SFRA (March 2012)

4.6.2 Residual Risk

There is a residual flood risk to the site as there are areas which flood in a 1in 20 year event. A sequential approach should be taken to locating development on site to areas of lower risk of flooding. Office buildings are to be located outside the 1 in 100 year +35% climate change flood extent. The finished floor levels for the buildings will be set at or above the 1 in 100 year + 35% climate change plus 300mm, which is above the flood level in the 1 in 1000 year event. However, there is a residual risk of flooding for 1 in 1000 year to the external areas of the site, potentially impacting the access to the buildings.

During detailed design, office car parking will need to be located on the site and this may need to be located in areas of the site at greater annual probability of flooding.

A flood evacuation and management plan will be required during detailed design to manage the residual risk of flooding on the site posed to both people and vehicles. The plan will consider:

- Signing up to the EA's flood warning service to provide early warning of a flood event on site;
- Closing of parts of the site predicted to be affected by flooding to prevent people entering the floodwater;
- Moving cars within car parking areas predicted to be affected by flooding to other areas on site or offsite;
- Methodology to establish how the flood levels are monitored and what/ when actions are taken on site.

5 Summary and Conclusions

BHE has prepared this FRA on behalf of Scenic Land Developments Limited to support the Outline Planning Application for the Bicester Office Park site. This FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and demonstrates that with the proposed mitigation measures, the Proposed Development is considered safe up to the 1 in 100 flood event with allowance for climate change and does not increase flood risk elsewhere for the lifetime of the Proposed Development. A summary of the key findings of the Flood Risk Assessment are provided in **Table 5-1**.

Table 5-1 Summary of the key findings

Subject	Element	Findings
Site Flood Risk	Fluvial	The majority of the site lies in Flood Zone 1. However, along the south eastern boundary, the site lies within 2, 3a and 3b. Areas along south eastern boundary are defined as 'Very low hazard', 'Danger for some' and small localised spots where it is classified as 'Danger for most'.
	Ground Water	Low risk of flooding. Further ground investigation recommended.
	Surface Water	The majority of the site is at very low risk of surface water flooding. There are areas of low to high risk of flooding associated with the drainage ditch crossing the site and low lying areas. Areas which pose a 'Danger for most' are associated with the drainage ditch. 'Very Low Hazard' and 'Danger for some' areas occur along south eastern and northern boundary.
	Sewers and Artificial Sources	Low risk of flooding
Planning Requirements	Vulnerability Classification	Office buildings are classified as 'less vulnerable', appropriate for Flood Zone 1, 2 and 3a. Car parking located in Flood Zone 3b is considered appropriate by the EA provided no ground raising.
	Sequential Test and Exception Test	As the site is allocated within the Adopted LDP, the Sequential Test is considered to have passed. An Exception Test is not required for the site.
	Sequential Approach	The Sequential Approach has been applied by locating buildings outside the 1 in 100 + 35% climate change flood extent. During detailed design, apply Sequential Approach to locate office parking to areas of lower risk of flooding.
Mitigation measures	Design Flood Event	1 in 100 year +25% climate event.
	Climate change	25% to 35% allowance
	Finished Floor Levels	Finished Floor Levels are proposed to be set at a minimum of the 1 in 100 year + 35% climate change plus 300mm freeboard.
	Safe access and egress	Safe access and egress to be provided from all buildings via Lakeview Drive at or above the 1in 100 year +35% climate change level.
	Floodplain compensation	No ground level raising within the Functional Floodplain. Ground raising permitted between the 1 in 20 year flood extent and the 1 in 100 year + 25% climate change flood extent if flood compensation provided on a level for level and volume for volume basis on site.
	Construction Phase	Contractor will need to sign up to EA's flood warning service and to locate stockpiles outside the 1 in 1000 year flood extent.
	Surface water drainage strategy	Primary infrastructure constructed on the site, sized for the Proposed Development. Discharge rates limited to greenfield rates. SuDS techniques to be implemented. Exceedance routes will need to be considered to route flood water away from the threshold of buildings.
	Residual Risk	A flood evacuation and management plan should be considered during detailed design to manage the residual risk of surface water and fluvial flooding on the site posed to both people and vehicles.

Appendix A Topographic and LiDAR survey