

# Future Defence Storage and Redistribution Programme, Redevelopment of MOD Bicester

Environmental Statement Volume 2: Main Report BIC/OPA/DOC/09 September 2011



#### Report for

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Future Defence Storage and Distribution Programme -**Redevelopment of** MOD Bicester

AMEC Environment & Infrastructure

Environmental Statement: Volume 2: Main Report (BIC/OPA/DOC/09)

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This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

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## **Non-technical Summary**

## What is proposed and what is the purpose of the Environmental Statement?

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The Defence Infrastructure Organisation<sup>1</sup> is applying for outline planning consent for the development of land at two sites to the south-east of Bicester in Oxfordshire. The two sites are Graven Hill, which is 0.9 miles (1.5 kilometres (km)) south-east of Bicester and C Site which is in the village of Upper Arncott, 3.6 miles (6km) south-east of Bicester (see Figure NTS 1). A Site is also shown on Figure NTS 1 and although the Defence Infrastructure Organisation is also proposing to dispose of A Site, this does not form part of this planning application.

The planning application for this proposed development is accompanied by an Environmental Statement, as required under The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (SI 1824) (the 'EIA Regulations'). The preparation of this Environmental Statement, which has been undertaken by AMEC Environment and Infrastructure UK Ltd<sup>2</sup>, forms part of the Environmental Impact Assessment (EIA) for the proposed development.

This report is the non-technical summary of the Environmental Statement. It summarises the content and conclusions of the Environmental Statement (see Volume 2 Main Report BIC/OPA/DOC/09 and Volume 3 Appendices BIC/OPA/DOC/10), to which readers should refer for further information. The following sections of the non-technical summary describe:

- the reasons why the proposed development is required;
- what is at the Sites where development is proposed at present;
- what the proposed development comprises;
- the EIA process;
- the likely significant effects of the proposed development; and
- the next steps and where the Environmental Statement can be viewed.







<sup>&</sup>lt;sup>1</sup> The Defence Infrastructure Organisation was formed on 1 April 2011 when the former Defence Estates was brought together with other property and infrastructure functions in the MOD to form a single organisation.

<sup>&</sup>lt;sup>2</sup> Following its acquisition by AMEC, Entec UK Ltd was integrated into AMEC Environment and Infrastructure in July 2011, all references to work previously completed by Entec are now to AMEC E&I.

#### Why is the proposed development required?

Graven Hill and C Site have been in use by the military since the establishment of the Central Ordnance Depot in 1941 in order to help supply the rapidly growing needs of the expanding World War Two (WWII) Army and many of the current buildings were built at that time.

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At the present time, the Logistics and Commodity Services operation provides logistics services for the Armed Forces. The majority of this service is provided from two sites: Bicester and Donnington in Telford. At MOD Bicester the logistics operation is located on more than one site - D and E Sites, which are part of Graven Hill and C Site in Arncott.

In 2009 a programme was undertaken to identify ways in which the logistics service could operate in a more efficient way and provide cost reductions. This identified that there was a need, amongst other requirements, to reduce the amount of stock stored, modernise the way in which goods were packaged and delivered and reduce the physical distances between the different tasks needed to process orders which will therefore help improve productivity. As a result it was decided to move the logistics service to one site. After a review of different options the MOD decided to move this service from Donnington and Graven Hill so that the whole service is located at C Site. Therefore the MOD no longer needs Graven Hill and has decided to dispose of this site (i.e. to sell it) along with the woodland (Graven Hill Wood). The MOD is seeking outline planning permission to redevelop this site prior to its sale. St David's Barracks, which is also located at Graven Hill, will remain in place and continue to operate as it currently does. The sale of the Graven Hill Site could potentially fund the proposed development at C Site.

### What is at the Sites and in the surrounding area at the moment?

#### Graven Hill

Approximately two-thirds of Graven Hill is 'brown field' land. This is land that has previously been developed. The Site mostly consists of warehouse buildings with some office space which are used by the MOD to store, process and distribute stock. Associated with these buildings are areas of hardstanding which are used for storage and car parking. There is also an external storage area know as Bicester International Freight Terminal where freight containers are stored and stacked. Approximately a third of the Site is greenfield land (i.e. land which has not been previously developed) and much of this comprises woodland most of which is located on Graven Hill and is known as Graven Hill Wood. This woodland is used for some military training such as cross country running, and some of the fields in the Site are currently leased to a local farmer for grazing.

St David's Barracks is also located within the Site (although this is outside the red line boundary so does not form part of the planning application) and will remain in place.

The Site is bordered by the A41 to the north, farmland to the east and north, the Oxford to Bicester railway line to the north-west and the MOD railway line to the south. Beyond the boundaries of the Site there is farmland to north-east, east, south and west which also includes some scattered residential properties. Bicester Sewage Treatment Works is approximately 100m to the north-west of the Site boundary. Bicester town centre is approximately 1.5km north of the Site with the closest residential suburb of Bicester (Langford Village)

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approximately 100m north of the Site. The village of Ambrosden is 600m south-east of the Site.

The current layout of Graven Hill is shown in more detail in Figure NTS 2.

#### C Site

C Site is currently used by the MOD for storage, office and logistics uses. The Site largely comprises warehouses with some office buildings and areas of hardstanding for parking and storage, open spaces and small areas of planting, woodland and scrub. There is rail access through the Site from Graven Hill (to the north-west) linking through C Site and providing rail access onto other MOD Bicester Sites although rail access is not currently used beyond C Site (into A, B, G and H sites). A small number of buildings on C Site are occupied by third party tenants, some of which activity is defence-related, some of which is not.

C Site is bordered by agricultural land to the west and south and by residential properties and the village of Arncott to the east. Further to the east and south-east of the Site are other MOD sites (A, B, G and H sites), St George's Barracks and MOD training areas.

The current layout of C Site is shown in more detail in Figure NTS 3.

#### What does the proposed development comprise?

The proposed development at each of the Sites is illustrated on Figures NTS 4 to

NTS 7 and comprises the following.

At Graven Hill:

- Proposed demolition of all MOD buildings on Graven Hill (E and D Site).
- Construction of 1,900 homes, up to 30% of which will be affordable housing.
- A local centre in the northern part of the Site which will include a two form entry primary school with a multi-use games area and car parking, a community hall (located next to the primary school), five local shops or units which could be used for other local services, a grocery store, a building which could be used as a hotel, pub or restaurant, offices and an energy centre to provide energy to the local centre. The site that the school is built on is large enough to extend the school to a three form entry school in the future.
- Commercial buildings in the southern part of the Site which can be used for light industrial uses, research and development uses and warehousing.
- A space in the southern part of the Site which will be reserved as a potential energy centre location.
- Public open spaces including children's play areas and sports pitches.
- Graven Hill Woodland Park.
- Two sites to be used as allotments.
- Improvements to two junctions providing access into the Site from the A41.

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- Retention of the MOD rail link from the Oxford-Bicester railway line, through Graven Hill and into C Site. Rail access will also be provided to the warehouses in the southern part of the proposed Graven Hill development.
- New footpaths and cycleways.
- New services such as a drainage system.
- Landscaping, planting and ecological enhancement measures.

#### At C Site:

- Demolition of all MOD buildings and features in the northern area of C Site and the removal of rail infrastructure and trees in the vicinity of the demolished buildings.
- Construction of a warehouse, known as the Fulfilment Centre. This will be up to 18.6m in height with 320m x 220m internal floor space. On the outside there will be 36 loading/unloading doors to provide access to the west side of the building where Heavy Goods Vehicles (lorries) will load and unload and an unloading yard to the west of building. There will be a canopy along the west side of the building to provide cover over the loading/unloading doors. There will also be some office accommodation attached to the main building on the south-western corner. There will be a car park for up to 350 cars to the south of the building and an access road to reach this car park along the eastern side of the building (Heavy Goods Vehicles will not be allowed to use this road to avoid disturbance to residents living close to the boundary of the Site).
- A container storage area will be provided to the north of the Fulfilment Centre and additional storage areas adjacent to this.
- A new freight terminal will be constructed between the southern end of the Fulfilment Centre and the railway line along the western boundary of the Site. This will replace the current freight terminal at E Site and will be used to move goods from rail to road and into storage and vice-versa.
- A new internal road layout will be constructed and the Site entrance will be realigned so that the Site gate is further back from the road than at present, to avoid lorries queuing onto the main road.
- An earth bund will be provided between the eastern side of the Fulfilment Centre and the eastern boundary of the Site and this will be planted with shrubs and trees to screen views of the Fulfilment Centre from Norris Road and Green Lane. The bund will also provide incidental benefits of noise attenuation. Additional vegetation will also be planted along the northern boundary to improve the existing vegetation which screens the Site from properties along Ploughley Road.

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• A new drainage system will also be provided.

Should the Defence Infrastructure Organisation be successful in gaining planning permission, the MOD would firstly work with contractors to construct the proposed Fulfilment Centre and external storage areas and road layout at C Site. This is estimated to take about two years to construct and would be finished by December 2014. The MOD would then move out from

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Graven Hill and into the new development at C Site so that Graven Hill could then undergo redevelopment. At Graven Hill, the Defence Infrastructure Organisation would work with individual developers who would then be responsible for obtaining detailed planning permission, building the proposed development and selling on the properties once built. It is expected that the proposed development at Graven Hill would be constructed over a period of about 13 years and would be completed by the end of 2028. This would be completed in phases and the assessment assumes that about 150 houses would be built each year.

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#### What does the Environmental Impact Assessment Process involve?

At an early stage in preparing its proposals for the proposed development, the Defence Infrastructure Organisation recognised that, given the scale of development proposed and the sensitivity of the surrounding environment, the development required Environmental Impact Assessment under the EIA Regulations. In view of this, the Defence Infrastructure Organisation decided to prepare an Environmental Statement to accompany the planning application for the Site.

A Scoping Report was prepared by the Defence Infrastructure Organisation in March 2011, which outlined the work that it was considered at that time was needed to assess the potentially significant effects of the proposed development. This report was issued to consultees for their comments.

The scope of the assessment was refined in response to comments received on the Scoping Report and also in response to comments received through subsequent consultation, environmental information obtained from further survey and assessment work, and changes that were proposed to the proposed development design. In addition, A Site was removed from the planning application for redevelopment because it is likely that the time frame over which redevelopment at A Site is likely to take place would be longer than the standard three year consent period sought in this application. The design process involved the consultant team working closely with the Defence Infrastructure Organisation and key stakeholders to identify how the proposed development proposals could be refined to mitigate negative environmental effects and deliver environmental enhancement.

The Environmental Statement includes an impartial assessment of the predicted environmental effects of the proposed development. To meet the requirements of the EIA Regulations, the assessment focuses on those effects that are potentially significant (both positive and negative), with a comparison being made between the likely environmental conditions in the presence of the proposed development and in its absence (i.e. the baseline situation).

As the various elements of the proposed development will be built over a period of 15 years (two years for C Site and then 13 years for Graven Hill) and then operated indefinitely, it cannot be assumed that the baseline conditions in the absence of the proposed development will be the same as at present. This reflects changes resulting from human influences, such as new development, or natural processes which have the potential to modify current environmental conditions. Therefore, where baseline conditions are likely to change over these 15 years (e.g. as with traffic flows), the assessment has predicted these future baseline conditions and the effects of the proposed development have been assessed against these. Where baseline conditions are unlikely to change, the effects of the proposed development are assessed against the existing baseline.

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Cumulative effects from the proposed development in-combination with other proposed development in the area surrounding the Sites have also been taken into account in the assessment. The assessment has, where appropriate, taken into account the effects from the Chiltern Railways Evergreen 3 project, Phase 1 Exemplar of the North West Bicester Eco-town, Kingsmere development and proposed business park to the south and east of the A41. In addition, although a planning application has not yet been submitted for the remainder of the North West Bicester Eco-town, the traffic modelling has also taken into account traffic that this development could generate.

Reaching a conclusion about which effects, if any, are likely to be significant is the result of an iterative process that involves the following stages:

- 1. identifying those effects that may be significant;
- 2. assessing environmental changes and any consequent effects on people, animal/ plant species or other 'receptors' (for example archaeological remains); and
- 3. determining whether or not these effects are likely to be significant.

The findings of the assessment will assist Cherwell District Council, those that it consults and other stakeholders in coming to a view about whether or not and, if appropriate, how the proposed development should proceed. This decision-making is also part of the EIA process.

What are the likely predicted significant effects of the proposed development?

The Environmental Statement has assessed the potentially significant effects, whether positive or negative, on population (including visual effects and effects on the local community, including from traffic), flora and fauna, soil, water, air, climatic factors, material assets (such as archaeology or listed buildings - the 'historic environment'), landscape and the interrelationship between all of these factors. The results of the assessment are summarised below.

#### **Traffic and Transport**

Both sites are currently operated by the MOD and the effects of the proposed developments have been assessed by considering the likely change in traffic flows that will occur.

The proposed development incorporates measures to improve both road access into the Sites and road capacity, and will also avoid queuing occurring at key road junctions as a result of traffic from the proposed development. Existing bus services will also be amended to serve Graven Hill.

With these measures in place pedestrians will be unlikely to experience significant effects caused by traffic associated with the operational development at either site, whether in the form of severance (the perceived division that could occur within a community when it becomes separated by a major road), delay (the time taken to cross roads), fear and intimidation associated with traffic or accidents. Although the proposed development will result in changes in traffic flows on local roads, these will not cause significant delays to road users.

Construction activity at the two sites will not happen at the same time. C Site will be completed first (over two years) so that the Graven Hill activities could move across. This and the proposed phasing of the Graven Hill development means the volume of construction traffic will be much less than that from operational traffic and will not result in any significant effects on road users and pedestrians.

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#### Air quality

The assessment of the effects of the proposed development on air quality has considered whether the development will have a significant effect on the air quality of existing residents in the area around each development site and of future residents of Graven Hill. Pollutants associated with the construction and operation of the development, in terms of construction dust, emissions of pollutants associated with construction traffic, and emissions of pollutants associated with operational traffic have been assessed.

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Effects from dust during construction and construction traffic have not been assessed in detail in terms of air quality, as appropriate mitigation (in the form of recognised good practices) will be used to ensure dust effects are minimised, and construction traffic will not be of significant numbers as to affect the future air quality in the area.

The effects on air quality from operational traffic in the areas surrounding the development will not be significant even with the whole development in place. This is because the development will not result in any exceedences of the air quality objectives (the standards set by the Government in relation to air quality pollution) and no effects on human health will occur.

#### Noise and vibration

Construction work at each site could lead to noise being generated which will be audible at existing residential properties in the vicinity of each site (due to the operation of fixed and mobile plant). The residential development at Graven Hill, proposed changes to the operation of C Site and the use of the freight rail line running between the two sites could potentially affect noise levels experienced by people living in close proximity to roads and railway lines in the area, as a result of changes in road and rail traffic patterns and changes in the operations at C Site. Finally, noise generated by existing local road and rail sources has the potential to affect the suitability of the Graven Hill Site for its proposed residential, commercial and educational uses. All of these effects have been assessed.

During construction, contractors will be required to work to set limits which will help to control excessive noise levels. Several other measures will also be put in place which will minimise the potential for disturbance by construction activities (e.g. construction work will be limited to standard daytime working hours). With these measures in place it is unlikely that noise from construction activities will have a significant effect on local people.

Noise from road traffic created by the development is in the main unlikely to have a significant effect on local people living close to roads near to both sites and the wider area. An increase of 3 decibels (the unit which noise levels are measured in) is needed to create a widely perceptible increase in road traffic noise and a change less than this is less perceptible to human hearing. For the majority of roads in the area, daytime and night-time road traffic noise levels will not increase by more than 3 decibels.

C Site will operate 24 hours per day Monday to Friday and due to MOD operational requirements a three shift pattern will be used. As a result of the morning shift changeover, significant short-term increases in road traffic noise during the period 05:00-06:00hrs are likely for residents on Ploughley Road (up to Ambrosden) and Palmer Avenue due to cars arriving at the Site. This will not be the case at the weekends when a skeleton staff will be required.

Noise from freight rail traffic utilising the line between Graven Hill and C Site will not increase ambient noise levels by more than 3 decibels over the daytime period, and hence will not have a significant effect on local people living close to the railway line.

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Noise from on-site activities at the new C Site Fulfilment Centre (e.g. loading and unloading of freight rail, lorry movements, etc.) will not increase ambient noise levels significantly above the existing background noise level, and hence will not have a significant effect on residents living in close proximity to the Site.

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Noise modelling has shown that the Graven Hill Site is suitable for housing and that people living in the new properties and attending/working in the school are unlikely to be affected by excessive noise. Further work will be undertaken as part of the detailed design of the development at the Reserved Matters Stage in relation to the design of the building facades (e.g. glazing/ventilation elements) to achieve minimum standards of noise reduction. This will ensure suitable internal conditions for residential/educational uses. Furthermore, outdoor living areas and teaching spaces will be positioned where possible to minimise the effects of road and rail traffic noise in these areas.

#### **Community and socio-economics**

The assessment has concluded that the proposed development will have significant positive effects for the economy and existing community in the local area as well as the new residents of the proposed development at Graven Hill. For existing and new residents within the ward or surrounding local area these result from the provision of open space (for recreation), affordable homes and labour supply at Graven Hill and jobs at both sites during both construction and operation. The increase in the number of jobs both during construction and operation as well as increased labour supply will also have significant positive effects for the local economy. Whilst these effects are likely to be significant for the local area (i.e. the local wards within which each site is located) they will be positive but not significant across the district (i.e. for everyone living within the Cherwell District Council area).

Graven Hill will include a number of community facilities including a primary school, sports pitches, open spaces for recreation, allotments, community hall, local shops, a grocery store and a building that could be used as a pub, restaurant or hotel. Providing these facilities will ensure that the new residents of the development have access to local services without constraining existing services in the surrounding area and therefore affecting access to services for the existing local community.

The assessment has identified that the increase in the local population which will result from Graven Hill could put a strain on local pre-school education. However, as the development could accommodate a nursery school in the proposed community hall, these effects are unlikely to be significant.

#### **Historic environment**

Graven Hill and C Site have been in use by the military since the establishment of the Central Ordnance Depot in 1941. On-site accommodation was provided within the depot in the form of Nissen huts organised into self-contained camps, and groups of Romney huts were added in order to supply the build-up of American forces during the war. The Site has continued to operate as a depot in the post-war period, though temporary hutted accommodation camps were gradually removed along with most of the Romney huts. None of the buildings within either site are listed.

The development of the Sites will involve the demolition of the military buildings within Graven Hill as well as in the northern part of C Site which will be developed. As the WWII buildings are of some historic interest a programme of recording will be undertaken in advance

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of their loss. A group of Romney huts within C Site will be retained. With these measures in place the loss of military buildings on each site is unlikely to be significant.

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Whilst much of the Graven Hill Site has been disturbed by the twentieth century military use, archaeological surveys have identified a number of areas of potential archaeological interest. These include the course of a former road, as well as evidence for sub-surface archaeological features. Provision will be made for the detailed excavation and recording of any such areas in advance of any demolition and construction work. It is not expected that similar sub-surface archaeology is likely to be present at C Site due to the building and disturbance that has already taken place. No significant effects on archaeology are likely to occur.

Off-site, there are two scheduled monuments (nationally important historic environment features) near to Graven Hill, with the nearest being Alchester Roman town. These monuments will not be disturbed as a result of the proposed development, and their setting will not be harmed. Several listed buildings are also located within the area around Graven Hill, and the proposed screening planned around the Site boundary will ensure that their settings will be protected. Similarly, there are a number of listed buildings near to C Site and the planned screening bund and boundary planting will ensure that the setting of these will be preserved or enhanced. Therefore, it is unlikely that there will be any significant effects on protected historic environment features in the area around each site.

#### Landscape and visual effects

#### Graven Hill - landscape effects

The Graven Hill Site lies within an area described in Cherwell District Council's Landscape Assessment as having lost its rural character and having become visually degraded. The Landscape Assessment suggests a strategy of 'restoration'. The change to the character of the landscape that will occur due to removal of the existing military buildings and structures and their replacement with new 'mixed use' development, with a new open space and landscape planting strategy to provide the setting has been assessed. During the construction phase of the development at Graven Hill the proposed development is likely to have a significant negative effects on landscape character, elements and patterns as a result of the presence of temporary features during construction and an increase in movement associated with construction activities. However, once the 13 year construction period is complete effects on the character of the landscape will, in the long-term, be positive and significant. The proposed development design restricts new development on the hillside of Graven Hill, retaining the wooded brow and adjacent open fields that characterise this landscape feature. The design also incorporates new planting proposals.

#### Graven Hill - visual effects

The changes in people's views that will occur as a result of the proposed development and the effect that these will have on visual amenity have been assessed. The Environmental Statement includes photomontages to illustrate these changes from key viewpoints. Views at different distances and locations have been assessed, in particular those experienced from residential properties, local footpaths and bridleways. Retained and planted trees and vegetation within the Site as well as vegetation in the area surrounding the Site will restrict views of the proposed development.

Views from Langford Park Farm, the isolated farms to the south-east of Langford Village, Wretchwick Farm and adjacent properties, properties in the western part of Ambrosden,





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properties on Langford Lane, isolated residential properties near Blackthorn Hill and from the public footpaths near Middle Wretchwick Farm are likely to experience significant negative effects at differing times during construction as the phased construction works take place. No one property is likely to experience effects for more than five years. It is anticipated however, that early perimeter earthworks and planting will help screen evidence of construction activity in later phases.

In the longer term, once construction is complete and new planting has matured (likely to take 10 to 15 years) there will be no significant negative effects on views. Properties on Langford Lane, in the western part of Ambrosden, Wretchwick Farm and adjacent properties and on Langford Lane adjacent to the stables are likely to experience significant positive visual effects as present views from the properties are of large-scale industrial warehouses and these will be replaced with smaller scale residential development set within maturing landscape planting.

#### C Site - landscape effects

C Site, situated at the base of Arncott Hill, lies within a similar area of landscape character to that at Graven Hill and is similarly described in Cherwell District Council's Landscape Assessment as requiring a strategy of 'restoration'. The military development is clearly evident in the locality and detracts from the setting of Arncott Village, although in terms of the wider area's landscape character, the proposed demolition of buildings in the north of the Site and their replacement with a new single building will not have a significant effect on landscape character.

#### C Site - visual effects

Views from a number of properties in Arncott (including those on Green Lane, Norris Road, Murcott Road, Hopcroft Close, Teal Close and Ploughley Road) as well as views from publicly accessible areas (such as the village green, the open space around the village hall and the public rights of way south of Brook Farm and leading to Merton Road) will experience significant negative effects during construction of the proposed development due to the changes in these views. Effects from construction will last for approximately two years although the earth bund and planting along the eastern side of the building will be implemented in the early phases of construction.

In the longer term, once the proposed development is complete, the earth bund along the eastern side of the building has been constructed and the planting within the Site has matured (likely to take approximately 10 to 15 years), a positive change is predicted. This is because the current views into the Site will be replaced by a backdrop of native trees and woodland understory planted on the perimeter screen bunding. These changes will be positive and significant for properties along Green Lane, Norris Road, Hopcroft Close and Teal Close. There will also be improved views to the C Site main gate area following the realignment of the security wire and landscape planting to adjacent open spaces.

#### **Biodiversity**

#### Graven Hill

A desk study and surveys undertaken in 2010 and 2011 identified the following sites, habitats and species of nature conservation importance within Graven Hill or close enough to it that they could be significantly affected by the proposed development. Statutory and non-statutory sites are: Arncott Bridge Meadows Site of Special Scientific Interest (SSSI) (a nationally important

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designation); Wendlebury Meads and Mansmoor Closes SSSI; Stratton Audley Quarries (SSSI); Otmoor (SSSI) and Bure Park Local Nature Reserve (LNR); Graven Hill Wood County Wildlife Site (CWS) (a county important conservation designation); Bicester Wetland Reserve (CWS); and Meadows north-west of Blackthorn Hill (CWS). Valued habitats located on-site or within the development's potential zone of influence include: ancient woodland, wet woodland, broad-leaved woodland, ponds and hedgerows. Legally protected and priority species that have been recorded on-site are: badger; Daubenton's bat; Leister's bat; Myotis sp. bat, long-eared bat; serotine; common pipistrelle; soprano pipistrelle and noctule bat (with the latter three species also roosting on-site); polecat; dormouse; great crested newt; common lizard; grass snake; breeding birds; and 21 priority and/or notable species of invertebrate and common spotted orchids have also been recorded on-site.

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Environmental measures incorporated within the proposed development design include the creation of a mosaic of habitats including waterbodies, scrub and a wildflower meadow (which will include the translocated common spotted orchids), the planting of 1.4km of species-rich hedgerow, the creation of 1.9ha of broad-leaved woodland (within 8.2ha of more general broad-leaved planting on-site), the provision of two artificial badger setts, the provision of alternative roosting space through the inclusion of bat tiles/bricks within the new commercial developments and 30 bat boxes, the provision of 50 dormouse boxes within Graven Hill Wood and the creation of green corridors linking Graven Hill Wood to the wider countryside. A habitat creation plan detailing the environmental measures to be incorporated within the development design will be written by a suitably qualified ecologist. This will provide a detailed specification of the habitats to be created, together with a programme of works.

Dust, light, noise and pollution abatement strategies will also be included within the proposed development design and the construction environmental management plan. Where appropriate, the necessary applications to Natural England for development licences in respect of legally protected species will be made.

Parts of Graven Hill Wood County Wildlife Site will be opened up to the public for access and recreation although access will be restricted to the northern area of woodland and surrounding habitats to minimise effects on species present within the woodland. This, along with the future management of retained, enhanced and newly created areas of habitat, will be detailed in an integrated recreation and habitat management plan.

As a result of the environmental measures to be included within the proposed development design, it is concluded that the proposed development will not have any significant effects on the ecological receptors that the Site supports. The creation of areas of woodland, waterbodies, mosaics of habitats and green corridors on-site will results in 'gains' to the biodiversity on-site and the legally protected/notable species that these areas of habitat support.

#### C Site

A desk study and surveys undertaken in 2010 and 2011 identified the following sites, habitats and species of nature conservation importance occurring within C Site or close enough to it that they could be significantly affected by the proposed development. Statutory and non-statutory sites are: Muswell Hill (SSSI); Whitecross Green & Oriel Woods (SSSI); Arncott Bridge Meadows (SSSI); Murcott Meadows (SSSI); Otmoor (SSSI); Wendlebury Meads and Mansmoor Closes (SSSI); Long Herdon Meadow (SSSI); Shabbington Woods Complex (SSSI); Meadows south of River Ray (CWS); Arncott Wood (CWS); and Bicester Garrison Site Local Wildlife Site (LWS). Legally protected and notable/priority species that have been recorded on-

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site are badger, roosting bats (common pipistrelle) as well as foraging bats Leisler's, Myotis sp., long-eared and serotine bats, dormice, great crested newts, breeding birds and five notable species of invertebrates.

xii

Environmental measures incorporated within the proposed development design include the creation of a mosaic of habitats including waterbodies, scrub and a wildflower meadow, 8.6ha of broad-leaved planting, the provision bat tiles/bricks (to facilitate access to roof spaces within new commercial buildings) and 20 bat boxes and the provision of arboreal links to join areas of isolated dormouse habitat. A habitat creation plan detailing the environmental measures to be incorporated within the development design will be written by a suitably qualified ecologist. This will provide a detailed specification of the habitats to be created, together with a programme of works. The long term management of the existing and newly created habitats will be detailed in a in a habitat management plan.

Dust, light, noise and pollution abatement strategies will also be included within the proposed development design and the construction environmental management plan. Where appropriate, the necessary applications to Natural England for development licences in respect of legally protected species will be made.

Through the adoption of theses measures it is concluded that the proposed development will not have a significant effect on the ecological receptors that the Site supports. The creation of areas of woodland and a mosaic of habitats within existing areas of amenity grassland represent 'gains' to biodiversity. Furthermore, it is proposed that a central area of woodl scrub in which a dormouse nest was found, is reconnected to the surrounding plantation woodland via a mixture of additional planting and through the installation of arboreal ropes, linking the canopies. These measures are likely to safeguard the future of the existing but vulnerable population of dormouse on-site, and as such positive effects on the local conservation status of this species are likely.

#### Water resources

There are ditches running throughout the Graven Hill Site and C Site, which drain into adjacent watercourses - the Langford Brook and other tributaries of the River Ray in the case of Graven Hill, and directly to the River Ray in the case of C Site. During construction measures will be implemented by the contractor to limit the likelihood of polluted run-off reaching local watercourses, for example by containing chemicals in a bunded area which will prevent any spillages escaping into local watercourses. The proposed development design includes a Sustainable Drainage System. This will include features which will also help to minimise effects on water quality from surface water run-off from the proposed development. For example, permeable paving and attenuation ponds on both Sites will allow sediments to settle before run-off reaches watercourses. As a consequence of these measures, significant effects on water quality from redevelopment at either Site are unlikely.

The Graven Hill Site is at present a mixture of brownfield and greenfield land whilst

C Site is largely brownfield land. The proposed development will result in more intensive development and the area of impermeable surfaces (such as buildings, roads and pavements) will increase thereby increasing the amount of water that runs-off these areas. To avoid this resulting in any increase in flooding, both on and off the Sites, computer modelling work has been used to determine the amount of water running off the Sites for different amounts of flooding once each Site has been developed and then identify the amount of storage required to store run-off from the Site so that the amount water draining from the Site is below existing

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levels. The design of the development has incorporated several measures at both Sites which will store and slowly release water back to local watercourses, mimicking the natural greenfield run-off patterns. Other measures such as permeable surfaces are included in the design to allow water to infiltrate into the ground and slow down the rate at which it reaches local watercourses.

xiii

Finally, as various larger watercourses and their floodplains are located next to the Sites, there is a risk that the new properties within the development could be at risk of flooding. To minimise this risk, built development will be located in those areas of each Site at least risk of flooding. In addition, at Graven Hill floor levels of buildings will be raised slightly as a precautionary measure to also minimise flooding risk.

#### Land quality

The construction works have been designed to ensure that soils are removed, stored and protected so that the risk of contamination from construction activities is minimised, and the physical characteristics of the soils, such as drainage properties, are maintained. The studies have shown that where contamination is likely to be present at the Sites it is localised and present in 'hotspots' on each Site (for example hydrocarbons around fuel tanks) and does not present risks across each site as a whole. Prior to construction work taking place additional investigation of these hotspots will be undertaken. This contamination will be treated to ensure that the affected land is suitable for its end use. As a result of the various measures that have been adopted, there are not likely to be any significant effects in relation to land quality.

#### Conclusions

The assessment has shown that the following significant positive effects are likely.

- Effects on existing and new residents within the ward or surrounding local area as a result of the provision of open space (for recreation). Graven Hill will provide 65.7ha of public open space which is nearly four times that required by planning policy and more than five times the current provision within Cherwell (hectares per 1,000 population).
- Effects on existing and new residents within the ward or surrounding local area as a result of the provision of affordable homes. Graven Hill will comprise up to 30% affordable housing giving a total of 570 affordable homes.
- Effects on existing and new residents within the ward or surrounding local area and the local economy due to an increase in the available number of jobs during construction and operation of both sites as well as increased labour supply from the presence of new residents at Graven Hill. During construction the proposed development will create approximately 28 full time jobs per year at Graven Hill and 143 full time jobs per year at C Site. Graven Hill is predicted to directly generate 2,070 jobs within the Ambrosden and Chesterton ward. If some home working is assumed to occur amongst the development's residents, this could increase the figure to a total of 2,221 direct jobs. 'Multiplier' effects are also likely to indirectly create further jobs. In addition, 200 jobs will be created at C Site. At Graven Hill it is predicted that there will be some 3,340 people of working age (16-64) which will translate into a labour supply of some 2,892 people.





Effects on people's views from local properties and Public Rights of Way within and close to both Sites will occur once planting that will take place at both sites has matured. This will screen views of both sites in the long term and improve views from those currently experienced in the local area.

xiv

The assessment has shown that the following significant negative effects are likely.

- Potential short-term noise effects on residents on Ploughley Road (up to Ambrosden) and Palmer Avenue during the period 05:00-06:00hrs. This is due to traffic associated with travelling to C Site for the morning shift changeover and is predicted to result in an audible increase in road traffic noise.
- Potential effects on landscape character, patterns and elements during the 13 year construction period at Graven Hill. The presence of temporary features and construction activities over the duration of the construction period will have a significant negative effect on the landscape.
- Potential effects on people's views from local properties and Public Rights of Way within and close to both sites during construction and the initial phases of the development once complete, prior to new landscape planting maturing.

#### What happens next?

Prior to determining the planning application, the Council will seek advice from the Environment Agency, Natural England and other organisations. Members of the public will also be able to comment on the planning application. The normal period for determining a planning application such as this is 16 weeks.

#### Where can more information be found?

The Environmental Statement can be viewed at the Cherwell District Council's offices:

**Bodicote House Bodicote** Banbury **OX15 4AA** 

Tel: 01295 227006

Email: planning@cherwell-dc.gov.uk

Website: www.cherwell.gov.uk

Further information about the overall project can be found on www.gravenhill.info

Defence







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	Residential	55.4ha
	3FE Primary School	3.4ha
	Hotel / Pub / Restaurant	1.5ha
	Community Hall	0.4ha
	Supermarket	0.6ha
	Local Shops	0.8ha
-	Offices	0.6ha
	Light Ind. (B2)	5.7ha
	Storage (B8)	18.6ha
	Public Open Space	29 6ha
	Woodland / Buffer	64.8ha
	Amenity Grassland	9.9ha
-	Allotments	4.0ha
	Energy Use	0.9ha
	St Davids Barracks	30.0ha
	Peripheral Road	3.7ha
	Rail Infrastructure	10.0ha
	Total Area	207,23ha

Approx 1,900 dwellings at 34 dph

(Internal road infrastructure included within land use areas)



Defence Infrastructure Organisation

amec<sup>©</sup>

Redevelopment of MoD Bicester Non Technical Summary

Figure NTS 4 Graven Hill Land Use Plan

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Figure NTS 5 Graven Hill Masterplan

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- Appendix G Community and socio-economics
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#### Introduction 1\_

#### Overview of the proposed development 1.1

The Defence Infrastructure Organisation (DIO)<sup>1</sup> wishes to gain outline planning 1.1.1 consent for a mixed use development at a Site known as Graven Hill and redevelopment for continued MOD use at a Site known as C Site. The sites comprise 207 hectares (ha) (Graven Hill) and 83 ha (C Site) of brownfield land and are located 0.9 miles (Graven Hill) and 3.6 miles (C Site) to the south-east of Bicester town centre, Oxfordshire and 3.3 miles (Graven Hill) and 6 miles (C Site) to the east of Junction 9 of the M40.

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1.1.2 The location of the Sites is shown in Figure 1.1 and they form part of the wider MOD Bicester group of sites. The red-line planning application boundary for Graven Hill is shown in Figure 1.2 and for C Site in Figure 1.3. A Site is also shown on Figure 1.1 and although DIO is also proposing to dispose of A Site, this does not form part of this planning application.

#### Graven Hill

- Defence Infrastructure Organisation's outline planning application description is 1.1.3 summarised as follows.
  - Proposed demolition of all MOD buildings on Graven Hill (which includes E and D Sites).
  - Residential development (55.4ha) of approximately 1, 900 homes (at a density of 34 dwellings per ha) including up to 30% affordable housing.
  - A Local Centre including:
    - a two form entry primary school incorporating a multi-use games area (MUGA) with parking areas on a 3.4ha site which can accommodate a three form entry school in future should one be required;
    - a Community Hall of  $660m^2$  co-located with the primary school on a 0.4ha site;
    - five local shops or facilities each comprising a built unit of up to 92.9m<sup>2</sup> on a site totalling 0.8ha;





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<sup>&</sup>lt;sup>1</sup> The Defence Infrastructure Organisation was formed on 1 April 2011 when the former Defence Estates was brought together with other property and infrastructure functions in the MOD to form a single organisation.
- a grocery store building  $1,858m^2$  on a 0.6ha site;
- a building to be used as hotel/pub/restaurant and parking areas within a 1.5ha site;
- an energy centre  $400m^2$ , co-located next to the hotel; and
- two storey offices comprising a 2,160m<sup>2</sup> building on a 0.6ha site.
- Commercial premises (up to 20,520m<sup>2</sup> of Classes B1(c) Light Industrial and B2 General Industrial plus up to 2,400m<sup>2</sup> of Class B1(b)) Research and development on a 5.7ha site with individual buildings from 50-800m<sup>2</sup> on maximum plots of 0.93ha each.
- Warehousing (class B8) on a 18.6ha site with individual units ranging from  $2,790m^2$  to  $9,290m^2$ .
- A 0.9ha site reserved for future use as an energy centre in the southern part of the Site.
- Provision of 29.6ha of open space comprising 5.87ha of playing pitches and 23.73ha of Natural Green Space as well as 3.6ha of playspace including two Neighbourhood Areas Equipped for Play (NEAP) and five Local Areas Equipped for Play (LEAPs).
- 64.8ha of woodland including Graven Hill Woodland Park (25.21ha) which includes new car parking areas and access paths.
- 9.9ha of interim private open space reserved for future development.
- Allotments on two sites totalling 4ha.
- Two improved junctions serving the Site off the A41.
- Creation of new footpaths and cycle paths.
- New services infrastructure including sub-stations and Sustainable Urban Drainage Systems (SUDS).
- Landscaping, planting and ecological enhancement measures.

#### C Site

- 1.1.4 Defence Infrastructure Organisation's outline planning application description is summarised as follows.
  - Demolition of MOD buildings in the northern area of C Site including buildings C1, C4, C7, C9, C11, C13, C21, C49, C60, C61 and C63.
  - Removal of rail infrastructure and trees in the vicinity of the demolished buildings to clear a development platform.







- Development of a new 70,400m<sup>2</sup> floor area warehouse known as the 'Fulfilment Centre' to include:
  - 36 loading/unloading doors along the western façade with a mix of floor access and dock level access (at 1.2m height);
  - a 20m wide canopy along the length of the western loading/unloading area;
  - office accommodation as a pod attached to the main building on the south-western corner;
  - a 30m deep unloading yard to the west of the building; and
  - parking for up to 350 cars.
- Re-provision of the container storage facility (to be removed from Graven Hill) and provision of a Road-Rail Transfer Area (RRTA), freight terminal and surge capacity area.
- Landscaping and planting including:
  - a new landscaped buffer, to the rear of existing private residential homes on Green Lane and Norris Road, consisting of an earth bund with screen planting; and
  - enhanced planting in the north of the Site to improve the landscape buffer to the rear of existing residential and mixed use properties along Ploughley Road.
- New internal road layout.
- Enhanced Sustainable Urban Drainage Systems (SUDS).

## A Site

1.1.5 As noted earlier, DIO also intends to dispose of A Site at the same time as Graven Hill. The buildings on A Site can be re-used immediately, but any potential future redevelopment has not been included as part of this application. This is because it is likely that the time frame over which redevelopment at A Site is likely to come forward would be outwith the standard three year consent period sought in this application. As such, A Site is not included in the planning application and will not be considered any further in this Environmental Statement.

# **1.2** Purpose of the Environmental Statement

1.2.1 This Environmental Statement (ES) has been prepared as part of an Environmental Impact Assessment (EIA) relating to the proposed development. EIA is required for certain developments under the *Town and Country Planning Act, 1990*, as defined under the *Town and Country Planning (Environmental Impact Assessment Regulations 2011* (SI No 1824) (as amended) (hereinafter referred to as the EIA Regulations). This ES has been prepared for the purpose of meeting those

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requirements of the EIA Regulations that pertain to ESs. The ES provides part of the information that will be used by Cherwell District Council (CDC) and others to inform the process of determining the planning application for the proposed development.

- 1.2.2 The proposed development requires EIA (i.e. it is 'EIA development') because it falls within Schedule 2 of the EIA Regulations and DIO has decided that EIA is required. On that basis no request for a screening opinion from CDC has been sought.
- 1.2.3 A scoping report was prepared to identify the potentially significant environmental effects of the proposed development that needed to be assessed further and to outline the approach to undertaking the assessments of these effects (DIO, 2011). The report, which was prepared having regard to the guidance in Circular 02/99, enabled statutory and non-statutory organisations and others with an interest in the proposed development ('stakeholders') to comment on the proposed scope of the assessment.
- 1.2.4 Drawing on the scoping report, scoping consultation responses and previous and subsequent assessment work, the ES reports the findings of an assessment of the potential environmental effects of the proposed development that it was considered could be significant. This reflects the requirement of the EIA Regulations for the ES to discuss in any depth only those effects that are likely to be significant. The Regulations do not define significance; the overall approach that has been taken to defining significance, as well as further information about the approach to preparing the ES is outlined in chapter 4.
- 1.2.5 Schedule 4 of the EIA Regulations specifies what should be included in an ES. This includes "A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development..."
- 1.2.6 Schedule 4 also specifies that the ES should describe those "aspects of the environment likely to be significantly affected by the development, including, in particular population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors."
- 1.2.7 In this ES, these topics are dealt with under the headings set out in Table 1.1. The ES also contains a number of appendices which are referenced throughout the document. A glossary of terms and abbreviations used throughout the entirety of the ES is provided in Appendix A, Volume 3 of the ES (see BIC/OPA/DOC/10).

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Topics in the EIA Regulations	Topics in this ES
Population	Landscape and visual [chapter 11]; Traffic and transport [chapter 6]; Noise [chapter 8]; and Community [chapter 9]
Fauna	Biodiversity [chapter 12]
Flora	Biodiversity [chapter 12]
Soil	Land quality [chapter 14]
Water	Water resources [chapter 13]
Air	Air quality [chapter 7]
Climatic factors	Air quality [chapter 7], Water resources [chapter 13]
Material assets, including the architectural and archaeological heritage	Historic environment [chapter 10]
Landscape	Landscape and visual [chapter 11]
The inter-relationship between the above factors	These are discussed within each section as relevant

#### Table 1.1 Environmental topics to be addressed in the ES

#### 1.3 Developer and the project team

DIO engaged AMEC Environment & Infrastructure UK Ltd (AMEC E&I<sup>2</sup>) to prepare 1.3.1 the ES for the proposed development as well as preparing the masterplan, Transport (BIC/OPA/DOC/12), Assessment (TA) Design and Access Statement (BIC/OPA/DOC/07), Drainage Strategy and Utility Reports (BIC/OPA/DOC/15-18), Flood Risk Assessment (FRA) (Appendix K of this ES) and Energy Statement (BIC/OPA/DOC/11). In undertaking this work, AMEC was supported by CBA Trees (arboricultural surveys BIC/OPA/DOC/19 and 20), Julian Brown Consultancy (additional badger surveys and assessment), Landscope Engineering (topographical surveys) and Archaeological Surveys Ltd (geophysical surveys).

#### 1.4 Structure of the ES

- The remainder of the ES is structured as follows: 1.4.1
  - chapter 2 explains the need for the proposed development, outlines the main alternatives considered for meeting this need and indicates the main reasons for the choice of the preferred alternative;







<sup>&</sup>lt;sup>2</sup> Following its acquisition by AMEC, Entec UK Ltd was integrated into AMEC Environment and Infrastructure in July 2011, all references to work previously completed by Entec are now to AMEC E&I.

- chapter 3 describes the proposed development;
- chapter 4 details the approach that has been adopted in preparing the ES;
- chapter 5 provides an overview of the legislation and policies that are relevant to the ES; and
- chapters 6-14 set out the technical assessments for the environmental topics that need to be considered in the ES.
- 1.4.2 In addition, a Non-Technical Summary is provided at the front of the ES and as a stand-alone report (BIC/OPA/DOC/08).
- 1.4.3 All Appendices are contained in Volume 3 of the ES (BIC/OPA/DOC/10).

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# 2. Proposed development need and alternatives

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# 2.1 Operational background and need

- 2.1.1 The Logistics and Commodity Services (LCS) logistics operation (formerly the Defence Storage and Distribution Agency (DSDA)) provides logistics services for the Armed Forces, as part of the Joint Support Chain (JSC). LCS manages an inventory of over 800,000 lines of non explosive stock to give priority to meeting UK operational military demands. Since 2005, two programmes (Future Defence Supply Chain initiative (FDSCi) efficiency programme (2005) and Operational Efficiency Programme (OEP (2009)) have been implemented to improve the delivery of this service.
- 2.1.2 The OEP identified the need to reduce stock holdings by 35%, assess options for the vacation and redevelopment of surplus land, achieve improvements in a cost-neutral way and ultimately realise value (from the disposal of surplus land) back to the Treasury.
- 2.1.3 Measures to meet these needs focussed on reducing manpower and the amount of stock held, alongside the sale of land and buildings. It was also identified that the consolidation of the remaining LCS built footprint into buildings which are 'fit for purpose' would also increase efficiency and cut costs. Furthermore, LCS has since identified several objectives in relation to operational need, in improving the efficiency of the services it provides and reducing costs.
- 2.1.4 Under current operations, LCS has a 'Fast Moving' Warehouse (FMW) at Donnington whilst Bicester is used to store and distribute the fastest moving commodity group, namely defence clothing. This system is however, limited by infrastructure and the consolidation that outgoing material requires, before onward distribution from the two different hubs at Donnington and Bicester. Therefore LCS has decided that to increase efficiency and reduce costs there is a need to locate all operations on one site. This will allow LCS to meet its objectives in relation to operational need.

# 2.2 **Operational alternatives**

#### Site selection

2.2.1 MOD Bicester was identified as offering the best operational location compared to other UK MOD locations, as it is a rail served location with sufficient available estate to enable the consolidation of storage activities on a single site. By changing to a





single hub at Bicester, it is estimated that a reduction of 12.5% in operating costs is achievable.

#### Site layout

2.2.2 Following confirmation that a move of all operational activity onto one MOD site would meet the LCS operational efficiency and cost reduction objectives, two conceptual options for site operation were evaluated by LCS. These are summarised below.

#### **Option 1: Primary warehouses**

- 2.2.3 The existing warehouses at MOD Bicester would be retained and each used as a distinct unit holding suitably categorised stocks, for example by stock type (e.g. defence clothing), storage characteristics or handling characteristics (e.g. fast moving small parts). Buildings suitable for this type of re-use would undergo mechanisation where required. Inbound goods would be received directly from suppliers, undergo processing (i.e. 'RSMI' - Receive, Store, Maintain and Issue) and then be despatched via the 'Defence Gateway'. This is an operational function rather than a specific location where different products are consolidated into 'capability modules' that support specific military front line needs, before being despatched.
- 2.2.4 Although this option would provide all storage and processing at the same site, goods would still be stored in different warehouses. These goods would need to be bought together as part of the processing of orders. Therefore the dispersal of storage across the Site would still add costs and time to the process as the components for each order would need to be obtained from each different warehouse before being brought together to fulfil the order. This was seen as a major disadvantage in terms of operational efficiency and the objectives of the OEP.

#### **Option 2: Fulfilment Centre and intermediate (supporting) warehouses**

- 2.2.5 Stockholding orders would be processed and despatched from a single 'Fulfilment Longer-term bulk storage of goods would take place in supporting Centre'. intermediate warehouses. The Fulfilment Centre would receive stock from the supporting intermediate warehouses but also directly from suppliers. Holding stock from these two supply lines together in the Fulfilment Centre would decrease the amount of time taken to process an order when compared with Option 1. Stock stored in the intermediate warehouses would then be used to replenish the smaller amounts of stock stored in the Fulfilment Centre as needed. The Fulfilment Centre would also include new conveyor technology which would also decrease the amount of time to pick stock to meet orders.
- 2.2.6 The Fulfilment Centre would also provide the location for the 'Defence Gateway' and would also provide for the receipt, storage (approximately two months stock holding) picking and consolidation of standard product. Approximately 80% of all products would be picked from the Fulfilment Centre.
- 2.2.7 Having evaluated each option, LCS is taking forward Option Two as this option will in summary, allow storage of a greater number of stock lines, provide the ability to

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process and despatch orders in very short timescales and provide the most efficient solution in relation to estate and manpower requirements.

## MOD Bicester: LCS site selection

- 2.2.8 Several criteria have led to C Site being identified as the preferred location for the LCS operation. C Site offers the opportunity to consolidate on a single site as it has the capacity to provide the necessary building and external hardstanding footprints, is rail-connected, has the potential for suitable road access and fundamentally allows the project to meet the pre-requisite of self-funding.
- 2.2.9 For the project to be self-funding the value of the surplus land is key and this has resulted in the planning application seeking consent for a mixed use development comprising 1,900 residential properties plus commercial development at Graven Hill. The necessary value would not be achieved if the LCS operation were to be located on Graven Hill and C Site released for disposal as C Site is unsuitable for the scale of residential development proposed and less desirable as a commercial location.
- 2.2.10 Other MOD Bicester sites are to be retained for military use with the exception of A Site. A Site is unsuitable for redevelopment as the Fulfilment Centre due to its size (it measures approximately 39ha compared to C Site at 83ha) and the buildings on site are unsuitable for use.

# 2.3 Evolution of the preferred development

2.3.1 The design of the proposed development at Graven Hill and C Sites has evolved over time to respond to the constraints and opportunities present at the Sites and in response to stakeholder consultation. Initially several design concepts were prepared and assessed for their viability. A brief summary of the design evolution for both sites is set out below. Further information on the design evolution can be found in the Design and Access Statement (DAS) (BIC/OPA/DOC/07) and on the consultation process in the Statement of Community Involvement (BIC/OPA/DOC/04).

## Graven Hill

- 2.3.2 For the Graven Hill Site, initially a site concept plan, which set out which land uses would go within the Site, was prepared. This was based on the following factors.
  - DIO's decision to include woodland and pasture on the top of the hill (initially only D and E sites were going to be redeveloped) within the disposal allowed the hilltop woodland to be retained and integrated with other 'green infrastructure' within the proposed development. It was decided to retain all woodland within the Site in order to mitigate effects on views of the Site, the landscape and biodiversity.
  - Geophysical surveys were undertaken to determine the likelihood of any significant archaeological remains underlying the Site which would need to be avoided as part of the proposed development.

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- An initial buffer area was incorporated into the proposed development to the east of Bicester Sewage Treatment Works (STW) to minimise potential odour effects on sensitive receptors within the proposed development.
- Exploration of options to redevelop the whole of the Site for housing as well as options for both housing and employment uses was undertaken. The re-use of rail infrastructure in the south of the Site provided an opportunity to redevelop the southern part of the Site for rail-enabled employment development. The proximity of the town centre to the northern part of the Site suggested this was a more appropriate location for housing and community facilities. Therefore, the decision was made to place residential land uses in the north and employment uses in the south.
- During consultation, Oxfordshire County Council (OCC) Highways highlighted the potential for Graven Hill to be linked to a peripheral road connecting the A41 to the east of Bicester with the A41 to the south of Bicester. Routes considered through the Site included northern and southern options around the Hill. The northern option was discounted due to the 'severance' effect on movement between Bicester town centre and the Hill and potential environmental and safety effects on new residents within the proposed development. However, the southern route would avoid these effects. Therefore, the masterplan has been designed so that in the future a peripheral connected road could route through the southern side of the proposed development. However, the full route is not included in the masterplan and would be the subject of full public consultation and a separate planning application in the future led by OCC Highways.
- Potential office development was located adjacent to the A41 as viability studies suggested this corridor has the potential to support this use.
- 2.3.3 Following the development of the initial concept plan both public consultation and workshops with officers from CDC and OCC were held to test the initial land use plan for the Site. The following factors influenced the evolution of the plan.
  - Baseline information from the landscape and visual assessment was used to determine how far up the slopes of the hill built development could be located. As a result of detailed testing it was identified that the open green fields below the Graven Hill Woodland tree line were important and needed to be kept to maintain the character of the hill when viewed from a distance. However, given the woodland enclosure at the eastern and western ends of the upper slope, some development was seen as appropriate in these areas and therefore two areas of development were incorporated above Circular Road.
  - Different options for the mixed-use local centre were tested during workshops with CDC and OCC. This identified a preference for a central location for the local centre to ensure that the centre and the school would be easily accessible to all residents. It was also identified that the local centre could include some office development and that the housing density could be increased.

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- avoid odour effects from Bicester STW. In addition, market viability testing indicated that the number of dwellings could be increased to 1,900 and office uses decreased. Therefore, the local centre, school and proposed office development were located within the gateway location and the area which was to be developed for office uses was replaced with housing.
- Paths within Graven Hill wood were designed to ensure that public access to the southern part of the woodland was prevented. This would assist with security needs for St David's Barracks which will be retained within the Site and minimise potential disturbance effects on the woodland from increased use by members of the public.
- The final masterplan for Graven Hill is described in more detail in chapter 3. Further 2.3.4 information in relation to planning need and the economic viability of Graven Hill is provided in the Planning Statement (BIC/OPA/DOC/02) and Financial Viability Appraisal (BIC/OPA/DIO/05).

## C Site

- 2.3.5 The location of the Fulfilment Centre within C Site is constrained by its size and the relationship between the Fulfilment Centre, Road Rail Transfer Area (RRTA), storage area and surge capacity<sup>3</sup> area which requires the provision of an extensive area of hardstanding around the Fulfilment Centre.
- 2.3.6 Six different location options were reviewed in relation to the Fulfilment Centre. These comprised three in the northern part of the Site (Options one, two and three) and three in the southern part of the Site (Options 4, 5 and 6) close to south-west corner of the Site. The following issues were identified in reviewing these locations.
  - Road access and circulation: The north options (Options one, two or three) were preferred as these offered a more sustainable and operationally efficient internal road system, by limiting the distance of travel from the main gate to the Fulfilment Centre.
  - Rail access: There were no significant distinctions between the northern and southern options in terms of rail access to the Site. However, the southern options were discounted as the distances between the Fulfilment Centre and the RRTA storage area and surge capacity area would be greater than under the northern options. Option was the preferred option as the layout maintains the optimum size and configuration of hardstanding adjacent to the RRTA for operations.

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<sup>&</sup>lt;sup>3</sup> In the context of this application 'surge' refers to an unplanned increase in demand created by military operational needs.

- <u>Surface water drainage</u>: The northern options were judged to be less disruptive in terms of implementing the required surface water drainage but there was little difference between Options 1, 2 and 3.
- <u>Noise</u>: Under the southern options, the Fulfilment Centre was more remote from local properties. However, greater vehicle movements through the Site would be necessary potentially increasing noise from HGVs and staff vehicle movements. Under both the northern and southern options the Fulfilment Centre noise effects could be mitigated by locating the building between noise sources (i.e. external operational activity) and sensitive residential properties along the Site boundary.
- <u>Landscape and visual</u>: All options offered opportunities to enhance the character of C Site along its boundary with Arncott village. Southern options would remove existing site screening but the height and scale of the northern options would have visual effects on local residents, although landscaping could be implemented along the Site's eastern boundary. Option 3 was marginally preferred in terms of landscape and visual effects.
- <u>Biodiversity</u>: The southern options would result in major loss of woodland/scrub habitat and therefore in terms of biodiversity the northern options were preferred, all of which offered the potential for ecological enhancement opportunities.
- 2.3.7 The overall preferred location option was Option 1 and this was taken forward in the masterplan. This location was best able to meet LCS operational requirements as well as minimising environmental effects on biodiversity.
- 2.3.8 Following consultation and feedback from local people further measures were incorporated into the masterplan to address concerns about effects on views from properties close to the boundary with C Site and overshadowing of these properties. The Fulfilment Centre was therefore moved from 29m from the Site boundary, at its closest point, to 61m. This provided an additional area of approximately 40m or more in width between the building and site boundary in which a planted landscaped bund could be constructed to mitigate effects on views from properties bordering the Site. Further information is contained in chapter 11.

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#### **Proposed development description** 3.

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#### Site description 3.1

## Graven Hill

- 3.1.1Graven Hill (see Figure 1.2) comprises approximately 133ha of brownfield land currently known as D Site, E Site and Bicester International Freight Terminal (BIFT). These sites are mostly used and operated by the LCS, which manages a range of storage, processing and distribution tasks on behalf of the MOD. D and E Sites largely comprise warehouses with some office buildings, areas of hardstanding used for parking and storage and open spaces. The BIFT comprises hardstanding which is used to store freight containers. Also located within the Graven Hill Site is approximately 74ha of greenfield land comprising woodland, which is used for some military training such as cross country running, and fields which are currently leased to a local farmer for grazing. St David's Barracks is also located within the Site (although this is outside the planning application red line boundary so does not form part of the planning application). The centre of the Site is located at national grid reference (NGR) 458800 220400.
- 3.1.2 The Site is immediately bounded by the A41 to the north, farmland to the east and north, the Oxford to Bicester railway line to the west and the MOD railway line to the south. Beyond the boundaries of the Site there is farmland to the north-east, east, south and west of the Site which also includes some scattered residential properties. Bicester Sewage Treatment Works (STW) is approximately 100m to the north-west of the Site boundary. Bicester town centre is approximately 0.9 miles north of the Site with the closest residential suburb of Bicester (Langford village) approximately 100m north of the Site. The village of Ambrosden is 600m south-east of the Site.
- 3.1.3 The A41, adjacent to the north of the Site, provides access to Bicester to the west, Junction 9 of the M40 to the south-west and to Aylesbury to the east. The B4100 provides access between the Site and Bicester town centre. The A4421 provides access to the Site and forms part of a ring road around the eastern side of Bicester and also provides access to the north of Bicester. In addition to footpaths and a cycle path along the B4100 there is also a pedestrian underpass from the Site passing beneath the A41 providing a link to the B4100 (see Figure 1.2). There is also a secondary road access in the western corner of the Site over which the MOD has a right of access which provides access to Langford Lane to the south-west eventually linking with the A41.
- 3.1.4 The site has MOD rail access from the main line which loops round through the Site. There is also a MOD rail link through to C Site to the south-west.

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#### C Site

- 3.1.5 C Site (see Figure 1.3) comprises approximately 83ha of brownfield land which is currently used by the MOD for storage, office and logistics uses. The Site largely comprises warehouses with some office buildings and areas of hardstanding for parking and storage, open spaces and small areas of planting, woodland and scrub. The centre of the Site is located at NGR 460750 217400. There is rail access through the Site from Graven Hill to the north-west, linking through C Site and providing rail access onto other MOD Bicester Sites although rail access is not currently used beyond C Site. A small number of buildings on C Site are occupied by third party tenants, activity at some of which is defence related.
- 3.1.6 The Site is bound by agricultural land to the west and south and bordered by residential properties and the village of Arncott to the east. Further to the east and south-east of the Site are other MOD Bicester Sites (A, B, G and H Sites), St George's Barracks and MOD training areas.
- Access to the Site from the A41 is via Ploughley Road through the villages of 3.1.7 Ambrosden and Arncott. However, HGV traffic is routed to access the Site from the A41 via the B4011 and Palmer Avenue to avoid the villages of Ambrosden and Arncott.

#### 3.2 Proposed layout of development components

3.2.1 This is an outline planning application with all matters except access reserved for future determination (see Planning Support Statement BIC/OPA/DOC/02). The components of the proposed development detailed in this section of the ES will be subject to detailed design and approval through the reserved matters process. The ES has been based on design parameters such as the masterplan layouts, building height and density information from the DAS (BIC/OPA/DOC/07).

#### Graven Hill

Figure 3.1 shows the layout of the different land uses within the proposed 3.2.2 development and the illustrative masterplan is provided in Figure 3.2.

#### Residential

- 3.2.3 The proposed development will provide up to 1,900 dwellings over 55.4ha of land at an average density of 34dph. A range of dwelling types, sizes and tenures will be provided for, including up to 30% affordable housing. The development form allows for a housing type and tenure mix, which includes a significant percentage of family homes and affordable housing as set out in detail in the Planning Support Statement (BIC/OPA/DOC/02). A mix of one, two, three and four plus bedroom homes are envisaged to be included as appropriate in each character area based upon the form and density of the location.
- 3.2.4 At least 10% of homes will be designed as life-time homes. These will be readily accessible and usable by the disabled and elderly, or capable of adaptation for such

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uses. The affordable homes will be located throughout the Site in clusters of no more than 10 units. Extra care homes (which allow for independent living, but with appropriate levels of care) are likely to be located close to the Local Centre for access to facilities.

- 3.2.5 The majority of residential buildings to the south and east will be two storeys in height plus roof (8.1m) with some 2.5 storey (8.5m) homes. Three storey (10.8m) homes will be located in appropriate locations within the proposed development, for example, along busier streets, at the end of residential blocks or in more urban spaces such as the main access from the A41 (see Figure 3.3).
- 3.2.6 Further detail on the residential component is provided in the Planning Support Statement (BIC/OPA/DOC/02), and chapter 9 (community and socio-economics) and chapter 11 (landscape and visual). More detail on building heights and massing is included in the DAS (BIC/OPA/DOC/07).

#### Primary school and community hall

3.2.7 The proposed development provides for a new two form entry (420 pupil) primary school on a 3.4ha site which would provide sufficient space for the school to be extended to three form entry (630 pupils) should this be required in the future. The primary school is likely to be single storey with some components (school hall and gym) up to two storeys (the latter has been assumed in this assessment). The location has been selected to ensure that the maximum number of residents are within a five minute walking distance. The primary school site will also accommodate a Multi-Use Games Area (MUGA) of 1,200m<sup>2</sup> which will be accessible to the public out of school hours. A 660m<sup>2</sup> community hall on a 0.4ha site will be located adjacent to the primary school.

#### Local shops

3.2.8 A parade of five local shops or facilities will be located on a 0.8ha site on a key corner of the local centre in the northern part of the Site. These are likely to comprise retail, service and community units of up to 92.9m<sup>2</sup> each and will form the ground floor of a three storey building to enable flexibility of uses 'above the shop' to include either office or residential use. Servicing and parking will be provided to the rear of the shops and co-located with other facilities' parking to form a main visitor parking area for the area.

#### **Grocery store**

3.2.9 The proposed development includes a grocery store with frontage onto the A41. This store will meet local needs and be sized at 1,858m<sup>2</sup> gross (up to two storeys in height) on a 0.6ha site in order to avoid competition with Bicester Town Centre. Car parking and deliveries will be to the rear of the building and co-located with other local centre parking to form a main visitor parking area.

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#### Hotel/pub/restaurant

3.2.10 A hotel/pub/restaurant facility of up to 3.5 storeys on a 1.5ha site will be located between the grocery store and local shops and the offices. Again, car parking will be to the rear of the building and will be co-located with the office parking.

#### Offices

Up to  $2,160m^2$  of office floorspace will be provided in buildings of up to four storeys 3.2.11 in height on a site of 0.6ha. This includes car parking to the rear of the buildings which will be co-located with the hotel/pub/restaurant provision.

#### **Energy centres**

- 3.2.12 The Energy Statement (BIC/OPA/DOC/11) sets out principles for the proposed development to use less energy, use energy efficiently and to use renewable and low carbon energy. As part of this strategy a range of opportunities for on-site or locally connected renewables have been considered, including on-site Combined Heat and Power (CHP), wind and micro-generation such as solar thermal, solar photo voltaic (PV) and ground source heat pumps. In response to emerging national policy there may also be opportunities for 'off-site' solutions, such as developer contributions towards energy efficiency or renewable energy schemes elsewhere in the Cherwell district.
- The proposed development includes a 400m<sup>2</sup> site co-located with the hotel/pub/ 3.2.13 restaurant which will accommodate a combined heat and power generator housed within a sound proofed building. All deliveries of fuel will be well contained to the rear of the building away from the main street.
- 3.2.14 In addition, a 0.9ha site located in the southern part of the development has been reserved for potential future use as a second combined heat and power generator to serve the proposed commercial premises in the locality. The site could also be rail served enabling fuel deliveries by rail.
- 3.2.15 At detailed design stage the developer(s) will agree the final composition of the energy strategy to be pursued, including contributions towards off-site measures, informed by feasibility and viability testing.

#### **Recycling centre**

3.2.16 A local recycling centre is planned within the local centre to be easily accessible to local residents in order to encourage use and a sustainable approach to waste. This is likely to be located at the rear of the grocery store, local shops and community hall and be accessible on foot and by car.

#### **Employment development**

The proposed development will provide up to 20,520m<sup>2</sup> of light and general industrial 3.2.17 floorspace (Classes B1(c) and B2) and 2,400m<sup>2</sup> of B1(b) use (research and development) on a 5.7ha site. This will be located in the eastern part of the Site to the east of the main employment area on the south side of Graven Hill. The buildings

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within this area are likely to comprise a range of sizes of between  $50-800m^2$  to support a range of potential businesses on maximum plots of 0.93ha each.

3.2.18 The southern part of Graven Hill is currently used as warehousing and storage. Initially it is likely that these facilities will be let out for commercial use in the short term until market demand for redeveloped new floorspace has been established. The proposed development includes space for 66,980m<sup>2</sup> of warehouse floorspace over an 18.6ha location with individual units ranging from 2,790m<sup>2</sup> to 9,290m<sup>2</sup> in size. In terms of building heights, the assessment has assumed any new buildings will be no higher than the tallest existing commercial buildings.

#### **Playing fields**

3.2.19 The 5.87ha of proposed playing pitches will be located within the main north-western open space area and could accommodate seven sports pitches which can be configured to accommodate football, rugby or cricket. One playing pitch is to be included within the school and is intended for dual use. This will also consist of a Multi Use Games Area (MUGA) which will be available for public use out of school operating hours.

#### Children's play space

3.2.20 The proposed development includes 3.6ha of children's play space comprising two Neighbourhood Equipped Areas for Play (NEAPs) and five Local Equipped Areas for Play (LEAPs) which will be supported by a lower tier of Local Areas for Play (LAPs) or alternative (for agreement at Reserved Matters).

#### Allotments

3.2.21 Two allotment areas are proposed to serve the neighbourhood areas within 15 minute walking distance of all new residents. These combine to deliver 4ha of allotment area in total with associated car park areas. The allotment site to the north-west is located adjacent to a proposed attenuation pond which may be utilised to provide grey water sustainable solutions for allotment users.

#### Interim private open space

3.2.22 Two areas of land to the north and north-west of the local centre have been designated as 'interim private open space'. This land is currently located within the odour constraint zone from the adjoining Sewage Treatment Works (STW) and therefore has not been proposed for development at this time. However, should suitable mitigation and improvements be undertaken at the STW then this land is in a suitable location for potential future development and as such will be safeguarded. The area will be fenced off from public use and managed as private open space.

#### **Green corridors**

3.2.23 A network of local recreation routes has been provided within the proposed development in the form of green corridors which typically comprise rich habitats (meadow grassland, woodland, trees, scrubs, streams, swales, waterbodies, etc.), segregated pedestrian/cyclist paths where appropriate and a pedestrian/cyclist friendly hierarchy of streets.

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#### Hilltop woodland

- 3.2.24 Gravenhill Wood will be divided into a conservation area with strictly no public access to retain the ecological habitats of value including high quality areas of foraging and nesting. Parts of the woodland will become accessible to the public through a network of public footpaths that will wind through the woodland leading in various directions. These proposed footpaths will follow existing marked out routes, as used by the military for training, and other historic routes that have become overgrown.
- 3.2.25 The woodland provides a number of informal recreational opportunities which will provide for all through links to the lower residential areas around the foothills of Graven Hill, and through the provision of a car park and disabled access, by way of an existing access track, located within a woodland clearing. Recreation opportunities will include potential trim trails, running routes and education, and areas and tracks for local schools and local people.

#### **Transport and access**

3.2.26 Two access points are proposed for the development, as shown on Figure 3.2:

- an enhanced roundabout junction between the A41 Aylesbury Road, the A4421, the B4100 London Road and Gravenhill Road North comprising signalisation and junction widening and provision of a signalised pedestrian/cycle (toucan) crossing; and
- a new roundabout junction between the A41 Aylesbury Road and the re-modelled Pioneer Road.
- A hierarchy of street types is proposed within the development from primary, 3.2.27 secondary and tertiary main streets to main residential and residential streets to lanes and pedestrian and cycle routes. The proposed development has been designed to accommodate a potential peripheral road. OCC has a long-term aspiration to provide a road linking the A41 east of Graven Hill with the A41 between Junction 9 of the M40 and Bicester Town Centre in the future. Therefore, the peripheral road running through the southern part of the Site has been designed to become part of this potential route should it come forward in the future, thus avoiding unnecessary costs and effects that will otherwise be associated with widening the route in the future. The proposed development has also been sensitively designed around this potential route. However, should OCC take forward this route in the future it would be subject to an appraisal of different route options, detailed assessment (such as EIA) and be the subject of a separate planning application.
- 3.2.28 Traffic modelling has been used to identify those areas of the wider highway network which will require improvements in order to accommodate the additional traffic generated by the proposed development. These improvements which are shown in Figure 3.4 comprise:
  - partial dualling within the existing road width along the A41 between the Site and the A41/B4030 roundabout;

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- improvements to the B4030/A41 roundabout; and
- developer contributions to Phase 2 of the proposed improvements at M40 Junction 9.
- 3.2.29 These improvements will take place within the existing highway carriageway and without land take or loss of vegetation. There will be no effects from these off-site improvements in relation to water, biodiversity or landscape or visual issues and therefore these effects do not require any further consideration. Effects in relation to traffic flows are considered further in chapter 6, 7 and 8 (traffic, air quality and noise respectively).
- 3.2.30 Pedestrian and cyclist routes are proposed throughout the Site and comprise a main circular route around the perimeter of the Site and a series of connecting paths along green corridors. A number of walking routes (both existing and proposed) will be provided through the woodland of Graven Hill. Off-site pedestrian and cycle routes will link to the town centre along the B4100 London Road via an existing pedestrian underpass under the A41, which will be upgraded in order to increase its attractiveness for use. New surface level crossings will also be provided at the A41/B4100/A4421 roundabout.
- 3.2.31 Existing freight rail tracks will be retained within the southern part of Graven Hill to potentially serve commercial warehouse and storage functions. The details of any upgrading or re-alignments necessary are as yet unknown until potential users take up the opportunity and so the details of rail access will be considered at reserved matters stage.
- 3.2.32 The proposed development will be served by a new 15-20 minute frequency bus service linking the Site with Bicester town centre and the Bicester Town and Bicester North rail stations. It is also proposed to divert an existing service (S5) into the northern part of the Site (neighbourhood centre and high density/affordable housing), providing a link between the Site and C Site and a route to Oxford. Further information is provided in the Transport Assessment (BIC/OPA/DOC/12).

#### Drainage

3.2.33 A Sustainable Urban Drainage System (SUDS) will be implemented as part of the proposed development. This will ensure that surface water flows from the Site are not above current rates. This will comprise features such as permeable paving, rainwater harvesting, swales, filter trenches, wet ponds and detention basins. The proposed development will also require a new pumping station and pumping main to discharge flows to the nearest public sewer from some parts of the proposed development. Further information is provided in the Drainage Strategy (BIC/OPA/DOC/15) for Graven Hill.

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#### Lighting

3.2.34 Street lighting will be provided within the development as appropriate to the area concerned and will be designed to avoid light spillage and pollution (see DAS -Lighting Strategy (BIC/OPA/DOC/07)).

#### C Site

3.2.35 Figure 3.5 shows the layout of the different land uses within the proposed development and the illustrative masterplan is provided in Figure 3.6.

#### Fulfilment Centre and associated external storage

- All redevelopment will take place within the northern part of C Site. Buildings C1, 3.2.36 C4, C7, C9, C11, C13, C21, C49, C60 C61 and C63 will be demolished and rail infrastructure and existing trees in the vicinity of the demolished buildings will also be removed.
- 3.2.37 The proposed development comprises a single building (the Fulfilment Centre) with a footprint covering 70,400m<sup>2</sup> in total. The building will be 14m internal clear height to the eaves to provide the required storage volume giving an external building height of 18.6m to the ridgeline. Two mezzanine floors will be formed within the structure to the south with storage heights of 3.5m. Office accommodation will be located externally on the south-western corner of the building.
- 3.2.38 Internally the building is likely to comprise a gateway and receipts area in the northwestern corner of the building forming the main internal open area. A marshalling area will be located on the western side of the building next to 36 loading/unloading doors. A consolidation area will be to the rear of this with a shelving discharge area. An internal office area will be located in the south-western corner. The remainder of the building is likely to be used for storage and split into three main areas:
  - full pallets and heavy duty racking in the north-east corner of the building;
  - quarter, half and full pallets in the central/eastern part of the building with medium parts shelving; and
  - the south-eastern corner comprising large, medium and small parts shelving within a mezzanine arrangement over two floors.
- 3.2.39 Outside, the development will comprise a 30m deep unloading yard to the west and north of the Fulfilment Centre. A RRTA will be provided adjacent to the west of the building as an integrated facility. Car parking for up to 350 cars will be provided to the south of the building. The container storage area will be re-located from Graven Hill BIFT and will comprise hardstanding along with additional provision covering container storage and capacity to cover 'surge' conditions.

#### Landscaping

3.2.40A landscape buffer comprising a mound between 3.13m and 4.26m in height above existing ground levels will be created between the eastern boundary of the Site and the

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Fulfilment Centre. Shrubs and trees will be planted within the buffer as shown indicatively on Figure 3.5 and in the cross-sections in Figure 3.8 and 3.9.

#### **Transport and access**

- 3.2.41 For security reasons all vehicles, pedestrians and cyclists will access the Site via a single point of access which will be located at the existing northern access point. The access will be re-modelled to move the security gate back from its current position and it will be set back at a distance of approximately 63m from Norris Road. This will allow up to five rigid trucks to wait for entry off the public highway. No improvements to the off-site highway network are required to facilitate this.
- 3.2.42 A new internal road will link the re-modelled access point, around the north and west of the new building to link into the existing internal road network with a new roundabout provided at the entrance into the container storage area to the north of the Fulfilment Centre. In addition, a second road will link the access point to the main staff car park along the eastern boundary of the Fulfilment Centre. This road will be for use by cyclists, pedestrians and staff only; no HGV traffic will use this road.
- 3.2.43 The existing freight rail tracks along the northern boundary of the Site will be retained and used as a rail sidings area but with no connection out of C Site to the east. The main rail access into the Site will be along the western edge of the Site connecting to the new RRTA. Rail access will still be possible to the southern part of the Site however the majority of movements will utilise the RRTA.
- 3.2.44 An existing bus service (S5) will be diverted to provide services to C Site connecting the Site with Bicester and the wider Oxfordshire area.
- 3.2.45 Traffic management measures are proposed on Ploughley Road and further information is provided in the TA (BIC/OPA/DOC/12) and chapter 6 of this ES.

#### Drainage

3.2.46 A Sustainable Drainage System (SUDS) will be implemented as part of the proposed development. This will ensure that surface water flows from the Site are not above The drainage features incorporated into the final design of the current rates. development are likely to comprise permeable paving with underground storage (i.e. sub-base with 30% voids or manufactured storage cells), bio-retention measures, swales, filter trenches and wet ponds. Further information is provided in the Drainage Strategy (BIC/OPA/DOC/17).

#### Lighting

- 3.2.47 There will be a continuing need for external lighting on-site. There will be no change in the south, while in the north new lighting will be provided to roads, to the RRTA and nearby hardstanding storage and operating areas. For the movement of warehouse stock, the new Fulfilment Centre will be accessed primarily from its west side, close to other areas of main activity.
- The new building will therefore provide separation from residents in the Village, 3.2.48minimising any change due to lighting. East of the building lighting will be confined

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to that for the access road and nearby car park, screened by the perimeter landscaping. Further lighting to hardstanding storage areas on the north side of the building will be required, screened by the retention and reinforcement of landscape planting in the vicinity of the Site's northern boundary.

# 3.3 Construction and demolition specification

3.3.1 At this outline stage of the project, there is only limited information available on the construction process and therefore indicative information has been used as the basis of this ES. The following sections summarise the likely demolition and construction works which will take place for each phase of the proposed development.

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#### Construction and demolition works

#### **Pre-construction works**

- 3.3.2 In advance of any demolition and construction work taking place, the following works will be carried out.
  - Archaeological excavation and recording of known archaeological remains at Graven Hill (where appropriate), which will be agreed in advance with the County Archaeologist. A record will be made of military buildings (where required) prior to demolition (further information is provided in chapter 10).
  - Additional protected species surveys where required many species of fauna are highly mobile and transient and as such, due to the lengthy period between the completion of the baseline ecological surveys and the onset of works, there will be the requirement to repeat some survey work prior to the commencement of work and potentially (particularly at Graven Hill where construction will take place over a 13 year period), during the construction phase. This is likely to include preconstruction and ongoing development checks for new badger setts, survey work to inform applications to Natural England for European Protected Species Mitigation licences (e.g. for bats and Great Crested Newts) and vegetation checks for nesting birds.
  - Application for protected species licences and translocation of protected species where required.
  - Construction of an earth bund along the eastern boundary of the Fulfilment Centre on C Site and associated landscaping; and planting and ecological enhancements on both C Site and Graven Hill.
- 3.3.3 Further details of the above measures can also be found in Table 3.3 and the relevant technical chapters.

#### Enabling works, demolition and site clearance

3.3.4 The following will take place during this phase:





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- demolition of all buildings<sup>4</sup> on D and E Sites and demolition of buildings C1, C4, C7, C9, C11, C13, C21, C49, C60, C61 and C63 on C Site;
- removal of disused infrastructure such as drainage and utilities infrastructure;
- earthworks, which will involve the excavation and/or levelling of material to create finished ground floor levels;
- removal of material off-site; and
- upgrading or installation of foul water and surface water drainage networks and connection, if required, to existing networks on and off-site.
- 3.3.5 The earthworks will be designed to maximise re-use of appropriate materials in order to minimise removal of material off-site. Where feasible, material will be re-used on site, where this was not possible, material will be removed off-site using HGVs (and potentially by rail) and either re-used for an appropriate project (i.e. residential development) or taken to an appropriately permitted treatment facility for recovery.
- 3.3.6 On C Site, the proposed Fulfilment Centre building floor level has been taken as 1.5m above the ground level in the north-west corner in order to provide loading bays at the correct height to load onto HGVs. Therefore on the eastern side of the building the floor level will be between 2.4m and 4m below the current ground level. Appropriate clean material, excavated to construct the Fulfilment Centre, will be used to create the landscape buffer along the eastern edge of the building.

#### **Construction works**

- 3.3.7 In summary the construction of the proposed development will involve the following.
  - Setting up the construction site and implementing health, safety and management systems as well as security measures.
  - Construction of new roadways and refurbishment of existing roads within the proposed development and new access points into the Site.
  - Upgrades to existing off-site highway junctions where required.
  - Upgrading of existing or installation of services such as gas, electricity, water, telecommunications, foul drainage and storm drainage. These services will be positioned within service corridors adjacent to the road infrastructure to facilitate minimum disruption to site operation during future maintenance work. The SUDS system will be constructed at the earliest feasible stage of the proposed development. If required, settlement lagoons will also be constructed to contain site run-off, which may contain silt.

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<sup>&</sup>lt;sup>4</sup> It should be noted that there is the potential for retention of the group of six air raid shelters adjacent to building D2. However, the EIA has been undertaken on the assumption that all buildings on D and E Sites will be demolished.

- Construction of foundations and buildings. Once the buildings are built and weather-tight, work will commence on internal finishes, etc. This work is largely contained within the building shell and comprises the installation of lighting, heating and cooling systems (where required).
- Connection of the buildings to the services (gas, water, drainage, electricity and communications networks, etc.) installed within the Site.

#### **Construction management**

#### Introduction

3.3.8 In delivering the proposed development, the control of construction activities, to ensure adverse environmental effects are avoided, will be a key factor. In this regard, an overall Construction Environmental Management Plan (CEMP) will be implemented for the relevant phase of development. This will be supported by topic specific measures, a summary of which is provided in the relevant topic chapter of this ES.

#### **Overview of Construction Environmental Management Plan**

- 3.3.9 Contractors working on the proposed development will be required to prepare and then implement a CEMP, which will detail working practices and any other measures that form part of the proposed development for which planning permission will have been granted, including the environmental measures that are summarised in Table 3.3 (about which more detail is provided in chapters 6 to 14).
- 3.3.10 The CEMP will:
  - identify potential environmental effects associated with construction activities of the proposed development;
  - eliminate or minimise those significant effects that could harm the environment, or which may have negative social or economic repercussions;
  - enhance those effects identified as being positive and beneficial; and
  - monitor and audit environmental management progress (e.g. implementation of measures to mitigate environmental effects) against specific objectives.
- 3.3.11 The environmental measures for which developers and contractors will have responsibility will be included in the tender documents issued to contractors, so that contractors allow for these in their costs and method statements.
- 3.3.12 Contractors will be required to register the Site with the Considerate Constructors Scheme, a Government-endorsed Scheme which encourages good practice on construction sites. The Site Code of Considerate Practice, to which the contractor will be required to sign up to, is provided in Appendix C.







#### **Construction hours**

3.3.13 It has been assumed that construction activities will be restricted to between 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays. Work will not normally be carried out during the evening, night-time or on Sundays or Bank Holidays.

#### Traffic management

- 3.3.14 A Traffic Management Plan will be prepared prior to demolition and construction. Routes for construction traffic and construction deliveries will be restricted so that traffic will be routed to avoid existing sensitive receptors (such as housing and schools) in the vicinity of the Sites and within Graven Hill as it is built out and becomes occupied.
- 3.3.15 In the vicinity of the Sites, Graven Hill construction traffic will route via the A41 and A4421 and the C Site construction traffic route will be A41 B4011 Palmer Avenue Ploughley Road/Norris Road. The use of Ploughley Road through Ambrosden will be avoided.

#### Indicative demolition and construction programme

3.3.16 The proposed development at C Site will be completed by the end of 2014. Once this is commissioned then all operational activity from Graven Hill will vacate that site and move to C Site. The proposed development at Graven Hill will then take place in phases as described in Table 3.2.

#### Phasing for C Site

3.3.17 Table 3.1 summarise the three phases of development at C Site.

Phase and year(s)	Overview of development
Phase 1: 2013	Demolition of buildings to enable groundworks and levelling of the Site in preparation for the construction of the Fulfilment Centre. All demolition works could be completed within approximately three months. Upgrading of the railway along the western boundary of the Site and construction of adjacent new hardstanding to provide the new RRTA in order to provide the means to deliver construction materials via rail.
Phase 2: 2013-2014	Construction of the new Fulfilment Centre with the first stage (estimated to take around three months) comprising levelling of the Site. Creation of landscape bund using excavated material. Planting around east and north perimeters and the main gate area during the winter of 2013/14. The redevelopment of site access (main gate) and re-alignment of the perimeter security fencing in its vicinity. Screen planting and habitat creation works on the western boundary of the Site.
Phase 3: 2014	Construction of the superstructure of the Fulfilment Centre followed by the installation of internal finishes and services. Clearance of the north part of the Site and completion of other external hardstanding areas, drainage and services. Construction of remaining roadways and private parking. Transition of operational activity into building.

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#### Phasing for Graven Hill

- 3.3.18 A build programme is proposed from 2015 to 2026 to deliver 1650 homes within the CDC plan period. This assumes a residential build rate of an average of 150 homes per financial year. Integrated systems like the SUDS network will be implemented through the phases in order to serve each phase. The remaining 250 homes will be delivered beyond the plan period from 2026 to 2028. Therefore construction of Graven Hill will take 13 years in total.
- 3.3.19 The southern part of Graven Hill will be vacated by the MOD in 2015, and the existing buildings and infrastructure will then be made available for rent by civilian commercial companies.
- 3.3.20 In the northern part of Graven Hill, subject to outline planning approval in 2011/12, it is assumed that the first Reserved Matters applications will follow to enable site clearance in 2014 and development to commence in 2015.
- 3.3.21 Phasing at Graven Hill is illustrated in Figure 3.7. Table 3.2 summarises the indicative development programme for Graven Hill.

Phase	Overview of development
Phase 1	<ul> <li>Employment land uses</li> <li>Construction of approximately 2.8ha of B1(b), B1(c) and B2 light industrial units (depending on demand) and/or rental of existing industrial units (2015-2018)</li> <li>Residential land uses</li> <li>300 dwellings (2015/2016 to 2016/2017)</li> <li>Other land uses</li> <li>Upgrade of the two site access points (2015)</li> <li>Local centre (2015-2016)</li> <li>Opening up of Graven Hill woodland, hill top open spaces and provision of sports/allotments provision (2015-2016).</li> <li>Initial bus link via the new gateways and Circular Road.</li> <li>Primary school.</li> </ul>
Phase 2	<b>Employment land uses</b> Construction of approximately 11.7ha of B1(b), B1(c) and B2 light industrial units and B8 warehousing (2018-2023) <b>Residential land uses</b> Eastern neighbourhood area - 840 dwellings (2016/2017 to 2021/2022)
Phase 3	Employment land uses Construction of remaining B8 warehousing (2023-2027) Residential land uses Western neighbourhood area - 760 dwellings (2021/2022-2027/2028) Other land uses Potential Peripheral Road connectivity in place on Graven Hill Circular Graven Hill bus route in place.

#### Table 3.2 Phasing of development: Graven Hill







#### 3.4 **Operational management**

## Graven Hill

## Implementation

- 3.4.1 Appropriate arrangements will be made for the ongoing maintenance of public open space, water and drainage features and un-adopted roads situated throughout the Site. It is yet to be established whether these will be transferred to the local authority with a commuted sum or maintained privately through a management agreement.
- 3.4.2 The responsibility for maintenance of SUDS is placed on local authorities under the Flood and Water Management Act 2010. National standards are being prepared at These standards will address the way drainage systems are designed, present. constructed, maintained and operated. Where an approving body adopts a drainage system it becomes responsible for its maintenance. In maintaining the system, the adopting body must comply with national standards for sustainable drainage.

## **Traffic generation and management**

- 3.4.3 Once operational, Graven Hill will generate additional traffic, above the level currently generated by the Site, most of which will be from the residents of the proposed development travelling to and from the Site and employees and deliveries associated with the employment areas in the southern part of the development. There will also be some traffic associated with the local community using the local centre, the bus services running through the Site, occasional deliveries and domestic refuse removal services. The proposed scale and mix of uses at the Site have been used by OCC to forecast traffic generation during the operation of the Site.
- 3.4.4 As part of the TA, a Travel Plan (TP) (BIC/OPA/DOC/13) has been prepared for Graven Hill. This comprises a package of measures to be implemented during the operational phase of Graven Hill with the purpose of promoting greener, cleaner and more effective travel choices. The TP sets out several objectives in relation to sustainable travel and measures to achieve these objectives. It proposes that a committee is established to oversee the implementation of TPs for the both the residential development and individual workplaces within the development once established. A travel working group which includes OCC and CDC will also be established. The full TP will be agreed with OCC at least three months prior to the initial occupation of the development and will commit the developer to undertake site travel surveys with occupiers of the Site at the set intervals. Further information is available in the Graven Hill TP.
- 3.4.5 Traffic effects are discussed further in chapters 6, 7 and 8 in relation to traffic and traffic related air quality and noise effects respectively.

#### Waste management

Graven Hill will result in an increase in the generation of household waste in the local 3.4.6 area. The additional waste generation will require collection, treatment and disposal in accordance with waste management practices for the district. Community recycling

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facilities will be provided in the vicinity of the local centre and additional refuse storage facilities will be conveniently positioned for residents, well screened and of sufficient size. These will also be located where there is easy vehicular access for refuse vehicles. Details of these will be provided in a future reserved matters planning application. Each household will be provided with waste and recycling collections in line with that provided in the CDC area.

#### Landscape and green infrastructure management

- 3.4.7 The landscape management of Graven Hill will allow for the long term maintenance of the formal and informal open spaces, equipped play areas, native tree and shrub planting, woodland and other areas of planting. Management regimes will be devised to ensure the intended function of the open spaces and green corridors is maintained in the long term. All open spaces and green corridors will be managed to ensure their continued safe and practical use.
- 3.4.8 With regard to the long term management of Graven Hill Woodland, there are opportunities to obtain grants to enhance and encourage the quality of public benefits and retain and enhance natural woodland habitats and wildlife foraging. These grants include the Woodland Management Grant, Woodland Improvement Grant and Woodland Regeneration Grant, available from the Forestry Commission which endeavours to encourage public enjoyment and successful long term woodland management. The developer will be required to implement a habitat creation plan at the reserved matters stage of the project. In the longer term, a recreation and habitat management plan will be drafted in close consultation with BBOWT. These plans will be written by a suitably qualified ecologist.

#### C Site

#### Implementation

- 3.4.9 The Fulfilment Centre will operate 24 hours a day Monday to Friday with a 'skeleton' staff over the weekends and bank holidays to deal with priorities. The Sunday to Thursday shifts will be along the lines of alternate shifts of 06:00-14:15 and 14:00-22:15 with a fixed night shift of 22:00-06:15, which will operate primarily within the building minimising vehicle movements after 22:00. At the end of each shift there is a 15 minute handover period to staff working the next shift.
- 3.4.10 To deal with 'surge' requirements the numbers of staff working during the weekend and weekday will be temporarily increased using a pool of previously trained agency/ temporary staff as well as transferring of full time skilled staff to key positions.
- 3.4.11 In general, the day to day activities at the Site are organised as follows:

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- early shift (06:00-14:15) picking of orders, receipt of goods and deliveries and replenishing stock;
- late shift (14:00-22:15) picking, consolidation and loading of orders; and





- night shift (22:00-06:15) consolidation and loading of orders, replenishing stock and internal receipt of goods.
- 3.4.12 From 04:00-08:00 the central planning team will produce the picking plan for the next 24 hours and from this the daily picking requirements, allocation of resource, hourly monitoring targets, plus the immediate and routine replenishments requirements from the other reserve stock holding warehouses on C Site are automatically processed. This plan will be reviewed by the Operations Manager at the start of the early shift and amended if required, and staff briefed and allocated to the appropriate teams. Throughout the day the Operations and Shift Managers will review the activity versus plan progress, by the hour, and make any changes necessary to meet the daily work requirements.
- 3.4.13 Activities in external areas will comprise the movement of stock and freight containers between the RRTA, freight terminal, container storage and 'surge capacity' areas and unloading and loading of HGVs and rail freight. It is likely that stock will be moved around the Site using forklift trucks. Activities in external areas will be avoided during the night shift with activity being concentrated within the Fulfilment Centre building. However, during 'surge' periods there may be a need for external movement of stock to take place during the night shift.

#### **Traffic generation and management**

- 3.4.14 Once operational, C Site will generate additional traffic associated with stock being delivered to, and taken away from the Site. There will also be some vehicle movements associated with staff which will largely occur during the shift handover periods.
- 3.4.15 A package of measures is proposed in the Travel Plan (TP) for C Site (BIC/OPA/DOC/14). The TP will be implemented by the MOD as part of the overall management of C Site and a committee (TPC) will be set up to oversee its implementation as well as working group established. The TP requires that the MOD to undertake a site travel survey of employees based at the Site every two years from initial occupation of the new buildings and a traffic survey count every five years. The results from this monitoring will be issued to CDC. Further information can be found in the C Site TP.
- 3.4.16 Traffic effects are discussed further in chapters 6, 7 and 8 in relation to traffic and traffic related air quality and noise effects respectively.

#### Landscape/ecological management plan

3.4.17 Areas of habitat to be created or enhanced on-site will be subject to habitat creation and management plans, to be written by a suitably qualified ecologist and implemented by the MOD.

#### **Environmental management**

It is an MOD objective to have all activities on the defence estate covered by an 3.4.18 Environmental Management System (EMS) based on ISO 14001. MOD Joint Services Publication 418 sets out the framework for the MOD EMS. At C Site a site

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specific EMS is currently in place. This currently includes measures to manage and mitigate potential environmental effects associated with activities and potential risks and incidents at the Site such as the receipt, storage and dispensing of fuel and tanker deliveries. The activities on-site and management measures are monitored regularly. Measures identified as part of the EIA to manage potential future environmental effects associated with the long-term operation of the Fulfilment Centre and its associated activities will be included in the C Site EMS.

# 3.5 Decommissioning specification

3.5.1 The EIA regulations require consideration be given to decommissioning. However, mixed use developments of the type proposed do not have a finite life and hence decommissioning cannot be sufficiently well defined (in terms of timing and extent) to enable the assessment of likely effects. This is not included in the scope of this assessment.

## 3.6 Implementation of environmental measures

3.6.1 Table 3.3 summarises the proposed environmental measures that form part of the proposed development to mitigate environment effects, as well as the mechanism which will be used to ensure that these measures are implemented as part of the proposed development. Greater detail on these measures can be found in each of the technical assessment chapters.

Environmental measure	Responsibility for Implementation	Compliance mechanism
General measures		
<b>Both sites</b> : Restriction of construction working hours so that construction activities take place between 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays. Work will not normally be carried out during the evening, night-time or on Sundays or Bank Holidays.	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
Traffic		
<b>Graven Hill</b> : Highway works and junction remodelling to help alleviate congestion from the proposed development.	Highway authority	Planning condition and S278 Agreements.
<b>C Site</b> : Routeing of HGV traffic through C Site to north and west to avoid disturbance to residents on eastern side of C Site. Road along eastern boundary of Fulfilment Centre is for staff only.	MOD	The planning permission will be tied to the master plan/Section 106 agreement.
Both sites: Travel Plans for each of the Sites.	Developer/Site Contractor/MOD	Planning condition.
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#### Table 3.3 Implementation of environmental measures





Environmental measure	Responsibility for Implementation	Compliance mechanism
<b>Both sites</b> : Preparation and implementation of a Construction Traffic Environmental Management Plan (CEMP) to encourage access to the Site by alternative modes of travel to the car and to control HGV traffic movements (including monitoring strategy).	Developer/Site Contractor	CEMP will be implemented through a planning condition.
<b>Both sites</b> : Implementation of a wheel washing to prevent spread of mud and dust off-site during construction.	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
Air quality		
<b>Both sites:</b> Measures in line with Best Practice Guidance to be defined in a Construction Environmental Management Plan.	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
<b>Both sites:</b> Preparation of a dust management plan during construction to detail best practice dust suppression methods to mitigate effects including wetting of stockpiles, sheeting of HGV loads, wheel washing, regular road cleaning and where possible locating potential dust-producing activities away from receptor locations.	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
<b>Graven Hill</b> : The proposed development has been designed so that sensitive receptors are not located in close proximity to sources of odour so that odour effects are not experienced at future residential receptor locations.	Developer/Site Contractor	The planning permission will be tied to the masterplan
<b>Graven Hill:</b> Detailed assessment of the CHP energy centres proposed within the development will be undertaken at the reserved matters stage of the proposed development following viability studies when sufficient detailed information will be available to undertake such an assessment.	Developer	Requirement of a planning condition
Noise		
<b>Both sites:</b> Implementation of measures to control noise from construction machinery and activities including compliance with noise limit:	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
Construction noise + existing ambient noise not to exceed 65dB $L_{Aeq, 12hr}$ (0700-1900hrs) at the worst affected existing residential properties.		Prior Consent Agreement under Section 61 of the <i>Control of</i> <i>Pollution Act 1974</i> (CoPA).
<b>Graven Hill:</b> Locating parking and delivery bays to rear of Local Centre to minimise noise effects on nearby residents.	Developer	The planning permission will be tied to the masterplan/Section 106 agreement
<b>Graven Hill:</b> Residential units designed to achieve, at minimum, the 'reasonable' internal noise level criteria of BS8233:1999 for living rooms and bedrooms.	Developer/Site Contractor	Requirement of a planning condition
<b>Graven Hill:</b> Consideration given to positioning external living areas (gardens etc.) on the opposite side of residential units from the major road/rail noise sources.	Developer	To be reviewed as part of detailed design.
<b>C Site:</b> Internal routeing of (HGV) site traffic through the Site to north and west to avoid disturbance to residents on eastern side of C Site. Road along eastern boundary of Fulfilment Centre is for staff only.	MOD	The planning permission will be tied to the masterplan/Section 106 agreement

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Environmental measure	Responsibility for Implementation	Compliance mechanism
Community and socio-economics		
<b>Graven Hill:</b> Education - A new two form entry primary school for 420 pupils on a Site which can accommodate a three form entry school. Developer funding for secondary school education.	Developer	Section 106 agreement/planning permission will be tied to masterplan.
<b>Graven Hill:</b> Community facilities to accommodate needs of new residents (on-site community hall, local shops and food store, sports pitches, play spaces, allotments, public open space and woodland park). Developer funding for off-site community facilities to support the new residents at Graven Hill where required.	Developer	Section 106 agreement/planning permission will be tied to masterplan.
Historic environment		
Graven Hill : Investigation and recording of sub- surface archaeological remains within Graven Hill.	Developer	Planning Condition
<b>Graven Hill</b> Earthworks will be avoided in the layout of the new paths.	Developer	Detailed Design
<b>Graven Hill</b> Recording of military buildings in advance of demolition. The level of detail required will reflect the nature of the individual buildings but it anticipated that it will generally comprise a Level 3 record (English Heritage, 2006).	Developer	Planning Condition
<b>C Site:</b> Retention of C Site Romney huts (C30 and C31) which have been identified as forming well-preserved groups of a particular type of building.	MOD	Planning permission will be tied to the masterplan.
Landscape and visual		
<b>Both sites:</b> Implementation of measures (for example fencing) to ensure that the root zones of retained trees and hedgerows are protected from construction activities such as excavation	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
		Compliance with BS 5837: 2005.
<b>Both sites:</b> Construction management measures (sensitive location of construction compounds and storage of materials, routing traffic to avoid sensitive visual receptors (residential properties), control of litter, minimise effects of security lighting by directing towards construction areas and away from sensitive receptors, minimising the duration of works to the upper, more visually exposed parts of buildings and manage use of cranes).	Developer/MOD/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
<b>Both sites:</b> Detailed lighting design to minimise visual intrusion.	Developer/MOD/Site Contractor	Planning condition/Reserved matters application.
<b>Graven Hill:</b> Restriction of new development and provision of height limit towards upper hillside.	Developer	The planning permission will be tied to the masterplan/Section 106 agreement
<b>Graven Hill:</b> Retention and management of existing woodland and planting of new woodland.	Developer	The planning permission will be tied to the masterplan/Section 106 agreement Woodland management plan
Graven Hill: Advance planting to landscape spaces	Developer/Site	Planning condition/Reserved

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Environmental measure	Responsibility for Implementation	Compliance mechanism
and perimeter areas.	Contractor	matters application.
Graven Hill: Detailed design of perimeter 'buffer zones' design including ground modelling and planting to address sight lines.	Developer/Site Contractor	Planning condition/Reserved matters application.
<b>C Site:</b> Maximum distance between Fulfilment Centre and eastern boundary of Site and implementation of mound with planting along eastern boundary to provide screening for residents in adjoining Green Lane and Norris Road with views from eyeline (1.75m).	MOD	The planning permission will be tied to the masterplan/Section 106 agreement
<b>C Site:</b> Sensitive treatment of of external facades of the Fulfilment Centre (i.e. use of gradation of colour to external cladding to upper levels of the building and the use of non reflective materials).	MOD	Planning condition/Reserved matters application.
<b>C Site:</b> Detailed design of engineering works to provide screen mounding at Site perimeters.	MOD/Site Contractor	Planning condition/Reserved matters application.
C Site: Early implementation of screen mounding.	MOD/Site Contractor	Planning condition/Reserved matters application.
<b>C Site:</b> Early completion of improved landscape setting around C Site main gate.	MOD/Site Contractor	Planning condition/Reserved matters application.
<b>C Site:</b> Early completion of landscape 'buffer' on west and north of the Site in conjunction with Sustainable drainage and habitat creation objectives.	MOD/Site Contractor	Planning condition/Reserved matters application
Biodiversity		
<b>Both sites:</b> Dust, lighting and noise control measures to avoid effects on off-site statutory and non-statutory nature conservation sites and sensitive flora within the Sites including watercourses as outlined in the Environment Agency's Pollution Prevention Guidelines	Developer/MOD/Site Contractor	Requirement of CEMP which will be implemented through a planning condition.
<b>Both sites:</b> Low level lighting strategy both during construction and operation to avoid effects on bird population using Bicester Wetland Reserve, wildlife using Graven Hill CW/S, badgere, bats, reptiles	Developer/MOD/Site contractor	Construction: Requirement of CEMP which will be implemented through a planning condition.
using Graven Fill GvvG, badgers, bals, replies		Operation: Detailed design & planning condition
<b>Both sites:</b> No vegetation clearance to occur during bird breeding season. Alternatively if this is not possible, vegetation clearance will be supervised by an ecological clerk of works to ensure that no nests are damaged.	Developer/MOD/Site contractor	Planning condition
<b>Graven Hill:</b> Access for recreational users will be restricted to northern part of the CWS to manage potential disturbance from increased recreational pressure.	Developer/Long term management of CWS	Management Plan will be implemented as requirement of planning condition.
<b>Graven Hill</b> : The drainage scheme has been designed to ensure that the area of wet woodland still receives sufficient ground and surface water to sustain this type of habitat.	Developer/Site contractor	Planning condition/Management plan
<b>Graven Hill:</b> New areas of broad-leaved woodland to be planted extending the coverage of Graven Hill Wood as well as creating additionally wooded areas	Developer/Site contractor	Planning condition/Management Plan

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Environmental measure	Responsibility for Implementation	Compliance mechanism
across the Site to mitigate effects from loss of woodland on site.		
<b>Graven Hill:</b> Enhancement of 10.8ha of retained semi-improved grassland to create a wildflower meadow situated amidst a mosaic of other habitat types (i.e. scrub and waterbodies). Retention of standard trees where possible. Creation of new marginal vegetation associated with the additional waterbodies and SUDS.	Developer/Site contractor	Habitat creation and management plans will be implemented as requirement of planning condition.
<b>Graven Hill:</b> Creation of approximately 25-30 waterbodies located on-site, both as part of the SUDS and through enhancement measures for nature conservation.	Developer/Site contractor	Planning condition/Management Plan/Detailed drainage strategy.
Graven Hill: planting of 1.4km of species-rich hedgerow and standard trees comprising native species of local origin.	Developer/Site contractor	Planning condition/Management Plan.
<b>Graven Hill:</b> Translocation of common spotted orchids from within the development area will be translocated to the newly created wildflower meadow.	Developer/Site contractor	Planning condition/Management Plan.
<b>Graven Hill:</b> Incorporation of SUDS to stabilise peak flows mitigating potential changes to drainage and hydrology of Langford Brook as a result of fluctuating water levels.	Developer/Site contractor	Planning condition.
<b>Graven Hill:</b> Provision of two artificial badger setts, enhanced areas of habitat for foraging badger including additional planting of fruit and nut bearing trees and green corridors linking badger setts across the Site to the wider countryside. Where necessary, sett closures will be carried out under a Natural England badger development licence. Artificial setts to be located in 'quiet areas' of Graven Hill CWS.	Developer/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
<b>Graven Hill:</b> Provision of alternative roosting sites for bats in advance of any works affecting existing roosts comprising incorporation of bat tiles and bat bricks within new commercial buildings to permit access to roof spaces and installation of 30 bat boxes in the areas of existing broad-leaved woodland and on mature standard trees where appropriate.	Developer/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
<b>Graven Hill:</b> Retention of bat foraging habitat wherever possible. Increased provision of woodland habitat on-site and construction of new ponds within a mosaic of other habitats providing an optimal foraging resource. Incorporation of new green corridors within the proposed development design for foraging and commuting bats.	Developer/Site contractor	Planning condition/Management Plan.
<b>Graven Hill:</b> Provision of additional areas of broad- leaved woodland and hedgerow incorporating a number of fruit and nut bearing species suitable as a foraging resource for dormice. Existing hedgerows will also be enhanced for dormice through the incorporation of hazel and fruit and nut bearing species. All habitat to be lost will be replaced on a 'like for like' basis, and where appropriate a phased approach to the removal of dormouse habitat will be adopted. 50 dormouse boxes are to be installed	Developer/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.

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Environmental measure	Responsibility for Implementation	Compliance mechanism
within Graven Hill Wood. Provision of green corridors linking areas of dormouse habitat across the Site to the wider countryside.		
<b>Graven Hill:</b> Provision of new areas of optimal aquatic and terrestrial habitat for GCN. Natural England GCN mitigation licence detailing appropriate mitigation and enhancement measures.	Developer/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
<b>Graven Hill:</b> Creation of areas of optimal habitat for reptile species. All works to be subject to a reptile mitigation method statement to be agreed with Natural England and implemented in advance of the works.	Developer/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
<b>Graven Hill:</b> Provision of adequate cover/refugia for reptiles in newly created areas of habitat. Leaflet drop to new residential areas highlighting conflict between cats and wildlife, and suggesting domestic cats wear bells.	Developer/Site contractor	Planning condition/Management Plan.
<b>Graven Hill:</b> Enhancement of semi-improved grassland flanking Graven Hill Wood through the creation of a mosaic of habitats. This will also include additional planting of blackthorn (for brown hairstreak butterflies), creation of a wildflower meadow, rotational management of grassland and the provision of dead wood and log pyramids.	Developer/Site contractor	Planning condition/Management Plan.
Graven Hill: Enhanced provision of optimal habitat for birds and installation of bird boxes around the Site.	Developer/Site contractor	Planning condition/Management Plan.
<b>Graven Hill:</b> Public footpaths to be opened within Graven Hill Wood and the grassland that flanks this. Footpaths restricted to northern half of woodland, to ensure 'quiet' areas retained for nature conservation. Provision of wildlife information boards as an educational resource within Graven Hill Wood.	Developer/Site contractor	An integrated recreation and habitat management plan will be written covering Graven Hill Wood CWS and surrounding habitats the requirement for which will be implemented through a planning condition.
<b>C Site:</b> Incorporation of SUDS within the proposed development design to prevent changes in water flows and quality reaching the River Ray (upstream of which is Arncott Bridge Meadows SSSI).	Developer/Site contractor	Planning condition.
<b>C Site:</b> retention of all badger setts (to be confirmed during detailed design). Provision of enhanced areas of habitat for foraging badger including additional planting of broad-leaved plantation containing areas of fruit and nut bearing trees. Installation of temporary fencing around setts that are located within 30m of construction areas.	Site contractor/MOD	Planning condition/CEMP/ Management plan/license to be obtained from Natural England (if required).
<b>C Site:</b> Provision of alternative roosting sites for bats (to compensate for potential loss of two small common pipistrelle summer roosts, comprising incorporation of bat bricks and bat tiles within the new development and 20 bat boxes on mature trees located on-site.	MOD/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
<b>C Site</b> : Retention of bat foraging habitat. Increased provision of woodland habitat on-site and construction of new ponds within a mosaic of other habitats providing an optimal foraging resource.	MOD/Site contractor	Planning condition/Management Plan/requirement of license to be obtained from Natural England.
C Site: Provision of new areas of optimal aquatic and	MOD/Site contractor	Planning condition/Management

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En	vironmental measure	Responsibility for Implementation	Compliance mechanism
terr Nat app	estrial habitat for GCN. All works to be subject to a ural England GCN mitigation licence detailing ropriate mitigation and enhancement measures.		Plan/requirement of license to be obtained from Natural England.
C S plan bea dorn woo des with	<b>ite:</b> Provision of additional areas of broad-leaved nation incorporating a number of fruit and nut ring species suitable as a foraging resource for mice. Incorporation of arboreal ropes and odland planting within the proposed development ign linking existing isolated populations of dormice the wider landscape.	MOD/Site contractor	Planning condition/Management Plan.
<b>C Site:</b> Enhancement of 7.3ha of retained amenity grassland to create a wildflower meadow situated amidst a mosaic of other habitat types (i.e. scrub and waterbodies). Standard trees will be retained wherever possible. The loss of marginal vegetation associated with the drainage ditches compensated for through the creation of new marginal vegetation associated with the additional waterbodies and SUDS.		MOD/Site contractor	Planning condition/Management Plan. Habitat creation plan and a habitat management plan, to be written by a suitably qualified ecologist and implemented through a planning condition.
Wa	ter resources		
<b>Bot</b> par	<b>h sites:</b> Implementation of measures included as of a CEMP to include:	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition
•	bunding of chemical and fuel stores to 110% of capacity;		
•	pollution incidence response plan to deal with any accidental spillages or leaks;		
•	maintenance and re-fuelling of vehicles and equipment on hardstanding; and		
•	direction of Site run-off (which may contain silt) into settlement lagoon(s).		
Bot amo Site	<b>h sites:</b> Implementation of SUDS to control the bunt and quality of surface water drainage from the s.	Developer/Site Contractor	Planning condition / Approval by OCC.
Bot	Both sites: Flood risk management measures: Developer/Site The planning permission		The planning permission will be
•	locating all building development in flood zone 1;	Contractor	agreement.
•	any development in flood zones 2, 3a and 3b to comprise open spaces or landscaping; and		
•	raising floor areas to 0.15m or above local ground levels (Graven Hill only).		
Bot the rece Bro	<b>h sites:</b> A Discharge Consent will be obtained for discharge of surface water run-off to the proposed eiving watercourses (i.e. tributaries of the Langford ok and River Ray) respectively.	Developer/MOD/ Site Contractor	Planning condition.
Lar	d quality		
Bot CEI	<b>h sites</b> : Implementation of measures as part of a MP to include:	Developer/Site Contractor	Requirement of CEMP which will be implemented through a planning condition
•	avoid loss of topsoil by reuse in greenspace areas/gardens or re-use in other projects;		
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Environmental measure		Responsibility for Implementation	Compliance mechanism
•	pre-construction survey of existing land drainage;		
•	topsoil and subsoil will be stripped separately, where possible in dry weather;		
•	topsoil and subsoil will be stored separately in accordance with best practice e.g. Construction Code of Practice for the Sustainable use of Soils in Construction Sites (Defra 2009);		
•	minimising soil compaction; and		
•	reinstated soils.		
Higher intensity of intrusive investigation in the areas to be developed (especially in areas on or adjacent to identified contaminant sources) to fully characterise the Sites, e.g. housing on Graven Hill, E Site Tip Area, proposed Primary School (Graven Hill), commercial /industrial development at C Site.		Developer/Site Contractor	Planning condition.
Implementation of a waste management plan which will detail measures for the disposal and management of solid waste created during construction which will encourage the minimisation of waste and re-use and recycling of construction materials.		Developer/Site Contractor	Planning condition.







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	Residential	A5 dha
	355 Orimoni School	3 dba
	SPE Primary School	3.4113
-	Hotel / Pub / Restaurant	1.5ha
	Community Hall	0.4ha
	Supermarket	0.6ha
	Local Shops	0.8ha
	Offices	0.6ha
	Light Ind. (BZ)	5.7ha
	Storage (B8)	18.6ha
-	Public Open Space	29.6ha
	Woodland / Buffer	64.8ha
	Amenity Grassland	9.9ha
	Allotments	4.0ha
	Energy Use	0.9ha
	St Davids Barracks	30.0ha
	Peripheral Road	3.7ha
	Rail Infrastructure	10.0ha
	Total Area	07.23ha
Approx.	1,900 dwellings at 34 dph	



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Redevelopment of MoD Bicester Environmental Statement

Figure 3.1 Graven Hill Land Use Plan

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Redevelopment of MOD Bicester Environmental Statement

Figure 3.2 Graven Hill Illustrative Masterplan

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		Proposed	4x
Hardstanding Road	Hardstanding	Exeting Building CP	Rallway
Section D - Ploughley Rd.			





# 4. Approach to preparing the ES

## 4.1 The EIA process

- 4.1.1 The preparation of the ES is one of the key stages in the EIA process, as it brings together information about any likely significant environmental effects, which CDC, as the competent authority responsible for determining the planning application, will use to inform its decision about whether or not to grant outline permission for the proposed development.
- 4.1.2 The steps to be followed in the EIA process are summarised in Box 4.1. These are based on the EIA Regulations, government guidance and good practice. They require inputs not only from the team that prepares the ES, but also from the developer and competent authority. Following a short section on terminology, the remainder of this chapter provides further information about some of the key steps in the process.

#### Box 4.1 Steps in the EIA process once the requirement for EIA has been established

- defining the project, including consideration of the need for the project and alternatives for meeting this need;
- deciding on the likely significant effects that need to be assessed and how the necessary assessments will be carried out;
- using the scoping report as a basis for consulting over the scope of the assessment that is reported in the ES and
  refining the scope in response to the comments that are received (with this refinement process continuing as the
  proposals for the proposed development and the understanding of its environmental effects evolve);
- assembling further information about the baseline environmental conditions that relate to the likely significant effects;
- determining whether this baseline is relevant to the assessment or whether it is more appropriate to predict how the baseline will have changed by the time that the development is constructed or operated;
- identifying measures to avoid, reduce or compensate for negative effects, or to increase the environmental benefits
  of the proposed development, and liaising with the project design team to incorporate these (where possible) into
  the proposals;
- ongoing consultation with statutory consultees and other interested parties, as appropriate;
- assessing the magnitude and other characteristics of the environmental effects being assessed;
- evaluating the significance of the predicted effects;
- collating the findings in an ES and summarising the findings in a non-technical summary (NTS);
- submission of the ES to the relevant competent authority;
- decision-making, which may involve inter alia ongoing negotiation and requests for further information;
- · informing stakeholders of the decision on whether or not the development is to be permitted; and
- ongoing environmental monitoring, assessment and other work, as required, including screening for the need for a further ES to be prepared in relation to the reserved matters development.



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#### 4.2 EIA terminology

4.2.1 In some ESs, the terms 'impacts' and 'effects' are used interchangeably, whilst in others the terms are given different meanings. Some use 'impact' to mean the cause of an 'effect' whilst others use the converse meaning. This variety of definitions has led to a great deal of confusion over the terms, both among the authors and the readers of ESs.

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- 4.2.2 The convention used in this ES is to use 'impacts' only within the context of the term EIA, which describes the process from scoping through ES preparation to subsequent monitoring and other work. Otherwise, this document uses the word 'effects' when describing the environmental consequences of the proposed development. Such effects come about as a result of:
  - physical activities that would take place if the proposed development were to proceed (e.g. vehicle movements during construction operations); and
  - environmental changes that are predicted to occur as a result of these activities (e.g. loss of vegetation prior to the start of construction work or an increase in noise levels). In some cases one change causes another change, which in turn results in an environmental effect.
- 4.2.3 The environmental effects that are predicted to result are the consequences of the environmental changes for specific environmental receptors (e.g. for bats from the loss of roosting sites or foraging areas, or for people from an increase in noise levels, etc.).
- 4.2.4This ES is concerned with assessing the effects of the proposed development, rather than the activities or changes that cause them. However, this requires these activities to be understood and the likely resultant changes identified, often based on predictive assessment work. An example of how a physical activity and environmental change can lead to an environmental effect is given in Box 4.2.

#### Box 4.2 Example of activities and environmental changes leading to an environmental effect

For a development that involves extensive earthmoving, mobile plant might undertake a number of activities related to the excavation of materials, including soils, superficial deposits and rock strata. These activities would lead to an increase in background noise levels that it might be determined could have significant effects on people living nearby and on wildlife. It would therefore be necessary to assess the change in noise levels, drawing on data from plant manufacturers to determine the amount of noise each item of plant would generate when undertaking excavation and other activities and comparing this with the baseline conditions in the absence of the proposed development. For each receptor that could be significantly affected, an assessment would be made of the effects caused by the change in noise levels.

#### Scoping and evolution of the proposed development 4.3

## Scoping

4.3.1 Scoping involves identifying:

> the people and environmental resources (collectively known as 'receptors') that could be significantly affected by the proposed development; and

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- the work required to take forward the assessment of these potentially significant effects.
- 4.3.2 AMEC's approach to scoping accords with DETR Circular 02/99 Environmental Impact Assessment, which states that:

"In many cases, only a few of the effects will be significant and will need to be discussed in the ES in any depth. Other impacts may be of little or no significance for the particular development in question and will need only very brief treatment to indicate that their possible relevance has been considered".

- 4.3.3 The approach undertaken for this proposed development has involved scoping being started at the outset of the work on the EIA, with the initial conclusions about the potentially significant effects of the proposed development being set out in a scoping report, which was written by the DIO (DIO, 2011). The preparation of this report was informed by the legislative and policy context relevant to the proposed development.
- 4.3.4 At the scoping report stage, the conclusion that is made about significance, is based upon professional judgement, with reference to the proposed development description, and drawing on, as appropriate, available information about the magnitude and other characteristics of the potential changes that are expected to be caused by the proposed development, receptors' sensitivity to these changes, the effects of these changes on relevant receptors and, the value of receptors. If the information that is available at the scoping report stage does not enable a robust conclusion to be reached that a potential effect is not likely to be significant, the effect is then taken forward for further assessment.
- 4.3.5 The scoping report for the proposed development was submitted for comment to CDC and others (see Table 4.1). CDC issued a scoping opinion on 11 April 2011, a copy of which is included in Appendix B. The scope of the assessment was progressively refined subsequent to the issue of the scoping report in response to comments from consultees (see section 4.4), the environmental information resulting from survey or assessment work, and the evolution of the proposed development (see section 2.3).
- 4.3.6 The technical chapters (6-14) detail the final scope of the assessment in relation to effects that it was considered could be significant and hence needed to be subject to more detailed assessment. These chapters also include (where appropriate) an explanation about why other effects that were initially identified as potentially significant are not likely to be significant. All other effects (i.e. that are not referred to in the technical chapters) are not potentially significant.

## Proposed development evolution and design iteration

4.3.7 Even before the start of the EIA process, many development proposals are informed by environmental considerations. For example, early decisions might be made to avoid direct effects to designated nature conservation or cultural heritage features and there will often be recognition of the need to implement standard measures to control noise and dust emissions, and to minimise the risk of pollution incidents. Further opportunities to avoid or reduce potential negative effects, or to deliver environmental

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enhancements, may be identified whilst preparing the scoping report. Some of these opportunities will become part of the proposed development for which consent is being sought. The iterative process of proposed development evolution, whereby design changes are made in response to environmental information and the amended proposed development is then subject to further assessment work, leading to further design changes (and so on), continues through to a 'design freeze' at which stage detailed work to assess the effects of the finalised proposed development can be completed.

4.3.8 AMEC's approach to EIA is to assess the effects of the proposed development as they stand at the 'design freeze' i.e. incorporating the environmental measures that have been designed into the proposed development.

## 4.4 Consultation

4.4.1 A scoping report was prepared in March 2011 by DIO (DIO, 2011) and issued to the consultees listed in Table 4.1 for comment on the proposed scope of the assessment. A copy of the responses received are provided in Appendix B and also discussed in more detail in the technical chapters, which also provide information on how comments raised were addressed in the assessment, if required. A copy of the scoping report is available on request.

Written response received?
Yes
Yes
Yes
Yes
No comments received
No comments received
Yes

#### Table 4.1 Consultees contacted for comment on the scoping report

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Consultee	Written response received?
The Environment Agency	Yes
English Heritage	Yes
The Highways Agency	Yes
Buckinghamshire, Berkshire and Oxfordshire Wildlife Trust	Yes
Bicester Local History Society	Yes
Thames Water	No comments received

- 4.4.2 In addition, to comments on the scoping report, some consultees were contacted directly regarding the technical assessment work. Further information about this additional consultation is provided in the technical chapters (chapters 6-14) where relevant. The assistance of these bodies is gratefully acknowledged.
- 4.4.3 At the time of preparing the scoping report the potential redevelopment of A Site formed part of the overall planning application and therefore the scope of the assessment included potential effects from the redevelopment of A Site. Subsequently DIO decided to dispose of A Site without obtaining planning permission to redevelop the site and therefore this no longer forms part of the scope of the EIA.

## 4.5 Overview of assessment methodology

## Introduction

- 4.5.1 All of the topic assessments presented in the ES have been undertaken on the basis of a common understanding of the nature of the proposed development, as summarised in chapter 3, for more detail see the DAS (BIC/OPA/DOC/07). For each topic, the detailed assessment of likely significant effects has been undertaken by people with relevant specialist skills, drawing on their experience of working on other development projects, good practice in EIA and on relevant published information. For some topics, use has been made of modelling or other methodologies.
- 4.5.2 The generic approach that has been adopted to defining the baseline for the assessment is set out in the following sub-section. Details of topic-specific assessment methodologies are provided in the topic chapters (6-14).
- 4.5.3 Except for those topics for which any potentially significant effects are assessed as not likely to be significant, each topic chapter follows a common format, as outlined below:
  - 1) introduction;
  - 2) policy and legislative context;
  - 3) data gathering methodology;

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- 4) overall baseline (where appropriate, further detail is set out under section 9 on the assessment of potential effects);
- 5) environmental measures incorporated into the proposed development;
- 6) scope of the assessment;
- 7) assessment methodology;
- 8) assessment of effects where appropriate, dealing separately with each receptor or category of receptors that could be significantly affected - the assessment is made against the predicted future baseline and, in so doing, incorporates consideration of any cumulative effects; and
- 9) conclusions of significance evaluation.
- 4.5.4 The exceptions to this structure are where only a limited amount of assessment work was necessary to demonstrate that any potentially significant effects are not likely to be significant (i.e. all effects under a particular topic are 'scoped-out'). For these chapters a brief overview of baseline conditions and the data gathering process is provided (to support the explanation as to why effects are unlikely to be significant). Details are provided of the relevant environmental measures incorporated into the proposed development and a summary as to the reasons why the predicted effects are not significant.

## Baseline for the assessment

## **Current and future baseline**

- 4.5.5 The assessment of potentially significant effects requires a comparison to be made between the likely environmental conditions in the presence of the proposed development and in its absence (i.e. the 'baseline'). As the various elements of the proposed development will be built over a period of 15 years and then operated indefinitely, it cannot be assumed that the baseline conditions in the absence of the proposed development will be the same as at present. This reflects changes that are likely to occur, which have the potential to modify the current environmental conditions (e.g. new development).
- 4.5.6 It is therefore necessary to undertake the assessment in relation to the baseline conditions that are likely to occur in the years that are selected for assessment. For most topics this is the completion date of 2028 when the proposed development at Graven Hill will be complete. However, it was agreed with OCC that the assessment of traffic effects (chapter 6) should be based on transport modelling work which looked at effects for the year 2031. This considered the completed Graven Hill and C Site proposals as well as other cumulative developments. Therefore 2031 has been used in this ES for the assessment of traffic related air quality and noise effects. Further information is provided in chapter 6.
- 4.5.7 Where it is concluded in the ES that aspects of the current conditions are likely to represent the future baseline in 2028 (or 2031), the predicted future baseline reflects

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current conditions. Where this is not the case, the future baseline has been extrapolated or otherwise predicted using:

- information about existing environmental conditions;
- modelling outputs;
- information about other developments that are under construction or that are likely to occur and could affect relevant aspects of the environment; and
- information about any other likely changes that could affect environmental conditions.
- 4.5.8 In combination, this information has been used to predict the likely baseline conditions when the proposed development is constructed and operated. It is against these predicted baseline conditions that the assessment has been carried out.

### **Cumulative effects**

- 4.5.9 Future baseline conditions have been considered by identifying the developments (and other land use/environmental changes) that are likely to happen over the same time period as the proposed development. This approach to defining the future baseline conditions has been used to address the requirements under the EIA Regulations to consider cumulative effects.
- 4.5.10 Committed (i.e. approved) developments within and around Bicester and Arncott comprise the following.
  - Kingsmere Development, south-west Bicester: This comprises up to 1,585 residential units; health village to include health and employment uses and elderly persons nursing home; B1 and B2 employment uses; local centre comprising of shops, a pub/restaurant, children's day nursery, offices and a community centre; two primary schools and a secondary school; hotel; sports pavilion; formal and informal open space; a link road between A41 and Middleton Stoney Road/Howes Lane junction; associated new roads, junctions, parking, infrastructure, earthworks and new accesses to agricultural land. Construction work on the first phase of this development is currently taking place.
  - A41 business park, South Bicester: This will comprise a 60,000m<sup>2</sup> business park incorporating offices (B1) and hotel (C1), parking for up to 1,837 cars, associated highway, infrastructure and earthworks.
  - Evergreen 3: This will involve constructing a short connecting rail line just south of Bicester, where the Chiltern Railways' London-Birmingham line crosses over the proposed east-west line which will run between Oxford and Milton Keynes. The Oxford-Milton Keynes line will be upgraded from just east of Bicester Town station to Oxford, to restore the double track and install new signalling and safety systems. Bicester Town and Islip stations will be rebuilt and additional platforms provided at Oxford, whilst a new station will be constructed near Water Eaton. A twice hourly service will then run between Oxford and London. Within the







vicinity of Graven Hill, these proposals will involve the realignment of Langford Lane further to the south and new bridge over the railway line.

- Immigration centre, Piddington: This will comprise the demolition of existing buildings and erection of an Immigration Removal Centre including an Accommodation Building (seven wings plus a Central Facilities Block) a Gate House, Visitor Centre and Energy Centre, car parking, access road, 5.2m fence and ancillary hard standing and landscaping.
- North West Bicester Eco-town First Phase Exemplar: 393 residential units, an energy centre, car parking, landscaping and amenity space, a nursery, a community centre, three retail units, an Eco-Business Centre, office accommodation, an Eco-Pub and a primary school site.
- 4.5.11 The potential environmental effects from these consented developments have been considered as part of the future baseline conditions around the Site in 2028 (the year in which the proposed development will be completed) to ensure that cumulative effects from approved developments are assessed.
- 4.5.12 In addition to the developments listed above, the traffic modelling has included traffic from the potential eco-town development of 5,000 residential units, employment and supporting uses at North West Bicester even though a planning application for this development has not yet been submitted. The traffic modelling has also taken into account traffic from other consented development in wider highway network (see Table 6.5). Therefore, the assessments in relation to traffic related effects in chapters 6, 7 and 8 also take into account the effects from this development.
- 4.5.13 The location of these developments is shown in Figure 4.1.

## Approach to significance evaluation

- 4.5.14 One of the requirements of an ES is to set out the conclusions that have been reached about the likely significant environmental effects of the proposed development that has been assessed. Reaching a conclusion about which effects, if any, are likely to be significant involves:
  - assessing the potentially significant effects that are identified at the scoping stage (see section 4.3) (and any causal environmental changes); and
  - determining whether or not these effects are likely to be significant.
- 4.5.15 Chapters 6-14 describe the approach that has been used in assessing effects and evaluating their significance, for each of the environmental topics that is considered in this ES. The latter involves a combination of professional judgement and a topic-specific significance evaluation methodology that draws on the results of the assessment work that has been carried out.
- 4.5.16 The conclusion about significance is arrived at with reference to the proposed development description, and available information about the magnitude and other characteristics of the potential changes that are expected to be caused by the proposed

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development, receptors' sensitivity to these changes and the effects of these changes on relevant receptors.

4.5.17 For some of the topics that are assessed in the ES, there is published guidance about significance evaluation. Where such guidance exists, even if in draft, it has been used to inform the development of the significance evaluation methodologies that are used in this ES. For other topics, it has been necessary to develop methodologies without the benefit of guidance. This has involved technical specialists drawing on their previous experience of significance evaluation in EIA.





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Key	
	Site boundary
Approximit (proposed)	ate site boundaries and consented development):
	North West Bicester Eco Town
	North West Bicester Eco Town: Phase 1 exemplar
	Kingsmare South West Bioaster
	A41 Business Park
	Evergreen 3
	Immigration Centre
0 ion	i iem 2 iem
0 Jun	1 lem 2 lem Samb 1.40,000 @ A3
0 Jon	1 im 2 im Sada 1.40,000 @ A3
Redevelo	1 Im 2 Im Set 1:0,000 & AS Defence Infrastructure Organisation Opment of MOD Bicester hental Statement
8 Jun Redevelo Environm Figure 4. Cumulat	1 Im       2 im         Same 1.40,000 @ A3       2 im         Same 1.40,000 @ A3       0 im         Defence Infrastructure Organisation       0 im         Opment of MOD Bicester mental Statement       1         .1       Ive Development Plan

#### Policy and authorisations overview 5.

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#### National planning policy context 5.1

- 5.1.1 Planning Policy Statements (PPSs) and Planning Policy Guidance notes (PPGs) represent national planning policy for England. There are several of these documents that are of relevance to the proposed development in terms of environmental effects.
- 5.1.2 These include:
  - PPS 1 Delivering Sustainable Development (ODPM, 2005);
  - PPS 3 Housing (DCLG, 2010);
  - PPS 4 Planning for Sustainable Economic Growth (DCLG, 2009);
  - PPS 5 Planning and the Historic Environment (DCLG, 2010);
  - PPS 7 Sustainable Development in Rural Areas (ODPM, 2004);
  - PPS 9 Biodiversity and Geological Conservation (ODPM, 2005);
  - PPS 22 Renewable Energy (ODPM, 2004);
  - PPS 23 Planning and Pollution Control (ODPM, 2004);
  - PPS 25 Development and Flood Risk (DCLG, 2010);
  - PPG 13 Transport (ODPM, 2001);
  - PPG 17 Planning for Open Space, Sport and Recreation (ODPM, 2002); and
  - PPG 24 Planning and Noise (ODPM, 1994).
- 5.1.3 A brief summary of these documents is provided in Appendix C, and they are considered further and expanded in detail in the relevant topic specific chapters of this ES.
- 5.1.4 It is noted that national planning policy guidance is changing. The draft National Planning Policy Framework is intended to bring together Planning Policy Statements, Planning Policy Guidance Notes and some Circulars into a single consolidated document. It is currently subject to consultation and likely to be in place in 2012. The draft framework includes the direction that 'planning must operate to encourage growth and not act as an impediment. Therefore, significant weight should be placed on the need to support economic growth through the planning system'. It contains policy proposals for sustainable economic growth, housing and sustainable communities. It is also noted that the regional planning policies will cease to be a





material consideration once the Localism Bill is enacted as it contains provisions to revoke the Regional Spatial Strategies. This is also likely to be in 2012.

#### **Development plan context** 5.2

- 5.2.1 The Development Plan for CDC consists of the South East Plan (GOSE, 2009) and the relevant saved policies in the Cherwell Local Plan (CDC, 1996), until superseded by the Local Development Framework (LDF).
- 5.2.2 Although not part of the statutory development plan, the non-statutory Local Plan (CDC, 2004) has been approved as interim planning policy for development control purposes.
- 5.2.3 As the draft Core Strategy (CDC, 2010) has been subject to one period of public consultation, it can be used as a material consideration in the assessment of applications for planning permission. However, limited weight only can be afforded to it, as it has not been submitted for examination and significant objections to its content have been received.
- 5.2.4 Relevant policies from the South East Plan (GOSE, 2009) comprise the following.
  - Policy C4: Landscape and Countryside Management.
  - Policy CC1: Sustainable Development.
  - Policy CC6: Sustainable Communities and Character of the Environment.
  - Policy CC8: Green Infrastructure.
  - Policy NRM9: Air quality.
  - Policy NRM12: Combined Heat and Power.
  - Policy S1: Supporting health communities.
  - Policy S3: Education and skills.
  - Policy S5: Cultural and sporting activity.
  - Policy S6: Community infrastructure.
  - Policy SP3: Urban Focus and Urban Renaissance.
- Relevant policies from the CDC's Local Plan (CDC, 1996) comprise the following: 5.2.5
  - Housing (Policies H4 and H5);
  - Employment (Policy EMP4);
  - Transport (Policies TR1, TR7 and TR10);
  - Recreation and community facilities (Policy R12);







- Rural conservation, urban conservation and design (Policies C1, C2, C4, C7, C13, C17, C25, C28 and C30); and
- Environmental protection (Policies ENV1, ENV7 and ENV12).
- 5.2.6 Relevant policies from the CDC's Non-Statutory Local Plan (CDC, 2004) comprise the following:
  - housing policies (policies H1A, H4 and H7);
  - employment policies (policies EMP 1 and EMP4);
  - environmental policies (policies EN3, EN7, EN8, EN9, EN13, EN22, EN23, EN24, EN25, EN27, EN28, EN39, EN44, EN47, EN34 and EN37);
  - recreation and community policies (policies R1, R8 and R9);
  - town centre and urban renewal policy (policy S1); and
  - transport policies (policies TR1, TR2 and TR4).
- 5.2.7 The Core Strategy is in draft form and has not been adopted. The draft has been subject to public consultation. The following are relevant policies from the latest draft of the Core Strategy (CDC, February 2010):
  - Policy SD 1: Mitigating and adapting to Climate Change;
  - Policy SD 5: Sustainable construction
  - Policy SD 6 Sustainable Urban Drainage Systems (SUDS);
  - Policy SD 11 Local Landscape Protection and Enhancement;
  - Policy SD 13 The Built Environment;
  - Policy I 3 Open Space, Sport and Recreation Provision;
  - Policy I 4 Local Standards of Provision;
  - Policy BIC 5 Meeting the Need for Open Space, Sport and Recreation in Bicester;
  - Policy H 4 Affordable Housing Target;
  - Policy H 5 Affordable Housing Requirements;
  - Policy E 1 Employment Development; and
  - Policy E 2 Supporting Urban Centres.

## 5.3 Required authorisations

5.3.1 The principal legislation under which permission is required to enable the development to go ahead is the *Town and Country Planning Act 1990* and the

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application will be determined by CDC which is the competent authority for determining the outline application.

5.3.2 Table 5.1 details the other authorisations that will be required in order to implement the proposed development.

Interest feature/activity	Summary of legislative context	Requirement
Land drainage	Works on, over or under or within 9 metres of the banks of any watercourse may require 'land drainage' consent under:	Consent will be required from the Environment Agency or other drainage authority for the construction of the authority for the
	<ul> <li>section 109 of the Water Resources Act 1991 where works could affect main rivers; or</li> </ul>	water drainage outfalls to the local watercourses.
	<ul> <li>section 23 of the Land Drainage Act 1991 where works could affect ordinary watercourses.</li> </ul>	
Discharge permit	In order to discharge water to controlled waters, a permit will be required from the Environment Agency if the discharge constitutes a Water Discharge Activity under Schedule 21 of the <i>Environmental Permitting Regulations 2010</i> (EPR). Under the EPR, it is an offence, except under and to the extent authorised by an environmental permit, to cause or knowingly permit a water discharge activity (which includes discharge of any poisonous, noxious or polluting matter, any solid matter or any trade or sewage effluent to controlled waters).	Discharge permit.
Works involving waste materials	The Environmental Permitting Regulations 2010 can be applied to any site to be used for the processing and/or deposition of Controlled Waste. Controlled Waste includes any material that has been or will be discarded, which in the context of construction/demolition means surplus excavation spoil or unsuitable material of any kind whether or not it is contaminated. An Environmental Permit (EP) may be required for a construction site where such waste is processed or incorporated in the works. However, obtaining an EP is an onerous procedure which should be considered as a last resort when all other options have been exhausted. Other options include mobile treatment permitting, exemptions and the 'Code of Practice'.	To be confirmed with the Environment Agency.
	Mobile plant used for treatment of contaminated soils is usually covered by an EP in its own right, so that such treatment can be carried out on any site (subject to a site-specific deployment form) without the need for the site itself to obtain an EP. The product of successful soil treatment is generally considered not to be waste and can thus be re-used without an EP.	
	Exemptions from the EP Regulations are also available for certain specific waste types and activities, such as the re-use of limited quantities of waste soils for environmental improvement works. Such exemptions must be registered with the Environment	

#### Table 5.1 Authorisations required

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Interest Summary of legislative context Requirement feature/activity Agency prior to the activity taking place. The CL:AIRE "Code of Practice" is a mechanism for industry self-regulation by which certain soils that would otherwise be defined as waste are reclassified as non-waste and thereby removed from control under the EP Regulations. This currently applies to only soils considered 'suitable for use' on the site of their origin, but is likely to be expanded to include 'clean' soils transferred from one site to another. The Code of Practice is a voluntary arrangement, sanctioned by the Environment Agency in England and Wales. Concrete and aggregate crushing equipment may require authorisation as a Part B process under the Environmental Permitting (England and Wales) Regulations 2010 SI 675. Legally protected and Many species of animal and plant are protected by law Specific licences will be controlled species and works that could affect some of these species required from Natural England require special consent. For species protected under for work affecting certain The Conservation (Natural Habitats, &c.) Regulations species. 1994 (SI 1994 No. 2716 (as amended) - known as the Habitats Regulations) (e.g. bats, great crested newt or otter), licences are required from Natural England for any activities that will damage or disturb the habitats used by the species or the species themselves. Under The Protection of Badgers Act 1992, a licence is required, from Natural England, for any activity that will disturb badgers or their setts. Works that affect species that are protected solely under the Wildlife & Countryside Act 1981 may require a licence from Natural England. The Wildlife & Countryside Act 1981 also includes controls over specified non-native species. Transportation Various agreements and consents would be required to facilitate the highway aspects of the development. S278 Agreement required. A Section 278 agreement would be required in order to allow the construction works within the public highway (both on and off-site) to be undertaken. A Section 106 agreement would be required to allow S106 Agreement required. contributions to be made towards various travel initiatives to be made. These include travel plan initiatives and bus provision. Temporary and permanent road closures or Order required from the restrictions will require Orders under section 247 of the Department for Transport. Highways Act 1980 A Section 38 agreement would be required, to allow S38 Agreement required. the adoption of the new highway infrastructure. It is likely that there would be a need for various TRO Various TRO's required. to be made by the local authority in and around the site to prevent inappropriate or inconsiderate parking and other traffic management initiatives

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# 6. Traffic and Transport

## 6.1 Introduction

6.1.1 This chapter describes the assessment of potentially significant traffic-related environmental effects on receptors, as a result of the proposed development of Graven Hill and C Site. This chapter should be read in conjunction with the proposed development description (Chapter 3 of this Environmental Statement). Air quality and noise effects resulting from changes in traffic flows are addressed in chapters 7 and 8.

## 6.2 Policy

6.2.1 Table 6.1 lists the issues from planning policy guidance and policies which have been considered in assessing potentially significant traffic-related environmental effects.

Policy	Policy Issue
PPG 13	The objectives of PPG13 are to integrate planning and transport at the national, regional, strategic and local level to promote more sustainable transport choices for both people and for moving freight. The objectives of PPG13 are also to promote accessibility to jobs and services by public transport, walking and cycling, and reduce the need to travel, especially by car.
SE Plan Policy SP3	The prime focus for development in the South East should be urban areas, in order to (amongst others) foster and avoid unnecessary travel. Development should be concentrated within or adjacent to the region's urban areas, be located on previously developed land, be well designed and consistent with the principles of urban renaissance and sustainable development and opportunities for intensification around transport hubs and interchanges should be sought.
CDC LP Policy H4	The provision of housing schemes for the elderly and people with disabilities will be encouraged on sites within convenient reach of shops, community facilities and public transport. Proposals that do not meet these criteria will normally be resisted.
CDC LP Policy TR1	Before proposals for development are permitted the council will require to be satisfied that new highways, highway improvement works, traffic-management measures, additional public transport facilities or other transport measures that would be required as a consequence of allowing the development to proceed will be provided.
CDC LP Policy TR7	Development that would regularly attract large commercial vehicles or large numbers of cars onto unsuitable minor roads will not normally be permitted.
CDC LP Policy TR10	Development that would generate frequent heavy-goods vehicle movements through residential areas or on unsuitable urban or rural roads will not be permitted. The council will resist proposals for the establishment of heavy-goods-vehicle operating centres where they would create traffic problems or adversely affect the amenity of residential areas or villages.
CDC Non- statutory Policy S1	Proposals that are likely to generate an increased demand for travel should be located in accordance with a sequential approach. First preference will be for a town centre location where suitable sites or buildings suitable for conversion are available, followed by an edge-of-centre site, and finally an out-of centre location can be considered, but only if it is accessible by a choice of means of transport.

Table 6.1 Policy issues

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Policy	Policy Issue
CDC Non- statutory Policy TR1	All traffic generating development must contribute to achieving the objectives of the local transport plan.
CDC Non- statutory Policy TR2	Major generators of travel demand should be located in existing centres which are highly accessible by means other than the private car.
CDC Non- statutory Policy TR4	Before proposals for development are permitted the council will need to be satisfied that all appropriate mitigation measures required to support that development are identified within an implementation programme. Such measures will include highway improvements, traffic management measures, improved public transport and/or facilities, and measures to improve pedestrian and cycle accessibility.
CDC Non- statutory Policy EMP4	Proposals for employment generating development, including redevelopment, will be permitted within an existing acceptable employment site provided that:-
	(i) the proposal and any associated employment activities can be carried out without undue detriment to residential amenity, the highway network, village character, the appearance and character of the landscape and the environment generally including any buildings or features of designated importance;
	(ii) the proposal is for small firms (up to about 500 square metres) or for firms whose source of supply, commercial linkages, labour supply and markets make a specific location necessary for them; and
	(iii) the proposal will not give rise to excessive or inappropriate traffic and will wherever possible contribute to the general aim of reducing the need to travel by private car.
	A minor extension to an existing acceptable employment site within or immediately adjoining a village will be permitted provided the proposals comply with criteria (i) to (iii) above.

## 6.3 Data gathering methodology

## Desk study

6.3.1 Information that has been obtained by AMEC in order to inform the preparation of this assessment is summarised in Table 6.2.

Organisation	Information supplied				
000	Personal Injury Accident data – 2007 – 2011				
000	Highway boundary information				
000	Committed highway schemes				
Halcrow (on behalf of OCC)	Model runs of the Bicester Saturn Model as follows:				
	2007 Baseline				
	2031 Future Baseline				
	2031 Future Baseline + Proposed Development				

Table 6.2 Information supplied

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6.3.2 The traffic and transport assessment has used data from the Bicester SATURN Traffic Model developed by consultants Halcrow on behalf of OCC and produced for the review of the Local Development Framework (LDF) allocations. Data collection around Bicester took place in 2007 and the model has been used by OCC to review through-traffic to inform the updated Transport Strategy for Bicester.

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## Survey and data used

- 6.3.3 The MOD sites have been tested using the Bicester SATURN model. In addition to the use of the Bicester SATURN Model, traffic surveys have been undertaken at the following junctions:
  - Graven Hill (E and D Site) accesses in July 2010;
  - C Site access in July 2010 and June 2011;
  - A41/Pioneer Road in June 2011;
  - A41/Ploughley Road in June 2011;
  - A41/B4011 in June 2011;
  - B4011/Palmer Avenue in June 2011; and
  - Palmer Avenue/Pioneer Road in June 2011.

## 6.4 Overall baseline

## **Current baseline**

## Access to the Graven Hill (D and E) Site

- 6.4.1 There are two accesses into the Graven Hill Site, which will continue to be used as part of the development proposals, as follows.
  - A41/B4100/A4421 junction: a five arm roundabout with 70m total inscribed circle diameter (ICD) including circulating carriageway. The A4421 runs around the edge of Bicester, providing access to the Bicester Industrial Estate and linking up with the A4095 at the north of the town. The B4100 London Road provides a route into Bicester town centre and access to Bicester Town Rail Station. The Graven Hill Site has direct access onto this junction from Gravenhill Road.
  - A41/Pioneer Road junction: a priority junction with a ghost island right turn lane from the A41. This right turn has a capacity for around 15 cars. Pioneer Road approach has two short lanes on the approach to the give way line. Visibility in both directions is to standard. Both the A41 and Pioneer Road are subject to 60mph speed limits on the approach to the junction. The junction provides access to Graven Hill (D Site) where the access road has restricted entry/exit.

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### Access to C Site

6.4.2 The access to C Site is from Ploughley Road (which becomes Norris Road), on the northern outskirts of the village of Arncott. This is a simple priority junction with a footway on the western (C Site) side. The access is some 40m south of the level crossing of the rail freight line which serves the MOD sites.

## Traffic flows from existing sites

- 6.4.3 The baseline has been taken from the Bicester SATURN Model, for which the base year is 2007. In addition, for the road network that is not covered by the Bicester SATURN Model, the traffic count data has been used.
- 6.4.4 The traffic generation from the existing sites in the peak hour periods is summarised in Table 6.3.

Site -	AM Peak (08:00-09:00)			PM Peak (17:00-18:00)		
	LV*	HGV	Total	LV*	HGV	Total
Graven Hill (E & D Sites)	75	11	87	31	5	36
C Site	142	14	156	76	3	79

### Table 6.3 Traffic generation from existing Sites

\* Includes cars, motorcycles and light goods vehicles

## Strategic road network

- 6.4.5 The Strategic Road Network (SRN) in the area comprises the M40 to the west of Bicester and the A43(T) at Junction 10, some five miles to the north of the town centre, and accessed via the B4100. Junction 9 is the main point of access to/from Bicester via the A41, but is also the key route into north Oxford via the A34. Both junctions suffer from peak hour congestion, more acutely at Junction 9 because of the A34 route to Oxford. The Highways Agency (HA) has recently completed improvements at the junction, namely:
  - the M40 Junction 9 southbound exit slip-road has been increased from two lanes to three lanes;
  - the roundabout between the A41 exit and entry points has been modified to provide three lanes;
  - the A34 southbound has been widened for approximately 600m and increased from two to three lanes; and
  - new traffic signals with extra low voltage (ELV) LED lights have been installed as well as three CCTV cameras which will be accessible by both the HA and OCC, providing improved operation of the A34/M40 roundabout and response times to incidents on the junction.

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- 6.4.6 The HA has identified Phase 2 improvements, however, these will only be completed when funding becomes available, most likely through developer contributions. The planned improvements include:
  - widening the A34 northbound carriageway approach from two lanes to three lanes, then to four lanes at the roundabout:
  - introduction of traffic signals on the A34 northbound approach;
  - widening the A41 northbound exit from two lanes to three lanes; and
  - extension of the A41 southbound three lane approach flare.

## Local road network

- 6.4.7 As identified in Figure 6.1, the main highway network feeding the Sites is the A41 running north-south to Junction 9 of the M40 and A34, and A41 running east-west towards Aylesbury and north London.
- 6.4.8 From Junction 9 of the M40 northwards towards Bicester, the A41 is a dual carriageway county road linking the M40 partially signalised roundabout junction. There is a compact grade separated junction at Chesterton and Wendlebury, some 2.4km from Junction 9. Just north of this is the new three arm roundabout intersecting with the South West Bicester perimeter road which is under construction as part of the Kingsmere South West Bicester development. The A41 turns eastwards at the A41/B4030 roundabout, a four arm junction with an Esso petrol filling station with service area on the west approach (referred to the Esso Roundabout). On the east side of the A41, 500m south of the B4030 roundabout, is a retail park with, currently, a left in, left out access off the southbound carriageway of the A41.
- 6.4.9 On the B4030, 150m to north of the Esso roundabout, is another roundabout providing access to a Tesco superstore and Bicester retail village, and there is pelican crossing immediately north of the A4030 (Tesco) roundabout. 100m north of this roundabout is a three arm mini roundabout with the B4030 link westwards to Whitney. The B4030 is de-restricted just south of the mini roundabout and 40mph to the north.
- The A41 east of the B4030 roundabout is a single carriageway county road 6.4.10 approximately 7.3m wide with a number of junctions along its length. This includes the A41/B4100/A4421/Gravenhill North Road roundabout and the A41/Pioneer Road priority junction, both of which provide access to the Graven Hill Site, as described in paragraph 6.4.1.
- 6.4.11 Further east is the A41/Ploughley Road priority junction with a ghost island right turn lane from the A41. This right turn has a capacity for around 15 cars. The Ploughley Road arm has two short lanes on the approach to the give way line. Visibility in both directions is to standard. Both the A41 and Ploughlev Road are subject to 60mph speed limits on the approach to the junction.
- Ploughley Road routes through the village of Ambrosden and has a 30mph speed limit 6.4.12 within the village envelope. There is a shared use footway/cycleway on the north side of the road and a footway on the southern side for most of the length of the road

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vicinity of the local community centre and shop, replacing a dropped kerb/pedestrian refuge crossing point. Continuing through the village, a primary school is located on the eastern side of Ploughley Road with vehicular accesses on the roads off Ploughley Road, north and south of the school site. In addition, there is a pelican crossing on Ploughley Road which is located directly in front of the pedestrian access into the school playground.

- 6.4.13 Further east on the A41 is the A41/B4011 priority junction with a ghost island right turn from the A41. The right turn lane has a capacity for up to eight cars. The B4011 arm flares on approach to the give way line providing a short slip for left turning vehicles towards Bicester, and is signed for all HGVs to MOD Bicester. Visibility in both directions is to standard. Both the A41 and B4011 are subject to 60mph speed limits on approach to the junction, enforced by a speed camera east of the junction for westbound vehicles.
- 6.4.14 The villages of Lower and Upper Arncott have a mix of vertical and horizontal traffic calming in the form of speed cushions and chicanes. HGV traffic from the existing MOD sites is advised (through signing) to use Palmer Avenue to minimise effects on the village of Lower Arncott and Ambrosden. Palmer Avenue is subject to a 60mph speed limit and is accessed from the west off Ploughley Road via a mini three arm roundabouts and from the east off the B4011 via a priority T junction.

## Personal Injury Accident (PIA) Assessment

- 6.4.15 Personal Injury Accidents (PIAs) are road traffic accidents where either slight, serious or fatal injuries to people have been recorded. The data would generally include such information as the location of the accident, number of casualties, modes of travel involved, age and gender of those involved and factors contributing to the accident.
- 6.4.16 The Department of Transport document 'Guidance on Transport Assessment'(2007) states that a Transport Assessment should: "*identify any significant highway safety issues and provide analysis of the recent accident history of the study area*".
- 6.4.17 Recorded PIAs were obtained from OCC for a number of highway links in the vicinity of Bicester for a five year period between January 2006 and May 2011. The accident assessment area is illustrated in Figure 6.2. The recorded PIAs were reviewed to in order to determine whether there is a history of accidents in the vicinity of the development sites.
- 6.4.18 A total of 216 PIAs were recorded in the search area during the five year period, of which 118 were within 20m of a junction and 98 were on lengths of road between junctions.
  - 182 PIAs were classified as slight.
  - 29 PIAs were classified as serious.
  - 5 PIAs were classified as fatal.
  - 7 PIAs involved pedestrians.






- 8 PIAs involved pedal cyclists.
- 37 PIAs involved motorcyclists.
- 6.4.19 It does not appear that any PIAs resulted from the layout or geometry on the link or junction where it occurred, and tended to be related to driver error, traffic conditions, and/or weather conditions, for example:

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- on the A41 (Oxford Road) link between Junction 9 of the M40 and the local road to Little Chesterton there is a pattern of seven out of 14 PIAs attributed to slow moving/queuing traffic; likely a result of traffic backing up from Junction 9 of the M40;
- at Junction 9 of the M40, nine of 45 PIAs occurred during queuing traffic/slow moving traffic, the majority of which were attributed to driver error; and
- there is a cluster of seven PIAs on the B4011, located approximately 400-500m south of the access to New Farm, five of which occurred due to wet or icy conditions. One of these PIAs was classified as fatal; however, this was attributed to reckless driving.
- 6.4.20 A more complete analysis of the PIA data is provided in Section 3.5 of the Transport Assessment (Document Reference BIC/OPA/DOC/12).

### **Baseline traffic flows**

6.4.21 The baseline traffic flows are summarised in Table 6.4.

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Road link	AM peak hour (0	(00:60-00:8	PM peak hour (1	7:00-18:00)	Reference
- -	Total vehicles	HGVs	Total vehicles	HGVs	Ι
A41 north of M40 J9	2170	130	2440	60	Halcrow Link Flows (SATURN)
A41 south of Oxford Road Junction	2872	150	2707	80	Halcrow Turning Flows (SATURN)
Oxford Road north of Pingle Drive	1650	30	1740	0	Halcrow Turning Flows (SATURN)
Oxford Road south of Pingle Drive	1943	50	1649	30	Halcrow Turning Flows (SATURN)
Middleton Stoney Road west of Kings End	026	40	840	0	Halcrow Turning Flows (SATURN)
A41 Boundary Way	2175	120	2295	70	Halcrow Turning Flows (SATURN)
B4100 London Road	1130	10	1120	0	Halcrow Turning Flows (SATURN)
Gravenhill Road North	180	0	200	0	Halcrow Turning Flows (SATURN)
Site Access - Pioneer Road	180	0	40	0	Halcrow Turning Flows (SATURN)
A4421 Neunkirchen Way	1360	50	1660	20	Halcrow Turning Flows (SATURN)
A41 south of Neunkirchen Way	2300	120	2390	50	Halcrow Turning Flows (SATURN)
A41 between Pioneer Road and Ploughley Road	2090	120	2340	40	Halcrow Turning Flows (SATURN)
Ploughley Road south of A41	393	42	348	0	Halcrow Turning Flows (SATURN)
B4011 south of A41	710	30	680	0	Halcrow Turning Flows (SATURN)
A41 between Ploughley Road and B4011	1753	82	2028	40	Halcrow Turning Flows (SATURN)
A41 east of B4011	1250	70	1560	40	Halcrow Turning Flows (SATURN)
Ploughley Road between Palmer Avenue and Ambrosden	501	11	408	7	2011 Traffic Counts

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Road link	AM peak hour ((	00:60-00:80	PM peak hour (1	17:00-18:00)	Reference	
	Total vehicles	HGVs	Total vehicles	HGVs	I	
Palmer Avenue between Ploughley Road and B4011	138	13	102	9	2011 Traffic Counts	
B4011 between Palmer Avenue and A41	552	26	648	13	2011 Traffic Counts	

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### **Predicted future baseline**

6.4.22 Following discussions with OCC and Halcrow, it was concluded that the future baseline year should be 2031 at which point the proposed development will be completed. Even though no planning consent exists for NW Bicester Eco-town, traffic flows generated by the potential eco-town development are included within the modelling.

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- 6.4.23 The modelling for 2031 has assumed that the following two scenarios will occur.
  - 2031 without development (i.e. without Graven Hill and C Site being constructed), i.e. the 2031 baseline.
  - 2031 with development (i.e. incorporating the combined traffic generation of Graven Hill and C Site).

### 2031 Baseline

6.4.24 Forecast traffic flows include development growth assumptions alongside national traffic demand growth figures (i.e. TEMPRO), but as a result of the quantity of development proposed to be located in the Bicester area, the growth in demand for travel will exceed district wide rates and hence only identified local growth has been used in the model. The 2031 development assumptions that are proposed for the Bicester area, over the 2007 baseline are summarised in Table 6.5.

Development	Type of development	Number of houses	Employment Area
SW Bicester	Residential + Employment/ Commercial	2,085	8.91ha B1/B2
Upper Heyford	Residential + Employment/ Commercial	761	1.6ha B1, 1.8ha B2 8.6ha B8
Bicester Eco-town (NW Bicester)	Residential + Employment/ Commercial	5,000	3,000 B1/B2 jobs
Gavray Drive	Residential	500	N/A
Caversfield MOD Site	Residential	187	N/A
Talisman Road	Residential	140	N/A
Bicester Business Park	Employment/Commercial	N/A	6ha B1
Bicester Town Centre	Employment/Commercial	N/A	1.3ha A3/A4, 0.22ha D2

### Table 6.52031 Cumulative development assumptions

6.4.25 It should be noted that the 2031 baseline includes the traffic generation from the existing developments on the Graven Hill Site and C Site, i.e. it assumes that these continue to operate as they do at present.

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- 6.4.26 With respect to the road network in the vicinity of C Site, which is not included in the Bicester SATURN Model, the 2011 traffic count data have been growthed to 2031 using TEMPRO growth (local growth factors) to produce the 2031 baseline scenario. The C Site traffic has not been growthed in this scenario, as it is assumed that it will carry on at the same level. The road network covered by this methodology is listed as follows:
  - Ploughley Road south of Ambrosden;
  - Palmer Avenue in its entirety;
  - B4011 south of the A41;
  - Junction of Ploughley Road and Palmer Avenue;
  - Junction of Palmer Avenue and B4011;
  - Norris Road; and
  - C Site Access junction.
- 6.4.27 The 2031 network assumptions that are proposed for the Bicester area are shown in the following list. These assumptions have been agreed with OCC. It is noted that the list has been drawn up with knowledge of, but not dictated by, ongoing or proposed development assumptions.
  - Junction access for SW Bicester, and associated A4095 speed reductions.
  - Caversfield infrastructure, including traffic calming.
  - Skimmingdish Lane.
  - East West Rail, including level crossings on Charbridge Lane and London Road.
  - South West Bicester Link Road.
  - Changes to Bure Place (including two new roundabouts and signalised car park access).
  - Evergreen 3.
  - Bucknell Road/Howes Lane junction improvement.
  - Middleton Stoney Road traffic calming.
  - M40 J9 Phase 2 improvements.
  - Bicester Eco-town internal site infrastructure.
- 6.4.28 Table 6.6 summarises the predicted 2031 baseline.

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Road link	AM peak hour ((	(00:60-00:80	PM peak hour (1	7:00-18:00)	Reference
	Total vehicles	HGVs	Total vehicles	HGVs	1
A41 north of M40 J9	2,740	180	2,960	150	Halcrow Link Flows (SATURN)
A41 south of Oxford Road Junction	3,784	294	3,430	174	Halcrow Turning Flows (SATURN)
Oxford Road north of Pingle Drive	1,760	70	1,800	10	Halcrow Turning Flows (SATURN)
Oxford Road south of Pingle Drive	2,087	104	1,739	54	Halcrow Turning Flows (SATURN)
Middleton Stoney Road west of Kings End	1,350	80	1,280	10	Halcrow Turning Flows (SATURN)
A41 Boundary Way	3,122	264	3,091	174	Halcrow Turning Flows (SATURN)
B4100 London Road	066	50	1,110	20	Halcrow Turning Flows (SATURN)
Gravenhill Road North	190	0	210	0	Halcrow Turning Flows (SATURN)
Site Access - Pioneer Road	200	20	50	0	Halcrow Turning Flows (SATURN)
A4421 Neunkirchen Way	1,760	130	1,950	30	Halcrow Turning Flows (SATURN)
A41 south of Neunkirchen Way	2,650	310	2,890	180	Halcrow Turning Flows (SATURN)
A41 between Pioneer Road and Ploughley Road	2,580	280	2,860	160	Halcrow Turning Flows (SATURN)
Ploughley Road south of A41	514	32	501	0	Halcrow Turning Flows (SATURN)
A41 between Ploughley Road and B4011	2,154	248	2,431	160	Halcrow Turning Flows (SATURN)
B4011 south of A41	608	42	720	10	Halcrow Turning Flows (SATURN)
A41 east of B4011	1,588	210	1,880	170	Halcrow Turning Flows (SATURN)
Ploughley Road between Palmer Avenue and Ambrosden	849	19	697	ю	2011 Traffic Counts

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Road link	AM peak hour (0	8:00-09:00)	PM peak hour (1	7:00-18:00)	Reference
To	otal vehicles	HGVs	Total vehicles	HGVs	
Palmer Avenue between Ploughley Road and B4011	234	22	174	10	2011 Traffic Counts
B4011 between Palmer Avenue and A41	935	44	1,108	22	2011 Traffic Counts

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# 6.5 Environmental measures incorporated into the proposed development

6.5.1 Environmental measures that have been incorporated into the proposed development are set out in Table 6.7. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

Potential receptors	Potential changes and effects	Incorporated measure
Potential receptors	Potential changes and effects         Changes in traffic flows, as a result of the proposed development, could lead to the following effects: <ul> <li>Severance (of people from other people and places)</li> <li>Driver delay</li> <li>Pedestrian delay</li> <li>Fear and intimidation</li> <li>Accidents and safety</li> </ul>	<ul> <li>Highway works and junction remodelling to help alleviate congestion and to improve the pedestrian and cyclist environment.</li> <li>New bus service to serve the Graven Hill Site and provide a link to the town and railway stations, which will also help reduce traffic generation and lessen effects on driver delay.</li> <li>Travel Plans for each site comprising a package of measures to be implemented to prioritise travel by foot, cycle, public transport and car share and reduce the number of journeys being undertaken (SE BIC/OPA/DOC13 &amp; 14).</li> <li>Preparation and implementation of a Construction Traffic Environmental Management Plan (CEMP) to encourage access to the Site by alternative modes of travel to the car and to control HGV traffic movements (including monitoring strategy).</li> <li>Preparation of a dust management plan during construction to detail dust suppression methods to sheeting of HGV loads, wheel washing, regular road cleaning and where possible locating potential dust-producing activities away from receptor locations.</li> <li>Implementation of a wheel washing to prevent spread of mud and dust off-site during construction.</li> <li>Restriction of construction working hours so that construction activities take place between 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays. Work will not normally be carried out during the evening, night-time or on Sundays or Bank Holidays.</li> </ul>
		<ul> <li>Routeing of HGV traffic through C Site to the north and west to avoid disturbance to residents on the eastern side of C Site. The road along the eastern boundary of the Fulfilment Centre is for staff cars only.</li> </ul>

### Table 6.7 Rationale for incorporation of environmental measures

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## 6.6 Scope of the assessment

6.6.1 In terms of the periods under assessment, consideration is given to the construction phases and the operational scenario (when the development is constructed and occupied/operated). However, assessment of the potential effects associated with construction traffic has not been considered as the quantum will be smaller in number, even at peak construction, than the operation of the development and has therefore been scoped out. The scope of assessment therefore deals only with the operational scenario for the completed development at 2031 (although C Site will be operational from 2015).

### **Potential receptors**

- 6.6.2 Based upon the 1993 Institute of Environmental Assessment<sup>5</sup> (IEA) publication *Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic* (hereafter referred to as the IEMA guidelines), the receptors that could be affected by the proposed development are:
  - users of the roads that are likely to be affected by changes in traffic movements; and
  - environmental resources fronting those roads, including the relevant occupiers and users.
- 6.6.3 The IEMA guidelines identify groups, locations and areas which may be sensitive to changes in traffic conditions and which should be considered for assessment. Groups, locations and areas could, for example, include pedestrians, cyclists, shopping areas, schools and accident hotspots. Where traffic flows are predicted to increase by 10% or more, those relevant sensitive groups, locations and areas will be assessed. It should also be noted that the IEMA guidelines also state that other affected parties could be added if the assessor considers it appropriate.

### Potentially significant effects

6.6.4 The IEMA guidelines recommend that the environmental effects summarised in Box6.1 could be considered as potentially significant whenever a new development is likely to give rise to changes in traffic flows and, therefore affect receptors.







<sup>&</sup>lt;sup>5</sup> Now the Institute of Environmental Management and Assessment

Box 6.1	Potentially significant traffic-related environmental effects
Noise	Fear and intimidation
Vibration	Accidents and safety
Visual effects	Hazardous loads
Severance	Air pollution
Driver delay	Dust and dirt
Pedestrian delay	Ecological effects
Pedestrian amen	ity Heritage and conservation

Source: IEA (1993). Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic.

- 6.6.5 Due to the specialist skills required to assess them, the following potentially significant traffic-related environmental effects have been considered in other chapters of this ES, where relevant; Air Quality (Chapter 7), Noise and Vibration (Chapter 8), Historic Environment (Chapter 10), Landscape and Visual (Chapter 11) and Biodiversity (Chapter 12).
- 6.6.6 It is assumed that hazardous loads will not be transported and, therefore, the effect of hazardous loads does not require further consideration. Wastes are determined hazardous in accordance with the following.
  - *The Hazardous Waste (England and Wales) Regulations 2005* which details the requirements for controlling and tracking the movement of hazardous waste and bans mixing different types of hazardous waste. In accordance with Part 6 of the Regulations, a consignment note must be completed to accompany hazardous waste when it is moved from any premises.
  - The *List of Wastes (England) Regulations 2005* which provides the European Waste Catalogue list of codes used to classify wastes.
- 6.6.7 The remaining traffic-related environmental effects are considered potentially significant and are included in this assessment. Each effect is defined below.
  - Severance: the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities. The effects of severance can also be applied to motorists, pedestrians or residents.
  - Driver delay: delays to non-development traffic can occur at several points on the local highway network as a result of the additional traffic that will be generated by a development.







- Pedestrian delay: changes in the volume, composition or speed of traffic may affect the ability of people to cross roads, and therefore, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend upon the general level of pedestrian activity, visibility and general physical conditions of the crossing location.
- Pedestrian amenity: pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.
- Fear and intimidation: the scale of fear and intimidation experienced by pedestrians is dependant on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths, as well as factors such as the speed and size of vehicles.
- Accidents and safety: as the proposed development is expected to produce a change in traffic distribution on the local road network, the IEMA guidelines state that professional judgement will be needed to assess the implications of local circumstances or factors which may elevate or lessen risks of accidents, such as junction conflicts.

## 6.7 Assessment methodology

### Methodology for the prediction of effects

- 6.7.1 The estimated traffic generation of the proposed development during operation is compared with baseline traffic flows in order to determine the percentage change in traffic flows on each road.
- 6.7.2 Those traffic-related environmental effects that could be potentially significant are then assessed for those receptors that are likely to be sensitive to change and where increases in traffic flows and the composition of HGV traffic is likely to be high.
- 6.7.3 The IEMA guidelines suggest the following rules define the scale and extent by which an assessment of potentially significant traffic-related environmental effects is undertaken.
  - Rule 1 Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%).
  - Rule 2 Include any specifically sensitive areas where traffic flows are predicted to increase by 10% or more.
- 6.7.4 The scope of this assessment considers that Ploughley Road through the village of Ambrosden is a sensitive route, and therefore the 10% rule has been applied. All other parts of the network under assessment are not considered sensitive and therefore the 30% rule has been applied.





### Significance evaluation methodology

### Methodology

6.7.5 The significance of each effect has been considered against the criteria within the IEMA guidelines, where possible. However, the IEMA guidelines state that:

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"For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.""<sup>6</sup>

6.7.6 The IEMA guidelines also state that:

"The detailed assessment of impacts is...likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur.""<sup>7</sup>

- 6.7.7 As described in section 6.4, 2031 is the future baseline year against which the change in traffic flows as a result of the development will be assessed.
- 6.7.8 If environmental effects are judged to be significant following assessment, appropriate measures will be proposed that seek to minimise and mitigate the overall disruption potentially created.
- 6.7.9 The criteria and standards that have been used to determine the magnitude and significance of each environmental effect are based on guidance contained within Section 4 of the IEMA guidelines and are summarised below.

### Effects

- *i)* Severance
- 6.7.10 There are no predictive formulae which give simple relationships between traffic factors and levels of severance.
- 6.7.11 The IEMA guidelines state that marginal changes in traffic flow are unlikely to create or remove severance, but that consideration in determining whether severance is likely to be an important issue should be given to factors such as road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

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<sup>&</sup>lt;sup>6</sup> IEA, 1993, para.4.5.

<sup>&</sup>lt;sup>7</sup> IEA, 1993, para.3.10

### *ii) Driver delay*

6.7.12 The IEMA guidelines state that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. The capacity of a road or a particular junction can be determined by establishing the ratio of flow to capacity (RFC).

### *iii) Pedestrian delay*

6.7.13 Given the range of local factors and conditions which can influence pedestrian delay, the IEMA guidelines do not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead. However the IEMA guidelines do note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road.

### *iv)* Pedestrian amenity

- 6.7.14 The IEMA guidelines note that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter a negative effect.
- *v) Fear and intimidation*
- 6.7.15 There are no commonly agreed thresholds by which to determine the significance of this effect. The IEMA guidelines note that special consideration should be given to areas where there are likely to be particular problems, such as high speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups and areas where the movement of hazardous loads is likely to occur.

### vi) Accidents and safety

6.7.16 Due to numerous local causation factors involved in personal injury accidents, the IEMA guidelines do not recommend the use of thresholds to determine significance. Again, professional judgement is required to assess the existing levels of recorded accidents and the possible effects of development generated traffic.

# 6.8 Assessment of combined traffic and transport effects

### Predicted effects and their significance

6.8.1 A description of the predicted traffic generation from the proposed development is provided in the following sections. The Bicester SATURN Model has been run to test the '2031 with development' scenario, the results of which are also presented. These results have then been compared to the '2031 baseline' scenario in order to evaluate the effects.







### **Operational development traffic generation**

6.8.2 Table 6.8 summarises the total site traffic generation for the proposed Graven Hill development in the AM and PM peak hours.

	Size	AM P	eak (08:00-	09:00)	PM P	eak (17:00-	18:00)
	3120	In	Out	Total	In	Out	total
Residential	1,900 units	147	537	685	488	299	787
B1(a) Office	2,160m <sup>2</sup>	31	3	32	3	24	26
B1(b) R&D	2,400m <sup>2</sup>	34	3	36	3	26	29
B1(c)/B2 Light Industry	20,520m <sup>2</sup>	101	53	154	43	88	131
B8 Warehousing	66,960m <sup>2</sup>	17	8	25	8	20	29
Primary School	420 pupils	56	11	68	1	2	3
Local Retail	2,323m <sup>2</sup>	34	31	65	21	22	43
Hotel/Restaurant/ Bar	100 rooms	22	25	47	25	19	44
Tota	l	442	671	1,112	592	500	1,092

Table 6.8 Summary of external vehicle generation by land use

- 6.8.3 With regards to the future C Site traffic generation, the Fulfilment Centre will operate 24 hours a day Monday to Friday with a 'skeleton' staff over the weekends and bank holidays to deal with priorities. There will be approximately 620 core staff operating the Sunday to Thursday shifts which will be along the lines of alternate shifts of:
  - Early shift (06:00-14:15): 260 staff;
  - Late shift (14:00-22:15): 260 staff; and
  - Night shift (22:00-06:15): 100 staff.
- 6.8.4 Based on results of Travel Surveys undertaken of staff at C Site there are approximately 20% of staff who currently travel via sustainable modes. The C Site Travel Plan (BIC/OPA/DOC/14) proposes that a maximum single occupancy vehicle (SOV) level of 75% for the redeveloped C Site is achieved within five years of opening. This will be a minimum 5% reduction (1% per annum) from existing C Site levels and due to the Site location and operating patterns, is felt to be a realistic achievable minimum reduction.
- 6.8.5 The traffic generation assumptions for C Site are as shown in Table 6.9 (peak travel hours are highlighted).

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Ti	me		In			Out			Total	
From	То	Staff vehs*	HGVs	Total	Staff vehs	HGVs	Total	Staff vehs	HGVs	Total
00:00	01:00	0	0	0	0	0	0	0	0	0
01:00	02:00	0	0	0	0	0	0	0	0	0
02:00	03:00	0	0	0	0	0	0	0	0	0
03:00	04:00	0	0	0	0	0	0	0	0	0
04:00	05:00	0	0	0	0	0	0	0	0	0
05:00	06:00	195	0	195	0	17	17	195	17	212
06:00	07:00	0	11	11	75	17	92	75	28	103
07:00	08:00	0	17	17	0	17	17	0	33	33
08:00	09:00	0	17	17	0	6	6	0	22	22
09:00	10:00	0	17	17	0	0	0	0	17	17
10:00	11:00	0	13	13	0	0	0	0	13	13
11:00	12:00	0	13	13	0	0	0	0	13	13
12:00	13:00	0	12	12	0	0	0	0	12	12
13:00	14:00	195	11	206	0	0	0	195	11	206
14:00	15:00	0	0	0	195	0	195	195	0	195
15:00	16:00	0	0	0	0	0	0	0	0	0
16:00	17:00	0	0	0	0	0	0	0	0	0
17:00	18:00	0	0	0	0	11	11	0	11	11
18:00	19:00	0	0	0	0	11	11	0	11	11
19:00	20:00	0	0	0	0	11	11	0	11	11
20:00	21:00	0	0	0	0	11	11	0	11	11
21:00	22:00	75	0	75	0	11	11	75	11	86
22:00	23:00	0	0	0	195	0	195	195	0	195
23:00	00:00	0	0	0	0	0	0	0	0	0
Тс	otal	465	110	575	465	110	575	930	220	1,150

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 Table 6.9
 C Site traffic generation - normal activity

Assumes 75% will travel by car, remaining by sustainable modes (car share, cycle, walk)

6.8.6 It should be noted that there is a routeing agreement for HGVs from C Site, along Palmer Avenue and the B4011, which has been maintained in the 2031 'with development' scenario. It has been assumed that all light vehicles route north to the A41, via Ambrosden and Ploughley Road. As this was not reflected in the Bicester SATURN Model, AMEC has manually adjusted the HGV turning movements into Ploughley Road using the 2011 traffic counts growthed to 2031. This gives a more

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appropriate set of figures for the HGV traffic into and out of Ploughley Road and the B4011. Changes have also been made to the mainline flow to represent the higher HGV movements that will be expected along this corridor. Halcrow has confirmed this methodology is robust and justifiable.

### 2031 Baseline + development

- 6.8.7 In the 2031 with development scenario, the traffic generation from the existing sites has been extracted and the predicted traffic development from the proposed developed has been added.
- 6.8.8 Table 6.10 summarises the predicted 2031 with development traffic flows.

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Road link	AM peak hour (0	(00:60-00:8	PM peak hour ('	7:00-18:00)	Reference
•	Total vehicles	HGVs	Total vehicles	HGVs	1
A41 north of M40 J9	2,780	190	3,140	170	Halcrow Link Flows (SATURN)
A41 south of Oxford Road Junction	3,824	294	3,490	174	Halcrow Turning Flows (SATURN)
Oxford Road north of Pingle Drive	1,900	80	1,940	30	Halcrow Turning Flows (SATURN)
Oxford Road south of Pingle Drive	2,257	134	1,899	74	Halcrow Turning Flows (SATURN)
Middleton Stoney Road west of Kings End	1,400	80	1,280	30	Halcrow Turning Flows (SATURN)
A41 Boundary Way	3,312	294	3,211	194	Halcrow Turning Flows (SATURN)
B4100 London Road	1,210	40	1,280	20	Halcrow Turning Flows (SATURN)
Gravenhill Road North	840	20	840	30	Halcrow Turning Flows (SATURN)
Site Access - Pioneer Road	270	10	250	10	Halcrow Turning Flows (SATURN)
A4421 Neunkirchen Way	1,970	140	2,090	60	Halcrow Turning Flows (SATURN)
A41 south of Neunkirchen Way	2,910	310	3,030	200	Halcrow Turning Flows (SATURN)
A41 between Pioneer Road and Ploughley Road	2,600	290	2,950	180	Halcrow Turning Flows (SATURN)
Ploughley Road south of A41	574	32	551	0	Halcrow Turning Flows (SATURN)
A41 between Ploughley Road and B4011	2,124	258	2,491	180	Halcrow Turning Flows (SATURN)
B4011 south of A41	658	50	680	22	Halcrow Turning Flows (SATURN)
A41 east of B4011	1,508	212	1,960	168	Halcrow Turning Flows (SATURN)
Ploughley Road between Palmer Avenue and Ambrosden	708	19	621	С	2011 Traffic Counts

Table 6.10 2031 with development: External road links

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Road link	AM peak hour (C	<b>)8:00-09:00</b>	PM peak hour (1	7:00-18:00)	Reference
	Total vehicles	HGVs	Total vehicles	HGVs	
Palmer Avenue between Ploughley Road and B4011	242	30	182	18	2011 Traffic Counts
B4011 between Palmer Avenue and A41	943	52	1,116	30	2011 Traffic Counts

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### Change in traffic flows

- 6.8.9 The predicted changes in traffic flows in 2031, during the AM and PM peak hours, are summarised in Tables 6.11 and 6.12.
- 6.8.10 These show above 30% growth on the roads that access the Graven Hill Site (Graven Hill North Road and Pioneer Road). It is likely that the proposed development traffic generation is greater than that from the existing Graven Hill site (D and E Sites). These have been discounted from the assessment as the existing users and receptors, with the exception of the barracks, will no longer remain on the Site.
- 6.8.11 The sensitive route of Ploughley Road through the village of Ambrosden is shown to have increases in total vehicles of 11.7% and 10% in the AM and PM peaks respectively, triggering an assessment of effects. It should be noted that the in the Bicester SATURN model, it was assumed that all light vehicles (e.g. cars) associated with C Site traffic, routeing towards the A41, will do so via Ploughley Road, which is a worst case scenario assumption. It is likely that some will route via Palmer Avenue and the B4011. The traffic predictions compared to the existing scenario indicate substantially fewer traffic movements in the peak periods due to the three shift operations, over a 24 hour period. The net increase along this route as indicated by the model results as a consequence of changes in background flows and not the proposed development traffic. It is further noted that all HGV traffic associated with C Site has been routed via Palmer Avenue and the B4011 in compliance with the existing routeing agreement which will be retained.
- 6.8.12 With respect to increases in HGVs, Palmer Avenue is identified as having an increase above the 30% threshold in both the AM and PM peaks. In the PM peak, Oxford Road, north and south Pingle Drive, Middleton Stoney Road and the A4421 Neunkirchen Way have increases above the 30% threshold. However, given that the overall traffic flow increase is less than 10% on all these routes, it is considered that there is not a trigger for an assessment of effects.
- 6.8.13 Therefore, the only route which has been identified for detailed assessment of effects is Ploughley Road.

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Road link	2031 Bas	e	2031 Bas Developm	e + ent		0	thange	
					Total veh	icles	НGN	/s
	Total vehicles	HGVs	Total vehicles	HGVs	Number	%	Number	%
A41 north of M40 J9	2,740	180	2,780	190	40	1.5	10	5.6
A41 south of Oxford Road Junction	3,784	294	3,824	294	40	1.1	0	0.0
Oxford Road north of Pingle Drive	1,760	70	1,900	80	140	8.0	10	14.3
Oxford Road south of Pingle Drive	2,087	104	2,257	134	170	8.1	30	28.8
Middleton Stoney Road west of Kings End	1,350	80	1,400	80	50	3.7	0	0.0
A41 Boundary Way	3,122	264	3,312	294	190	6.1	30	11.4
B4100 London Road	066	50	1,210	40	220	22.2	-10	-20.0
Gravenhill Road North	190	0	840	20	650	342.1	20	0.0
Site Access - Pioneer Road	200	20	270	10	70	35.0	-10	-50.0
A4421 Neunkirchen Way	1,760	130	1,970	140	210	11.9	10	7.7
A41 south of Neunkirchen Way	2,650	310	2,910	310	260	9.8	0	0.0
Ploughley Road south of A41	514	32	574	32	60	11.7	0	0.0
A41 between Pioneer Road and Ploughley Road	2,580	280	2,600	290	20	0.8	10	3.6
B4011 south of A41	608	42	658	50	50	8.2	8	19.0
A41 between Ploughley Road and B4011	2,154	248	2,124	258	-30	-1.4	10	4.0

Table 6.11 Change in traffic flows: 2031 AM peak hour

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Road link	2031 Bas	se	2031 Bas Develorm	e + ent		0	thange	
					Total veh	icles	HGN	/s
	Total vehicles	HGVs	Total vehicles	HGVs	Number	%	Number	%
A41 east of B4011	1,588	210	1,508	212	-80	-5.0	2	1.0
Ploughley Road between Palmer Avenue and Ambrosden	849	19	708	19	-141	-16.6	0	0.0
Palmer Avenue between Ploughley Road and B4011	234	22	242	30	80	3.4	8	36.4
B4011 between Palmer Avenue and A41	935	44	943	52	80	0.9	8	18.2
Table 6.12 Change in traffic flows: 2031 PM peak	k hour							

Road link	Base		Base + Devel	opment		Cha	nge	
					Total vel	hicles	НС	Š
	Total vehicles	HGVs	Total vehicles	HGVs	Number	%	Number	%
A41 north of M40 J9	2,960	150	3,140	170	180	6.1	20	13.3
A41 south of Oxford Road Junction	3,430	174	3,490	174	60	1.7	0	0.0
Oxford Road north of Pingle Drive	1,800	10	1,940	30	140	7.8	20	200.0
Oxford Road south of Pingle Drive	1,739	54	1,899	74	160	9.2	20	37.0
Middleton Stoney Road west of Kings End	1,280	10	1,280	30	0	0.0	20	200.0
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Road link	Base		Base + Devel	opment		Cha	nge	
					Total ve	hicles	ИСИ	S
	Total vehicles	HGVs	Total vehicles	HGVs	Number	%	Number	%
A41 Boundary Way	3,091	174	3,211	194	120	3.9	20	11.5
B4100 London Road	1,110	20	1,280	20	170	15.3	0	0.0
Gravenhill Road North	210	0	840	30	630	300.0	30	0.0
Site Access - Pioneer Road	50	0	250	10	200	400.0	10	0.0
A4421 Neunkirchen Way	1,950	30	2,090	60	140	7.2	30	100.0
A41 south of Neunkirchen Way	2,890	180	3,030	200	140	4.8	20	11.1
A41 between Pioneer Road and Ploughley Road	2,860	160	2,950	180	06	3.1	20	12.5
Ploughley Road south of A41	501	0	551	0	50	10.0	0	0.0
B4011 south of A41	720	10	680	52	-40	-5.6	12	120.0
A41 between Ploughley Road and B4011	2,431	160	2,491	180	60	2.5	20	12.5
A41 east of B4011	1,880	170	1,960	168	80	4.3	-2	-1.2
Ploughley Road between Palmer Avenue and Ambrosden	697	ю	621	ю	-76	-10.9	0	0.0
Palmer Avenue between Ploughley Road and B4011	174	10	182	18	8	4.6	8	80.0
B4011 between Palmer Avenue and A41	1,108	22	1,116	30	œ	0.7	8	36.4

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### i) Severance and pedestrian delay

6.8.14 Ploughley Road is subject to a 30mph speed limit and incorporates two signalised crossing facilities at key pedestrian desire line locations on its route through the village, namely at the community centre and local shop and at the school. As already identified the increase in traffic flow is not attributable to the proposed development as the three shift operations at the future C Site will result in reductions in peak hour traffic flows and over the 24 hour day.

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6.8.15 The increase in traffic represents less than one vehicle per minute and it is felt that the existing pedestrian facilities are adequate so that there will not be an effect on severance or pedestrian delay.

### ii) Driver delay

- 6.8.16 As identified above, the increase in traffic is not attributable to the C Site proposed development (nor Graven Hill as no development traffic has been predicted to route along Ploughley Road), indeed, the proposed development at C Site will result in a reduction in MOD related traffic due to the shift basis working. An increase of 50 vehicles, which is less than one per minute is not likely to affect driver delay through the village of Ambrosden.
- 6.8.17 It is acknowledged that there are queuing issues at the A41/Ploughley Road junction. However, the development proposals will improve the situation in the peak periods although the traffic model results are indicating an increase in background traffic along the route.
- 6.8.18 In terms of driver delay, the proposed development will not have a significant effect on driver delay, and is likely to provide a benefit through traffic reductions through the peak periods.

### iii) Pedestrian amenity

6.8.19 Pedestrian amenity is defined as the relative pleasantness of a journey. The pedestrian environment through the village of Ambrosden is good with excellent footways and crossing facilities. As already identified, the proposed development will result in a reduction of traffic volumes during the peak periods, and all HGV traffic will route via the B4011 and will therefore not affect the village and pedestrian environment. The effect is therefore unlikely to be not significant.

### iv) Fear and intimidation

6.8.20 Footways, turning points and accesses are located along Ploughley Road. Footways are generally set back from the road throughout the settlement; thereby forming a protective barrier for pedestrians and restricting their proximity to traffic. Ploughley Road, through Ambrosden, is also subject to a 30mph speed limit. Therefore, pedestrians should not experience fear and intimidation from high-speeding vehicles. The development will result in a reduction of MOD related light vehicles and HGVs will be subject to a routeing strategy via the B4011.

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6.8.21 In summary, the degree of fear and intimidation likely to be experienced along Ploughley Road as a result of the predicted increases in total traffic and HGVs, is likely to be negligible. The effect is, therefore, unlikely to be significant.

### v) Accidents and safety

- 6.8.22 A total of ten accidents have occurred along Ploughley Road from its junction with the A41 and to the end of the village of Ambrosden, a distance of approximately 1.5km.
  - Ploughley Road/A41 (Aylesbury Road) priority junction a total of three PIAs, all classified as slight, no vulnerable road users involved. Causation factors suggest they were attributed to driver error and/or mechanical failure.
  - East Hawthorn Road/Ploughley Road priority junction a total of two PIAs were recorded at this junction, both recorded as slight, but involved vulnerable road users. These were caused due to a vehicle failing to give way to a motorcyclist and a child pedestrian running onto the path of an oncoming vehicle.
  - Merton Road/Ploughley Road and Ploughley Road/Unnamed Road toward Ambrosden priority junctions - a total of three PIAs were recorded, two slight and one serious. The PIA recorded as serious involved a cyclist, which occurred as a result of the cyclist moving into the path of the vehicle. Driver error was the causation factor of the slight PIAs.
  - Ploughley Road between Ploughley Road/A41 (Aylesbury Road) priority junction and East Hawthorn Road/Ploughley Road priority junction - a total of three PIAs were recorded on the link, all of which were classified as slight. No vulnerable road users were involved.
- 6.8.23 The PIA analysis concluded that the layout or geometry of the locations within the study area did not appear to result in PIAs along Ploughley Road. The likelihood of accidents occurring as a result of the development may be affected by the shift hour operations and this will be addressed through appropriate health and safety briefings at C Site as part of site management regarding driving and unsocial hours.
- 6.8.24 Accidents and safety are, therefore, unlikely to be a significant effect.

# 6.9 Conclusions of significance evaluation

6.9.1 Table 6.13 summarises of all predicted negative traffic and transport effects assessed in this chapter of the ES.







Receptor	Effect	Significance	Rationale
The users of local roads	Severance	Not significant	Existing low vehicle speeds through Ambrosden.
users of land uses that	Driver delay	Not significant	Existing pedestrian crossing provision/crossing facilities at Ambrosden
nont them	Pedestrian delay	Not significant	Footways set back from Ploughley Road through
	Pedestrian amenity	Not significant	Ambrosden; thereby forming a protective barrier for pedestrians and restricting their proximity to traffic.
	Fear and intimidation	Not significant	Reduction in development generated traffic.
	Accidents and safety	Not significant	Existing PIA records indicate ten accidents along approximately 1.5km of Ploughley Road from the A41 through to the end of the village, all but one of which was classified as slight.
			Proposed development results in reduction in MOD traffic through the village.
			Health and safety briefing regarding working and driving in unsocial hours. Existing road layout and geometry in the study area.
			Proposed signalised junction where Gravenhill Road meets the A41.
			Proposed roundabout where Pioneer Road meets the A41.
			Implementation of Travel Plans.

#### Summary of negative traffic and transport effects and evaluation of their significance Table 6.13



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### 7. **Air Quality**

#### 7.1 Introduction

7.1.1 This chapter presents the results of an assessment of the effects of the proposed development on air quality at existing and potential new residential receptors in the area and the potential effect of the existing surrounding land uses on the air quality of the new residential receptors which form part of the development. This chapter should be read in conjunction with the proposed development description (Chapter 3).

#### 7.2 **Policy and legislation**

### **Planning policy context**

7.2.1 Table 7.1 lists the issues from planning policy guidance and policies which have been considered in assessing air quality and odour effects.

Policy	Policy Issue
PPS 1 Supplement	Sets out how planning should contribute to reducing emissions and stabilising climate change and take into account the unavoidable consequences.
PPS 23	Includes guidance in relation the effects of development upon ambient air quality and reiterates the need for development to contribute to the principles of sustainability which is set out in PPS 1. Establishes that included within the decision making should be the potential effects of new developments in or close to Air Quality Management Areas (AQMAs) and areas of existing poor air quality. Reference is also made to the consideration of local air quality reviews and assessments.
SE RRS NR9	Sets outs strategy for the South-east region which should be considered in preparing local plans. Includes the following considerations for air quality: ensure consistency with any existing Air Quality Action Plans (AQAP's); reduce effects of traffic; mitigating effects of a development and reducing exposure of a development to poor air quality; use of best practise mitigation measures during demolition and construction and the effect of increased traffic on internationally designated nature sites.
CDC LP ENV1	Development which is likely to cause materially detrimental levels of smell, smoke fumes or other types of environmental pollution will not normally be permitted including effects of traffic generation on existing residential properties. Effects from pollution sources in areas where development is planned will be limited by ensuring the planned development is a suitable distance from the pollution source.
CDC Draft CS Policy SO12 and	Reduce dependency on private cars and increase the opportunities and attraction of alternative means of transport.
3014	Protect and enhance the natural environment, maximise biodiversity and minimise pollution in urban and rural areas.

#### Table 7.1 **Policy issues**



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### Legislative requirements

### **Ambient Air Quality Regulations**

7.2.2 The European directive on air quality and cleaner air for Europe (2008/50/EC) and the European directive relating to arsenic, cadmium, mercury, nickel, and polycyclic aromatic hydrocarbons in ambient air (2004/107/EC) are the principal instruments governing outdoor ambient air quality policy in the EU. They set binding Limit Values for concentrations of pollutants in the air we breathe.

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- 7.2.3 The Air Quality Standards Regulations 2010<sup>8</sup> transpose into English legislation these two European directives, the council's decision on exchange of information<sup>9</sup>, as well as replacing the Air Quality Standards Regulations 2007<sup>10</sup>. The Air Quality Standards Regulations came into force in the UK on 11 June 2010. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards (AQS) with attainment dates in line with the European Directives.
- 7.2.4 In the UK, action on air quality is driven by the health-based Objectives for key air pollutants made statutory through the *Air Quality Regulations 2000*, as amended in 2002<sup>11</sup> and set out in the 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra, 2007). The Air Quality Standards/Air Quality Limit Values are based on medical and scientific reports on how and at what concentration each pollutant affects human health. The Air Quality Objectives (AQOs) are based on the Air Quality Standards/Air Quality Limit Values, with interim target dates to help the UK move toward the achievement of the Air Quality Limit Values. The AQOs in the Air Quality Strategy are a statement of policy intentions or policy targets and as such, there is no legal requirement to meet these objectives except as far as these mirror any equivalent legally binding Limit Values in EU legislation.
- 7.2.5 Part IV of the *Environment Act 1995* requires local authorities to periodically review concentrations of the UK Air Quality Strategy pollutants within their areas and to identify areas where the AQOs may not be achieved by their relevant target dates. This process of Local Air Quality Management (LAQM) is an integral part of delivering the Government's AQOs detailed in the Regulations. When areas are identified where some or all of the Objectives might potentially be exceeded and where there is relevant public exposure, i.e. where members of the public will regularly be exposed over the appropriate averaging period, the local authority has a duty to declare an Air Quality Management Area (AQMA) and to implement an Air Quality Action Plan (AQAP) to reduce air pollution levels towards the AQOs, to the extent that emission sources are under their control. Where a development is proposed close to or within an AQMA consideration needs to be given as to whether the

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<sup>&</sup>lt;sup>8</sup> The Air Quality Standards Regulations 2010, Statutory Instrument 2010 No 1001.

<sup>&</sup>lt;sup>9</sup> Council Decision 97/101/EC on exchange of information.

<sup>&</sup>lt;sup>10</sup> The Air Quality Standards Regulations 2007, Statutory Instrument 2007 No. 64.

<sup>&</sup>lt;sup>11</sup> The Air Quality (England) Regulations 2000, Statutory Instrument 2000 No. 928, The Air Quality (England) (Amendment) Regulations 2002.

development will affect the objectives laid out in the AQAP and the measures that the development proposal has considered to mitigate any negative effects.

7.2.6 Table 7.2 sets out the air quality objectives that are relevant to this assessment, and the dates by which they are to be achieved.

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7.2.7 The UK Government (and the Devolved Administrations) has set new national air quality objectives for particulate matter smaller than 2.5µm diameter (PM<sub>2.5</sub>). These objectives have not been incorporated into LAQM Regulations, and authorities have no statutory obligation to review and assess air quality against them. Although the PM<sub>2.5</sub> objectives (see Table 7.2) are not included in the Regulations, PM<sub>2.5</sub> has been included in this assessment.

Pollutant	Objective (UK)	Averaging period	Date to be achieved by and maintained thereafter (UK)
Nitrogen dioxide - NO <sub>2</sub>	200 µg m <sup>-3</sup> not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 μg m <sup>-3</sup>	Annual mean	31 Dec 2005
Particles - PM <sub>10</sub>	50 µg m <sup>-3</sup> not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
	40 μg m <sup>-3</sup>	Annual mean	31 Dec 2004
Particles <sup>A</sup> - PM <sub>2.5</sub>	25 μg m <sup>-3</sup>	Annual mean	2020
	Target of 15% reduction in concentration at urban background locations	3 year mean	Between 2010 and 2020.
Nitrogen Oxides <sup>B</sup> - NO <sub>X</sub> Vegetation based directive which has not been included in the LAQM regulations.	30 µg m <sup>-3</sup>	Annual Mean	31 Dec 2000

#### Table 7.2 Summary of relevant air quality standards and objectives

Notes:

<sup>A</sup> The UK Government and the Devolved administrations have set national air quality objectives for particulate matter smaller than 2.5 micrometer diameter (PM2.5). These objectives have not been incorporated into LAQM Regulations and authorities have no statutory obligation to review and assess air quality against them.

<sup>B</sup> Vegetation based directive which has not been included in the LAQM Regulations.

7.2.8 The main issue in terms of the objective for  $NO_2$  is the more stringent annual mean objective. It is generally considered that the 1 hour mean NO<sub>2</sub> objective will not be exceeded if the annual mean objective is not exceeded. For PM<sub>10</sub>, the 24-hour mean objective is more stringent than the annual mean.

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### **Designated ecological sites**

7.2.9 As well as affecting human health, some pollutants also have an effect on vegetation. Concentrations of pollutants in air and deposition of particles can damage vegetation directly or affect plant health and productivity. The pollutant of most concern for sensitive vegetation near roads is  $NO_x$ . The First Daughter Directive set a Limit Value for  $NO_x$  for the protection of vegetation to be met by 2001 (Table 7.2). This value was based on studies undertaken by UNECE and WHO, and was incorporated into the UK Air Quality Limit Value Regulations 2001.

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- 7.2.10 The policy of the UK statutory nature conservation agencies (Natural England, the Countryside Council for Wales and Scottish Natural Heritage) is to apply the criterion in internationally designated conservation sites and SSSIs (Sites of Special Scientific Interest) on a precautionary basis. Therefore, the Limit value when applied by these agencies only applies to locations more than 20km from towns with more than 250,000 inhabitants or more than 5km from other built up areas, industrial installations or motorways.
- 7.2.11 In addition vegetation can be adversely affected by nitrogen deposition associated with road transport. Critical loads for nitrogen deposition represent the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem. Critical Loads have been established for certain habitats dependant on low nitrogen levels. Critical loads are expressed in deposition units of kg N ha<sup>-1</sup>year<sup>-1</sup>.

# 7.3 Data gathering methodology

### Desk study

- 7.3.1 Data for the ES baseline has been gathered through a desk-top study. This has involved collating data regarding air quality in the area surrounding the development from the various sources listed below.
  - Air Quality Monitoring data from the national Automatic Urban and Rural Network (AURN).
  - Estimated background pollution concentration maps (compiled by Netcen (National Environmental Technology Centre) for Defra).
  - Passive and continuous monitoring data from CDC.
  - CDC's Air Quality Review and Assessment Reports.

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- Ordnance survey maps and aerial photographs of the area to identify land use, sensitive receptor locations and potential sources of pollutants.
- Consultation with the Environmental Health Officer at CDC responsible for air quality.



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### Survey

7.3.2 No survey work was undertaken for this assessment as appropriate data were available from existing sources.

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# 7.4 Overall baseline

### Current baseline

### Local air quality

- 7.4.1 Consultation with CDC has found that there are no Part A processes operating in the Borough and there are no changes to any existing Part B processes in the Borough which could have a significant effect on air quality in the area.
- 7.4.2 CDC has not declared any Air Quality Management Areas (AQMAs) within the District at present.
- 7.4.3 The 2009 Progress Report identified three locations in the District where there were exceedences of the annual mean AQO for  $NO_2$  in 2008. The three locations were:
  - Horsefair, Banbury;
  - Hennef Way, Banbury; and
  - Queen's Avenue, Bicester.
- 7.4.4 CDC was therefore required to undertake a Detailed Assessment for these three locations.
- 7.4.5 To date a Detailed Assessment has only been completed for the Hennef Way, Banbury location. This was completed in 2010 and recommended that CDC consider the declaration of an AQMA in this area in addition to carrying out a Further Assessment.
- 7.4.6 The closest of these locations to the Site is Queen's Avenue, Bicester. This is also the location of the nearest NO<sub>2</sub> diffusion tube. The annual mean NO<sub>2</sub> concentration at the Queen's Avenue site for 2008 was 43.6  $\mu$ g m<sup>-3</sup>. This is an exceedence of the annual mean NO<sub>2</sub> AQO. However, this location is in the centre of Bicester approximately 1.5km to the north of the Graven Hill and is not considered to be representative of the air quality at the proposed development Sites.
- 7.4.7 Continuous monitoring is undertaken at one location in the District, alongside the Hennef Way diffusion tube location in Banbury. Banbury is located approximately 20km to the north-west of Bicester and this monitor is located close to the M40, which passes the eastern edge of Banbury. This monitor is therefore not considered to be representative of the air quality at the proposed development sites.
- 7.4.8 Estimates of annual mean background concentrations have been compiled by the National Environmental Technology Centre (NETCEN) for Defra on an annual basis for 1km grid squares in the UK, taking into account the sources of pollutants in each

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square and the migration of pollutants from other grid squares. Estimates of annual mean background concentrations are provided for all years from 2008 to 2020.

7.4.9 Baseline modelling for 2010 (see section 7.9 and Appendix E) indicates that there are currently no exceedences of the annual mean AQOs for NO<sub>2</sub>,  $PM_{10}$  (40 µg m<sup>-3</sup>) and  $PM_{2.5}$  (25 µg m<sup>-3</sup>) and no exceedences of the 24-hour mean AQO for  $PM_{10}$  (50 µg m<sup>-3</sup> with 35 permitted exceedences in a calendar year).

### **Dust emissions**

7.4.10 There are currently no major dust raising activities taking place in the area around either development site.

### Predicted future baseline

### Local air quality

- 7.4.11 Section 4.5 of this ES sets out the other developments that have been considered within the future baseline traffic flows which have been used in this assessment.
- 7.4.12 Following the introduction of catalytic converters and European emission standards in 1992, emissions from cars and heavy-duty vehicles have been decreasing due to the penetration of new vehicles and trucks meeting the emission regulations. Future emissions (per vehicle) are therefore likely to be reduced as new vehicles, meeting the increasingly stringent emission regulations, replace older vehicles and form a greater part of the UK fleet. Market demand and future UK and European policies are likely to achieve further reductions in vehicle emissions.
- 7.4.13 However, in recent years there has also been a trend in the stabilisation of  $NO_2$  emissions, and only a very slight downward trend in  $NO_x$  emissions, based on observed monitoring data. The precise reason for this disparity is currently not fully understood and is thought to be related to actual on-road performance of diesel road vehicles when compared to calculations based on the Euro standards<sup>12</sup>. Preliminary studies suggest the following.
  - NO<sub>x</sub> emissions from petrol vehicles appear to be in line with current projections and have decreased since the introduction of catalytic converters.
  - $NO_x$  emissions from diesel cars under urban driving conditions do not appear to have declined substantially up to and including Euro Standard 5. There is limited evidence to suggest that this same pattern may occur for motorway driving conditions.
  - NO<sub>x</sub> emissions from HGV vehicles equipped with SCR reduction are much higher than expected when driving at low speeds.

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<sup>&</sup>lt;sup>12</sup> http://laqm2.defra.gov.uk/FAQs/index.htm 25/10/10 17:20. Defra, Review and Assessment Helpdesk, September 2010.

- 7.4.14 It is unclear exactly how the balance between  $NO_X$  emission reductions and increases in primary  $NO_2$  percentages will influence the achievements of the objectives and limit values in 2010 and beyond, because of the uncertainty associated with estimates of future emissions. Based on the current findings of ongoing investigations, it appears that Euro standards will only deliver marginal, if any, reductions in  $NO_X$  and  $NO_2$  concentrations until the Euro Standard 6 emission standards begin, as is currently forecast, to play a major role (circa after 2015).
- 7.4.15 Given the operational year for the completed development is 2031, it is likely that the current predictions for background  $NO_X$  and  $NO_2$  concentrations will have decreased in line with current expectations.
- 7.4.16 Baseline modelling for 2031 show no exceedences of the annual mean AQOs for either NO<sub>2</sub> or PM<sub>10</sub> (40  $\mu$ g m<sup>-3</sup>) and PM<sub>2.5</sub> (25  $\mu$ g m<sup>-3</sup>). In addition there are no predicted exceedences of the 24-hour mean PM<sub>10</sub> AQO (50  $\mu$ g m<sup>-3</sup>) with 35 permitted exceedences in a calendar year).

### **Dust emissions**

7.4.17 There is no major dust raising activities planned for the future. No large scale developments within 200m of receptor locations are proposed to be built in the near future.

# 7.5 Environmental measures incorporated into the proposed development

7.5.1 The environmental measures that have been incorporated into the proposed development, which are relevant to air quality, are set out in Table 7.3. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

Potential receptors	Potential changes and effects	Incorporated measure
Existing and future residential receptors	Dust generation from the demolition and construction phase.	Management measures in line with Best Practice Guidance to be defined in a Construction Environmental Management Plan (CEMP).
Future Residential Receptors	Odour effects associated with the nearby waste water treatment works and the nearby chicken farm.	The proposed development has been designed so that the odour effects associated with these two land uses are not experienced at future residential receptor locations. This has involved designing the layout of the Site to ensure that sensitive receptors are not located in close proximity to sources of odour.
Existing and future residential receptors	Effects from emissions from potential Combined Heat and Power energy centres within Graven Hill.	It is recommended that detailed assessments of the CHP centre are undertaken at the reserved matters stage of the proposals once viability work has been undertaken to inform the type and detail of the CHP centres at the Site and sufficient

Table 7.3	Rationale for incorporation of environmental measures
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Potential receptors	Potential changes and effects	Incorporated measure
		information is available to undertake a detailed assessment.
		The southern CHP site has been located to maximise the distance between the Site and potentially sensitive receptors such as existing and proposed residential properties.
		potentially sensitive receptors such as existing proposed residential properties.

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#### 7.6 Scope of the assessment

### **Potential receptors**

- 7.6.1 Receptors with the potential to be affected by air quality effects from the proposed development comprise:
  - existing residential and ecological receptors located within 100m of each site boundary and downwind of the Site: these receptors could be affected by dust during construction and demolition works;
  - new residential receptors within Graven Hill: these receptors could also be affected by dust during construction and demolition works as this will be phased over a period of more than 13 years, earlier completed phases of this development could be affected by dust associated with construction of later phases (see Figure 3.7);
  - residential receptors that are located within 200m of roads experiencing a change in road traffic flows: these receptors could be affected by changes in emissions from road traffic flows: and
  - Arncott Bridge Meadows Site of Special Scientific Interest (SSSI): this site is located within 200m of a road with the potential to experience changes in road traffic flows and therefore this SSSI may be affected by NO<sub>X</sub> emissions and Nitrogen deposition associated with emissions from road transport. At present the condition of the SSSI is considered to be favourable. Please refer to Chapter 11 (Biodiversity) for more information regarding this SSSI.

### **Receptors sensitive to dust effects**

7.6.2 The amount of dust that might cause complaint or annoyance in a particular circumstance is very difficult to determine and there are no statutory limits such as those applicable to suspended particulates or gaseous pollutants. However, the research carried out on behalf of the former Department of the Environment (DoE, 1995) gives some guidance as to the determination of nuisance from fugitive dust and suggests that complaints are likely when the rate of dust deposition is two to three times the normal background level of dust deposition in the area. The report suggests that it is preferable that continuous sources with a high or medium dust emission potential are separated by a stand off distance from sensitive uses. The report suggests a stand off distance of between 100-200m from a significant dust emitting source, with

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the qualification that these distances can be reduced if appropriate, and if effective mitigation measures are identified and implemented.

7.6.3 As a general rule, even in the absence of mitigation, dust effects will not be expected at distances beyond about 100m from the work activity and then only when these receptors are downwind of the dust source (ODPM, 2005).

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7.6.4 Guidance in respect of the sensitivity of potential dust sensitive receptors is summarised in Table 7.4 (ODPM, 2005). Based on this guidance, receptors within close proximity to the proposed development will be classed as being of 'medium' or 'low' sensitivity.

um	Low
ls	Farms
ential areas	Light and heavy industry
retailers	Outdoor storage
Greenhouses and nurseries	
Horticultural land	
S	
	um ols ential areas retailers shouses and nurseries ultural land s

### Table 7.4 Examples of dust sensitive receptors

### Receptors sensitive to road traffic emissions

- 7.6.5 Environmental Protection UK (EPUK) guidance (EPUK, 2010) suggests that an air quality assessment may be required where proposals will result in a change in any of the following traffic measures on a road with more than 10,000 annual average daily traffic (AADT);
  - a change in AADT or peak traffic flows of more than  $\pm 5\%$  or  $\pm 10\%$  depending on local circumstances;
  - a change in vehicle speed (typically more than  $\pm 10$  kph); or
  - a significant change in the heavy goods vehicle (HGV) component of the traffic composition.
- 7.6.6 Seven of the road links included in the assessment are predicted to experience a change in traffic flows of 5% or more. It was therefore considered appropriate to model those receptors located adjacent to the roads in the assessment area.
- 7.6.7 A worst-case receptor has been selected for each of the assessed roads based upon the closest distance that a receptor is located to the road centreline and whether this road

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is a major road or an intersection of several roads. These receptors reflect the worst possible air quality effect that can occur along the assessed road. A list of the worstcase receptors is provided in Table 7.5. If exceedences of the AOOs are not identified at the selected worst-case receptors, it will not be expected for the AQOs to be exceeded at receptors located further from the road network.

### Potentially significant effects

7.6.8 The potentially significant effects relating to the proposed development, which are subject to further assessment in this chapter, are summarised below.

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- Potential effects from demolition and construction dust on the new residents of the proposed Graven Hill development during the different phases of demolition and construction and, at nearby existing residential receptors in the vicinity of Graven Hill and C Site.
- Potential air quality effects from changes in emissions of  $PM_{10}$ ,  $PM_{2.5}$  and  $NO_2$ from road traffic associated with the operation of the proposed development on existing residential and ecological receptors within 200m of the affected road network. This assessment focuses on NO<sub>2</sub> and PM<sub>10</sub> as these are the two pollutants of greatest health concern associated with road traffic; emissions of PM<sub>2.5</sub> have also been considered. The primary NO<sub>X</sub> emitted from combustion sources undergoes photochemical oxidation in the atmosphere to form secondary NO<sub>2</sub>, which is the pollutant of concern for local air quality; primary NO<sub>2</sub> is also emitted from road traffic sources. As a worst-case all of the PM<sub>10</sub> emissions from road traffic are considered as PM<sub>2.5</sub> for the purposes of this assessment. The Arncott Bridge Meadows SSSI is designated as a habitat which is sensitive to nitrogen deposition (low/medium altitude hay meadow) (Highways Agency, 2007) and therefore the effect of nitrogen deposition at this receptor has been considered further in this assessment.
- 7.6.9 Assessment of each of the following potential effects has led to the conclusion that they are not likely to be significant and hence do not require further assessment:
  - Potential effects associated with construction traffic on local air quality: These have not been considered as the volume of construction traffic will be lower, even at peak construction, than the operational traffic and will therefore not be of a significant number to affect the long term achievement of the AQOs. Significant air quality effects are therefore unlikely.
  - Potential effects from emissions of pollutants (other than  $PM_{10}$ ,  $PM_{2.5}$  and  $NO_2$ ) from changes in road traffic flows associated with the proposed development: Emissions of other exhaust gases, essentially, Carbon Monoxide (CO), small quantities of Sulphur Dioxide (SO<sub>2</sub>) and non-methane volatile organic compounds (NMVOC) including 1,3-butadiene and benzene, will also occur from vehicles. National level measurement and modelling assessments carried out by Defra have shown that policy measures already in place should reduce levels of CO, 1,3-butadiene and benzene to ensure compliance with the respective standards and objectives, even at busy roadside locations.

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- *Potential effects from demolition and construction dust on Arncott Meadows SSSI:* This site is located more than 200m from areas of construction within C Site. In addition, several measures will be incorporated into the CEMP to minimise the effects from dust during demolition and construction works at C Site.
- *Emissions from construction plant operating on either site:* These have been scoped out as the number of plant on-site at a given time is likely to be small in number and therefore the emissions will also be small. Furthermore, the emissions from plant operating on either site will also be localised to the Site itself. Therefore, emissions from plant operating on either site are unlikely to have a significant effect on air quality in the area.
- Potential odour effects associated with Bicester STW and the nearby Chicken *Farm*: These have been scoped out of the assessment as these were considered in earlier stages of the planning process and the final masterplan for the Site has been designed so that effects due to odours associated with these two land uses will not be experienced at future residential receptor locations.
- Potential effects of future road traffic emissions on the wider road network at new residential receptors within Graven Hill: These have been scoped out as these new residential receptors are located more than 200m from the major road network and as such will not experience significant air quality effects.
- 7.6.10 The proposed development at Graven Hill includes a location in the north of the Site which will be co-located with the hotel/pub/restaurant use and will be developed as a combined heat and power energy centre. A larger site is also reserved in the southern part of the Site for potential future development as a CHP as well. At this stage of the proposals there are no details regarding the design and operation of these potential CHPs, for example, the type of fuel that will be used.
- 7.6.11 At the detailed design stage the developer(s) will agree the final composition of the energy strategy to be pursued, including contributions towards off-site measures, informed by feasibility and viability testing for on-site CHP. At that stage there will be sufficient information regarding the CHP energy centre(s) to enable a detailed assessment of the potential air quality effects from emissions from the centre(s) to be undertaken. The design of the centre(s) will need to meet with requirements of the relevant guidance at the time of the assessment and building standards. Assuming that the design is developed to comply with this guidance it is unlikely that there will be any significant effects on air quality.

# 7.7 Assessment methodology

### Methodology for the prediction of effects

### **Construction effects - dust**

7.7.1 The assessment of effects of dust from the demolition and construction phase of the development has been undertaken qualitatively. This has considered the distance of

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receptors to the development with reference to the prevailing wind direction in the area to determine the likelihood of dust effects at identified receptors. The Building Research Establishment (BRE) Best Practice Guidance (BRE, 2003) has then been used to identify appropriate mitigation measures which could be incorporated into the demolition and construction phase to ensure that dust effects are minimised.

### **Operational effects - emissions from road traffic**

7.7.2 Assessing the potential effects that road traffic may have on local ambient air quality is normally carried out by calculating the concentrations of air pollutants that will arise in the future at an identified receptor which is then compared with relevant air quality criteria.

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7.7.3 The prediction method can be evaluated by comparison with measured pollutant concentrations; this process is known as verification. Verification can only take place where there is local monitoring data available that is representative of the Site. The assessment then determines the magnitude of significance of the effect of the future air quality on the proposed development.

### DMRB methodology

- 7.7.4 The Highways Agency Design Manual for Roads and Bridges (DMRB) screening methodology (Highways Agency, 2007) has been utilised for this assessment in order to quantify the likely ground level concentrations of NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> that the existing and new residential receptors within the development will be exposed to as a result of the operational phase of the development.
- 7.7.5 This assessment is based on the Site being fully operational by 2031. However, the DMRB will only assess years up to 2020; therefore 2020 has been used in the DMRB assessment to represent 2031, which will present a worst-case evaluation of vehicle emission factors.

### Model inputs

- 7.7.6 The DMRB assessment incorporates numbers of road traffic vehicles, vehicle speeds on the local roads and the breakdown of the traffic composition. The vehicle speeds have been taken from actual traffic data, where available, and adjusted where road junctions and pedestrian crossings are located close to receptors, to take account of slower moving traffic. The traffic data used in the assessment is shown in Table E.1, Appendix E.
- 7.7.7 The background air quality concentrations, in the absence of any localised monitoring data, have been taken from the estimated concentrations compiled by Netcen for 2020, as the estimates are not available for years beyond 2020. The closest diffusion tubes to the proposed development sites are located in the centre of Bicester and are therefore not representative of the Sites. In addition they are not considered to be an appropriate comparison location for the proposed development sites for background NO<sub>2</sub> concentrations.
- 7.7.8 The modelled receptor locations are shown in Table 7.5. The distance from the receptor to the road centreline has been used in the DMRB assessment.

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Rof	Pecentor Name	Location		Roads	Distance from
IVE!	Receptor Name	x-coordinate	y-coordinate	Nodus	road (metres)
1	Church Lane, Wendlebury	455881	219720	A41	40
2	Caravan Park, A41	457058	220882	A41	20
3	Kings End Roundabout	457903	222274	Middleton Stoney Road	30
				Oxford Road (A41)	10
4	London Road	458805	221474	A41	30
				B4100	30
5	Kestrel Way	459160	221274	B4100	40
				Wretchwick Way	20
6	Ravencroft	459482	221394	Wretchwick Way	20
7	Wretchwick Lodge	459242	221056	Aylesbury Road	25
8	Aylesbury Road	459827	220656	Aylesbury Road	10
9	Stone Pit's Farm	461337	220378	Aylesbury Road	10
10	Thame Road	461809	219463	B4011	7
11	Ploughley Road, Ambrosden	460610	219682	Ploughley Road	7
12	SSSI Arncott Bridge Meadows	461024	218153	Ploughley Road	7
13	Ploughley Road, Upper Arncott	461009	218063	Ploughley Road	7
14	Ploughley Road, Upper Arncott	461114	217848	Ploughley Road	7

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#### Table 7.5 Sensitive receptor locations

### Scenarios modelled

7.7.9 The scenarios modelled in this assessment are:

- existing baseline (2010);
- ٠ future baseline traffic in the area with all committed and potential developments in the area, excluding the proposed development (2031); and
- ٠ future baseline traffic in the area with all committed and potential developments in the area, including the proposed development (2031).

### Model outputs

7.7.10 The total background values available from Netcen have been used in the DMRB model to calculate predicted total concentrations of  $PM_{10}$  and the likely number of





exceedences of the 24-hour mean  $PM_{10}$  objective. The total background values from Netcen are calculated on the basis of all of the sources of air pollutants in the 1km grid square and any air pollutants which may be in the grid square via sources from other grid squares. Using the total Netcen background values provides a worst-case background as it is likely the roads in the assessment are already contributing to the total background values.

- 7.7.11 For the prediction of  $NO_2$  concentrations, the total background concentrations have not been used in the DMRB model itself and instead the output of the model for NO<sub>X</sub> has been converted to NO<sub>2</sub>, for all modelled scenarios, using the methodology in LAQM TG (09) and NO<sub>X</sub> to NO<sub>2</sub> conversion tool developed by AEA Technology for Defra. This tool also utilises the total background  $NO_X$  and  $NO_2$  concentrations but using a different method to the DMRB methodology. This assessment has utilised version 2.1 of the NO<sub>X</sub> to NO<sub>2</sub> conversion tool.
- 7.7.12 Verification of the DMRB assessment has not been undertaken. The nearest diffusion tube to the Site is located in Bicester. There are no other tubes located close to the Site. It is not considered to be a robust verification method where only one tube is available due to the potential uncertainties in relying upon one measurement. In addition this tube is located a considerable distance from the Site and is not in a location which is representative of the area surrounding the Site. It is not considered that the lack of model verification is a limitation to the approach undertaken, as it is anticipated that the approach undertaken presents a likely worst-case assessment.
- 7.7.13 Designated ecological sites within 200m of the roads affected by the proposed development can be affected by emissions from road traffic due to emissions of  $NO_x$ and nitrogen deposition rates. For the designated ecological site (Arncott Bridge Meadows SSSI) the predicted NO<sub>X</sub> concentration at the SSSI will be calculated using the DMRB model and compared against the NO<sub>x</sub> vegetation European directive (Table 7.2).

### Significance evaluation methodology

### **Construction effects - dust**

7.7.14 The significance of potential air quality effects is determined by a number of factors, including the sensitivity of the receptor and the magnitude of the change in dust that occurs. Although there are a number of ways in which dust can be quantified, it is difficult to relate the amount of potential dust deposition to significant effects. Instead it is considered more valid to assess dust receptors on the basis of their relative risk of exposure. This means taking into account a number of pertinent factors, including the proximity of a receptor to a potential dust generating activity and its relative position in terms of prevailing wind direction. The nature and duration of an activity, together with other climatic factors such as site rainfall levels are also important criteria in determining the risk, prior to the incorporation of measures to mitigate effects, which include the quality of the Site design and the efficiency and effectiveness of site management.





7.7.15 Dust effects will therefore be considered as likely to be significant where a highly sensitive receptor (Table 7.3) was located downwind and within 100m of the Site boundary, in the absence of appropriate mitigation measures.

### **Operational effects - emissions from road traffic (human receptors)**

- 7.7.16 Although no formal guidance exists for classifying the magnitude and significance of air quality effects, several documents, including technical guidance (EPUK, 2010) suggest ways to address this issue.
- 7.7.17 The magnitude of change is a term used to describe the change in pollutant concentration likely to arise with the proposed development, i.e. the difference between pollutant concentrations predicted with and without the proposed development. The magnitude of change is often expressed as a percentage and does not take into account any change in the numbers of people exposed or any change in the achievement of the AQO. The EPUK guidance provides examples of terms that can be used to describe the magnitude of change based on the absolute change in concentration; these descriptors, presented in Table 7.6, have been used in this assessment for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.

Magnitude of Change	Annual Mean NO₂/PM₁₀ (μg m³)	Days PM₁₀>50µg m <sup>-3</sup>	Other pollutants (eg PM <sub>2.5</sub> )
Large	Increase/Decrease >4	Increase/Decrease >4 days	Increase/Decrease >10% of AQO
Medium	Increase/Decrease 2 - 4	Increase/Decrease 2 - 4 days	Increase/Decrease 5 - 10% of AQO
Small	Increase/Decrease 0.4 - 2	Increase/Decrease 1 - 2 days	Increase/Decrease 1 - 5% of AQO
Imperceptible	Increase/Decrease <0.4	Increase/Decrease <1 day	Increase/Decrease <1% of AQO

- 7.7.18 The significance of a change in pollutant concentration is based not only on the magnitude of the change but also the attributed sensitivity and the number of people exposed to the changes.
- 7.7.19 The sensitivity of a receptor is dependent on how close pollutant concentrations are to the relevant AQO, with the highest sensitivity being attributed to those receptors with existing air quality problems, i.e. where baseline concentrations are above the target levels. Smaller magnitudes of change could, therefore, potentially cause significant effects, either positive or negative, where the sensitivity is deemed to be higher. The AQO are developed based upon the exposure of sensitive individuals, e.g. in hospitals, schools, to pollutant concentrations. Consequently, there is no added value in categorising the type of receptor considered.

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- 7.7.20 The EPUK descriptors take account of the magnitude of the change and sensitivity, but make no allowance for the number of people exposed to the change. This assessment has determined the effect of any change in annual mean concentrations of NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> at a receptor, based on the criteria in Table 7.6. In terms of determining significance, effects which are 'substantial' or 'moderate' are likely to be significant whereas effects that are 'slight' or 'negligible' are unlikely to be significant. Table 7.7 can be used for identifying where there are potentially effects which may not be insignificant at a receptor associated with the annual mean concentrations of both NO<sub>2</sub> and PM<sub>10</sub>, as they have the same AQO ( $40\mu$ g m<sup>-3</sup>).
- 7.7.21 For assessing the potential effects of the development on the 24-hour  $PM_{10}$  AQO, at a receptor, the criteria in Table 7.8 have been used.
- 7.7.22 For assessing the potential effects of the development on the annual mean  $PM_{2.5}$  AQO at a receptor the same proportions of the assessment level as in Tables 7.7 and 7.8, i.e. 90-100% is considered as 'just below' with less than 75% considered as 'well below' have been used.
- 7.7.23 For assessing the potential effects at the ecological receptor in terms of  $NO_X$ . The same criteria as used for  $PM_{2.5}$  will be used.
- 7.7.24 For effects which are considered to be imperceptible at a receptor, the significance of effects is considered to be negligible.

Table 7.7	Air quality effect descriptors for changes to Annual Mean NO <sub>2</sub> and PM <sub>10</sub>
	concentrations at a receptor

Absolute Concentration in relation to the AQO	Small	Medium	Large
Decrease with development			
Above Standard without development (>40 $\mu$ g m <sup>-3</sup> )	Slight Positive	Moderate Positive	Substantial Positive
Just below Standard without development (36- $40\mu g m^{-3}$ )	Slight Positive	Moderate Positive	Moderate Positive
Below Standard without development (30-36µg m <sup>-3</sup> )	Negligible	Slight Positive	Slight Positive
Well below Standard without development (<30μg m <sup>-3</sup> )	Negligible	Negligible	Slight Positive
Increase with development			
Above Standard without development (>40µg m <sup>-3</sup> )	Slight Negative	Moderate Negative	Substantial Negative



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Absolute Concentration in relation to the AQO	Small	Medium	Large
Just below Standard with development (36-40µg m <sup>-3</sup> )	Slight Negative	Moderate Negative	Moderate Negative
Below Standard with development (30-36µg m <sup>-3</sup> )	Negligible	Slight Negative	Slight Negative
Well below Standard with development (<30 $\mu$ g m <sup>-3</sup> )	Negligible	Negligible	Slight Negative
	Effects likely to be significant		

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Standard in the context of this table relates to the specific AQO in question.

### Air quality effect descriptors for changes in the number of days with $PM_{10}$ concentration greater than 50 $\mu g~m^{-3}$ at a Receptor Table 7.8

Absolute Concentration in relation to the AQO	Small	Medium	Large	
Decrease with development				
Above Standard without development (>35 days)	Slight Positive	Moderate Positive	Substantial Positive	
Just below Standard without development (32- 35 days)	Slight Positive	Moderate Positive	Moderate Positive	
Below Standard without development (26-32 days)	Negligible	Slight Positive	Slight Positive	
Well below Standard without development (<26 days)	Negligible	Negligible	Slight Positive	
Increase with development				
Above Standard without development (>35 days)	Slight Negative	Moderate Negative	Substantial Negative	
Just below Standard with development (32-35 days)	Slight Negative	Moderate Negative	Moderate Negative	
Below Standard with development (26-32 days)	Negligible	Slight Negative	Slight Negative	
Well below Standard with development (<26 days)	Negligible	Negligible	Slight Negative	
	Effects likely to be significant			

Standard in the context of this table relates to the specific AQO in question.

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### **Operational effects - emissions from road traffic (ecological receptors)**

- 7.7.25 The predicted  $NO_X$  concentration at the Arncott Bridge Meadows SSSI has been compared to the vegetation criterion for  $NO_X$  (the  $NO_X$  vegetation based EU Directive - Table 7.2). If the development is likely to result in an increase of at least 2 µg m<sup>-3</sup> of  $NO_X$  concentrations at the receptor and the predicted total concentrations at the receptor are very close to or exceed the criterion, then the sensitivity of the species at the receptor should be considered in terms of the cumulative effects of air quality, water pollution and habitat loss.
- 7.7.26 The calculated rate of nitrogen deposition predicted at the ecological receptor will be assessed against the critical load for the main habitat type.

### Determining significance - emissions from road traffic

- 7.7.27 When considering the overall significance of effects of a development the following, along with any proposed mitigation measures, are taken into consideration:
  - number of properties affected by slight, moderate or substantial air quality effects;
  - number of people exposed to poor air quality when a development introduces new exposure into an existing area of poor air quality;
  - magnitude of the changes and descriptions of the effects at receptors;
  - is an exceedence of an objective or limit value predicted to arise in a study area where none existed before or where an exceedence area is substantially increased?;
  - whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced;
  - the significance of the interference with or prevention of the implementation of actions within an air quality Action Plan;
  - the significance of the interference with the implementation of a local air quality strategy;
  - the uncertainty of the results; and
  - the extent to which an objective or limit value is exceeded.

## 7.8 Assessment of effects: Dust effects

### Predicted effects and their significance

7.8.1 The receptors located within 100m of each development site boundary are listed in Table 7.10 and shown in Figure 7.1 (Graven Hill) and 7.2 (C Site). Table 7.9 shows the receptors sensitivity to dust effects based on the criteria in Table 7.4 and their direction in relation to each site. The table then categorises the risk to the receptor of dust effects based on their distance, sensitivity and whether they are in the direction of the prevailing wind. The prevailing wind direction for Bicester is based on

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meteorological measurements at Brize Norton for the past five years. Brize Norton is the closest meteorological station to the Site, and is considered to provide the most relevant meteorological data for the area. These show a prevailing south-westerly wind direction. The risk to the identified receptors has been assumed on the basis of no mitigation measures in place.

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# Table 7.9Dust sensitive receptors (within 100m of site boundary) and their likely risk of dust<br/>effects

Receptor within 100m site boundary	Sensitivity	Direction from Site	Within prevailing wind direction?	Risk without mitigation and rationale
Graven Hill Site				
Langford Park Farm	Low	North	Yes	Low - sensitivity of the receptor is low and the proposed land use within the Site adjacent to this receptor is for a series of sports pitches. The construction activity associated with building these sports pitches is likely to be minimal and of less than 1 year duration.
Residential properties on Robin Way (backing onto London Road), Bicester	Medium	North	Yes	Low - separated from the development Site by the A41 and a large amount of vegetation. The proposed land use within the Site closest to these properties is parkland and therefore the construction activities associated with the Site at this receptor location are likely to be minimal and of less than 1 year duration.
Residential properties on the southern part of Kestrel Way (backing onto London Road), Bicester	Medium	North	Yes	Low - separated from the development Site by A41, a large amount of vegetation and the proposed land use within the Site closest to these properties is parkland and therefore the construction activities associated with the Site at this receptor location are likely to be minimal and of less than 1 year duration.
Wretchwick Lodge, Aylesbury Road (A41)	Medium	North	Yes	Low - separated from the development site by the chicken farm and a large amount of vegetation. The likelihood of dust effects reaching this receptor are therefore minimal.
Residential properties on Aylesbury Road to the north of Wretchwick Farm (A41)	Medium	North-east	Yes	Low - separated from development site by A41, a large amount of vegetation and the proposed land use within the Site closest to these properties is parkland and therefore the construction activities associated with the Site at this receptor location are likely to be minimal and of less than 1 year duration.
Wretchwick Farm and adjacent properties	Low	North-east	Yes	Low - sensitivity of the receptor is low, separated from the development site by a railway and a perimeter road and a large amount of vegetation at the Site

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Receptor within 100m site boundary	Sensitivity	Direction from Site	Within prevailing wind direction?	Risk without mitigation and rationale
				boundary, construction activities associated with the Site at this receptor are therefore likely to be minimal.
C Site				
Residential Properties on Ploughley Road (western side), Lower Arncott	Medium	North-east / north	Yes	Medium - Rear of gardens at some properties adjoin the Site boundary, although along this site boundary is a railway line which will remain, separated from the residential receptors by a large amount of vegetation. These receptors are therefore unlikely to experience dust effects associated with the construction activities at C Site.
Brook Farm, Lower Arncott	Low	North	Yes	Low - sensitivity of the receptor is low and rear of the farm adjoins the Site boundary, although along this site boundary is a railway line which is planned to remain, separated from the residential receptors by a large amount of vegetation. These receptors are therefore unlikely to experience dust effects associated with the construction activities at C Site.
Residential Properties on Norris Road (between Patrick Haugh Road and Green Lane), Upper Arncott	Medium	East	Yes	High - Rear of gardens at some properties adjoin the Site boundary, although these properties will be separated from the Site by a proposed earth bund (being constructed as part of the works) and vegetation. The construction of the bund will be short in duration (less than 2 months) and the construction activities behind this bund will be for the Fulfilment Centre Building whose construction will also be short in duration (less than 1 year).
Residential Properties on Green Lane, Upper Arncott	Medium	East	Yes	High - As above
Residential Properties on Murcott Road. Upper Arncott	Medium	East	Yes	Medium - residential properties on Murcott Road are not located adjacent to the Site boundary being separated by the properties on Green Lane. In addition the land uses planned for the area of the Site closest to Murcott Road are set back from the Site boundary and are for warehousing which will require a short construction period (less than 1 year)
Residential Properties on Harper Close, Upper Arncott	Medium	East, South- east	Yes	Medium - Only a small number of properties have their gardens adjacent to the Site boundary, and at these properties the land use of the Site is landscaped areas. The construction activities associated with the Site closest to this receptor are therefore unlikely to result in high levels of dust.





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Receptor within 100m site boundary	Sensitivity	Direction from Site	Within prevailing wind direction?	Risk without mitigation and rationale
Residential Properties on Greenfields, Upper Arncott	Medium	East, South- east	Yes	High - the rear of some of these properties are located adjacent to the Site boundary. At this location the Site will be occupied by warehouse facilities which are likely to be constructed in a short time period (less than 1 year).
Castle Farm	Low	South-west	No	Low - sensitivity of the receptor is low and the Site is not within the direction of the prevailing wind. Dust effects are therefore unlikely to be significant at this receptor.

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- 7.8.2 The table shows that of the identified receptors only two of the areas with residential properties are likely to experience a high risk of dust effects in the absence of measures to mitigate dust effects. This is mainly due to these receptors being located adjacent to the Site boundary, in the path of the prevailing wind and where construction activities are taking place close to the Site boundary. These receptors are all located in Upper Arncott close to C Site.
- 7.8.3 Appropriate good practice measures to minimise dust from the Site will be used continuously on-site and it is assumed that these will be so that the risk is reduced to low / medium for all of the identified receptors.
- 7.8.4 In addition the potentially dust generating site works which take place close to those residential receptors identified as being at high risk of dust effects are likely to be of short duration. Once the building superstructure for the warehouse facilities has been erected, the internal works will not be dust generating activities.
- 7.8.5 For the new residents of the proposed Graven Hill development, there are large areas of green space between the different housing areas and it is likely that this will reduce the proximity of earlier phases of the development and limit dust effects of the demolition and construction of the later phases of the development.

#### 7.9 Assessment of effects: Emissions from road traffic

### **Baseline conditions**

### **Current baseline**

7.9.1 The DMRB assessment was undertaken for the baseline year of 2010. The results of the assessment for 2010 are shown in Table E.2 to E.5 in Appendix E. The results of the assessment predict that there are no exceedences of the annual mean AQOs for  $NO_2$ ,  $PM_{10}$  (40 µg m<sup>-3</sup>) and  $PM_{2.5}$  (25 µg m<sup>-3</sup>) and no exceedences of the 24-hour mean AQO for  $PM_{10}$  (50 µg m<sup>-3</sup> with 35 permitted exceedences in a calendar year). The maximum predicted annual mean concentration of NO2 was 25.8 µg m<sup>-3</sup>, 20.9 µg m<sup>-3</sup> for the maximum predicted annual mean concentrations of  $PM_{10}$ , and 14.9 µg m<sup>-3</sup> for

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the maximum predicted annual mean concentrations of  $PM_{2.5}$ . The maximum number of days which were predicted to exceed the 24-hour mean  $PM_{10}$  AQO was less than 1 day.

7.9.2 The annual mean  $NO_X$  AQO for vegetation (30 µg m<sup>-3</sup>) at the ecological receptor Arncott Bridge Meadows was also not exceeded; with a predicted  $NO_X$  annual mean concentration of 16.5 µg m<sup>-3</sup>, which is well below the AQO.

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### **Future baseline**

- 7.9.3 The predicted future baseline concentrations for 2031 without the development in place show no exceedences of the annual mean AQOs for either NO<sub>2</sub> or PM<sub>10</sub> (40  $\mu$ g m<sup>-3</sup>) and PM<sub>2.5</sub> (25  $\mu$ g m<sup>-3</sup>). In addition there are no predicted exceedences of the 24-hour mean PM<sub>10</sub> AQO (50  $\mu$ g m<sup>-3</sup>) with 35 permitted exceedences in a calendar year). The results of the assessment for 2031 are shown in Tables E.2 to E.5 in Appendix E. The maximum predicted annual mean concentration of NO<sub>2</sub> was 21.5  $\mu$ g m<sup>-3</sup>, 19.7  $\mu$ g m<sup>-3</sup> for the maximum predicted annual mean concentrations of PM<sub>10</sub>, and 13.4  $\mu$ g m<sup>-3</sup> for the maximum predicted annual mean concentrations of PM<sub>2.5</sub>. The maximum number of days which were predicted to exceed the 24-hour mean PM<sub>10</sub> AQO was less than one day.
- 7.9.4 The annual mean  $NO_X$  AQO for vegetation (30 µg m<sup>-3</sup>) at the ecological receptor Arncott Bridge Meadows was also not exceeded; with a predicted  $NO_X$  annual mean concentration of 16.7 µg m<sup>-3</sup>, which is well below the AQO.

### Predicted effects and their significance

7.9.5 The predicted future concentrations for 2031 with the development in place show no exceedences of the annual mean AQOs for either NO<sub>2</sub>,  $PM_{10}$  (40 µg m<sup>-3</sup>) or  $PM_{2.5}$  (25 µg m<sup>-3</sup>). In addition, there are no predicted exceedences of the 24-hour mean  $PM_{10}$  AQO (50 µg m<sup>-3</sup> with 35 permitted exceedences in a calendar year). The results of the assessment for 2031 are shown in Tables E.2 to E.5 in Appendix E. The annual mean NO<sub>X</sub> AQO for vegetation at the ecological receptor Arncott Bridge Meadows was also not exceeded.

### Annual mean NO<sub>2</sub> concentrations

- 7.9.6 The maximum predicted annual mean NO<sub>2</sub> concentration with the development in place was 23.2  $\mu$ g m<sup>-3</sup> at Receptor 3 (King's End Roundabout). The receptor which is predicted to experience the largest change in annual mean NO<sub>2</sub> concentrations with the development in place is also Receptor 3, with an increase in annual mean NO<sub>2</sub> concentrations of 1.69  $\mu$ g m<sup>-3</sup>. All of the predicted NO<sub>2</sub> concentrations at the modelled receptors are therefore well below the annual mean NO<sub>2</sub> AQO of 40  $\mu$ g m<sup>-3</sup>. Further detail is shown in Table E.2 in Appendix E.
- 7.9.7 Of the 14 modelled existing receptor locations, two were predicted to experience a decrease in concentrations with the development in place. These decreases in concentrations are due to changes in the traffic flows in the area as a result of the

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development at C Site, where changes in the shift patterns at C Site for the service personnel result in less traffic throughout the day.

7.9.8 The magnitude of change in annual mean  $NO_2$  concentrations at the existing receptors was predicted to be either small or imperceptible. As the predicted total concentrations of annual  $NO_2$  were less than 30 µg m<sup>-3</sup> at all of the existing receptors, the description of effects is considered to be negligible, based on the criteria in Table 7.7, and therefore effects on annual mean  $NO_2$  concentrations are not significant.

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### Annual mean PM<sub>10</sub> concentrations

- 7.9.9 The maximum predicted annual mean  $PM_{10}$  concentration with the development in place, was 19.8 µg m<sup>-3</sup> at Receptor 1 (Church Lane, Wendlebury). The receptor which was predicted to experience the largest change in annual mean  $PM_{10}$  concentrations with the development in place was Receptor 14 (Ploughley Road, Upper Arncott), with an increase in annual mean  $PM_{10}$  concentration of 0.31 µg m<sup>-3</sup>. All of the predicted  $PM_{10}$  concentrations at the modelled receptors are therefore well below the annual mean  $PM_{10}$  AQO of 40 µg m<sup>-3</sup>. Further detail is shown in Table E.3 in Appendix E.
- 7.9.10 As with the predicted annual mean  $NO_2$  concentrations, two of the receptors were predicted to experience a decrease in annual mean  $PM_{10}$  concentrations; again this is believed to be the result of changing traffic flows on the roads surrounding the development.
- 7.9.11 The magnitude of change in annual mean  $PM_{10}$  concentrations at the existing receptors was predicted to be imperceptible. As the predicted magnitude of change at all of the existing receptors was imperceptible, the description of effects is considered to be negligible, based on the criteria in Table 7.7, and therefore is considered to be not significant.

### 24-Hour mean $PM_{10}$ concentrations

- 7.9.12 None of the receptors were predicted to experience any days when the average  $PM_{10}$  24 hour concentrations were above the 24 Hour  $PM_{10}$  AQO of 50 µg m<sup>-3</sup>. Further detail is shown in Table E.4 in Appendix E.
- 7.9.13 The magnitude of change in the number of days exceeding the 24-hour mean  $PM_{10}$  AQO at all of the existing receptors was predicted to be imperceptible. As the predicted magnitude of change at all of the existing receptors is imperceptible, the significance of effects is considered to be negligible and is therefore not significant.

### Annual mean PM<sub>2.5</sub> concentrations

7.9.14 For this assessment the road contribution to annual mean  $PM_{10}$  concentrations were considered to be all  $PM_{2.5}$ , as a worst case. The maximum  $PM_{2.5}$  concentration predicted by this assessment was therefore 13.7 µg m<sup>-3</sup> at Receptor 3 (King's End Roundabout). The receptor which is predicted to experience the largest change in annual mean  $PM_{2.5}$  concentrations with the development in place was Receptor 14 (Ploughley Road, Upper Arncott), with an increase in annual mean  $PM_{2.5}$ 

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concentrations of 0.31  $\mu$ g m<sup>-3</sup>. All of the predicted PM<sub>2.5</sub> concentrations at the modelled receptors are therefore well below the annual mean PM2.5 AQO of  $25 \ \mu g \ m^{-3}$ . Further detail is shown in Table E.5 in Appendix E.

Using the criteria in Table 7.7 the magnitude of change at existing receptors was 7.9.15 predicted to be imperceptible. As the predicted magnitude of change at all of the existing receptors was imperceptible, the description of effects is considered to be negligible, based on the criteria in Tables 7.7 and 7.8 (see also paragraph 7.7.22), and is therefore not significant.

### Annual mean NO<sub>X</sub> concentrations - ecological receptor

- The predicted annual mean NO<sub>X</sub> concentrations at the ecological receptor Arncott 7.9.16 Bridge Meadows with the development in place was 15.8  $\mu g\ m^{-3}.$  This was a predicted decrease in NO<sub>x</sub> concentrations of 1  $\mu$ g m<sup>-3</sup>. Using the criteria in paragraph 7.7.25 the effect of the development traffic on the SSSI will not be negative, as the predicted annual mean concentration is well below the Annual mean AQO for NO<sub>X</sub> for vegetation (30  $\mu$ g m<sup>-3</sup>) and there is no increase in NO<sub>X</sub> concentrations at this receptor. The effect of the development on the ecological receptor Arncott Bridge Meadows SSSI is therefore not significant.
- 7.9.17 Using the methodology in the DMRB guidance to calculate the nitrogen deposition at the SSSI due to the nearby road has found that the addition of the traffic from the development results in an imperceptible change in the nitrogen deposition at this receptor. The calculated nitrogen deposition at this site was 16.8 kg N/ha/yr compared to a critical load value of 20-30 kg N/ha/yr.

### Uncertainty in future predictions and emission factors for NO<sub>x</sub> and NO<sub>2</sub>

- 7.9.18 As mentioned in paragraph 7.4.13 there is current uncertainty in the future predictions of  $NO_X$  and  $NO_2$  concentrations and the emission factors for future years. This creates uncertainty in the modelled results for the future years. To take into account this uncertainty in the calculation of NO<sub>2</sub> concentrations the results of the DMRB modelling for NO<sub>2</sub> have been calculated using the NO<sub>x</sub> to NO<sub>2</sub> calculator with the 2010 emission factors and the 2010 background concentrations.
- 7.9.19 The results of this additional calculation have shown that the  $NO_2$  annual mean concentrations without the development in place range from 15.3 to 24.1  $\mu$ g m<sup>-3</sup> at the modelled receptor locations. With the development in place the annual mean  $NO_2$ concentrations range from 15.0 to 25.6  $\mu g$  m  $^{\text{-3}}$  . The maximum change in annual mean  $NO_2$  concentrations with the development in place is 1.47 µg m<sup>-3</sup>, which is considered All other receptors are predicted to experience either small or to be small. imperceptible changes in annual mean NO<sub>2</sub> concentrations with the development in place.
- Given the predicted NO<sub>2</sub> annual mean concentrations at the receptors are well below 7.9.20 the annual mean NO<sub>2</sub> AQO of 40  $\mu$ g m<sup>-3</sup>, and the predicted change in annual mean NO<sub>2</sub> concentrations with the development in place are predicted to be either small or

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imperceptible, the effects of road traffic in the area on existing residential receptors is considered to be negligible and therefore insignificant.

#### 7.10 **Conclusions of significance evaluation**

7.10.1 Table 7.10 shows a summary of all predicted air quality effects assessed in this chapter of the ES.

Receptor	Magnitude of effect <sup>1</sup>	Sensitivity of receptor <sup>2</sup>	Significance <sup>3</sup>	Rationale		
Existing receptors (both sites) - operational Traffic effects	Imperceptible - Small	Medium	NS	Effects of emissions from operational traffic do not result in an exceedence of the AQOs for NO <sub>2</sub> , PM <sub>10</sub> and PM <sub>2.5</sub> , or a significant increase in NO <sub>2</sub> , PM <sub>10</sub> and PM <sub>2.5</sub> concentrations.		
SSSI Arncott Bridge Meadows (C Site) - operational traffic effects	Small	Medium	NS	Effects of emissions from operational traffic do not result in an exceedence of the $NO_X$ AQO for vegetation or a significant increase in $NO_X$ concentrations.		
Existing receptors (both site) - construction dust effects	Low-Medium	Medium	NS	Mitigation Measures used onsite during the construction phase will ensure dust effects are minimised.		
New residential receptors (Graven Hill) - construction dust effects	Low-Medium	Medium	NS	Mitigation Measures used on- site during the construction phase will ensure dust effects are minimised.		
1: As per Table 7.7 and paragraph 7.7.26 2: Low / Medium / High						

#### Table 7.10 Summary of negative air quality effects and evaluation of their significance

3: NS = not significant / S = significant

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### **Noise and Vibration** 8.

#### 8.1 Introduction

8.1.1 Noise and vibration can have an effect on the environment and quality of life enjoyed by individuals and communities. This chapter addresses the potential effects of the proposed development of Graven Hill and C Site upon noise levels at existing noise sensitive receptors in the vicinity of the Sites. Additionally, the potential effects of noise and vibration upon the proposed receptors at the Site (e.g. at Graven Hill the proposed residential, commercial and educational users) due to road and rail traffic noise sources in the vicinity of the Site, have been assessed. The noise assessment evaluates the magnitude and significance of the effects described above and should be read in conjunction with the development description presented in Chapter 3.

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#### 8.2 **Policy and legislation**

### **Planning policy context**

8.2.1 Table 8.1 lists the issues from planning policy guidance and policies which have been considered in assessing noise and vibration effects. Table 8.2 summarises the guidance documents relevant to this assessment.

Policy Document	Issues to be considered
PPG 24 Planning and Noise	The guidance on assessing site suitability for noise sensitive development and in assessing potential noise effects from development. The planning system should, wherever practicable, ensure separation of noise sensitive development and noisy activities. Where this is not possible, local planning authorities should consider whether it is practicable to sufficiently reduce the effects of noise through the use of conditions or planning obligations. For proposed new residential developments PPG24 provides a method for the determination of site suitability, based upon the assignment of Noise Exposure Categories (NEC) across a proposed residential site (see section 8.7 for further information). PPG 24 makes reference to a number of separate guidance documents which contain advice on the assessment and control of noise from different sources (see Table 8.2).
CDC LP Policy ENV1	Development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not normally be permitted.
CDC Non-statutory LP Policy EN3	Development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not be permitted.

#### Table 8.1 **Policy issues**

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Policy Document	Issues to be considered
CDC Non-statutory LP	Development sensitive to noise generated by road traffic will be:
	(i) refused where external noise levels exceed $L_{Aeq}$ . 16hr = 72dB and $L_{Aeq}$ 8hr =66dB between 07:00-23:00 hrs and 23:00-7:00 hrs respectively.
	(ii) generally resisted where external noise levels between 07:00-23:00 hrs and 23:00-07:00 hrs fall into the ranges $L_{Aeq}$ 16hr = 63 to 72dB and $L_{Aeq}$ 8 hr = 57 to 66dB respectively.
	(iii) expected to achieve a specified internal acoustic environment when the external noise levels between 07:00-23:00 hrs and 23:00-07:00 hrs fall into the ranges $L_{Aeq}$ 16 hr = 55 to 63dB and $L_{Aeq}$ 8 hr = 45 to 57dB respectively.
CDC Non-statutory LP Policy EN8	Development sensitive to noise generated by rail traffic will be:
	(i) refused where external noise levels exceed $L_{Aeq}$ 16 hr = 74dB between 07:00-23:00 hrs and $L_{Aeq}$ 8hr = 66dB between 23:00 and 07:00 hrs.
	(ii) generally resisted where external noise levels between 07:00-23:00 and 23:00-07:00 fall into the ranges $L_{Aeq}$ 16 hr = 66 to 74dB and $L_{Aeq}$ 8 hr = 59 to 66dB respectively.
	(iii) expected to achieve a specified internal acoustic environment when external noise levels between 07:00-23:00 and 23:00-07:00 hrs fall into the ranges $L_{Aeq}$ 16 hr = 55 to 66 dB and $L_{Aeq}$ 8 hr = 45 to 59 dB respectively.
CDC Non-statutory LP Policy EN9	Notwithstanding policies EN7 and EN8 development sensitive to vibration will be refused in locations where vibration levels are likely to affect the material comfort of end users.

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#### Table 8.2 Noise guidance documents

Guidance Document	Summary
BS5228:2009 Code of practice for noise and vibration control on construction and open sites	This document provides guidance on the assessment and control of noise and vibration on construction sites, in two separate volumes,, along with suggestions for the derivation of guideline noise limits.
Calculation of Road Traffic Noise (1988)	Prediction methodology for road traffic noise.
Design Manual for Roads and Bridges Vol 11 Environmental Assessment (2008)	Contains advice on the assessment of noise from road traffic, particularly that from new/altered roads.
Calculation of Rail Noise (1995)	Prediction methodology for rail noise.
BS8233:1999 Sound insulation and noise reduction for buildings – a code of practice	Presents 'good' and 'reasonable' design criteria for internal noise levels in residential living rooms during the day and in bedrooms at night.
World Health Organisation Guidelines for Community Noise (1999)	Presents guideline noise levels for community noise in specific residential environments e.g. outdoor living areas, outside bedrooms.
DfES Building Bulletin 93: Acoustic Design of Schools (2003)	Provides internal noise level criteria for classrooms, lecture halls and other educational areas, to provide suitable conditions for learning, and outdoor noise limits for outdoor teaching areas / playing fields, etc.
BS4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas	This British Standard provides a methodology for determining whether a new or existing industrial or commercial noise source is likely to cause noise complaints by comparing the operational noise level (noise due to the industrial source) with the background level (noise level without the industrial source).

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### Legislative requirements

- 8.2.2 Legislation on noise issues is primarily focussed on the control of noise emissions for example through statutory nuisance or the control of occupational exposure to noise. Key relevant legislation includes the following:
  - Environmental Protection Act 1990, Part III;
  - Noise Act 1996; and
  - Control of Pollution Act 1974.

# 8.3 Data gathering methodology

### Desk study

8.3.1 A number of key information requirements were identified in order to facilitate preparation of this ES chapter. Information obtained in order to fully assess the noise effects of the proposals includes the following.

### **Base mapping**

8.3.2 A comprehensive noise model of the Graven Hill Site was developed using Ordnance Survey base mapping data to show the relative positions of the major road and rail traffic noise sources in the area. On-site development areas and hence the positions of key future receptors on site were identified from the relevant site masterplans (see Figure 3.3 and 3.6).

### Traffic data

- 8.3.3 Traffic data was supplied (see Transport Assessment BIC/OPA/DOC 12) for all major routes in the vicinity of the Site on the future baseline (2031) and With Development scenarios (2031) and included total 2-way traffic flows and HGV percentages for each affected road segment included in the road traffic model.
- 8.3.4 Additional predictions were made for key proposed routes with the Graven Hill Site boundary (i.e. operational residential/commercial access routes within Graven Hill).

### Rail data

- 8.3.5 Details regarding future railway traffic movements on the Oxford-Bicester line (both passenger and freight) was sourced from the ES for Chiltern Railways Evergreen 3 project (prepared by Environmental Resources Management Ltd. (ERM), 2008). The ES includes information regarding future passenger and freight rail movements on the line, and predicted noise emission levels, as a result of improvements to the route.
- 8.3.6 Details regarding proposed future freight rail movements to Graven Hill, and between Graven Hill and C Site as a result of operation of the proposed redeveloped sites were provided by the MOD and analysed by AMEC's transport team, based on the required carrying capacity (wagon loads) per day.

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### **C** Site operations

8.3.7 Details regarding the proposed Fulfilment Centre, associated parking/freight transfer facilities and proposed operations both inside and outside of the building were obtained in consultation with MOD.

### **Baseline noise survey**

- 8.3.8 A baseline noise survey was undertaken at various locations in the environs of Graven Hill and C Site from Monday 28 March to Wednesday 30 March 2011. The purpose of the monitoring was to establish existing baseline noise levels at key noise sensitive receptors in the vicinity of the proposed development Sites (and potentially affected road traffic routes in the area), and also existing ambient noise levels on site at Graven Hill.
- 8.3.9 Noise monitoring was undertaken at a total of 12 locations, as agreed in advance with CDC's Environmental Health Department. The noise monitoring locations are shown on Figure 8.1, and are listed below.
  - C1 Arncott, Ploughley Road
  - C2 Arncott, Brook Farm
  - C3 Arncott, Norris Road
  - C4 Arncott, Harper Close
  - C5 Ambrosden, MOD Rail Crossing
  - C6 Ambrosden Farm
  - D/E1 Wretchwick Farm
  - D/E2 Langford Park Farm
  - D/E3 Circular Road (MOD D/E Site)
  - D/E4 Bicester, 17 Kestrel Way
  - D/E5 Langford Lane property.
- 8.3.10 The equipment (a series of Rion NL-31 Class 1 integrating sound level meters (SLMs), housed in environmental protection apparatus) was installed on-site during the daytime of:
  - Monday 28 March 2011 between 13:35-15:05hrs (at locations C5, C6, D/E2, D/E3, D/E4, D/E5); and
  - Tuesday 29 March 2011 between 12:20-15:45hrs (at locations C1, C2, C3, C4 and D/E1)
- 8.3.11 Following installation, noise levels were monitored continuously at each location (consecutive 5 minute logging periods). The equipment was collected from each location only after a minimum period of 24 hours had elapsed. The noise monitoring

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therefore includes both daytime (07:00-23:00hrs) and night-time (23:00-07:00hrs) measurements.

- All noise monitoring was undertaken in accordance with BS 7445-1:2003, i.e. with 8.3.12 microphones mounted to a height of 1.2-1.5m, and in free-field conditions (at least 3m away from any noise reflecting surfaces, other than the ground).
- 8.3.13 Calibration levels for all equipment were checked prior to and on completion of the survey, with no significant drift in calibration recorded in any of the instrumentation utilised. Full laboratory calibration details for the instrumentation used in the survey are provided in Appendix F-1.
- 8.3.14 Weather conditions for the survey were clear, calm and dry, with only very occasional Data from a nearby weather station<sup>13</sup> indicates that daytime precipitation. temperatures were in the range 5-14°c on 28 March (after 12:00hrs), 1-12°c on 29 March and 9-11°c on 30 March (before 12:00hrs). Night-time temperatures were in the range 1-4°c on the night-time of the 28 March, and 9-12°c on the night-time of the 29 March.
- 8.3.15 Windspeeds did not exceed 5m/s (15 min average) at any time during the survey. Precipitation was rare, with light showers occurring on occasion during both daytime and night-time periods between 29 and 30 of March. However, rainfall rates did not exceed 3mm/hr at any time.
- 8.3.16 It is concluded that weather conditions are unlikely to have had a substantial effect upon the noise monitoring results, and therefore no further consideration of weather effects is required in the interpretation of the baseline noise monitoring data.

#### 8.4 **Overall baseline**

### **Current baseline**

8.4.1 A summary of baseline noise levels at the 11 monitoring locations is shown in Table 8.3. Full noise monitoring data is presented graphically in Appendix F-2.

Table 8.3	Baseline	noise	monitoring	results
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Location	Time Period	L <sub>Aeq, T</sub> (dB)	L <sub>Amax</sub> (dB)	L <sub>A10, T</sub> (dB)*	L <sub>A90, T</sub> (dB)
Daytime (07:00-23:00hrs)					
C1 Arncott, Ploughley Road	07:00-23:00hrs	48.8	87.1	48.6	43.8
C2 Arncott, Brook Farm	07:00-23:00hrs	52.8	83.8	47.8	42.1

<sup>13</sup> IOXFORD10, 12:00hrs 28 March 2011 – 12:00hrs 30 March 2011, source: www.wunderground.com

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Location	Time Period	L <sub>Aeq, T</sub> (dB)	L <sub>Amax</sub> (dB)	L <sub>A10, T</sub> (dB)*	L <sub>A90, T</sub> (dB)
C3 Arncott, Norris Road	07:00-23:00hrs	48.6	82.6	48.5	44.4
C4 Arncott, Harper Close	07:00-23:00hrs	50.9	78.3	50.9	46.9
C5 Ambrosden, MOD Rail Crossing	07:00-23:00hrs	62.3	89.2	60.5	40.8
C6 Ambosden Farm	07:00-23:00hrs	58.9	81.7	61.7	45.6
D/E1 Wretchwick Farm	07:00-23:00hrs	57.2	76.2	59.0	51.9
D/E2 Langford Park Farm	07:00-23:00hrs	56.1	108.1	48.8	43.8
D/E3 Circular Road (MOD D/E Site)	07:00-23:00hrs	56.1	92.4	54.6	42.9
D/E4 Bicester, 17 Kestrel Way	07:00-23:00hrs	56.2	79.1	58.3	49.4
D/E5 Langford Lane property	07:00-23:00hrs	45.5	82.3	45.4	37.4
Night-time (23:00-07:00hrs)					
C1 Arncott, Ploughley Road	23:00-07:00hrs	43.2	64.8	40.3	37.3
C2 Arncott, Brook Farm	23:00-07:00hrs	40.8	62.8	39.9	36.3
C3 Arncott, Norris Road	23:00-07:00hrs	42.5	68.1	41.6	37.8
C4 Arncott, Harper Close	23:00-07:00hrs	46.8	68.5	45.2	41.8
C5 Ambrosden, MOD Rail Crossing	23:00-07:00hrs	59.6	89.7	44.5	39.2
C6 Ambosden Farm	23:00-07:00hrs	56.7	78.6	51.7	40.5
D/E1 Wretchwick Farm	23:00-07:00hrs	50.3	70.4	49.4	33.3
D/E2 Langford Park Farm	23:00-07:00hrs	50.2	71.5	48.5	43.0
D/E3 Circular Road (MOD D/E Site)	23:00-07:00hrs	53.5	88.0	48.3	41.4
D/E4 Bicester, 17 Kestrel Way	23:00-07:00hrs	53.8	75.9	54.5	41.5
D/E5 Langford Lane property	23:00-07:00hrs	51.1	80.7	50.0	44.7

Average noise levels are determined as follows:  $L_{Aeq}$  – logarithmic average;  $L_{A10}$  &  $L_{A90}$  – arithmetic average;  $L_{Amax}$  – maximum recorded during period.

\* Averages for L<sub>A10</sub>, in accordance with CRTN, i.e. daytime, 18hr (0600-2400hrs); night-time, 6hr (0000-0600hrs)

8.4.2 General notes on the positions of the noise monitoring equipment, site observations of the noise sources noted during the survey and the general noise climate at each location are detailed in Table 8.4 (refer to Figure 8.1 for monitoring locations).

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#### Ref Position Noise sources C Site C1 80m off Ploughley Road, The dominant noise source was distant road traffic on the M40, to the south. to the rear of the Tally Ho Other noise sources included reversing alarms and vehicle movements within C Hotel Site, motorcycle racing noise in the distance, occasional cars passing on Ploughley Road and birdsong. At night the dominant noise source was distant road traffic on the M40, with occasional car passes noted on Ploughley Road. C2 6m from the northern The dominant noise source was distant road traffic on the M40. Other noise façade of the farmhouse sources noted included noise from livestock at the farm (chickens and cows), on a grassy area occasional vehicle passes on Ploughley Road, and birdsong. At night the dominant noise source was again distant road traffic on the M40. C3 Within C Site, near The dominant noise source at this location was distant road traffic on the M40. Building C1, on grass, and Other noise included MOD contractor vehicle movements, children playing adjacent to the rear nearby and occasional vehicle passes on local roads within Arncott. At night, the garden of 17 Norris Road. dominant noise source was again distant road traffic on the M40. C4 Within C Site, near The dominant noise source at this location was distant road traffic on the M40. Building C1 and adjacent Other noise included MOD contractor vehicle movements, fork lift reversing alarms, construction works at a house nearby and birdsong. At night, the to the rear gardens of properties on Harper dominant noise source was again distant road traffic on the M40. Close C5 The dominant noise source at this location was distant road traffic on the M40. On the front driveway of the south-westernmost Other sources occasional vehicle passes on Merton Road, dogs barking and property at the rail birdsong. At night, the dominant noise source was again distant road traffic on crossing, approximately the M40. 4m from the carriageway of Merton Road and 25m from the railway crossing C6 Approximately 20m west The dominant noise source at this location was distant road traffic on the M40, of Ploughley Road in the and intermittent noise due to vehicles on the A41. Other sources included front garden of the occasional vehicle passes on Ploughley Road, a small aircraft flying overhead property and birdsong. At night, the distant M40 was the dominant noise source. Graven Hill Site Off the north-west façade D/E 1 The dominant noise source at this location was distant road traffic on the M40. of the property, on grass in and intermittent noise due to vehicles on the A41. At night, the dominant noise a free field position source was again distant road traffic on the M40. D/E 2 Off the south-east façade The dominant noise source at this location was distant road traffic on the M40, of the property, on grass in and also the A34, to the west. Intermittent noise from vehicles on the A41 was also noted. Other noise sources included reversing alarms/vehicle uses from a free field position existing commercial areas at the Graven Hill Site. At night, the dominant noise source was again road traffic on both the M40 and A34. D/E 3 Within Graven Hill (D The dominant noise source at this location was distant road traffic on the M40, Site), at the junction and intermittent noise from vehicles using the A41. Additionally, vehicle between Circular Road movements were noted at the Bicester International Freight Terminal, to the and Pioneer Road. on a north, with additional, occasional vehicle movements on the Circular Road. At grassy area approximately night, the dominant noise source was again distant road traffic on the M40. 2m from the Pioneer Road carriage D/E 4 In a grassy area close to The dominant noise source at this location was distant road traffic on the M40, the nearest properties to with additional intermittent noise from vehicles using the A41 and Neunkirchen Graven Hill in the southern Way. At night, the dominant noise source was again distant road traffic on the

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#### Table 8.4 Noise survey observations

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M40.

fringes of Bicester (Kestrel

Way)



#### Ref Position Noise sources D/E 5 At the boundary between The dominant noise source at this location was distant road traffic on the M40 the property and Graven and A34, with additional intermittent noise from vehicles using the A41. At night, Hill Site in a free field the dominant noise source was again distant road traffic on both the M40 and location A34.

### Predicted future baseline

- 8.4.3 Ambient noise levels at key receptors in the vicinity of the Sites are expected to be subject to changes in road traffic noise up to the development completion year of 2028. Information regarding changes in road traffic volumes on key routes has been provided by AMEC's transport team, which has factored this traffic growth (as well as other cumulative development schemes) into the calculation of baseline road traffic noise levels for the agreed assessment year of 2031 (see paragraph 4.5.12).
- 8.4.4 Additionally, the Bicester-Oxford railway line located to the west of Graven Hill has been the subject of a proposed redevelopment scheme as part of the Chiltern Railways Evergreen 3 scheme (see paragraph 4.5.10). This consented development includes the addition of carrying capacity on the line between Bicester and Oxford, with associated increases in passenger and freight rail movements. The effect of this development (to Phase 2) on ambient noise levels in the vicinity of the line has been sourced from the publicly available ES by ERM.

### 8.5 Environmental measures incorporated into the proposed development

8.5.1 Environmental measures that have been incorporated into the Development are set out in Table 8.5. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

Potential receptor	Predicted changes and potential effects	Incorporated measure
Existing residential properties in the vicinity of proposed construction areas.	Increase in ambient noise and vibration levels due to construction activities (fixed and mobile plant on site). Construction works are often characterised by temporary increases in ambient noise levels which may result in short-term disturbance to nearby sensitive receptors.	<ul> <li>The Construction Environmental Management Plan (CEMP) will include the following measures:</li> <li>Use of equipment fitted with effective silencers/insulation;</li> <li>Use of SMART reversing alarms to reduce the effect of reversing bleepers on site vehicles;</li> <li>All plant to be regularly serviced, maintained and operated in accordance with manufacturer's</li> </ul>
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#### Table 8.5 Rationale for incorporation of environmental measures



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Potential receptor	Predicted changes and potential effects	Incorporated measure
		instructions. Machines that are intermittently used should be shut down in the intervening periods between work or throttled down to a minimum;
		<ul> <li>Erection of site hoardings, to act as noise barriers reducing emissions to nearby noise sensitive receptors;</li> </ul>
		<ul> <li>Appointment of site contact to whom complaints/queries about construction activity can be directed. Any complaints to be investigated and action taken where appropriate;</li> </ul>
		<ul> <li>All construction activity to be undertaken in accordance with good practice as described in BS5228-1:2009; and</li> </ul>
		<ul> <li>Routeing of HGVs to be agreed with the Local Authority.</li> </ul>
		Construction noise + existing ambient noise not to exceed 65dB $L_{Aeq, 12hr}$ (0700-1900hrs) at the worst affected existing residential properties.
		Registration with the Considerate Constructors Scheme (see Appendix C).
		Working hours will be restricted to Monday to Friday 08:00 - 18:00 and Saturday 08:00-13:00, so that no noise from site works will be audible at nearby noise sensitive premises outside these hours.
		Obtaining a 'Prior Consent' Agreement under Section 61 of the <i>Control of Pollution Act 1974</i> (CoPA) allowing the contractor and CDC to agree an appropriate noise management strategy prior to the commencement of works.
Proposed future residential units on the Graven Hill Site (including	Future road and rail traffic noise levels affecting residential amenity.	Residential units designed to achieve, at minimum, the 'reasonable' internal noise level criteria of BS8233:1999 for living rooms and bedrooms.
proposed noter).		External living areas (gardens etc.) could be positioned on the opposite side of residential units from the major road/rail noise sources.
Proposed commercial/office development in north-east of Graven Hill.	Future road traffic noise levels affecting commercial/office use.	Commercial units designed to achieve, at minimum, the 'reasonable' internal noise level criteria of BS8233:1999 for various office spaces.
Proposed school in the north of Graven Hill.	Future road traffic noise levels affecting use of the school.	School buildings to be designed to meet the internal noise level criteria of BB93 within specified noise sensitive use areas (e.g. classrooms, workshops etc.).
		Outdoor teaching areas / layout with respect to school building designed to achieve outdoor noise level criteria of BB93.

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# 8.6 Scope of the assessment

### **Potential receptors**

8.6.1 There are two major groups of receptors which have the potential to be affected by noise during the construction and operational phases of the development.

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- Existing noise and vibration sensitive receptors (local residents) with the potential to experience changes in noise and vibration levels as a result of noise from the activities at each proposed development Site as well as from changes in traffic along routes affected by traffic from the proposed development and those close to railway lines to be used in the transfer of goods to/from (and between) the Sites.
- Future site occupants (Graven Hill only) including all proposed future noise sensitive residential, educational or commercial (office) uses. The site needs to be suitable, in terms of noise levels, to accommodate noise sensitive development.

### **Existing receptors**

8.6.2 In relation to C Site these receptors comprise:

- residential properties to the north of the Site on Ploughley Road (adjacent to the northern boundary of the Site, on the opposite side of the railway lines) (ref. noise monitoring position C1);
- residential properties to the north of the Site at Brook Farm (west of the railway lines) (ref. noise monitoring position C2);
- residential properties to the east of the Site on Norris Road (adjacent to the eastern boundary of the Site) (ref. noise monitoring position C3); and
- residential properties to the east of the Site on Harper Close (adjacent to the eastern boundary of the Site) (ref. noise monitoring position C4).
- 8.6.3 In relation to Graven Hill these receptors comprise:
  - residential property at Wretchwick Farm (adjacent to the eastern site boundary) (ref. noise monitoring position D/E1);
  - residential property at Langford Park Farm (to the north of the Site) (ref. noise monitoring position D/E2);
  - residential properties in the southern extremities of Bicester (to the north of the Site) (ref. noise monitoring position D/E4);
  - residential property at Langford Lane (to the west of the Site) (ref. noise monitoring position D/E5);
- 8.6.4 Additionally, due to their proximity to the railway line running between C Site and Graven Hill, the following receptors may be potentially affected by noise from rail movements between the two Sites.

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- residential properties in Ambrosden (close to the railway line between C Site and Graven Hill) (ref. noise monitoring position C5).
- 8.6.5 In addition to all of the above, any existing residential receptors on the local road network covered by the Transport Assessment (BIC/OPA/DOC/12) may potentially be affected by changes in road traffic volumes resulting from operation of the proposed development(s).

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- 8.6.6 For the purposes of this assessment, it is assumed that existing residential receptors located on or close to road segments predicted to undergo an increase in total two-way traffic movements greater than 25% or a decrease of more than 20% (or a substantial change in the percentage of HGV traffic) may potentially be affected by changes in road traffic noise resulting from the proposed development.
- 8.6.7 Identification of road segments for detailed assessment was based upon data provided by AMEC's transport team. Full scoping of the traffic data for all major routes in the vicinity of both Graven Hill and C Site was carried out as detailed in Appendix F-3.
- 8.6.8 No potentially significant increases in road traffic were found on any populated road segments during the 18-hour daytime period 06:00-24:00hrs<sup>14</sup>. Also, no potentially significant increases in road traffic were found during the peak hour night-time period 05:00-06:00hrs, with the following exceptions:
  - Ploughley Road (between Palmer Avenue and Ambrosden); and
  - Palmer Avenue (between Ploughley Road and the B4100).
- 8.6.9 Due to the proposed shift changeover pattern at C Site, the volume of road traffic is likely to increase by more than 25% during the peak hour 05:00-06:00hrs on both of these populated road segments (see Table 6.9 in chapter 6 which shows 195 staff vehicles enter the Site during this period). Hence, the potential effects of road traffic noise on existing residential receptors are further considered, for these road segments during the night-time peak hour period only.

### **Future site occupants (Graven Hill only)**

- 8.6.10 There is a need to ensure that the Graven Hill Site is suitable for noise sensitive development. Worst affected receptors are likely to include, in particular, those units located on site boundaries close to existing main roads off-site (or major traffic routes within the Site), railway lines servicing existing commercial uses in the south of the Graven Hill, and proposed commercial and industrial land uses within Graven Hill.
- 8.6.11 Effects on the following key receptor groups have been assessed.
  - Future residential occupants (including all proposed residential units and the hotel site in the north-east of the Graven Hill Site).

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<sup>&</sup>lt;sup>14</sup> 18-hour daytime (06:00-24:00hrs) and peak hour night-time (05:00-06:00hrs) periods, in accordance with CRTN.

- Future office/commercial occupants (proposed commercial area in the north-east of the Graven Hill Site, close to the A41).
- Future educational occupants (proposed primary school site in the north- east of the Graven Hill Site).

### Potentially significant effects

- 8.6.12 The potentially significant effects relating to the proposed development, which are subject to further assessment in this chapter, are summarised below.
  - Potential effects from an increase in ambient noise levels affecting existing noise sensitive receptors, due to construction/demolition of the proposed development (including the operation of all fixed and mobile plant on each site).
  - Potential effects from an increase in road and rail traffic noise levels (from both sites) affecting existing noise sensitive receptors during the operational phase of the development, due to additional development related traffic on the local network.
  - Potential effects from an increase in rail traffic noise levels due to proposed freight rail movements to Graven Hill/C Site potentially affecting existing noise sensitive receptors in the vicinity of the railway line.
  - Potential effects from an increase in ambient noise levels due to proposed operational activities at C Site potentially affecting existing noise sensitive receptors in the vicinity of the Site.
  - An assessment of the suitability of the Graven Hill Site for the proposed noise sensitive uses (residential/educational/commercial) due to existing and/or future ambient noise affecting the Site (including noise emissions from local road, rail and commercial/industrial noise sources).
- 8.6.13 Assessment of each of the following potential effects has led to the conclusion that they are not likely to be significant and hence do not require further assessment.
  - Potential effects from an increase in vibration levels (construction phase) affecting existing residential receptors in close proximity to the proposed construction site(s) at Graven Hill and C Site, due to piling operations on site: A review of the proposed development areas with respect to existing residential receptors indicates that piling activities will not progress close to existing residential buildings, and hence will be unlikely to lead to significant levels of nuisance vibration.
  - Potential effects from an increase in road traffic noise levels affecting existing noise sensitive receptors during the construction phase of the development, due to construction traffic using the local network: Since a detailed construction programme is not currently available, it is not possible to quantify the volume of additional light and heavy vehicle traffic which will be routed on the local network as a result of construction/demolition of Graven Hill and C Sites. However, it is expected that construction traffic movements will be confined to daytime hours

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only, and will be of a level significantly below predicted levels of operational traffic. Analysis of operational traffic has shown significant effects only at two populated road segments affected by traffic from C Site, and only during the nighttime peak hour. It is concluded that daytime road traffic movements resulting from construction/demolition operations will also not significantly increase ambient road traffic noise levels above the baseline.

#### 8.7 Assessment methodology

### Methodology for the prediction of effects

8.7.1 The methodology used in the prediction of noise effects is detailed in sections 8.8 to 8.14.

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### Significance evaluation methodology

### Overview

- 8.7.2 The determination of significance has largely been based on the relevant assessment criteria for the specific noise issue being assessed, although these assessment criteria are not directly related to the categories of 'Significant' and 'Not Significant' that underpin EIA.
- 8.7.3 The determination of significance in EIA is based on the sensitivity of a particular receptor (which depends on local circumstances), as well as the magnitude of change in noise levels (which is related to existing ambient noise levels, and predicted noise levels due to the development). The absolute noise level (predicted noise level) can also influence the determination of significance, since it may either exceed or comply with relevant guideline noise limits, irrespective of the amount of change predicted.

### Noise sensitivity

- 8.7.4 PPG 24 focuses on residential properties as being noise sensitive, although it does cite developments such as offices, hospitals and schools as containing buildings and activities that are potentially noise sensitive. However, it does not differentiate between these and therefore it is considered appropriate to determine sensitivity on a case by case basis at a local level.
- 8.7.5 Typically, the existing residential properties in the area will be considered to be of medium sensitivity. Future residents of the Site itself are considered less sensitive than the existing residents, as they have a 'vested interest' in the Site, however they will still be assigned a 'medium' sensitivity. Potential use of the primary school site will also be considered of 'medium' sensitivity.

### Noise magnitude

The magnitude of effect has been based on the noise predictions that have been 8.7.6 undertaken. However, since the noise predictions have been based on worst case assumptions, it will be inappropriate to conclude that a high magnitude has arisen

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simply because the relevant noise limits have been predicted to be breached. The amount by which the limits are predicted to be breached, along with the duration of the effect should also be taken into account. The apportionment of a magnitude rating has therefore taken this situation into account by applying an element of professional judgement.

8.7.7 In terms of the amount of change in noise levels, this will only potentially become significant if the change is perceptible. Table 8.6 summarises typical responses to changes in steady noise levels, based on laboratory conditions. It is considered likely that changes in a variable or moving noise source will be perceived at lower levels.

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#### Table 8.6 Perception of changes in steady noise levels

Change in noise level dB(A)	Response
< 3	Difficult to perceive
> 3	Perceptible
<10	Up to a doubling of perceived loudness
> 10	Over a doubling of perceived loudness

8.7.70 As stated previously, significance is related to sensitivity and magnitude. Table 8.7 presents a matrix which shows the interaction between sensitivity and magnitude, and how this has been used to determine the significance of any noise effects.

#### Table 8.7 Significance matrix

Magnitude	Sensitivity			
-	High	Medium	Low	
Low	Not Significant	Not Significant	Not Significant	
Medium	Significant	Not Significant	Not Significant	
High	Significant	Significant	Not Significant	





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### Assessment of effects: construction noise (fixed and 8.8 mobile plant on site)

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### Assessment methodology

- As detailed construction programmes are not currently available, quantitative 8.8.1 predictions of construction noise emission levels from the Site have not been undertaken for this ES. As an alternative, noise limits have been proposed for construction activities at the nearest potentially affected noise sensitive receptors.
- 8.8.2 The noise limits are based on existing pre-construction ambient noise levels, in accordance with the guidance of BS5228-1:2009. Existing pre-construction ambient noise levels at each of the potentially affected receptors were measured on 28-30 March 2011.
- BS5228-1:2009 states that where existing ambient noise levels are below 65dB  $_{\text{LAeq, T}}$ 8.8.3 (when rounded to the nearest 5dB), a noise limit of 65dB LAeq, 12hr (07:00-19:00hrs) should be considered for total ambient noise plus construction noise.
- 8.8.4 Based upon the long term monitoring data obtained on site 28-30 March 2011, preexisting ambient noise levels are not expected to exceed 60dB  $L_{Aeq, 12hr}$  at any of the existing noise sensitive receptors in the vicinity of either of the Graven Hill or C Sites, hence a limit of 65dB LAeq, 12hr (07:00-19:00hrs) will be appropriate for all receptors (higher limits will apply where pre-existing ambient noise levels are greater).
- 8.8.5 The magnitude criteria used in the assessment of construction activity noise effects is summarised as follows.
  - Low magnitude: Construction noise + total pre-construction ambient noise level does not exceed 60dBL<sub>Aeq. 12hr</sub> (07:00-19:00hrs).
  - Medium magnitude: Construction noise + total pre-construction ambient noise level does not exceed 65dBL<sub>Aeq, 12hr</sub> (07:00-19:00hrs).
  - High magnitude: Construction noise + total pre-construction ambient noise level exceeds 65dBL<sub>Aeq, 12hr</sub> (07:00-19:00hrs).

### Predicted effects and their significance

- 8.8.6 The proposed phasing of the developments at C Site and Graven Hill are given in section 3.3. For C Site this is a relatively short period ~ two years, whilst Graven Hill is ~13 years, due to the size of the Site and complexity of the proposals. Construction and demolition activities at Graven Hill in particular, whilst temporary in nature, may take place at certain times over a protracted period (up to the development completion year of 2028). While the works will comprise numerous different activities, it is not expected that construction will occur in very close proximity to any particular existing or proposed residential receptors for extended periods of time.
- 8.8.7 A range of best practice/environmental measures have been incorporated into the proposed development in order to minimise and manage noise effects due to

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construction operations. These are described in detail in Section 8.5, and include restricted hours of operation for construction activities.

8.8.8 Taking these mitigation measures into account, and assuming that the noise management scheme is developed sufficiently to allow the Site to operate within the limits specified above, it is considered that the most appropriate magnitude to be assigned to construction noise effects is medium. For existing/proposed residential receptors in the areas surrounding Graven Hill and C Site (which are of medium sensitivity), it is concluded in accordance with the criteria summarised above that the effects of construction noise will not be significant.

# 8.9 Assessment of effects: traffic noise (operational)

## Assessment methodology

- 8.9.1 The prediction method for calculating road traffic noise increases on the local network is based upon the methodology presented in the Calculation of Road Traffic Noise (CRTN), as stipulated under PPG 24 (Annex 1).
- 8.9.2 Calculations undertaken in accordance with CRTN allow determination of road traffic noise emissions for various routes around the Sites, for both the Baseline (2031) and With Development (2031) scenarios. The year 2031 has been chosen to reflect completion of all of the proposed development (as set out in paragraph 4.5.12) and is in line with the transport assessment (BIC/OPA/DOC/12).
- 8.9.3 Based on the data provided, road traffic noise levels were modelled in terms of  $L_{A10, 18hr (daytime)}$  and  $L_{A10, pk-hr (night-time)}$ , in accordance with CRTN. The road traffic model was based upon total vehicle flow, percentage HGV and average speed data for the daytime 18-hour (06:00-24:00hrs) and night-time peak hour (05:00-06:00hrs).
- 8.9.4 A comparison between the two sets of noise levels gives a value for the predicted change in noise emissions for each road segment, as a result of additional development related traffic on the local network.
- 8.9.5 The Design Manual for Roads and Bridges (Vol. 11, 2008) (Highways Agency, 2007) recommends that the magnitude of noise effects should be categorised, and provides the following example.

#### Table 8.8 DMRB classification of magnitude of noise effects

Noise Change in L <sub>A10,18hr</sub>	Magnitude of effect
0	No Change
0.1 - 0.9	Negligible
1 - 2.9	Minor
3 - 4.9	Moderate
5+	Major

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8.9.6 The classification of magnitude of effect used in this chapter is based on a three step, (low, medium, high) magnitude of effect. To ensure a conservative assessment, the magnitude criteria used in this chapter will be low (0-1dB), medium (1-3dB) and high (3dB+).

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#### Predicted effects and their significance

8.9.7 Traffic noise levels were calculated for all potentially affected, populated road segments for the Baseline (2031) and With Development (2031) scenarios. A comparison between noise levels generated on each road segment during the two scenarios was used to determine the predicted magnitude of noise effect on each affected road segment, as shown in Table 8.9 (night-time, pkhr only). Full CRTN calculations are detailed in Appendix F-4.

#### Table 8.9 Predicted change in road traffic noise levels: Baseline (2031) > With Development (2031) (night-time, pkhr)

Road Segment	Noise Level, Baseline (2031), L <sub>A10, 18hr</sub>	Noise Level, With Development (2031), L <sub>A10, 18hr</sub>	Development Noise Level Increase, dB	Magnitude of Effect / Significance
15. Ploughley Road between Palmer Avenue and Ambrosden	57.0	65.9	8.9	High (negative) / Potentially Significant
16. Palmer Avenue between Ploughley Road and B4100	57.9	62.9	5.0	High (negative) / Potentially Significant

- 8.9.8 As shown in Table 8.9, the proposed increase in road going vehicles during shift changeover at C Site in the period 05:00-06:00hrs has the potential to significantly increase road traffic noise levels at existing residential receptors on the above road segments due to approximately 195 staff vehicles entering the Site during this period.
- 8.9.9 The effect is limited to the night-time peak hour only, but will occur once per day, Monday to Friday. Weekends and Bank Holidays will experience a much lower effect due to there being only a skeleton staff on site (see paragraph 3.4.9) at these times.
- 8.9.10 Opportunities for mitigating this weekday effect are limited, as redistribution of traffic (e.g. by restricting staff movements to Palmer Avenue/B4100) will only serve to increase the potential effect on residents along this route. Furthermore, it is understood that no potential alternatives exist to the proposed 8-hour shift changeover pattern due to MOD requirements for the operation of the Site.





# 8.10 Assessment of effects: freight rail noise

## Assessment methodology

- 8.10.1 The prediction method for calculating rail traffic noise increases on the local network, as a result of additional development-related freight rail movements, is based upon the methodology presented in the Calculation of Road Rail Noise (CRN).
- 8.10.2 Calculations undertaken in accordance with CRN allow determination of rail noise emissions for the freight routes to be utilised at and between Graven Hill and C Sites. A comparison between the predicted and baseline noise levels gives a value for the likely change in noise emissions for each potentially affected receptor.
- 8.10.3 Calculations are based upon two freight rail movements per day on the Graven Hill/ C Site line, assuming a Class 66 freight locomotive and nine container wagons. It is understood that the train will come to a stop and sound its horn at both the Ambrosden crossing and MOD secure gateway to C Site before resuming its journey.
- 8.10.4 Determination of magnitude for rail noise movements is based on a similar methodology for road traffic noise effects, as outlined above, i.e. the magnitude criteria used in this chapter will be low (0-1dB), medium (1-3dB) and high (3dB+), based on a comparison of predicted rail noise emissions for the Baseline (2031) and With Development (2031) scenarios.

## Predicted effects and their significance

- 8.10.5 Information provided by AMEC's transport team indicates that current (baseline) freight rail movements include one freight train per day (on average, two movements) to the Bicester International Freight Terminal (BIFT) and zero freight trains between Graven Hill and C Site.
- 8.10.6 Operational freight movements in the With Development (2031) scenario include one freight train per day (two movements) to the new Graven Hill employment area, and one freight train per day (two movements) between Graven Hill/C Site, which will pass through the village of Ambrosden.
- 8.10.7 It is understood that current routeing of freight rail to BIFT involves the arrival of the train to the Graven Hill sidings (in the south-west of the Site) from the Bicester-Oxford line. Trains are then required to reverse back around to the west/north in order to reach BIFT.
- 8.10.8 As a result, current arrivals to BIFT make a total of four movements (two on arrival, two on departure) past the nearest affected receptor (D/E 5 Langford Lane). Arrivals to the new Graven Hill employment area will only pass this receptor once on arrival, and once on departure (two movements).
- 8.10.9 For this train only, the proposed development will represent a net improvement in ambient noise levels at the Langford Lane receptor. However, as noted above, an additional freight train is proposed between Graven Hill and C Site, which will also take the same route into Graven Hill before routeing to C Site. Hence, the Langford

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Lane receptor will be subject to four total freight rail movements in a daily period, which represents no change to the existing baseline scenario.

- 8.10.10 Other receptors situated on the line between Graven Hill and C Sites will be subject to two freight rail movements, not currently included in the baseline scenario. Receptors for these activities include properties close to the Graven Hill/C Site railway line in Ambrosden (ref. noise monitoring position C5), and properties at Brook Farm (ref. C2) and Ploughley Road (ref. C1) at C Site.
- 8.10.11 The single event level for a typical MOD freight rail pass is 94dB  $L_{AE}$  at 5.5m<sup>15</sup>. Based on two movements per day in a 16 hour period, the equivalent contribution to noise levels has been calculated for the potentially worst affected receptors in the vicinity of the freight rail lines, as shown in Table 8.10.

# Table 8.10Predicted change in rail noise levels: Baseline (2031) > With Development (2031)<br/>(night-time, pkhr)

Receptor	Minimum Distance (m)	Noise Level, Baseline (2031), L <sub>Aeq, 16hr</sub> )	Freight Rail Contribution (L <sub>Aeq, 16hr</sub> (dB)	Noise Level (With Development), L <sub>Aeq, 16hr</sub> (dB)	Development Noise Level Increase, dB	Magnitude of Effect / Significance
Ambrosden Village (ref. C5)	5.5	52.0*	46.8	53.1	+1.1	Medium / not significant
Brook Farm (ref. C2)	75.0	52.8	31.3	52.8	+0.0	Low / not significant
Ploughley Road (ref. C1)	130.0	48.8	31.9	48.8	+0.0	Low / not significant

\* Measured baseline level corrected for additional distance to road traffic noise source (Merton Road) to rear garden of potentially worst affected property in Ambrosden

8.10.12 As shown in Table 8.10, changes to rail noise levels resulting from additional freight movements associated with the redeveloped C Site will at most have only an effect of medium magnitude at the Ambrosden receptors, over the 16-hour daytime period (all others will be low). Whilst it is acknowledged that rail movements will certainly be audible when they occur, it should be noted that these will be limited to two events per day at each receptor. It is concluded that the effects of changes in rail noise will not be significant for existing residential receptors in the vicinity of the rail line.

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<sup>&</sup>lt;sup>15</sup> ERM, 2009. Chiltern Railways (Bicester to Oxford improvements order) Environmental Statement - Volume 4. Section D, p. 32.

8.10.13 The effect of freight rail movements upon proposed residential units at Graven Hill has been incorporated into the daytime noise model for site suitability, and is therefore addressed in Section 8.12.

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# 8.11 Assessment of effects: C Site operational noise

## Assessment methodology

- 8.11.1 Based upon information received from the MOD on-site activities are likely to comprise:
  - freight rail movements into/out of C Site;
  - unloading of freight trains at the RRTA and movement of containers around the unloading yard (west and north of the Fulfilment Centre);
  - shunter operations at the railway sidings adjacent the northern site boundary; and
  - HGV movements into/out of the Site.
- 8.11.2 The following guidance has been used to assess the noise effects associated with onsite activities at C Site:
  - BS5228-1:20096<sup>16</sup>: this guidance has been used to determine the noise levels produced by on-site activities (other than freight rail noise emissions);
  - Calculation of Road Rail Noise: this guidance has been used to calculate freight train noise emissions from shunting movements within C Site; and
  - BS4142:1997: this guidance has been used to assess the effects from the changes in noise levels as a result of the proposed development at C Site.

## **BS5228** Calculations

8.11.3 Sound power levels (dB, <sub>LwA</sub>) for the plant complement have been determined based on data from similar plant held on file by AMEC. Sound power levels for the plant complement used in the prediction of noise emissions from C Site are shown in Table 8.11.

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<sup>&</sup>lt;sup>16</sup> Whilst the methodologies contained within the standard are generally applied to construction and other open sites (e.g. quarries / opencast mining), they are also useful in the prediction of noise from industrial sites including both fixed and mobile plant items.

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Activity	Plant	Number	Sound Power Level, L <sub>w</sub> , dB(A)	Data Source	On time
		Normal Op	erations		
Freight train arrivals/departures into C Site	6A49 MoD Freight Train (Class 66 locomotive)	1	N/A: Calculation in accordance with CRN	N/A: Calculation in accordance with CRN	N/A: Calculation in accordance with CRN
Unloading/loading of freight containers in RRTA	Reach stacker	3	105	AMEC (file data)	Based on haul length & site speed limit.
Shunter operations in northern sidings	Shunting unit	1	99	AMEC (file data)	Based on haul length & 3mph average speed.
Product imports/exports by road going HGV	Road going HGV	As transport figures*	106	AMEC (file data)	Based on haul length & site speed limit.

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#### Table 8.11 **Plant Complement and Sound Power Levels**

<sup>†</sup> Calculated from predicted maximum noise level due to rail passes at Langford Lane Crossing House (ES, Evergreen 3 Volume 2)

\* Data provided by AMEC transport: worst case 33mvts. per hour (daytime), 2-3mvts. per 5 minutes (night-time)

#### **BS4142** assessment

- 8.11.4 The standard provides a methodology for determining whether a new or existing noise source is likely to cause noise complaints by comparing the operational specific noise level with the background level, (i.e. the level that will be present without development. If the industrial noise contains any annoying characteristics (tonal or intermittent components such as hums, clanks or bangs), it is also subject to a 5dB rating penalty. A difference of +10 dB or more means complaints are likely, whereas a difference of around +5dB is of marginal significance. For differences of less than +5dB the likelihood of complaints reduces further.
- It is assumed for the purposes of this assessment that no significant operations will be 8.11.5 undertaken outside of the Fulfilment Centre building during the night-time period 23:00-07:00hrs, with the exception of HGV arrivals/departures. Assessments in accordance with BS4142 are undertaken for worst case predicted noise emissions over 1 hour for the daytime period (07:00-23:00hrs) and over 5 minutes for the night-time (23:00-07:00hrs).
- 8.11.6 The categories of magnitude are summarised as follows.
  - Low magnitude: Industrial noise rating levels are 10dB(A) or more below existing background noise levels.

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- Medium magnitude: Industrial noise rating levels are within 5dB(A) of existing background noise levels.
- High magnitude: Industrial noise rating levels are more than 5dB(A) above existing background noise levels.

### Predicted effects and their significance

8.11.7 A summary of predicted daytime noise levels occurring as a result of operations at C Site is shown in Table 8.12.

		Noise Level (dB)				
Operation	Ploughley Road (C1)	Brook Farm (C2)	Norris Road (C3)			
	Daytime (07:00	-08:00hrs)				
Freight trains	44	43	19			
Reach stackers	38	34	19			
Shunter	43	41	32			
HGV's	42	41	44			
TOTAL (daytime)	48	47	44			
	Night-time (Worst case 5mins, 06:00-07:00hrs)					
HGV's	40	37	41			
TOTAL (night-time)	40	37	41			

#### Table 8.12 Predicted noise emission levels (C Site operations)

8.11.8 Predicted noise levels during the worst case daytime (1 hour) and night-time (5 minute) periods were assessed in accordance with the methodology of BS4142:1997, as shown in Table 8.13 and Table 8.14, respectively.





		Noise Level (dB)			
Operation	Ploughley Road (C1)	Brook Farm (C2)	Norris Road (C3)		
Predicted noise level, L <sub>Aeq</sub>	48	47	44		
Rating penalty	+5	+5	+5		
Noise rating level, LAr	53	52	49		
Background noise level, $L_{A90}^{*}$	48	47	48		
Difference	5	5	1		
Magnitude of effect / significance	Medium / not significant	Medium / not significant	Medium / not significant		
* Background noise level calculated for the period 0700-0800hrs at each receptor from measured baseline data.					

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#### Table 8.13 BS 4142 assessment: daytime noise emissions from C Site

Fable 8.14	BS 4142 assessment: night-time noise emissions from C Site
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		Noise Level (dB)		
Operation	Ploughley Road (C1)	Brook Farm (C2)	Norris Road (C3)	
Predicted noise level, L <sub>Aeq</sub>	40	37	41	
Rating penalty	+5	+5	+5	
Noise rating level, L <sub>Ar</sub>	45	42	46	
Background noise level, $L_{A90}^*$	45	44	44	
Difference	0	-2	2	
Magnitude of effect / significance	Medium / not significant	Low / not significant	Medium / not significant	
* Background noise level calcul	ated for the period 0700-0800h	rs at each receptor from me	asured baseline data.	

8.11.9 As shown in Table 8.13 and Table 8.14, predicted worst case daytime (1 hour) and night-time (5 minutes) rating noise levels resulting from the operation of C Site are not expected to exceed 5dB(A) above the existing background noise level, during relevant periods at any of the nearest, potentially worst affected noise sensitive receptors.

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8.11.10 It is concluded that the effect of operational noise from C Site upon existing residential receptors in the vicinity of the Site will be of, at worst, a medium magnitude and hence not significant for receptors of medium sensitivity.

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#### 8.12 Assessment of effects: site suitability (residential)

## Assessment methodology

## **Prediction of noise levels**

- 8.12.1 For this assessment LimA, a computational noise modelling suite was used and included the effects of both road and rail traffic noise sources upon the noise climate across the Graven Hill Site. LimA has been widely used in noise modelling and noise mapping projects throughout the UK and Europe. Developed by Stapelfeldt Ingenieuresellschaft mbH, LimA can implement a number of methodologies for the calculation of noise levels, including CRTN for the calculation of road traffic noise and CRN for the calculation of rail traffic noise.
- 8.12.2 The LimA noise model allows a 3-dimensional environmental model to be constructed using digital mapping and topographic data taking into account:
  - noise source location based on the positioning of rail and road traffic noise sources, as shown by the OS digital mapping data;
  - noise emission data comprising sound power levels or sound pressure levels calculated from road traffic volumes, percentage HGVs, segment speeds etc. (CRTN) or frequency of passenger/freight rail traffic (CRN);
  - the distance between noise source and receptor based on the Master Plan and OS digital data;
  - ground contours from OS digital data and on-site topographic survey;
  - locations and dimensions of barriers between noise source and receptor; and
  - ground attenuation related to the ground cover between the source and the receptor.
- 8.12.3 Due to the potential nature of residential development, a series of noise maps was developed to show noise propagation across the Graven Hill Site, at the following heights:
  - daytime: 1.5m (ground level); and
  - night-time: 4.0m (first floor).
- 8.12.4 The effects of road and rail traffic noise were modelled separately, as detailed below. The results of both models were then summed to give the total predicted noise levels in 2031 for use in the assessment of site suitability in accordance with PPG 24. Noise levels were obtained for the daytime (07:00-23:00hrs) and night-time (23:00-07:00hrs) periods.

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### Road traffic modelling for site suitability assessment

- 8.12.5 In order to allow the road traffic noise model to be used in the assessment of site suitability, in accordance with PPG 24, the daytime and night-time calculated road traffic noise levels, in terms of  $L_{A10, 18hr}$  and  $L_{A10, pk-hr}$  were converted to daytime and night-time  $L_{Aeq}$  values, in accordance with the PPG 24 assessment periods  $L_{Aeq, 16hr}$  (daytime, 07:00-23:00hrs) and  $L_{Aeq, 8hr}$  (night-time, 23:00-07:00hrs). The following corrections were applied:
  - Daytime:  $L_{Aeq, 16hr} = L_{A10, 18hr} 2dB$
  - Night-time:  $L_{Aeq, 8hr} = L_{A10, pkhr} 6.5 dB^{17}$
- 8.12.6 In addition to the above, maximum night-time noise levels at worst affected positions at the boundaries of the Site (closest to the road traffic noise sources) were determined, based upon typical maximum noise emission levels for HGVs (106dB Lw), and corrected for distance to the nearest proposed residential areas.

## Rail traffic modelling for site suitability assessment

- 8.12.7 Rail noise modelling was completed with reference to rail noise emission levels predicted to occur on the Bicester-Oxford line by ERM as a result of future consented works associated with the Chiltern Railways Evergreen 3 Project (to Phase 2).
- 8.12.8 Rail noise sources west of the Site (Bicester-Oxford line) were calibrated to give results in the noise model equal to those predicted by ERM at the Langford Lane Crossing House receptor<sup>18</sup> (located immediately east of the line), as follows:
  - Daytime:  $L_{Aeq, 16hr} = 66dB$
  - Night-time:  $L_{Aeq, 8hr} = 63dB$
- 8.12.9 Additionally, it is expected that one freight train per day (i.e. two movements) will arrive to the redeveloped Graven Hill Site via the junction, also west of the Site, during daytime hours only. Additions to the daytime rail noise model only were made on this basis, using worst case freight rail passby noise levels of 94dB  $L_{AE}$  (at 5.5m), also measured by ERM as part of work on the Evergreen 3 Project<sup>19</sup>. It should be noted that due to the very low rail traffic levels into Graven Hill, the effect of these additional freight rail movements upon the total 16-hour daytime  $L_{Aeq}$  noise levels is minimal with respect to traffic on the Bicester-Oxford line.

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<sup>&</sup>lt;sup>17</sup> Correction consists of 3dB to convert LA10, 1hr to LAeq, 1hr (in accordance with PPG24), and -3.5dB to convert LAeq, 2hr (including BOTH peak hours) to LAeq, 8hr (S. Bird, Bird Acoustics 2002). The - 3.5dB is a method for converting a measured LAeq, 2hr to an LAeq, 8hr, including the effects of two peak hours. In the modelling, we only consider one peak hour, and so this correction is effectively an overstatement of noise levels over the full 8-hour night-time period.

<sup>&</sup>lt;sup>18</sup> ERM, 2009. Chiltern Railways (Bicester to Oxford improvements order) Environmental Statement – Volume 2. Section 6, p. 34

<sup>&</sup>lt;sup>19</sup> ERM, 2009. Chiltern Railways (Bicester to Oxford improvements order) Environmental Statement – Volume 4. Section D, p. 32

8.12.10 Finally, maximum night-time noise levels at worst affected residential positions on the western boundary of the Site were determined, based upon maximum noise levels predicted by ERM on the Bicester-Oxford line only (i.e. due to night-time freight train movements), at the Langford Lane Crossing House receptor of 86dB L<sub>Amax</sub><sup>20</sup>.

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#### Assessment criteria

#### Site suitability

8.12.11 Determination of site suitability for residential use is based upon the assignment of Noise Exposure Categories (NEC), applied to proposed new dwellings as noise receptors. The categories range from A to D to reflect an increasing level of concern regarding the noise climate, as summarised in Table 8.15.

Table 8.15	Noise exposure	categories	from	<b>PPG 24</b>

Noise Exposure Category	Description
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
В	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
С	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

8.12.12 PPG 24 provides a specified range of noise levels for each of the four exposure categories, according to the nature of the predominant noise source. Since the Site is expected to be affected primarily by road traffic noise, or a combination of road and rail traffic noise sources, the target noise limits for 'road traffic/mixed sources' have been used, as shown in Table 8.16.

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<sup>&</sup>lt;sup>20</sup> ERM, 2009. Chiltern Railways (Bicester to Oxford improvements order) Environmental Statement – Volume 2. Section 6, p. 34

#### Table 8.16 Noise levels corresponding to the Noise Exposure Categories for new dwellings LAeq,T (dB)

Noise Exposure Category						
Road traffic	/ mixed sources	А	В	С	D	
PPG 24	07:00-23:00 day time	<55	55-63	63-72	>72	
	23:00-07:00 night-time	<45	45-57	57-66	>66	

8.12.13 Additionally, PPG 24 states that if any measured or predicted night-time maximum noise levels exceed 82dB(A) several times in any hour, the Site should be treated as NEC C.

#### Internal living areas

8.12.14 Where significant levels of noise exist outside noise sensitive dwellings, PPG 24 refers to BS8233 'Sound Insulation and noise reduction for buildings - Code of Practice' (1999), which presents design criteria to ensure acceptable internal noise levels for resting in living rooms during the day, and for resting and sleeping in bedrooms during the night, as shown in Table 8.17.

Criterion	Typical Situations	Design Range LAeq,T dB	
	_	Good	Reasonable
Reasonable Resting or Sleeping	Living Rooms	30	40
Conditions	Bedrooms	30	35

#### Table 8.17 BS 8233 internal noise level criteria (residential)

- 8.12.15 Additionally, BS8233 states that for a reasonable standard in bedrooms at night, individual noise events (measured with fast time-weighting) should not regularly exceed 45 dB LAmax.
- 8.12.16 Assessment of site suitability for residential use is based upon the assumption that the external envelope of all residential buildings will be design to meet BS8233 criterion for reasonable conditions for resting in living rooms during the day, and for resting/sleeping in bedrooms at night.

#### *External living areas*

8.12.17 BS8233 is based upon the WHO 'Guidelines for Community Noise' (2000), but allows for some deviation from it. In addition to consideration of internal noise levels, the WHO guidelines recommend a noise level of LAeq 55dB to avoid serious





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annoyance in outdoor living areas (i.e. gardens, balconies etc.). However, it should be noted that the levels proposed in the WHO guidance are considered to be guideline, aspirational values only. The WHO guidance itself states that approximately 40% of the population of the European Union is exposed to road traffic noise in excess of the 55dB(A) value, and that more than half of all European Union residents live in areas that do not ensure acoustical comfort. These guideline values are therefore often viewed as aspirational targets and should not be considered as mandatory limits.

#### Summary

8.12.18 The magnitude criteria used in the assessment are summarised in Table 8.18.

Guidance	Low magnitude*	Medium magnitude*	High magnitude
PPG 24	Predicted external noise levels in NEC A, i.e. $<55dBL_{Aeq, 16hr}$ (day); $<45dBL_{Aeq, 8hr}$ (night)	Predicted external noise levels in NEC B, i.e. $55-63dBL_{Aeq, 16hr}$ (day); $45-57dBL_{Aeq, 8hr}$ (night), or Predicted Noise levels in NEC C $63-72dBL_{Aeq, 16hr}$ (day); $57-66dBL_{Aeq, 8hr}$ (night)	Predicted external noise levels in NEC D, i.e. >72dBL <sub>Aeq, 16hr</sub> (day); >66dBL <sub>Aeq, 8hr</sub> (night)
BS 8233	Compliance with 'good' BS8233 criteria for internal noise levels in living rooms during the day, and in bedrooms at night, i.e. 30dBL <sub>Aeq, 16hr</sub> (daytime) & 30dBL <sub>Aeq, 8hr</sub> ; 45dBL <sub>Amax</sub> (night).	Compliance with 'reasonable' BS8233 'criteria for internal noise levels in living rooms during the day, and in bedrooms at night, i.e. 40dBL <sub>Aeq, 16hr</sub> (daytime) & 35dBL <sub>Aeq, 8hr</sub> (night) 45dBL <sub>Amax</sub> (night).	Non-compliance with BS8233 criteria for internal noise levels in living rooms during the day and/or in bedrooms at night, i.e. >40dBL <sub>Aeq, 16hr</sub> (daytime), or >35dBL <sub>Aeq, 8hr</sub> (night) 45dBL <sub>Amax</sub> (night).

#### Table 8.18 Site suitability (residential) magnitude criteria

Predicted noise levels need to meet both PPG24 and BS8223 criteria to fall within this category of magnitude

#### Predicted effects and their significance

- 8.12.19 Assignment of PPG24 noise exposure categories for residential units on the Graven Hill Site was based on an analysis of the noise maps for daytime (LAeq, 16hr) and nighttime (LAeq, 8hr) noise. The models for the With Development scenario in 2031 include the growth in road and rail traffic on existing routes, predicted to occur up to the development completion year of 2028, and changes in road traffic levels (on local routes) associated with the consent and operation of the development itself.
- 8.12.20 Assignment of PPG 24 noise exposure categories for night-time noise also includes the predicted occurrence of regular exceedances of  $82dB L_{Amax}$  (due to road and or rail movements around Graven Hill), in worst affected residential areas during the nighttime period 23:00-07:00hrs.

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#### **Daytime noise levels**

8.12.21 The noise map for daytime noise emissions to the Site (see Figure 8.2), at 1.5m above ground level, shows that the majority of residential units on the Site will fall in NEC A, but with substantial areas close to the A41, site access routes via Graven Hill Road/ Pioneer Road and the Bicester to Oxford railway line falling into NEC B. Some units located very close to the road traffic noise sources only may fall into NEC C, as shown on Figure 8.2.

#### Night-time noise levels

- 8.12.22 The noise map for night-time noise emissions to the Site (see Figure 8.3), at first floor height (i.e. 4.0m above ground level), shows that the majority of residential units on the Site will fall in NEC B, with some areas located close to the A41 falling into NEC C.
- 8.12.23 A small proportion of residential units at the Site will fall into NEC A during the night-time period.
- 8.12.24 In addition to the NEC C areas shown on Figure 8.3, it should be assumed that any units located close to any internal or external road segment could potentially be regularly exposed to night-time maximum noise levels in excess of 82dB L<sub>Amax</sub>, where these are located no greater than 6m from the kerbside (roads only).
- 8.12.25 Night-time maximum noise levels for units in closest proximity to the A41 could be expected to be no greater than 70dB L<sub>Amax</sub> (at 25m minimum).
- 8.12.26 Night-time maximum noise levels at units closest to the Oxford-Bicester railway line will not regularly exceed 72dB L<sub>Amax</sub> (at 60m closest approach).

#### Identification of environmental measures (internal living areas)

- 8.12.27 Determination of glazing requirements for the Graven Hill Site is based principally upon the assignment of noise exposure categories for residential units across the Site e.g. all living room windows in areas of NEC B will be designed to achieve façade noise reduction based on external noise level in the upper limit of NEC B, i.e. 63dB L<sub>Aeq, 16hr</sub>.
- 8.12.28 The sound reduction performance required for living room and bedroom windows at residential units within areas of the Site assigned to Noise Exposure Categories A-C are shown in Table 8.19 and Table 8.20, based on assessment in accordance with BS8233:1999. Reference to Figures 8.2 and 8.3 shows broadly the areas requiring these glazing specifications, based on the  $L_{Aeq}$  noise emissions to the Site only.

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Receptors	Living Rooms, NEC A	Living Rooms, NEC B	Living Rooms, NEC C			
External Noise Level $L_{Aeq,T} dB$ (Free field)	55	63	72			
External Noise Level L <sub>Aeq,T</sub> dB (Facade)	58	66	75			
Glazing Spec. (mm)	4/12/4	4/12/4	10/12/6			
Façade Reduction, closed windows dB	-29dB R <sub>TRA</sub> *	-29dB R <sub>TRA</sub> *	-36dB R <sub>TRA</sub> *			
Internal Noise Level (dB)	29	37	39			
BS8233 Criterion	30dB (Good); 40dB (Reasonable)	30dB (Good); 40dB (Reasonable)	30dB (Good); 40dB (Reasonable)			
Compliance with BS8233 Criteria?	Yes (Good)	Yes (Reasonable)	Yes (Reasonable)			

# Table 8.19 BS8233 assessment - sound reduction requirements for living room windows in NEC Categories A-C

\* Based on typical 40% glazed area of total living room/bedroom façade (+4dB correction), and assuming average room absorption is higher than  $\sigma = 0.15$  (typically, inhabited rooms will be in the range  $\sigma = 0.4 - 0.8$ )

# Table 8.20 BS8233 assessment - sound reduction requirements for bedroom windows in NEC Categories A-C (LAeq only)

Receptors	Bedrooms, NEC A	Bedrooms, NEC B	Bedrooms, NEC C
External Noise Level $L_{Aeq,T} dB$ (Free field)	45	57	66
External Noise Level $L_{Aeq,T} dB_{,I}Facade)$	48	60	69
Glazing Spec. (mm)	4/12/4	4/12/4	10/12/6
Façade Reduction, closed windows dB	-29dB R <sub>TRA</sub> *	-29dB R <sub>TRA</sub> *	-36dB R <sub>TRA</sub> *
Internal Noise Level (dB)	17	31	33
BS8233 Criterion	30dB (Good); 35dB (Reasonable)	30dB (Good); 35dB (Reasonable)	30dB (Good); 35dB (Reasonable)
Compliance with BS8233 Criteria?	Yes (Good)	Yes (Reasonable)	Yes (Reasonable)

\* Based on typical 40% glazed area of total living room/bedroom façade (+4dB correction), and assuming average room absorption is higher than  $\sigma$  = 0.15 (typically, inhabited rooms will be in the range  $\sigma$  = 0.4 - 0.8)



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8.12.29 Further consideration of mitigation requirements for the control of maximum noise level events during the night-time period is also required. The glazing performance requirements for control of maximum noise levels due to both road and rail traffic are shown in Table 8.21. Note that these glazing specifications supersede those shown above, and where there is an apparent conflict, the higher glazing specification for a given position on site should always be used.

Receptors	Bedrooms, minimum 6m from roads	Bedrooms, minimum 25m from nearside carriageway of A41	Bedrooms, minimum 60m from Bicester/Oxford railway line
External Noise Level L <sub>Amax</sub> dB (Free field)	82	70	72
External Noise Level L <sub>Amax</sub> dB (Facade)	85	73	75
Glazing Spec. (mm)	10/12/6	4/12/4	4/12/4
Façade Reduction, closed windows dB	-42dB R <sub>w</sub> *	-35dB R <sub>w</sub> *	-35dB R <sub>w</sub> *
Internal Noise Level (dB)	43	38	40
BS8233 Criterion	No regular exceedances of 45dB	No regular exceedances of 45dB	No regular exceedances of 45dB
Compliance with BS8233 Criteria?	Yes	Yes	Yes

# Table 8.21 BS8233 Assessment - sound reduction requirements for bedroom windows 4.0m (maximum noise levels due to road/rail noise sources)

\* Based on typical 40% glazed area of total living room/bedroom façade (+4dB correction), and assuming average room absorption is higher than  $\sigma = 0.15$  (typically, inhabited rooms will be in the range  $\sigma = 0.4 - 0.8$ )

8.12.30 The above scheme of glazing will be sufficient to control external noise levels to acceptable internal levels for resting in living rooms during the day, and for resting and sleeping in bedrooms during the night. Glazing requirements and the need for any acoustic trickle vents can be dealt with a Reserved Matters stage when the layout of individual plots will be confirmed. For example, alternative mitigation might include siting of habitable living room and bedroom windows on facades facing away from road and rail noise sources, in which case a reduction of up to15dB L<sub>Aeq</sub> / L<sub>Amax</sub> could be reasonably expected due to screening provided by the building itself. In most situations, based on predicted noise levels at this site, this will allow use of standard double glazing (typical construction 4mm glass/12mm cavity/4mm glass) throughout.

## **External Noise Levels**

8.12.31 It should be noted that much of the Site will be exposed to daytime free-field noise levels of 55dB L<sub>Aeq, T</sub> or above (i.e. NEC B or above, see Figures 8.2 and 8.3). The

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WHO Guidelines recommend a noise limit value of 55dBL<sub>Aeq,T</sub> to avoid serious annovance in outdoor living areas (gardens, balconies etc.).

8.12.32 It is therefore recommended that outdoor living areas be placed, where possible, on the opposite side of the buildings from the nearest road and rail traffic noise sources, in order to reduce noise exposure in outdoor living areas. Screening provided by the residential units themselves could be reasonably expected to provide up to 15dB  $L_{Aeg}$  / LAmax of noise reduction to outdoor living areas. Based on predicted noise levels at this site, this will bring external daytime noise levels within the criterion for most areas of the Site.

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8.12.33 However, it should be noted that the levels proposed in the WHO guidance are considered to be guideline values only, as approximately 40% of the population of the European Union is already exposed to road traffic noise in excess of the 55dB(A) value, and more than half of all European Union residents live in areas that do not ensure acoustical comfort. However, the limit can be considered an aspirational target to improve the amenity of residential use on site, while not a strict statutory limit.

#### **Summary**

- 8.12.34 Assuming that the internal noise level requirements of BS8233 are met at Reserved Matters stage, then the magnitude of noise effect for future residents of the Site (including the proposed hotel) will be, at worst, of medium magnitude and hence not significant.
- 8.12.35 General guideline design advice has been provided to provide compliance with the external noise level criteria of the WHO Guidelines for Community Noise (2003), although compliance with these values do not form part of the assessment of significance for site suitability.

# 8.13 Assessment of effects: site suitability (offices)

## Assessment methodology

- The results of the noise modelling (see section 8.12) were also used to determine 8.13.1 predicted external noise levels at the proposed employment/commercial area in the north-east of the Graven Hill proposed development. As the exact positioning and configuration of the layout of the buildings has not been finalised at this stage, it is not possible to undertake a full quantitative assessment of noise effects for the proposed commercial area. However, predicted noise levels at the worst affected areas of the Site are provided to give some context to the detailed design stage.
- 8.13.2 For noise levels affecting proposed commercial/office development, BS8233 provides additional internal noise level criteria to ensure reasonable conditions for study and work requiring concentration. A range of internal noise level criteria are provided for various typical offices spaces, as shown in Table 8.22.

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Criterion	Typical Situations	Design Ra	ange L <sub>Aeq,T</sub> dB
		Good	Reasonable
Reasonable conditions for study and work requiring	Cellular office	40	50
concentration	Meeting room, executive office	35	40

#### Table 8.22 BS 8233 internal noise level criteria (offices)

- 8.13.3 Assessment of site suitability for office/commercial use is based upon the assumption that the external envelope of all residential buildings will be design to meet BS8233 criterion for reasonable conditions for resting in living rooms during the day, and for resting/sleeping in bedrooms at night.
- 8.13.4 The magnitude criteria used in the assessment are summarised as follows.
  - Low magnitude: Compliance with 'good' BS8233 criteria for internal noise levels in critical areas, e.g. 35dB LAeq, T for meeting rooms/executive offices.
  - Medium magnitude: Compliance with 'reasonable' BS8233 criteria for internal noise levels in critical areas, e.g. 40dB LAeg, T for meeting rooms/executive offices.
  - High magnitude: Non-compliance with BS8233 criteria for internal noise levels in critical areas.

#### Predicted effects and their significance

- 8.13.5 The results of noise modelling for the Graven Hill development (ref. Figure 8.2) indicate that daytime noise levels at the north-east boundary of the proposed commercial site (i.e. close to the outer circular road will be at the boundary of NEC's B/C i.e. 63dB  $L_{Aeq, 16hr}$ , with the majority of the Site falling into NEC B.
- 8.13.6 The glazing performance requirements for control of daytime noise levels due to road traffic in the worst affected areas of the Site are shown in Table 8.23.

#### **Table 8.23** BS 8233 assessment - sound reduction requirements for office windows at upper limit of NEC B

Receptors				Off	ices, NEC B	
External Noise Level $L_{Aeq,T} dB$ (Free field)					63	
External Noise Level $L_{Aeq,T} dB_{J}Facade)$					66	
Glazing Spec. (mm)					4/12/4	
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Façade Reduction, closed windows dB	-26dB R <sub>TRA</sub> *
Internal Noise Level (dB)	40
BS8233 Criterion (executive office / meeting room)	35dB (Good); 40dB (Reasonable)
Compliance with BS8233 Criteria?	Yes (Reasonable)
* Based on typical 80-90% glazed area of total living office faca	de, and assuming average room absorption is higher

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than  $\sigma = 0.15$  (typically, inhabited rooms will be in the range  $\sigma = 0.4 - 0.8$ )

- 8.13.7 Generally speaking, office/commercial developments include mechanical ventilation systems ameliorating the need for building facade rapid/purge ventilation. However, where building façade ventilation elements are utilised in preference, these should be carefully selected to ensure that the sound reduction performance of the façade is not degraded below the values specified.
- 8.13.8 Assuming that the internal noise level requirements of BS8233 are met at the Reserved Matters stage, then the magnitude of noise effect for future users of the commercial/office development will be, at worst, of medium magnitude and hence not significant.

#### 8.14 Assessment of effects: site suitability (school)

## Assessment methodology

- 8.14.1 The results of the noise modelling (see section 8.12) were also used to determine predicted external noise levels at the proposed school site in the north-east of Graven Hill. As the exact positioning and configuration of the layout of the buildings has not been finalised at this stage, it is not possible to undertake a full quantitative assessment of noise effects for primary school location. However, predicted noise levels at the worst affected areas of the Site are provided to give some context to the detailed design stage.
- 8.14.2 For noise levels affecting proposed new schools, Building Bulletin 93 'Acoustic Design of Schools' (Part E4 of Building Regulations 2000, 2003 Edition BB93) specifies acceptable levels of internal noise in critical spaces, including classrooms, libraries, resources areas, design and technology labs, etc. Upper limits for indoor ambient noise levels are specified for each type of room, depending on noise tolerance e.g. classrooms have a low noise tolerance (noise limit 35dB LAeq, 30min), but dining rooms have a high noise tolerance (noise limit 50dB LAeg, 30min).
- 8.14.3 As of 2003, BB93 has been a mandatory requirement in the design of new schools and hence external building elements must be designed to ensure sufficient attenuation of external noise levels to meet the internal noise limit criteria.
- BB93 also applies to outdoor teaching areas e.g. playing fields, playgrounds etc., and 8.14.4 hence further noise mitigation measures e.g. noise barriers may be required for external teaching spaces exposed to excessive environmental noise. BB93 indicates

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that noise levels in external teaching areas (e.g. sports pitches, etc.) should not exceed 55dB  $L_{Aeq, 30mins}$ , and at least some areas should be provided where noise levels do not exceed 50dB  $L_{Aeq, 30mins}$ . The criteria for external areas are compared with the predicted worst case noise levels affecting the school site to provide context for future development of noise mitigation measures for external areas e.g. acoustic barriers etc.

- 8.14.5 Assessment of site suitability for education use is based upon the assumption that the external envelope of all school buildings will be design to meet BB93 guidelines for internal noise levels in various noise critical educational spaces (e.g. classrooms, resource areas, etc.).
- 8.14.6 The magnitude criteria used in the assessment are summarised as follows.
  - Low magnitude: Internal noise levels are 5dB or more below the requirements of BB93 in various teaching spaces and external noise levels are 5dB or more below the requirements of BB93 in outdoor teaching areas.
  - Medium magnitude: Internal noise levels comply with the requirements of BB93 in various teaching spaces and external noise levels comply with the requirements of BB93 in outdoor teaching areas.
  - High magnitude: Non-compliance with indoor ambient noise requirements of DfES Building Bulletin 93, or external noise levels do not comply with the requirements of BB93 in outdoor teaching areas.

## Predicted effects and their significance

- 8.14.7 The results of noise modelling for the Graven Hill development (ref. Figure 8.2) indicate that daytime noise levels at the southernmost boundary of the proposed site (i.e. close to the outer circular road will be at the boundary of NEC's B/C i.e. 63dB  $L_{Aeq, 16hr}$ . However, the bulk of the Site will experience noise not in excess of NEC A i.e. 55dB  $L_{Aeq, 16hr}$ . It should therefore be feasible to provide outdoor teaching areas compliant with BB93 criteria, depending on the final chosen layout of the school buildings/playing field areas. Ideally, school buildings will be located to the south of the Site, and playing fields to the rear (north). Additionally, screening to the road traffic noise source will allow provision of areas meeting the BB93 criterion of 50dB  $L_{Aeq, 30mins}$ .
- 8.14.8 All school buildings will be designed to achieve a level of sound reduction compliant with BB93 criteria for ambient internal noise levels in critical teaching areas (e.g. classrooms, workshops, etc.). As full details of the layout/design of the school development are not available at this stage, it is not appropriate to fully evaluate the sound reduction requirements of the external envelope. However, in accordance with the guidance of BB93, this should be developed comprehensively at detailed design stage.
- 8.14.9 Assuming that the internal and external noise level requirements of BB93 are met, then the magnitude of noise effect for future occupants of the school will be, at worst, of medium magnitude and hence not significant.

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# 8.15 Conclusions of significance evaluation

8.15.1 Table 8.24 shows a summary of all predicted noise effects considered in this chapter of the ES.

Receptor	Probability	Sensitivity/ Value	Magnitude	Significan	ce
				Level	Rationale
Construction Phase					
Increase in ambient noise due to construction (fixed and mobile plant on site), affecting existing noise sensitive receptors	Likely	Medium	Medium	Not significant	Construction/demolition programme undertaken in accordance with best practice guidelines / registration with Considerate Constructors Scheme, etc. to meet BS5228-1:2009 emissions levels, i.e. total ambient noise plus construction noise not to exceed 65dB LAeq, 12hr at worst affected residential properties.
Operational Phase					
Increase in ambient noise due to additional C Site development related road traffic on local routes, affecting existing noise sensitive receptors	Likely	Medium	High	Significant	Shift changeover movements (light traffic only) due to C Site operations are predicted to result in ambient noise level increases in excess of +3dB(A) for residents on Ploughley Road (up to and including residential receptors in Ambrosden), and Palmer Avenue.
					The increase in road traffic noise may be significant for these receptors, during weekdays but is confined to the night-time peak hour (0500-0600hrs)
Increase in ambient noise due to additional development related rail traffic affecting existing noise sensitive receptors	Likely	Medium	High	Not significant	Predicted increases in rail noise related to additional freight movements do not exceed $+3dB(A)$ $L_{Aeq, 16hr}$ at any potentially affected receptor.
Industrial noise emissions from C Site operations affecting existing residential receptors in the vicinity of the Site	Likely	Medium	Medium	Not significant	Predicted daytime (1 hour) and night-time (5 mins) noise emission levels are not expected to exceed the background noise level by more than +5dB(A) at any of the nearest, potentially affected noise sensitive receptors.
Site suitability for proposed	Likely	Medium	Medium	Not significant	Road/rail traffic noise levels meet PPG24 NECs A-C, and external

#### Table 8.24 Summary of negative noise effects and evaluation of their significance

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Receptor	Probability	Sensitivity/ Mag	Magnitude	Significant	Ce
	,	Value		Level	Rationale
residential use (including hotel)					envelopes of all residential buildings will be subject to detailed design to comply with BS8233 internal noise level criteria for living rooms and bedrooms.
Site suitability for proposed commercial/office use	Likely	Medium	Medium	Not significant	External envelope of all office buildings to be subject to detailed design such that internal noise levels in all noise critical spaces meet BS8233 internal noise level criteria.
Site suitability for proposed educational use (primary school)	Likely	Medium	Medium	Not significant	External envelope of all school buildings to be subject to detailed design such that internal noise levels in all noise critical spaces meet the requirements of BB93, and
					Noise to outdoor teaching areas mitigated to provide suitable external noise levels for teaching of sports etc.
Key:	Probability	Value	Magnitude	Significance	
	Certain Likely Possible Unlikely	High Medium Low	High Medium Low	Significant Not Significar	nt



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#### **Community and Socio-economics** 9.

#### 9.1 Introduction

9.1.1 This chapter presents the results of an assessment of the effects of the proposed development on community and socio-economics within the local study area and within the district of Cherwell. This chapter should be read in conjunction with the proposed development description (chapter 3).

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#### Policy 9.2

9.2.1 Table 9.1 lists the issues from planning policy guidance and policies which have been considered in assessing community and socio-economic effects.

Policy Reference	Policy Issues
PPS 1	Outlines Government policy on achiveing sustainable development through the planning system. Provides support for socially inclusive communities with access to a range of jobs, health, housing, education, shops, leisure and community facilities.
PPS 3	The PPS underpins the delivery of the Government's strategic housing policy objectives, by setting out approaches to land supply and improving the affordability and supply of housing in all communities, including rural areas.
PPS 4	The PPS states that the Government's overriding objective is sustainable economic growth. Underlying objectives include: building prosperous communities, reducing the gap in economic growth rates between regions, delivering more sustainable patterns of development, promoting the vitality and viability of town centres and raising quality of life.
PPG 17	This PPG describes the role of the planning system in assessing opportunities and needs for sport and recreation provision and safeguarding open space which has recreational value. Local planning authorities should take account of the community's need for recreational space, having regard to current levels of provision and deficiencies and resisting pressures for development of open space which conflict with the wider public interest.
SE Plan Policy S1	Role of planning system in supporting health sustainable communities.
SE Plan Policy S3	Promoting access for all sections of society to education facilities at locations with good public transport access.
SE Plan Policy S5	Ensuring access to cultural and sporting facilities.
SE Plan Policy S6	Ensuring community infrastructure supports economic growth and regeneration, with particular priority for health and education provision.
SE Plan Policy CC8	Ensuring sufficient green infrastructure is provided for developments.

Table 9.1 **Policy issues** 

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Policy Reference	Policy Issues
Regional Economic Development Strategy: The Strategy	By 2016 the south east will be a world class region achieving sustainable prosperity.
Regional Economic Development Strategy Core values	Building on excellence for global competitiveness; investing in potential to lift underperformance; safeguarding quality of life as a competitive advantage.
Regional Economic Development Strategy Headline targets	Achieve an average annual increase in GVA per capita of at least 3%; increase productivity per worker by an average 2.4% annually; reduce the rate of increase in the region's ecological footprint.
CDC Non-statutory LP Policy H1b	Local policy on allocation of sites for housing.
CDC Non-statutory LP Policy H4	Local policy on types of housing.
CDC Non-statutory LP Policy H7	Local policy on affordable housing.
CDC Non-statutory LP Policy EMP1	Local policy on allocation of sites for employment generating development.
CDC Non-statutory LP Policy R1	Local policy on allocation of land for recreational use.
CDC Non-statutory LP Policy R8 and R9	Local policies on provision of outdoor playing space and amenity areas in association with new residential development.

#### Data gathering methodology 9.3

## **Desk study**

9.3.1 Publicly available data sets have been gathered and used in order to understand the socio-economic position of the district of Cherwell, the South East region and England. Where the relevant data is available, this has also been examined for the study area (Ambrosden and Chesterton ward). Data sources are tabled below.

#### Table 9.2 Data sources

Торіс	Information sought	Sources and organisations approached			
Employment	Economic activity and unemployment rates, employment by sector, skills levels	Office for National Statistics NOMIS website Neighbourhood statistics website Cherwell County Council Draft Core Strategy Non-Statutory Cherwell Local Plan 2011 Adopted Cherwell Local Plan 1996			
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Торіс	Information sought	Sources and organisations approached
Housing	Levels of local home ownership and housing needs	Cherwell County Council Housing Strategy 2005-2011 Affordable housing viability study 2010 Cherwell housing needs assessment 2009 Draft Core Strategy
Healthcare	Information about status of services	North-east Oxfordshire Primary Care Trust (PCT) NHS Oxfordshire Strategy 2008-2013 NHS Oxfordshire Annual Healthcheck 09/10
Education	Information about status of services	Oxfordshire County Council Pupil Place Plan 2010-2016 Graven Hill pre-application advice Schoolsnet website - List of schools in the area
Open space	Accessibility and needs	Cherwell District Council Green Space Strategy (2008-2016) Draft Core Strategy
Wider social and community infrastructure	Information about location and status of services	Local planning documents and desk review of directories
		Cherwell District Council Green Space Strategy (2008-2016) Playing Pitch Strategy (2008) Draft Core Strategy
		Oxfordshire County Council Graven Hill pre-application advice
Social cohesion		local planning documents

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A list of websites is provided in the references section of the ES after chapter 15.

#### Survey

9.3.2 No surveys were undertaken.

#### 9.4 **Overall baseline**

9.4.1 The Graven Hill Site is located within the ward of Ambrosden and Chesterton (hereinafter referred to as Ambrosden) and C Site is located within the ward of Launton. Baseline information regarding population and economics has been included for both wards. However, as the proposed development at C Site does not include any residential dwellings or any changes to open space/community facilities in the local area issues such as housing, education and healthcare will not be affected in Launton and therefore baseline information in relation to these issues has not been collected. For comparative purposes the socio-economic baseline position is set within the context of district data and ward data (and in certain instances national data).

## **Current baseline**

9.4.2 Information on traffic and transport, noise, air quality and visual effects, all of which can affect the local community, is provided in chapters 6, 7, 8 and 10 respectively.

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#### **Population**

9.4.3 As of 2001 Ambrosden and Launton had total populations of 3,330 and 3,048 people respectively (2001 Census). Both wards are situated in Cherwell District within the South East region.

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9.4.4 The total population of Cherwell in 2011 is projected to be 141,800. As can be seen from the chart below, in 2011, the general age profile of Cherwell is projected to be similar to that of the region and the country as a whole, with the following exceptions; a higher than average proportion of the population are aged 0-4, 35-49 and a lower than average proportion of the population are aged 20-24 compared to the national and regional averages.



#### Figure 9.1 **Population Structure 2011**

Source: 2008-based Sub-national population Projections.

9.4.5 Population projections are not available at a ward level, however comparing the populations of Cherwell to Ambrosden and Launton in the year 2001 does allow an appreciation of how the age profiles differ. There are a number of considerable differences, with a higher proportion of the population aged between 20-44 in both Ambrosden and Launton compared to the district and a lower proportion of the population aged over 45 in Ambrosden and Chesterton compared to the district.

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Figure 9.2 Comparison of study areas and Cherwell population structures 2001

Source: 2001 Census data

#### Economy

- 9.4.6 In Ambrosden during 2001 a higher than average proportion of the population was economically active (88.7% in Ambrosden and compared to the 82.2% in Cherwell and the national average of 76.9%) (NOMIS website). This is likely to be partly due to the higher than average working age population compared to those aged 65 and over in the study area. However, Launton has a lower than average economically active proportion (65.9%), despite having a similar proportion of the population over 65 compared to Cherwell.
- 9.4.7 In 2001 the working age population (those aged from 16 to 64) was 2,320 people (69.7% of the total population) in Ambrosden and 2,199 people (72% of the population) in Launton. This proportion of working age population is higher than the average within the Cherwell district (65.5%) and the English average (64.1%).
- 9.4.8 Considering the industry sectors that employ residents in Ambrosden ward, a significantly higher than average proportion work within public administration and defence (35% compared to 5.7% for England). As a result of the number of people within the ward working within defence, the proportions of the population working in other sectors was considerably less compared to the rest of England (especially manufacturing and wholesale/retail trade). There is also a higher proportion of the population working within public administration and defence in Launton (12%) but this is not to the same level as in Ambrosden.

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Figure 9.3 Sectors of employment

Between 2004 and 2011, the unemployment rate (based upon claimant counts) in both of the study areas were consistently substantially lower than the national, regional or district rates (see Figure 9.4).



Figure 9.4 Comparison of JSA claimant counts in study area, the district, region and nation

Source: NOMIS (2011)



9.4.9 The nearest town centre from Graven Hill and C Site is Bicester Town located 0.9 miles (1.5km) north-west of the Graven Hill Site. According to a study by Cherwell District Council (CDC, 2007), in 2007 there were approximately 76 retail units in the town centre, the majority of which are for retail use (A1) with the other uses comprising restaurants, cafes and drinking establishments, financial and professional services, charity shops and hot food takeaway.

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#### Housing and house prices

- 9.4.10 In 2009, there were a total of 58,202 dwellings within Cherwell with 1,876 dwellings sold at an average house price of £198,500 (NOMIS website). Since 2005/06 there has been a drop in completion and sales of new properties in Cherwell, this is partly due to the delay in the development of large strategic sites as a result of financial viability issues. During the same period there have been an increased number of applicants on the housing register for social housing (CDC, 2011).
- 9.4.11 In 2008/09 87 affordable dwellings were completed in total within Cherwell, which made up 20% of the total dwelling completions (CDC, 2010b).
- 9.4.12 Between 2002 and 2010 the mean house price to mean annual income ratio in Oxfordshire was consistently substantially higher than the average house price in the South East.



#### Figure 9.5 Comparison of average house prices

Source: Land Registry (2011) and ONS (2011)

#### Healthcare

9.4.13 The Oxfordshire Primary Care Trust (PCT) is responsible for Ambrosden and Chesterton and Bicester. The healthcare commission annual health check (08/09)

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9.4.14 The nearest doctors' surgeries to Graven Hill are Langford Medical Practice (seven doctors) which also has a branch surgery in Ambrosden village centre (four doctors). There are three further doctors' surgeries in Bicester; North Bicester Surgery (three doctors), Montgomery House Surgery (nine doctors) and Bicester Health Centre (ten doctors) and six dental practices in and around Bicester town centre. Bicester Community Hospital provides a minor injuries unit.

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#### Education

- 9.4.15 Children centres provide a range of services for parents with young children under five years of age, including; childcare and education, family health services (such as antenatal classes), and support for parents. There are currently three graduated children centres in Bicester/Ambrosden:
  - Glory Farm Children's Centre;
  - Bicester Children's Centre Brookside; and
  - Ambrosden Children's Centre.
- All of these centres are currently operating at or near capacity.<sup>21</sup> 9.4.16
- Within Bicester there are nine primary schools. Table 9.3 shows the capacity and 9.4.17 numbers in primary schools in these schools as it stood in October 2010.

Name	Net Capacity (-8%)*	Numbers on roll Y1-6
Brookside Primary School	250	193
Bure Park Primary School	294	372
Glory Farm Primary School	250	311
King's Meadow Primary School	333	299
Langford Village Primary School	305	377
Longfields Primary School	194	203
Southwold Primary School	284	254

#### Table 9.3 Capacities and roll numbers of primary schools in Bicester

<sup>21</sup> Pre-application information provided by OCC.

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Name	Net Capacity (-8%)*	Numbers on roll Y1-6
St Edburg's Primary School	159	135
St Mary's (VA) Catholic Primary School	221	223
Total	2,290	2,367

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\*The County Council has decided that it is sensible for planning purposes to retain 8% spare capacity in schools in urban areas.

9.4.18 There are two secondary schools within Bicester; Bicester Community College and The Cooper School. The capacities and numbers on roll at these schools are shown in Table 9.4.

#### Table 9.4 Capacities and roll numbers for secondary schools in Bicester

Name	Net Capacity (-8%)*	Total Pupil Numbers (Oct 10)
Bicester Community College	1374	1096
The Cooper School	1072	962
Total	2,446	2,058

\*The County Council has decided that it is sensible for planning purposes to retain 8% spare capacity in schools in urban areas.

Source: Pre-application information provided by OCC.

9.4.19 There are currently no special educational needs schools within the study area, however, it is expected that 1.1% of all pupils in Oxfordshire will attend special schools.

#### **Open space, recreation and leisure**

- 9.4.20 According to the Cherwell Green Spaces Strategy (2008-2016) (CDC, 2008) there is 356.83ha of open space at the district level which are made up of the following;
  - five parks and gardens (total of 22.88ha, equivalent to 0.17ha per 1,000 population);
  - 54 natural and semi-natural green space sites (total of 203.99ha, equivalent to 1.55ha per 1,000 of the population);
  - 299 amenity green space sites (total of 69.77ha, equivalent to 0.5 ha per 1,000 population);
  - 49 allotment sites (total of 40.55ha, equivalent to 0.31 per 1,000 population); and

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- 177 dedicated, equipped play areas (total of 13.64ha, equivalent to 0.48 per 1,000 population).
- 9.4.21 This can be further focused onto the Rural South area within the Cherwell district (including the wards; Ambrosden and Chesterton, Kirtlington, Launton, Otmoor & Yarnton, Gosford & Water Eaton), as follows.
  - 0 parks and gardens;
  - 14 natural and semi-natural green space sites (totalling 52.16ha);
  - 48 amenity green space sites (totalling 8.66ha);
  - 21 dedicated, equipped play areas (totalling 1.91ha); and
  - one Multi Use Game Area (MUGA).
- 9.4.22 According to the same report sports facilities on the district level include;
  - 24 Multi-Use Game Areas (MUGAs);
  - 35 tennis courts;
  - 10 bowling greens; and
  - 7 golf courses.

## Community services and facilities

- 9.4.23 Youth Service provision in Bicester is currently delivered at the Bicester Courtyard youth centre and by the youth bus. Services provided by the youth centre include; one to one tuition for young people out of school, space for counselling or mentoring, music/art projects, advice services.
- 9.4.24 The Adult Learning Service (ALS) in Bicester is currently provided at Bicester Community College secondary school. Currently within Oxfordshire 5% of the adult population per annum use the ALS and it is assumed that within Bicester there are similar levels of uptake. Bicester Library is currently operating below the County's adopted standard and there are plans to relocate and improve library facilities within the area.1
- 9.4.25 In addition to the services mentioned above there is the West Bicester Community Centre, eight sports facilities (including the Bicester and Plough Sports Centre) and a shopping centre in Bicester Town within 5km from the Site.

## Predicted future baseline

9.4.26 The relative change in population will have implications for social and community services which will need to be considered as part of the assessment of effects arising from the population change resulting from the proposed housing development.



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9.4.27 The population has been projected through to 2028<sup>22</sup> as this is the proposed completion date of the Graven Hill development. Compared to the region and country as a whole Cherwell is expected to have a lower proportion of the population aged 20-24.

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#### Figure 9.6 Population structures in 2028

- 9.4.28 Based on the 2008 mid year estimates from ONS, Cherwell has a total estimated population of 141,800 in 2011. This is projected to grow to 159,500 by 2028, reflecting a growth rate of 12.5%. This growth rate is similar to those projected on a regional and national level during the same period (13.7% expected for South East and 12.3% expected for England).
- 9.4.29 When comparing the population structure based on these projections from 2011 to 2028 within Cherwell district it can be seen that the age profile of the population is moving proportionately towards the older age groups (55 and above).

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<sup>&</sup>lt;sup>22</sup> 2028 was chosen as a year as it is the proposed completion date of the development at Graven Hill. It should be borne in mind that these projections do not take into account policy, including the number of dwellings to be built.



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Figure 9.7 Population structure for Cherwell District at 2011 and 2028

#### Environmental measures incorporated into the 9.5 proposed development

9.5.1 Measures that have been incorporated into the proposed development in response to socio-economic changes and community effects are set out in Table 9.5. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

Potential receptors	Potential changes and effects	Incorporated measure	
Existing and new residents	An increased population as a result of the development will increase demand on primary schools many of which are already over capacity.	A new 2 form entry primary school for 420 pupils is proposed. This will be built on a site which can accommodate a 3 form entry school so that the school can be extended in the future to accommodate up to 630 pupils if needed.	
Existing and new residents	An increase population as a result of the development will increase demand for open space and community facilities.	The following have been proposed as part of the development.	
		• 1 MUGA	
		A new community hall	
		Local shops (including a grocery store)	
		A hotel/pub/restaurant facility	
		<ul> <li>67.64 ha of public open space (including 5.87 ha playing pitches, 3.6 ha children's play</li> </ul>	

Table 9.5	Rationale for incorporation of community measures
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Potential receptors	Potential changes and effects	Incorporated measure
		space, 4 ha allotments, opening hilltop woodland for public access)
		Developer contributions to local community services in the surrounding area.

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#### 9.6 Scope of the assessment

### Potential receptors

- 9.6.1 In terms of socio-economic effects, the potential receptors of any effects will be people and the local economy. Within this however, certain groups and organisations can be identified upon which the proposed development could have a number of effects. Analysis of the baseline data suggests that the following receptors should be scoped into the assessment:
  - residents of the local wards within which both sites sit;
  - new residents moving into the development area; and
  - the local and regional economy, including local businesses.

# Potentially significant effects

- 9.6.2 The potentially significant effects relating to the proposed development, which are subject to further assessment in this chapter, are summarised below.
  - Potential effects on the local economy in the wards of Ambrosden and Launton as a result of an increase in employment opportunities provided by the proposed development at each site.
  - Potential effects on existing residents in the Ambrosden and Launton wards as a result of an increased number of jobs associated with the construction of both Graven Hill and C Site. An increase in the number of jobs could have a positive and significant effect on local people.
  - Potential effects on existing residents in the Ambrosden ward as a result of increased demand on local services (health, housing and education) from the increased population at Graven Hill. If services are currently operating at or near to full capacity, any increase in the local population may have a negative effect.
  - Potential effects on existing residents in the Ambrosden ward as a result of changes in the amount and quality of public open space provided. This will result in a change in the recreational opportunities for local people.
  - Potential effects on the quality of life for the new residents at Graven Hill in terms of the open space and community facilities provided.







9.6.3 For the reasons set out below, the following potential effects are not likely to be significant and are therefore not considered further in this ES.

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• Potential effects on the existing population in Launton Ward as a result of changes in demand for local services from the proposed development at C Site. The proposed development does not include any residential homes, community facilities or recreational sites. Therefore, there will be no change in the demand for local services such as schools or medical facilities in this ward.

# 9.7 Assessment methodology

# Methodology for the prediction of effects

- 9.7.1 The methodology to predict community and socio-economic effects draws on available best practice and developing guidance, including:
  - The Green Book, Appraisal and Evaluation in Central Government, HM Treasury 2003;
  - A Standard Approach to Assessing the Additional Impact of Projects, English Partnerships, Second Addition 2004;
  - The Additionality of Project Benefits, Project Advice Note 8/2005, OFFPAT;
  - Impact Assessment Guidelines, European Commission SEC (2005) 791, June 2005;
  - Circular 04/06 (ODPM): Planning Inquiries Into Major Infrastructure Projects: Economic Impact Reports, DCLG (then ODPM) 2006;
  - Assessing the Impacts of Spatial Interventions: Regeneration, Renewal and Regional Development, DCLG (then ODPM) 2003; and
  - Introduction to EIA, Spon, Third Edition, 2004.
- 9.7.2 Much of the guidance recommends 'proportionate assessment' of effects, that is, the level of effort to quantify predicted effects should be commensurate with their potential significance; this regards the use of qualitative evidence in equal standing to quantitative evidence, where appropriate.

### Significance evaluation methodology

- 9.7.3 The determination of significance is based on the use of professional judgement, with reference, as appropriate, to the following considerations:
  - the extent to which the population will be affected by changes that are expected to result from the proposed development;
  - the sensitivity of the receptors to the changes that are likely to occur; and

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- the likely magnitude, duration and other characteristics of the effects.
- 9.7.4 Within the above, particularly regarding magnitude, it will also be the case that what can be considered significant at one geographic level (e.g. the ward), may not be considered significant at another (the district and region). For this reason, the assessment of significance will also consider both the geographic extent of the effects and the likely significance of the effects within the particular geographic levels.
- 9.7.5 A related facet will be the effects in comparison to the baseline over time. For any variable within a location, over time there will be some variation (changes relative to the average). Therefore, should the magnitude of the effects be large compared to this past variation, this could be considered significant. Therefore, the size of the effects compared with the past variation will also be a consideration.

#### Sensitivity of receptors

- 9.7.6 The sensitivity of the receptor varies and takes into account factors such as:
  - the potential for a differential effect on a vulnerable group or community such as different ethnic groups, occupational groups, the poor, house owners, unemployed, elderly, young, women, etc.;
  - society and its economies are dynamic and can often have a variable capacity to cope or respond to change; and
  - particular local needs or concerns that are specific to the Site/surrounding area.

#### Magnitude of the effect

- 9.7.7 The determination of the magnitude and characteristics of an effect often essentially relies on professional judgement rather than using any measurable scale of effects (other than where time series data are available). The characteristic of an effect on a given receptor may take into account factors such as:
  - the spatial extent and number of people or firms affected (for example, individuals, neighbourhoods, local area, region, UK economy);
  - the duration of the effect (for example, temporary or permanent, irreversible or reversible, short-term, medium-term or long-term); and
  - thresholds, where an effect will create an unacceptable step change.





# 9.8 Assessment of effects on the local economy

# Predicted effects and their significance

### Creation of new jobs during construction

- 9.8.1 Using an average output per employee of £43,835<sup>23</sup> and an estimation of the total annual value of the construction activities at both sites, the proposed development is estimated to provide some 278.2 person years of employment in construction per year at Graven Hill and some 1425.8 person years of employment in construction per year at C Site. Assuming a standard ratio of 10 person-years of employment is equivalent to one Full Time Employee (FTE) this will translate to roughly 28 and 143 FTE per year at Graven Hill and C Site respectively. However, it should be noted that the development at Graven Hill is over a significantly longer period than C Site (two years of construction at C Site compared to 13 years at Graven Hill).
- 9.8.2 Construction work at C Site will occur prior to the start of construction work at Graven Hill. The jobs generated from C Site during the two years constitute 4.92% of the mean number of construction jobs within Cherwell (2003-2008). Graven Hill will generate 0.7% of the construction jobs in Cherwell over the same period.
- 9.8.3 The number of construction jobs created at both the proposed developments is likely to be significant and positive for the local (ward level) economy. In addition, C Site may generate enough construction jobs to be borderline significant over the larger district area for the two years that construction takes place. There is the potential for new residents within Graven Hill to be employed in construction jobs at Graven Hill. However, this is unlikely to result in significant effects for the new residents of Graven Hill.

### Creation of new jobs during operation

- 9.8.4 The total number of jobs created by the developments, including both direct jobs<sup>24</sup> and indirect jobs generated from multiplier effects, will be some 2,842 jobs within the district (including 421 indirect jobs) and 3,091 jobs (including 670 indirect jobs) within the region. Although this will be a positive contribution to jobs on both levels, representing 4.3% of jobs within the district and 0.08% of jobs within region, this is unlikely to be significant. However, the number of direct jobs created at a ward level for both of the developments is likely to be significant.
- 9.8.5 The light industrial, warehousing, retail, community services (including the 2 form entry primary school with the potential to be extended to a 3 form entry school) and office provision at Graven Hill is estimated to generate 2,070 jobs within the Ambrosden and Chesterton ward. If some home working is assumed to occur amongst the development's residents, this could increase the figure to a total of 2,221 direct

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<sup>&</sup>lt;sup>23</sup> 2009 figure taken from ONS construction industry statistics.

<sup>&</sup>lt;sup>24</sup> Based upon the proposed land areas and floorspace of these uses and an estimate on the level of home working generated.

jobs. Compared to the jobs within the ward, this number of jobs will represent some 110.1% of the total number of jobs<sup>25</sup> which is likely to result in positive significant effects for the local (ward) economy.

9.8.6 The development of a new warehouse at C Site (the Fulfilment Centre) is expected to generate 200 new jobs within the Launton ward. Compared to the ward, this number of jobs will represent some 11.4% of the total number of jobs, which is likely to result in positive significant effects for the local (ward) economy.

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- 9.8.7 The flexibility in the provision of different classifications of employment land within the proposed development may allow for a greater provision of B2 land which will further increase the positive effects from job creation at both the ward and district level. However, the significance of the additional employment cannot be determined without the scale of B2 land provision being quantified.
- 9.8.8 The availability of jobs within the local area is likely be significant for new residents at Graven Hill as working within close proximity to their residences could be an attractive proposition for them. This is likely to result in significant positive effects for the new residents.

#### Labour supply effects

9.8.9 Based upon the projected population structure for the proposed Graven Hill development in 2028<sup>26</sup>, there will be some 3,340 people of working age (16-64) which will translate into a labour supply of some 2,892<sup>27</sup>. The difference between the number of jobs created within the development site and the potential labour supply infers that some 50 people may commute elsewhere to work (although in reality there will likely be commuting into the area for work as well as commuting out). The potential labour supply however will be approximately 0.037 times the labour supply within the district in 2028. Compared to the current baseline this will be 0.029 times the labour supply within the district and 38.5 times of the labour supply within Ambrosden. This potential labour supply will therefore be significant for local businesses and although it will also have a positive effect on businesses at a district level this is not at a scale which is likely to be significant.

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<sup>&</sup>lt;sup>25</sup> based on the mean number of jobs within the ward over the period 2003-08.

<sup>&</sup>lt;sup>26</sup> Information provided by OCC.

 $<sup>^{27}</sup>$  This is based on the % of working age population in employment in 2001, the most up to date figure available.

# 9.9 Assessment of effects on local services

# Predicted effects and their significance

### Population

9.9.1 Applying occupancy estimates to the mix of housing proposed and the mix of affordable housing requested by CDC, the proposed development of 1900 new dwellings is estimated to result in a total population of 5,187 in 2028. This will be 155.7% of the total population of the Ambrosden ward as it stood in 2001 (3,330). At the level of the district however, this level of population will represent 2.3% of the estimated 2011 population and 2% of the population as it is projected to stand at 2028.<sup>28</sup> This information has been used in the following assessments.

### Housing

- 9.9.2 Given the projected population change between 2011 and 2028 within Cherwell, there will be a need for significant levels of housing to be provided (approximately 7,589 new dwellings using the population assumptions above and average dwelling occupancy rate of 2.35 per dwelling)<sup>29</sup>. The development will provide some 25% of this need.
- 9.9.3 Up to 30% of the housing proposed will be affordable housing, giving a total of 570 affordable homes. This provision of affordable homes is likely to be significant for those living in the local (ward) area.
- 9.9.4 Within the Cherwell Local Plan there is a reference to an annual affordable housing need of 686 dwellings (Fordham Research, 2004). The development at Graven Hill is expected to generate 150 dwellings each year for 12 years and 100 dwellings in the final 13th year of construction. This equates to up to 45 affordable dwellings per year with 30 dwellings in the final year of construction which meets 6.5% and 4.3% of Cherwell's annual affordable housing need. Whilst positive, this effect is unlikely to be significant for the district.

### Health services

- 9.9.5 The effects of the development upon the health of the existing and new residents at all geographical levels are also discussed in the noise and air quality chapters (see chapters 7 and 8).
- 9.9.6 Within two miles of the Site, there is one GP practice (Langford Medical Practice) with a site in Bicester and a satellite site in Ambrosden. It is understood that seven doctors work between these sites. Within Ambrosden this equates to 3,330 people per

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<sup>&</sup>lt;sup>28</sup> As projected by the 2008 based sub-national population projections, ONS.

<sup>&</sup>lt;sup>29</sup> http://www.statistics.gov.uk/downloads/theme\_compendia/GLF09/GLF09chapter3-Households.xls.

surgery and 476 people per GP. Within Cherwell district<sup>30</sup> there are approximately 23 general practices which equates to approximately 6,165 people per practice.

9.9.7 The increase in the population expected as a result of the proposed development is estimated to increase the number of people served by the practice in Ambrosden to 8,517 people and 1,217 people per GP by 2028 assuming that the number of GPs remains unchanged from the current provision. Similarly, assuming that the number of GP surgeries remains the same at the district level, this will equate to 6,935 people per practice in 2028. The latest available data (for 2009 for England) shows that the ratio of people to GP's practices was 6,298 (NHS, 2009).

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- 9.9.8 Forward planning for primary healthcare will reflect, in part, projected population increases. By 2028, the proposed development will lead to an increase in the population within Ambrosden which is 12.5 times greater than the projected population increase for Cherwell (155.7% compared to 12.5%). This significant increase in a localised population will lead to a demand for primary healthcare above that anticipated when based on the projected population increase for the district alone. Whilst additional primary healthcare services are likely to be required in the long term consultation with the PCT has indicated that existing infrastructure in the Bicester can cope with the additional population in the initial phases of the development<sup>31</sup>.
- 9.9.9 When compared to current provision, the demand created by the overall development at Graven Hill will be equivalent to a practice containing approximately five GPs. Suitable and timely provision of additional future healthcare services will need to be considered by the PCT. Developer funding for off-site community facilities will be provided if required, subject to further consultation with the health care service provider. However, initial consultation has indicated this is not currently required. With such measures in place no significant effects in relation to the provision of health care services are likely.

### **Open space and recreation**

- 9.9.10 According to Cherwell's Green Spaces Strategy (CDC, 2008) there are some 356.83ha of open space within the district, which equates to 2.5ha provision per 1,000 population.<sup>32</sup>
- 9.9.11 The proposals for the development at Graven Hill provide 62.41ha of public open space which comprises allotment provision (4ha), Accessible Woodland (not all of the woodland will be made accessible to the public for nature conservation reasons) at 25.21ha, Playing Pitches at 5.87ha, Playspace at 3.6ha and Natural Green Space at 23.73ha. The total open space required to serve this development excluding allotments is 19.44ha based upon the Draft Core Strategy open space requirements for

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<sup>&</sup>lt;sup>30</sup> NHS choices http://www.nhs.uk/Services/Trusts/GPs/DefaultView.aspx?id=3598.

<sup>&</sup>lt;sup>31</sup> Per Comms, Oxfordshire PCT to DIO, 22/09/11.

<sup>&</sup>lt;sup>32</sup> based on projections of Cherwell population 2011.

the predicted population (5,134) that will be living within the Graven Hill development.

9.9.12 Graven Hill is currently inaccessible to members of the public as it is in use as a military site. Therefore, the provision of 62.41ha of public open space is over three times that required by planning policy and, as it equates to approximately 11.4ha per 1,000 population, is almost five times the current provision within Cherwell. Therefore, the provision of open space will more than meet the requirement of the new residents but is also likely to have significant positive effects for the existing local (ward) community by providing additional areas of open space in the local area.

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9.9.13 Further information and details on the open spaces within the proposed development is provided in the Design and Access Statement (BIC/OPA/DOC/07).

#### Education

- 9.9.14 Upon completion in 2028 the Graven Hill development is likely to increase the population of 0-4 year olds by 370 bringing the total population of 0-4 year olds within Ambrosden ward to 628, an increase of some 143% compared to current recorded (2010) levels. The three existing early year centres in Bicester/Ambrosden are currently operating at or near capacity. The increase in 0-4 year olds is therefore likely to result in increased demand for early years education. The proposed development includes buildings which could be used as a nursery, for example, the community centre adjacent to the primary school. The provision of a nursery or playgroup will be discussed and agreed in further detail during the reserved matters stage of the planning application. However, this potential effect can be mitigated through the proposed land uses within the development and therefore no significant effects on either new or existing residents are likely.
- 9.9.15 In 2028, the number of children of primary school age within Ambrosden is likely to increase by 556 from present as a result of the Graven Hill development.
- 9.9.16 At present primary school capacity within Bicester is exceeded by 3% (see Table 9.3). Demand for school places is likely to increase over time as a result of background growth in population and other consented development within Bicester which in turn will require OCC to address capacity issues in local schools. An increase of 556 pupils from the proposed development will result in an increase in the number of primary school pupils within Bicester of 23.4%.
- A new two form entry primary school for 420 pupils will provided as part of the 9.9.17 development. However, given that this school will not cover the total estimated increase in the population of primary school children from the development, the school has been accommodated on a site which is large enough to accommodate a three form entry school (630 pupils) to allow for the school to be extended in the future as needed. Therefore, as it is possible for the school to accommodate the total number of predicted primary school children from the proposed development, no significant effects on local primary schools are likely to occur.
- 9.9.18 It is estimated that the number of children of secondary school age within the local area will increase by 433 from present as a result of the development. This represents





a 21% increase when compared to current total pupil numbers in the two local secondary schools. This will increase numbers of pupils to 1.84% above capacity. However, another development at Kingsmere proposes to add a secondary school which will increase capacity by some 850 pupils, a proportion of which will be expected to be taken from other developments such as Graven Hill. Taking this into consideration along with the fact that estimated population growth for secondary school children within the local population not including the development is expected to be less than for other age groups<sup>33</sup> it is not expected that the increase in secondary school pupils as a result of the development will have a significant effect on secondary school services.

#### Conclusions of significance evaluation 9.10

Receptor and summary of predicted positive/negative effects	Significance	Summary Rationale for Significance Evaluation
Existing Residents		
Construction: jobs (positive)	S (local) NS (district)	Construction of both sites will generate a significant number of construction jobs at the level of the ward. Graven Hill will not produce enough construction jobs a year on a district scale to be significant, however, C Site may generate enough construction jobs to be borderline significant over the short period
Economic: Jobs (positive)	S (local) NS (district)	The number of jobs generated as a result of the developments at Graven Hill and C Site will be significant at the ward level but not significant at the district level.
Economic: Labour Supply (positive)	S (local) NS (district)	The level of labour supply generated from the development at Graven Hill will significant at the local level but not at the district level.
Housing: Affordability (positive)	S (local) NS (district)	The provision of 45 new affordable homes a year for 12 years and 30 new homes in the final year will meet 6.5% and 4.3% of the district demand for affordable housing and will therefore be significant at ward level but is unlikely to be significant at the district level.
Community Aspects: Health (neutral)	NS (local) NS (district)	The extra demand for health services created by the new resident population will be significant and greater than that experienced by the rest of the district. Further consultation with the PCT will be required to confirm how additional health care services are to be provided but if required, developer funding to off-site community facilities could be provided mitigating potential effects on existing services.

#### Table 9.6 Summary of effects and evaluation of their significance

<sup>33</sup> Based on population projections to 2028 compared to 2011 for the district for ages 10-19 (roughly equivalent to secondary school age) will be 3% relative to 2011 baseline compared to an increase in population of 12.5% for the population as a whole over the same period.

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Receptor and summary of predicted positive/negative effects	Significance	Summary Rationale for Significance Evaluation
Community Aspects: Recreation (positive)	S (local) NS (district)	Within the development there are significant provisions to open space and community facilities which will increase the facilities available for the existing population.
Community Aspects: Education (neutral)	NS (local) NS (district)	Early year centre provision will be affected by the new resident population increase and the associated increase in demand for services. However a playgroup or nursery could be accommodated on-site, for example at the community centre and therefore significant effects are unlikely.
		The provision of a two form entry primary school planned as part of the development will accommodate 420 pupils. This will be provided on a site large enough to accommodate a 3 form entry (630 pupils) school allowing the school to expand as future demand occurs. Therefore significant effects on local primary school provision are unlikely.
		Given that the capacity of secondary schools will be increased following the development at Kingsmere it is expected that the increase in population and demand for places will not have a significant effect on secondary school provision.
New Residents		
Construction: jobs (positive)	NS	It will be likely that some new residents could be employed for the available jobs from the continued construction activities of the development. However, this is unlikely to be significant.
Economic: Jobs (positive)	S	The availability of jobs within the development area is likely to be significant for new residents as working within close proximity to their residences could be an attractive proposition for them. The number of jobs will also be significant
Economic: Labour Supply (positive)	NS	Some of the new residents will form part of the labour supply within the development and as such the presence of a labour supply will, of itself, not be significant
Community Aspects: Health (neutral)	NS	The extra demand for health services created by the resident population will be mitigated through measures to be identified by the PCT such as expansion and provision of additional services at existing GP surgeries in the local area. However, consultation with the PCT has indicated that no such measures will be required, at least for the initial phase of development.
Community Aspects: Recreation (positive)	S	Open space, community facilities and service retail is to be developed within Graven Hill and this will contribute significantly to the overall quality of life of the residents as there is a provision of open space above that required by CDC planning policy.
Community Aspects: Education (neutral)	NS	As the development plans include a provision of a new two form entry primary school (on a site which could accommodate a three form entry school) local residents are unlikely to experience a lack of provision or significant effects.
		It is expected that the increase in population and demand for places will not have a significant effect on secondary school provision and there will be adequate provision for new residents in schools in the surrounding area.
		There will be an increase in demand for pre-school education. This can be accommodated within the proposed development.

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Receptor and summary of predicted positive/negative effects	Significance	Summary Rationale for Significance Evaluation
Economy/Businesses		
Economic: Labour Supply (positive)	S (local) NS (district)	For the local economy and businesses within Bicester, the available labour supply will be significantly increased. The increase in labour supply within the district will not be significant.
Economic: Jobs (positive)	S (local) NS (district)	The number of jobs provided will be significant within both Ambrosden and Launton and could open up increased supply linkages for local businesses. The multiplier effects will also be significant. However, at the district level the increase in jobs will not be significant.



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# **10. Historic Environment**

# 10.1 Introduction

10.1.1 This chapter sets out the results of an assessment of the effects of the proposed development on the historic environment during demolition, construction and operation. This chapter assesses these potential effects and should be read in the light of the project description in chapter 3. A range of potential receptors have been considered, including archaeological features, military buildings and off-site scheduled monuments and listed buildings.

# 10.2 Policy and legislation

### **Planning policy issues**

10.2.1 Table 10.1 lists the issues from planning policy guidance and policies which have been considered in assessing historic environment effects.

Policy	Policy Issue
PPS 5: Planning for the Historic Environment	Recognises that heritage assets (a building, monument, site, place, area or landscape positively identified as having a degree of significance (defined in paragraph 10.7.2 of this chapter meriting consideration in planning decisions), including those which have not been designated, are a non-renewable resource.
PPS 5 Policy HE6	Requires applicants to provide information on the significance of assets which may be affected by a proposed development.
PPS 5 Policy HE7	In determining applications, local authorities should consider the effects on the significance of the heritage assets, taking into account the desirability of sustaining and enhancing the significance of assets.
PPS 5 Policy HE8	The effect on the significance of a non-designated heritage asset or its setting is a material consideration in determining a planning application.
PPS 5 Policy HE9	There should be a presumption in favour of the conservation of designated heritage assets and that presumption should be greater for more important heritage assets.
PPS 5 Policy HE10	Planning authorities should treat favourably those applications which preserve elements of the setting of an asset that make a positive contribution to the significance of an asset. Where this is not possible, any harm should be weighed against the wider benefits of the application.
CDC LP Policy C25	In considering proposals for development which would affect the Site or setting of a scheduled ancient monument, other nationally important archaeological sites and monuments of special local importance, the council will have regard to the desirability

#### Table 10.1 Policy issues

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Policy **Policy Issue** of maintaining its overall historic character, including its protection, enhancement and preservation where appropriate. Development should preserve listed buildings, their features and settings, and CDC Non-Statutory LP Policy **EN39** preserve or enhance the character or appearance of designated conservation areas, as defined on the proposals map. Development that conflicts with these objectives will not be permitted. CDC Non-Statutory LP Policy Special care will be taken to ensure that development that is situated within the setting **EN44** of a listed building respects the architectural and historic character of the building and its setting CDC Non-Statutory LP Policy Sustainability of the historic environment will be promoted through conservation, EN47 protection and enhancement of the archaeological heritage and its interpretation and presentation to the public. In particular it will: Ensuring that scheduled ancient monuments and other unscheduled sites of national and regional importance and their settings are permanently preserved. Ensuring that development which could adversely affect sites, structures, landscapes or buildings of archaeological interest and their settings require an assessment of the archaeological resource through a desk-top study, and where appropriate a field evaluation. Development that would adversely affect archaeological remains and their settings will not be permitted unless the applicant can demonstrate that the archaeological resource will be physically preserved in-situ, or a suitable strategy has been put forward to mitigate the impact of development proposals. Ensuring that where physical preservation in- situ is neither practical nor desirable and sites are not scheduled or of national importance, the developer will be responsible for making appropriate provision for a programme of archaeological investigation, recording, analysis and publication that will ensure the Site is preserved by record prior to destruction. Such measures will be secured either by a planning agreement or

#### Legislative requirements

10.2.2 Certain features that are deemed to be of particular significance to the historic environment are given legal protection through legislation. The *Ancient Monuments and Archaeological Areas Act 1979* provides for a schedule of monuments which are protected.

by a suitable planning condition.

- 10.2.3 *The Planning (Listed Buildings and Conservation Areas) Act 1990* provides for the definition and protection of listed buildings and conservation areas. Conservation areas are normally designated by local planning authorities (LPAs) and maintained on regional and district registers.
- 10.2.4 Additional information on legislation, policy and English Heritage guidance is provided in Appendix H-1.





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# **10.3** Data gathering methodology

# **Desk study**

10.3.1 For the purpose of this assessment the following sources were consulted:

- Nationally and County-based registers of known archaeological and historical sites;
- Cartographic and historic documents;
- Aerial photographs;
- Place and field name evidence; and,
- Published sources (including the Victoria County History (VCH)).
- 10.3.2 These were obtained from the following organisations:
  - English Heritage the National Monuments Record (NMR);
  - Oxfordshire County Council; and
  - Oxford Central Library.
- 10.3.3 The assistance of these bodies is gratefully acknowledged.
- 10.3.4 Oxfordshire County Council (OCC) maintains the County Historic Environment Record (CHER), formerly the Sites and Monuments Record (SMR), in addition to providing planning advice to the LPA on archaeological and cultural heritage matters.
- 10.3.5 In order to place the development in context and to attempt to identify the potential for unknown archaeological remains, data was collected for a study area extending to a minimum 1km radius from the Site boundary. A list of designated heritage assets within 1km of the Site boundaries is included as Appendix H-2 and of features recorded in the CHER as Appendix H-3.

# Survey

### Site walkover

10.3.6 The Site was visited on 17 March 2011 and 25 May 2011. The 25 May visit was carried out in the company of Roger Thomas of English Heritage in order to assist in the assessment of the potential historic interest of the military buildings.

### **Geophysical survey**

### Graven Hill

10.3.7 Accessible and potentially suitable areas within the Graven Hill Site were subject to geophysical survey, and this was carried out in two phases. The first phase involved survey of suitable land in D and E Sites (which comprise the developed areas within the Graven Hill Site), and this meant excluding all land which was occupied by buildings, hardstanding, roads and rail, woodland or scrub or which were densely

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occupied by services. Based on this, survey areas were selected in the north-western and northern part of E Site and all suitable land was surveyed. As the survey areas appeared not to have been previously developed, there was a reasonable degree of confidence in the success of the survey.

10.3.8 The second phase of the survey was instigated by the decision to include land around Graven Hill within the development area. It was therefore decided to undertake a geophysical survey within the suitable agricultural land surrounding Graven Hill Wood. This includes a relatively large area and it was known that much of it had previously been occupied by hutted camp accommodation, which had the potential to affect the success of the survey. As there was therefore uncertainty over the success of the survey it was decided to complete an initial 50% sample based on equally spaced transects, with provision to infill selected areas. The initial survey did indeed identify significant areas of disturbance and though some likely archaeology was identified, it was agreed with OCC that further survey was not required to define the likely extent of this.

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- 10.3.9 The detailed magnetic survey was carried out using Bartington Grad601-2 gradiometers. The instruments effectively measure a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally. The instruments are extremely sensitive and are able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to  $\pm 100$ nT when surveying with the highest sensitivity.
- 10.3.10 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m<sup>2</sup>) giving 3,600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).
- 10.3.11 The completed geophysical survey reports are included within Appendix H-4.

#### C Site

10.3.12 C Site does not have open grassed areas of the extent of those that are present at Graven Hill and no areas which were suitable for geophysical survey were identified. Therefore no geophysical survey was planned or implemented within C Site.

### Off-site survey

10.3.13 Off-site designated heritage assets were visited in order to assist in an appraisal of their current settings and the extent to which these contribute to their heritage significance. Potential changes to views of, and from, the assets which will result from the proposed development were then considered to determine whether these have a potential to affect their heritage significance. Where required, reference was made to photomontage or other illustrative material (see chapter 11).

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# 10.4 Overall baseline

### **Current baseline**

### Site description

### Context - Graven Hill

10.4.1 The Graven Hill Site is located 0.9 miles (1.5km) to the south of the centre of Bicester with the northern site boundary formed by the A41 and the boundary to the west being the main (Oxford to Bicester) railway line. Relatively flat agricultural land is located to the south and the village of Ambrosden is located to the south-east.

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- 10.4.2 Land around Graven Hill has been in use as a military depot since 1941-2 and so the Site is occupied by a number of large storage building arranged around the base of the hill. These are all served by a local network of roads and rail lines which encircle Graven Hill, with agricultural land on the sloping ground which rises toward the wooded hill top.
- Context C Site
- 10.4.3 C Site forms part of a wider group of depot sites arranged around Arncott Hill, approximately 3.6 miles (6km) to the south-east of Bicester. The village of Upper Arncott is located to the immediate east, with agricultural land leading down to the River Ray to the west. C Site has also been in use as a military depot since 1941-42 and so it is similar in appearance to the Graven Hill Site, with a number of large storage buildings served by roads and railways.
- 10.4.4 Baseline information on topography is provided in chapter 11 (landscape and visual) and information on geology provided in chapter 14 (land quality).

### **Designated heritage assets**

There are no designated heritage assets<sup>34</sup> within either site, but there are scheduled 10.4.5 monuments and listed buildings within the surrounding areas and these are listed in Appendix H-2 and shown on Figure 10.1.

### Site history

### Prehistoric period - Graven Hill

10.4.6 There are no confirmed features of the prehistoric period within the Site itself, though evidence from the surrounding area shows that it was occupied during this period. There has been some suggestion in the past that the top of Graven Hill was the Site for an Iron Age hill fort and that a linear earthwork, which is still visible within the Gravenhill Wood, formed part of the ramparts. However, these earthworks were investigated by the excavation of a number of trial trenches in 1999, with no clear

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<sup>&</sup>lt;sup>34</sup> World Heritage Sites, Scheduled monuments, Listed Buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields and Conservation Areas.

10.4.7 Evidence for prehistoric settlement and activity within the 1km study area comes from a variety of sources. Other than those which have been recorded by excavation, sites have most notably been identified as cropmarks seen on aerial photographs and as artefact finds.

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- 10.4.8 Iron Age settlement sites have been identified at Chesterton Lane (HER 16213-5) and at Bicester Fields Farm (16120). The Chesterton Lane site was investigated in advance of construction for dualling of the A41 and identified the presence of Middle Iron Age gullies, postholes and sub-rectangular enclosures, all being indicative of settlement. An isolated Bronze Age burial was also identified. The Bicester Fields Farm site is north of Graven Hill and excavation identified an Iron Age enclosure of two phases, and surrounded by other domestic features: pits, boundary ditches and both human and animal burials. A late Iron Age date was identified on the basis of the pottery assemblage, and other finds suggested an economy of pastoralism, with unusually large cattle and ironworking indicating that the farmstead may have been of relatively high status. Evidence for earlier prehistoric (Mesolithic) activity was also identified.
- 10.4.9 Cropmark evidence includes two possible round barrows of probable Bronze Age date to the north-west of the Site (HER 5633) which are visible as ring ditches. In addition, a banjo-type enclosure, three hut circles and a number of sinuous ditches have been identified on aerial photographs to the immediate south-west of the Alchester Roman town site. These have been interpreted as possible evidence for pre-Roman settlement within this area, although it has not been subject to any additional investigation.
- 10.4.10 Further evidence has been found in the form of artefact finds, including a Bronze Age palstave (HER 16086) found from the vicinity of Alchester Roman town and Bronze Age spearhead (HER 13922) from south of Graven Hill. There has also been various finds of late Iron Age pottery (e.g. HER 4469).

# Prehistoric period - C Site

10.4.11 There are no confirmed finds or features of prehistoric date within 1km of C Site. Land around the Site has historically been poorly drained and it is possible that it was not favoured for early settlement. However, the lack of finds may result as much from the lack of previous investigations in this area

### Romano-British - Graven Hill

10.4.12 The principal settlement site of Roman date within the area was the town of Alchester, and this, together with the associated Roman roads, defines the Roman settlement pattern in this area. The layout of the Roman town is described in Section 10.12. However, other areas of Roman settlement were also present, including a site which has been excavated at London Road in Bicester (HER 26005). This was within an area of raised ground between two palaeo-channels, and comprised a large number of

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ditches, pits and postholes. The excavation presented a picture of settlement within an area which was generally wet and marshy.

10.4.13 Another Roman period settlement site has been excavated to the north of Graven Hill at Oxford Road (HER 15867). Evaluation and subsequent excavation revealed extensive survival of late Iron Age and Romano-British settlement within the floodplain of Langford Brook. All identified features were preserved under post-Roman alluvium, and appeared to represent two phases of occupation. The first of these was dated to the period AD 20/30 to 60/70, and the second to AD 60/70 to 100/120. It was interpreted as low status rural site typical of Upper Thames region for the period, at a time when increasing agricultural intensification required use of previously marginal land.

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- 10.4.14 Other evidence of Roman occupation is in the form of numerous artefact finds, many of which have been from within and around the Alchester site or along the known routes of the Roman roads.
- Romano-British C Site
- 10.4.15 C Site is located approximately 2km to the south of the route of Akeman Street and there are no records of Roman period finds or features in this area.
- Medieval Graven Hill
- 10.4.16 There is relatively little known of the early Medieval settlement within the area, though the Roman town at Alchester was abandoned, perhaps from around the fifth century. Bicester appears to have been established as a Saxon settlement in the sixth century and was previously called Burencestre, which has been described as either meaning an inhabited enclosure in Bernwood Forest or being derived from the personal name of Beorna. The earliest excavated evidence for settlement within the town is from a site to the rear of the King's Arms (HER 16137), which lies to the north of Graven Hill. Excavated remains included pits, gullies and evidence for a number of sunken-feature buildings, which may represent former houses.
- 10.4.17 The 1st Edition OS Map of 1885 includes the note site of battle between the Danes and Saxons AD. 871 within Gravenhill Wood (HER 9382). However, there is no other known reference to an early medieval battle at this location and it is not clear on what this is based. Without further evidence, this record should be treated with a significant degree of caution.
- 10.4.18 Graven Hill is located within the parish of Ambrosden, and forms the highest point within the parish. Ambrosden formed the principal settlement within the parish from the medieval period, though other settlements were also located at Arncott. Following the Norman conquest, the estate of Ambrosden passed from the lade Elveva to the Norman, Hugh d'Ivry, and by the late twelfth century it had become part of the estates of the St Valery family. In 1288 it was granted to Ashridge Priory by Edmund of Cornwall and it remained with the priory until its dissolution in 1539.
- 10.4.19 During the medieval period, much of the land around Graven Hill appears to have been in arable use and the VCH records that the agricultural land of Ambrosden

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village was organised around three main fields known by the seventeenth century as East, South and West Fields. The extent of arable cultivation is indicated on aerial photographs of the 1940s which show ridge and furrow earthworks (derived from medieval ploughing) on much of the land surrounding the hill, including some of the lower slopes.

10.4.20 In addition to the surviving settlements of medieval origin, such as Ambrosden, there was also a medieval settlement at Wretchwick, to the north of Graven Hill. Wretchwick was in the possession of Bicester Priory, before being depopulated by the priory to make way for sheep, as described in Section 10.12.

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### Medieval - C Site

- 10.4.21 C Site is located within Arncott, which formed part of the parish of Ambrosden, with Arncott Hill being the second highest point within the parish behind Graven Hill. During the early medieval period, Arncott was divided into two manors, being Lower Arncott (Arncott Prioris) and Upper Arncott (Arncott Abbatis). Lower Arncott was granted in the twelfth century to Missenden Abbey and then in 1232 it was purchased by Bicester Priory. The Priory held the manor until its dissolution, when it was granted to a Thomas Martin, of Ambrosden.
- 10.4.22 Upper Arncott was granted following the Norman Conquest to Robert d'Oilly and Roger d'Ivry before being granted in the twelfth century to Oseney Abbey. Following dissolution of the abbey in 1539, Upper Arncott was eventually acquired by the Martin family of Ambrosden and so passed into the same ownership as Lower Arncott. The Martin family appear to have lived at Lower Arncott, on the Site of the current Manor Farmhouse (LB 243403).
- 10.4.23 There are few recorded finds or features within the study area and during the medieval period, much of the land around C Site appears to have been in arable use. The VCH records that accounts of Bicester Priory and Oseney Abbey suggest that the area of arable cultivation was expanding during the medieval period.

### Post-Medieval - Graven Hill

10.4.24 Following the dissolution of Ashridge Priory, the Crown granted the estate to John Denton and in 1604 it was sold to Margaret Whethill of London, who left it to her husband Sir Thomas Mildmay of Chelmsford. As a prominent Roman Catholic, and Royalist family the Mildmays experienced serious financial difficulties through the period of the English Civil War and the estate was partly broken up for sale, with the remainder eventually sold in 1673 to Sir William Glynne of Bicester. It was sold again in 1718 to Sir Edward Turner, who had made a fortune in the South Sea bubble (stock market speculation), and the Turner family were to hold the estate into the twentieth century.

#### Post-Medieval - C Site

10.4.25 Within Arncott, the Martin family, later known as the Standards, retained their ownership of the manors until the eighteenth century and presumably had the current Manor Farmhouse built. In 1706 Thomas Standard left Arncott to his nephew Charles

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Graham and in the early nineteenth century it was bought by Richard Holloway, whose family retained it into the later nineteenth century.

#### Twentieth century - both sites

- 10.4.26 The major development of the twentieth century, which has shaped the current form of the Site, was the establishment of the Central Ordnance Depot in 1941 during World War Two (WWII). This followed from an order given to Colonel Palmer on 13 January 1941 to identify a site for, and to establish a new depot complex. This was needed to supply the rapidly growing needs of the expanding wartime army. The Bicester site was chosen as being suitable as it was located within southern England, with good road and rail links, and with sufficient space for the creation of a dispersed complex required for protection against air attack. It was also felt that the presence of Graven Hill will provide some additional protection in this regard. The depot was to spread over a wide area, occupying a number of sites from Graven Hill in the north to Arncott and Piddington in the south, collectively known as MOD Bicester.
- 10.4.27 The selection of MOD Bicester was approved in May 1941 and construction began soon after. Initial construction involved the laying of a 42 mile military rail network within and linking the various sites, followed by construction of the warehouse buildings. Graven Hill comprised D Site (armaments stores) to the south and E Site (small arms) to the north. Stores began to be issued from the MOD Bicester depot in August 1942, and it remained a key supply point for the army for the remainder of the war.
- 10.4.28 The entry of the United States into the war led to the arrival of large numbers of American troops into Britain, and it was necessary to provide depot facilities for their equipment. This operation was codenamed Bolero and at Bicester it involved the construction of temporary warehouses in the form of groups of Romney huts served by rail spurs and roads. The completed depot at MOD Bicester served as a key facility in supplying equipment for the Normandy landings in June 1944 and subsequent European campaign. Following completion of MOD Bicester Colonel Palmer was promoted to Brigadier and made commandant of MOD Bicester, remaining in this position for the duration of the war.
- 10.4.29 Initial estimates for the required MOD Bicester workforce were put at around 7,000, though this was later increased to 9,000 and during construction the workforce reached as high as 24,000. As the local civilian workforce was limited in numbers, the population of Bicester at the time being only 4,500, much of the workforce comprised military personnel. These were drawn particularly from the Royal Engineers and the Royal Pioneer Corps, as well as significant numbers of women from the Auxiliary Territorial Service. It was necessary to provide accommodation within the depot for this number of staff, and this was provided by Nissen huts organised into nine self-contained camps. Three of these, Camp Nos. 5, 6 and 7 were located on the slopes around Gravenhill Wood. Accommodation camps which served C Site were located largely on the eastern side of Arncott.
- 10.4.30 MOD Bicester continued to operate as a Central Ordnance Depot in the post-war period, though the military workforce was gradually replaced by an increasing number

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of civilian workers. This meant the need for civilian workers to move into the area and some new housing was built within Bicester to accommodate them. The temporary hutted accommodation camps were gradually removed and in 1956 new barracks had been completed to the west of Gravenhill Wood on the current St David's Barracks site. Other changes included the removal of the Bolero warehouses in the period after WWII.

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#### **Data sources**

Historic Environment Record

10.4.31 There are records of finds and features recorded on the Oxfordshire HER representing occupation and activity from the prehistoric period onwards. A number of these are noted in the preceding sections and the location of features recorded on the HER are shown on Figures 10.2 and 10.3.

#### Aerial photographs

- 10.4.32 A list of aerial photographs viewed as part of this assessment is included in the bibliography. In total, the NMR holds 95 vertical aerial photographs of the Graven Hill Site and C Site, covering the period 1944 to 1996.
- 10.4.33 The earliest aerial photograph of the Graven Hill Site was taken on 10 April 1944 and shows the ordnance depot to be substantially complete with the large warehouse units and military railway network all in place. The layout of the depot around Graven Hill was essentially as it is now, though the lower slopes of the hill were occupied by a series of dispersed accommodation camps.
- 10.4.34 In 1944, much of the agricultural land surrounding the depot was occupied by ridge and furrow and areas of ridge and furrow also survived within the depot. Changes visible on aerial photographs within the Graven Hill Site are:
  - construction work on St David's Barracks by 1954;
  - hutted accommodation north of Gravenhill Wood had been removed by 1959;
  - more of the hutted accommodation had been removed by 1966 and trees within Gravenhill Wood had been felled;
  - only a small number of accommodation huts were still present by 1975. Gravenhill Wood had been replanted and no ridge and furrow earthworks are shown to survive within the Site; and
  - all accommodation huts had been removed by 1989.
- 10.4.35 In addition, the sequence of aerial photographs show the gradual removal by ploughing of ridge and furrow from the surrounding agricultural land, and this was largely absent by 1975.
- 10.4.36 The earliest aerial photograph of C Site was taken on 10 April 1944 and shows the ordnance depot to be substantially complete with the large warehouse units and military railway network all in place. The layout of the depot was essentially as it is

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now, with the larger warehouses on the eastern side and sidings as well as open air storage on the western side.

10.4.37 In 1945, much of the agricultural land surrounding C Site was occupied by ridge and furrow and areas of ridge and furrow also survived within the depot. The sequence of aerial photographs show the gradual removal of this from within the Site and the surrounding agricultural land, and it was largely absent by 1975.

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#### Historic maps

- 10.4.38 The Site is shown is detail on a series of OS Maps dating from 1880 onwards. In 1880, the Graven Hill Site is shown as comprising a series of enclosed fields arranged around Gravenhill Wood (Figure 10.4). A single farmstead was present within the Site boundary in 1880 and this was located on the southern edge of Gravenhill Wood and was known as Mount Pleasant. A building is shown at this location on the aerial photographs of 1944-45 and it is possible that Mount Pleasant remained until the development of St David's Barracks in the 1950s.
- 10.4.39 Other buildings within the Site boundary during the later nineteenth and early twentieth centuries were limited to a small number of small buildings of probable agricultural use, as well as a rifle range with butts to the north of Gravenhill Wood.
- 10.4.40 One feature of interest shown on the early OS editions is the course of Langford Lane which ran within the Graven Hill Site boundary. From its current location at Alchester the lane continued to the east and crossed a stream before splitting in two. One branch turned to the south and continued toward Merton, remaining outside of the Site boundary. The other branch continued to the east, following a line on the north side of Graven Hill, joining the line of Akeman Street at Wretchwick Farm. Given its location, it is possible that this may be a survival of the original Roman Road which led east from Alchester to link with Akeman Street. This route appears to have survived the initial construction of the Graven Hill ordnance depot as it can be seen on aerial photographs of 1945 as a double line of trees.
- 10.4.41 In 1880, C Site (Figure 10.5) is shown as comprising a series of enclosed fields to the west of Upper Arncott. It remained largely unchanged as agricultural land until the development of the ordnance depot and no other features of note are visible on the historic maps within the Site boundary.
- 10.4.42 No other features of note are visible on the historic maps within the C Site boundary.

#### Geophysical survey

- 10.4.43 The results of the geophysical surveys at Graven Hill are shown in Figure 10.6, with full results set out in Appendix H-4.
- 10.4.44 In some areas the survey highlighted relatively high levels of presumed modern disturbance, as well as buried services and strong magnetic responses from buried ferrous objects, and these are all in line with expectations given the twentieth century history of the Site. However, features of potential archaeological interest were found in a number of limited areas. These included a number of isolated positive linear anomalies of uncertain origin which could be of archaeological interest, as well as

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evidence of ploughed out former ridge and furrow. In addition to these, three areas of more likely archaeological interest were identified within specific areas.

#### Other previous investigation

- 10.4.45 The Oxfordshire HER records that there has been some limited previous archaeological investigation within the Graven Hill Site, though none has resulted in any notable discoveries.
- 10.4.46 In 2006, two trial trenches were excavated within a former tennis court at St David's Barracks in advance of construction of an accommodation block, though no archaeological features were identified.
- 10.4.47 Defence Infrastructure Organisation's consultation with Dr Ebehard Sauer, excavator at Alchester, has confirmed that nothing of defined date was found during exploratory works on Graven Hill itself (pers. Comm.).

### Predicted future baseline

- 10.4.48 Based on available information, it is considered unlikely that there will be any material change to the historic environment baseline situation prior to development taking place.
- 10.4.49 The Evergreen 3 proposals include provision for a new road and rail crossing to the east and south of the Alchester scheduled monument. These have been designed in order to preserve the monument and its setting, and the Evergreen 3 Environmental Statement predicted a slight effect on the setting of the monument, with additional mitigation in the form of planting and management of trees and hedgerows. It is therefore presumed that the character of the monument will not be significantly affected.

# 10.5 Environmental measures incorporated into the proposed development

10.5.1 Environmental measures that have been incorporated into the proposed development are set out in Table 10.2. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

Potential receptors	Potential changes and effects	Incorporated measure
Sub-surface Archaeology	Disturbance to areas containing sub- surface archaeological remains resulting in their loss.	Archaeological excavation and recording of deposits in advance of their loss. In order to better define the extent the identified remains this will be preceded by a programme of archaeological field evaluation.

#### Table 10.2 Rationale for incorporation of environmental measures

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Potential receptors	Potential changes and effects	Incorporated measure
		Archaeological investigations can be secured by a planning condition and be undertaken in advance of construction, as each phase comes forward for development.
Military Buildings	Demolition of buildings in advance of development.	The C Site Romney huts (C30 and C31) which have been identified as forming well-preserved groups of a particular type of building will be retained within C Site.
		For those buildings which will need to be demolished, a record will be made in advance of their demolition. The level of detail of recording will depend on the historic interest of the individual buildings to be recorded and greatest attention will be paid to substantially unaltered buildings which formed part of the original WWII establishment of the depot. As the buildings are mostly of a standard form and historic plans for the building types survive, the record will predominantly comprise a written and photographic record.
Earthworks in Gravenhill Wood	Potential for disturbance as a result of construction of new woodland paths.	Earthworks will be avoided in the layout of the new paths.

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# 10.6 Scope of the assessment

10.6.1 Development can affect the historic environment as a result of direct disturbance to or loss of heritage assets (e.g. land take), but also through changes to the setting of assets or historic landscapes. Effects on the setting of cultural heritage features are frequently termed 'indirect effects', although effects which do not materially affect the physical remains of a feature can nevertheless have a direct effect on its setting.

### **Direct effects**

10.6.2 Direct effects on assets can occur as a result of the loss of, or disturbance, to elements of the historic environment. Direct effects may therefore occur on any features that are known to be or could potentially be within areas where ground may be directly disturbed as a result of a proposed development. Any development has the potential to affect heritage assets, although particularly where this entails either the disturbance of a 'greenfield' site, where archaeological remains are more likely to survive, or the physical alteration or demolition of an historic building.

### Indirect effects

10.6.3 Indirect effects can occur as a result of changes that do not result in direct physical loss or damage to an asset, but affect them in other, often less tangible ways, for example, by altering the setting of a heritage asset or from effects on the preservation of remains which will not otherwise be physically affected (e.g. through changes to





drainage). These can be short term (e.g. resulting from construction activities) or long term (e.g. resulting from new structures).

#### **Potential receptors**

- 10.6.4 The following historic environment receptors are present and could potentially be affected by redevelopment of Graven Hill and C Site.
  - Sub-surface Archaeology.
  - Military Buildings.
  - Former Road.
  - Earthworks in Gravenhill Wood.
  - Off-site designated heritage assets.
- 10.6.5 The extent and location of off-site designated heritage assets has been reviewed in relation to the proposed development and it was concluded that there is potential for the settings of the following scheduled monuments to be affected by the development within Graven Hill, and there was therefore a need to include these in the assessment:
  - Alchester Roman Town (SM OX18); and
  - Wretchwick Deserted Medieval Settlement (SM 28148).
- 10.6.6 Similarly, it was concluded that an assessment of potential effects on the settings of the following listed buildings was required:
  - Wretchwick Lodge (LB 243388);
  - Wretchwick Farm (LB 243386 and 1046522); and
  - Langford Park Farm (LB 1369739).
- 10.6.7 It was concluded that an assessment of the effects on the following listed buildings was required with respect to the proposed development at C Site.
  - Wood Farm Cottage (LB 243404);
  - Manor Farmhouse (LB 243403);
  - Methodist Chapel (LB 243401); and
  - Miropa: 16, Green Lane (LB 243402).
- 10.6.8 There are no further designated heritage assets that could be affected by the proposed development and therefore none which should be considered as receptors in this assessment.

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## Potentially significant effects

10.6.9 The potentially significant effects relating to the proposed development, which are subject to further assessment in this chapter, are summarised below.

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- Potential effects from construction activities which could involve the removal or disturbance to sub-surface archaeological deposits at Graven Hill.
- Potential effects from construction activities at Graven Hill involving the demolition or alteration of military buildings within the Site.
- Potential effects from construction activities at Graven Hill which could involve the removal of a former road which may have originated as a Roman road.
- Potential effects from construction activities at Graven Hill which could involve disturbance to or change in the setting of a group of earthworks in Gravenhill Wood.
- Potential changes to the settings of the off-site designated heritage assets noted above as potential receptors as a result of the new buildings at both Graven Hill and C Site.
- 10.6.10 For the reasons set out below, the following potential effects are not likely to be significant and are therefore not considered further in this ES.
  - Potential effects from construction activities which could involve the removal or disturbance to sub-surface archaeological deposits at C Site: There is no expectation that any notable areas of sub-surface archaeology will survive in C Site.
  - *Effects on the setting of off-site designated features other than those listed in the preceding section*: Such features are sufficiently far from each site or sufficiently screened from both sites by topography or other features for significant effects on their setting to occur.

# **10.7** Assessment methodology

# Methodology for the prediction of effects

10.7.1 The assessment of significance of any effect is largely a product of the importance/ sensitivity of a feature, as informed by legislation and policy, and the magnitude of the effect on it, qualified by professional judgement.

### Significance of Heritage Assets

10.7.2 PPS5 sets out that the effect of a proposed development on the significance of a heritage asset or its setting is a material consideration in determining a planning application. In order to assess this, it is necessary to have an understanding of the nature, extent and importance of the significance of the asset. Therefore, a feature must have a degree of significance before it can be considered as a heritage asset, and

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not all assets are of equal value. The significance of assets, including the contribution of their setting to their significance, can be based on values which are set out in Conservation Principles. These are:

- evidential value: the potential of a place to yield evidence about the past;
- historical value: the ways in which the past can be connected to the present through a place through association with or illustration of the past;
- aesthetic value: the ways in which people draw sensory and intellectual stimulation from a place either through design or fortuitous development over time; and
- communal value: the meanings of a place to the people who relate to it through social, spiritual or commemorative values attached to a place.
- 10.7.3 For the purposes of assessing the significance of effects in EIA terms, the heritage importance has also been assigned to one of four classes. This is done with reference to the heritage values described above but also relies on professional judgement as informed by policy and guidance. The hierarchy given in Table 10.3 is independent of any specific designation, although it should be noted that the interests (e.g. archaeological interest) of an asset that contributed to its designation will also bear on the assessment of its significance.

Importance	Summary Rationale
High	Asset has importance for an outstanding level of archaeological, architectural, historic or artistic interest or a high level of more than one interest
Medium	Asset has importance for a high level of archaeological, architectural, historic or artistic interest or several elements of more than one interest
Low	Asset has importance for elements of archaeological, architectural, historic or artistic interest
Negligible	Asset has importance for elements of archaeological, architectural, historic or artistic interest

#### Table 10.3 Summary of importance of the significance of heritage assets

### Designated Heritage Assets

- 10.7.4 The Historic Environment Practice Guide defines designated heritage assets as including World Heritage Sites, scheduled monuments, listed buildings, protected wreck sites, conservation areas, registered parks and gardens and registered battlefields. There are no World Heritage Sites, registered battlefields or protected wreck sites within the extended study area.
- 10.7.5 By legal definition, scheduled monuments are considered as being of national importance. As the process of scheduling is ongoing, there are further features which are not scheduled but which may also meet the established criteria and may also be of

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national importance. For the purposes of this assessment, these features have been considered to have a high level of importance.

10.7.6 All listed buildings are given equal protection by law and are of special architectural or historic interest. Although the buildings are graded in importance, for the purposes of this assessment, all grades of listed buildings have been considered as having a high level of importance.

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- 10.7.7 Sites included in the non-statutory Register of Parks and Gardens by English Heritage are also graded using the same scale and have therefore been considered as having a high level of importance.
- 10.7.8 Conservation areas, maintained on regional and district registers, can be considered to be of medium or high importance.

#### Other Heritage Assets

- 10.7.9 The identification and the assessment of the importance of the significance of nondesignated heritage assets rely on professional judgement and reference to the values set out in Conservation Principles. PPS 5 notes that in some instances heritage assets will be identified by a local planning authority. This may be in the form of a 'local list' of buildings of historic or architectural interest or areas of archaeological interest identified in the local plan-making process.
- 10.7.10 Information on a wider range of non-designated features is held by local authorities on their Historic Environment Records (HER) and by English Heritage as part of the National Monuments Record (NMR). Many of the features or areas on these records will have significance such that they will need to be considered as heritage assets.
- 10.7.11 PPS 5 and the accompanying practice guide provide an outline of the steps which may be required to provide an understanding of the significance of a features or area, and therefore whether it should be considered as a heritage asset. It is worth noting that programmes for reviewing designations are ongoing, so the heritage significance of sites that are not designated may be of low, medium or high importance. Many nondesignated heritage assets are likely to be considered as having medium or low levels of importance, though those which are potentially suitable for designation may have a high level of importance.
- 10.7.12 It should be noted that some other heritage assets of high importance may not be sufficiently well defined or otherwise suitable for designation and therefore will not be protected by legislation.

#### Other features

10.7.13 Other features or records may be included in a HER or identified during an assessment which may contribute something to an understanding of the historic environment of an area but which nevertheless are not capable of being considered a heritage asset in their own right. These may include records of artefact finds, place-name evidence, or features which are too poorly-preserved or are otherwise not of sufficient heritage interest to be valued for significantly more than their utility. While such features may

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not have direct significance of themselves they may be a factor in providing texture to the landscape and providing evidence of events or activity in a given locale.

### Magnitude of effects

- 10.7.14 The magnitude of an effect on a given heritage asset may depend on the type of feature being assessed, as well as the extent of any loss or alteration to it. For example, the loss of part of a Bronze Age burial mound will significantly compromise its integrity and intrinsic value. However, in the event of the unavoidable loss of part of a medieval field system (with appropriate record), the remainder of the field system could still retain intrinsic value.
- 10.7.15 Effects on receptors are assigned to one of four classes of magnitude, defined in Table 10.4, following the guidance given in PPS 5.

Magnitude	Definition
Total	Total loss of an asset. Complete and permanent loss of or change to the characteristics of an asset's setting, such as could be caused by its disassociation (or re-establishment) with its historical setting.
Substantial	Partial loss of or alteration of asset which will substantially affect its importance. Substantial change to the key characteristics of an asset's setting, which falls short of being a total disassociation with the historical context, or a more total loss which is temporary and/or reversible.
Minor	Minor loss to or alteration of an asset which leave its current importance largely intact. Minor and short term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact.
Negligible	Minor alteration of an asset which does not affect its importance in any notable way. Minor and short term, or very minor and reversible changes to it's setting which do not affect the key characteristics.

#### Table 10.4 Definition of magnitude

10.7.16 As noted above, the assessment of magnitude of an effect in EIA terms largely relies on professional judgement in the light of relevant legislation and policy rather than any scoring of criteria. With respect to potential effects on the setting of designated heritage assets, the magnitude of an effect reflects the extent to which the key characteristics of the setting (the 'immediate setting') will be altered.

## Significance evaluation methodology

10.7.17 Effects are considered to be significant or not significant according to the matrix in Table 10.5.





Receptor importance	Magnitude of change			
	Negligible	Minor	Substantial	Total
High	Not significant	Not significant	Significant	Significant
Medium	Not significant	Not significant	Not significant	Significant
Low	None	Not significant	Not significant	Not significant
Negligible	None	None	Not significant	Not significant

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#### Table 10.5 Matrix of significance

# 10.8 Assessment of effects: Sub-surface archaeology at **Graven Hill**

#### Current baseline conditions

- 10.8.1 The presence of sub-surface archaeological remains within limited parts of the Graven Hill Site is suggested by the results of the geophysical survey. Aerial photographs also show that remains of ridge and furrow were present within the Site.
- 10.8.2 The identified archaeological remains appear to include pits and ditches, though in most cases there is a lack of a clear pattern, partly due to the limited areas in which features of potential archaeological interest were identified.
- 10.8.3 Two principal areas of potential archaeological interest were identified within the Site boundary and these are all shown on Figure 10.6 and within the geophysical survey reports in Appendix H.4.
- 10.8.4 Positive linear and curvilinear anomalies that appear to relate to cut ditch-like features with archaeological potential where identified near to the north-western site boundary (Area A, Field 1, Archaeological Survey Ltd Report no.332). The extent of the probable archaeological features was too limited to discern a clear form, though they may also extend beyond the Site boundary to the north-west. This area is within around 700m of Alchester Roman town and so it is possible that they may be associated.
- 10.8.5 Positive linear, curvilinear and discrete anomalies were located within a field to the immediate north of Gravenhill Wood (Area H east, Archaeological Survey Ltd Report no.347). These may indicate cut features, such as ditches and pits and whilst a relatively recent origin can not be ruled out, they may be of archaeological interest. This area appears not to have been previously occupied by Nissen huts and so the survival of earlier features of archaeological interest is possible.
- 10.8.6 Archaeological remains within these areas will be of some evidential value, with a potential to contain evidence on past activity within the area. In particular, any





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surviving remains of Romano-British date could contain evidence for settlement and activity within the hinterland of the town of Alcester, whilst there is also a potential for the presence of earlier activity.

10.8.7 The pattern of twentieth century development within the Site and the results of the geophysical survey suggest that the surviving archaeological remains are not Construction of the depot buildings will have removed underlying extensive. archaeological deposits and even on the currently unoccupied slopes of Graven Hill the temporary accommodation camps appear to have resulted in a considerable degree of disturbance. Therefore surviving remains have been subject to a degree of fragmentation but with a possible association with the scheduled remains of Alcester, the surviving archaeology within Graven Hill is considered to be of medium importance.

#### Future baseline conditions

10.8.8 There is no expectation that the baseline condition with respect to sub-surface archaeology at Graven Hill will change if the current land use remains.

#### Predicted effects and their significance

- 10.8.9 The area of potential archaeological interest located north of Gravenhill Wood (Area H east, Archaeological Survey Ltd Report no.347) is within an area which will be retained as open space. As a result of this, it is anticipated that there will be no disturbance to any archaeological remains and these will not be affected.
- 10.8.10 The area of potential archaeological interest located near to the north-western site boundary (Area A, Field 1, Archaeological Survey Ltd Report no.332) is within the Phase 3 residential development (see Figure 3.7). It is anticipated that there will be a loss of these archaeological remains as a result of construction activities, though archaeological recording will be undertaken in advance as part of the environmental measures. As a result, there will be a substantial magnitude of effect on sub-surface archaeology within the Graven Hill Site. Based on the apparent limited extent of these remains, they have been assessed as being of medium importance and so their loss will not be significant, subject to appropriate archaeological mitigation.





# 10.9 Assessment of effects: Military Buildings

# Current baseline conditions

10.9.1 The Graven Hill Site contains a range of military buildings, most of which were built for the storage of equipment and materials. Other uses include office, welfare, railway infrastructure, and air raid shelters.<sup>35</sup>

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### **Storage buildings**

- 10.9.2 Most of the storage buildings within E and D Sites at Graven Hill (see Figure 1.2) appear to have been built as part of the initial phase of construction from 1941/42 and appear to have been in place by 1944. These are mostly large storage buildings which were often provided with single storey office accommodation along one external wall or, in the case of Building E1, as a projecting wing.
- 10.9.3 Similarly, most of the storage buildings within C Site (see Figure 1.3) appear to have been built from 1941/42 and appear to have been in place by 1944. These are mostly large storage buildings which were often provided with single storey office accommodation along one external wall or, in the case of buildings C1, C2 and C3, as a projecting wing.

## Air raid shelters

- 10.9.4 In some cases, air raid shelters were provided at the ends of these office ranges and a number of these still survive. In other cases, air raid shelters were provided as external brick-built structures with concrete roofs. There are no surviving external air raid shelters within E Site, but a number of examples do survive within D Site, alongside buildings D1, D2 and D3. In particular, Building D2 has a complete range of six shelters on the eastern side of the building. In each case, the external shelters are rectangular in shape, with an entrance at both ends and a viewing 'embrasure' within the long walls. At one end there is space for two chemical toilets. Each shelter appears to have been built to accommodate up to 50 persons (R Thomas pers. Comm.).
- 10.9.5 C Site also has a mix of shelters built as part of the office ranges and as external structure and a range of external shelters survive around building C1, though these appear to be in a poor condition. The external shelters at C Site appear to be identical in design to those at Graven Hill (D Site).

### 'Bolero' buildings

10.9.6 Groups of Romney huts were built at Graven Hill (in both E and D Site) as part of Operation Bolero following the US entry into WWII. These were needed to accommodate the additional requirement entailed in the supply of the American forces

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<sup>&</sup>lt;sup>35</sup> A report regarding the heritage value of the military buildings is currently being prepared by English Heritage and will be forwarded onto CDC upon receipt. It is unlikely that the findings of the report will changed the conclusions reached in the assessment.

in the build up to the Normandy campaign. The Romney huts were arranged in groups of six with three such groups in E Site and four in D Site. Only one of the Romney huts which appear to have been built at Graven Hill as part of Operation Bolero now survives. This is located within E Site and the sites of the other huts are marked by areas of hardstanding.

- 10.9.7 Two groups of six Romney huts were built in C Site as part of Operation Bolero following the US entry into WWII. These are still present, together with a small brick-built hut which may have served as an office for this group.
- 10.9.8 The buildings within the Sites are listed in Tables 10.6 and 10.7.

Building	Date	Function	Description
E Site			
E1	1941-44	Store	Large brick-built store with office range on western side. One corner of include a 'protected' area with concrete roof, steel internal doors and external shutters.
E2	1941-44	Store	Large brick-built store.
E3	1941-44	Store	Large brick-built store.
E4	1941-44	Store	Smaller brick-built store.
E5	1941-44	Store	Brick-built store.
E6	1941-44	Store	Brick-built store.
E7	1941-44	Guardroom	Brick-built guardroom.
E15	1941-44	Store	Brick-built store.
E15A	c. 1950s/60s	Office	Brick built offices.
E16	c. 1960s	Workshop	Railway engine shed.
E17	Post-1989	Store	
E20	c.1954	Substation	
E31	1941-44	Store	Romney hut. Formerly part of area which included three groups of six huts which were built as part of Operation Bolero. It is now the only surviving hut from this group and only the hardstandings for the other huts now survive.
D Site			
D1	1941-44	Store	Large brick-built store. This building was originally provided with six external brick-built air raid shelters (assumed to have been intended for up to 50 people each). Only three of these now survive and the locations for the other three are marked by areas of hardstanding.
D2	1941-44	Store	Large brick-built store. This building was provided with six external brick-built air raid shelters and all of these are still present.
D3	1941-44	Office	Brick built office building. Four air raid shelters are present, two on

#### Table 10.6 Military buildings in Graven Hill

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Building	Date	Function	Description	
			either side of the building.	
D4	1941-44	Store	Large brick-built store.	
D5	1941-44	Store	Large brick-built store.	
D6	1941-44	Store	Large brick-built store.	
D7	1941-44	Store	Large brick-built store.	
D8	1941-44	Store	Large brick-built store.	
D9	1941-44	Store	Large brick-built store.	
D10	1941-44	Store	Large brick-built store.	
D14	1941-44	Store	Small Nissen-type hut with brick sides.	
Other Buildings				
ROD1	1941-44	Club	May have been built as a group of accommodation huts.	
SU2, 3, 11	c.19456	Store	A group of Romney, Nissen and other 'temporary' structures which were built adjacent to the gun park in 1944/45. A railway siding was provided on the southern side.	
FT 1-4	1941-44	Workshop	Offices, workshop and toilet block	
GHT1	1950s	Theatre	Garrison theatre – built of red brick.	

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#### Table 10.7 Military buildings in C Site

Building	Date	Function	Description
C1	1941-44	Storehouse	Large brick-built store. This building was provided with twelve external brick-built air raid shelters and all of these are still present, though appear to be in a poor condition as the concrete roofs are failing.
C2	1941-44	Storehouse	Large brick-built store.
C3	1941-44	Storehouse	Large brick-built store.
C4	1941-44	Storehouse	Large brick-built store.
C5	1941-44	Storehouse	Large brick-built store.
C7	1941-44	Storehouse	Large brick-built store.
C8		Storehouse	
C9	1941-44	Storehouse	Large brick-built store.
C10	1941-44	Storehouse	Brick-built store.
C11	1941-44	Workshop	Brick-built workshop.

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Building	Date	Function	Description
C12	1941-44	Storehouse	Brick-built store.
C14	1941-44	Store	Small Nissen-type hut with brick sides.
C22	1941-44	Workshop	Brick-built workshop.
C24	1941-44	Workshop	Brick-built workshop.
C30	1941-44	Storehouse	Group of six Romney huts. Part of a pair of groups of huts (with C31) which were built as part of Operation Bolero.
C31	1941-44	Storehouse	Group of six Romney huts. Part of a pair of groups of huts (with C30) which were built as part of Operation Bolero.
C32	1941-44	Storehouse	Large brick-built store.
C52	c.1970	Storehouse	
C6A	1941-44	Storehouse	'Marston' building which has been re-clad.
C6N	1941-44	Storehouse	'Marston' building which has been re-clad.

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- 10.9.9 Individually, the military buildings are generally typical for the period and are of only limited historic interest. Therefore, as a result of their historic value in their role during WWII and in particular for the contribution which the Sites made to the build up to the Normandy landings, they are of low importance. However, they are of some greater interest as a group, and there is particular interest in some specific groups of buildings as well-preserved groups of their type.
- 10.9.10 Air raid precautions were incorporated into the design of the Sites from the outset and part of this was the provision of external brick-built air raid shelters which were built to protect site staff in the event of an attack. These were grouped together in groups of up to six, and whilst a number of these are no longer present, an unusually wellpreserved group is located on the eastern side Building D2. In addition to the surviving fabric of the buildings, these also retain traces of their original painted signage.
- 10.9.11 Another feature of the Sites is the groups of Romney huts built as part of the American military build up known as 'Operation Bolero'. These are therefore associated with the build up of American forces in England during WWII. They were only ever intended to be temporary structures and most have now been removed from Graven Hill and C Site. However, a single intact group is retained within the southern part of C Site. As well-preserved examples of their type and for their historical interest, these buildings are considered to be of medium importance.

#### **Future baseline conditions**

10.9.12 Some of the military buildings were clearly designed to have a limited period of use and there is evidence of deterioration in a number of buildings which are no longer in use, with evident decay to concrete and brickwork. It can be expected that this decay will continue in the future and that without specific maintenance measures this will affect the longer term survival of the structures.

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#### Predicted effects and their significance

10.9.13 All of the current buildings within Graven Hill and in the northern area of C Site will be demolished in advance of the development, with a record of them being made in advance as described in section 10.5. Whilst this will involve a total loss of the affected buildings, the retention of identified buildings of medium importance and proposed mitigation will mean that the effect will not be significant.

## 10.10 Assessment of effects: Former Road

#### **Current baseline conditions**

- 10.10.1 A Roman Road is believed to have led east from the Roman town of Alchester and crossed the Site to the north of Graven Hill. Indeed, various OS Editions indicate a lane which entered the Site as Langford Lane and crossed the Site as being on the course of the Roman Road. It is not clear if there is any positive evidence that this is on the course of the Roman Road, though as a continuation of Langford Lane, it would fit with what is known about the layout of the Roman town of Alchester.
- 10.10.2 The 1st Edition OS map suggests that this lane was still largely present in 1880, but appears to have fallen out of use and was beginning to break up. Subsequent OS maps and aerial photographs indicate that it was still present at the time of construction of the depot, though its route was bisected by a number of the storage buildings (e.g. D9) and the circular road. Much of the route of this lane has gradually become obscured by developments within the depot and its route can now only be traced as a length of field boundary to the north of Gravenhill Wood.
- 10.10.3 This field boundary was examined during the site walkover and it was noted that the short sections of the earthworks remains of the former lane can be seen as a low bank along parts of the hedgerow. Where it survives, the earthwork is approximately 3-4m wide and up to around 0.5m high, cutting into the natural north-facing slope of this area. In addition, the geophysical survey traced a continuation of the road to the east as a positive linear anomaly (Figure 10.6). This section is within a field that was formerly occupied by accommodation Camp No.6 and the geophysical survey results indicated a high degree of disturbance to sub-surface deposits so any remains of the track are likely to be poorly preserved. There are no visible remains in this field.
- 10.10.4 It is not clear if there are any Roman origins to this track. Though it appears to be clear that the visible remains are of the nineteenth century track, it may be on the line of an earlier road and traces of this may survive as sub-surface features. Any such remains will be of evidential value for their potential to yield information on the possible date and method of road construction, as well as for earlier transport organisation in this area. Remains are likely to be fragmentary, with only a limited section being marked by a surviving field boundary, limiting its historical value as a reference to the historic pattern of land use and movement within the area. In light of these factors and as an apparent nineteenth century track with possible earlier origins it is considered to be of low importance for its evidential and historical value.

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#### Future baseline conditions

10.10.5 There is no expectation that the baseline condition with respect to the former road will change if the current land use remains.

#### Predicted effects and their significance

- 10.10.6 Much of the surviving route of the road, where it is currently marked by a hedgerow, will be retained in an area of open space to the north of Gravenhill Wood and will therefore not be affected by the proposed development. However, other sections where remains of the former road may survive will be lost to Phase 3 of the residential development (see Figure 3.7).
- 10.10.7 Archaeological recording will be undertaken in advance of the loss of this road as part of the environmental measures. With this mitigation the effect on the road will be of a low magnitude, and so this will be not significant.

# 10.11 Assessment of effects: Earthworks in Gravenhill Wood

#### **Current baseline conditions**

- 10.11.1 Earthworks are present within the south-eastern part of Gravenhill Wood and these comprise a section of low bank and ditches (HER 1607). It has been suggested that these could have formed part of an Iron Age fort at Graven Hill. Two sections through the earthwork were cut in 1999 by the Oxford University Archaeological Society. This investigation failed to uncover any significant material with the most diagnostic find being a small fragment of Iron Age or Bronze Age pottery, which could have been within re-deposited material. The ditches themselves were found to be between 0.8m and 1.0m deep.
- 10.11.2 Therefore the origin of these earthworks remains unknown, but the lack of finds does not suggest settlement of the hill top location and there is no evidence that the earthworks ever formed a circuit around the hill. A possibly more likely explanation is that they are agricultural remains of Medieval or post-Medieval date. In this respect, it is perhaps relevant that aerial photographs show that ridge and furrow earthworks were once extensive within the depot site and surrounding agricultural land. Whilst all visible traces of the ridge and furrow have now gone, it does indicate that this area was extensively ploughed in the Medieval and post-Medieval periods.
- 10.11.3 Despite the generally negative results of the previous investigations, the earthworks are of some evidential value as there is a potential for more extensive investigation to yield some information on their date and function. Also, as they clearly derive from, and are illustrative of, the historic use of this area, they are also of historical value. Taking account of the evidential and historical value of these earthworks, but also the relative lack of context in which to interpret and understand them, they are considered to be of low heritage importance.

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10.11.4 The earthworks are located within woodland and so are not prominent, and indeed are difficult to see from any distance. As a result of this, their setting is limited in extent to the southern part of Gravenhill Wood and this makes no significant contribution to their heritage importance.

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#### Future baseline conditions

10.11.5 There is no expectation that the baseline condition with respect to the earthwork will change if the current land use remains.

#### Predicted effects and their significance

- 10.11.6 The earthworks are located within Gravenhill Wood, which will be retained within the redeveloped site. There will be a change to the surrounding area, with a higher density of development surrounding Gravenhill Wood (see Figure 3.2). However, the current setting of the earthworks does not extend beyond the woodland and this is not expected to change. New built development will not be built closer than 200m from the earthwork, and change within the woodland will be restricted to the creation of new footpaths, for public access, which will avoid the earthworks.
- 10.11.7 As a result of these factors, the proposed development will have no effect on this receptor.

# 10.12 Assessment of effects: Off-site designated heritage assets

#### **Current baseline conditions**

#### **Scheduled Monuments**

- 10.12.1 There are two scheduled monuments within 1km of the Graven Hill Site boundary, and these are described below. There are no scheduled monuments within 1km of C Site (see Figure 10.1).
- Alchester Roman Town (SM OX18)
- 10.12.2 The monument of Alchester Roman town comprises the extensive remains of a defended Roman settlement and environs. There are some earthworks visible, most of which relate to the former defensive ditch and rampart, but the site of the town has formerly been under arable cultivation and the most complete plan of the town has been obtained from an analysis of aerial photographs.
- 10.12.3 The town defences enclosed a square area of approximately 10.5ha to the immediate south of Langford Lane and the line of the defences are largely reflected by field boundaries as well as Langford Lane itself. The town was set within a network of internal and external roads, with a central junction around which the town was set. The east to west aligned Akeman Street is believed not to have crossed through the town but passed approximately 500m to the north. A north-south aligned road ran

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from Dorchester-on-Thames to Bicester, and this did run through the centre of Alchester, presumably crossing Akeman Street to the north. The centre of the town was marked by a junction between this north-south road and an east-west road which crossed through the town and extended beyond the ramparts to either side. This road appears to extend to the east and joined the current line of Langford Lane. Additional roads and alleys can be traced forming a grid around these roads both with and beyond the ramparts to form a series of insulae. The principal roads appear to have been approximately 6-8m wide with flanking ditches for drainage, whilst smaller roads were up to 3m in width. A further road has also been identified to the east of the town.

- 10.12.4 Cropmarks show that numerous buildings were located within the town defences and also alongside the road to the immediate east. In particular, aerial photographs taken during the dry summer of 1996 show an exceptional level of detail on the town layout with masonry wall footings, excavated pits and ditches and paved yards. There are a number of larger, probably public, buildings suggesting an administrative function, whilst a possible temple is also present. A range of smaller buildings may have been a mix of houses, shops and workshops.
- 10.12.5 Within the immediate environs of the town, the aerial photographs show a series of ditched enclosures and field systems, as well as a military parade ground and camp. A banjo-type enclosure and associated ditches near the south-western corner is likely to represent a pre-Roman phase of occupation.
- 10.12.6 The scheduled monument includes the whole extent of the defended town, together with some of its associated field systems and the banjo-type enclosure.
- 10.12.7 The monument is now largely under pasture, comprising a series of enclosed fields marked by hedgerows and fencing. Langford Lane cuts through the monument on an east-west axis, with a further lane entering the monument from the north and forming a T-junction with Langford Lane.
- 10.12.8 The monument predominantly comprises sub-surface remains and therefore makes what is in some respects only a limited visual impression. However, there are some surviving earthwork remains, such as the defensive ditches, and the basic form of the town and some of its connecting roads can still be seen in the layout of field boundaries and the local roads. The monument is located within agricultural land to the west of Graven Hill and though it is bordered on the eastern side by the main railway line and the A41 dual carriageway is a short distance to the west there is relatively little impression of it being enclosed by these modern features. The setting of the monument is therefore essentially rural and comprises the surrounding agricultural fields. Due to the generally flat topography and presence of hedgerows the views of and from the monument are limited in extent and the only notable medium or longer distance view is of Graven Hill to the east. In this view the hill appears to wholly wooded and so the only part of the hill which can be seen is that part which is occupied by Gravenhill Wood. There are few intrusive features in this view, though the upper parts of the Graven Hill boilerhouse can be seen.

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10.12.9 The monument is of evidential value for the potential of the sub-surface remains to reveal information on the nature of Roman and earlier settlement in this area. As a reference to a past settlement pattern which is reflected in the current organisation of field boundaries, the site is also of historical value. Taking account of these values, and reflecting the scheduled status of the monument, it is considered to be of high importance. Though the setting is of limited extent, its rural nature comprising agricultural fields makes some contribution to the value of the site.

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#### Wretchwick Deserted Medieval Settlement (SM 28148)

- 10.12.10 Wretchwick Deserted Medieval Settlement comprises the earthwork and sub-surface remains of the former settlement of Wretchwick and the scheduled monument is located within two pastures fields located to either side of the current Middle Wretchwick Farm. Both fields are located to the west of Wretchwick Way and are enclosed by well-established hedgerows.
- 10.12.11 The remains within the northern field are less regular than those to the south and it is possible that the older part of the village was in this area, with a later planned extension to the south. Earthworks comprise hollow trackways, building platforms, of various sizes, as well as a series of water management channels and small ponds.
- 10.12.12 Wretchwick is mentioned as an estate in the Domesday survey and by 1274 it was in the ownership of Bicester Priory. A survey of 1274 identified it as having around 30 households. By the fifteenth century the population had been much reduced, and it is likely that the Black Death played a considerable part in this. Rental accounts of the period 1432-37 indicate that the population by this time had fallen to around a dozen families and Bicester Priory was clearly struggling to find tenants for a number of holdings within the manor. The fortunes of the settlement were only to worsen however, and Bicester Priory decided to evict the remaining tenants and enclose the land in March 1489. A court case in 1517 records that at that time the village had fallen to five households containing only 18 individuals and that all of these people were forced to leave.
- 10.12.13 The monument is located on the edge of the agricultural land at the eastern side of Bicester and is bordered to the west by the A4421 with modern residential development immediately beyond this. The busy A41 is located approximately 200m to the south and the Graven Hill Site is beyond this. The main visible feature of the Graven Hill Site as it is currently used is the stacked containers of the outdoor storage area (see Figure 11.32). Enclosed agricultural fields, predominantly used as pasture, are located to the east. Earthwork remains of the former village are present throughout the scheduled area and it is the extent of the visible remains which has defined the extent of the scheduled area. However, there are only low earthworks and these are not prominent.
- 10.12.14 The monument will contain surface and sub-surface remains with the potential to yield information on the medieval settlement and economy of this area and is therefore of evidential value. It is also of historical value as a visible reference to the changes in settlement patterns which have occurred in the area. Taking account of these values, and reflecting the scheduled status of the monument, it is considered to be of high

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importance. The setting is of limited extent, but its rural nature comprising agricultural fields makes some contribution to the value of the site.

#### Listed Buildings - Graven Hill

#### Wretchwick Lodge (LB 243388)

10.12.15 This is a small late eighteenth or early nineteenth century single storey cottage of colourwashed limestone with a thatch roof. It fronts on to the A41 and is set within a small domestic garden behind a picket fence, with a shelter belt of trees surrounding the cottage and screening it from the Graven Hill Site (see Figure 11.6). Historic mapping indicates that the cottage and garden have been enclosed by trees for at least the last 150 years.

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10.12.16 As an historic building, the cottage is of historical value and as a small attractive cottage it is also of some aesthetic value, though this is limited by the close proximity of the busy A41. Taking account of these values, and reflecting the scheduled status of the monument, it is considered to be of high importance. The setting of Wretchwick Lodge is highly restricted by the presence of the A41 to the north and the thick belt of trees to the south. As a result of these, its setting makes little contribution to its heritage value.

#### Wretchwick Farm (LB 243386 and 1046522)

- 10.12.17 These are the two listed buildings east of Graven Hill (D Site) which comprise the current Wretchwick Farm. The VCH records that the farm was established in the seventeenth century as one of a number of farms in the manor of Wretchwick as part of a process of enclosure.
- 10.12.18 The current farmhouse is early eighteenth century in origin with later eighteenth and early nineteenth century alterations. It is L-shaped in plan and of limestone rubble construction with brick dressings and some wooden lintels. There is an old plain-tile roof with brick gable stacks. The house has two storeys and an attic, and the roof has three gabled dormers with leaded casement windows.
- 10.12.19 The barn approximately 50m south of Wretchwick Farmhouse is also listed. It is early eighteenth century in construction of coursed limestone with a corrugated asbestos roof. Wretchwick Farm is located within gardens and a farmyard, the limits of which are defined by belts of trees to the north and west, and by farm buildings to the south. These define the full extent of the setting of the listed building.
- 10.12.20 As an historic building, the farmhouse is of historical value and it is also of some aesthetic value, and as a listed building is of high importance.

#### Langford Park Farm (LB 1369739)

10.12.21 The current farmhouse is eighteenth century in origin with early nineteenth century alterations. It has two parallel ranges, one of two storeys and an attic and the other of one storey plus attic. Construction is of limestone rubble with wooden lintels and some rendered walls. The roof is of old plain-tile and concrete plain-tile roofs with brick stacks.

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10.12.22 There is a range of farm buildings south of the farmhouse, and though none of these are separately listed they are within the curtilage of the house. The curtilage of the farmhouse provides its principal setting, though the immediately surrounding agricultural land makes some contribution to this.

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10.12.23 As an historic building, the farmhouse is of historical value and it is also of some aesthetic value, and as a listed building is of high importance.

#### Listed buildings - C Site

#### Wood Farm Cottage (LB 243404)

- 10.12.24 Wood Farm Cottage is a seventeenth century house with early to mid eighteenth century alterations. It is built of random and coursed squared limestone rubble with some ashlar dressings and a concrete plain-tile roof with rubble and brick ridge stack. The roof has four low dormers and a seventeenth century stack on a rubble base is a particular feature of the house.
- 10.12.25 The cottage is located near C Site alongside Ploughley Road, with an enclosed garden to the rear. Its roadside location and enclosed garden mean that the setting of the cottage is limited and is primarily seen in the contribution which the cottage makes to the character of this part of Ploughley Road. As an historic building, the farmhouse is of historical value and it is also of some aesthetic value, and as a listed building is of high importance.
- Manor Farmhouse (LB 243403)
- 10.12.26 This is a farmhouse near C Site, and was probably originally the manor house. It has a datestone with the date 1679, and was remodelled in the early nineteenth century. It is built of coursed squared limestone rubble with some wooden lintels, plain-tile roof, with rubble and brick stacks. The house is L-shaped in plan.
- 10.12.27 The farmhouse fronts on to Ploughley Road with a farmyard containing farm buildings to the rear and the setting of the house does not extend beyond this farmyard. As an historic building, the farmhouse is of historical value and it is also of some aesthetic value, and as a listed building is of high importance.

#### Methodist Chapel (LB 243401)

- 10.12.28 The chapel has 1834 marked on the datestone, and is rectangular in plan. It is built of limestone rubble with wooden lintels and a Welsh-slate roof. The interior has simple mid/late nineteenth century pine bench pews and fittings.
- 10.12.29 The chapel is located on Green Lane and looks out across the Green in Upper Arncott. Therefore, the extent of its setting is defined by the green and does not extend beyond this. The building is of historical value, particularly in light of the recorded retention of pine pews and other internal fittings. As a listed building it is of high importance.





Miropa: 16, Green Lane (LB 243402)

10.12.30 Miropa is a late seventeenth or early eighteenth century house of colour-washed limestone rubble and wooden lintels. It has a thatch roof with brick gable stacks.

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10.12.31 This house is located to the rear of the Methodist chapel in Upper Arncott, within an enclosed garden. The location and the surrounding dense tree screening results in the setting of the house being very restricted. As an historic building, the house is of historical value and it is also of some aesthetic value, and as a listed building is of high importance.

#### Future baseline conditions

10.12.32 The Evergreen 3 proposals include the construction of a new road and rail crossing to the east and south of the Alchester scheduled monument. However, the proposed development has been designed to preserve the monument and so it is assumed that the character of the monument and its setting will not be significantly altered by those proposals.

#### Predicted effects and their significance

#### **Scheduled Monuments**

#### Alchester Roman Town (SM OX18)

10.12.33 Graven Hill can be seen in the view to the east, across the monument from Langford Lane. None of the areas to be developed are visible in this view as the Graven Hill Site is screened by trees located alongside the main railway line. Therefore, the main change in this view as a result of the proposed development will be the removal of the boilerhouse. There will be no notable change in views of the monument and so overall there will be no negative effect on the setting of the monument as a result of the proposed development at Graven Hill and therefore no significant effects are likely.

#### Wretchwick Deserted Medieval Settlement (SM 28148)

- 10.12.34 Views from Wretchwick Deserted Medieval Settlement will change as a result of the proposed development by the initial removal of the containers and ending of activity associated with the current outdoor storage area. Houses will then be built within this area and elsewhere on the northern edge of Graven Hill during Phase 2 of the residential development. This will be more extensive and initially more visually prominent from the monument than the current structures, as illustrated in the photomontage of Viewpoint 5 (Figures 11.32-34). However, additional planting will strengthen the screening along the northern edge of the Site and over time this will screen and soften the view of the new development.
- 10.12.35 As the view towards Graven Hill across the monument makes some contribution to its setting these changes can be expected to have some effect on the setting of the monument. The containers within the outdoor storage area form a dominant and changing element which may be considered as a negative aspect to the setting of the monument. Therefore, their removal is likely to be beneficial to the setting of the





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monument. They will be replaced by the Phase 2 residential development which will be visible across a wider field of view and so during construction and on completion the development may be more visually dominant than the storage containers, resulting in a negative effect. As the new planting matures it will form an effective screen and negative effects in comparison with the current baseline can be expected to cease.

10.12.36 Due to the size and extent of the residential development which will be seen from the monument, it is likely that it will result in a negative effect on its setting of substantial magnitude during construction and on completion. However, as the screen planting matures this effect will cease and in some respects the change in the view will be positive compared to the current situation. Therefore overall, and considering the negative aspects of the current situation, it is likely that the effect on the setting of the monument will be of a minor magnitude and not significant.

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#### Listed Buildings - Graven Hill

#### Wretchwick Lodge (LB 243388)

10.12.37 The key features which define the setting of Wretchwick Lodge are the A41 to the north and the belt of trees to the south. These will remain unchanged as part of the redevelopment at Graven Hill and so there will be no significant effect on the setting of the building.

#### Wretchwick Farm (LB 243386 and 1046522)

10.12.38 The proposed development will involve construction of houses within approximately 140m of the listed buildings during Phase 2 of the residential development. Structural planting will be introduced along the Site boundary in Phase 1, but as this will not have matured sufficiently, the Phase 2 construction will be visible from within the setting of the farm. In the longer term, views to the Site from within the farm's setting will comprise elements of the residential development and will be screened and heavily filtered by the boundary planting. There will be some additional lighting at the A41 junction, but overall, taking account of the extent of the setting and the boundary planting which will be introduced, there will be no significant effect on the setting of the farm.

#### Langford Park Farm (LB 1369739)

10.12.39 The proposed development will involve the removal of the large storage buildings that are currently within Graven Hill (E Site). No development will take place in close proximity to Langford Park Farm, as much of the northern edge of the Graven Hill Site will be retained as open space. As a result, there will be no negative or significant effects on the setting of the listed farmhouse.

#### Listed buildings - C Site

#### Wood Farm Cottage (LB 243404)

10.12.40 The cottage fronts on to Ploughley Road and this comprises its principal setting. As a result of this and the existing tree screening along the Site boundary (see Figure 3.9),

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the setting of this building will not be affected and therefore no significant effects will occur.

#### Manor Farmhouse (LB 243403)

10.12.41 The setting of the farmhouse is primarily defined by its farmyard situation. As a result of the presence of a range of farm buildings between the house and the Site, and the existing tree screening along the Site boundary (see Figure 3.9), the setting of this building will not be affected and therefore no significant effects will occur.

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#### Methodist Chapel (LB 243401)

10.12.42 The chapel fronts on to the green and this comprises its principal setting. As a result of this and the woodland screening which will be planted along the earth bund within the Site boundary, the setting of this building will not be affected (see Figure 3.5 and 3.8) and therefore no significant effects will occur.

#### Miropa: 16, Green Lane (LB 243402)

10.12.43 Whilst there may be disruption in views toward the Site during construction, the new perimeter bund and planting will ensure a greater sense of enclosure and separation between the Site and the setting of the house. As a result of this, there will be a positive effect on the setting of this building of minor magnitude, however this will not be significant. This is illustrated in the photomontage for Viewpoint 7 (Figures 11.41 to 11.43).

## 10.13 Conclusions of significance evaluation

- 10.13.1 The proposed development has the potential to affect elements of the historic environment through the disturbance of archaeological remains (both above and below ground), loss of military buildings of historical interest and changes to the settings of other heritage assets. The potential for all of these to give rise to significant effects has been considered.
- 10.13.2 Graven Hill contains a number of features of archaeological interest, and some of these will be partially or wholly lost as a result of the proposed development. Probable sub-surface archaeology has been identified as a result of the completion of a geophysical survey, and some of these features will be disturbed by development. Further investigation and recording will be required as part of the development, but the evaluation results indicate that they are of medium importance and their partial loss will not be significant, with appropriate mitigation. A former road also passes through the Site to the north of Graven Hill and it is possible that this has a Roman origin. Part of this will be lost to development, but again, further investigation and recording will be carried and consequently the effect will not be significant.
- 10.13.3 Most of the military buildings will be demolished, but well-preserved groups buildings which are good examples of their type have been identified and will be retained. Buildings to be lost will be recorded in advance of their demolition.

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10.13.4 In addition, the potential for effects on the settings of scheduled monuments and listed buildings have been considered. There will be some effect on the setting of Wretchwick Deserted Medieval Settlement during and after Phase 2 of the residential development, but in the longer term this effect will cease as the screening to be planted along the Site boundary matures.

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10.13.5 Table 10.8 shows a summary of all predicted historic environment effects assessed in this chapter of the ES.

Receptor	Magnitude of effect <sup>1</sup>	Sensitivity of receptor <sup>2</sup>	Significance <sup>3</sup>	Rationale
Sub-surface archaeology within Graven Hill.	Substantial	Medium	NS	Some areas of low archaeological importance around Graven Hill will be lost as a result of development. Their further evaluation and recording in advance of construction is an appropriate response.
Military Buildings	Total	Low/Medium	NS	Identified buildings of medium importance will be retained (C30/C31). Buildings that will be demolished during the development will be assessed for significance and subject to appropriate recording prior to demolition.
Former Road	Substantial	Low	NS	The course of a former road passes through the Graven Hill and it is possible that this is the route of a Roman Road leading east from Alchester. Much of this route has been lost to twentieth century development, and the development will result in the loss of a further section.
Off-site site designated heri	tage assets			
Scheduled monuments	Minor	High	NS	
Miropa: 16, Green Lane	Minor	High	NS	Bund and planting will provide separation and screening between the Site and setting of the house and therefore be positive.
Other Listed Buildings	None	High	NS	
	1: Negligible Minor Substantial Total	2: Negligible Low Medium High	3: NS = not significant S = significant	
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#### Table 10.8 Summary of negative historic environment effects and evaluation of their significance

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## 11. Landscape and Visual

## 11.1 Introduction

11.1.1 This chapter sets out the results of the landscape and visual assessment of the construction and operation of the proposed development at Graven Hill and at C Site. The landscape and visual assessment should be read in conjunction with the description of the proposed development in chapter 3 and associated masterplans illustrated at Figures 3.2 and 3.6. Other figures referred to are included at the end of the chapter. Further supporting information can be found at Appendix I as follows:

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- Appendix I.1: Landscape and Visual Assessment Methodology;
- Appendix I.2: Graven Hill: Evaluation of Significance Landscape Effects and Appendix I.3 Visual Effects (evaluation tables supporting the text in this chapter);
- Appendix I.4: C Site: Evaluation of Significance Landscape Effects and Appendix I.5 Visual Effects (evaluation tables supporting the text in this chapter).
- 11.1.2 Tree surveys have also been completed for both sites and are provided as separate reports in support of the planning application (BIC/OPA/DOC/19 and 20).

## 11.2 Policy and legislation

#### **Planning policy issues**

11.2.1 Table 11.1 lists the issues from planning policy guidance and policies that have been considered in assessing landscape and visual effects.

Policy	Policy Issue
SE RSS Policy C4	Development should protect and enhance the diversity and local distinctiveness of the region's landscape (informed by landscape character assessment).
CDC LP Policy C7	Development will not be permitted if it would cause demonstrable harm to the topography and character of the landscape.
CDC LP Policy C13	Development should conserve and enhance the character of Areas of High Landscape Value (AHLV) with particular attention paid to scale, type, siting and design of proposed development (reference being to Musell Hill as an AHLV).
CDC LP Policy C28	Layout, design and external appearance should be sympathetic to the character of the urban and rural context.

#### Table 11.1 Policy issues

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Policy	Policy Issue
CDC Non Statutory LP EN34	Development should conserve and enhance the character and appearance of the landscape.
CDC Non Statutory LP EN35	Development should retain woodlands, trees, hedges, ponds or any other features that are important to the character or appearance of the local landscape.
CDC Non Statutory LP EN37	Development should ensure appropriate countryside management of woodland, hedgerows, etc.
CDC Draft CS Policy SD1	Development should enhance character and appearance of the landscape through restoration, management or enhancement of landscapes, features or habitats; securing appropriate mitigation where damage cannot be avoided.
CDC Draft CS Policy SD13	Development should compliment and enhance character through sensitive siting, layout and high quality design.
ADLP RA.8	Development should respect the landscape character and will not be permitted if it adversely affects character unless appropriate mitigation measures can be secured.

#### Legislative requirements

11.2.2 Important hedgerows in England and Wales can be identified under the *Hedgerow Regulations 1997*. The relevant legislation for Tree Preservation Orders (TPOs) is contained in Part VIII of the *Town and Country Planning Act 1990* and in the *Town and Country Planning (Trees) Regulations 1999*. Tree surveys have been undertaken for both sites in accordance with BS 5837: 2005 Trees in relation to construction.

## 11.3 Data gathering methodology

#### Desk study

11.3.1 Table 11.2, below, lists the organisations that were approached for data to inform the landscape and visual assessment.

Table 11.2	Organisations and da	ita
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Organisation	Data
Natural England	Natural England's National Character Areas (previously known as Joint Character Areas).
Cherwell District Council	Cherwell District Landscape Character Assessment (November 1995).
Aylesbury Vale District Council	Aylesbury Vale Landscape Character Assessment (May 2008).



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#### Surveys

- 11.3.2 Field surveys initially took place in July 2010 as part of the preliminary landscape and visual appraisals informing the proposals for each site. In addition to supplementary site visits, further field survey work was undertaken on the 01 and 02 March 2011, 31 March 2011 and the 21 June 2011. Field surveys at the beginning of March were undertaken to look more closely at features that had been identified in earlier work, to establish the approximate visual envelope for each site (considering the influence of intervening topography, vegetation and existing development) and confirm potential visual receptors. The approximate visual envelope also defines the study area used for the assessment. 'Winter' photographs, showing existing vegetation without foliage, were also taken, to assist in the assessment. The remaining surveys involved further photography (including that required for the preparation of photomontages) and completion of field assessment as the preferred masterplans for each site were finalised.
- 11.3.3 Comprehensive field notes and photographs were taken in accordance with the recommendations set out in the second edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA) (Landscape Institute & IEMA, 2002). All photographs included within the assessment were recorded with a digital SLR camera set to produce photographs equivalent to that of a 35mm SLR camera with a 50mm focal length lens. Survey work was undertaken from within each site, or from publicly accessible areas. A number of residential properties close to the Sites were also visited including the following:
  - Graven Hill: Langford Park Farm, Wretchwick Farm and neighbouring properties; and
  - C Site: properties on Green Lane and Norris Road, Arncott.
- 11.3.4 A night-time site survey was carried out on the 12 July 2011 to inform the assessment of effects arising from night-time lighting at each site.

## 11.4 Graven Hill: overall baseline

#### Graven Hill: landscape baseline

#### Site location and landscape context

- 11.4.1 Landscape Character Areas are illustrated on Figure 11.1. Landscape designation information is shown on Figure 11.2.
- 11.4.2 The Graven Hill Site forms part of a number of military sites located within the eastern part of the CDC area to the south of Bicester, collectively known as MOD Bicester. The Site is located on the southern edge of Bicester and Langford Village and is approximately 600m to the west of Ambrosden village at its closest point.
- 11.4.3 With the exception of the higher land up to and including Graven Hill itself, the Site is predominantly developed and currently consists of two military sites (E and D Sites) that are characterised by large storage buildings, linked by the internal road and rail





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network. The Bicester International Freight Terminal (BIFT) is situated to the north, adjacent to the A41. The BIFT is a hardstanding area, functional in character, linked to the MOD rail system and used for container storage and distribution of military goods and equipment.

#### Surrounding land use

11.4.4 The northern part of the study area is dominated by the urban area of Bicester and the adjacent Langford Village, with its supporting infrastructure including 'A' Roads, Bicester's main railway line and sewage treatment works (STW). All are within either close proximity to, or adjoining, the Site. The edges of Bicester have become characterised by rural fringe farmland and urban fringe land uses such as transport corridors and ribbon development (such as Bicester Village).

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11.4.5 The landscape within the remaining parts of the study area is predominantly agricultural farmland with its associated loose settlement pattern of small villages, hamlets and isolated farms. The large MOD land holding is also characteristic of the area, including the Graven Hill Site and other MOD sites surrounding Arncott Hill.

#### Topography

- 11.4.6 The landform of the surrounding study area is predominantly flat and generally at elevations of approximately 60m to 65m Above Ordnance Datum (AOD), rising gently to the north of Bicester. This flat landform is associated with the River Ray floodplain and small tributary streams that dominate the southern half of the study area. The Graven Hill landform at the heart of the Site rises to 115m AOD and is one of a series of isolated hills (Poundon Hill, Arncott Hill and Muswell Hill) that rise above the surrounding landscape. The majority of the developed part of the Site lies below 75m AOD, closer to levels within the immediate surroundings. The predominantly undeveloped landform rises steeply from approximately 80m AOD to the hilltop.
- 11.4.7 Topographical variations within the Site and the study area combine to influence the extent and nature of visibility. The upper parts of the Site (Graven Hill and the upper pastoral fields above 80m AOD) are evident across a wide part of the study area, whereas views of the lower parts of the Site are more restricted. Longer distance views are also available to the Site from elevated areas within the study area.

#### Landscape Character Areas (LCA)

- The landscape character of the study area has been assessed at district level in the 11.4.8 Cherwell Landscape Assessment (CDC 1995). This assessment divides the District into eight landscape character areas (LCAs), each of which is divided further into landscape character types. The landscape character types are a series of generic areas reflecting the most distinctive combinations of landform and land cover characteristics and are the main determinants of local landscape character across the District.
- The Site and its immediate surroundings lie within the Otmoor Lowlands LCA. The 11.4.9 main characteristics of this landscape character area relevant to the study area are as follows.

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- Owing to its poor drainage, traditional land cover has consisted of grazed wet meadows with willow pollards lining streams and drainage ditches.
- Isolated hills form distinct focal features with woodland cover on their brows and tend to be surrounded by mixed farming and military development which sprawls across the landscape to the east of the area surrounding Bicester.
- 11.4.10 The Site lies within Landscape Character Type R5a Isolated Hills with Woodland and Mixed Uses. The main characteristics of this landscape type are as follows.
  - Distinct topography which rises up to 50m above the surrounding flat floodplains.
  - The brows of the hills are wooded, with farmed slopes below.
  - Land at the foot of the hills is mainly used by the MoD and is characterised by depots, warehouses, security fences and goods yards.
  - Graven Hill and Arncott Hill are visible for considerable distances across the plain, forming prominent and curious focal points within an otherwise flat and uneventful landscape.
- 11.4.11 Landscape Character Types are illustrated on Figure 11.1.

### Landscape elements and features

- 11.4.12 The Graven Hill Site conforms to the characteristics of the Otmoor LCA and the Isolated Hills and Mixed Uses Landscape Character Type described above. The Site is approximately 207ha in size and comprises a mix of land uses (see Figure 1.2). These are principally defined by their relationship to the Graven Hill landform i.e. the existing development encircles the lower slopes of the Hill.
- 11.4.13 The currently operational MOD land is defined by perimeter security fencing plus further internal security fencing separating different parts of the Site, with gated access. The landscape is typical of functional military sites, with large, dispersed, buildings mainly used for storage and distribution of material. St David's Barracks, situated within Graven Hill (but outside the planning application boundary) on the south side of the Hill, is more intensively developed and distinct in featuring more recent, three storey development for soldiers' accommodation.
- 11.4.14 The open spaces within the Site itself typically consist of large areas of amenity grassland with individual trees. However, there are areas of pastoral fields (mainly in the northern part of the Site) and large areas of semi-natural woodland, plantation woodland, scrub and hedgerows, the latter mainly associated with the periphery of the Site. The lower, outer areas of the Site also include a number of small ponds and drainage ditches with associated vegetation.
- 11.4.15 The Graven Hill woodland occupies the heart of the Site and is surrounded mainly by agricultural fields (both pastoral and arable) that occupy the upper slopes of the Hill. St David's Barracks forms a noticeable break in the agricultural land use surrounding







the hilltop. The centrally located Graven Hill woodland and adjacent pastoral fields form around 36% (c. 74ha) of the Site.

- 11.4.16 The Site and adjacent barracks are served by a main access road that circles the Hill, off which secondary roads provide access to specific buildings. The Site is also served by rail. Neither is of particular significance in the context of the wider landscape although both are evident locally; as is the BIFT.
- 11.4.17 The tree surveys identify that the woodland and tree cover is predominantly in good condition. The majority of woodland within the Site is Category 'B'. The woodland covering Graven Hill itself is Category 'A' and an Ancient Semi-Natural Woodland (ASNW). The Tree Survey results for individual trees associated with hedgerows, roads and open spaces show a wide mixture of 'A', 'B' and 'C' Categories (see BIC/OPA/DOC/19 and 20).

#### Landscape condition and capacity

- 11.4.18 Cherwell Landscape Assessment (CDC, 1995) has identified strategies for 'landscape intervention' to restore, conserve and enhance the landscape. The strategy for the Graven Hill Isolated Hills with Woodland and Mixed Uses landscape character type, is one of 'restoration'. This applies to a landscape that has been identified as: "quite seriously degraded, although do retain some discernible remnants of their former character... lost its rural character and become visually degraded, in some instances as a result of intrusive built development, around the urban fringes or along transport corridors".
- 11.4.19 The Graven Hill Site has largely lost its rural character as a result of the introduction of MOD development across the majority of the Site. However, the central and northern parts retain some rural character due to the presence of agricultural fields and the Graven Hill woodland.
- 11.4.20 The Cherwell Landscape Assessment identifies these landscapes as having "greater capacity to accommodate positive change because their former character has already been so substantially weakened". The Assessment notes that positive intervention should concentrate on strengthening the landscape framework in order to improve landscape quality and create a stronger sense of place, ensuring "new development is well sited and sensitively designed so it does not worsen the existing problems of poorly integrated, intrusive development". The following interventions are noted in the Cherwell Assessment.
  - *Replanting hedgerows and hedgerow trees, together with gapping up.*
  - Woodland planting, in a form appropriate to (their) character area, with larger woodland belts with smaller copses (using indigenous species).
  - Existing development should be contained within a strong distinctive landscape framework tightening up the landscape structure along road corridors and around urban fringes.





- New development should be integrated within a strong landscape framework which should be based on features found within the relevant character area and should respect long views over open countryside.
- 11.4.21 The desk and field studies completed for this assessment concur with that evaluation, concluding that the upper parts of the Site, consisting of the Graven Hill woodland and upper pastoral fields, are more sensitive to development than the less elevated parts of the Site. The woodland forms a distinct focal point, which is a key characteristic of the Otmoor Lowlands LCA and is evident over a wide area within the surrounding landscape. Furthermore, the woodland is itself sensitive, being classified as Ancient Semi-Natural Woodland (ASNW) and surveyed during preparation of the development proposals as a Category 'A' tree group. The area formed by the upper pastoral fields and Graven Hill woodland therefore has limited capacity to assimilate development.

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- 11.4.22 In comparison, the lower parts of the Site are already developed, with large storage buildings and storage activities, which whilst typically less visible than the upper slopes, detract from the prevailing landscape character of the area.
- 11.4.23 As noted above, there are a number of landscape elements and features within the Site that are considered to be of value including the Graven Hill ASNW, other woodland plantations, individual trees and ponds.

#### Landscape designations

- 11.4.24 There are no landscape designations within the Site. The closest landscape designation is an Area of High Landscape Value located 4km to the south-east of the Site (refer Figure 11.2).
- 11.4.25 Baseline descriptions and the assessment of effects related to other relevant designations such as Listed Buildings and Scheduled Monuments are reported within the Historic Environment chapter (Chapter 10).

#### Night-time lighting: landscape baseline

11.4.26 The night-time character of the Site and its surrounding landscape is dominated by the heavily lit roads around Bicester. In addition, the existing BIFT, at the north of the Site adjacent to the A41, is illuminated during hours of darkness. Whilst there is a considerable amount of spillage and night-time glare, primarily from the illuminated roads and urban area of Bicester, the silhouette of Graven Hill itself is visible at night and any lighting associated with Graven Hill is viewed in the context of Bicester.

### Graven Hill: visual baseline

#### Overall visual context and extent of visibility

11.4.27 The approximate visual envelope i.e. the extent of the area from within which the, proposed development at Graven Hill, or parts thereof, may be viewed, is illustrated on Figure 11.3, which also shows the locations of photographic viewpoints (1-26), representing the nature and extent of typical views towards the Site (these are illustrated on Figures 11.4 to 11.19).

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- 11.4.28 Figure 11.3 indicates the 'visual envelope' from where views may be experienced of the proposed development. However, this only provides an indication of the potential rather than actual extent of visibility based on site visits and mapping information. Due to topographical variation and the presence of intervening vegetation there are likely to be many areas within the visual envelope that will not experience views of the proposed development. Beyond the identified visual envelope and study area, views may include the Site, although from these areas only the upper parts of the Graven Hill woodland will be discernable and any change barely perceptible.
- 11.4.29 It is estimated that, in clear conditions, potential visibility to the Site will extend up to approximately 3.5km to the north-west and north-east, 2km to the east, 6.5km to the south-east, 3km to the south and 2.5km to the west.
- 11.4.30 The extent of visibility for the upper and lower parts of the Site differs. Views of the lower and peripheral parts of the Site (comprising the existing MOD operational areas) are predominantly restricted to those within close proximity. This is due to the relatively flat nature of the surrounding landscape and the high presence of mature hedgerows (and hedgerow trees), woodland and roadside corridor planting to the west, south and east of the Site that together form screening layers of vegetation. Vegetation located within the Site, notably woodland and tree and shrub belts on the periphery, also reduces the visibility of the existing development located within the lower parts of the Site.
- 11.4.31 Views of the upper parts of the Site (predominantly the wooded hill top and pastoral fields as well as some upper parts of larger MOD buildings) are available from further a field. The furthest vantage points within the surrounding landscape typically occur at the higher elevations provided by the isolated hills referred to above.
- 11.4.32 The Site as a whole is not visible from one single vantage point due to the higher, central site area. The areas of woodland, tree and shrub belts close to the Site boundary have an important role in screening views of the lower parts of the Site and there are few open boundaries. Due to the flat nature of the lower part of the Site and the high incidence of mature hedgerows and hedgerow trees, woodlands, tree belts and roadside corridor vegetation, the visibility of the lower parts of the Site reduces significantly with distance away from the Site.
- 11.4.33 Vegetation associated with the local road network and rural landscape also screens and filters views into the Site. This typically includes dense and mature hedgerows with trees (associated with field boundaries, stream corridors and local lanes), small woodland blocks and thick roadside corridor planting. Within the generally flat landscape surrounding the Site these combine to restrict the availability of views from large parts of the study area. Where vegetation is absent and large scale agricultural fields predominate, notably to the south of the Site, views to the Site are more freely available.

#### Summary of receptors and viewing distance

11.4.34 For the assessment of visual effects the following groups of receptors have been identified.

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- 11.4.35 Receptors with close views (less than 0.75km distance from the Site) comprise:
  - residential receptors including Langford Park Farm, Langford Village, isolated farms (to the south-east of Langford Village), Wretchwick Farm (and adjacent properties), western parts of Ambrosden, Home Farm, Langford and the Promised Land Farm;
  - users of a local Public Rights of Way (to the north-east and south-west);
  - users of St David's Barracks; and
  - users of the local road and rail network.
- 11.4.36 Close distance views are represented in Photographic Viewpoints 1, 3, 5, 8, 9, 17, 18 and 22.
- 11.4.37 Receptors with middle distance views (0.75 to 1.5km distance from the Site) comprise:
  - residential receptors including isolated properties near Blackthorn Hill and Merton Road (including Astley Bridge Cottage and Farm and Merton Grounds), also isolated residential properties to the east of Wendlebury, residents of Bicester and Langford Village;
  - users of PRoWs near Blackthorn Hill, Merton Road and east of Wendlebury; and
  - users of the local road and rail network.
- 11.4.38 Middle distance views are represented in Photographic Viewpoints 14, 17, 19 and 26.
- 11.4.39 Due to the elevated nature of parts of the Site long distance views are possible from a wide area. Receptors with long distance views (greater than 1.5km distance from the Site) comprise:
  - residential receptors including those within Bicester, near Poundon Hill and Bucknell, at Upper Arncott, Merton, and Charlton-on-Otmoor, and users of the local road network (including the M40);
  - users of PRoWs near Poundon Hill, Bucknell, south of Launton, Arncott Hill and Muswell Hill; and
  - users of the surrounding road network including the M40.
- 11.4.40 Long distance views are represented in Photographic Viewpoints 7, 10, 11, 12, 13, 15, 16, 20, 21, 23, 24 and 25.

#### Night-time lighting: visual baseline

11.4.41 Existing lighting within the Site is located both along roads and on the exteriors of buildings. The storage area adjacent to the A41 includes tall floodlights which give off a bold, crisp white light which is not characteristic within the softer glow of the street lighting associated with Bicester. The northern part of the Site is partially lit by street lighting, including the two entrance points from the A41. The southern and





eastern parts of the Site are relatively unlit with a small cluster of street lights towards the eastern edge. The south-western part of the Site where the rail sidings are located is unlit, however the barracks located adjacent to this are heavily lit and very visible at night.

#### Graven Hill: Predicted future baseline

11.4.42 The following proposed developments will potentially affect the landscape character of the Otmoor Lowlands area, resulting in the loss of agricultural land and landscape features; some further weakening of landscape patterns and the extension of urban land uses within the area.

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- Land to the South and East of the A41.
- Kingsmere/Bicester South West (Land At Whitelands Farm).
- · Evergreen 3 Oxford Bicester Rail link improvements and re-alignment of Langford Lane across land south of the Graven Hill Site.
- 11.4.43 Further description of the above is provided at Chapter 4, Section 4.5. People in the surrounding area will potentially experience changes to their views and there will be cumulative effects on landscape character as a result of combined views of the proposed development at Graven Hill and the developments noted above, during both construction and operation.

#### 11.5 C Site: Overall baseline

### C Site landscape baseline

#### Site location and landscape context

- 11.5.1 C Site is located on level or only gently sloping land at the foot of Arncott Hill, adjacent to Arncott Village. The Site is developed throughout, with dispersed, large scale storage buildings. C Site mainly falls within the 'Isolated Hills with Woodland and Mixed' uses Landscape Character Type also applicable to the Graven Hill Site (refer Figure 11.1).
- 11.5.2 The Site's overall context is broadly split between the generally open, low lying arable land to the north and west, and the Site's immediate east where Arncott Hill and its associated wooded areas, provides a greater sense of enclosure, reinforced by the presence of the village. The village itself includes older and more characterful buildings including the listed properties on Ploughley Road (Manor Farm and Wood Farm Cottage) plus two further properties on Green Lane (Miropa and the now disused methodist chapel), but also significant areas of more recent development. This includes an expansion of the village up towards Arncott Hill to the east, more recent infill and new housing at Orchard Close to the east of the Site off Murcott Road.





11.5.3 The Site forms one part of the extensive MOD Bicester landholding in the immediate vicinity of Arncott village. The presence of existing, large, MOD storage buildings within the perimeter security wire that surrounds the Site, alongside other MOD property around the village is a notable influence on local landscape character.

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11.5.4 The Site forms one element of the backdrop also provided by Arncott Hill and Arncott Village to the open landscape further east and south. In this context, and in common with other, similar military developments at Graven Hill, the existing buildings and structures on site are somewhat intrusive, but established features in the landscape.

#### Land use

11.5.5 Surrounding land uses fall broadly into three types. The predominantly residential settlement of Arncott lies immediately adjacent to C Site, also having adjacency with currently vacant military buildings that lie to the east side of Norris Road and to military land on its east side, coinciding with Arncott Hill itself. The remainder of the surroundings (with the exception of the linear village development following Ploughley Road in a north-west direction) consist of open agricultural land. This extends due west until Merton village is reached and is dissected by the M40, which at its closest point is around 1.2km to the south. Immediately south and adjacent to the Site an area of rough ground is used for off road motor sports. Together with the disused military land in the vicinity this detracts from the local landscape setting.

#### Topography

11.5.6 The landform of the Site is predominantly level or only gently sloping, at approximately 62m to 70m AOD. This reflects the wider topography associated with the River Ray floodplain and its tributaries. In contrast, the Arncott Hill landform rises steadily to 108m AOD to the south-east, one of the series of isolated hills (Graven Hill, Poundon Hill, and Muswell Hill) that rise above the surrounding landscape.

#### Landscape Character Areas

11.5.7 The national and local context of C Site is broadly similar to that of the Graven Hill Site in respect of the surrounding landscape character. C Site falls within a similarly identified Isolated Hills with Woodland and Mixed Uses landscape type. As previously detailed at paragraphs 11.4.8 to 11.4.10.

#### Landscape elements and features

- 11.5.8 C Site conforms to the characteristics of the Otmoor LCA and the Isolated Hills and Mixed Uses Landscape Character Type described above. The Site is approximately 83ha in size and comprises of a series of dispersed, utilitarian warehouse buildings served by a dedicated rail link, with associated external storage and service areas. The Site is defined by its perimeter security fence and is immediately evident on the Murcott Road approach to Arncott Village from the south, though less evident from the north until the Site's main gate is reached.
- 11.5.9 Within the Site, the warehouse buildings form the main features, although the water storage tower in the north of the Site is particularly evident. Vegetation within the

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Site is mainly confined to the perimeter areas and serves to help assimilate development with the wider surroundings. However, the Site also includes a number of individual trees along roadsides. On-site vegetation contributes to the 'softening' of the effects of existing MOD development in the locality. However, many parts of existing development, including the water tower in the north of the Site and the rooflines of a number of buildings, are evident in the wider context.

11.5.10 The tree survey noted that arboricultural management of the Site appears to have been limited to individual specimens predominantly along the central road network and located close to the entrances to the main buildings on Site. The vast majority of individual trees growing across the Site are young deciduous species providing only limited landscape value. A small proportion of dead specimens were also noted across the Site. The larger blocks of woodland and hedgerows have been classified as Category B and hence worthy of retention.

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#### Landscape condition and capacity

- 11.5.11 As previously noted (refer paragraph 11.4.18), Cherwell Landscape Assessment (CDC 1995) has identified strategies for 'landscape intervention' to restore, conserve and enhance the landscape. The strategy for the Isolated Woodland Hills and Mixed Uses Landscape Type landscape type within which C Site falls is 'restoration'.
- 11.5.12 The military land use in close proximity to Arncott Village detracts from the landscape setting and though partially screened in the north, C Site is particularly evident around the main gate area, and further south from the village approach, contributing to this influence.
- 11.5.13 A number of positive interventions are applicable to the Isolated Woodland Hills and Mixed Uses Landscape Type area identified in the Cherwell Landscape Assessment including hedgerow, tree and woodland planting, and the provision of a strong and distinctive landscape framework for existing and new developments, with consideration to long views over open countryside (refer paragraph 11.4.20).
- 11.5.14 The desk and field studies completed for the C Site assessment concur with the evaluation produced by CDC. In terms of landscape restoration, some limited on-site measures will be appropriate in order to compensate for the future, progressive loss of the poorer condition tree cover, to reinforce perimeter screening and improve the aspect to the village.
- 11.5.15 Within the wider landscape setting, there is a clear boundary between the character of the Site (within the Isolated Woodland Hills and Mixed Uses Landscape Type) and the open landscape types to the west and south, from where the upper part of Arncott Hill and associated woodland is evident as a prominent feature. In this respect C Site has some similarity with Graven Hill, in that it corresponds to the lower, least sensitive parts of the character type.

#### Landscape designations

11.5.16 C Site does not fall within any landscape designations, the nearest being the Area of High Landscape Value situated, at its closest, approximately 1.5km to the south-east.

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11.5.17 Baseline descriptions and the assessment of effects related to other designations relevant to C Site such as Listed Buildings and Scheduled Monuments are assessed within the Historic Environment chapter (refer Chapter 10).

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#### Night-time lighting: landscape baseline

11.5.18 C Site is located within a rural setting and during darkness the landscape is predominantly unlit with only small groups of lighting found within the villages surrounding Bicester. This quiet, relatively tranquil setting contributes to the landscape character within which C Site is located. Though the landscape is predominantly dark, the silhouette of Arncott Hill is still identifiable as a contributor to the prevailing landscape character.

#### C Site: Visual baseline

#### Overall visual context and extent of visibility

- 11.5.19 The approximate visual envelope surrounding C Site is illustrated on Figure 11.20, which also shows the locations of photographic viewpoints (these are illustrated on Figures 11.21 to 11.31).
- 11.5.20 In clear conditions, the extent of potential visibility to the Site is estimated to be approximately 3.5km to the north-west. To the west/south-west, the relatively level topography suggests a similarly extensive visual envelope, although planting alongside the M40 motorway, along with local topographic variations generally limits views to those within the area to the north of the motorway.
- 11.5.21 Visibility to the Site from the north is limited by the presence of perimeter tree planting and generally there are only glimpses towards the Site from between properties on Ploughley Road. Occasional views may therefore be available from PRoWs crossing the fields between Lower Arncott and Blackthorp.
- 11.5.22 To the east, Arncott Hill, and its wooded areas limit the availability of views to the Site, although the southern part of the Site is evident further east on the higher ground at Muswell Hill. At a distance of nearly 4km however, the effect of any change to views will be slight.
- 11.5.23 The large areas of woodland and scrub located on the northern, western and southern edges of the Site are influential in restricting views into the Site.
- 11.5.24 Vegetation associated with the local road network and rural landscape also screens and filters views into the Site. This typically includes dense and mature hedgerows with trees, associated with field boundaries and local lanes. These combine to restrict views from large parts of the study area. More open views into the Site are available across the River Ray floodplain where agricultural fields are typically large and hedgerow cover is thinning and low cut. Where vegetation is absent, notably due to the large scale of agricultural fields, then views towards the Site are more freely available. Views to the Site from Arncott Hill beyond the village boundary are not considered further as these fall within land under military ownership and are not publicly accessible.

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#### Summary of receptors and viewing distance

11.5.25 For the assessment of visual effects related to C Site, the following groups of receptors have been identified:

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- 11.5.26 Receptors with close views (less than 0.75km distance from the Site) comprise the following:
  - Residential receptors at Arncott, adjoining the Site (located along Green Lane, Norris Road and Ploughley Road) who have views directly into the Site of buildings and associated infrastructure (road, rail, hard standing, storage areas, etc.).
  - Residential receptors within the village on Murcott Road with views to the Site across foreground public open space, from which existing development is evident beyond foreground vegetation that provides a partial screen.
  - Residential receptors within Arncott, likely to have views to the Site between foreground buildings and garden vegetation, primarily from upper storeys in the vicinity of Hopcroft Close, Teal Close, Orchard Close and properties south and west of Arncott Village Hall; but also from upper parts of the village off Buchanan Road and Mill Lane.
  - Users of PRoW to the west and south-west of the Site, with views across open agricultural fields of the large scale buildings within the Site, viewed above or filtered through vegetation (woodland and scrub) located on the periphery of the Site.
  - Users of the open space in the vicinity of Arncott Village Hall (off Murcott Road), with views of the upper parts of existing development on C Site viewed above vegetation on the Site periphery.
  - Users of the village green (off Green Lane) with views of the upper parts of existing development on C Site between houses in the village.
  - Users of local roads (notably Ploughley Road, Norris Road, Green Lane, Harper Close, Greenfields, Murcott Road and roads within the elevated parts of Upper Arncott aligned towards the Site) experience a variety of views of buildings and infrastructure located within the Site.
- 11.5.27 Close distance views are represented in Photographic Viewpoints 2,3,4,5,7,8,9, 11 and 12. (Figures 11.5 to 11.10).
- 11.5.28 Receptors with middle distance views (0.75 to 1.5km distance from the Site) comprise the following.
  - Residents within the southern part of Ambrosden (associated with Akeman Avenue) will potentially have views of the upper parts of development within the Site from upper floors or where there are gaps within the adjoining roadside hedgerow. The Site and buildings are viewed against the backdrop of Arncott Hill. Intervening built form within Ambrosden itself prevents views of the Site from the remaining parts of the village.

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- Astley Bridge Farm, near Merton Road with views of the upper parts of existing buildings and infrastructure on site, seen against the backdrop of Arncott Hill.
- Users of the PRoWs leading to Merton Road.
- Motorists travelling on Murcott Road, as it passes over the M40.
- 11.5.29 Middle distance views are represented in Photographic Viewpoints 1, 10 and 13 (Figures 11.4, 11.9 and 11.11).
- 11.5.30 Receptors with long distance views (greater than 1.5km distance from the Site) comprise the following.
  - Astley Bridge Farm Cottage, near Merton Road with views of the upper parts of existing buildings and infrastructure on site, seen against the backdrop of Arncott Hill.
  - Residential receptors on the eastern edge of Merton Village, with long views, primarily to the south part of the Site.
  - Users of the bridleway on Muswell Hill, from where clear views of large scale buildings located within to the south of C Site occur.
  - Recreational users of Merton Community Wood.
  - Motorists travelling on Merton Road
- 11.5.31 Long distance views are represented in Photographic Viewpoint 6 (Figure 11.7).

#### Night-time visual baseline

- 11.5.32 Currently, the only source of night-time lighting on site comprises occasional street lighting with building lighting located sporadically through the Site. The lighting within the Site is predominantly low pressure sodium lamps which gives a soft, yellow glow and is in keeping with other street lighting located along the roads through Arncott surrounding the Site.
- 11.5.33 C Site is located within a rural setting on the edge of Arncott village. This rural landscape is predominantly dark with clusters of lighting within the small residential settlements with Bicester settlement become more prominent to the north.

#### C Site: predicted future baseline

11.5.34 Planning approval has been obtained for a new Immigration Centre adjacent to A Site. This comprises demolition of existing buildings and erection of an Immigration Removal Centre including an Accommodation Building (seven wings plus a Central Facilities Block) a Gate House, Visitor Centre and Energy Centre, car parking, access road, 5.2m fence and ancillary hard standing and landscaping (CDC planning ref. 08/02511/F). Should this development proceed, it will potentially affect the landscape character of the Otmoor Lowlands. However, the location of the Site is to the east of Arncott Hill and therefore separated from C Site in terms of other potential cumulative effects.





#### Cumulative views of C Site and Graven Hill

- 11.5.35 Concurrent views of both sites are confined to receptors located within elevated areas of the surrounding landscape or locations between the Sites in the absence of intervening vegetation. From elevated locations both sites are visible although one site is typically viewed within the background from the other and barely perceptible (refer to Photographic Viewpoints 13, 11, 20, 21, 25 and 7). There are few locations where both sites are clearly visible and these are restricted to a limited range of receptors using Merton Road and nearby public bridleways.
- 11.5.36 Users of Merton Road will experience glimpsed and oblique views across agricultural fields of both the Graven Hill Site on one side and C Site on the other. The wooded hilltop and upper pastoral fields of Graven Hill are visible as are the upper parts of large storage buildings located within the southern part of the Site. However, existing woodland and scrub along the southern part of the Site screens the majority of the buildings in this area. Large storage buildings and the water tower within C Site are visible across open, flat agricultural fields and are viewed above, and lightly filtered through, intervening vegetation.
- 11.5.37 Users of the public bridleway to the west of Arncott experience oblique and long distance views across the agricultural landscape towards Graven Hill; viewed above a low cut hedgerow. Within these views Graven Hill forms a focal point, with its wooded brow and upper pastoral fields. The large storage buildings located within the eastern part of the Graven Hill Site also form noticeable elements due to their light colour. From the bridleway, oblique views are also available to the upper parts of buildings located within C Site.

# 11.6 Environmental measures incorporated into the proposed development

#### **Demolition and construction measures**

11.6.1 The environmental measures that have been incorporated into the proposed development in relation to demolition and construction work at both sites, which are relevant to the assessment of landscape and visual effects, are set out in Table 11.3. Information on how these measures will be implemented is also provided in Table 3.3 in Chapter 3.

## Table 11.3 Rationale for incorporation of environmental measures: demolition and construction (both sites)

Potential receptors	Potential changes and effects		Incorporated measure
Sensitive visual receptors with potential views of one or both sites	Introduction elements as construction of the Site	of temporary activities and sociated with demolition and resulting in a change in views	Selective and sensitive location of the contractors' compound(s), security fencing and temporary storage of materials and plant.
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Potential receptors	Potential changes and effects	Incorporated measure
		Implementation and monitoring of site management procedures including the regular removal of any construction related litter from the immediate environment.
Sensitive visual receptors along proposed access routes to each site	Visual changes from presence of construction machinery and vehicles accessing each site	Use of designated routes around each site for construction vehicles and plant
Trees and vegetation within each site	Potential damage and loss from construction and demolition activities	The contractor will be required to work in accordance with 'BS 5837:2005 Trees in relation to construction' in order to protect trees and vegetation.
Sensitive visual receptors with potential views of one or both sites	Disturbance during night-time hours from increased lighting within each site	Measures to minimise the visual effects of temporary lighting during the construction period, including directing lighting to construction activity and materials storage areas in a way that avoids unnecessary glare for nearby receptors.
Sensitive visual receptors with potential views of one or both sites	Temporary changes in views due to presence of machinery such as cranes needed to demolish buildings	Measures will consider ways of minimising the duration of works to the upper, more visually exposed parts of buildings during demolitions and redevelopment and manage use of cranes.

#### **Design measures**

11.6.2 Tables 11.4 and 11.5, below, summarise the environmental measures incorporated in the proposed development design at Graven Hill and at C Site respectively. Information on how these measures will be implemented is also provided in Table 3.3 in Chapter 3.

	Table 11.4	Graven Hill: Rationale for incorporation of environmental mea	sures
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Potential receptors	Potential changes and effects	Incorporated measure	
Landscape Character	The introduction of new development towards the summit of Graven Hill, leading to the erosion of Graven Hill as a landscape feature and its role as a focal point in the surrounding landscape, resulting in negative effects on the landscape character.	The landscape strategy restricts new development on the hillside, retaining the wooded brow and adjacent open fields that characterise this landscape feature. In combination with selective positioning of new development, building heights in the 'upper area' has been restricted to a maximum of 2 storeys.	
	Loss of vegetation contributing to the prevailing landscape patterns evident in the area, including woodland and hedgerows on lower parts of the Site and along its perimeter; resulting in negative effects on landscape character.	The majority of woodland on site is retained and where this is not possible, or vegetation is judged to be in a condition that requires its replacement. The landscape strategy incorporates new planting proposals. This is both to compensate for any loss of vegetation but also to re-enforce the setting for new development.	

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Potential receptors	Potential changes and effects	Incorporated measure	
	The introduction of changes in drainage regime resulting in indirect effects on vegetation patterns.	The landscape strategy for the Site incorporates a sustainable drainage system designed to incorporate, where possible, the existing system of surface water drainage and associated vegetation.	
Visual receptors	Changes to long distance views that include the upper levels of Graven Hill, resulting in negative visual effects.	Restrictions on hillside development (as described above) has been incorporated to enable views of the Graven Hill wooded brow and adjacent pastoral land to be retained.	
	Negative effects arising from changes in close and middle distance views due to new development and associated infrastructure, resulting in negative visual effects (primarily experienced from nearby properties and PRoWs but also including middle distance views such as those from the periphery of Ambrosden).	The landscape strategy includes the retention of perimeter vegetation where this assists in visual screening. Perimeter 'buffer' zones are also incorporated in the masterplan, of sufficient width to enable detailed landscaped design including ground modelling and planting to address sight lines.	

#### Table 11.5 C Site: Rationale for incorporation of environmental measures

Potential receptors	Potential changes and effects	Incorporated measure		
Landscape Character	The introduction of a net increase in floor area of c. 32,500m <sup>2</sup> , replacing existing warehouses with a single new building in proximity to Arncott Hill, resulting in negative effects on the surrounding, predominantly rural landscape character.	The Design and Access Statement describing the new development indicates, in outline, potential means of reducing the apparent scale and mass of the new warehouse through the sensitive treatment of its external facades. This can include the use of gradation of colour to external cladding to upper levels of the building and the use of non reflective materials. Peripheral areas of the Site will also be subject to additional landscape planting to soften the effects of new development.		
	The introduction of replacement lighting to working areas in the north of the Site results in negative effects due to an increase in night-time sky glow.	Lighting will be designed to minimise the effects of sky glow and resultant effects on the setting of the Site.		
Residential visual receptors within Arncott	Removal of boundary fencing, buildings, rail and road infrastructure and hard standings within close distance of residents leading to potentially significant negative effects during construction.	The application of a considerate contractors' scheme and introducing measures to reduce visual intrusion caused by construction activities on adjoining residents.		
Residential visual receptors within Arncott	Introduction of new large scale built form in the north of the Site, leading to visual intrusion and potentially significant negative effects during operation.	The building footprint and floor slab level has been positioned to limit visual intrusion, within the constraints presented by its operational requirements. The building has been located sufficiently distant from residential properties to enable the inclusion of a landscape buffer zone adjacent to the properties (comprising an earth bund and structural planting). The buffer zone is		

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Potential receptors	Potential changes and effects	Incorporated measure
		wide enough to enable a significant band of planting to be introduced, to filter and screen views of the new building from residents once matured.
		Existing site levels fall slightly towards the north/west. Detail design can exploit this level change, using cut and fill to lower the apparent height of the building in views from nearby residential properties.
Other receptors: residential properties, recreational receptors using PRoWs and other publicly accessible land to the south and west	Visual intrusion due to the introduction of new development resulting in potentially negative effects.	The masterplan incorporates new landscape planting to re-enforce the screening effect of existing planting along the western periphery of the Site. In addition detail design of the new warehouse is anticipated to incorporate recessive colours and non reflective surface finishes.

#### Scope of the assessment 11.7

#### Potential receptors

- 11.7.1 Through a combination of desk and field studies the approximate visual envelope surrounding the proposed development was determined (i.e. the approximate area from within which views might occur). Further field studies were then carried out to more accurately identify potential receptors, taking account of existing landscape character and the influence of topography and existing vegetation on views towards the Sites.
- 11.7.2 The proposed scope of the Landscape and Visual Assessment for each site was set out in the EIA Scoping Report (DIO, 2011), which was issued to consultees for comment. Reponses in relation to the EIA Scoping Report (DIO, 2011) are provided in Appendix B. Locations for proposed photographic viewpoint locations and photomontage viewpoints vocations were submitted to CDC for comment. No comment was received at the time of this assessment.

### Potentially significant effects

- 11.7.3 The potentially significant effects relating to the proposed development that are subject to further assessment in this chapter are summarised below.
  - Potential landscape effects associated with the loss of landscape elements within • both sites.
  - Potential effects on the landscape character of the Otmoor Lowlands Landscape Character Area (demolition, construction and operation/occupation phases at both sites).
  - Potential effects on the Area of High Landscape Value Landscape (refer Figure 11.2) (demolition, construction and operation/occupation phases at both sites).

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- Potential effects on visual receptors located within the Visual Envelope for both sites (refer Figure 11.3) associated with the construction and operation/occupation phases).
- Potential cumulative effects on the landscape and visual receptors, taking account of other proposed developments.
- 11.7.4 For the reasons set out below, the following potential effects are not likely to be significant and are therefore not considered further in this ES.

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- *Landscape character areas at a national level:* the Upper Thames Clay Vales subcharacter area Wiltshire, Oxfordshire and Buckinghamshire Vales (within which C Site is located) is not considered further. This is because the area will not be subject to significant effects related to the proposed development, due to its geographic extent in relation to the scale of change proposed.
- *Effects beyond the identified Visual Envelope:* distances are such that the development proposals will be barely perceptible and any effects are therefore scoped out of the assessment.
- Potential cumulative effects on the landscape and visual receptors associated with the Immigration Centre adjacent to A Site: these are scoped out due to the lack of visual relationship between this site and the proposed development Sites.

# 11.8 Assessment methodology

#### Methodology for the prediction of effects

- 11.8.1 The methodology used for this Landscape and Visual Assessment is based on the GLVIA. This is widely regarded by the landscape profession as the 'industry standard'. The assessment distinguishes between landscape and visual effects, which are discussed in separate sections of this chapter. The landscape and visual assessment covers both the construction and operation stages of the development (including the effectiveness of measures incorporated into the proposed development to mitigate effects).
- 11.8.2 In summary, the approach involves categorisation of landscape and visual 'receptors' based on sensitivity to change. The type of effect (negative, neutral or positive temporary or permanent direct or indirect) caused by the introduction of new development is identified. The magnitude of any change is also assessed and recorded, by reference for example, to extent of land take or visual intrusion.
- 11.8.3 The 'Magnitude of Change' and 'Sensitivity' of landscape resource (or visual receptor) is combined in order to judge the predicted level of effect. The predicted landscape (or visual) effect is reported using seven descriptions ranging from 'substantial' to 'negligible'. Determining the 'threshold' at which an effect is potentially significant requires the application of systematic, consistent, professional judgement.

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11.8.4 The assessment has also been informed by the use of photomontages, which are designed to assist the assessor and reader of the ES in visualising the proposals.

#### Photography and photomontages: Graven Hill

- 11.8.5 Graven Hill photomontage locations are indicated on Figure 11.3 and illustrated on Figures 11.32 to 11.40. The photomontages illustrate the effect on views of structural planting carried out in 2015. Due to the phasing of development, the photomontages show the proposed development at the following stages.
  - Photomontage Viewpoints 5 and 9 and 23: the current baseline situation (Figures 11.32, 11.35 and 11.38).
  - Photomontage Viewpoints 5 and 9: 0 years at completion of residential phase 2 in 2022, with structural landscaping (trees approximately six years growth planted Nov 2015 to Mar 2026 approximately 2m-5m height) (Figures 11.33 and 11.36).
  - Photomontage Viewpoint 23: 0 years at completion of residential Phase 3 in 2028 with structural landscaping (trees approximately 12 years' growth approximately 8-10m height) (Figure 11.39).
  - Photomontage Viewpoints 5 and 9 and 23: 15 years Post-planting 2031 (trees at approximately 15 years of growth planted Nov 2015 to Mar 2026 approximately 12 -20m height) (Figures 11.34, 11.37 and 11.40).
- 11.8.6 C Site photomontage locations are indicated on Figure 11.20 and illustrated on Figures 11.41 to 11.46. The photomontages illustrate the effect of on views of structural planting carried out in 2015.
- 11.8.7 The photomontages for C Site show the proposed development at the following stages.
  - Photomontage Viewpoints 7 and 12: the current baseline situation (Figures 11.41 and 11.44).
  - Photomontage Viewpoints 7 and 12: 0 years i.e. at completion of the proposed development towards the end of 2014 with structural landscaping (trees and shrubs at time of planting approximately 400-600mm height) (Figures 11.42 and 11.45).
  - Photomontage Viewpoints 7 and 12: 15 years Post-Completion (trees at approximately 8-12m height) (Figures 11.43 and 11.46).
- 11.8.8 The above viewpoints are referenced, where appropriate, to visual receptors within the evaluation tables at Appendix I. The photomontages are for the purpose of reviewing the scale and extent of built form and do not seek to present detail of building materials and finishes. The visual assessment, supporting viewpoint photography and photomontages, were carried out in winter when existing and proposed vegetation is subject to leaf loss and the potential for visual effects will be at its greatest.

#### Study area

11.8.9 In each case the extent of the study area was established during field work, when verifying the potential visual envelope, derived initially from desk study.

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#### Significance evaluation methodology

11.8.10 In terms of *The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 SI No. 1824*, significant landscape and visual effects resulting from the proposed development are judged to be those effects likely to result in a 'substantial' or a 'Moderate/Substantial' effect. The remaining effects are considered to be not significant. In determining the threshold for significance the assessment has taken account of the likely sensitivity of visual receptors, the existing baseline landscape resource and inherent landscape capacity within the area to accept the proposed development.

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11.8.11 Full details of the Landscape and Visual assessment methodology are provided within Appendix I.1.

### 11.9 Assessment of landscape effects - Graven Hill

#### Predicted effects and their significance

#### **Demolition and construction phase**

Overview of landscape changes

- 11.9.1 The principal activities during the 13 year construction period (starting 2015 and finishing 2028) that will result in landscape change are summarised below.
  - Removal of vegetation across the 207ha site; it is estimated that up to approximately 3.6ha of woodland, c. 33ha of pastoral land and 1.4km of hedgerows will be affected. This permanent change will be progressive, as each phase of construction is undertaken.
  - There will be a variety of construction plant such as cranes, earth moving equipment and also contractors' compounds, materials storage areas, site security fencing, signage, associated movement of traffic and plant, evident on different parts of the Site during each construction phase.
- 11.9.2 Due to the progressive phasing of new development (see Figure 3.7) the character of those parts of the Site to be developed will become transient and typical of that evident on any large construction site, with plant and vehicle movement and regular changes in the composition of landscape patterns, as land cover is periodically removed, new areas are prepared to receive development and construction of new buildings takes place.
- 11.9.3 Whilst advanced planting of new landscape areas will form part of the landscape strategy, the landscape spaces surrounding development areas will be immature and those parts of the Site retaining a rural landscape character will be temporarily affected. The balance of effects associated with construction will however transfer to those evident after completion of development within the context of a new, maturing landscape setting.

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Evaluation of landscape changes and consequent effects

11.9.4 The evaluation of landscape effects during the demolition and construction stage of the proposed development is detailed at Appendix I.2, Table I2.1.

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- The most sensitive woodland occurs at the summit of Graven Hill and this area is 11.9.5 retained as part of the masterplan. The plantation woodland proposed for removal has been assessed as of medium sensitivity, although still a locally valued resource and characteristic of the Otmoor Lowlands landscape character area and Isolated Hills and Mixed Use landscape character type. The proposed will result in the loss of a small amount of woodland (estimated at less than 5%).
- 11.9.6 The landscape strategy for the proposed development is designed around the retention of landscape features of value, and the retention of existing street trees and avenues. There will be instances where at detailed design some tree loss will be necessary, however this is judged to be limited in landscape terms, given the level of new planting introduced in the masterplan. Prior to detailed design, it is not possible to accurately determine the exact number of individual trees affected but this will require full justification at Reserved Matters stage.
- Whilst the removal of woodland and trees will be negative, the magnitude of change is 11.9.7 predicted to be low and the effect not significant.
- 11.9.8 A part of the pastoral fields within the northern and lower slopes of Graven Hill will be lost to development. Whilst these are considered to be typical of the Otmoor Lowlands LCA and Isolated Hills and Mixed Use landscape character type, they are common throughout the wider area and do not contain elements or features of high value. As such they are assessed to be of low sensitivity. There will be a loss of some pastoral land associated with the Graven Hill landform although woodland will remain surrounded by agricultural land, which is a key characteristic. Whilst the loss of these elements will be negative the magnitude of change is insufficient to change the prevailing character of the Otmoor Lowlands LCA or Isolated Hills and Mixed Uses landscape character type. The effect, therefore, will not be significant.
- 11.9.9 The removal of security fencing, large military buildings and associated external storage areas will generate a high magnitude of change. MOD development is a defined characteristic of the Otmoor Lowlands LCA and Isolated Hills and Mixed Uses landscape character type, identified in the landscape character assessment as being visually degraded with some visually intrusive built form. The features associated with the MOD development are of low value and low sensitivity and effects associated with their removal will be positive.
- 11.9.10 Whilst other large scale buildings do exist throughout the Otmoor Lowlands landscape character area, the removal of military built form will alter a defined characteristic of the Otmoor Lowlands landscape character area and clearly lead to a change in the Isolated Hills and Mixed Use landscape character type. The effect will be positive and significant.
- 11.9.11 There will be a high magnitude of change resulting from the combination of the removal of MOD built form and its replacement with a transient landscape as construction phases are completed. The combined landscape effects of the loss of

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elements/land cover plus the introduction of temporary construction elements and activities, as each phase of development takes place, are assessed overall to be significant and negative.

11.9.12 Effects on the setting and character of the Area of High Landscape Value (located to the south-east see Figure 11.2) will not be significant. Graven Hill is barely perceptible from within the designated area. The magnitude of change will therefore be negligible.

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#### **Operation/occupation phase**

#### *Overview of landscape changes*

- 11.9.13 Permanent land-take and the introduction of built development and associated changes will occur incrementally as each phase of construction is completed, supplanting the landscape changes and consequent effects noted above.
- 11.9.14 The completed development will introduce a new urban character consisting of mixed use development within a new landscape that capitalises on the best of the existing green infrastructure on site. The main landscape change will be associated with the permanent loss of the military development and agricultural land (within the northern part of the Site and on the lower slopes of Graven Hill) and the introduction of a new type and character of built form across the Site (with its associated landscape elements and patterns).
- 11.9.15 The existing landscape character of Otmoor Lowlands and Isolated Hills and Woodland and Mixed Uses landscape character type will change. However, the potential for change to the character of the wider landscape setting beyond the Site will be limited, due to the retention of key areas of vegetation on its periphery. The implementation of new landscape planting within the Site will also result in a net increase in woodland cover across the Site, having a positive effect.

#### Evaluation of landscape changes and consequent effects

- 11.9.16 The evaluation of landscape effects during the operation phase of the proposed development is detailed at Appendix I.2, Table I.2.2.
- 11.9.17 Effects relating to the introduction of new development of a scale and type more typical of the settlements within the character area will lead to a change in one of the key characteristics of the Otmoor Lowlands landscape character area (which describes the presence of MOD development 'sprawling' across the landscape) and a clear change to the Isolated Hills and Mixed Uses landscape character type.
- 11.9.18 As previously noted, the Otmoor Lowlands character area is considered to be of medium sensitivity with existing military development (large scale and distinctive buildings and security fencing) viewed as negative and detracting features of low value and sensitivity. The Isolated Hills and Mixed Uses landscape character type is considered to be of low sensitivity and has been identified as a landscape in need of 'restoration'.

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- 11.9.19 Whilst there will be a loss of c. 33ha of agricultural land, the introduction of a finer grain of landscape pattern and new positive landscape and built elements (housing, trees, woodland and waterbodies) will result in a far more cohesive landscape than that presented by the existing military development. The proposed development will therefore more closely reflect the nearby urban environment but in doing so, retain the characteristic Isolated Hills and Mixed Uses landscape character type associated with the upper slopes of Graven Hill. The effect on both the prevailing character area and character type will therefore be significant and positive.
- 11.9.20 In addition, all of the 27ha of existing semi natural ancient woodland on the upper part of Graven Hill will be retained and tree cover will be further enhanced through a net additional 4.2ha of woodland planting and tree belts and further individual tree planting, as part of the landscape strategy. The net increase in tree cover across the Site will also generate positive effects in line with the strategies identified by CDC for the Isolated Hills and Mixed Uses landscape character type.
- 11.9.21 These changes are over a relatively large area and will result in a high magnitude of change for the Isolated Hills and Mixed Uses landscape character type and medium magnitude of change for the Otmoor Lowlands LCA and as a result effects will be positive and significant.
- 11.9.22 Effects on the character and setting of the Area of High Landscape Value located to the south east have been assessed to be not significant, for similar reasons to those summarised at paragraph 11.9.12.

# Cumulative effects associated with the future development of land to the south and east of the A41

- 11.9.23 Whilst the new business park will result in a negative effect, due to the increase in urban built form around Bicester, it will introduce a land use that is typical of the urban fringe landscape found within the area, close to the Site. This includes Bicester Village, the garden centre, sewage treatment works and main road and rail transport corridors. The proposed development at Graven Hill will result in a change in one of the key characteristics of the Otmoor Lowlands LCA and a clear change in the Isolated Hills and Mixed Uses landscape character type. These effects will be positive as this is already a developed site that has been identified as a landscape in need of restoration.
- 11.9.24 On balance, there will remain a positive effect to landscape character as a result of the cumulative effects of both developments, although these will lead to negligible additional changes to landscape character and as a result effects will not be significant.

#### Cumulative effects associated with Kingsmere/Bicester South West (Land at Whitelands Farm)

11.9.25 The new residential development at Kingsmere will result in an increase in developed land around Bicester and within the Otmoor Lowlands LCA, and loss of an area of low lying arable farmland (to the south of Bicester). As noted above, the Graven Hill development will result in a change in one of the key characteristics of the Otmoor Lowlands LCA and a clear change in the Isolated Hills and Mixed Uses landscape character type. However, these effects in isolation will be positive, as Graven Hill is

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already a developed site that has been identified by CDC as a landscape in need of restoration.

11.9.26 There will be adverse additional changes to landscape character as a result of the Kingsmere/Bicester South West development (an increase in built form and loss of agricultural land) and on balance there will be positive effect to landscape character due to the cumulative effects of both developments. This is because the positive effects associated with the proposed development at Graven Hill are judged to outweigh the negative effects associated with the Kingsmere/Bicester South West development. However, the effect will not be significant.

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#### Cumulative effects associated with the Evergreen 3 Rail Upgrade

11.9.27 Cumulative effects associated with the realignment of Langford Lane will result in a Whilst this will represent an increase in localised change in the landscape. infrastructure evident with the agricultural landscape, it will be similar to roads within the existing area and as such will generate negligible additional changes to landscape character and effects will not be significant.

#### Night-time lighting: Overview of landscape effects

- 11.9.28 The proposed development will introduce additional lighting associated with the proposed residential areas, and improved road system through the eastern and southern parts of the Site. Development will not encroach on the upper area of Graven Hill, retaining the hilltop silhouette, maintaining the influence of the Isolated Hilltops and Mixed Uses character type on the setting at night-time.
- Lighting associated with the proposed development on the lower slopes of the Hill and 11.9.29 on the lowest parts of the Site will alter the landscape character of the area, however this will be viewed in the context of the existing Bicester settlement and the Kingsmere development on the southern outskirts of the town and will appear as an extension of the current Bicester settlement. It is therefore likely that this will not have a significant effect on the night-time landscape character.
- 11.9.30 The lighting scheme will introduce new lighting that will be designed and located to minimise light pollution (glare, 'trespass' and sky glow), which will reduce the potential for significant effects on the character of the landscape at night.

# 11.10 Assessment of landscape effects - C Site

#### Predicted effects and their significance

#### **Construction effects**

Overview of landscape changes

- 11.10.1 The principal activities that will result in landscape change during the c.23 month construction period are summarised below.
  - Removal of a number of individual trees in the north of the Site.

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• Completion of new main gate area improvements, perimeter landscape planting, mounding and surface drainage balancing ponds, early in the construction period.

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- Demolition of existing buildings, to be replaced by the proposed Fulfilment Centre warehouse in the north of the Site.
- Replacement of rail lines and provision of new external hardstanding and lighting.

#### Evaluation of landscape changes and consequent effects

- 11.10.2 The evaluation of landscape effects during the construction stage of the proposed development is detailed at Appendix I.4, Table I.4.1.
- 11.10.3 Landscape elements within the Site that will be lost as a result of the proposed development will be confined to the individual trees and tree groups in the Site's northern area. The magnitude of change will be low and the arboricultural survey indicates that given the prevailing age and condition of the trees, sensitivity is low. The effect will therefore be slight and not significant.
- 11.10.4 Phasing of activity on site will not have a material influence on the nature and extent of change to surrounding landscape character. However, at a very local level, early planting and completion of landscape spaces around the main gate and perimeter areas of the north of the Site will have a positive effect on the village setting. With the exception of some additional planting along the Site's western boundary and improvements to the Site's main gate area, all construction activity will occur within the perimeter security wire.
- 11.10.5 In its northern area, the Site's existing character, which is noted as detracting from its landscape setting, will change quickly as construction activity begins and demolition of existing buildings progresses. The introduction of plant, in particular cranes used for the construction of the new warehouse, will introduce new, but temporary features into the landscape. Other typical construction site elements such as hoarding, signage, lighting and temporary spoil stockpiles will influence character only in the immediate locality. As these changes will be temporary and their disposition within the Site will vary as construction proceeds, the magnitude of change is judged to be low rising to medium as construction nears completion. In the context of the medium sensitivity attributed to the Otmoor Lowlands character area, the effect will be moderate and not significant.
- 11.10.6 C Site corresponds to the lower, least sensitive parts of the Isolated Woodland Hills and Mixed Uses Landscape Type represented by Arncott Hill, which is also identified for 'restoration'. The Site also has a strong influence on the character of the village of Arncott, its functional and utilitarian character detracting from the village environment. In this respect the introduction of new landscape planting to the perimeter areas in the north of the Site will be positive. The magnitude of change will however be low, prior to the new landscape becoming mature, and the effect will not be significant.
- 11.10.7 The Area of High Landscape Value to the south-east (see Figure 11.2) is largely separated by Arncott Hill and at its closest point is some 1.5km to the south-east.

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C Site therefore has limited influence on the character of the Area. The Area is assessed to be of high sensitivity. However, the magnitude of change during construction will be low and therefore any effect not significant.

11.10.8 There will be no change in the south of the Site, where existing MOD development will remain in situ.

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#### **Operation effects**

#### Overview of landscape changes

11.10.9 The completed development will deliver a net increase in building floor area on site and will increase the maximum height of buildings on site by an estimated maximum of 8-9m. The key change will be the replacement of five separate, existing storage buildings, with a single, larger building. This will introduce a new, large scale element into the landscape setting. As new perimeter planting matures this will also serve to enclose the northern part of the Site, although the upper parts of the new building will maintain evidence of the current military land use identified in the landscape character analysis for the area.

#### Evaluation of landscape changes and consequent effects

- 11.10.10 The proposed development is of a scale that will result in a medium magnitude of change in the context of the Isolated Hills and Woodland and Mixed Uses landscape character type, there being a net increase in MOD development, but confined to previously developed military land on the lower, less sensitive parts of the character type. However, in the immediate locality, the village character will be enhanced as a result of new landscape measures in the vicinity of the main gate and around the Site perimeter. The character type is assessed as being of medium sensitivity, resulting in a moderate effect that will not be significant.
- 11.10.11 The proposed development represents a continuance of the existing MOD land use within the existing MOD land holding and as the magnitude of change to the Otmoor Lowlands landscape character type will be negligible, the effect will be slight and not significant.
- 11.10.12 Due to the distance and separation provided by Arncott Hill, C Site has limited influence on the character of the Area of High Landscape Value to its south-east. The effect of the proposed development on this area during the Site's operation will therefore not be significant.

#### Night-time lighting: Overview of landscape effects

- 11.10.13 It is likely that the proposed development at C Site will have no significant effects on the existing night-time character of the landscape.
- 11.10.14 New and replacement lighting will be required in the vicinity of the warehouse and associated hard standing and when in use, will introduce an additional light source alongside that currently associated with both C Site and the adjacent village. External night-time working for which lighting will be needed will not be a routine requirement and therefore lighting to working areas will not regularly be evident. When in use

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some additional sky glow will be evident at the base of Arncott Hill, although evidence of the Hill itself, as a contributor to the prevailing landscape, will remain.

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# 11.11 Assessment of visual effects - Graven Hill

### Predicted effects and their significance

#### **Construction effects**

#### Overview of visual changes

- 11.11.1 Visual changes associated with the construction stage are driven principally by the loss of vegetation, land cover and existing large scale built form and security fencing and the visual intrusion caused by the plant, materials and equipment that will be operating and stored on site. Existing views will potentially be obstructed through the introduction of new elements; opened up through the removal of existing vegetation or intruded upon by the introduction of new activities and elements.
- 11.11.2 Construction will occur over a 13 year period with three phases of development, occurring concurrently on the northern (predominantly residential and related development) and southern (predominantly light industrial and storage) parts of the Site, as described in Chapter 3 and summarised below.
  - Phase 1 primarily residential development, school and other community facilities, within northern part of the Site adjacent to the main entrance; light industry within the central eastern part of the Site.
  - Phase 2 residential development within north-eastern part of the Site and light industry/commercial within the south/south-eastern part of the Site.
  - Phase 3 residential development within western part of the Site and commercial development within the south/south-eastern part of the Site.
- 11.11.3 Due to the localised nature of views and the extent of the Site, only certain phases of construction will be experienced by visual receptors identified in the baseline study.

### Evaluation of visual changes and consequent effects

- 11.11.4 The evaluation of visual effects on all identified receptors during the construction stage of the proposed development is detailed in Table I.3.1 in Appendix I.3. Examples of typical views are illustrated in Photographic Viewpoints shown on Figures 11.4 to 11.19 with photograph locations provided on Figure 11.3.
- 11.11.5 Several of the identified groups of visual receptors in close proximity to the Site will experience significant negative effects as a consequence of changes to their views during the construction phase. Commentary on the main receptors is provided below.
  - Users of St David's Barracks (immediately adjacent to the Site) for construction phase 3.

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- Langford Park Farm (immediately adjacent to the Site) for construction phase 1.
- Wretchwick Farm and adjacent properties (immediately adjacent to the Site) for construction phase 2.
- Residents of isolated properties located to the south-east of Langdon Village and Bicester for construction phase 2.
- Residents within the western part of Ambrosden, for construction phase 2 predominantly.
- Residents on the eastern edge of the small settlement of Langford (immediately adjoining the Site) for construction phase 3.
- Residents of isolated properties near Blackthorn Hill for construction phase 3.
- · Users of PRoW near Middle Wretchwick Farm (to the south-east of Langford Village and Bicester) for construction phase 2.
- 11.11.6 Significant effects will be temporary, although sustained over a period of time, ranging up to approximately five years depending on the location of the receptor.
- 11.11.7 For receptors experiencing middle and long distance views, low level construction activities will predominantly be screened by intervening woodland and tree cover. Construction activities associated with the demolition of existing larger buildings, the operation of plant and construction work on the lower slopes of Graven Hill will be visible, although as smaller elements within wider views and in some locations be barely perceptible.

#### **Operation/occupation effects**

#### Overview of visual changes

- 11.11.8 Visual effects associated with the operation of the Site will result from permanent changes in land-use and the introduction of new built form and its associated use. As with the construction period, no receptors will have a complete view of the entire Graven Hill proposed development.
- 11.11.9 Visual change will be caused by the limited introduction of built form on the part of the Site that is currently undeveloped, alongside the replacement of existing large scale military buildings, lighting, infrastructure and fencing with built form and landscape elements similar in type and scale to that found within the surrounding area.

#### Evaluation of visual changes and consequent effects

- 11.11.10 The evaluation of visual effects on all identified receptors during the operation stage of the proposed development, are detailed in Table I.3.1 in Appendix I.3. This chapter discusses those effects likely to be significant.
- 11.11.11 Several of the identified visual receptor groups will experience significant, but temporary effects as a consequence of changes to their views. However, the introduction of extensive areas of structural planting around the periphery of the Site

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will avoid negative effects once the planting has matured sufficiently to fulfil its screening function (which is estimated to take 10 to 15 years from planting). For many of these receptors, the removal of existing visually intrusive military built form (i.e. large storage buildings but also site storage containers, other equipment and materials) from large areas of the Site, and their replacement with built form and landscape elements of a scale and type that is less intrusive allied with increased tree cover, will result in significant effects that are likely to be positive.

- 11.11.12 Receptors likely to experience significant positive effects, once planting has matured, are as follows. All other receptors assessed are unlikely to experience significant effects. Further information is provided in Table I.3.1 in Appendix I.3.
  - Residents of Wretchwick Farm and adjacent properties. Visually intrusive security fencing and military buildings will be removed and new structural planting that will mature to restrict views of new residential development within the Site.
  - Residents within the western parts of Ambrosden. Visually intrusive security fencing and military buildings will be replaced with views of smaller scale residential development located beyond structural planting that will filter and screen views once matured.
  - Residents of Langford Lane on the western edge of the Site adjacent to the stables. Visually intrusive military buildings will be removed and will be replaced with views of new development located beyond structural planting that will screen and filter views once matured.
- 11.11.13 There are unlikely to be any significant negative effects on views of the Site in the long term.
- 11.11.14 The list of receptors experiencing substantial changes to their views represents a small proportion of receptors identified within the approximate Visual Envelope (Figure 11.3). This is due to a number of factors which include the following.
  - The retention of visually important areas of woodland and trees within and on the periphery of the Site.
  - The incorporation of structural planting around the periphery of the Site during construction Phase 1.
  - The influence of vegetation (predominantly hedgerows and trees) within the surrounding landscape in screening and filtering views of the Site; emphasised by the flat low lying nature of the landscape.
  - The removal of highly visible large storage buildings from a large part of the Site and the introduction of new built form and landscape elements of a smaller scale and type that reflect the positive aspects of adjacent local landscape character.

#### Night-time effects

11.11.15 Receptors to the north have glimpsed views of intermittent street lighting within the Site through existing vegetation, views being experienced within the context of the

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well-lit A41. The removal of the existing floodlighting within the storage area will have a positive effect on receptors to the north. However, it is likely that the proposed residential area will generally be more visible due to additional street lighting, though this will be a more appropriate height and with appropriate detail design is not in itself likely to result in sky glow that is any greater than that existing due to lighting along the A41 and therefore effects are unlikely to be significant.

- 11.11.16 The Site is barely perceptible to receptors in the east as the Site includes only a small group of lights on its north-east side. The silhouette of the hilltop is discernible within a primarily unlit landscape. It is likely that the Site will become more prominent at night due to the proposed development, in particular with lighting associated with the main road passing through the east part of the Site. This will have a negative effect on receptors located to the east of the Site, particularly residents along the west edge of Ambrosden, although this is not judged to be significant.
- 11.11.17 Long distance views from south of the Site are dominated by the lighting of the existing barracks on the southern side of Graven Hill. It is likely that the change in views from the south will be low, due to the more limited development in the southern part of the Site. Some additional lighting will be visible though this will not be significant in the context of the barracks lighting.
- 11.11.18 Receptors to the west have existing views of the intermittent street and building lighting located within the western part of the Site. There is an area of lighting within this part of the Site which gives a small white glow at the base of the hill. Close distance receptors to the west will have glimpses of the residential development located in the western part of the Site. It is likely that receptors with long distance views of the Site from the west will experience a change to a more heavily lit landscape around the base of Graven Hill. However, this will be viewed in the panoramic landscape which comprises the heavily lit streets associated with Bicester and the lighting of the proposed Kingsmere development in the foreground and therefore effects are unlikely to be significant.

# 11.12 Assessment of visual effects - C Site

### Predicted effects and their significance

#### **Construction effects**

#### Overview of visual changes

- 11.12.1 Visual changes associated with the construction stage will be driven principally by the loss of existing buildings, infrastructure (road and rail) and hard standings and the visual intrusion caused by the presence of plant, materials and equipment that will be operating and stored on site. Existing views will potentially be obstructed or intruded upon due to the introduction of new elements and activities.
- 11.12.2 The construction stage will be carried out over a 23 month period as described in Chapter 3.

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Evaluation of visual changes and consequent effects

11.12.3 The evaluation of visual effects on all identified receptors during the construction stage of the proposed development is detailed in Table I.4.1 in Appendix I.4.

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- 11.12.4 A number of the identified groups of visual receptors will experience significant negative effects as a consequence of changes to their views during the construction phase. These are predicted to be experienced by receptors located within close proximity to the Site and will include the following.
  - Residents on Green Lane, who will experience close views to construction activity, although this will be short term and less evident following the completion of earth mounding on the Site's east side. Following completion the change in views is predicted to remain significant. While there may be some loss of evening light, there will be a clear improvement to the immediate environment, particularly for properties on the west side of the road, as planting establishes.
  - Residents on Norris Road, who will experience similar changes to those described above.
  - Residents on Murcott Road, close to Arncott Village Hall and users of the public adjacent open space, where it is predicted that the upper part of the new warehouse will be visible beyond foreground vegetation, are likely to experience significant effects.
  - Residents in the vicinity of Hopcroft Close and Teal Close, where it is predicted that some upper storey views will experience broadly similar changes to those described above.
  - Residents on Ploughley Lane in the vicinity of the Tally Ho Public House, during construction only. Following completion the effect will not be significant, as planting establishes.
  - Users of public open space close to Arncott Village Hall.
  - Users of the Village Green public open space, where for a short period, construction plant is likely to be evident.
  - Users of the PRoW, south of Brook Farm on the west of the Site, where there will be a significant effect for a short period due to construction activity and prior to the establishment of the new perimeter planting proposed for this part of the Site.
- 11.12.5 Significant effects will be temporary and sustained for up to approximately a 23 month period. However, the actual construction period for the new warehouse will be approximately 12 months.
- 11.12.6 For receptors located further away (middle and long distance views), low level construction activities will predominantly be screened by intervening woodland and tree cover and therefore effects are unlikely to be significant.

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#### **Operation effects**

#### Overview of visual changes

11.12.7 Visual changes associated with the operation of the Site will result from the introduction of the large scale storage building, night-time lighting, new landscape buffers (earth bund with planting) on the edge of the proposed development, a new landscaped entrance to the Site and the strengthening of existing boundary planting.

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#### Evaluation of visual changes and consequent effects

- 11.12.8 The evaluation of visual effects on all identified receptors during the operation stage of the proposed development, are detailed in Table I.5.1 in Appendix I.5.
- 11.12.9 A number of receptors are likely to experience significant positive effects in the long term, once planting has matured sufficiently to screen the development (estimated to take 10 to 15 years) as follows.
  - Residents of Green Lane. Whilst there will be significant change due to the 'enclosing' effect of new planting, this will replace the previous view towards building C4, and the immediate environment will be improved due both to the screen planting and bunding to the rear of properties and to the main gate area improvements.
  - Residents of Norris Road. Following the establishment of landscape works to the Site's periphery, the immediate surroundings will improve, compared to the current situation. Properties on the east side of Norris Road will only experience glimpses of the Site between foreground buildings
  - Residents in the vicinity of Hopcroft Close and Teal Close with upper storey views to the Site. Where views occur, the existing view across the Site will be replaced by an improved aspect towards screen planting

#### Night-time effects

- 11.12.10 Current night-time lighting on C Site comprises occasional street lighting with building lighting located sporadically through the Site. The lighting within the Site is predominantly low pressure sodium lamps similar to other street lighting located along the roads through Arncott surrounding C Site. The effect of lighting within Arncott and C Site is currently similar to that of other settlements in the predominantly rural landscape, with the settlement of Bicester becoming more prominent to the north.
- 11.12.11 Where views towards the Site are available from the north evidence of lighting associated with C Site is apparent within the context of Arncott village and forms part of the sky glow due to the settlement and its street lighting. Night-time views into the Site from residents along Ploughley Road comprise only a small number of exterior building lights. Detailed design of the lighting scheme will take into account the potential for glare from new lighting on hardstanding areas in the north, however, once mature, new screen planting will prevent any direct views to the light source. With appropriate lighting design to avoid additional sky glow, effects will not be significant.

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- 11.12.12 Receptors to the east, particularly residents of Arncott, have some glimpsed views of the existing street and building lighting within C Site, though this is intermittent and within the context of other street lighting within Arncott. No lighting from C Site or the west side Arncott Hill is discernible from Muswell Hill.
- 11.12.13 The most sensitive receptors are located adjacent to the east boundary of the Site at properties in Norris Road and Green Lane. Measures have been incorporated in the proposed development to address potential effects of glare and light trespass, by locating working areas away from the east boundary. Lighting on the east side of the building will be confined to that required for the access road immediately adjacent to the warehouse, below the sight line defined by perimeter bunding and landscape planting. The effect on properties to the east will therefore not be significant.
- 11.12.14 Receptors located immediately adjacent to the southern part of C Site have views of the intermittent lighting located on the exterior of buildings and along the roads within the Site, however this is viewed in the context of street lighting associated with Arncott Village. As the new development is situated in the north of C Site, change is unlikely to be discernible.
- 11.12.15 Receptors located to the west of C Site (particularly at Merton and users of Merton Road) have long distance views of dispersed lighting located around the base of Arncott Hill. The occasional lighting around C Site is relatively bright within an otherwise unlit landscape. The lighting gives a yellow glow around the silhouette of Arncott Hill with other lighting from Arncott visible. When in use, lighting to the northern part of C Site will introduce a change in the pattern of lighting, with some increased emphasis to this part of the Site. However, this will be viewed in the context of the existing lighting within the southern part of the Site and surrounding village of Arncott and will therefore not be significant.

# 11.13 Conclusions of significance evaluation

11.13.1 Full details of the significance evaluation are included at Appendix I. Tables 11.6 and 11.7, below, list all predicted significant effects identified in this chapter of the ES.

Receptor	Magnitude of effect	Sensitivity of receptor	Significance	Rationale
Landscape – Construct	tion Phase			
Landscape Character	High	Medium	S -	Introduction of new temporary elements during construction will detract from landscape character.
Landscape Elements.	High	Medium	S -	Existing elements will be replaced with an increase in movement and the introduction
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Table 11.6 Summary of significant effects and evaluation of their significance: Graven Hill

Receptor	Magnitude of effect	Sensitivity of receptor	Significance	Rationale
				of new, contrasting temporary elements across the Site.
Landscape Patterns.	High	Medium	S -	There will be a reduction of existing landscape patterns through an increase in movement and the introduction of a new temporary and shifting pattern of elements.
Landscape – Operation	n Phase			
Landscape Character	High	Medium	S +	The removal of military development will lead to a fundamental, positive change in one of the key characteristics of the Otmoor Lowlands landscape character area and a fundamental, positive change for the Isolated Hills and Mixed Use landscape character type.
Visual – Construction	& Operation			
Residents of Langford Park Farm (Refer to Photographic Viewpoint 1)	High	High	S-	<u>Construction</u> Construction works associated with the northern part of Phase 1 will be in clear view from the outer farm premises and works associated with construction of the allotments and adjacent POS will be in clear view of the farmhouse.
Residents of isolated farms to the south- east of Langford Village (Refer to Photographic and	High	High	S -	<u>Construction</u> Construction elements and activities associated with Phase 2 will introduce new elements within the middle ground.
Viewpoint 5)	High	High	S +	<u>Operation</u> New development result in a negative effect prior to maturation of landscape planting. Once planting is mature the effect will become positive when compared to the baseline.
Residents of Wretchwick Farm and adjacent properties (Refer to Photographic	High	High	S -	<u>Construction</u> Construction work associated with Phase 2 will form prominent elements with the foreground and middle ground.
νιεωροιήτ δ)	Medium	High	S +	<u>Operation</u> The existing large storage building on the outskirts of the Site, visible where boundary vegetation is absent will be replaced with views of smaller scale development interspersed with tree planting, that will screen and filter views into the





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Receptor	Magnitude of effect	Sensitivity of receptor	Significance	Rationale
				Site.
Residents within the western part of Ambrosden (Refer to Photographic and Photomontage Viewpoint 9)	Medium	High	S -	Construction Construction elements and activities within the eastern part of the Site (associated with Phases 1, 2 and 3) will be visible from the western edge of Ambrosden.
	Medium	High	S+	<u>Operation</u> Existing, visually intrusive buildings will be replaced with views of residential built form that is smaller in scale, interspersed with tree planting that will screen and filter views into the Site.
Residents of Langford Lane on the western edge of the Site adjacent to the stables (Refer to Photographic Viewpoint 18)	Medium	High	S -	<u>Construction</u> Construction elements and activities located within the south-western part of the Site (associated with the Phase 3 - residential) will form readily noticeable features in the middle ground.
	Medium	High	S +	<u>Operation</u> Existing views of large scale buildings will be replaced by filtered views of residential built form that is smaller in scale and will introduce a finer grain of built element within the view. New tree planting will mature to further screen views.
Isolated residential properties near Blackthorn Hill (Refer to Photographic Viewpoint 26)	Medium	High	S -	<u>Construction</u> Construction elements and activities within the eastern part of the Site (associated predominantly with Phase 2) will be visible.
Users of public footpaths near Middle Wretchwick Farm (Refer to Photographic Viewpoint 5).	High	High	S -	<u>Construction</u> Construction elements and activities associated with Phase 2 will introduce new elements within the middle ground.
	High	High	S +	<u>Operation</u> New development result in a negative effect prior to maturation of landscape planting. Once planting is mature the effect will become positive when compared to the baseline.
Key: S = significant	+ = positive	- = negative		

S = significant

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Receptor	Magnitude of effect	Sensitivity of receptor	Significance	Rationale
Residents on Green Lane	High	High	S -	<u>Construction</u> Properties at Green Land will have direct, close views to the construction site.
	High	High	S +	<u>Operation</u> Whilst there will be significant change due to the 'enclosing' effect of new planting, this will replace the previous view towards building C4, and the immediate environment will be improved.
Residents on Norris Road (Refer Figure 11.23 Viewpoint 4)	High	High	S -	<u>Construction</u> Residents in Norris Road will have direct, close views to the construction site including views towards the main gate area which will be re-configured and the security fence re-aligned.
	High	High	S +	Operation Following the establishment of landscape works to the Site's periphery, the immediate surroundings will improve, compared to the current situation.
Residents on Murcott Road (Refer Figure 11.26 Viewpoint 8)	High	High	S -	<u>Construction</u> Approximately 18 properties on the east side of Murcottt Road will experience views (mainly from upper storeys) towards the demolition of building C4 and the subsequent construction of the new warehouse.
Residents in the vicinity of Hopcroft Close and Teal Close	Medium	High	S -	<u>Construction</u> It is likely that residents in this location will experience upper storey views towards construction activity, filtered by rear garden vegetation and partially obstructed by other properties in the foreground.
	Medium	High	S +	<u>Operation</u> Where views occur, the existing view across the Site will be replaced by an improved aspect towards screen planting.
Residents on Ploughley Road (Refer Figure 11.22 Viewpoints 1 and 3)	High	High	S -	<u>Construction</u> Residents in the vicinity of the Tally Ho Public House will experience views towards construction activity, these being more evident towards the south east where existing screen planting on site is less effective.

#### Summary of significant effects and evaluation of their significance: C Site Table 11.7

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Receptor	Magnitude of effect	Sensitivity of receptor	Significance	Rationale
Users of public open space in the vicinity of Arncott Village Hall Arncott (Refer Figure 11.26 Viewpoint 8)	High	Medium	S -	<u>Construction</u> Views will occur towards the demolition of building C4 and the subsequent construction of the new warehouse.
Users of the Village Green, Arncott (Refer Figure 11.25 Viewpoint 7 and photomontage)	High	Medium	S -	<u>Construction</u> For a limited period, there will be views towards the demolition of building C4 and towards cranes used during the construction of the warehouse, evident above the rooflines of houses adjacent to the Green.
PRoWs south of Brook Farm and leading to Merton Road (Refer Figure 11.30 Viewpoint 12 and photomontage)	High	Medium	S -	Construction Direct views to the construction area in the north of the Site will occur from the PRoW in this location, filtered through the existing hedgerow on the Site's west boundary. Further south on the footpath the effect will diminish however, due to the screening effect of the Site's perimeter vegetation.

Key: S = significant + = positive - = negative

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	Site boundary: C site
61	Counties boundary
-	Urban areas
1 Xt	Landscape Character Types
27	R fall Elecated or low-tyrng, arable farmland with weak structure
	R2a Roting grable landscape with weak left pattern and isolated trees
	R 3b. Rolling arable tendecape with strong field pattern and isolated trees
一声的	R 2c. Elevated open pasture with occassional remnant health vegetation
	R3e Large scale arable termiandenciosed by woodland betts
	R4a. Strongly undulating complex of familand hills and valleys
all a	R4b Small scale rolling lamland with strong field puttern
	R4c Low-tyrig pastoral landscape with willow lined watercourses
	R5a isolated hills with woodland and mixed uses
15-	R5a 18th Century enclosed parkland
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1-	Landscape Character Zones (Laken from the Aylesbury Vale Landscape Character Assessment) 7.1 Poundor-Charadon SetDed Hills
12	7.5 Bernwood Forest
- Jo	8.1 Marsh Gibbon Vale
100	8.8 Paralili Vale
1	9.5 Bnll and Muswell Hill
7.5	Defence Infrastructure Organisation
7.5	Redevelopment of MOD Bicester Landscape and Visual Impact Assessment Figure x.x Landscape Character Areas
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	Figure 11. Graven Hi Represen	3 II: Visual Envelo tative Viewpoint	pe and Locations
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Viewpoint 1: Langford Park Farm boundary on edge of Graven Hill site. (Taken inside the MoD boundary).



Viewpoint 1: continued.





Viewpoint 2: A41



Viewpoint 3: Kestrel Way, Langford Village.

Redevelopmen	t of MOD Bicester
Environmental	Statement
Figure 11.5	
Graven Hill Ph	oto Viewpoints 2 & 3



Viewpoint 4: Alongside A41 near Wretchwick Lodge.



Viewpoint 4: continued.





Viewpoint 5: Public Right of Way near Middle Wretchwick Farm.



Viewpoint 6: Public Right of Way south of Launton Village.

Redevelopment of M	IOD Bicester
Environmental State	ment
Figure 11.7 Graven Hill Photo \	/iewpoints 5 & 6



Viewpoint 7: Lane near Poundon Hill.



Viewpoint 8: Ploughley Road near Wretchwick Farm.





Viewpoint 9: Western edge of Ambrosden Village,



Viewpoint 10: Public Right of Way to north-west of Arncott Village.



Redevelopment Environmental S	of MOD Bicester Statement
Figure 11.9	
Graven Hill Pho	oto Viewpoints 9 & 10



Viewpoint 11: Buchanan Road, Upper Arncott.



Viewpoint 12: Public Rights of Way on Muswell Hill.





Viewpoint 13: Murcott Road crossing point over M40.



Viewpoint 14: Merton Road and Public Right of Way.





Viewpoint 15: Public Right of Way on north-eastern edge of Merton Village.



Viewpoint 16: Mill Lane, Chariton-on-Otmoor.

Redevelopment	of MOD Bicester
Environmental S	Statement
Figure 11.12	
Graven Hill Pho	oto Viewpoints 15 & 16


Viewpoint 17: Public Right of Way and Langford Lane.



Viewpoint 18: Langford Lane.





Viewpoint 19: Eastern edge at Langford and Public Right of Way.



Viewpoint 19: continued.





Viewpoint 20: Lane south-west of Wendlebury crossing point over M40.



Viewpoint 21: Green Lane crossing point over M40.



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Viewpoint 22: Lane near Bicester Avenue.





Viewpoint 23: A4095



Viewpoint 23: continued.





Viewpoint 24: B4030



Viewpoint 25: Lane south-west of Bucknell at crossing point over M40.

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Environmental	Statement	
Figure 11.18		
Graven Hill Ph	toto Viewpoints 24 8	2



Viewpoint 26: Public Right of Way near Blackthorn Hill.

Redevelopment	of MOD Bicester
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Figure 11.19	
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Viewpoint 1: Southern edge of Ambrosden.



Viewpoint 1: continued

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Viewpoint 2: Ploughley Road, Lower Arncott.



Viewpoint 3: Ploughley Road, Lower Arncott.

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Viewpoint 4: Norris Road, Lower Arncott.



Viewpoint 4: continued





Viewpoint 5: Buchanan Road, Upper Arncott.



Viewpoint 6: Public Right of Way on Muswell Hill.





Viewpoint 7: The Green adjoining Green Lane.



Viewpoint 7: continued





Viewpoint 8: Public Open Space adjoining Murcott Road.



Viewpoint 8: continued





Viewpoint 9: Murcott Road.



Viewpoint 9: continued.





Viewpoint 10: Murcott Road crossing point over M40.





Viewpoint 11: Public Right of Way to the south of C Site.



Viewpoint 11: continued.





Viewpoint 12: Public Right of Way to the north-west of C Site.



Viewpoint 12: continued.

Figure 11.30
Site Photo Viewpoint 12



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Viewpoint 13: View east from Merton Road
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Figure 11.31	
Site Photo Vi	ewpoint 13



# **Existing View**

# Viewpoint parameters:

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# 12. Biodiversity

# 12.1 Introduction

12.1.1 This chapter presents the results of an assessment of the effects of the proposed development on the biodiversity and ecological receptors present at the Graven Hill and C Sites (see Figure 1.1 for the locations of these Sites). This chapter should be read in conjunction with the proposed development description (chapter 3).

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# 12.2 Policy and legislation

#### **Planning policy issues**

12.2.1 National, regional and local policies relating to biodiversity may have a bearing on the scope of the assessment of effects on biodiversity. Table 12.1 lists the policies and policy issues which have been considered in assessing effects on biodiversity.

Policy reference	Policy issue
PPS 9	Effects on: designated sites of international, national and local importance; legally protected species, habitats and species of principal importance for the conservation of biodiversity in England; ancient woodland; and veteran trees.
	Measures to mitigate adverse effects and/or opportunities for enhancing biodiversity.
SE Plan Policy CC1	Ensuring the physical and natural environment of the South East is conserved and enhanced through sustainable development.
CDC LP Policy C1	Effects on Sites of Special Scientific Interest or other areas of designated wildlife or scientific importance. Protection of sites of local nature conservation value.
	The potential adverse affect of development on such sites will be a material consideration in determining planning applications.
CDC LP Policy C2	Effects on any species protected by Schedule 1, Schedule 5 and Schedule 8 of the <i>Wildlife and Countryside Act 1981</i> , and by the E.C. <i>Habitats Directive 1992</i> .
CDC LP Policy C4	Creation of new habitats and nature conservation areas in new development.
CDC LP Policy C17	Enhancement of the urban fringe through tree and woodland planting.
CDC Non-statutory LP Policy EN13	Effects on ecology of watercourses and river corridors.
CDC Non-statutory LP Policy EN22	Retention, enhancement and protection of features of nature conservation value within a proposed development site.

#### Table 12.1 Policy issues

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Policy reference	Policy issue
CDC Non Statutory LP Policy EN23	Requirement to submit ecological survey to establish the likely impact on the nature conservation resource.
CDC Non Statutory LP Policy EN24	Effects on a site of ecological or geological value.
CDC Non Statutory LP Policy EN25	Effects on any species protected by Schedule 1, Schedule 5 and Schedule 8 of the <i>Wildlife and Countryside Act 1981</i> , and by the <i>EU Habitats Directive 1992</i> , or its habitat.
CDC Non Statutory LP Policy EN27	Creation of new habitats and nature conservation areas in new development.
CDC Non Statutory LP Policy EN28	Protection and enhancement of the ecological value, biodiversity and rural character of the flood plain of Langford Stream and River Ray.
UK Biodiversity Action Plan (UK BAP) (Biodiversity Reporting and Information Group, 2007)	Effects on priority habitats and species listed in the UK BAP.
CDC and Oxfordshire Local BAP (LBAP)	Effects on priority habitats and species listed in the Oxfordshire BAP and Cherwell LBAP 2011-2012.

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#### Legislative requirements

- 12.2.2 In preparing this EIA, account has been taken of relevant legislation and regulations, namely:
  - Natural Environment and Rural Communities Act 2006 (NERC Act);
  - Protection of Badgers Act 1992;
  - Conservation of Habitats and Species Regulations 2010 (hereafter referred to as the Habitat Regulations);
  - Wildlife and Countryside Act 1981 (as amended); and
  - Countryside and Rights of Way Act 2000.

# 12.3 Data gathering methodology

#### **Desk study**

- 12.3.1 A data-gathering exercise was undertaken to obtain information relating to statutory and non-statutory nature conservation sites, priority habitats and species, and legally protected and controlled species. Full details of this data gathering exercise are presented in the Baseline Biodiversity Report (see Appendix J).
- 12.3.2 Given the potential for the proposed development to affect biodiversity resources located off- as well as on-site, data were requested for:

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• sites of international nature conservation interest located within 10km of the Sites' boundaries;

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- sites of national nature conservation interest located on or within 5km of the Sites' boundaries;
- sites of county nature conservation interest located within 1km of the Sites' boundaries;
- records of bat roosts within 5km of the Sites' boundaries; and
- records of legally protected and priority species to a distance of 2km from the Sites' boundaries<sup>36</sup>.
- 12.3.3 Sources of desk study information are listed in Table 12.2.

Торіс	Source of information
Statutory nature conservation sites	Multi-Agency Geographic Information for the Countryside website http://magic.defra.gov.uk/
Non-statutory nature conservation sites	Thames Valley Environmental Records Centre (TVERC)
Ancient woodland	Multi-Agency Geographic Information for the Countryside website http://magic.defra.gov.uk/
Records of legally protected and	Thames Valley Environmental Records Centre
priority species	Buckinghamshire and Milton Keynes Records Centre
	Bat records from the Oxfordshire Bat Group
	The Oxfordshire badger (Meles meles) and herpetofauna groups
	Black and brown hairstreak butterfly records from the Oxfordshire butterfly recorder

Table 12.2 Sources of desk study information

#### Survey work

12.3.4 A summary of the biological surveys carried out in support of the EIA for the Sites is provided in Table 12.3. The methodologies for, and results of, these surveys can be found in the Baseline Biodiversity Report and the Confidential Badger Annex located in Appendix J.

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<sup>&</sup>lt;sup>36</sup> The basis for selecting these areas of search is set out in section 2.1.2 of the Baseline Biodiversity Report (see Appendix J).

Table 12.3	Baseline surveys
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Survey requirement	Survey specification	Date	Reference
Habitat mapping within site boundary	Extended Phase 1 habitat survey	2008 and revisited in 2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Badgers	Survey of site for evidence of badger activity (Graven Hill and C Sites) and bait marking survey (Graven Hill only)	2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Bats	Emergence surveys of potential roost sites	2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
	Winter and summer inspections of buildings and potential hibernacula (including air raid shelters)	2010- 2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
	Activity survey of potential foraging areas	2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Dormice	Dormice nest tube survey	2010-2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Water vole	Water vole survey	2010-2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Great crested newts (GCN)	Great crested newt presence/absence survey and population estimate	2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Reptiles	Reptile population survey	2010-2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Birds	Breeding bird survey	2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J
Invertebrates	Invertebrate survey	2010 and 2011	Baseline Biodiversity Report/AMEC (2011)/Appendix J

# 12.4 Overall ecological baseline

12.4.1 An overview of the biodiversity baseline for the Sites is presented in this section. More details can be found in the Biodiversity Baseline Report in Appendix J, supported by figures and data in Annexes to that report.

### Graven Hill

#### Statutory nature conservation sites and land classifications

12.4.2 Although there are no sites of international nature conservation interest located within 10km of the Site boundary, there are five statutory nature conservation sites located within 5km of the Site boundary, although the nearest is over 1.5km away. These are Arncott Bridge Meadows Site of Special Scientific Interest (SSSI), Wendlebury

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Meads and Mansmoor Closes (SSSI), Stratton Audley Quarries (SSSI), Otmoor (SSSI) and Bure Park Local Nature Reserve (LNR).

#### Non-statutory nature conservation sites and land classifications

- 12.4.3 There are three non-statutory nature conservation sites located within 1km of the Site boundary. One of these, an ancient woodland site (Graven Hill Wood County Wildlife Site (CWS)), is located within the centre of the Graven Hill Site, whilst the Bicester Wetland Reserve is located almost adjacent to the western site boundary (within 40m).
- 12.4.4 Reference to the Multi-Agency Government Information for the Countryside (MAGIC) website demonstrates that the Graven Hill Site is within 280m of the 'Upper Thames Tributaries' Environmentally Sensitive Area (ESA).

#### Protected and otherwise priority species

- 12.4.5 The key species records located within 2km of Graven Hill, obtained during the desk study, are summarised below. Full details of the biological records for each study area are presented in Appendix J; apart from badger records which are listed in a confidential report (the latter should not be placed in the public domain, to avoid the potential for illegal interference with setts).
- 12.4.6 Key species records occurring within 2km of Graven Hill Site boundary are:
  - Bats: Brown long-eared bat (*Plecotus auritus*), leisler's bat (*Nyctalus leisleri*), natterer's bat (*Myotis nattereri*) and pipistrelle (*Pipistrellus sp.*) bat;
  - grass snake (*Natrix natrix*);
  - great crested newt (GCN) (*Triturus cristatus*);
  - Wildlife & Countryside Act, Schedule 1 bird species associated with the Bicester Wetlands Reserve (CWS): Pintail (*Anas acuta*), bittern (*Botaurus stellaris*), merlin (*Falco columbarius*), hobby (*Falco subbutteo*), peregrine (*Falco peregrinus*), little ringed plover (*Charadrius dubius*), black-tailed godwit (*Limosa limosa*), green sandpiper (*Tringa ochropus*), greenshank (*Tringa nebularia*), barn owl (*Tyto alba*) and kingfisher (*Alcedo atthis*).
  - UK BAP priority bird species: Lapwing (Vanellus vanellus), curlew (Numenius arquata), cuckoo (Cuculus canorus), yellow wagtail (Motacilla flava), grasshopper warbler, marsh tit (Parus palustris), willow tit (Parus montanus), linnet (Acanthis cannabina), twite (Carduelis flavirostris), yellowhammer (Emberiza citronella) and reed bunting (Emberiza schoeniclus).
  - UK BAP priority and nationally scarce invertebrate species: The ground beetle (*Bembidion quadripustulatum*), grizzled skipper (*Pyrgus malvae*), wall moth (*Lasiommata megera*) and a rove beetle (*Philonthus fumarius*). These records are associated with the Gavray Drive complex (Bicester). There are also records of black hairstreak (*Satyrium pruni*) and brown hairstreak (*Thecla betulae*) butterflies; and

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• other UK BAP priority species: Common toad (*Bufo bufo*) and hedgehog (*Erinaceus europaeus*)

#### Waterbodies within 500m of the Site

12.4.7 Review of Ordnance Survey maps and aerial photographs indicated that there are a total of 30 waterbodies located on-site and 22 waterbodies located within 500m of the Site boundary (including three within St David's Barracks).

#### Habitats

#### Site context and surrounding habitats

12.4.8 The Graven Hill Site comprises D and E Site, areas of woodland and agricultural land (used for grazing cattle or to provide a hay crop). The Site is largely surrounded by agricultural land, with suburban housing to the north-east, from which it is separated by the busy A41 trunk road. At its closest point, Langford Brook flows approximately 40m to the north of the Site boundary. A railway line running along the north-western boundary of the Site separates it from a sewage treatment works.

#### On-site habitats

12.4.9 The Site is set on a hill rising out of an otherwise generally flat agricultural landscape. It comprises a set of fenced compounds, St David's Barracks (comprising residential accommodation and sports facilities), warehouses, office buildings and hardstanding. Areas of species-poor, semi-improved grassland, amenity grassland, scrub, standard trees and hedgerows, drains and waterbodies also occur on-site. There are also a number of areas of coniferous, mixed and broad-leaved woodland/plantation. One of these areas of woodland is classified as wet woodland, whilst another comprises ancient woodland that is notified as Graven Hill Wood CWS. Other potentially valued types of habitat present on-site include hedgerows and two ponds, both of which were dry at the time of the GCN surveys in April and May 2011.

#### Species

- 12.4.10 In addition to a variety of common and widespread species, the field surveys have identified the presence of the following legally protected or controlled, and/or priority species on or adjacent to the Site (see Appendix J for definitions of these categories and more details of the surveys and findings):
  - badger (see confidential badger report);
  - common pipistrelle (*Pipistrellus pipistrellus*) bat: three common pipistrelle roosts, of which one is a maternity roost whilst the other two are summer roosts used by a couple of individual common pipistrelle bats. High levels of foraging activity were identified during the bat activity surveys;
  - soprano pipistrelle bat: one maternity soprano pipistrelle (*Pipistrellus pygmaeus*) roost (shared with the common pipistrelle and noctule bats (*Nyctalus noctula*)). Moderate levels of foraging activity were identified during the bat activity surveys;

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- serotine bat (*Eptesicus serotinus*): low levels of foraging activity were identified during the bat activity surveys;
- Myotis sp. Bat: low levels of foraging activity were identified during the bat activity surveys;
- Daubenton's bat (*Myotis daubentoni*): low levels of foraging activity were identified during the bat activity surveys;
- Leisler's bat: low levels of foraging activity were identified during the bat activity surveys;
- long-eared bat: low levels of foraging activity were identified during the bat activity surveys;
- polecat: a dead polecat was found on-site during a reptile survey;
- GCN: one large metapopulation and seven small populations of GCN were recorded on-site, with a further three small populations within 500m of the Site boundary;
- common lizard (*Zootoca vivipara*): one 'good' population of common lizard (between 6-10 individuals recorded during one survey);
- grass snake (*Natrix natrix*): one 'low' population of grass snake (between 1-5 individuals recorded during one survey);
- priority invertebrate species including four UK BAP, one Oxfordshire BAP, one Extinct, three Red Data Book, one Near Threatened and eleven Nationally Scarce (or equivalent) species and one species new to Britain; and
- breeding birds.
- 12.4.11 In addition to these species, other priority species such as toad (*Bufo bufo*) and hedgehog (*Erinaceus europaeus*) have been recorded within 2km of the Site boundary and considering the habitats present, are likely to occur on-site.

### C Site

#### Statutory nature conservation sites and land classifications

12.4.12 Although there are no sites of international nature conservation interest located within 10km of the Site boundary, there are eight statutory designated sites located within 5km of C Site. These are Arncott Bridge Meadows SSSI, Muswell Hill (SSSI), Whitecross Green and Oriel Woods (SSSI), Murcott Meadows (SSSI), Otmoor (SSSI), Wendlebury Meads and Mansmoor Closes (SSSI), Long Herdon Meadow (SSSI) and Shabbington Woods Complex (SSSI). The nearest of these is Arncott Bridge Meadows SSSI, located 50m to the north of the Site boundary.

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#### Non-statutory nature conservation sites and land classifications

12.4.13 There are three non-statutory sites located within 1km of the Site boundary, Meadows South of River Ray (CWS), Arncott Wood (CWS) and Bicester Garrison Local Wildlife Site (LWS). Of these, the closest is Bicester Garrison LWS which is located 240m to the west of the Site boundary.

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12.4.14 Reference to the MAGIC website demonstrates that the western Site boundary is continuous with the Upper Thames Tributaries ESA. There are no other statutory land designations within 1km of the Site boundary.

#### Legally protected and priority species

- 12.4.15 The key species records located within 2km of C site, obtained during the desk study, are summarised below:
  - Bats: Brown long-eared bat, pipistrelle bat, bechstein's bat (*Myotis bechsteinii*), daubenton's bat and noctule bat;
  - GCN;
  - common lizard;
  - legally protected, UK BAP priority species/Birds of Conservation Concern: barn owl (*Tyto alba*), cuckoo and curlew, willow warbler, kestrel and green woodpecker;
  - UK BAP priority invertebrate species include: large nutmeg butterfly (*Apamea* anceps), rustic moth (*Hoplodrina blanda*), white admiral butterfly (*Limenitis* camilla), lackey moth (*Malacosoma neustria*), shaded broad-bar (*Scotopteryx* chenopodiata), white ermine moth (*Spilosoma lubricipeda*), oak hook-tip (*Watsonalla binaria*), wood white (*Leptidea sinapis*), brown hairstreak and small heath butterfly. Nationally scarce or notable invertebrates include: two ground beetles (*Acupalpus exiguous* and *Bembidion gilvipes*), a rove beetle (*Sepedophilus* pedicularius) and black hairstreak butterfly;
  - other UK BAP priority species, common toad and hedgehog.
  - tubular water dropwort (*Oenathe fistulosa*): A red list vulnerable plant and a UK BAP priority species, and
  - true fox sedge (*Carex vulpina*): A red list vulnerable plant, a UK BAP priority species and a nationally rare plant species.

#### Waterbodies within 500m of the Site

12.4.16 A review of Ordnance Survey maps and aerial photographs indicated that there are a total of 21 waterbodies located on-site, with a further 12 waterbodies located within 500m of the Site boundary.

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#### Habitats

#### Site context and surrounding habitats

12.4.17 C Site lies adjacent to the village of Upper Arncott. The wider landscape and land immediately surrounding the Site comprises arable and improved/semi-improved grassland fields. Other small settlements and army sites are also located nearby. The River Ray at its closest point, is located 130m from the Site boundary.

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On-site habitats

12.4.18 The Site comprises areas of young, broad-leaved woodland, standard trees, drainage ditches, ponds, water tanks, scattered and dense scrub, amenity grassland, semi-improved grassland, buildings, warehouses, roads and hardstanding.

Species

- 12.4.19 In addition to a variety of common and widespread species, the field surveys have identified the presence of the following legally protected or controlled, and/or priority species on or over the Site (see Appendix J for definitions of these categories and more details of the surveys and findings):
  - badger (see confidential badger annex);
  - common pipistrelle bat: two small common pipistrelle summer roosts were identified during the emergence surveys, in addition to moderate levels of foraging activity recorded during the bat activity surveys;
  - noctule bat: moderate levels of foraging activity were identified during the bat activity surveys;
  - long-eared bat: low levels of foraging activity were identified during the bat activity surveys;
  - serotine bat: low levels of foraging activity were identified during the bat activity surveys;
  - Leisler's bat: low levels of foraging activity were identified during the bat activity surveys;
  - Myotis sp. Bat: low levels of foraging activity were identified during the bat activity surveys;
  - Dormouse: a small and fragmented population of dormice was recorded during the surveys;
  - GCN: four small populations of GCN were recorded on-site and one small population of GCN was recorded within 500m of the Site;
  - notable terrestrial invertebrates: five notable invertebrate species including one near threatened, two nationally scarce and two species new to Britain or science were recorded during the invertebrate surveys; and

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- breeding birds.
- 12.4.20 In addition to these species, other priority species such as toad and hedgehog were recorded within 2km of the Site and considering the habitats present are likely to occur on-site.

#### **Future baseline**

12.4.21 Information on future baseline conditions is provided in sections 12.8 to 12.20. Overall in the absence of the proposed development there will be little change in the baseline conditions present at either Site.

# 12.5 Environmental measures incorporated into the proposed development

12.5.1 The proposed development includes a number of measures designed to minimise effects on biodiversity and ensure compliance with relevant legislation. In addition, the proposed development includes measures to enhance biodiversity, as required by Planning Policy Statement (PPS) 9: Biodiversity and Geological Conservation which states that there is a need to 'enhance biodiversity in green spaces and among developments so that they are used by wildlife and valued by people'. The measures included are summarised in Table 12.4 for the Graven Hill Site and Table 12.5 for C Site and, where they comprise habitat creation and/or enhancements are shown on Figures 12.1 and 12.2 for Graven Hill and C Site respectively. Information on how these measures will be implemented is also provided in Table 3.3 in Chapter 3.

Potential receptors	Potential changes and effects	Incorporated measure
Off-site statutory and non-statutory nature conservation sites, including Bicester Wetland Reserve	Dust and pollution from construction works could damage sensitive flora and fauna.	Standard pollution prevention measures, as outlined in the Environment Agency's Pollution Prevention Guidelines <sup>37</sup> , will be implemented during the construction phase of the development.
County Wildlife Site (CWS) which is located nearly adjacent to the Site	Increased levels of light during the construction and operation phase could disturb populations of birds utilising the Bicester Wetland Reserve.	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases.
On-site non-statutory conservation site (Graven Hill CWS)	Increased levels of dust, noise, light and pollution from the construction and operational phases of development could damage/disturb	Standard pollution prevention measures, as outlined in the Environment Agency's Pollution Prevention Guidelines, will be implemented during the construction phase of the development.

#### Table 12.4 Rationale for incorporation of environmental measures at Graven Hill Site

<sup>&</sup>lt;sup>37</sup> The Environment Agency and SEPA (Scottish Environment Protection Agency). Guidelines relevant to this work would include, PPG1 (general), PPG2 (on-site oil storage), and PPG6 (construction activities).



Potential receptors	Potential changes and effects	Incorporated measure
	sensitive flora and fauna within the on-site CWS.	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases.
	Public access to be granted to Graven Hill Wood, resulting in increased levels of disturbance to sensitive fauna within the CWS during the operational phase.	Access for recreational users will be restricted to northern part of the CWS.
Wet woodland	Changes to hydrology of the Site could dry out the area of wet woodland.	The drainage of the proposed development has been designed to ensure that the area of wet woodland still receives sufficient ground and surface water to sustain this type of habitat.
Woodland	Permanent loss of a small area of coniferous and broad-leaved plantation.	New areas of broad-leaved woodland to be planted extending the coverage of Graven Hill Wood as well as creating additional wooded areas across the Site (see Figure 12.1).
Species-poor, semi- improved grassland fields, amenity grassland, marginal vegetation associated with drainage ditches and standard trees.	Permanent loss of areas of species- poor, semi-improved grassland, amenity grassland, marginal vegetation associated with drainage ditches and standard trees.	Enhancement of 10.8ha of retained semi-improved grassland to create a wildflower meadow situated amidst a mosaic of other habitat types (i.e. scrub and waterbodies). Standard trees will be retained wherever possible. The loss of marginal vegetation associated with the drainage ditches will be more than compensated for through the creation of new marginal vegetation associated with the additional waterbodies and SUDS.
		qualified ecologist. This will provide a detailed specification of the habitats to be created, together with a programme of works.
Ponds	Permanent loss of one seasonal pond that is prone to drying out	Creation of approximately 25-30 waterbodies located on-site, both as part of the SUDS and through enhancement measures for nature conservation.
Hedgerows	Permanent loss of 1.4km of species- poor hedgerow.	<ol> <li>4km of species-rich hedgerow and standard trees to be planted, comprising native species of local origin.</li> </ol>
Orchids	Potential loss of a small number of common spotted orchids from within the development area.	Orchids within the development area will be translocated to the newly created wildflower meadow.
Off-site stream (Langford Brook)	Changes to drainage and hydrology as a result of the development could result in fluctuating water levels in Langford Brook.	Incorporation of SUDs to stabilise peak flows.
	Increased levels of dust and pollution created during the construction phase of development could damage flora and fauna	Standard pollution prevention measures, as outlined in the Environment Agency's Pollution Prevention Guidelines <sup>38</sup> , will be implemented during the construction phase of the development.

<sup>&</sup>lt;sup>38</sup> The Environment Agency and SEPA (Scottish Environment Protection Agency). Guidelines relevant to this work would include, PPG1 (general), PPG2 (on-site oil storage), and PPG6 (construction activities).

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Potential receptors	Potential changes and effects	Incorporated measure
	contained within the stream.	
Badger	Permanent loss of badger setts and foraging habitat resulting in an	Provision of two artificial setts.
	increased risk of contravening the legislation relevant to badger.	Provision of enhanced areas of habitat for foraging badger including additional planting of fruit and nut bearing trees.
		Provision of green corridors linking badger setts across the Site to the wider countryside.
		Where necessary, sett closures will be carried out under a Natural England badger development licence.
	Disturbance to badgers resulting from increased levels of noise and light during the construction and operational phases of development.	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases. A noise abatement strategy will also be incorporated within the proposed development design during the construction phase.
	Increased risk of persecution of badgers by new local population.	Artificial setts to be located in 'quiet areas' of Graven Hill CWS. Where appropriate, retained setts located in the vicinity of developed areas will be surrounded by dense scrub planting to make them less visible and less accessible to the general public.
Roosting bats	Permanent loss of mixed species maternity roost (common pipistrelle, soprano pipistrelle and noctule bats) and two common pipistrelle summer roosts, resulting in an increased risk of contravening the legislation relevant to this group of species.	Alternative roosting sites for bats will be provided in advance of any works affecting existing roosts. Bat tiles and bat bricks will be incorporated within new commercial buildings to permit access to roof spaces. A total of 30 bat boxes will also be installed in the areas of existing broad-leaved woodland and on mature standard trees where appropriate.
		All work to the existing roost sites will be subject to a Natural England bat mitigation licence.
Foraging bats	Permanent loss of bat foraging habitat.	Retention of bat foraging habitat wherever possible. Increased provision of woodland habitat on-site and construction of new ponds within a mosaic of other habitats providing an optimal foraging resource.
		Incorporation of new green corridors within the scheme design for foraging and commuting bats.
	Disturbance to bats through increased levels of light during the construction and operational phases of the development.	A low level lighting strategy is to be incorporated within the proposed development design to minimise light pollution during both the construction and operational phases.
Dormouse	Permanent loss of small areas of potential dormouse habitat resulting in an increased risk of contravening the legislation relevant to dormice.	Provision of additional areas of broad-leaved woodland and hedgerow incorporating a number of fruit and nut bearing species suitable as a foraging resource for dormice. Existing hedgerows will also be enhanced for dormice through the incorporation of hazel and fruit and nut bearing species. All habitat to be lost will be replaced on a

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Potential receptors	Potential changes and effects	Incorporated measure
		'like for like' basis, and where appropriate a phased approach to the removal of dormouse habitat will be adopted.
		50 dormouse boxes are to be installed within Graven Hill Wood.
		All works affecting potential dormouse habitat will be subject to a Natural England development licence in respect of this species.
	Enhanced connectivity of dormouse habitat.	Provision of green corridors linking areas of dormouse habitat across the Site to the wider countryside.
Great crested newt	Permanent loss of sub-optimal terrestrial and aquatic habitat supporting populations of great crested newts (GCN).	Provision of new areas of optimal aquatic and terrestrial habitat for GCN.
	Increased risk of contravening the legislation relevant to GCN.	All works to be subject to a Natural England GCN mitigation licence detailing appropriate mitigation and enhancement measures.
Reptiles (common lizard and grass snake)	Permanent loss of areas of sub- optimal and optimal reptile habitat.	Creation of areas of optimal habitat for reptile species.
	Disturbance to reptiles through increased levels of light and noise during the construction phase.	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases. Noise abatement strategy to be incorporated within the proposed development design during the construction phase.
	Increased risk of contravening the legislation relevant to common lizard and grass snake.	All works to be subject to a reptile mitigation method statement to be agreed with Natural England and implemented in advance of the works.
	Increased risk of predation by cats originating from new residential areas.	Provision of adequate cover/refugia for reptiles in newly created areas of habitat. Leaflet drop to new residential areas highlighting conflict between cats and wildlife, and suggesting domestic cats wear bells.
Invertebrates	Permanent loss of areas of existing semi-improved grassland, a pond, drainage ditches and hedgerows that provide potential habitat for priority/notable invertebrate species.	Enhancement of semi-improved grassland flanking Graven Hill Wood through the creation of a mosaic of habitats. This will also include additional planting of blackthorn (for brown hairstreak butterflies), creation of a wildflower meadow, rotational management of grassland and the provision of dead wood and log pyramids.
Birds	Disturbance to breeding birds during the construction phase. Increased risk of contravening the legislation relevant to breeding birds.	No vegetation clearance will occur during bird breeding season. Alternatively if this is not possible, vegetation clearance will be supervised by an ecological clerk of works to ensure that no nests are damaged.
	Loss of some bird breeding habitat i.e. semi-improved grassland, hedgerows, coniferous/brod-leaved plantation and standard trees	Enhanced provision of optimal habitat for birds and installation of bird boxes around the Site.



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Potential receptors	Potential changes and effects	Incorporated measure
Recreational users	Public footpaths to be opened within Graven Hill Wood and the grassland that flanks this. This will result in an	Footpaths restricted to northern half of woodland, to ensure 'quiet' areas retained for nature conservation.
	of wildlife amidst the local community.	Provision of wildlife information boards as an educational resource within Graven Hill Wood.
		An integrated recreation and habitat management plan will be written covering Graven Hill Wood CWS and surrounding habitats. This should be written by a suitably qualified ecologist and implemented, with the agreement of, and by, the Oxfordshire Wildlife Trust.

#### Table 12.5 Rationale for incorporation of environmental measures at C Site

Potential receptors	Potential changes and effects	Incorporated measure
Off-site statutory and non-statutory nature conservation sites (excluding Arncott Bridge Meadows SSSI)	Increased levels of dust and pollution created during the construction and operational phases of development could damage sensitive flora and fauna contained within these sites.	Standard pollution prevention measures, as outlined in the Environment Agency's Pollution Prevention Guidelines39, will be implemented during the construction phase of the development.
Arncott Bridge Meadows SSSI	Changes to the drainage and hydrology as a result of the development could result in fluctuating water levels in the River Ray (which flows through the SSSI) and which could be detrimental to the uncommon vegetation that the SSSI supports.	Incorporation of SUDs within the proposed development design.
	Increased levels of dust and pollution created during the construction phase of development could damage sensitive flora contained within this site.	Standard pollution prevention measures, as outlined in the Environment Agency's Pollution Prevention Guidelines40, will be implemented during the construction phase of the development.
Amenity grassland, marginal vegetation associated with drainage ditches and standard trees.	Permanent loss of areas of amenity grassland, marginal vegetation associated with drainage ditches and standard trees.	Enhancement of 7.3ha of retained amenity grassland to create a wildflower meadow situated amidst a mosaic of other habitat types (i.e. scrub and waterbodies). Standard trees will be retained wherever possible. The loss of marginal vegetation associated with the drainage ditches will be more than compensated for through the creation of new marginal vegetation associated

<sup>&</sup>lt;sup>39</sup> The Environment Agency and SEPA (Scottish Environment Protection Agency). Guidelines relevant to this work would include, PPG1 (general), PPG2 (on-site oil storage), and PPG6 (construction activities).

<sup>&</sup>lt;sup>40</sup> The Environment Agency and SEPA (Scottish Environment Protection Agency). Guidelines relevant to this work would include, PPG1 (general), PPG2 (on-site oil storage), and PPG6 (construction activities).

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Potential receptors	Potential changes and effects	Incorporated measure
		with the additional waterbodies and SUDS. This area of habitat (along with the other areas of habitat to be created / enhanced on-site) will be subject to a habitat creation plan and a habitat management plan, to be written by a suitably qualified ecologist and implemented by the MOD.
Badger	Permanent loss of badger foraging habitat. It is hoped that all setts will be retained (albeit this will need to be confirmed at the detailed design stage). Due to the close proximity of	Provision of enhanced areas of habitat for foraging badger including additional planting of broad- leaved plantation containing areas of fruit and nut bearing trees.
	setts to construction areas there is an increased risk of contravening the legislation relevant to this species.	If necessary, sett closures will be carried out under a Natural England badger development licence.
	Disturbance to badgers resulting from increased levels of noise, light and vibration during the construction and operational phases of	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases.
	development.	Noise abatement strategy to be incorporated within the proposed development design during the construction phase.
		Where appropriate, temporary fencing will be installed around setts that are located within 30m of development areas, to prevent construction traffic straying into these areas and damaging setts.
Roosting bats	Permanent loss of two small common pipistrelle summer roosts resulting in an increased risk of contravening the legislation relevant to this group of species.	Alternative roosting sites for bats will be provided (in advance of any works affecting existing roosts), to enhance the future provision of roosting opportunities on-site. This will involve the incorporation of bat bricks and bat tiles within the new office buildings, as well as the installation of 20 bat boxes on mature trees located on-site.
		All work to roosts to be subject to a Natural England bat mitigation licence.
Foraging bats	Permanent loss of bat foraging habitat.	Retention of bat foraging habitat wherever possible. Increased provision of woodland habitat on-site and construction of new ponds within a mosaic of other habitats providing an optimal foraging resource.
	Disturbance to bats through increased levels of light during the construction and operational phases of the development.	Low level lighting strategy to be incorporated within the proposed development design to minimise light pollution during both the construction and operational phases.
Great crested newt	Permanent loss of sub-optimal terrestrial and aquatic habitat supporting populations of great crested newts (GCN).	Provision of new areas of optimal aquatic and terrestrial habitat for GCN.
	Increased risk of contravening the legislation relevant to GCN.	All works to be subject to a Natural England GCN mitigation licence detailing appropriate mitigation and enhancement measures.
Dormouse	Enhanced provision of dormice habitat.	Provision of additional areas of broad-leaved plantation incorporating a number of fruit and nut bearing species suitable as a foraging resource for



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Potential receptors	Potential changes and effects	Incorporated measure
		dormice.
	Enhanced connectivity of dormouse habitat.	Incorporation of arboreal links and woodland planting within the proposed development design linking existing isolated populations of dormice with the wider landscape.
Invertebrates	Permanent loss of areas of grassland, standard trees and drainage ditches that could provide habitat for notable invertebrate species.	Enhancement of amenity grassland in the southern section of the Site to create a wildflower meadow and a mosaic of habitats for invertebrate species. This will include the provision of dead wood and log pyramids.
Birds	Disturbance to breeding birds during the construction phase.	uring No vegetation clearance will occur during bird breeding season (March-August inclusive).
	Increased risk of contravening the legislation relevant to breeding birds.	clearance will be supervised by an ecological clerk of works to ensure that no nests are damaged.
	Loss of some bird breeding habitat i.e. amenity grassland and standard trees	Enhanced provision of optimal habitat for birds and installation of bird boxes around the Site.

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#### Further survey requirements as part of the environmental measures

- Development of Graven Hill is scheduled to commence in 2015 (and is due to be 12.5.2 completed in 2028), whereas construction work will commence in 2013 at C Site and last for a period of two years. Many species of fauna are highly mobile and transient and as such, due to the lengthy period between the completion of the surveys and the onset of works, there will be the requirement to undertake survey work prior to the commencement of construction work and potentially (particularly at Graven Hill), during the construction phase. This will likely include:
  - pre and during construction checks for new badger setts;
  - survey work to inform applications to Natural England for European Protected Species Mitigation licences (specifically for bats, dormouse and GCN); and
  - vegetation checks for nesting birds.

#### 12.6 Assessment methodology

#### Methodology for identifying potential receptors and prediction of effects

- This section details the approach to identifying receptors that could be significantly 12.6.1 affected by the proposed development.
- 12.6.2 The EIA process was undertaken in parallel to the process of proposed development design with a view to minimising the adverse ecological effects of the proposed development and, where possible, delivering benefits for biodiversity. Desk study data collection and survey work were carried out as part of the EIA process, with the

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objective of ensuring that sufficient data were collected to identify the designated sites, and habitat areas and species that could be significantly affected by the proposed development, and then to inform the assessment of effects on these potential biodiversity receptors.

12.6.3 The area for which biological data were collected was based on an assessment of the ecological zone of influence of the development (i.e. the area that could be affected by the development within which there is the potential for significant ecological effects). The starting point was that significant effects on nationally designated nature conservation sites were unlikely to occur over 5km from the Site's boundary, whilst significant effects on priority habitats (over 1km away) and priority species (over 2km away) were unlikely to occur. Desk study data were collected for this area (see section 12.3), whilst field surveys focused on the Site of the proposed development; the specification for the latter surveys were defined through an initial extended Phase 1 habitat survey (see Appendix J).

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- 12.6.4 The next stage of the assessment was to determine which, if any, of the Sites, habitats and species within the zone of influence (referred to in this ES as 'potential biodiversity receptors') had the potential to be significantly affected by the proposed development (see section 12.7). A high level 'scoping' assessment was then undertaken (see section 12.7) to differentiate effects that were sufficiently likely to be significant as to merit more detailed assessment from those that were not likely to be significant (known as 'scoped-out' effects).
- 12.6.5 Reflecting the iterative nature of the EIA and proposed development design processes, there was the potential at any stage during the assessment process for the findings to have implications for the proposed development design and for data gathering or assessment at an earlier stage. The results of the assessment, as set out in the remainder of this chapter, reflect the potentially significant effects associated with the final proposed development design.
- 12.6.6 The assessment of how the potential biodiversity receptors are likely to be affected by the environmental changes associated with the proposed development is based not only upon the results of the desk study and field surveys, but also on published information, as appropriate, on the potential biodiversity receptors' status, distribution, sensitivity to these changes, biology, and knowledge of ecological processes and functions.

#### Significance evaluation methodology

- 12.6.7 As part of the high level assessment reported in section 12.7, the conclusion about whether effects are sufficiently likely to be significant as to merit more detailed assessment is informed by a judgement about whether:
  - the site, habitat or species population is of sufficient quality or size that an effect upon it could be significant; and
  - the environmental changes associated with the development are such that there is the potential for a significant effect to occur (i.e. for the integrity of a site or for the

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conservation status of a habitat area or species population to be affected (IEEM, 2006)).

12.6.8 If the answer to both of these questions is yes, the relevant receptor is subject to more detailed assessment (see section 12.8 and subsequent sections) and the significance of effects is evaluated based on the methodology that is outlined below. However, in some cases, a receptor may be taken through for more detailed assessment even when the answer to one or both of the above questions is 'no', with this reflecting the need for a more detailed justification for the 'no' answer than could be provided in the high level assessment in section 12.7.

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#### **Negative Effects**

12.6.9 For habitat areas and species, an effect is assessed as being significant if the favourable conservation status of the specified biodiversity receptor is compromised by the proposed development. Conservation status is defined by the IEEM (2006) as follows:

"for habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the longterm survival of its typical species within a given geographical area; and

for species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area".

- 12.6.10 The decision as to whether the conservation status of the specified biodiversity receptor has been compromised has been made using professional judgement drawing upon the results of the assessment of how each receptor will be affected by the proposed development.
- 12.6.11 A similar procedure has been used for designated sites that are affected by the development, except that the focus is on the effects on the integrity<sup>41</sup> of each site, defined as "the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified".

#### **Positive Effects**

12.6.12 A positive effect is assessed as being significant if development activities are predicted to cause:

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<sup>&</sup>lt;sup>41</sup> The term 'integrity' was first adopted for assessing effects on biodiversity within the context of Appropriate Assessments for European wildlife sites, as required under the Habitats Directive. The principle of integrity in terms of the structure and function of sites is, however, equally relevant to designated sites that are not European sites. For this reason, the term was adopted by IEEM (2006) in its Guidelines for Ecological Impact Assessment in the United Kingdom.

- an improvement in the condition of a habitat/species population from unfavourable to unfavourable recovering or favourable condition data are only available for SSSIs but professional judgement has been used to apply the same principle to habitats/species elsewhere; or
- partial or total restoration of a site's favourable condition.
- 12.6.13 If a species population, habitat or site is already in favourable condition, it is still possible for there to be a significant positive effect. There is, however, no simple formula for determining when such effects are significant. In such cases, decisions about significance have therefore been made on a case by case basis. A justification is provided as to why the decision has been reached.

# **12.7** Scope of the assessment

#### Potential biodiversity receptors

- 12.7.1 The assessment of the ecological zone of influence of the development concluded that the development would be likely to result in changes in the extent and/or condition of the existing land cover on the Sites, with potential effects on habitats and species on the Site. There is also the potential for effects on any areas that adjoin the Sites, where their fauna might make use of the land cover on the Sites.
- 12.7.2 The potential for off-site changes in noise and dust deposition was also assessed. It was concluded that, with the dust control measures that have been built into the proposed development proposals, which are important for avoiding significant effects on people as well as biodiversity, there is no likelihood of significant effects associated with dust (see chapter 7). Changes in noise levels could, though, affect any sensitive bird or mammal populations in close proximity to the Site. The zone of influence for such changes will depend upon the species that could be affected but would be unlikely to extend beyond 500m.
- 12.7.3 In summary, therefore, the ecological zone of influence of the development is defined as:
  - the site of the proposed development (fauna and flora);
  - habitats adjoining the Site (fauna);
  - up to a 500m radius from the Site (noise-sensitive birds and mammals only); and
  - watercourses that are located within 500m, that are hydrologically linked to the Site.
- 12.7.4 As a basis for determining which biodiversity receptors need to be assessed within the zone of influence of the development, IEEM's guidelines (IEEM, 2006) recommend that consideration be given to the biodiversity conservation value of the Sites, habitats



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and species that occur within the zone (as appropriate). The guidelines also refer to the need to consider the legal status<sup>42</sup> that is afforded to some species.

- 12.7.5 Legal status (see Box 1.1 in the Baseline Biodiversity Report in Appendix J) needs to be considered because all developments must comply with the requirements of the law. By implication, therefore, there cannot be significant effects as a result of non-compliance with the law. However, it should be noted that, notwithstanding legal requirements, there is the potential for some legally protected species to be significantly affected in relation to their biodiversity conservation value or because of the potential for the changes in their populations caused by a development to have significant socio-economic effects (see below).
- 12.7.6 In relation to biodiversity conservation value, only those designated sites, habitat types and species that fall within one or more of the categories defined in Box 1.1 of the Baseline Biodiversity Report (see Appendix J) are of sufficient importance that they could be significantly affected by the proposed development.
- 12.7.7 The IEEM guidelines (IEEM, 2006) also recommend that consideration be given to the socio-economic role that is played by biodiversity (e.g. relating to the enjoyment of flora and fauna by the public). In this case, people are the receptors rather than biodiversity, but information is needed about how the relevant species and habitats are likely to change as a result of the development in order that the effects on people can be assessed.
- 12.7.8 Drawing upon the biological data assembled for the purposes of this EIA (see section 12.3), the potential receptors in relation to the proposed development are listed in Table 12.6 for Graven Hill and 12.7 for C Site, together with the rationale for their inclusion, relating to biodiversity conservation value, legal status and socio-economic value.

Table 12.6	Potential receptors at Graven H	lill
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Potential receptor	Rationale	Legal protection
Arncott Bridge Meadows (SSSI), Wendlebury Meads and Mansmor Closes (SSSI), Stratton Audley Quarries (SSSI), Otmoor (SSSI), Bure Park (LNR)	Biodiversity conservation value Legal status	Off-site statutory designated sites
Graven Hill Wood (CWS)	Biodiversity conservation value	On-site non-statutory designated sites
Bicester Wetland Reserve (CWS) and Meadows north-west of Blackthorn Hill CWS	Biodiversity conservation value	Off-site non-statutory designated site

<sup>42</sup> Legal status is used in this report to cover legally protected and controlled species.



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Potential receptor	Rationale	Legal protection
On-site ancient woodland (Graven Hill Wood)	Biodiversity conservation value	UK BAP priority habitat
On-site wet woodland	Biodiversity conservation concern	UK and Oxfordshire BAP priority habitat
On-site secondary broad-leaved woodland and plantation	Biodiversity conservation value	UK BAP priority habitat (Lowland Mixed Deciduous Woodland)
Other valued on-site habitats (ponds and hedgerows).	Biodiversity conservation value	UK, Oxfordshire and Cherwell BAP priority habitats
Badger	Legal status	Protection of Badgers Act 1992
Common pipistrelle bat	Biodiversity conservation value	UK BAP priority species
	Legal status	Oxfordshire LBAP priority species
		Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Soprano pipistrelle bat	Biodiversity conservation value	Wildlife and Countryside Act 1981
	Legal status	Habitats Regulations 2010
Noctule bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Serotine bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Leisler's bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
<i>Myotis</i> sp. bat	Biodiversity conservation value	Wildlife and Countryside Act 1981
	Legal status	Habitats Regulations 2010
Daubenton's bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Dormouse	Biodiversity conservation value	UK BAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Polecat	Biodiversity conservation value	UK BAP priority species
	Legal status	Wildlife and Countryside Act 1981

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**Potential receptor** Rationale Legal protection GCN Biodiversity conservation value UK BAP priority species Legal status Wildlife and Countryside Act 1981 Habitats Regulations 2010 Common lizard Biodiversity conservation value Wildlife and Countryside Act 1981 Legal status Grass snake Biodiversity conservation value Wildlife and Countryside Act 1981 Legal status Notable/priority invertebrates Biodiversity conservation value Nationally scarce species, near threatened species, red data book species, previously believed to be extinct species and species that are new to Britain or science or both. Notable/priority birds Biodiversity conservation value UK BAP priority species Wildlife and Countryside Act 1981 Legal status All nesting birds Legal status Wildlife and Countryside Act 1981 Residents of adjoining and nearby Socio- economic value properties

#### Table 12.7 Potential receptors at C Site

Potential receptor	Rationale	Legal protection
Muswell Hill (SSSI), Whitecross Green and Oriel Woods (SSSI), Arncott Bridge Meadows (SSSI), Otmoor, Wendlebury Meads and Mansmoor Closes (SSSI), Long Herdon Meadow (SSSI) and Shabbington Woods Complex (SSSI)	Biodiversity conservation value Legal status	Off-site statutory designated sites
Meadows south of River Ray (CWS), Arncott Wood (CWS), Bicester Garrison Site Local Wildlife Site (LWS)	Biodiversity conservation value	Off-site non-statutory designated sites
River Ray	Biodiversity conservation value	UK BAP priority habitat
Badger	Legal status	Protection of Badgers Act 1992
Common pipistrelle bat	Biodiversity conservation value	UK BAP priority species
	Legal status	Oxfordshire LBAP priority species
		Wildlife and Countryside Act 1981
		Habitats Regulations 2010



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Potential receptor	Rationale	Legal protection
Soprano pipistrelle bat	Biodiversity conservation value	Wildlife and Countryside Act 1981
	Legal status	Habitats Regulations 2010
Noctule bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Serotine bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Leisler's bat	Biodiversity conservation value	Oxfordshire LBAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Dormouse	Biodiversity conservation value	UK BAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
GCN	Biodiversity conservation value	UK BAP priority species
	Legal status	Wildlife and Countryside Act 1981
		Habitats Regulations 2010
Prioirity invertebrates	Biodiversity conservation value	Nationally scarce species, near threatened species and red data book species.
Priority breeding birds	Biodiversity conservation value	UK BAP priority species
	Legal status	Wildlife and Countryside Act 1981
All nesting birds	Legal status	Wildlife and Countryside Act 1981

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#### Potentially significant effects - Graven Hill

- 12.7.9 The following receptors at Graven Hill are taken forward for detailed assessment on the basis that effects upon them are sufficiently likely to be significant as to merit more detailed assessment:
  - Graven Hill Wood CWS (ancient woodland) (see section 12.8);
  - Bicester Wetland Reserve CWS (see section 12.9);
  - badger (see section 12.10);
  - bats which roost on-site (see section 12.11);
  - foraging bat species (see section 12.12);

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- dormouse (see section 12.13);
- GCN (see section 12.14); and
- reptiles (common lizard and grass snake) (see section 12.15).
- 12.7.10 The other receptors that are listed in Table 12.6 are 'scoped-out' as, on the basis of a high level assessment, it has been concluded that they are not likely to be significantly affected by the proposed development. The rationale for this conclusion in respect of each is outlined below.
  - Potential effects on off-site statutory nature conservation sites: The statutory nature conservation sites within 5km of the Site boundary are designated as a result of the sensitive vegetation communities that they support. All of these sites are situated in excess of 1.6km from the Site boundary and are separated from it by areas of arable land and residential properties. None are hydraulically linked to the development area. Due to their distance from the Site and the dust abatement and pollution prevention measures incorporated into the proposed development (see section 12.5, chapter 7 (air quality) and 13 (water resources) as well as Table 3.3) there will be no significant effects on these sites.
  - Potential effects on Meadows north-west of Blackthorn Hill CWS: This site is designated as a non-statutory nature conservation site as it comprises flower-rich hay meadows. It is located 1km from the Site boundary and is separated from it by areas of arable land. The CWS is not hydraulically linked to the development area. Due to its distance from the Site and the dust abatement and pollution prevention measures incorporated into the proposed development (see section 12.5, chapter 7 (air quality) and 13 (water resources) as well as Table 3.3), there will be no significant effects on this site.
  - Potential effects on the area of wet woodland: Wet woodland is a UK and Oxfordshire BAP priority habitat. Changes made to the hydrology and drainage of the Site could dry out this area of wet woodland. With this in mind the drainage scheme has been designed to ensure that the area of wet woodland on-site still receives sufficient ground and surface water to sustain this type of habitat. As such, no significant negative effects on the wet woodland on-site are likely.
  - Permanent loss of coniferous and broad-leaved plantation: Plantation extending to 3.61ha is to be permanently lost to the proposed development. The majority of this is coniferous plantation, with the balance comprising willow (*Salix sp.*). The areas of plantation to be lost are of low intrinsic biodiversity value on account of their limited size, relative isolation, recent origin and species-poor ground flora. It is therefore concluded that these areas of plantation are of insufficient value for an effect upon them to be significant. Notwithstanding this, environmental measures have been designed into the proposed development to off-set the loss of plantation habitat, with the proposed creation of a block of broad-leaved woodland measuring 1.9ha located to the south of the coniferous plantation and an additional 8.2ha of woodland planting, as three new woodland blocks, across the Site as a whole (see Figure 12.1).







- Permanent loss of hedgerows: Hedgerows (1.4km) will be lost to the proposed development. Although hedgerows are a UK BAP priority habitat, the hedgerows to be lost to the development are species-poor, gappy and support an impoverished hedgebank flora. It is therefore concluded that the hedgerows to be lost are of insufficient value for an effect upon them to be significant. Notwithstanding this, environmental measures have been designed into the proposed development to offset the loss of hedgerows, with the proposed creation of 1.4km of species-rich hedgerow, comprising native species derived from local stock. Green corridors have also been incorporated into the proposed development design, such that the overall coverage of hedgerow habitat as well as the connectivity of different habitat types and areas across the landscape will be enhanced.
- Permanent loss of pond: One, seasonally dry, pond will be permanently lost to the proposed development. Although ponds are a UK BAP priority habitat, this pond is of low intrinsic biodiversity value on account that it rarely holds water and supports only minimal amounts of aquatic and marginal vegetation. It is therefore concluded that this pond is of insufficient value for an effect upon it to be significant. Notwithstanding this, environmental measures have been designed into the proposed development to off-set the loss of the pond, with the proposed creation of between 25-30 new waterbodies located on-site, designed as part of SUDS or for nature conservation purposes. As such, the amount of pond and marginal habitat located on-site will substantially increase, representing a net 'gain' to biodiversity.
- Potential effects on Langford Brook (off-site): This off-site stream runs at its closest point approximately 40m from the closest area of works, albeit the majority of the stream is located between 100-200m away from the Site boundary. Although streams are a UK BAP priority habitat, this stream has been subject to intensive dredging and modification in part. This said, it still constitutes a valued habitat on the basis that forms part of the wider hydrological system that flows beyond the Site and can therefore also act a wildlife corridor. As such environmental measures designed to protect and enhance the stream habitat have been incorporated within the proposed development design. SUDS waterbodies will intercept the increased levels of run-off (likely arising through the increased coverage of impermeable surfaces arising through development), and act as a slow release mechanism, meaning that although the same amount of water will reach Langford Brook, it will be held back on-site in ponds and released to the brook more slowly (for information on flow rates see Table 4.6 of the Drainage Strategy (ref. BIC/OPA/DOC/15)). In terms of sustaining the flora and fauna associated with Langford Brook, this could be positive. Mindful of this and the dust abatement and pollution prevention measures incorporated within the proposed development design (see section 12.5) there will be no significant negative effects on Langford Brook.
- Loss of on-site habitat that supports priority and notable invertebrate species: The invertebrate survey concluded that the most important area of habitat for invertebrates on the Site is Graven Hill Wood, which is ancient woodland. This will be retained in its entirety and a new block of broad-leaved woodland

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measuring 1.9ha will be planted to the south of the coniferous plantation, linking Graven Hill Wood to a small broad-leaved copse. The over-all coverage of broadleaved woodland on-site will be increased by 8.2ha, as a result of the measures included within the proposed development design, a measure that will be beneficial to invertebrates. The next most important habitat for invertebrates on-site is the semi-improved grassland fields that flank Graven Hill Wood. In total there is approximately 61ha of species-poor, semi-improved grassland on-site, of which 32.4ha will be permanently lost to the development. Of the remaining semiimproved grassland to be retained, 10.8ha will be subject to measures designed to enhance the provision of habitat for invertebrates (as well as other legally protected and priority species). These will include additional planting of blackthorn (Prunus spinosa) scrub as a food source for brown hairstreak butterflies, as well as the creation of a wildflower meadow, rotational management of grassland, the creation of additional waterbodies and the provision of log piles and dead wood. Additionally, the majority of the semi-improved grassland foraging habitat to be lost will replaced by residential areas with gardens which will provide a substantial suitable foraging resource for invertebrate. Although the overall coverage of invertebrate habitat will be reduced, the quality of the remaining habitat will be enhanced and managed in perpetuity through recommendations made in the habitat creation and management plans (covering both Graven Hill CWS and the newly created mosaic of habitats). As such, no significant negative effects on notable invertebrate species are likely.

- Potential effects on priority and notable birds due to loss of/changes in on-site habitats: The breeding bird survey identified the presence of the following legally protected/notable/priority bird species occurring on-site. These are skylark (Alauda arvensis), song thrush (Turdus philomelos), starling (Sturnus vulgaris), linnet (Acanthis cannabina), bullfinch (Pyrrhula pyrrhula), red kite (Milvus milvus), barn owl (Tyto alba), dunnock (Prunella modularis), marsh tit (Parus palustris), kestrel (Falco tinnunculus), stock dove (Columba oenas), green woodpecker (Picris viridis), swallow (Hirundo rustica), mistle thrush (Turdus viscivorus), whitethroat (Sylvia communis) and willow warbler (Phylloscopus trochilus). Notwithstanding the potential for these species to continue breeding onsite during construction and subsequently, these species are still sufficiently common in Oxfordshire that any effects on the single pairs that were recorded on/adjacent to the Site will not be significant. Furthermore, additional planting of trees and scrub, (including those that are fruit bearing) and the installation of bird boxes on-site will enhance the food sources and nesting opportunities available onsite.
- Potential disturbance to breeding birds during the construction phase: To avoid contravention of the *Wildlife and Countryside Act 1981* (as amended) in relation to disturbance of breeding birds, vegetation removal will only take place outside the bird-breeding season or if surveys have confirmed that no birds are breeding in the areas to be cleared.
- Loss of habitat for other priority species: Although the Site provides habitat that could support populations of other notable species (e.g. species of principal







importance such as hedgehog and polecat (Mustela putorius), the type and quantity of habitat to be developed is such that it is unlikely that these will occur in sufficient numbers that development of the Site will result in any negative effects on the conservation status of these species. Notwithstanding this, environmental measures which include the planting of new areas of broad-leaved woodland and the creation of waterbodies amidst a mosaic of habitats will compensate for these losses.

Socio-economic effects: The more 'visible' species that occur on the Site are likely to enhance the quality of life of people living in the vicinity of the Site, who may enjoy looking at them, for example the orchids and bird species that occur on-site. Given that many areas of semi-natural vegetation on the Site will be retained (and enhanced from a biodiversity perspective) it is likely that many of the species that nearby residents enjoy will continue to be visible to them. In addition, the provision of public access to Graven Hill Wood will provide the opportunity for local people to see more of the Site's wildlife (mindful that the Site is not currently available for public access), as well as provide other benefits relating to the availability of accessible natural greenspace. Pathways with wildlife education boards are also to be installed throughout the CWS and adjoining enhanced areas of semi-improved grassland, providing a wildlife education resource. The net effect of these changes is expected to be an enhancement of the social benefits that the Site delivers, specifically in relation to biodiversity, although it is assessed that this is not likely to be significant. The recreational use of Graven Hill Wood CWS and the surrounding habitats will be managed through the implementation of an integrated recreation and habitat management plan.

#### Potentially significant effects - C Site

- The following receptors at C Site are taken forward for detailed assessment on the 12.7.11 basis that effects upon them are sufficiently likely to be significant as to merit more detailed assessment:
  - Arncott Bridge Meadows SSSI (see section 12.16);
  - badger (see section 12.17);
  - roosting bats (see section 12.18);
  - foraging bats (see section 12.19);
  - GCN (see section 12.20); and
  - dormouse (see section 12.21).
- The other receptors that are listed in Table 12.7 are 'scoped-out' as, on the basis of a 12.7.12 high level assessment, it has been concluded that they are not likely to be significantly affected by the proposed development. The rationale for this conclusion is outlined below.

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- Potential effects on off-site statutory nature conservation sites: The statutory nature conservation sites located within 5km of the Site boundary are designated as a result of the vegetation communities that they support. With the exception of Arncott Bridge Meadows SSSI (which is considered separately), all of these sites are situated in excess of 3km from the Site boundary and are separated from it by areas of arable land and residential properties. Due to their distance from the Site and the dust abatement and pollution prevention measures incorporated into the proposed development (see section 12.5, chapters 7 (air quality) and 13 (water resources) and table 3.3), no significant negative effects on these sites are likely.
- Potential effects on off-site non-statutory nature conservation sites: All three nonstatutory nature conservation sites are designated as a result of the vegetation communities that they support. The closest of these, Bicester Garrison LWS is located 240m away from the Site boundary and is separated from it by an area of rough grassland and scrub. Dust abatement and pollution prevention measures are incorporated into the proposed development (see section 12.5, chapters 7 (air quality) and 13 (water resources) and table 3.3) and as a result there will be no significant effects on any of these sites.
- Potential effects on the River Ray (off-site): The River Ray runs at its closest point approximately 40m from the Site boundary and approximately 250m from the closest area of works. Much of the river has been over widened and deepened this said, the river is valued on the basis that it forms part of the wider hydrological system that flows across the landscape acting as a wildlife corridor. Additionally, the banks of the River Ray support BAP priority species (i.e. tubular dropwort) and as such the River Ray itself qualifies as a priority BAP habitat<sup>43</sup>. Dust abatement and pollution prevention measures have been incorporated within the proposed development design to protect the river habitat and the priority species that it supports. Furthermore, it has been confirmed by the drainage and hydrology specialists that an overall reduction of 20% in the 'peak flow of the Site' (see water resources chapter 13) is to be achieved through the installation of SUDS (as requested by the Environment Agency). SUDS waterbodies will intercept the increased levels of run-off (created as a result of the increased coverage of impermeable surfaces within the development), and act as a slow release mechanism, meaning that although the same amount of water will reach the River Ray, it will be held back on-site in ponds and be released more slowly (for information on flow rates see Table 4.7 of the C Site Drainage Strategy (ref. BIC/OPA/DOC17)). In terms of sustaining the flora and fauna associated with River Ray, this could be beneficial. Mindful of this and the dust abatement and pollution prevention measures incorporated within the proposed development design (see section 12.5) there will be no significant negative effects on the River Ray.
- Loss of on-site habitat that supports priority invertebrate species: The invertebrate survey concluded that there are five species of notable invertebrate species on-site.

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<sup>&</sup>lt;sup>43</sup> UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

These species are associated with the natural pond and woody scrub in the northern section of the Site, as opposed to the 13ha of amenity grassland and standard trees that are to be lost to the proposed development. To compensate for this loss 7.3ha of amenity grassland and standard trees in the southern section of the Site are to be subject to enhancement proposals. This will include additional planting of blackthorn scrub as a food source for brown hairstreak butterflies, the creation of a wildflower meadow, rotational management of grassland, the creation of additional waterbodies and the installation of log piles and dead wood within this area. Overall, although the coverage of sub-optimal invertebrate habitat will be marginally reduced, the quality of the remaining habitat will be enhanced, such that no negative significant effects on priority and notable invertebrate species are likely.

- Potential effects on priority and notable birds due to loss of/changes in on-site habitats: The breeding bird survey identified the presence of the following notable birds occurring on-site: skylark, song thrush, starling, house sparrow, linnet and bullfinch, barn owl, dunnock, kestrel, stock dove, green woodpecker, swallow, house martin, mistle thrush, whitethroat and willow warbler. Notwithstanding the potential for these species to continue breeding on-site during construction and subsequently, these species are still sufficiently common in Oxfordshire that any effects on the single pairs that were recorded on/adjacent to the Site will not be significant. Furthermore, additional planting of trees and scrub, (including those that are fruit bearing) and the installation of bird boxes on-site will enhance the food sources and nesting opportunities available on-site.
- Potential disturbance to breeding birds during the construction phase: To avoid contravention of the *Wildlife and Countryside Act 1981* (as amended) in relation to disturbance of breeding birds, vegetation removal will only take place outside the bird-breeding season or if surveys have confirmed that no birds are breeding in the areas to be cleared.
- Loss of habitat for other priority species: Although the Site provides habitat that could support populations of other notable species (e.g. species of principal importance such as hedgehog and toad), the type and quantity of habitat to be developed is such that it is unlikely that these will occur in sufficient numbers that development of the Site will result in any adverse effects on the conservation status of these species.

# 12.8 Assessment of effects: Graven Hill Wood CWS (Graven Hill)

#### **Baseline conditions**

#### **Current baseline**

12.8.1 This CWS site is located in the central area of the proposed development. It comprises an area of ancient woodland with a pedunculate oak (*Quercus robur*)/ash





(*Fraxinus excelsior*) canopy and understorey of hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna agg.*), spindle (*Euonymus europaeus*) and wayfaring-tree (*Viburnum lantana*). Ground flora includes bluebell (*Hyacinthoides non-scripta*), dog's mercury (*Mercuralis perennis*), wood anemone (*Anemone nemorosa*), primrose (*Primula vulgaris*) and yellow archangel (*Lamiastrum galeobdolon*). Birds of conservation interest noted on-site include willow warbler and grasshopper warbler (*Locustella naevia*). The site is managed by the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) and there is currently no public access. This site is of county importance for nature conservation, as indicated by its non-statutory nature conservation designation.

#### **Future baseline**

12.8.2 In the absence of the proposed development, it is likely that Graven Hill CWS will continue to be managed by the BBOWT and will remain in a similar condition to that which currently exists.

#### Predicted effects and their significance

- 12.8.3 In the absence of environmental measures incorporated within the proposed development design, the construction phase of the proposed development could result in increased levels of dust, noise and light pollution, as well as an increased risk of pollution incidents, which could adversely affect the sensitive flora and fauna that this CWS supports. As such, a pollution prevention strategy will be devised and agreed with Natural England prior to the commencement of works and incorporated into the Construction Environmental Management Plan (CEMP) (see chapter 3). This will incorporate the measures set out in the Environment Agency's Pollution Prevention Guidelines (see section 12.5). Additionally, a low level lighting strategy will be incorporated within the proposed development design so as to minimise operational effects on sensitive fauna that the CWS supports arising through increased levels of lighting.
- 12.8.4 The proposed residential areas will result in an increase in the immediate population of approximately 5000 people by the year 2028. In order to increase the provision of recreational space for this population, public access will be granted to parts of the CWS and the surrounding habitats. This will inevitably result in increased levels of disturbance to flora and fauna within the CWS. In order to manage the levels of disturbance experienced, access will be restricted to a network of public footpaths through the northern part of the woodland. No access will be permitted to the southern half of the woodland, which will be retained as a 'quiet' area, retained specifically for nature conservation. The footpaths within the woodland will not be surfaced or fenced however signs will be installed requesting that recreational users remain on the paths and that their dogs are kept on leads to help minimise disturbance to wildlife. A number of green corridors have been incorporated within the proposed development design (mainly comprising woodland planting) that will link this area of woodland, which is located in the centre of the Site, to the wider landscape, thus promoting species interchange across the landscape unit.

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- 12.8.5 Graven Hill will be retained in its entirety, along with areas of the semi-improved grassland that flank the northern part of the woodland. Furthermore, an additional 1.9ha of broad-leaved woodland will be planted on the two areas of semi-improved grassland that currently separate Graven Hill Wood from the coniferous woodland to the north. Areas comprising 10.8ha of species-poor, semi-improved grassland that flank Graven Hill Wood CWS will be enhanced to create a mosaic of habitats including a wildflower meadow, scrub and waterbodies. These measures, together with the expansion of the woodland, can be seen as a contribution to the conservation objectives set within the Ray Conservation Target Area whereby the increased coverage of both lowland meadow and broad-leaved and mixed deciduous woodland is desired.
- 12.8.6 A habitat creation plan detailing the environmental measures to be incorporated within detailed design of the proposed development will be written by a suitably qualified ecologist at the reserved matters stage of the development. This will provide a detailed specification of the habitats to be created, together with a programme of works. It is likely that this will be implemented by the developer. Additionally an integrated recreation and habitat management plan covering Graven Hill Wood CWS and the newly created areas of habitats will also be written by a suitably qualified ecologist, and subsequently implemented. It is likely that an agreement with the BBOWT would be made whereby the Wildlife Trust are responsible for the long term management of the habitats and species on-site into perpetuity, albeit this will require funding. This will set out management practices designed to manage optimal areas of habitat for legally protected and priority species including badgers, roosting and foraging bats, dormouse, polecat, GCNs, reptiles, invertebrates and breeding birds.
- 12.8.7 Overall it is concluded that there will be no significant negative effect on Graven Hill Wood, instead the over all coverage of Graven Hill Wood will increase by 7% which will result in a 'gain' to biodiversity in the immediate area.

# 12.9 Assessment of effects: Bicester Wetland Reserve CWS (Graven Hill)

#### **Baseline conditions**

#### **Current baseline**

- 12.9.1 This site comprises wet grassland maintained as a result of an outfall from the adjacent Bicester Sewage Treatment Works (STW). There is also a drier field and a small area of reedbed. The citation for this site states that the Site is important for overwintering wildfowl and supports a number of birds of conservation concern: including teal (*Anas crecca*), pochard (*Aythya farina*), gadwall (*Anas strepera*), pintail (*Anas acuta*), wigeon (*Anas penelope*), snipe (*Gallinago gallinago*) and water rail (*Rallus aquaticus*).
- 12.9.2 Wetland plant species recorded on-site include purple loosestrife (*Lythrum salicaria*), wild angelica (*Angelica sylvestris*), water figwort (*Schrophularia auriculata*), common reedmace (*Typha latifolia*), celery-leaved water crowfoot (*Ranunculus*)

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sceleratus), water mint (Mentha aquatica), water chickweed (Myosoton aquaticum), redshank (Persicaria maculosa), reed canary-grass (Phalaris arundinacea), common reed (*Phragmites australis*), reed sweet-grass (*Glyceria maxima*), jointed rush (*Juncus* articulatus), soft rush (Juncus effusus), hard rush (Juncus inflexus) and false fox sedge (Carex obtrubae).

#### **Future baseline**

12.9.3 In the absence of the proposed development, it is likely that provided the ground conditions remain unaltered by the STW outfall, the reserve will continue to exist in a similar condition.

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#### Predicted effects and their significance

- 12.9.4 There is the potential that changes to the drainage and hydrology of the development site could have negative effects on the water levels at Bicester Wetland Reserve which is located 40m from the Site boundary. The Drainage Strategy (BIC/OPA/DOC/15) has identified that there will be an overall reduction of 20% in peak flow from the Site (see water resources chapter 13, Drainage Strategy and Flood Risk Assessment (Appendix K.2 of this ES) for further details of this) is to be achieved through the installation of SUDS, this will not affect Bicester Wetland Reserve, the water levels of which are maintained as a result of an outfall from the STW, not by site drainage or run-off.
- 12.9.5 A pollution prevention strategy designed to minimise the risk of pollution incidents will be devised and agreed with Environment Agency prior to the commencement of works and incorporated into the CEMP. This will incorporate the measures set out in the Environment Agency's Pollution Prevention Guidelines (see section 12.5) to protect the sensitive wetland flora within the CWS against effects associated with increased levels of dust deposition and risk of pollution incidents. A low level lighting strategy will also be adhered to, designed to minimise the effects of light on the populations of overwintering birds that this site supports, during construction and operational phases. A noise abatement strategy will also be incorporated during the construction phase. Overall it is concluded that, through the implementation of these measures, no significant negative effects on Bicester Wetland Reserve are likely.

# 12.10 Assessment of effects: Badger (Graven Hill)

#### **Baseline conditions**

#### **Current baseline**

12.10.1 The survey work undertaken by AMEC between February and April 2011 identified the presence of twenty-two badger setts located within the Graven Hill survey area. These comprise two main setts along with 19 other setts. A bait marking survey showed that these setts were inhabited by at least two social groups. Furthermore, with the exception of one disused outlying sett, all of the setts displayed signs of 'current use' by badgers and consequently all of these structures are afforded

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protection under the *Protection of Badgers Act 1992*. Full details of the size and level of activity of all the setts recorded are provided in the confidential badger annex (see Appendix J).

12.10.2 The site contains an abundance of foraging habitat including the broad-leaved woodland and plantation, coniferous plantation, scrub, semi-improved grassland, tall ruderal vegetation, hedgerows, marginal vegetation associated with the drainage ditches and the amenity grassland.

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#### **Future baseline**

12.10.3 In the absence of development, it is expected that the resident badger population will continue to utilise the Site for its habitat requirements at a similar level.

#### Predicted effects and their significance

- The bait marking survey identified the presence of two social groups of badger 12.10.4 utilising the Graven Hill site. Within social group 2's territory, the main sett, annexe sett and two outlying setts will be retained. However, six of this group's outlying setts are situated within and immediately adjacent to the development footprint and are therefore expected to require closure. Badgers use several different setts within their territory, for a number of different purposes so damage or disturbance to just one or two setts in their territory will not necessarily have a negative effect on the badger population (this rule does not generally apply to main setts). Thus, it is the use and availability of alternative setts that largely determines the severity of the effect that sett damage or disturbance will have. Without measures to mitigate effects, the closure of these six setts is likley to be significant for this group. In order to compensate for the loss of setts, two artificial setts are to be constructed in the 'quiet area' of Graven Hill Wood (where no public access is permitted). The artificial setts will be constructed at least six months in advance of the sett closures in accordance with Natural England guidance (English Nature, 2002) to provide sufficient time for badgers to take up residence within the new setts and for vegetation to establish across the setts, which will provide cover and protection for badgers. The sett closures required will be carried out under a sett interference licence from Natural England.
- 12.10.5 In contrast, only one outlying sett used by social group 1 will be lost to the development and as such the licensed closure of this sett will have little or no impact on this group.
- 12.10.6 For all badger setts within 30m of the working area the requirement for a badger disturbance licence will be assessed during the detailed design stage of the development in consultation with Natural England. Where the potential for disturbance is identified, and is unavoidable, works will be carried out under a licence from Natural England and will follow a detailed mitigation method statement to achieve minimal disturbance to badgers.
- 12.10.7 For badger setts that will be retained adjacent to the boundary of the working area (i.e. setts 1, 11 and 14), temporary fencing (e.g. Heras security fencing, which will not restrict badger movement) will be erected around each sett to create sett protection zones. This fencing will remain throughout the duration of major works to prevent

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unlicensed disturbance, habitat damage and potential sett interference resulting from accidental encroachment by machinery into the protection zones.

12.10.8 As well as the loss of setts, badgers from both social groups will also experience a permanent loss of foraging habitat. Social Group 1 is expected to experience a permanent loss of 6.0ha of foraging habitat, equivalent to 18% of this group's foraging area. It is generally accepted that the loss of around 25%<sup>44</sup> or more of a social group's territory could have a significant effect on the viability of the group by reducing the foraging resource to a level unable to sustain the number of badgers present within the territory. Notwithstanding this, the effect of habitat loss on a badger group is likely to vary in relation to the type and amount of habitat lost and retained within a territory. As such, this loss of foraging habitat falls below the level that would be considered as a significant loss, hence no negative effects from the loss of badger foraging habitat are likely for Social Group 1.

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- 12.10.9 In contrast, Social Group 2 is expected to experience a permanent and temporary loss (the temporary loss includes areas that will become amenity grassland and gardens) of 29.6ha of foraging habitat, equivalent to 38% of this group's foraging area. This exceeds the 25% threshold of significance for foraging loss. However 47.0ha of predominantly broad-leaved woodland and grassland would be retained within this group's territory which provides optimal habitat in which to forage for earthworms. Additionally, the territory area for Social Group 2 has been calculated using the Minimum Convex Polygon method of analysis (see confidential badger report in Appendix J) and therefore this group may have access to the land situated between the two territories. Nonetheless, without mitigation, the expected land-take within this territory is likely to be significant for members of Social Group 2.
- 12.10.10 To compensate for this loss, the remaining foraging resources within Social Group 2's territory will be enhanced through the additional planting of broad-leaved woodland and the rotational management of the grassland with the intention of creating a mosaic of different vegetation heights, but with a significant proportion of short turf. New planting will aim to create sheltered areas of grassland surrounded by narrow, dense planting features, dominated by fruit- and nut-producing trees and shrubs, along with a proportion of hawthorn, blackthorn, dog or field rose (*Rosa canina* or *Rosa arvensis*) and bramble (*Rubus fruticosus agg.*). New planting will not be restricted to native species; heavily-cropping cultivars will be included, and in certain locations, a proportion of mature and semi-mature stock will be provided, to produce fruit straight away.
- 12.10.11 Arisings produced during mowing/strimming and other material produced as a result of routine landscape management will be composted on site (compost heaps will provide a source of invertebrates for badgers), in locations to which badgers from both social groups can gain access. Any felled timber created during site clearance will be

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<sup>&</sup>lt;sup>44</sup> This figure has not been published but has been accepted in numerous Public Inquires (e.g. The Ruffets, Meadow Walk, Chepstow, Monmouthshire - Planning Inspectorate Reference APPE6940\A\00\1052150).

formed into dead-wood piles within retained areas as these will also help increase invertebrate populations for badgers.

- 12.10.12 In addition, increased levels of noise, light and vibration could occur during the construction phase of the development. This will result in heightened levels of disturbance for these two badger groups. Effects will be minimised through the employment of a noise and light abatement strategies and through the effective management of vibration (through the incorporation of sett protection zones) which could otherwise cause tunnels within setts to collapse.
- 12.10.13 Once the Site is in operation, increased levels of noise and light are also likely. Again a low level lighting strategy will be incorporated within the proposed development design and will focus on the retention of dark areas in the vicinity of setts which are close to developed areas.
- 12.10.14 The increased residential population (of approximately 5000 people by 2028) in the immediate vicinity will also result in both heightened levels of human disturbance and an increase in the risk of persecution of badger by baiters. To manage these effects (as far as possible), the two new setts will be located in the 'quiet' southern area of Graven Hill Wood CWS and recreational users will be requested to keep dogs on leads, thus helping to reduce these levels of disturbance. Additionally, where appropriate, retained setts located in the vicinity of developed areas will be surrounded by dense scrub planting to make them less visible and less accessible to the general public, thus discouraging interference.
- 12.10.15 No fragmentation of the two badger territories is predicted. The network of 'green links' proposed within the development master plan will provide badgers with unrestricted access to existing and created foraging areas and ensure the free movement of badgers between social groups, the latter being important in maintaining genetic diversity in the local badger population.
- 12.10.16 Provided the sett closures are carried out under licence, following a strategy agreed with Natural England, the environmental measures including the noise and light abatement strategies are implemented and the enhancement measures are included within the proposed development design, no significant negative effects on the badgers at Graven Hill are likely.

## 12.11 Assessment of effects: Roosting bats (Common pipistrelle, soprano pipistrelle and noctule) (Graven Hill)

#### **Baseline conditions**

#### **Current baseline**

12.11.1 The survey work undertaken by AMEC in July 2011 to inform this assessment confirmed the presence of four bat roosts on-site (see Appendix J). The most important of these is a maternity roost located in building E15 Annex. This roost is

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used by three different species of bat. Common pipistrelle, soprano pipistrelle and noctule bats have all been recorded emerging from this building. Noctule bats do not often roost in buildings and although some usage of buildings is recorded in the UK, invariably buildings are not the most important type of maternity roosting site for this species of bat. A maximum count of 98 bats was recorded emerging from the building on any one occasion of which the majority were common pipistrelle bats.

- 12.11.2 Single common pipistrelle bats were recorded emerging from both buildings E5 and the theatre and a single pipistrelle bat was recorded emerging from E15A. Due to the faint recording it was not possible to determine which species of pipistrelle bat this was. These roosts are best described as summer roosts and are likely to support, at most, only a few individuals, most likely non-breeding females or males.
- 12.11.3 Common pipistrelle is the most common and widespread bat species in the UK (estimated population size 2,430,000<sup>45</sup>) and it frequently uses urban habitats for roosting and foraging. Soprano pipistrelle, although designated as a priority species in the UK Biodiversity Action Plan, is the next most common and widespread UK bat species (estimated UK population size 1,300,000) and also regularly occurs in urban habitats. Noctule is classified as an 'uncommon' bat species (as determined by the Bat Conservation Trust) (estimated population size 50,000) and recent concerns over population decline led to it being added to the UK BAP priority list in 2007. All species of British bats are protected under the Habitats Regulations 2010.
- 12.11.4 The conservation status of a roost is largely determined by the type of roost present (i.e. whether it is a maternity roost or a summer roost) and the rarity of the bat species that it supports. Both common and soprano pipistrelle bats are the most commonly occurring species in the UK. Although noctule bats are less commonly occurring, the fact that only a small number of noctules were recording using this roost, and the fact that invariably buildings are not the most important type of maternity roosting site for this species, means that the maternity roost in E15 Annex is of moderate conservation status. The common pipistrelle and pipistrelle bat summer roosts located in E5 the theatre and E15A are of low conservation status.

#### **Future baseline**

12.11.5 In the absence of the proposed development it is likely that bats will continue to roost in these four buildings.

#### Predicted effects and their significance

12.11.6 The proposed development will result in the permanent loss of both the maternity and the summer roosts. In the absence of mitigation the loss of the maternity roost could be considered as significant (and illegal). This said, the proposed development will not proceed until 2022 in this part of the Site. As such it will be necessary to carry out further survey work to ensure all mitigation measures are based on up to date survey

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<sup>&</sup>lt;sup>45</sup> All population estimates from: National Bat Monitoring Programme (2006). The state of the UK's bats. Bat Conservation Trust, London.

information. Nonetheless, in order to mitigate for the loss of the maternity roost, alternative roosting habitat will be provided on a 'like for like' basis or better and will be available to the bats in advance of the demolition work. The alternative roosting space will be carefully sited and linked to the existing roost by green corridors to increase the likelihood that the bats find the alternative roosting provision. Additionally, bat tiles and bat bricks will be installed in some of the new office buildings and commercial developments. Approximately 30 bat boxes (most likely the Schwegler 1FF design) will be installed in the existing areas of broad-leaved woodland, and where appropriate on mature standard trees that are located in darker areas of the Site, and which are situated along existing foraging and commuting corridors. These measures will enhance the future availability of roosting habitat onsite for all species of bats recorded during the surveys.

- 12.11.7 To ensure compliance with the legal protection afforded to bats and their roosts, no work to the roosts will commence until an appropriate Method Statement has been submitted to Natural England, who in turn have agreed it and issued a mitigation licence for the works.
- 12.11.8 In combination, these measures are likely to mean that the proposed development has a positive effect on the conservation status of the roosting bats present on-site, albeit this effect is unlikely to be significant given the small number of bats likely to be affected.

# 12.12 Assessment of effects: Foraging bats (Common pipistrelle, soprano pipistrelle, noctule, Myotis sp. Daubenton's, Leisler's, serotine and long-eared bats) (Graven Hill)

#### **Baseline conditions**

#### **Current baseline**

- 12.12.1 The survey work undertaken by AMEC between May-June 2011 confirmed the presence of nine species of bat foraging or commuting over the Site (see Appendix J). Of these species, the most frequently recorded bats were common pipistrelle and soprano pipistrelle, albeit noctule bats were also recorded frequently. Less frequently recorded bat species were Myotis sp., serotine and Leisler's. Long-eared and Daubenton's bats were only recorded on a couple of occasions and are unlikely to use the Site on a regular basis.
- 12.12.2 The site contains an abundance of suitable foraging habitat for bats. Activity was mainly focused along the boundary features including the hedgerows, woodland/plantation margins, the semi-improved grassland field boundaries and with a limited amount of activity along the tree lined avenues of the garrison. For security reasons, much of the garrison is very well lit, a factor that reduces the suitability of foraging within the main garrison site.

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- 12.12.3 Common pipistrelle is the most common and widespread bat species in the UK (estimated population size 2,430,000). It frequently uses urban habitats for roosting and foraging. This said, a decline in the national population over the last thirty years has meant that this species, along with soprano pipistrelle, noctule and long-eared bats are now UK BAP priority species.
- 12.12.4 Of the other species of bats recorded on-site (which have not already been discussed in section 12.11 above), Daubenton's is the most commonly occurring bat in the UK with an estimated UK population of approximately 560,000 individuals. This species prefers to forage close to the surface of waterbodies and woodland. The next most common species that occurs on-site is long-eared bat (most likely brown long-eared bats albeit not possible to distinguish this from the recordings) with an estimated UK population of 245,000 individuals. This species prefers to utilise woodland habitat for its foraging requirements. Serotine bats have an estimated UK population of 15,000, albeit this species is predominantly restricted to the more southerly regions of England. Serotine bats forage in a range of habitats, although they are more common than noctule bats in suburban areas. Of the bats recorded on-site, Leisler's bat is the scarcest species, with an estimated UK population of just 10,000 individuals. This species also prefers woodland for its foraging requirements. All species of British bats are protected under the *Habitats Regulations 2010*.

#### **Future baseline**

12.12.5 In the absence of development, it is likely that the bats will continue to forage on-site in similar numbers.

### Predicted effects and their significance

- The proposed development will result in the temporary loss of approximately 80ha of 12.12.6 predominantly sub-optimal foraging habitat, particularly within D and E Sites comprising mostly amenity grassland with standard trees). Other types of habitat to be lost include areas of semi-improved grassland, drainage ditches, water storage tanks and 3.6ha of coniferous and willow plantation. This said, the majority of foraging habitat to be lost will be replaced by residential areas with gardens (the residential area itself is estimated to cover 55.4ha) which will provide a substantial suitable foraging resource for common and soprano pipistrelle bats and serotine bats. Urban gardens are particularly good for pipistrelle bats, which of all the bats species recorded, were present in the highest numbers at this site. Furthermore, these losses will be compensated for through the additional planting of 8.2ha of trees (including a 1.9ha extension to Graven Hill Wood). The increased coverage of woodland will be beneficial for woodland foraging species such as the noctule bats, Leisler's bats and the long-eared bats. The proposed waterbodies (to be created both as measures to mitigate effects on the GCN and as a results of the SUDs) will also provide additional foraging habitat for bats (particularly Daubenton's). The enhancement of the 10.8ha of retained, semi-improved grassland that flanks Graven Hill Wood will also provide an optimal foraging area for most species recorded on-site.
- 12.12.7 Additionally, green corridors to be incorporated within the proposed development design will extend across the Site, linking Graven Hill Wood to the wider countryside.

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These green corridors will comprise bands of trees, waterbodies, scrub and grassland and will be used by the existing population of bats for both commuting and foraging.

12.12.8 Much of the barracks is currently too well lit to be of use to foraging bats. In order to minimise the effects of lighting on bats arising from the new development, a low level lighting strategy is proposed. Lighting of the Site at night will be kept to a minimum and restricted to areas where it is absolutely necessary. Furthermore, its effects will be reduced by following measures in accordance with best practice guidance (Bat Conservation Trust and Institution of Lighting Engineers, 2008).

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12.12.9 Overall the proposed development will result in the temporary loss of approximately 80ha of mostly sub-optimal foraging habitat for bats. Approximately 55.4ha of this will be replaced by residential areas with gardens of a typical size for a housing development of this type. Additionally, the increased coverage of woodland, the creation of a mosaic of habitats in the grassland that flanks Graven Hill Wood and the improvements in the connectivity of Graven Hill Wood to the wider landscape will have positive effects on the existing populations of bats. The proposed lighting strategy (involving the use of directional lighting and leaving darker areas on-site) will also minimise effects on bats from light pollution arising from the new development. As such, no significant negative effects on foraging bats are likely.

# 12.13 Assessment of effects: Dormouse (Graven Hill)

### **Baseline conditions**

### **Current baseline**

- 12.13.1 Dormouse surveys undertaken by AMEC in 2011 confirmed the presence of a population of dormice using Graven Hill Wood in the centre of the Site (see Appendix J). One confirmed dormouse nest was recorded during the September 2011 survey on the northern edge of Graven Hill Wood. Although no dormouse signs were found in any of the other areas of woodland/scrub that occur on-site, or in the hedgerows radiating from Graven Hill Wood itself (the majority of these are sub-optimal), there is the potential that dormice could occasionally use these areas for their habitat requirements.
- 12.13.2 Dormice are legally protected under the *Habitats Regulations 2010*. They are also UK BAP priority species. Although there are records of dormice near Bicester and in other parts of Oxfordshire, their geographical distribution is limited within the county.

### **Future baseline**

12.13.3 In the absence of the future development it is likely that the existing population of dormice may continue to exist on-site in very small numbers, but there is a potential that, considering the isolated and fragmented nature of the habitats present on-site, this population may naturally die out.

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### Predicted effects and their significance

- 12.13.4 Although the proposed development will not result in the loss of any areas of Graven Hill Wood (where the nest was found), it will result in the loss of some surrounding habitat, notably some of the sub-optimal hedgerows and scrub providing sub-optimal dormouse habitat. As such, an application to Natural England for a development licence in respect of dormice will be required. This will detail an appropriate mitigation strategy to ensure the no dormice are harmed during the construction work.
- 12.13.5 The Dormouse Conservation Handbook<sup>46</sup> states that where dormouse habitat is to be lost, compensation measures should be based on the provision of alternative habitat on 'a like for like' basis. The proposed development involves additional planting of 8.2ha of broad-leaved woodland and scrub, both through the extension of Graven Hill Wood and through the provision of green corridors. Scrub and hedgerows to be planted will include a high percentage of hazel (*Corylus avellana*) and other fruit and nut bearing plants, which will enhance the provision of foraging habitat for this and other legally protected/priority species. Dormice are predominantly arboreal creatures and will generally not cross open space. As such, the proposed green corridors are designed to facilitate links between Graven Hill Wood and the wider landscape. These enhancements will enable dormice from this isolated population within Graven Hill Wood to access the habitat that occurs beyond the Site boundary, and in doing so will promote species interchange across the landscape unit.
- 12.13.6 As an enhancement measure, 50 dormouse nesting boxes will be permanently installed in Graven Hill Wood, providing additional habitat for this species.
- 12.13.7 Overall, no significant negative effects on the population of dormice that occurs onsite are likely. The enhancement measures focusing around the provision of additional woodland habitat and green corridors will safeguard the future of the existing population of dormouse on-site, and as such a positive, albeit not significant, effect on the local conservation status of this species is likely.

# 12.14 Assessment of effects: GCN (Graven Hill)

### **Baseline conditions**

### **Current** baseline

12.14.1 Surveys undertaken by AMEC in April and May 2011 confirmed the presence of eight populations of GCN located on-site, with a further three populations within 500m of the Site boundary (see Appendix J). One is a large population of GCN, whilst the remaining seven populations are small<sup>47</sup>. In the absence of barriers to movement,

<sup>47</sup> The great crested newt mitigation guidelines state that populations of GCN can be classed as follows:

- Small' for maximum counts of GCN up to 10
- 'Medium' for maximum counts between 11 and 100

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<sup>&</sup>lt;sup>46</sup> The Dormouse Conservation Handbook (2006). Natural England.

GCN will travel up to 500m from their breeding ponds to utilise suitable terrestrial habitat. Therefore GCN originating from off-site waterbodies within 500m of the development could utilise areas of terrestrial habitat located within the area to be developed. As such, effects on these off-site GCN still need to be considered within the mitigation strategy.

12.14.2 Of the eight populations of GCN located on-site, there is one large metapopulation<sup>48</sup>, two small metapopulations and three small populations located on-site. There were also three small populations of GCN located off-site, albeit these all formed metapopulations with the on-site GCNs. The largest number of GCNs recorded in any one waterbody, during any one survey night, using one survey technique, was 122 GCNs, which was recorded in waterbody 11.

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The Natural England Great Crested Newt Mitigation Guidelines 2001 detail how there 12.14.3 have been various attempts at developing multipliers to convert survey results into actual population size estimates, but these are regularly shown to be unreliable. This said, at the few sites in the UK where complete consensus are available to compare with survey data, the work indicates that surveys reveal between 2-30% of the total population. Having taken the maximum number of GCNs recorded during any one survey at each of the waterbodies, and applied this assertion, it can be assumed that the Site supports between 513 and 7000 GCN. This is a large range and, as such, is not particularly useful in determining the population of GCN on-site for which mitigation measures and habitat enhancements are required. In order to obtain a more realistic population estimate it is necessary to consider the quality of the existing aquatic and terrestrial habitat. All of the on-site GCN populations were recorded in either the emergency water storage tanks or in the drainage ditches. The storage tanks comprise artificial concrete tanks measuring 10m x 10m and contain virtually no aquatic vegetation that is suitable for spawning. As such, they are likely to provide very sub-optimal breeding habitat for GCNs. Furthermore, although the drainage ditches contain an abundance of the types of aquatic vegetation suitable for spawning, these ditches are subject to widely fluctuating water levels, such that although they were found to be used for breeding, it is likely that eggs laid on the vegetation within the ditches are routinely exposed to the air when water levels fall, and are therefore unlikely to develop beyond eggs. As a result of the predominantly sub-optimal aquatic and terrestrial habitat it is likely that the actual number of GCNs present onsite will be considerably lower than the maximum estimate of 7000 individuals.

'Large' for maximum counts in excess of 100.

These figures relate to a peak count derived from only using one survey technique for one survey night.

<sup>48</sup> Populations of GCN form a 'metapopulation' when the breeding waterbodies are located within 250m from one another and are not separated by any barriers to movement. As such, it is assumed that individuals will interchange between breeding waterbodies thus helping to promote genetic diversity amidst the GCN population. A 'large' metapopulation occurs when two or more ponds within 250m of one another have a total GCN count of in excess of 100 GCN during any one survey night. A 'medium' sized metapopulation occurs when two or more ponds have a total GCN count of between 11-100 individuals and a 'small' metapopulation occurs when there is a total count of between 1-10 GCN.

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12.14.4 GCN are legally protected under the *Habitats Regulations 2010*. They are also UK BAP priority species.

### Future baseline

12.14.5 In the absence of development, it is likely that the populations of GCN will continue to utilise the Site at a similar level as that observed currently. This said, should the MOD have an emergency on-site, water from these emergency water storage tanks may be used to extinguish fires, which puts the GCNs within these tanks at risk of killing or injury. As such the GCNs continued survival on site will depend on the MOD retaining the water levels within the emergency water storage tanks.

### Predicted effects and their significance

- 12.14.6 The proposed development will result in the permanent loss of six emergency water storage tanks (10m x 10m) used as breeding habitat by GCN and a network of drainage ditches (two ditches 10m in length x 1m in width) including the two in which GCN were recorded. In total approximately  $640m^2$  of sub-optimal aquatic habitat will be lost to the proposed development. In addition, a total of 80ha of potential terrestrial habitat will be permanently lost to the proposed development, the majority of which is sub-optimal. Although much of this habitat (approximately 55.4ha) will be replaced by residential areas, residential gardens only provide sub-optimal terrestrial habitat for GCN.
- 12.14.7 Approximately 25-30 new waterbodies will be created on-site. At least 15 of these will be part of a SUDS scheme and as such cannot be considered as compensation for effects on GCN, albeit GCNs are likely to benefit from the creation of these waterbodies and the surrounding vegetation. It is preferable that the newly created GCN waterbodies are located within 250m of the existing breeding waterbody (albeit this is not always possible). The main area of aquatic and terrestrial habitat (which is to be designed as a receptor site specifically to provide habitat for GCN) will be located in the lower sections of the semi-improved grassland fields that flank Graven Hill Wood (see Figure 12.1). This proposed receptor site is situated within 350m of the existing large metapopulation of GCN and as such, still occurs within the natural range of this population of GCNs.
- 12.14.8 Natural England requires any GCN habitat lost to the development to be re-created on a 'like for like' basis. Whilst this is achievable for the provision of aquatic habitat, it is not possible to provide 80ha of new terrestrial habitat within the proposed development design. Instead the compensation measures will focus on enhancing existing areas of retained, sub-optimal habitat for GCN.
- 12.14.9 In order to establish the quantity of terrestrial habitat required within the proposed development design to support the existing population of GCNs reference is made to literature published by The Herpetofauna Groups of Britain and Ireland<sup>49</sup>. This states

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<sup>&</sup>lt;sup>49</sup> Herpetofauna Groups of Briatin and Ireland. Evaluating Local Mitigation/Translocation Programmes: Maintaing Best Practice and Lawful Standards. HGBI Advisory notes for amphibian and Reptile Groups (ARGs).

that GCNs can occur at a density of 250 individuals per hectare of optimal terrestrial habitat, with woodland habitat being able to support many more GCNs than this figure. As such, using a worst case scenario where by 7000 GCNs occur on-site, a total of 28 hectares of optimal habitat will be required to support the resident population of GCN. This said, as discussed above the quality of the existing terrestrial and aquatic habitat is such, that it is very unlikely that the Site currently supports this number of GCNs.

- 12.14.10 The proposed development involves the creation and enhancement of 23ha of optimal terrestrial and aquatic habitat (of which 8.6ha comprises woodland planting). The main area of habitat creation and enhancement for GCN (measuring 10.8ha) will comprise a series of purpose-built waterbodies located in the grassland that flanks Graven Hill Wood. These will be screened from public interference through the planting of scrub, likely blackthorn (which will also be beneficial for species of invertebrate such as brown hairstreak butterflies know to occur in the vicinity of Graven Hill). A mosaic of habitats will be created surrounding these waterbodies, through the planting of trees and scrub and the rotational management of the grassland. Log piles and artificial hibernacula will also be created within this area. Additional waterbodies and associated areas of terrestrial habitat designed to provide habitat for GCN will be created around the periphery of the Site in the vicinity of waterbodies 8, 12, 17 and 15a and b. This will total an area of approximately 12.7ha.
- 12.14.11 Furthermore, by relocating the GCNs to the newly created mosaic of habitats located within the grassland fields that flank Graven Hill Wood, the relocated population will be placed within 125m of Graven Hill Wood. Currently Graven Hill Wood is sited at the upper extent of the terrestrial range of most of the existing populations of GCN located on-site i.e. Graven Hill Wood is located between 400-500m away from most of the known breeding waterbodies. By translocating the large population of GCN to within 125m of Graven Hill Wood, in addition to the 10.8ha of newly created habitat within this area, GCNs from this population will also be able to access the 29 hectares of woodland habitat contained within Graven Hill Wood. Overall therefore, GCNs from the Site will have access to 52ha of terrestrial and aquatic habitat, such that even in the worst case scenario of 7000 GCN occurring on-site, the provision of terrestrial and aquatic habitat will be ample to sustain the existing population.
- 12.14.12 In order to avoid the risk of killing or injury to GCN during the construction works, it will be necessary to design and carry out a GCN translocation scheme. This will clear the proposed development area of GCNs enabling their relocation in the newly created/enhanced habitat that either flanks Graven Hill Wood, or that occur around the periphery of the Site. It is important that not all the GCN populations are translocated to the same receptor area as this will reduce the geographical distribution of this species across the Site.
- 12.14.13 The creation of green corridors within the Site will also facilitate the movement of this species across the landscape and between populations, encouraging the interchange of individuals and promoting genetic diversity amidst the existing population.

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- 12.14.14 The removal of GCN from the development areas will involve a lengthy programme of exclusion and trapping. The development areas will be fenced with amphibian exclusion fencing (likely adopting a compartmentalised approach) and a trapping programme of at least 90 days will be carried out. On completion of the trapping, a destructive search will be conducted prior to the Site being released for development. All of this work will need to be supervised by an ecologist who holds a current GCN survey licence. The scheme will also require an application to Natural England for a licence to conduct works. Natural England will only grant a licence if they were satisfied that there were no satisfactory alternative to the scheme, and that the work authorised will not be detrimental to the maintenance of the population of GCN at a favourable conservation status in their natural range (Regulation 44(2) (e). of the *Habitats Regulations 2010*).
- 12.14.15 Having considered the predominantly sub-optimal quality of the existing aquatic and terrestrial habitat to be lost to the development, the extensive habitat creation and enhancement measures that are proposed as part of this proposed development and the fact that all translocation activities will be carried out under a Natural England GCN development licence, it can be concluded that there will be no significant negative effects on GCNs at this site. Positive effects on the conservation status of the resident GCN population are likely but these are unlikely to be significant.

### 12.15 Assessment of effects: Reptiles (Graven Hill)

### **Baseline conditions**

### **Current baseline**

12.15.1 The AMEC surveys conducted between 2010 and 2011 recorded a maximum count of six common lizards and two grass snakes, during any one survey (see Appendix J). Using Froglife's (1999) guidelines on reptile survey<sup>50</sup>, the population of common lizard and grass snake is assessed to be "good" for common lizard and 'low' for grass snake. Common lizard and grass snake are legally protected and are UK BAP priority species. The majority of the Site provides only sub-optimal habitat for reptile species (i.e. the amenity grassland and semi-improved grassland fields grazed by cows) although the Site also contains approximately 19.75ha of optimal habitat (i.e. woodland and plantation edges, hedgerows, scrub, drainage ditches and grassland field margins).

### **Future baseline**

12.15.2 In the absence of future development it is likely that the Site will continue to support populations of reptiles at a similar level.

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<sup>&</sup>lt;sup>50</sup> Froglife (1999) *Reptile Survey: An introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10.* Froglife, Halesworth.

#### Predicted effects and their significance

- 12.15.3 The proposed development will result in the loss of approximately 5.5ha of optimal reptile habitat. Furthermore in the absence of measures to mitigate effects, the construction activities could also result in an increased risk of accidental injury or killing of reptiles, as well as disturbance arising through increased levels of noise, light and vibration.
- 12.15.4 In respect of effects during construction, in order to safeguard the conservation status of reptiles at Graven Hill, and to avoid contravention of the legislation, a suitable mitigation strategy will be devised and agreed with Natural England prior to the commencement of works. This will entail the exclusion and trapping of reptiles within development areas (undertaken in conjunction with clearing the development areas of GCNs) and translocation of the population to the newly enhanced habitat located in the semi-improved grassland at the base of Graven Hill Wood. In total, approximately 13ha of habitat will be subject to enhancement proposals for reptiles (along with other legally protected species) including the additional planting of broadleaved woodland (1.9ha) and scrub, creation of waterbodies and surrounding mosaics of habitats (10.8ha), rotational moving of grassland and the installation of log piles, artificial hibernacula and refugia.
- 12.15.5 The creation of green corridors within the Site will also facilitate the movement of reptiles across the landscape, encouraging the interchange of individuals and promoting genetic diversity amidst the existing population.
- 12.15.6 Once the development is operational, further effects on reptiles could occur, likely arising through increased levels of predation by domestic pets (cats) originating from the newly built residential areas. Bearing in mind the small number of reptiles recorded on-site, there is the potential that predation by cats could result in the eradication of these species on-site. To reduce the risk of predation by cats, the newly created areas of habitat will be designed to provide ample cover for reptiles. In addition, it is proposed that a leaflet drop is carried in the newly created residential areas, making pet owners aware of the potential conflicts between cats and reptiles/other wildlife, and suggesting that their cats wear a bell.
- 12.15.7 Having considered the proposed mitigation strategy, together with the extensive habitat creation/enhancement measures that are to be delivered as part of this proposed development, it is likley that effects associated with the construction phase of the development can be fully mitigated to ensure no significant negative effects occur. This said, it is difficult to measure the extent of cat predation on reptiles during the operational phase. Both species of reptile are still common and widespread in Oxfordshire and South-East England, such that if cat predation resulted in the loss of this population from the Site, the population itself is not considered to be of sufficient value that negative effects on upon it, although undesirable, will be considered as significant.

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### 12.16 Assessment of effects: Arncott Bridge Meadows SSSI (C Site)

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### **Baseline conditions**

### **Current** baseline

12.16.1 This site lies on the flood plain of the River Ray, to the north of the river itself. The meadows comprise medieval ridge and furrow features and are managed as hay meadows and pasture, supporting a variety of species which are largely confined to old, unimproved, neutral grassland. The rich flora is attributable to the variation in soil wetness caused by the ridge and furrow. Wetter areas are dominated by sedges and rushes whilst the drier areas contain a high proportion of herbs, including species of ancient, unimproved grassland. The vegetation in and along the adjacent River Ray contains species becoming increasingly rare both regionally and nationally. The bank grassland contains the nationally uncommon narrow-leaved water dropwort, a species now confined to only a few sites in Britain. Other locally uncommon species such as flowering rush (Butomus umbellatus) and bladder sedge (Carex vesicaria) occur along the river. This site is of national importance for nature conservation as indicated by its statutory designation.

### **Future baseline**

12.16.2 In the absence of the proposed development, it is likely that provided the ground conditions remain unaltered, the Site will continue to exist in a similar condition to that which occurs currently.

### Predicted effects and their significance

- 12.16.3 Arncott Bridge Meadows is notified as a result of the rich flora that it supports and the increasingly rare plants that grow along the banks of the River Ray. The meadows are sited on the northern side of the River Ray and as such they will not be affected by any changes to the drainage of land on the southern side of the floodplain, where C Site is located. Surface and ground water from the development currently drains into the River Ray just downstream of the SSSI. As such, neither the SSSI nor the section of the River Ray that flows through the SSSI will be subject to changing water levels owing to changes to the drainage of the Site.
- 12.16.4 Notwithstanding this, Arncott Bridge Meadows is situated 40m from the Site boundary and as such a dust abatement and pollution prevention strategy designed to minimise the risk of pollution incidents will be devised and agreed with Natural England prior to the commencement of works. This will incorporate the measures set out in the Environment Agency's Pollution Prevention Guidelines (see section 12.5) to protect the sensitive flora within the SSSI against effects associated with dust and pollution incidents.
- 12.16.5 Overall it is therefore concluded that there will be no significant negative effects on Arncott Meadows.

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# 12.17 Assessment of effects: Badger (C Site)

### **Baseline conditions**

### **Current baseline**

12.17.1 The survey work undertaken by AMEC between February and April 2011 identified the presence of nine badger setts located within the survey area at C Site. These comprise two main, one annex and six outlier setts (see confidential badger report Appendix J). All of the setts displayed signs of 'current use' by badgers and consequently all of these structures are afforded protection under the *Protection of Badgers Act 1992*. The site contains an abundance of foraging habitat to support badger, mostly the amenity grassland and woodland plantation.

### **Future Baseline**

12.17.2 In the absence of the development of the Site, it is likely that the resident badger population will continue to utilise the Site for their habitat requirement at similar levels.

### Predicted effects and their significance

- 12.17.3 Although none of the setts are located within the development area, there are three setts situated immediately adjacent to it, and as such, these could be damaged by construction work. For all badger setts within 30m of the working area the requirement for a badger disturbance licence will be assessed during the detailed design stage in consultation with Natural England. Where the potential for disturbance is identified, and is unavoidable, works will be carried out under a licence from Natural England and will follow a detailed mitigation method statement to achieve minimal disturbance to badgers. This is likely to involve the erection of temporary fencing (e.g. Heras security fencing, which will not restrict badger movement) around each sett to create sett protection zones. This fencing will remain throughout the duration of major works to prevent unlicensed disturbance, habitat damage and potential sett interference resulting from accidental encroachment by machinery into the protection zones.
- 12.17.4 The loss of potential foraging habitat at C Site is to a much lesser extent than that to be lost at Graven Hill. As such, the proposed development did not trigger the need for a bait marking survey to determine the presence of different social groups or the extent of their territories. However, the proposed development will result in the loss of 13.6 ha of potential foraging habitat for badger. This represents 15% of the total amount of potential foraging habitat present on-site, albeit a bait marking survey has not been undertaken to confirm the percentage of territory that this 13.6ha represents.
- 12.17.5 The survey identified badger pathways radiating outwards from the Site, such that it can be assumed that badgers originating from C Site have a territory that extends beyond the Site boundary. The loss of foraging habitat will be compensated for through the additional planting of 8.6ha of woodland and the enhancement of 7.3ha of grassland in the southern section of the Site (Figure 12.2) to provide optimal foraging

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habitat for badgers. This will be achieved through the rotational management of the grassland with the intention of creating a mosaic of different vegetation heights, but with a significant proportion of short turf. New planting will aim to create sheltered areas of grassland surrounded by narrow, dense planting features, dominated by fruitand nut-producing trees and shrubs, along with a proportion of hawthorn, blackthorn, dog or field rose and bramble. New planting will not be restricted to native species; heavily-cropping cultivars will be included, and in certain locations, a proportion of mature and semi-mature stock will be provided, to produce fruit straight away.

- 12.17.6 Arisings produced during mowing/strimming and other material produced as a result of routine landscape management will be composted on-site (compost heaps will provide a source of invertebrates for badgers), in locations to which badgers can gain access. Any felled timber created during site clearance will be formed into dead-wood piles within retained areas as these will also help increase invertebrate populations for badgers.
- 12.17.7 In addition, increased levels of noise, light and vibration are likely during the construction phase of the development. This will result in heightened levels of disturbance for the badgers on-site. Effects will be minimised through the employment of a noise and light abatement strategy and through the effective management of vibration (through the incorporation of sett protection zones) which could otherwise cause tunnels within setts to collapse.
- 12.17.8 Once the Site is in operation, the levels of light, noise and disturbance are not envisaged to alter from those currently experienced, as the Site will continue to be used for the same purpose (i.e. the consolidation and distribution of MOD equipment). This said, a low level lighting strategy will be incorporated within the proposed development design and will focus on the retention of dark areas in the vicinity of setts which are close to developed areas.
- 12.17.9 Having considered the compensation measures to be incorporated within the proposed development design, and acknowledging that should any of the nearby setts need to be closed, this will be done under licence and following prior consultation with Natural England, it is concluded that there will be no significant negative effects on badgers as a result of this development.

# 12.18 Assessment of effects: Roosting Bats (C Site)

### **Baseline conditions**

### **Current baseline**

- 12.18.1 The AMEC surveys confirmed the presence of two small common pipistrelle summer roosts on the Site. One of these is located within in a weeping willow (Salix babylonica) tree whilst the other occupies part of building C8A.
- 12.18.2 Common pipistrelle is the most commonly occurring species of bat in the UK. Its status is discussed in section 12.11 of this ES. Only one individual bat was recorded utilising each of the roosts, likely a non-breeding male or female. Considering

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common pipistrelle is the most commonly occurring species in the UK and the fact that these roosts support only very small numbers of bats, these roosts are considered to be of a low conservation status.

### **Future baseline**

12.18.3 In the absence of the proposed development it is likely that bats will continue to periodically utilise the weeping willow and C8A for their roosting requirements.

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### Predicted effects and their significance

- 12.18.4 The proposed development will result in the loss of this tree and the roost it supports, whilst development will take place in close proximity to building C8A with potential refurbishment of building C8. Therefore, in order to assess a likely worst-case scenario it is assumed that potential refurbishment of this building will result in the loss of the roost. In order to mitigate for this loss, bat tiles and bat bricks will be installed in some of the new buildings that are proposed as part of the development.
- 12.18.5 Approximately 20 bat boxes (most likely the Schwegler 1FF design) will be installed in advance of any proposed demolition work and will be sited in the existing areas of broad-leaved plantation, and where appropriate on mature standard trees that are located in darker areas of the Site, and which are situated along existing foraging and commuting corridors. These measures will enhance the future availability of roosting habitat on-site for all species of bats recorded during the surveys.
- 12.18.6 To ensure compliance with the legal protection afforded to bats and their roosts, no work to the roosts will commence until an appropriate Method Statement has been submitted to Natural England, who in turn have agreed it and issued a mitigation licence for the works.
- 12.18.7 In combination, these measures are likely to mean that the proposed development has a positive effect on the conservation status of the roosting bats present on-site, albeit that this effect is unlikely to be significant given the small number of bats likely to be affected.

### 12.19 Assessment of effects: Foraging bats (Common pipistrelle, soprano pipistrelle, noctule, Myotis sp., Leisler's, serotine and long-eared) (C Site)

### **Baseline conditions**

### **Current** baseline

12.19.1 The survey work undertaken by AMEC between May and June 2011 (see Appendix J) confirmed the presence of seven species of bat foraging or commuting over the Site. Of these species, the most frequently recorded bats were common pipistrelle and soprano pipistrelle, albeit noctule bats were also recorded frequently. Less frequently recorded bat species were Myotis sp. and serotine. Long-eared and Leisler's bats were





only recorded on a few occasions and are unlikely to use the Site on a regular basis. The status of these bats has already been discussed in section 12.12 of this ES.

12.19.2 The site contains some suitable foraging habitat mostly comprising the broad-leaved plantation, waterbodies, drainage ditches and mature standard trees situated within the Activity was mainly focused along the boundary features amenity grassland. including the woody/scrub margins, around the waterbodies but with a limited amount of activity along the tree lined avenues of the main site. For security reasons, much of the Site is very well lit, a factor that reduces site's suitability for foraging.

### **Future baseline**

12.19.3 In the absence of development, it is likely that the bats will continue to forage on site in similar numbers.

### Predicted effects and their significance

- The proposed development will result in the permanent loss of 13.6ha of potential 12.19.4 foraging habitat. The majority of this is amenity grassland with standard trees and as such is sub-optimal. Other types of foraging habitat to be lost include some small stretches of drainage ditch and the emergency water storage tanks. These losses will be compensated for through the additional planting of an area of 8.6ha of broad-leaved woodland and the enhancement of 7.3ha of amenity grassland in the southern area of the Site, through the creation of a wildflower meadow, planting of scrub and implementation of rotational mowing to enhance the foraging opportunity present at this site. The proposed waterbodies to be created (both as mitigation for GCNs and as a results of the SUDS) will also provide additional foraging habitat for bats.
- 12.19.5 Much of the Site is currently too well lit to be of great use to foraging bats. In order to minimise the effects of lighting on bats arising from the new development, a lighting strategy is proposed. Lighting of the Site at night will be kept to a minimum and restricted to areas where it is absolutely necessary. Furthermore, its effects will be reduced by following measures in accordance with best practice guidance (Bat Conservation Trust and Institution of Lighting Engineers, 2008).
- 12.19.6 Overall the proposed development will result in a small loss of existing sub-optimal foraging habitat, albeit this will be more than compensated for through the enhanced provision of quality foraging areas for bats. The increased coverage of woodland and the creation of a mosaic of habitats in the southern area of the Site will have positive effects on the existing populations of bats. The proposed lighting strategy (involving the use of directional lighting and leaving darker areas on-site) will also minimise effects on bats from light pollution arising from the new development. As such, no significant negative effects on foraging bats are likely.

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# 12.20 Assessment of effects: GCN (C Site)

### **Baseline conditions**

### **Current baseline**

- 12.20.1 Surveys undertaken in April and May 2011 confirmed the presence of one 'medium'<sup>51</sup> population and three 'small' populations of GCNs located on-site, with a further 'small' population located off-site but within 500m of the Site boundary. GCNs were recorded in three emergency water storage tanks and one natural pond, the latter of which is surrounded by dense scrub. The population of GCNs that was recorded off-site occurred in a field pond.
- 12.20.2 In the absence of barriers to movement, GCN will travel up to 500m from their breeding ponds to utilise suitable terrestrial habitat. As such, there is the potential that GCNs originating from off-site waterbodies (located within 500m) could utilise terrestrial habitat that occurs within the development area, hence could be affected by the development. None of these individual populations formed part of a larger metapopulation. The largest number of GCNs recorded in one waterbody during any one survey night, using any one survey technique was 14 (which equates to a 'medium' sized population). This was recorded in waterbody E5.
- The Natural England Great Crested Newt Mitigation Guidelines 2001 detail how there 12.20.3 have been various attempts at developing multipliers to convert survey results into actual population size estimates, but these are regularly shown to be unreliable. This said, at the few sites in the UK where complete consensus are available to compare with survey data, the work indicates that surveys reveal between 2-30% of the total population<sup>52</sup>. Having taken the maximum number of GCNs recorded during any one survey at each of the waterbodies, and applied this assertion, it can be assumed that the Site supports between 107 and 1600 GCNs. This figure accounts for a huge variation, and as such, is not particularly useful in determining the population of GCNs on-site for which mitigation measures and habitat enhancements are required. In order to obtain a more realistic population estimate it is necessary to consider the quality of the existing aquatic and terrestrial habitat. All of the on-site GCN populations were recorded in the emergence water storage tanks. These artificial concrete tanks measure 10m x 10m and contain virtually no aquatic vegetation that is suitable for spawning. As such, they provide very sub-optimal breeding habitat for GCNs. As a result of the predominantly sub-optimal aquatic and terrestrial habitat that occurs it is likely that the actual number of GCNs present on-site will be considerably lower than the maximum estimate of 1600 individuals.

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<sup>&</sup>lt;sup>51</sup> The great crested newt mitigation guidelines state that populations of GCN can be classed as follows:

<sup>• &#</sup>x27;Small' for maximum counts of GCN up to 10

<sup>• &#</sup>x27;Medium' for maximum counts between 11 and 100

<sup>• &#</sup>x27;Large' for maximum counts in excess of 100.

These figures relate to a peak count derived from only using one survey technique for one survey night.

<sup>&</sup>lt;sup>52</sup> English Nature (2001). Great Crested Newt Mitigation Guidelines

12.20.4 GCN are legally protected under the *Habitats Regulations 2010*. They are also UK BAP priority species.

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### Future baseline

12.20.5 In the absence of development, it is likely that the populations of GCN will continue to utilise the Site at a similar level as that observed currently. However, should MOD have an emergency on-site, water from these emergency water storage tanks may be used to extinguish fires, which puts the GCNs within these tanks at risk of killing or injury. Therefore, the GCNs continued survival on site will depend on the MOD retaining the water levels within the emergency water storage tanks.

### Predicted effects and their significance

- 12.20.6 The proposed development will result in the loss of one emergency water storage tank used as breeding habitat by GCN (waterbody 1) equating to 100m<sup>2</sup> of sub-optimal aquatic habitat. A maximum count of two GCNs was recorded during any one survey visit to this waterbody, indicative of a 'small' population of GCNs.
- 12.20.7 A total of 13.6ha of potential terrestrial habitat will be lost to the proposed development in addition to the waterbody mentioned above. Natural England requires any GCN habitat lost to the development to be re-created on a 'like for like' basis. The majority of the existing terrestrial habitat to be lost to the development comprises amenity grassland, and as such is sub-optimal.
- 12.20.8 To compensate for the loss of one waterbody (the emergency water storage tank), two purpose-built waterbodies for GCN will be created in an area of species-poor, semiimproved grassland and scrub located in an area just outside of the secure compound, located along the north-western boundary of the Site (within 250m of the existing breeding waterbody) (Figure 12.2). These waterbodies will be surrounded by a mosaic of habitats including, grassland, scrub and new plantation. Log piles and artificial hibernacula will also be created within this area. This area will also contain newly created SUDS waterbodies. Although these cannot be considered as compensation for effects on GCNs, GCNs are likely to benefit from the creation of these waterbodies and the surrounding vegetation. The total area of terrestrial and aquatic habitat in the northern area of the Site to be created and/or enhanced is 16.7ha which exceeds the amount to be lost.
- In addition, although the GCN populations in the southern part of the Site will not be 12.20.9 affected by the proposed development, they will benefit from the enhancement of a second area of habitat in the southern area of the Site (Figure 12.2). This measures 7.3ha and will be enhanced both for GCNs and other legally protected/notable species that have been recorded in the southern part of the Site. Measures will include the provision of further ponds within a mosaic of habitats, as well as artificial refugia.
- 12.20.10 In order to avoid the risk of killing or injury to GCN during the construction works, it will be necessary to design and carry out a GCN translocation scheme. This will clear the proposed development area of GCNs enabling their relocation to the newly created/enhanced habitat located along the north-western boundary. The removal of

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GCN from the development areas will involve a programme of exclusion and trapping. The development areas will be fenced with amphibian exclusion fencing (likely adopting a compartmentalised approach) and a trapping programme of at least 60 days will be carried out. On completion of the trapping, a destructive search will be conducted prior to the Site being released for development. All work will need to be supervised by an ecologist who holds a GCN survey licence. The scheme will also require an application to Natural England for a licence to conduct works. Natural England will only grant a licence if they were satisfied that there were no satisfactory alternatives to the scheme; and that the work authorised will not be detrimental to the maintenance of the population of GCN at a favourable conservation status in their natural range (Regulation 44(2) (e). of the *Habitats Regulations 2010*).

12.20.11 Having considered the predominantly sub-optimal quality of the existing aquatic and terrestrial habitat to be lost to the development, the extensive habitat creation and enhancement measures that are proposed as part of this proposed development and the fact that all translocation activities will be carried out under a Natural England GCN development licence, it can be concluded that there will be no significant negative effects on GCNs at this site. Positive effects on the conservation status of the resident GCN population are likely although these are unlikely to be significant.

### 12.21 Assessment of effects: Dormouse (C Site)

### **Baseline conditions**

### **Current baseline**

- 12.21.1 Dormouse surveys undertaken by AMEC between 2010 and 2011 confirmed the presence of a population of dormice using the Site (see Appendix J). Two confirmed dormouse nests and a third 'possible' dormouse nest have been recorded in the scrubby/plantation plots located centrally within the Site. This scrubby/woodland is neither extensive nor well connected to other plots on-site and is isolated from the other linear woodland and scrub areas, which run along the western Site boundary, by rail tracks and sidings. Although no dormouse signs were found in tubes placed in the woodland and scrub area on the eastern boundary, there is the potential that dormice also use this area too for their habitat requirements.
- 12.21.2 Dormice are legally protected under the *Habitats Regulations 2010*. They are also UK BAP priority species. Although recorded in other parts of Oxfordshire, their geographical distribution is limited within the county.

#### **Future baseline**

12.21.3 In the absence of the future development it is likely that the existing population of dormice may continue to exist on-site in very small numbers, but there is a possibility that, considering the isolated and fragmented nature of the habitats present on-site, this population may naturally die out.





### Predicted effects and their significance

- 12.21.4 The proposed development will not result in the loss of any habitat located on-site that could be used by dormice. As such, an application to Natural England for a development licence in respect of dormice will not be required. However, considering the fragility and relative isolation of the existing population of dormice on-site, from a conservation point of view, it will be beneficial to include habitat enhancements for this species within the proposed development design.
- 12.21.5 The proposed development involves additional planting of 8.6ha of plantation woodland and scrub. Scrub to be planted will include a high percentage of hazel and other fruit and nut bearing plants, which will enhance the provision of foraging habitat for this and other legally protected/priority species. Dormice are predominantly arboreal creatures and will generally not cross open space. As such, it is proposed that the central area of woody scrub in which two dormouse nests were found, is reconnected to the surrounding plantation woodland by a mixture of additional planting and through the installation of arboreal links. These enhancements will enable dormice from this isolated population to access the habitat that occurs beyond the Site boundary, and in doing so will promote species interchange across the landscape unit.
- 12.21.6 Overall, no significant negative effects on the population of dormice that occurs onsite are likely. The enhancement measures focusing around the provision of habitat links are likely to safeguard the future of the existing population of dormouse on-site, and as such a positive, albeit not significant, effect on the local conservation status of this species is likely.

### 12.22 Conclusions of significance evaluation

12.22.1 Tables 12.8 and 12.9 summarise of all predicted ecological effects assessed in this chapter of the ES.

Receptor and effect	Significance	Rationale
Graven Hill Wood: Disturbance/damage to CWS through increased levels of	-NS	Implementation of standard pollution prevention measures to prevent pollution during the construction phase.
dust, noise and pollution arising through construction process		A low level lighting strategy is to be incorporated within the proposed development deign to minimise light pollution during both the construction and operation phases of development.
Graven Hill Wood: Disturbance through opening public access to CWS	-NS	Access restricted to northern parts of the wood. Information boards installed to notify recreational users of the nature conservation interest of the area and to request dogs are kept on leads.
Graven Hill Wood: Increased coverage of adjoining	+NS	Additional planting of 1.9ha of broad-leaved woodland to contribute to biodiversity targets outlines in the Ray

Table 12.8	Summary e	ffects on I	biodiversity	at Graven	Hill and	evaluation (	of their	significance

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Receptor and effect	Significance	Rationale
woodland habitat		Conservation Area.
Bicester Wetland Reserve: Potential changes to hydrology affecting sensitive flora	-NS	Implementation of standard pollution prevention measures to prevent pollution during the construction phase. Water levels within the wetland reserve are maintained by the outfall from the STW not via run-off and surface water from the development site. As such, changes to the hydrology of the development site will not affect water levels within the wetland reserve.
Disturbance to birds utilising site from increased levels of noise and light		Incorporation of a lighting strategy to minimize pollution from increased lighting during the construction and operation phase.
Badger: Permanent loss of setts	-NS	Provision of two artificial setts. Where necessary, sett closures will be carried out under a Natural England badger development licence.
Badger: Permanent loss of foraging habitat	-NS	Provision of enhanced areas of habitat for foraging badger including additional planting of fruit and nut bearing trees.
		Provision of green corridors linking badger setts across the Site to the wider countryside.
Badger: Increased levels of disturbance from noise and light	-NS	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases. A noise abatement strategy will also be incorporated within the proposed development design during the construction phase.
Badger: Increased risk of persecution of badgers by new local population	-NS	New setts to be located in 'quiet areas' of CWS. Where appropriate, retained setts located in the vicinity of developed areas will be surrounded by dense scrub planting to make them less visible and less accessible to the general public.
Bats (roosting): Permanent loss of maternity and summer roosts	-NS	The provision of alternative roosting habitat through the inclusion of bat tiles and bricks within the commercial buildings. Bat boxes will also be installed on the mature standard trees and in the broad-leaved woodland. All work to be subject to a Natural England mitigation licence.
Bats (foraging): Permanent loss of sub-optimal foraging habitat and disturbance through increased levels of	-NS	Much of the 80ha of mostly sub-optimal foraging habitat will be replaced with 55.4h of residential areas. Urban gardens provide a good foraging resource for the two most commonly occurring bats on-site.
construction and operation.		Enhancement of retained existing habitat and additional planting of 8.6ha of broad-leaved woodland.
		Inclusion of a low level lighting strategy to minimise the effects on bats through increased levels of lighting during the construction and operational phases.
Dormouse: Permanent loss of small areas of potential dormouse habitat resulting in an increased risk of contravening the legislation relevant to dormice.	-NS	Provision of additional areas of broad-leaved woodland and hedgerow incorporating a number of fruit and nut bearing species suitable as a foraging resource for dormice. Existing hedgerows will also be enhanced for dormice through the incorporation of hazel and fruit and nut bearing species. All habitat to be lost will be replaced on a 'like for like' basis, and where appropriate a phased approach to the removal of dormouse habitat will be adopted.
		50 dormouse nesting boxes are to be installed within Graven Hill Wood.
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All works affecting potential dormouse habitat will be subject to a Natural England development licence in respect of this species.

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#### **Receptor and effect** Significance Rationale Dormouse: Enhanced -NS Provision of green corridors linking areas of dormouse habitat connectivity of dormouse across the Site to the wider countryside. habitat. Great crested newt: -NS The provision of up to 15 waterbodies as mitigation within 23ha Permanent loss of subof habitat for GCN. GCN excluded from the area of works and optimal aquatic and terrestrial translocated to areas of newly created habitat. All work to be habitat and increased risk of carried out under a Natural England mitigation licence contravening the legislation relevant to GCN. Reptiles: Permanent loss of -NS Creation of areas of optimal habitat for reptile species. predominantly sub-optimal A low level lighting strategy is to be incorporated within the foraging habitat, increased proposed development designed to minimise light pollution disturbance to reptiles through during both the construction and operational phases. Noise noise and light during the construction phase and abatement strategy to be incorporated within the proposed increased risk of killing and development design during the construction phase. injury during construction. All works to be subject to a reptile mitigation method statement to be agreed with Natural England and implemented in advance of the works. Reptiles: Increased risk of -NS Provision of adequate cover/refugia for reptiles in newly created predation by cats. areas of habitat. Leaflet drop to new residential areas highlighting conflict between cats and wildlife, and suggesting domestic cats wear bells. NS = not significant -negative S = significant + positive

#### Table 12.9 Summary effects on biodiversity at C Site and evaluation of their significance

Receptor and effect	Significance	Rationale
Arncott Meadows: Disturbance/damage to SSSI through increased levels of dust and pollution arising through construction process.	NS	Implementation of standard pollution prevention measures to prevent pollution during the construction phase.
Arncott Meadows: Damage to nationally uncommon bankside vegetation though fluctuations in water levels	NS	The run-off and surface water from the development site is discharged downstream of the SSSI, as such the bankside vegetation within the SSSI will not be affected by any changes to the levels of flow within the River Ray arising as a result of the development or through the incorporation of SUDS.
Badger: Potential loss of setts	-NS	If necessary, sett closures will be carried out under a Natural England badger development licence.
Badger: Permanent loss of foraging habitat	NS	Provision of enhanced areas of habitat for foraging badger including additional planting of fruit and nut bearing trees.
Badger: Increased levels of disturbance from noise and light	NS	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases. A noise abatement strategy will also be incorporated within the proposed



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Receptor and effect	Significance	Rationale
		development design during the construction phase.
Bats (roosting): Permanent loss of summer roosts	NS	The inclusion of bat tiles and bricks within the office buildings and installation of bat boxes on mature standard trees will enhance the provision of roosting habitat available on-site. All work to roosts to be subject to a Natural England mitigation licence.
Bats (foraging): Permanent loss of sub-optimal foraging habitat and disturbance	NS	The loss of sub-optimal foraging habitat will be compensated for through the enhancement of retained existing habitat and additional planting of 8.6ha of broad-leaved woodland.
lighting during both construction and operation		Inclusion of a low level lighting strategy within the environmental measures to minimise effects on bats through increased levels of lighting during the construction and operational phases.
Great crested newt: Permanent loss of sub- optimal aquatic and terrestrial habitat and increased risk of contravening the legislation relevant to GCN.	NS	The provision of 2 waterbodies within 16.7ha of habitat for GCN. GCN excluded from the area of works and translocated to areas of newly created habitat. All work to be carried out under an NE development licence.
		Further waterbodies and terrestrial habitat created as an enhancement measure in the southern section of the Site.
Dormouse: Increased risk of disturbance to dormice through noise and light.	NS	A low level lighting strategy is to be incorporated within the proposed development designed to minimise light pollution during both the construction and operational phases. A noise abatement strategy will also be incorporated within the proposed development design during the construction phase.
Dormouse: Enhanced provision and connectivity of dormice habitat	NS	Provision of additional areas of broad-leaved plantation incorporating a number of fruit and nut bearing species suitable as a foraging resource for dormice.
		Incorporation of arboreal links and woodland planting within the proposed development design linking existing isolated populations of dormice with the wider landscape.
NS = not significant	-nega	ative

S = significant

+ positive

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# 13. Water Resources

### 13.1 Introduction

13.1.1 This chapter sets out the results of an assessment of the effects of the proposed development on water resources during construction and operation and should be read in the light of the project description in chapter 3.

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13.1.2 All potential effects in relation to water resources are unlikely to be significant and the remainder of this chapter provides information as to why this conclusion has been reached and why these effects have been scoped-out of the assessment. Potential effects on nature conservation as a result in changes in water quality or flows are discussed in chapter 12.

### 13.2 Policy and legislation

### Planning policy context

13.2.1 Table 13.1 lists the issues from planning policy guidance and policies which have been considered in assessing water resources effects.

Policy	Policy issues
PPS23	Provides guidance relating to the consideration of the quality of land, air or water and potential impacts arising from new developments.
PPS25	Provides guidance on the requirements for assessing flood risk from all sources, and for the siting of development to avoid flood risk. Provides guidance on design to ensure the development is safe from flooding and the management of surface water from a new development to ensure that flood risk is not increased to people and property downstream.
CDC Draft CS Policy SD 1	Mitigate and adapt to climate change - avoiding areas that may be affected by climate change, minimising the risk of flooding and making use of sustainable drainage methods.
CDC Draft CS Policy SD 5	Sustainable Construction - make use of sustainable drainage methods.
CDC Draft CS paragraph A.59 to A.64	The Core Strategy (CS) contains no specific flood policy, as this would largely duplicate PPS25 and its practice guide. Refers to the Cherwell Strategic Flood Risk Assessment (SFRA) and the Flood and Water Management Act (2010).

Table 13.1 Pc	olicy issues
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Policy	Policy issues
CDC Draft CS Policy SD 6	Sustainable Urban Drainage Systems (SUDS) - The use of sustainable drainage systems (SUDS) for the management of surface water run-off generated by developments will be encouraged. Site specific Flood Risk Assessments should be used to determine how SUDS can be used on particular sites and to design appropriate systems. Where relevant (infiltration based SUDS) consider the need to protect groundwater quality. SUDS to be located on suitable land - i.e. to be accessible by Oxfordshire County Council (OCC) who , following satisfactory completion and their adoption, will be responsible for their ongoing maintenance.
CDC - Strategic Flood Risk Assessment (SFRA)	Provides an outline assessment of flood risk across the Council's entire area, focussing in on key flood risk sources and settlements. Provides some basic outline guidance on flood risk assessments preparation. Provides some context, but contains limited information relevant specifically to Graven Hill and C Site.

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- 13.2.2 Other policy and general guidance includes the following:
  - Environment Agency Pollution Prevention Guidance Notes (PPG) comprising:
    - PPG 1 General guide to the prevention of water pollution;
    - PPG 2 Above ground oil storage tanks;
    - PPG 3 Use and design of oil separators in surface water drainage systems;
    - PPG 4 Disposal of sewage where no mains drainage is available;
    - PPG 5 Works in, near or liable to affect watercourses;
    - PPG 6 Working at construction and demolition sites;
    - PPG 8 Safe storage and disposal of used oils; and
    - PPG 21 Pollution incident response planning.
  - CIRIA Report C502: Environmental Good Practice on Site.
  - CIRIA Report C532: Control of Water Pollution from Construction Sites.
  - CIRIA Report C697: The SUDS Manual
  - CIRIA Report R168: Culvert Design Manual.
  - BS6031: 1981 Code of Practice for Earth Works.
  - Good Practice Guide for Handling Soils (MAFF 2000).

### Legislative requirements

13.2.3 The *Floods and Water Management Act (2010)* provides the key guidance on the requirements for the provision and maintenance of surface water drainage features. Under the *Flood and Water Management Act (2010)* OCC is the 'approving body' for

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the proposed SUDS at the development sites. As required by the act, the SUDS will be designed to comply with current national guidance (i.e. CIRIA C697).

- 13.2.4 Key legislative drivers relating to the water environment which have been considered in this assessment include the following:
  - Control of Pollution Act 1974;
  - EC Dangerous Substances Directive (76/464/EEC);
  - EC Fisheries Directive (78/659/EEC);
  - Environment Protection Act 1990;
  - Land Drainage Act 1991;
  - Environment Act 1995;
  - Groundwater Regulations 1998;
  - UK Water Quality (Water Supply) Regulations 2000; and
  - Water Framework Directive (WFD) (2000/60/EC).

#### Data gathering methodology 13.3

#### **Desk study**

The information detailed in Table 13.2 was obtained in support of this chapter. 13.3.1

Data Source	Information
Environment Agency	Flood Risk, hydrological, hydrogeological and water quality data. By data request and via website. LIDAR data for south-east corner of Graven Hill Site.
Cherwell District Council, April 2009	SFRA (completed in April 2009) - additional flood risk information and flood records.
Thames Water	Sewer and surface water flooding.
Ordnance Survey	Site Mapping.
British Geological Survey	Site geological information.
Cranfield University - LANDIS database	Site soil type information.
AMEC, 2011	Flood Risk Assessment for both Graven Hill and C Site in accordance with the guidance and requirements set out in PPS25 Development and Flood Risk and the accompanying practice guide.
AMEC, 2011	Land Quality Assessments for Graven Hill ('D and E Sites'), and C Site.

#### Table 13.2 Desk study information sources

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### Survey

13.3.2 The following surveys have been undertaken in support of this assessment:

- Topographic Survey (2010); and
- site visits by AMEC staff between 2009 and 2011 (overview of site and key drainage features).

# 13.4 Overall baseline

13.4.1 For an outline description of the land uses currently at Graven Hill and C Site see section 3.1. Details of the existing hydrological features are shown on Figures 13.1 (Graven Hill) and 13.2 (C Site) respectively. Information on nature conservation sites is provided in chapter 12 (Biodiversity) and a detailed description of the topography of both sites is provided in chapter 11 (landscape and visual).

### **Current baseline**

### Hydrology

13.4.2 Both sites ultimately drain to the River Ray. C Site drains westwards, directly to the River Ray via several ditches. Graven Hill is drained by various ditches, the northern and eastern portions draining to two small tributaries of the River Ray that rise adjacent to Graven Hill. The western/southern proportion of Graven Hill drains via ditches direct to the Langford Brook, a larger tributary of the River Ray.

### Hydrogeology

- 13.4.3 Neither Site overlies or is adjacent to a Source Protection Zone (SPZ) zones designated in order to protect aquifers important for public water supply. All of C Site and the majority of the Graven Hill Site overlie non-productive strata i.e. geology that holds insignificant amounts of water. There are two discrete areas within the extreme south of the Graven Hill Site which overlie solid and superficial geology that is classified by the Environment Agency as a 'Secondary A' aquifer. This is an aquifer comprised of: "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*". In addition, a strip of land connecting the Graven Hill Site to C Site is also underlain in places by a Secondary A Aquifer.
- 13.4.4 Groundwater levels are understood (DE, 2008) to have been recorded at approximately 30m (Graven Hill) below ground level. The entirety of the Graven Hill Site is within a Nitrate Vulnerable Zone, which is likely to be associated with the current adjacent agricultural land use and historic agricultural use of the Site. More detailed information on soils and geology underlying both sites is provided in section 14.4.

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### Water quality

13.4.5 Water quality monitoring is carried out by the Environment Agency for the Langford Brook from upstream of the Bicester Sewage Treatment Works (STW) immediately west of the Graven Hill Site to the confluence with the River Ray downstream, a distance of 12km. There is also monitoring on the River Ray from upstream of C Site to downstream of Graven Hill. The Bicester STW discharges into the Langford Brook. The latest data from the EA is provided in Appendix K.

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- 13.4.6 The chemical and biological water quality in the Langford Brook is fair to good, with high levels of nutrients (Phosphate (P) and Nitrates (N)) downstream of the STW. The chemical water quality of the River Ray is fair, also with high levels of nutrients (P and N) associated with an upstream STW.
- 13.4.7 The WFD classification of the reaches of watercourse adjacent to the Graven Hill Site classifies the Langford Brook as having an ecological status of 'moderate' and the River Ray as 'poor'. All stretches of watercourse which are monitored are at risk from ammonia, phosphorous (from other sources) and combined source sanitary nutrients and the River Ray is also at risk from agricultural sources of phosphorus and diffuse pollution. Additional data is provided in Appendix K.
- 13.4.8 Both Graven Hill and C Site are served by Bicester STW. In terms of 'sanitary nutrients', under the Urban Wastewater Treatment Directive (UWWTD), (91/271/EEC), the Langford Brook downstream of Bicester is designated a sensitive watercourse. This places limits on the nutrient concentration of the treated effluent released into the watercourse.

### Licensed abstractions and discharges

- 13.4.9 There are seven groundwater and one surface water abstraction licences within 1km of the Graven Hill Site boundary and three potable water abstraction licences within 2km of the Site boundary (GroundSure Environsight reports, 2011). Details of the abstractions present are provided in Appendix K.
- 13.4.10 There are no groundwater or surface water abstraction licences within 1km of the C Site boundary and no potable water abstraction licences within 2km of the Site boundary (GroundSure Environsight reports, 2011).
- 13.4.11 There are 15 licenced Discharge Consents within the Graven Hill Site, or within 500m of the Graven Hill Site boundary. There are five licenced Discharge Consents within C Site, or within 500m of C Site's boundary. For both the Graven Hill Site and C Site, the discharges comprise treated effluent, surface water run-off and storm overflows.

### Flood risk

13.4.12 The Environment Agency's flood maps show that the majority of both sites are in Flood Zone 1, i.e. less than a 0.1% risk of flooding from fluvial sources in a given year. Small parts of the Graven Hill Site are located in Flood Zone 3 and 2, although these are small areas in the extreme north-west of the Site adjacent to the existing railway line. Part of C Site is also shown as being in Flood Zone 3/2, although this is

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the railway embankment approach to the Site, and as such is raised above flood levels. The smaller tributaries/drainage ditches near the Sites, and on the Sites are too small to have been included in the Environment Agency flood mapping.

13.4.13 In terms of flood risk from other sources, i.e. surface water run-off, surface water runon, groundwater, and risks from artificial sources the FRAs have identified limited issues. There are no artificial structures near the Sites that could cause flooding of the Sites (i.e. embankment waterbodies, flood defences, etc.). Flood risk from groundwater appears to be limited, although springs are naturally present in the area around Graven Hill. There is limited potential for run-on onto the Sites from surrounding areas since the Sites are generally higher than surrounding areas.

### Future baseline

- 13.4.14 The future baseline could potentially change due to consented development near Bicester (see section 4.5). This could lead to increased demand for water supplies, increased treated effluent flows from the STW into local watercourses, and potentially larger amounts of run-off from impermeable developed areas into watercourses thereby exacerbating flood risk. Climate change may also result in more intense rainfall events, and higher flood levels.
- 13.4.15 The implication of these factors on the water environment is limited. Water supply and the discharge of treated effluent will have to comply with existing environmental legislation aimed at ensuring abstraction for water supply and discharge of treated effluent do not adversely affect the water environment. These issues are managed strategically by the relevant water company though future planning and development as set out in their Strategic Business Plan. Current planning guidance on flood risk means that all new developments must manage their surface water run-off so as not to increase downstream flood risk. Sustainability measures also mean that new developments are designed to be more water-efficient than older developments.
- 13.4.16 Allowances for climate change, have been included in the assessment, both in developing the drainage system to allow for more intense rainfall (a 30% increase in intensity), and by ensuring that the development areas are above future flood levels.

# 13.5 Environmental measures incorporated into the proposed development

13.5.1 Environmental measures that have been incorporated into the proposed development are set out in Table 13.3. Information on how these measures will be implemented is also provided in Tables 3.3 in chapter 3.







Table 13.3	Rationale for incorporation of environmental measures
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Potential receptors	Potential changes and effects	Incorporated measure
Water quality of F surface water and re ground water s resources re	Pollution effects as a result of accidental spillage and polluted run-off from construction	Construction work will take place in accordance with the Environment Agency Pollution Prevention Guidelines. In addition the contractor will be required to implement a Construction Environment Management Plan (CEMP) which will include measures such as:
	activities.	<ul> <li>bunding of chemical and fuel stores to 110% of capacity;</li> </ul>
		<ul> <li>pollution incidence response plan to deal with any accidental spillages or leaks; and</li> </ul>
		<ul> <li>maintenance and re-fuelling of vehicles and equipment on hardstanding.</li> </ul>
Downstream flood risk	Run-off during Site development.	The development design includes Sustainable Urban Drainage Systems (SUDS) which will provide treatment to surface water run-off from the development. The SUDS system will be constructed at the earliest feasible stage of the development. Site run-off, which may contain silt, will be directed to settlement lagoon(s) and a Discharge Consent obtained for the discharge of this water to the proposed receiving watercourses (i.e. tributaries of the Langford Brook and River Ray).
		An application for approval of the SUDS will be made as part of the planning application; this application will be made in the form required by OCC. Once approved by OCC, following consultation with relevant organisations (i.e. the Environment Agency) and the resolution of any queries on the systems design, the system(s) at Graven Hill will be adopted and responsibility for the maintenance of drainage systems located within will lie with the approving body (OCC). OCC may require a fee to assess the proposed SUDS, and a bond to ensure satisfactory completion of the SUDS drainage system. Once adopted the SUDS must be maintained by OCC in compliance with current national SUDS guidance.
		The SUDS at C Site will be privately managed, with the MOD being responsible for their ongoing performance and maintenance (the maintenance will be carried out by appropriate contractors).
Water quality of surface water and ground water resources	Pollution effects from polluted run-off from the development once constructed and fully occupied.	Given the nature of the development (residential with a small retail centre and community buildings plus associated access roads, and some employment uses - storage and distribution) the routeing of run- off through SUDS features such as swales and attenuation basins will provide sufficient water quality treatment to ensure downstream water quality is not impaired by the development. The guidance provided in CIRIA C697 will be followed to ensure the appropriate levels of treatment are provided.
Properties within In the development flo	Properties within the development and off-site lincrease in impermeable areas as the Site is developed as built	Several measures have been identified in the FRA which has been incorporated into the development design. These include:
and on-site		<ul> <li>locating all development within Flood Zone 1 in areas least at risk of flooding;</li> </ul>
	aevelopment.	<ul> <li>using the limited areas of the Sites within Flood Zones 2, 3a and 3b where the risk of flooding is greater as amenity areas such as public open space and landscaping;</li> </ul>
		<ul> <li>raising floor levels to 0.15m or more above local ground levels to minimise the risk of surface water and sewer flooding to properties within the Graven Hill Site; and</li> </ul>

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Potential receptors	Potential changes and effects	Incorporated measure
		<ul> <li>inclusion of several control measures within the proposed development which will mimic natural drainage, allow some infiltration and restrict run-off from the Site. Such measures will include permeable paving storage plus storage within the drainage system and will also include attenuation basin(s) and swales.</li> </ul>

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### 13.6 Scope of the assessment

- 13.6.1 A consultation response from the Environment Agency (EA) indicated that overall the EA had no significant issues that need to be addressed through EIA but set out recommendations in relation to the FRA and SUDS design. These issues have been addressed in the masterplan, FRA and Drainage Strategies (see BIC/OPA/DOC/15 and 17). A consultation response from OCC requested that the SUDS design is submitted for agreement at an early stage as the final designs will influence the masterplan/development layout. The OCC response also detailed the arrangements currently being put into place as a result of the *Floods and Water Management Act* (2010) with regards to the SUDS design, agreement and adoption process. These issues have also been addressed separately as part of the masterplan (BIC/OPA/DOC/07), Drainage Strategies (see BIC/OPA/DOC/15 and 17) and FRAs (see Appendix K).
- 13.6.2 A copy of the consultation responses is provided in Appendix B.

### Potential receptors

- 13.6.3 New development (i.e. construction works, buildings, access roads and supporting infrastructure) has the potential to affect the hydrological and hydrogeological aspects of the local environment. Potentially both water quality and quantity in adjacent waterbodies could be affected by construction and operational activities.
- 13.6.4 Receptors with the potential to be significantly affected by the proposed development comprise:
  - the surface and groundwater quality of the Langford Brook and River Ray and their tributaries, and the secondary A Aquifer;
  - nature conservation designations such as the Arncott Bridge Meadows SSSI (note that potential effects on these receptors are addressed in chapter 12); and
  - proposed residential properties on Graven Hill and farmland and individual properties downstream and off-site from both sites.

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### Potentially significant effects

13.6.5 The following potential effects are not likely to be significant and therefore not considered further in this ES.

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- Potential effects on surface and groundwater quality as a result of accidental pollution spillage and incidents during construction: The measures outlined in Table 13.4 will minimise the potential effects on water resources. Good practice will be followed during construction, with a CEMP prepared to minimise the risk of the accidental release of contaminants into local waterbodies (for example oils/lubricants/fuel from construction vehicles or silty water from construction site run-off). Therefore, it is unlikely that there will be any significant affects on the quality of surface and groundwater resources.
- Potential effects on surface and groundwater quality as a result of contaminated run-off from the operation of the proposed development: These are unlikely to be significant for the following reasons.
  - Both site's foul drainage water will be routed to Thames Water's sewer network, where it will be piped to the local sewage treatment works for appropriate treatment before discharge of the treated effluent to a watercourse. Appropriate consents and conditions are imposed by the Environment Agency to ensure that the effluent is treated to a satisfactory standard prior to its release. Appropriate upgrades to the Bicester STW will be required to be incorporated by Thames Water to ensure continued compliance with present and future standards as the development (and other nearby developments) progresses.
  - The groundwater resource beneath the two sites is of limited sensitivity as neither Site overlies or is adjacent to a Source Protection Zone (SPZ) and all of C Site, and the majority of the Graven Hill Site overlies non-productive strata. The only areas of minor aquifer are located around the edges of the Graven Hill site. Within these parts of the Site the proposed land use will be landscaping and/or allotments. Infiltration will therefore not be reduced, and these land uses are unlikely to result in the degradation of water quality in the minor aquifer.
  - To mitigate the risk of diffuse pollution the two development sites each include a SUDS, which will ensure that run-off passes through several features (such as filter strips, swales and attenuation ponds), where entrained debris can settle out, and contaminants in the first flush of run-off will be naturally treated before the run-off reaches the downstream receiving watercourse.
  - Groundwater abstractions are unlikely to be affected by the proposed development at Graven Hill as they are located at some distance from the Site (the closest is approximately 400m north-west of the Site). Furthermore, the classification of the geology as non-aquifer/secondary A aquifer, means the probability of effects extending this far is unlikely. The surface water abstraction (317m south-west of the Site) is from a watercourse that does at present and will in future receive run-off from the Site. However, the nature of the Site usage at present and in future is unlikely to prevent the use of this water as 'make-up/top-up' water (i.e. for pesticide application) as it is currently. In







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terms of private water supply, i.e. the Potable water abstractions, the nearest is over 600m west of the Site, on the opposite side of the Langford Brook. It is very unlikely that redevelopment within the Site boundary will affect a groundwater abstraction on the opposite valley side. There are no groundwater or surface water abstraction licences within 1km of the C Site boundary and no potable water abstraction licences within 2km of the Site boundary and therefore in relation to C Site no effects are likely.

- For both the Graven Hill Site and C Site, the discharges from the Sites currently comprise treated effluent, surface water run-off and storm overflows. As the proposed development will include SUDS which will help maintain water quantity and quality, the ability of watercourses to accept and dilute the existing consented discharge is unlikely to be reduced. Therefore, these discharge consents will be unaffected.
- Potential effects on proposed residential properties on Graven Hill and existing off-site receptors as a result of an increased risk of flooding from both sites are unlikely to be significant for the following reasons.
  - Proposed residential development on Graven Hill lies within Flood Zone 1 (less than a 0.1% risk of flooding from fluvial sources in a given year). Those parts of both sites which lie within Flood Zones 2 and 3 will either be left as open space (Graven Hill) or will not be redeveloped as part of the proposed development and are raised above flood levels (railway embankment approach to C Site). The masterplans for both sites include the use of modern design standards for drainage design, and the raising of building flood levels slightly above ground level will minimise the flood risk from on-site watercourses.
  - There are no artificial structures near the Sites that could cause flooding of the Sites (i.e. embankment waterbodies, flood defences etc.) and there is limited potential for run-on onto the Sites from surrounding areas since the Sites are generally higher than surrounding areas.
  - Flood risk from groundwater is likely to be limited, although springs are naturally present in the area around Graven Hill. The provision of SUDS and the slight raising of building floor levels will minimise the risk from groundwater flooding.
  - Flood risk to properties off-site will not increase as a result of the proposed development as the drainage systems have been designed to ensure that the rate of run-off for the Sites will not increase above existing rates (i.e. by storage and slow release), and that the run-off from redeveloped areas is actually slightly reduced in order to provide a betterment. An allowance for climate change over the lifetime of the developments has been included in the assessments.

Potential effects on designated nature conservation sites, such as the Arncott Bridge Meadows SSSI are addressed in chapter 12.

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# 14. Land Quality and Soils

### 14.1 Introduction

14.1.1 This chapter sets out the results of an assessment of the effects of the proposed development on land quality and soils. The chapter should be read in the light of the proposed development description in chapter 3.

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14.1.2 All potential effects in relation to land quality and soils are unlikely to be significant and the remainder of this chapter provides information as to why this conclusion has been reached and that these effects have been scoped-out of the assessment.

### 14.2 Policy and legislation

### Planning policy context

14.2.1 Table 14.1 lists the issues from planning policy guidance and policies which have been considered in assessing land quality effects.

Policy	Policy Issue
PPS7	Sustainable Development in Rural Areas
PPS9	Biodiversity and Geological Conservation
PPS23	Planning and Pollution Control
	These policies and advice in accompanying Annexes (Annex 1: Pollution Control, Air and Water Quality and Annex 2: Development on Land Affected by Contamination) are material to decisions on individual planning applications.
CDC LP Policy ENV12	Contaminated Land
	Development on land which is known or suspected to be contaminated will only be permitted if:
	(i) Adequate measures can be taken to remove any threat of contamination to future occupiers of the Site
	(ii) The development is not likely to result in contamination of surface or underground water resources
	(iii) The proposed use does not conflict with the other policies in the plan.
	Proposals for the redevelopment of sites known or suspected to be contaminated will be considered against the above policy.
	<ul> <li>(i) Adequate measures can be taken to remove any threat of contamination to future occupiers of the Site</li> <li>(ii) The development is not likely to result in contamination of surface or underground water resources</li> <li>(iii) The proposed use does not conflict with the other policies in the plan.</li> <li>Proposals for the redevelopment of sites known or suspected to be contaminated will be considered against the above policy.</li> </ul>

#### Table 14.1 Policy issues







- Other policy and general guidance includes the following. 14.2.2
  - Environment Agency (EA) Pollution Prevention Guidance Notes (PPG) comprising:
    - PPG 1 General guide to the prevention of water pollution;
    - PPG 2 Above ground oil storage tanks;
    - PPG 3 The use and design of oil separators in surface water drainage systems;
    - PPG 5 Works and maintenance in or near water;
    - PPG 6 Working at construction and demolition sites;
    - PPG 8 Safe storage and disposal of used oils; and
    - PPG 21 Pollution incident response planning.
  - BS 3882:2007: Specification for topsoil and requirements for use.
  - BS 6031: 1981: 1981 Code of Practice for Earth Works.
  - CIRIA Report C502: Environmental Good Practice on Site.
  - CIRIA Report C532: Control of Water Pollution from Construction Sites.
  - CIRIA Report C665: Assessing Risks posed by hazardous ground gases to buildings.
  - MAFF, 2000, Good Practice Guide for Handling Soils: Guidance for restoration standards.

### Legislative requirements

- 14.2.3 Key legislative drivers relating to land quality that have been considered in this study include the following:
  - Control of Pollution Act 1974; and
  - Environment Protection Act (EPA) 1990, including Part 2A of the EPA 1990 -Contaminated Land (England) Regulations 2006.

#### 14.3 Data gathering methodology

14.3.1 The preparation of this chapter and scoping assessment was informed by several phases of land quality assessment (LQA), which drew upon information on historic site use, abstraction licensing, waste management/disposal activity and site setting (from an emapsite<sup>TM</sup> - GeoInsight and EnviroInsight reports), a Site walkover survey, geological, hydrogeology mapping (including Groundwater Vulnerability mapping) and OS mapping, aerial photographs and previous land quality assessment reports.

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The most up-to-date information available on publicly accessible websites and mapping has been used to determine the existing baseline conditions on the Sites, and in the immediate surrounding area. This has allowed identification of sensitive receptors which will need consideration during the design of each Site.

### **Desk study**

14.3.2 The assessment involves the collection and interpretation of a wide range of data and information from published and purchased material. The data and sources of information collected are listed in Table 14.2.

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Торіс	Source of Information
Topography	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
Surface waters (water	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
	Environment Agency http://www.environment-agency.gov.uk/maps/
Groundwater and	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
	Environment Agency Source Protection Zone maps www.environment-agency.gov.uk
Geology and soils	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
	British Geological Survey (BGS) <u>http://www.bgs.ac.uk/geoindex/index.htm</u>
Water resource use and	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
water abstractions	Environment Agency Source Protection Zone maps www.environment-agency.gov.uk
Historical use	Site Walkover
	The Bicester Military Railway and the Army's Central Railway Workshops by E.R. Lawton & Major M.W. Sackett, Oxford Publishing Company, 1992 ISBN 0 86093 467 4 5
	English Heritage (National Monuments Record) Aerial Photographs
	Phase 1 and 2 land quality assessment reports (AMEC, 2008)
	emapsite™ -GeoInsight and EnviroInsight reports, January 2010
Other	Multi-Agency Geographic Information for the Countryside (MAGIC) website www.magic.gov.uk
	Local Authority (Cherwell District Council) environmental data search
	An Explosive Ordnance Threat Assessment (EOTA), Battle Area Clearance, Training, Equipment and Consultancy (BACTEC) reference 3063TA, February 2010

Land quality - sources of information Table 14.2

### Survey

14.3.3 An intrusive site investigation was carried out over a two week period from 12 to 23 July 2010. AMEC E&I designed and supervised the intrusive works. The

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investigation undertaken was a risk-based assessment of selected sources of potential contamination in areas of C Site and Graven Hill (D and E Sites), as highlighted in the Phase One LOAs and included contaminant source areas that potentially posed a moderate (or higher) risk to identified receptors. The risk-based Site investigation was used to establish the presence and possible extent of ground contamination present. The scope of the intrusive investigation is detailed in Table 14.3.

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#### **Table 14.3** Land quality - scope of intrusive investigation

Торіс	Scope of works (collectively for E, D and C Sites)
Non-Intrusive Survey	
Radiological Survey	Radiological surveying undertaken on a 100% coverage survey of approximately 13ha including burning grounds and waste disposal landfill areas.
Topographic Survey	The location and elevation of the ground at each exploratory hole was established.
Intrusive Investigation	Drilling of 52 No. window sampling boreholes up to a maximum depth of 5.0m bgl.
	Drilling of 5 No. cable percussion boreholes to depths of between 6.0m and 10.0m bgl.
	Excavation of a total of 24 No. trial pits to a maximum depth of 3.5m bgl.
	Collection of surface water samples in 15 No. locations from the surface water drainage network collected on 3 No. occasions.
	6 No. rounds of post-installation ground gas monitoring.

### 14.4 Overall baseline

14.4.1 This section summarises the baseline environment, gathered from the sources listed in the previous section.

### **Current baseline**

14.4.2 The baseline information for land quality and factors which influence or are affected by it are described in this section. Information on topography is provided in chapter 11 (landscape and visual). Information on designated nature conservation sites is provided in chapter 12 (biodiversity) and more detailed information on hydrogeology, groundwater vulnerability, surface watercourses, water quality and water abstractions is provided in chapter 13 (water resources).

### **Previous land use**

14.4.3 All of MOD Bicester was built on agricultural land and woodland during the period 1941 to 1943 and was subsequently stocked with tanks, armoured cars, other vehicles and guns in preparation for the invasion of Europe in 1944. As of June 1943 the Sites were part of what was called 'COD (Central Ordnance Depot) Bicester'. The Sites were used for the processing of return stores from the Second World War and for

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stores issue in 1949 for the Korean War. MOD Bicester was re-designated as a Base Ordnance Depot (BOD) in the 1950s. By 1961 MOD Bicester had been reorganised, with technical stores and Motor Transport (MT) units moved to other depots including BOD Donnington in Shropshire. BOD Bicester was established as the main UK depot for military clothing and general stores. By 1992, the MOD Bicester became known as the Defence Storage and Distribution Centre, Bicester.

#### Soils and Agricultural Land Classification

14.4.4 The soils for the majority of C Site and Graven Hill are described on the National Soils Research Institute website (http://www.cranfield.ac.uk/sas/nsri/index.html) as being "slow permeable, seasonally wet, basic loams and clays". Naturally wet, loamy soils can be found on the eastern and southern boundaries of Graven Hill. Naturally wet, loamy and clayey floodplain soils can be found adjacent to the River Ray which will affect only small areas of C Site and Graven Hill. The estimated Agricultural Land Classification (ALC) layer taken from the www.magic.gov.uk website for C Site and Graven Hill indicates that the agricultural land quality for the majority of the developed areas is Grade 4 (Poor). Land adjacent to the Sites is classified as Grade 3 (good to moderate) (no data are available about the extent of Grade 3a/3b land as Grades 3a and 3b have not been differentiated at the county level).

# Geology

- 14.4.5 For both sites the superficial (or drift) geology types were generally absent, although deposits of alluvium (clay, silt, sand and gravel), Made Ground and topsoil were all encountered during the Site investigation at the Sites. These deposits were underlain by clay layers that were consistent across the Sites with firm, orange-brown mottled and brown-grey mottled, clay layers with occasional sand and gravel bands of fine gypsum crystals encountered at shallow depth. These layers were underlain by a firm, brown, laminated, clay layer typically with highly weathered yellow chalk veins and fine gypsum crystals.
- 14.4.6 The bedrock (or solid) geology encountered underlying the clay layers (described above) in all areas of the Sites comprised stiff grey laminated clay with shell fragments and occasional gypsum crystals and was believed to be part of the Peterborough Member (mudstone) of the Oxford Clay Formation. Beneath the Oxford Clay Formation, the Kellaways Sand and Kellaways Clay members of the Kellaways Formation with the Cornbrash Formation (predominantly calcareous shelly mudstones and fossiliferous limestones) located beneath the Kellaways Formation.
- 14.4.7 Detailed information on hydrogeology and groundwater vulnerability can be found in section 13.4.

#### **Pollution incidents**

14.4.8 According to the EnviroInsight report the EA has provided information on a number of pollution incidents in the area surrounding the proposed development sites. These include:



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- a diesel spill on E Site [Rodney House, 1993] (Category 2 (Significant) incident) with regard to the impacts to land and water in 2003);
- an oil spill on E Site [Operational Service Unit, 1994] (Category 3 (Minor) incident), an oil spill on C Site [C33, 1996] (Category 3 (Minor) incident); and
- two 'other sewage material' spills (Category 3 (Minor) and Category 4 (No Impact) incidents in 2002 at a location 37m north-east of the Graven Hill).

# **Existing infrastructure**

14.4.9 The majority of the existing infrastructure was built on agricultural land and woodland during the period 1941 to 1943. There are many warehouses and some office buildings with a significant amount of existing hardstanding, pipework, services and drains.

# **Predicted future baseline**

- 14.4.10 If new development or redevelopment of the current sites is not implemented then the baseline conditions are unlikely to change in the future.
- 14.4.11 Changes in the baseline are not expected *per se* but effects on receptors could potentially be expected in the event of soil disturbance or the accidental creation of pathways to receptors during any other construction or remediation works at the Sites.
- Most of the land at C Site and the Graven Hill Site is designated as poor agricultural 14.4.12 land. It was previously agricultural land that will have deteriorated due to soil sealing and soil compaction as a result of the development of MOD Bicester. The land could potentially be returned to Grade 3 (good to moderate) agricultural land. However, the redevelopment of brownfield land (as in this case) is consistent with the Government's commitment to sustainable development (rather than developing greenfield land).

# 14.5 Environmental measures incorporated into the proposed development

14.5.1 Environmental measures that have been incorporated into the proposed development, which are relevant to potential land quality and soils effects, are set out in Table 14.4. Information on how these measures will be implemented is also provided in Table 3.3 in chapter 3.

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Potential receptor	Potential changes and effects	Incorporated measure		
People and Property	Affected by increased exposure to soil contaminants from soils, surface run-off, watercourses or groundwater.	Soils testing to confirm the absence of contamination in areas of development located close to identified contaminant source areas. This will be dependant on the final development design. These measures should confirm that there are no localised risks to people and property from potential contamination.		
Construction workers	Potential health effects from disturbance of unknown contaminated land and remediation works to known contaminated land.	The few areas of suspected contamination will be subject to further investigation during the detailed design stage and, if required, an appropriate remediation strategy will be implemented.		
		All construction workers will be issued with appropriate Personal Protective Equipment (PPE).		
Controlled waters (surface water drainage ditches and groundwater [where present])	Potential pollution effects from disturbance of unknown contaminated land and during remediation of known contaminated land.	The few areas of suspected contamination will be subject to further investigation during the detailed design stage and, if required, appropriate remediation management actions will be implemented.		
		Method statement and risk assessments will be in place for the construction phase, which will include earthworks and remediation.		
Soils	Topsoil may become buried under subsoil or sterilised by development resulting in the loss of topsoil.	The following measures will be implemented during the construction stage:		
		<ul> <li>Avoid loss of topsoil by reuse in greenspace areas/landscaping/gardens.</li> </ul>		
		Reuse topsoil on all sites. Where there is surplus topsoil, contractor will be required to identify ways of reusing for other projects/landscaping.		
		These measures will be detailed in the Construction Environmental Management Plan (CEMP).		
Soils	Inappropriate storage and/or handling of soils during construction may result degradation of the soil structure. Some construction activities may have the same effect (for example heavy machinery can cause soils to become compacted).	The following measures will be implemented during the construction stage.		
		• A pre-construction survey will be carried out covering existing land drainage and the requirement for drainage modifications identified prior to construction.		
		<ul> <li>Topsoil and subsoil will be stripped separately, where possible in dry weather.</li> </ul>		
		<ul> <li>Topsoil and subsoil will be stored separately in accordance with best practice in accordance with BS 3882:2007</li> </ul>		
		<ul> <li>Outside areas of excavation, soil compaction will be minimised via the use of temporary tracks, low ground pressure tyres, tracked vehicles, low axle loads and limiting the use of machinery in wet weather.</li> </ul>		
		• Reinstated soils/natural soils over which construction vehicles have travelled may require aftercare to ensure the quality of the soils is restored. This will generally require the seeding of the soils as soon as possible and or loosening of soils which may have become compacted.		

# Table 14.4 Rationale for incorporation of environmental measures

These measures will be detailed in the CEMP.

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# 14.6 Scope of the assessment

- 14.6.1 Phase One and Phase Two LQA's (ref. BIC/OPA/DOC/21 and 22) have been produced for C Site (for a commercial/ industrial end use) and Graven Hill (for a mixed residential with gardens and commercial/industrial end use). The findings of the assessment confirmed that the vast majority of the Sites are underlain by superficial clay layers and bedrock of the Oxford Clay Formation. The geology beneath the Sites is classified as unproductive strata resulting in a low sensitivity for the quality of any groundwater present. As such, there is little potential risk from the proposed development to groundwater quality from the elevated concentrations of contaminants such as petroleum hydrocarbons, chlorinated solvents, ammonium and sulphate that have been identified within both soil and groundwater.
- 14.6.2 The LQAs did identify that further intrusive site investigation should be performed (depending on the final development design) in specific areas of the proposed development in order to characterise the risks to identified receptors further and enable remediation where appropriate. The site for the proposed primary school will be fully characterised and remedial management actions implemented if necessary. This can be secured through a planning condition.

# **Potential receptors**

- 14.6.3 Receptors with the potential to experience effects as a result of changes in land quality as a result of the proposed development include the following:
  - people and property;
  - construction workers (which could be affected by exposure to contaminated land);
  - controlled waters (to relevant river or watercourse via surface water drainage ditches and groundwater [where present]); and
  - soils.

# Potential significant effects

- 14.6.4 For the reasons set out below, the following potential effects are unlikely to be significant and therefore are not considered further in this ES.
- 14.6.5 Potential effects on receptors including people and property, construction workers and controlled waters (via surface water drainage ditches and groundwater [where present]) resulting from the presence of contaminated land at D and E sites within Graven Hill: These are unlikely to be significant for the following reasons.
  - The contaminants found to be present at Graven Hill (hydrocarbons from above and below ground fuel tanks are present at the Site and contaminants at the E Site (E15) Tip Area include hydrocarbons, metals, asbestos and radium) are highly localised and are therefore, unlikely to present risks across the Graven Hill Site as a whole.

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- The risks associated with the contaminants found can be managed via further assessment prior to the proposed development being constructed. These areas will be subject to further investigation at the detailed design stage and, if required, an appropriate remediation strategy will be implemented. On the basis of the types and quantities of contamination that are likely to occur, it is likely that a strategy could be developed that will avoid significant effects.
- The site for the proposed primary school will be fully characterised and remediated.
- 14.6.6 Potential effects on receptors including people and property, construction workers and controlled waters (via surface water drainage ditches and groundwater [where present]) resulting from the presence of contaminated land at C Site: These are unlikely to be significant for the following reasons.
  - The contaminants identified at the Site comprise Hydrocarbons, polyaromatic hydrocarbons (PAHs) and chlorinated solvents around fuel storage tanks and the area around building C33 (including the C33 landfill area). One sample from the C33 landfill area contained lead above the commercial/industrial generic assessment criteria (GAC) for human health but no other samples at C Site were recorded above commercial/industrial GAC. These contaminants are localised and considered unlikely to present risks across C Site as a whole.
  - The risks associated with the contaminants found can be managed via further assessment prior to the proposed development being constructed. These areas will be subject to further investigation at the detailed design stage and, if required, an appropriate remediation strategy will be implemented. On the basis of the types and quantities of contamination that are likely to occur, it is likely that a strategy could be developed that will avoid significant effects.
- 14.6.7 Potential effects to controlled waters (via surface water drainage ditches and groundwater [where present]) resulting from contamination caused by disturbance of contaminated soils or the accidental spillage of chemicals during construction at both sites: These are unlikely to be significant for the following reasons.
  - It is unlikely that such a pollution incident will occur due to the management measures which will be implemented during construction. Significant effects are therefore unlikely.
  - The results of the LQAs confirm that the majority of the Sites are underlain by clay layers above the Oxford Clay Formation which are unproductive strata of low sensitivity with respect to groundwater quality. Although elevated levels of contaminants have been identified within soil and groundwater, the low sensitivity should mean there is little potential risk from the proposed development to groundwater quality.
  - The local surface water sensitivity is higher than that of groundwater but on the basis of the types and quantities of contamination that are likely to occur and the environmental measures that will be implemented, it is unlikely that potential effects will be significant.







- 14.6.8 *Potential effects on agricultural land*: This includes the loss of a small area (~33ha) of the Graven Hill Site which is used for rough grazing by a tenant farmer. The planned land use for this area includes residential development, public open-space use and allotments. Some of this land will be temporarily or permanently unavailable for agricultural use. Approximately 9ha will be left undeveloped and therefore has the potential to be brought back into agricultural use. The land that will be permanently lost (to development) as part of the proposed development does not represent the best and most versatile agricultural land (Grades 1, 2 and 3a) as it is classified as Grade 4 and therefore effects are unlikely to be significant.
- 14.6.9 *Potential effects on soils caused by the loss of topsoil and changes in soil structure:* These are unlikely to be significant as the implementation of measures that will form part of a CEMP (see Table 14.4) will ensure that topsoil will be protected and appropriately re-used.



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OS/75312	163	SP 634 176	05 JUL 1975
OS/75392	191	SP 586 210	21 SEP 1975
OS/84243	992	SP 590 200	26 NOV 1984
OS/84243	993	SP 591 208	26 NOV 1984
OS/89440	3	SP 586 202	23 SEP 1989
OS/89440	4	SP 586 208	23 SEP 1989
OS/91021	168	SP 628 185	10 APR 1991
OS/91021	169	SP 625 178	10 APR 1991
OS/94037	151	SP 604 170	26 MAR 1994
OS/94037	152	SP 610 170	26 MAR 1994
OS/94037	153	SP 617 170	26 MAR 1994
OS/94037	154	SP 623 169	26 MAR 1994
OS/94037	155	SP 629 169	26 MAR 1994
OS/94037	200	SP 630 182	26 MAR 1994
OS/94037	201	SP 623 182	26 MAR 1994
OS/94037	202	SP 617 182	26 MAR 1994
OS/94037	203	SP 611 182	26 MAR 1994
OS/94037	209	SP 589 196	26 MAR 1994
OS/94214	20	SP 578 204	28 JUN 1994
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OS/94214	47	SP 589 202	28 JUN 1994
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OS/94214	90	SP 609 175	28 JUN 1994
OS/94214	91	SP 609 170	28 JUN 1994
OS/96633	4	SP 589 205	15 JUN 1996
OS/96633	5	SP 584 204	15 JUN 1996
OS/74264	321	SP 583 201	24 OCT 1974
OS/74264	322	SP 589 200	24 OCT 1974
OS/74264	384	SP 608 174	24 OCT 1974
OS/74264	388	SP 635 173	24 OCT 1974



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