7.0 ECOLOGY

Introduction

7.1 This chapter of the Environmental Statement (ES) assesses the likely significant effects of the Proposed Development on ecology and nature conservation through the construction, operational and decommissioning stages of the project. This chapter is supported by six appendices;

- Appendix 7.1: Ecology Assessment - West Sussex Sites – Wisborough Green – 1;
- Appendix 7.2: Wisborough Green-1 Protected Species Report;
- Appendix 7.3: Consultation Log;
- Appendix 7.4: Habitat Regulations Assessment;
- Appendix 7.5: Tree Survey Report; and
- Appendix 7.6: Confidential Appendix.

7.2 This chapter includes the following information;

- the legal and policy basis for the topic;
- the identification of key ecological features (receptors) and their value;
- the sources of impact and the sensitivity of receptors to impacts;
- the nature, scale and duration of any effects (both direct and indirect) of the proposal on sensitive receptors;
- potential mitigation measures to reduce negative effects; and
- assessment of the significance of residual effects.

7.3 This chapter has been prepared by URS Infrastructure and Environment UK Ltd.

Planning Policy Context

National Planning Policy

National Planning Policy Framework

7.4 The National Planning Policy Framework (NPPF) (Ref. 7.1) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible, including by establishing coherent ecological networks that are more resilient to current and future pressures. The NPPF should be read in conjunction with the Government Circular: Biodiversity and Geological Conservation, ODPM Circular 06/2005 (Ref. 7.2).

7.5 Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife will be judged. Distinctions should be made between the hierarchy of international, national and locally designated sites, so that protection is commensurate with their status.

7.6 To minimise impacts on biodiversity, planning policies should plan for biodiversity at a landscape-scale; identify and map components of the local ecological networks; and promote the preservation, restoration and re-creation of priority habitats and ecological networks and the protection and recovery of priority species populations and identify suitable indicators for monitoring biodiversity.

7.7 A number of principles should be applied by local planning authorities when determining planning applications. Notably, the primary aim should be to avoid significant harm to protected species and habitats and, if not possible, mitigate impacts, or, as a last resort, provide adequate compensation. Furthermore, opportunities to incorporate biodiversity should be sought.

Local Planning Policy

Chichester District Local Plan (1999) (Ref. 7.3)

7.8 The Chichester District Local Plan was adopted in April 1999. The Local Plan will eventually be replaced by the new Local Plan Core Strategy. Until the Local Plan Core

Strategy is adopted the saved strategies of the Chichester District Local Plan forms the development plan.

7.9 Protection of ecology is addressed primarily by the nature conservation policies RE7 (Nature Conservation – Designated Sites) and RE8 Nature Conservation (Non-Designated Areas) and BE14 (Wildlife Habitat, Trees, Hedges and Other Landscape Features). These policies recognise nature conservation interest within and outside of designated sites, which may include ancient woodland, Local Nature Reserves and wildlife corridors.

West Sussex Minerals Local Plan (adopted July 2003) (Ref. 7.4)

7.10 The plan sets out its policies for the protection of the environment. Those relevant to the Application Site are;

- Policy 10: Proposals for mineral working which may irreversibly damage statutorily designated sites of historic, architectural, natural or scientific interest will only be granted if the damage can be prevented or the need for the minerals outweighs the environmental objections relating to those designations;
- Policy 13: Proposals for mineral extraction in areas which do not have statutory protection but which are of local environmental significance will be given careful consideration and will not be permitted unless the benefits of the development would outweigh the detrimental effects of the proposal on the value of these areas having taken into account measures to mitigate any adverse impacts; and
- Policy 16: Appropriate measures will be required for safeguarding the water environment during working and the prudent use and recycling of water within mineral workings will be encouraged.

UK Post-2010 Biodiversity Framework (Ref. 7.5)

7.11 This document sets a broad enabling structure for action across the UK between now and 2020, including a shared vision and priorities for UK-scale activities to help deliver the 'Aichi targets' and the EU Biodiversity Strategy. A major commitment by Parties to

the Convention of Biological Diversity is to produce a National Biodiversity Strategy and/or Action Plan.

7.12 The UK Post-Development Framework is relevant in the context of Section 40 of the NERC Act 2006 (Ref. 7.6), meaning that Priority Species and Habitats are capable of being material considerations in planning. These species are identified as species of conservation concern often due to their rarity and/or a declining population trend.

Chichester Local Biodiversity Action Plan (Ref.7.7)

7.13 The Local Biodiversity Action Plan (LBAP) for Chichester District is a strategic document bringing together the Council's planned activities to protect our local biodiversity, as well as proposing new areas of activity such as habitat improvements to some of the Biodiversity Opportunity Areas identified by the Sussex Biodiversity Action Plan.

Other Relevant Guidance

Birds of Conservation Concern (Ref. 7.8)

7.14 Leading governmental and non-governmental conservation organisations in the UK reviewed the population status of 247 bird species regularly found in Britain, and placed them onto one of three lists - red, amber or green. Although these listings offer no legal protection, they are meant to help guide conservation action for individual species.

7.15 Red List Species are species of high conservation concern. They are Globally Threatened according to International Union for the Conservation of Nature (IUCN) criteria, and include:

- those whose population or range has declined rapidly in recent years; and
- those that have declined historically and not shown a substantial recent recovery.

7.16 Amber List Species are species of medium conservation concern. They have an unfavourable conservation status in Europe, and include:

- those whose population or range has declined moderately in recent years;
- those whose population has declined historically but made a substantial recent recovery;
- rare breeders; and
- those with internationally important or localised populations.

7.17 Green List Species are the remaining species with stable or increasing populations and that are presently not of conservation concern.

Legislation

The Wildlife and Countryside Act 1981 **(Ref. 7.9)**

7.18 The Wildlife and Countryside Act 1981 (as amended) (WCA) is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) and the European Union Directive on the Conservation of Wild Birds (79/409/EEC) (EU Birds Directive) are implemented in Great Britain.

7.19 Wild animals listed on Schedule 5 of the WCA are subject to specific protection under Section 9, which make the following an offence:

- Intentional killing, injuring and taking;
- Possession or control;
- Intentional or reckless damage to, destruction of, obstruction of access to any structure or place used by a scheduled animal for shelter or protection;
- Intentional or reckless disturbance of an animal occupying such a structure or place;
- Selling, offering for sale, possessing or transporting for the purposes of sale; and
- Advertising for buying or selling.

7.20 The WCA prohibits the intentional killing, injuring or taking of any wild bird (with certain exceptions) and the taking, damaging or destroying of a wild birds' nest or eggs. Special penalties are given for offences related to birds listed on Schedule 1.

7.21 A number of plant species, including Japanese knotweed *Fallopia japonica* and giant hogweed *Heracleum mantegazzanium* are listed on Schedule 9 of the WCA. This makes it an offence to plant them in the wild or otherwise cause them to grow.

The Countryside and Rights of Way Act 2000 **(Ref. 7.10)**

7.22 Part III of the Countryside and Rights of Way Act, 2000 (CRoW) requires that Government Departments have regard for the conservation of biodiversity, in accordance with the Convention on Biological Diversity in 1992.

7.23 In addition, it demands that the Secretary of State publishes a list of living organisms and habitat types that are considered to be of principal importance in conserving biodiversity. These species and habitats are listed under Section 74 of the CRoW Act, as amended by Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC) (Ref. 7.11).

7.24 The CRoW Act amends the WCA, by also making it an offence to "recklessly destroy, damage or obstruct" access to a sheltering place used by an animal listed in Schedule 5 of the Act or "recklessly disturb" an animal occupying such a structure or place.

Natural Environment and Rural Communities Act 2006

7.25 The NERC Act further extends the requirement to have regard for biodiversity to all public authorities, which includes local authorities and local planning authorities, and requires that the Secretary of State consults Natural England in the publication of the list of living organisms and habitat types deemed to be of principal importance in conserving biodiversity.

The Conservation of Habitats and Species Regulations 2010 (Ref. 7.12)

7.26 The Conservation of Habitats and Species Regulations 2010 (as amended), hereafter referred to as the 'Habitats Regulations' are the principal means by which the European Union Directive on the Natural Habitats and Wild Fauna and Flora (92/43/EEC) (EC Habitats Directive) is transposed in England and Wales. These 2010 Regulations update the legislation and consolidate the many amendments which have been made to the Habitats Regulations since they were first approved in 1994.

7.27 The Habitats Regulations place a duty on the Secretary of State to compile a list of sites considered to be important for habitats or species listed in Annexes I and II of the EC Habitats Directive. There are 39 plant species on Schedule 9 of the Act for which it is illegal to let escape or cause to grown in the wild.

7.28 The Habitats Regulations also assign a European level of protection to a variety of native species of plants and animals listed in Annex IV(a) of the EC Habitats Directive, which are known as European Protected Species (EPS). It is an offence to deliberately pick, collect, cut, uproot or destroy a wild plant of an EPS. In addition, wild animals, which are listed on Schedule 2 of the Regulations, are subject to the provisions in Regulation 39, which make it an offence to:

- Deliberately capture, injure or kill a wild animal of a EPS;
- Deliberately disturb any such animal which is likely to:
    - To impair their ability to survive, to breed or reproduce, or to rear or nurture their young, or, in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
    - To affect significantly the local distribution or abundance of the species to which they belong;
- Deliberately take or destroy the eggs of such an animal; or
- Damage or destroy a breeding site or resting place of such an animal.

The Protection of Badgers Act 1992 **(Ref 7.13)**

7.29 The Protection of Badgers Act 1992 protects badgers against killing, injury or taking. Badger setts are also protected against damage, destruction or obstruction and it is illegal to disturb a badger whilst it is in its sett.

The Wild Mammals (Protection) Act 1996 **(Ref. 7.14)**

7.30 It is an offence to intentionally cause all wild mammals unnecessary suffering by certain methods, including crushing and asphyxiation.

Assessment Methodology

Scoping and Consultation

7.31 A consultation exercise was undertaken to establish the scope of protected species surveys to be conducted (see Appendix 7.3 for consultation log). On 14th March 2013, URS met with the County Ecologist from West Sussex County Council (WSCC) to discuss the scope of works required to support the planning application for the Proposed Development. The following principles were agreed.

- Detailed information on bat activity should be collated to inform a Habitat Regulation Assessment screening (see Appendix 7.4 for information to inform the Habitats Regulation Assessment). This would include;
    - Desk study information on the activity of bats from the Mens Special Areas of Conservation (SAC) and Ebernoe SAC.
    - Bat activity survey data for the Application Site, gathered in accordance with Bat Conservation Trust (BCT) (2012) guidelines (Ref. 7.15).
- An assessment of the structure of woodland edge and a hazelnut search would provide sufficient data to assess the potential effects on hazel dormouse in areas

where there will be no loss of suitable hazel dormouse habitat resulting from the development proposals.

- Breeding bird survey data is not required to assess the potential effects of small scale, temporary projects of this type; however, a search for the nests of Schedule 1 birds should be undertaken prior works beginning, if works are started within the bird breeding season.
- Enhancements to the Application Site should be targeted at species known to be present and should be carefully located so as not to be impacted by any future works at the Application Site.

7.32 A Scoping Report for the Proposed Development was issued to WSCC and stakeholders in April 2013 (refer to Chapter 2 for further information). Requirements set out in the Scoping Opinion relating to ecology are presented below:

- Screening the scheme for a Habitat Regulation Assessment to assess any potential effects on The Mens and Ebernoe SACs.
- Considering impacts upon statutory and non-statutory designated wildlife sites and other sensitive habitats, such as ancient woodland;
- Conducting relevant protected species surveys for the project and where those species are found providing the following information within the ES:
    - An assessment of how the species uses the Application Site;
    - The direct and indirect effects of the development upon that species;
    - Full details of mitigation or compensation that might be required;
    - Whether the impact is acceptable and/or licensable.
- Conducting relevant surveys for protected species at the optimum time of year by suitably qualified and, where appropriate, licensed ecologists;
- The development design should aim to reduce adverse impacts on sensitive areas or species, and should if possible provide opportunities for overall wildlife gain;
- Consideration of cumulative and or in-combination impacts.

7.33 On 12th June, 2013, URS undertook a telephone consultation with the Protected Species and Environmental Planning Adviser at Natural England to discuss the extent of bat survey data required to inform a screening for a Habitat Regulations Assessment. Natural England advised that the Application Site should be considered a medium-sized site of medium quality, and that BCT (2012) guidelines (Ref. 7.15) should largely be followed in terms of survey effort. It was agreed that monthly bat activity surveys between April and August, with one dusk and pre-dawn survey within a 24 hour period would be appropriate.

7.34 The survey area considered during the ecological investigations included the Application Site which is approximately 1.65ha and is depicted in **Figure 7.1**. The adjacent habitats were also included in order to evaluate potential nearby sensitive receptors which could be impacted by the Proposed Development.

7.35 The scope of ecological investigations undertaken for the assessment is as follows:

- Desk-based study to search the online websites and collate records from local record centres and recorders;
- Extended Phase 1 habitat survey to record the nature and extent of vegetation and habitats within and near to the Application Site;
- Specific surveys for the following receptors:
    - otters *Lutra lutra*;
    - water voles *Arvicola terrestris*;
    - badger *Meles meles*;
    - bats; and
    - hazel dormouse *Muscardinus avellanarius*.

7.36 The Extended Phase 1 habitat survey noted the potential of the Application Site to support very low numbers of common reptile species; however, it is unlikely that surveys would record any individuals under these conditions. Furthermore, it is unlikely that significant effects on the conservation status of reptiles or legal offences would occur if suitable avoidance and measures are adopted. For this reason reptiles

were scoped out of the protected species surveys, but will be considered in the ES to ensure that they are protected in accordance with current legislation.

7.37 On 13th February 2013, The Environmental Dimensions Partnership (EDP) undertook an arboriculture survey of trees on the Application Site in accordance with BS5837:2012 guidelines (Ref. 7.16) (see Appendix 7.5 for full detailed of the tree survey). The trees along the woodland edge to the north and west of the Application Site were assessed to record details of species, size, age and condition. Based on these characteristics, the trees were then categorised in terms of their arboricultural and landscape value. The survey also allowed protection measures to be developed to prevent damage to the trees during construction works.

Desk-Based-Study

7.38 A desk-based study was undertaken between January and May 2013 to collate existing records of rare, notable, protected and invasive species up to 5km from the Application Site (see Appendix 7.1 for details). Rare, notable, protected and invasive species includes species included under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); Schedules 2 and 4 of The Conservation of Habitats and Species Regulations 2010 (the Regulations); and Species and Habitats of Principal Importance in England, listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

7.39 The following sources were contacted for information:

- The Mens and Ebernoe Management Team at Sussex Wildlife Trust;
- Sussex Biodiversity Record Centre;
- South Downs National Park Authority;
- Sussex Bat Group;
- Sussex Ornithological Society; and
- Multi-Agency Geographical Information for the Countryside.

7.40 For full survey details see Appendices 7.1 & 7.2.

Field Surveys

7.41 For full survey details see Appendices 7.1 & 7.2.

Vegetation and Habitats

7.42 An Extended Phase 1 habitat survey was undertaken in January 2013 and updated in August 2013, to record vegetation and habitats within and adjacent to the Application Site (see Appendix 7.1 for full survey details). Habitats were recorded according to published JNCC guidelines for Phase 1 habitat survey (Ref. 7.17). Habitats were mapped and target notes made for features of particular interest.

7.43 The habitats were then appraised for their suitability to support rare, notable or protected species.

Badger

7.44 The Application Site and a buffer was surveyed for badgers using the methodologies of Harris, Cresswell & Jefferies (Ref. 7.18). The Application Site was systematically searched for signs of badgers, including setts, latrines, signs of foraging, tracks, paths and hair on fencing in January, April and June 2013 to monitor levels of badger activity in the area. The status of the entrances of any setts was assessed according to criteria set out in Neal and Cheeseman (Ref. 7.19).

Water Vole and Otter

7.45 In January and August of 2013, Boxal Brook was survey for evidence of water voles and otters according to current survey guidelines (Ref. 7.20 & 7.21). The banks of all waterbodies were walked to search for signs of these animals. Any signs of water voles such as burrows, latrines, feeding remains, paths or the animals themselves

were recorded on a scale map of the site. Furthermore, signs of otters such as holts, spraints, footprints or the animals themselves were also mapped.

Bats

Bat Roost Assessment

7.46 An assessment of trees on and adjacent to the Application Site was undertaken in January 2013, to determine their potential to support roosting bats (see Appendix 7.2 for full details of surveys). Each tree was assigned to one of the following categories based on its potential to support roosting bats using the following criteria as defined by the BCT guidelines (Ref. 7.15):

- Category 1*: Trees with multiple, highly suitable features capable of supporting larger roosts.
- Category 1: Trees with definite potential, supporting fewer suitable features than category 1* trees or with the potential for use by single bats.
- Category 2: Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
- Category 3: Trees with no potential to support bats.

Bat Activity Surveys

7.47 Transect surveys were conducted around the Application Site during the months of May, June and July, and will continue each month until September 2013. This level of survey effort will provide sufficient data to assess bat activity throughout the bat active season. Surveyors walked the transect route recording all bats seen or heard together with their species, numbers and activity (see Appendix 7.2 Protected Species Report for full details of surveys). Identification was aided by the use of electronic bat detectors.

7.48 Following BCT guidance, dusk activity surveys away from roosts at dusk started a quarter of an hour before sunset and lasted for up to three hours. A pre-dawn transect survey was also conducted in June. This was undertaken within 24 hours of a duck activity survey. This survey was undertaken for two hours prior to sunrise.

7.49 In addition to the walked transect surveys, automated surveys (using SM2 bat detectors) were undertaken around the Application Site during April, May and July and will continue each month until September, 2013.

7.50 During each month four detectors were placed in strategic locations along the woodland edge, near to the Application Site. The detectors were left in place for at least five nights on each occasion to record all bat activity between half an hour before dusk and two hours after dawn.

Hazel Dormouse

7.51 Searches for hazelnuts that have been gnawed by dormouse is the most efficient method of surveying for dormouse (Ref. 7.22). In April 2013, in line with current guidelines (Ref. 7.22) over 100 hazelnuts were collected from the floor of woodland near to the Application Site. Each nut was examined for the tooth marks indicative of hazel dormouse predation.

7.52 Furthermore, an assessment of the woodland edge was made for its suitability to support hazel dormouse. The assessment was based on the structure of the vegetation, the lateral connectivity of the vegetation (in terms of allowing arboreal species to move freely through the canopy), and plant species composition.

7.53 No evidence of dormouse was found during the hazelnut survey and therefore further surveys were not conducted.

Limitations

7.54 Not bat transect survey was undertaken in April 2013. This was due to the unusually cold and wet weather conditions in 2013 which, according to BCT Guidelines, were suboptimal for bat surveying (Ref. 7.15).

7.55 The assessment evaluates sites, habitats, species and other ecological features using an approach based on the 'Guidelines for Ecological Impact Assessment in the United Kingdom' (Ref. 7.23), classifying potential ecological receptors into a hierarchy of ecological value based on geographical scale of importance. Key areas and/or species of ecological value within the site are identified and the main factors contributing to their current ecological value are described. The assessment also takes account of relevant wildlife legislation and national and local planning policies.

7.56 In order to determine the significance of any effects of the Proposed Development a robust assessment methodology is required. The assessment method used is based upon various different protocols for the assessment of significance. The criteria draw on the IEEM guidelines for ecological impact assessment.

7.57 The value of receptors are identified and placed in a geographic context from "international" to "site" levels in accordance with the following scale:

- International (Very High);
- UK and National (High);
- Regional/County (Medium);
- Local or Parish (Low);
- Site (Very Low); and
- Negligible.

7.58 Processes or factors within the proposed development that could potentially affect habitats and species or the wider environment are identified within the assessment.

7.59 Habitats and species within the survey area that might be affected by potential effects either directly or indirectly are considered and existing conditions are defined.

7.60 Likely significant effects arising from the development and the effects (beneficial or adverse) of these on species and their habitats are predicted, and where possible quantified. The geographic level at which these effects are considered to be significant is determined. IEEM guidelines suggest ecological experience and professional judgement should be integral part of this assessment process and impacts are described simply as "significant" or "not significant" at certain geographical levels.

7.61 In order to produce a summary of the ecological impacts within this chapter the IEEM impact descriptions are translated to the terms for effect significance throughout the rest of the ES. The approach to this translation is shown in Table 7.1.

Table 7.1: Translation between IEEM assessment and ES Significance Terminology

EIA Effect Significance		Equivalent IEEM Assessment
Significant	Major Beneficial	Positive Impact on ecological integrity or conservation status at Regional, National or International level.
	Moderate Beneficial	Positive Impact on ecological integrity or conservation status at Borough - County level.
Non-significant	Minor Beneficial	Positive Impact on ecological integrity or conservation status at Site - Local level.
Neutral	Negligible	No Significant Impact on ecological integrity or conservation status.
Non-significant	Minor Adverse	Adverse Impact on ecological integrity or conservation status at Site - Local level
Significant	Moderate Adverse	Adverse Impact on ecological integrity or conservation status at Borough - County level.
	Major Adverse	Adverse Impact on ecological integrity or conservation status at Regional, National or International level

7.62 Measures to avoid or reduce significant effects, if possible, have been developed in conjunction with other elements of the design and mitigation for other environmental disciplines. Where necessary, measures to compensate for impacts to features of nature

conservation importance are also included. Remaining (residual) impacts of the Proposed Development after the implementation of mitigation are then reported.

7.63 Scope and opportunity for enhancement within the Proposed Development is considered, even if there are no significant negative impacts.

Baseline Conditions

Desk-Based Study Results

Statutory Designated Sites

7.64 The Mens Special Area of Conservation (SAC) lies *c.*0.7km to the south of the Application Site (**Figure 7.2**). The Annex I habitats that are a primary reason for selection of the SAC site include Atlantic acidophilous beech *Fagus sylvatica* forests which is a beech forest with holly, growing on acid soils, in a humid Atlantic climate.

7.65 The Mens is an extensive area of mature beech woodland rich in lichens, bryophytes, fungi and saproxylic invertebrates. It is one of the largest tracts of Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range.

7.66 Annex II species that are qualifying feature, but not a primary reason for site designation includes a colony of barbastelle *Barbastella barbastellus* bats. Surveys, undertaken in 2008 for the Sussex Wildlife Trust, revealed that a breeding population of between 80-120 breeding females are present at The Mens (Ref. 7.24). Radio-tracking studies were been undertaken to identify core foraging areas for these bats and identified that the barbastelles of The Mens SAC forage to the east of the SAC, principally on the floodplain of the river Arun from close to Horsham in the north, to Parham in the south. They also cross to the Adur floodplain. In some cases the bats travelled up to 7km to visit foraging areas (Ref. 7.24).

7.67 The Mens is also designated as a Site of Special Scientific Interest (SSSI) due to being one of the most extensive examples of wealden woodland in West Sussex. It is important for its size, structural diversity and the extremely rich fungal and lichen flora. The wood also supports a diverse community of breeding birds and a nationally endangered species of fly.

7.68 Ebernoe Common SAC is located approximately 5km west of the Application Site (**Figure 7.2**). The Annex I habitats that are a primary reason for selection of this site are Atlantic *acidophilous* beech forests. Ebernoe Common has an extensive block of beech high forest and former wood-pasture. The woods are important for a number of bat species, in particular Bechstein's *Myotis bechsteinii* bat and barbastelle bats; both bat species are primary reasons for the selection of this site as an SAC.

7.69 Studies, undertaken in 2008 for the Sussex Wildlife Trust, have shown that the barbastelle from Ebernoe Common SAC follow the River Kird and woodland edges to the north and south of the SAC for commuting and foraging (Ref. 7.24). There has been less study of the bechstein bat populations. However, those radio-tracking projects which have been implemented for the species have established that the tracked individuals generally remained within approximately 1.5km of their roosts (Ref. 7.24).

7.70 Ebernoe Common is also and SSSI and is of national importance as an example of a large ancient woodland. It contains a wide range of structural and vegetation community types which have been influenced in their development by differences in the underlying soils and past management. The native trees, particularly those with old growth characteristics, support rich lichen and fungal communities, and a diverse woodland breeding bird assemblage. Nationally important maternity roosts for barbastelle bat and Bechstein's bat occur within the woodland.

Non-Statutory Designated Sites

7.71 Dunhurst & Northup Copses Site of Nature Conservation Importance (SNCI) lies approximately 15m north of the Application Site boundary and is an area of ancient

woodland (**Figure 7.2**). The majority of the woodland is dominated by oak *Quercus robur*, growing over dense hazel *Corylus avellana* and hawthorn *Crategus monogyna*. The ground flora includes ivy *Hedera helix*, bluebell *Hyacinthoides non-scripta* and Goldenrod *Solidago virgaurea*.

Flora and Fauna

Vegetation

7.72 Blocks of ancient woodland were recorded within 1km of the site. The invasive plants Japanese knotweed *Fallopia japonica* and variegated yellow archangel *Lamiastrum galeobdolon* subsp*. Argentatum* have been recorded within 1km of the Application Site. The rare species true fox-sedge *Carex vulpina*, rye brome *Bromus secalinus* and chamomile *Chamaemelum nobile* have also been recorded within 1km.

Bats

7.73 Six species of bats were recorded within 5km of the site: brown long-eared bat *Plecotus auritus*, common pipistrelle *Pipistrellus pipistrellus*, Daubenton's bat *Myotis daubentonii* and noctule *Nyctalus lasiopterus*, serotine *Eptesicus serotinus* and barbastelle bats. The closest bat record was for a Daubenton's bat recorded approximately 210m to the north of the Application Site.

Other Mammals

7.74 Badger, weasel *Mustela nivalis*, roe deer *Capreolus capreolus*, grey squirrel *Sciurus carolinensis*, wood mouse *Apodemus sylvaticus* and rabbit *Oryctolagus cuniculus* have all been recorded within 1km and could occur on the site or within nearby woodland. There are no records of hazel dormouse within 1km.

Birds

7.75 Three Schedule 1 bird species were identified during the search these were kingfisher *Alcedo atthis*, barn owl *Tyto alba* and hobby *Falco subbuteo*.

7.76 Furthermore, a number of Species of Principal Importance for Nature Conservation under section 41 of the NERC Act 2006 and/or Red or Amber List Birds of Conservation Concern have been recorded within 2km of the Application Site (wood warbler *Phylloscopus sibilatrix*, snipe *Gallinago gallinago*, barn swallow *Hirundo rustica,* turtle dove *Streptopelia turtur*, tawny owl *Strix aluco*, skylark *Alauda arvensis*, nightingale *Luscinia megarhynchos*, fieldfare *Turdus pilaris*, song thrush *Turdus philomelos*, redwing *Turdus iliacus*, spotted flycatcher *Muscicapa striata*, marsh tit *Parus palustris*, starling *Sturnus vulgaris*, house sparrow *passer domesticus*, linnet *Carduelis cannabina* and yellowhammer *Emberiza citronella*), however, none of these species were recorded on the Application Site or the field in which it is located.

7.77 Of the above species, skylark is the only species likely to use the arable land within the Application Site for nesting. The adjacent woodland is likely to support a range of other bird species.

Reptiles

7.78 The relatively more widespread reptile species, grass snake *Natrix natrix*, slow worm *Anguis fragilis* and common lizard *Lacerta vivipara*, have been recorded within 1,060m, 892m and 1,060m of the Application Site, respectively. Whilst grass snakes are often associated with aquatic habitats, slow worm and common lizards may be found in areas of scrub and grassland. None of these species are likely to occur on arable land as these areas contain few food sources for these animals and are regularly disturbed by farm operations.

Invertebrates

7.79 The rare and/or notable invertebrates, stag beetle *Lucanus cervus*, brown hairstreak moth *Thecla betulae*, white admiral butterfly *Limenitis camilla* and purple emperor butterfly *Apatura iris*, have been identified within 1,130m, 272m, 362m and 814m, of the Application Site, respctively. These species are all associated with woodland and/or hedgerow habitats and are unlikely to occur on the arable land of the Application Site.

Site Survey Results

Phase 1 Habitat Survey

7.80 The Application Site is approximately 1.65ha in size. It largely comprises a small area of an intensively managed arable field which supported cereal stubble at the time of survey. Part of the proposed access track is coincident with an existing farm track which comprises hard standing. A small area of improved grassland falls within the Application Site boundary. This habitat was dominated by perennial rye-grass *Lolium perenne* and white clover *Trifolium repens.* Furthermore, two mature trees overlap the access track where it meets the Kirdford Road.

7.81 Adjacent habitats include a narrow strip of semi-improved grassland which forms the field boundary. This habitat was dominated by false oat-grass *Arrhenatherum elatius*, cock's foot *Dactylis glomerata.*

7.82 A block of broadleaved semi-natural and ancient woodland (Dunhurst & Northup Copses SNCI) lies to the north and west of the Application Site. This woodland comprised stands of oak, alder *Alnus glutinosa*, hazel*,* blackthorn *Prunus spinosa,* hawthorn*,* crab apple *Malus sylvestris*, ash *Fraxinus excelsior,* crack willow *Salix fragilis,* holly *Ilex aquifolium* and field maple *Acer campestre*. The ground flora comprised bluebell *Hyacinthoides non-scripta* and ivy *Hedera helix*.

7.83 Boxal Brook runs through the woodland approximately 40m to the north of the Application Site. The brooks did not contain any aquatic or marginal vegetation, but small areas of stinging nettles *Urtica dioica* were recorded on the banks.

7.84 Hedgerows to the north and south of Kirdford Road were classified as species-poor intact hedgerows. These comprised hawthorn *Crataegus monogyna*, hazel *Corylus avellana*, field maple *Acer campestre* and dog rosa *Rosa canina*.

7.85 A dry ditch runs parallel with Kirdford Road. It is connected underneath the field entrance by a ceramic pipe. Species present adjacent and within the ditch included bramble and bracken *Pteridium aquilinum*. Other species present included false brome *Brachypodium sylvaticum*, black knapweed *Centaurea nigra* and rosebay willowherb *Chamerion angustifolium*.

7.86 There is one building near to the field entrance. The building is a single-storey metal construction which has no potential to support roosting bats.

Water Vole and Otter

No evidence of water voles or otters was recorded during the surveys and it is concluded that these species do not use the stretch of Boxal Brook within the survey area.

Badger

For badger survey results see Appendix 7.6

Bat Roost Assessment

7.87 Twenty-four trees on the edge of the woodland were assessed as having potential to support roosting bats (15 Category 1 trees and 9 Category 2 trees). The woodland may also provide foraging habitat for bats. No other trees on the edge of the woodland or in proximity to the access road were considered to have the potential to support roosting bats. For full survey results refer to Appendix 7.1 and 7.2.

Bat Activity Survey

7.88 The April static bat detector survey recorded 308 bat passes over five nights. 52% of the passes were recorded by the static detector at Location 2, on the edge of the woodland, approximately 15m north of the Application Site (**Figure 7.3**). A further 38% of the passes were recorded at Location 4, which was along the eastern field boundary, approximately 200m southeast of the Application Site. The majority of registrations were of common pipistrelle bat. Twenty-two passes by barbastelle bats were recorded. All of the barbastelle registrations were made at Location 4.

7.89 The May static bat detector survey recorded 1,061 bat passes over eight nights. 51% of the registrations were for common pipistrelle and a further 24% were for soprano pipistrelle. 185 barbastelle passes were recorded over eight nights, with all but one registration being made at Location 3, which was approximately 140m east of the Application Site, along the eastern field boundary. *Myotis* species. were identified at locations 1, 2 and 3. Some of the registrations at Location 1 were identified as Daubenton's bat, a common *Myotis* species associated with aquatic habitats.

7.90 During the May transect survey, two barbastelle bats were recorded flying along the edge of the woodland opposite the northeast corner of the Application Site. Furthermore, six common pipistrelle and 20 soprano pipistrelle passes were recorded along the northern and eastern field boundaries. The first bat recorded during this survey occurred at 21:14, approximately 33 minutes after sunset, and was identified as a soprano pipistrelle recorded commuting northwards towards Northup Copse. No bats were recorded over the arable habitat.

7.91 The June static bat detector survey recorded 1,315 bat passes over five nights. 82% of the registrations were made at Location 2, with pipistrelle species making up 95% of the records. Four registrations of barbastelle were recorded over the five nights. These passes were recorded at Locations 1 and 2.

7.92 During the June transect survey 87 bat passes were recorded (includes passes recorded during the dusk and dawn survey). No barbastelles were recorded; however, two *Myotis*

species were recorded at 22:43 and at 03:42, respectively. The first bat recorded was identified as a soprano pipistrelle at 21:45, approximately 40 minutes after sunset. The last calls were recorded at 03:59, consisting of two soprano pipistrelle bats, at approximately 47 minutes before sunrise. This suggests that the bats roost at some distance from the survey area.

7.93 Bat activity was recorded predominately along the eastern field boundary. No bats were recorded over the arable habitat.

7.94 The July static bat detector survey recorded 3,339 bat passes over seven nights. 49% of the bat registrations were recorded at Location 4. The majority of the registrations were for pipistrelle species and no barbastelle bats were recorded. Six registrations of *Nyctalus* species (Noctule and Leislers) were recorded for the first time. Registrations were made at Locations 2 and 4.

7.95 During the July transect survey, a total of 30 bat passes were recorded comprising common pipistrelle and an unknown pipistrelle species. The majority of activity was located to the south of the Application Site, near to the eastern field boundary. The first bat recorded was approximately 42 minutes after sunset suggesting that the roost site was some distance from the survey area. No bats were recorded within the arable area of the field. No barbastelle bats were recorded during the July transect surveys.

7.96 No Bechstein's bats were recorded during the transect or static bat detector surveys.

7.97 Barbastelle activity was recorded in April, May and June. Barbastelle activity peaked in May. Barbastelle activity was predominantly recorded along the eastern site boundary.

7.98 Bats foraged and commuted along the woodland edge and were not recorded over the Application Site, which is characterised by arable habitat.

7.99 For full survey results refer to Appendix 7.2.

Hazel Dormouse

7.100 Over 100 hazelnuts were collected within the woodland surrounding the Application Site. An examination of each nut revealed no evidence of hazel dormouse. An assessment of the woodland edge habitat revealed that the woodland edge closest to the Application Site was gappy, with a poor structure and sparse understory vegetation. Furthermore, there are no records of dormouse within 1km of the Application Site.

Future Baseline

7.101 The habitats within the Application Site are managed as arable farmland. Assuming this continues, this area is unlikely to support different species in the future because the habitats are not natural, species-poor and regularly disturbed. The grassland is cut and also disturbed by farming operations and therefore is unlikely to change in future years.

7.102 The hedgerows, trees and woodland are established habitats and in the absence of a change of management are unlikely to change in future years.

7.103 In the absence of development, substantive changes to these habitats in not expected.

Evaluation

7.104 This section evaluates the nature conservation interest of the study area in terms of the habitats and the species it supports. This value is placed in a geographical context through the framework described in the Assessment Methodology section.

Designated Sites

7.105 The Mens SAC is of International (Very High) Value to ecology due to its international statutory designation and the habitats and species that it supports.

7.106 The Mens SSSI is of National (High) Value to ecology due to its national statutory designation.

7.107 Ebernoe Common SAC is of International (Very High) Value to ecology due to its international statutory designation and the habitats and species that it supports.

7.108 Ebernoe Common SSSI is of National (High) Value to ecology due to its national statutory designation.

7.109 Dunhurst & Northup Copses SNCI, which incorporates the woodland and trees to the north of the Application Site, is an area of ancient woodland which contains numerous mature trees and a varied ground flora characteristic of ancient woodland. The woodland is likely to support a range of animals including foraging and roosting bats, birds, badgers and small mammals. Ancient woodland is a rare habitat and the SNCI is assessed to be is of County (Medium) value.

On Site Habitats

7.110 On site habitats include small areas of arable land, improved grassland and hard standing. The arable land is intensively managed and offers few opportunities for wildlife. Birds may forage in the stubble during the winter and skylark may use the field for nesting; however, the Application Site is only 1.65ha of land which is a small proportion of the total arable habitat available within the wider landscape. Furthermore, arable land provides few of the invertebrates required by foraging bats (Ref. 7.24). improved grassland is a common and widespread habitat in the UK and is of negligible value due to the small area on the site. The hard standing has negligible value to wildlife. Together, the habitats on the Application Site are considered to be of Site (Very Low) value.

7.111 Two mature trees overlap the field entrance where the new access track adjoins Kirdford Road. One of these trees has been assessed as having moderate potential to support

roosting bats. Taking into account the number of similar mature trees in the area, the trees are assessed as being of Local (Low) value.

Adjacent Habitats

7.112 Woodland habitats are assessed as part of the SNCI above.

7.113 A narrow semi-improved grass margin abuts the woodland edge. This habitat may provide a corridor for low numbers of common reptiles and invertebrates. This habitat is of Negligible value.

Badger

7.114 One badger sett was recorded approximately 20m from the Application Site. Mammal paths were noted in the woodland that were probably created by badgers. The habitats within the site boundary provide few opportunities for badgers due to the small area involved and because arable land does not provide optimal foraging habitat for badgers compared to the woodland and grassland in the wider landscape. Badger is a widespread and common species in West Sussex and is considered to be of Site (Very Low) value.

Bats

7.115 At least six species of bats were recorded using the habitats adjacent to the Application Site (common pipistrelle, soprano pipistrelle, Leisler's bat, noctule, barbastelle and *Myotis* sp.). Good numbers of passes of relatively more common/widespread bat species were recorded (common pipistrelle, soprano pipistrelle and Leisler's bat). Fewer passes by rarer bats were also recorded (barbastelle and *Myotis* species) along the woodland edge to the east of the site. It is probable that a proportion of barbastelle bats from The Mens SAC use the woodland edge for commuting and foraging. It is unlikely that a significant number of bats from Ebernoe Common SAC use the Application Site or its immediate surrounds as the available radio-tracking data indicated that these bats do not travel east from their roost site. The bats are of County (Medium) value.

Hazel Dormouse

7.116 The surveys revealed no evidence of dormouse in the habitats surrounding the Application Site. Furthermore, there are no confirmed records of dormouse within 1km of the Application Site. Whilst the presence of dormouse cannot be completely discounted, in the absence of any evidence of presence, dormouse are considered to be of Site (Very Low) value.

Birds

7.117 It is likely that a number of species of birds use the woodland for foraging and nesting. Furthermore, skylark may nest in the arable field on or close to the Application Site. However, the Application Site itself represents a small area of relatively poor-quality habitat for birds and the immediate surrounds include similar intensively managed arable land and a small section of woodland edge which could support only a limited number of birds compared to the number of birds in the wider landscape. The birds using the Application Site and adjacent habitats are of Site (Very Low) value.

Reptiles

7.118 The grassy field margin and woodland edge may support low numbers of common reptiles, such as grass snake, slow worm and common lizard. Due to the very low numbers that the grassland could support, reptiles are assessed as being of Site (very Low) value.

Evaluation Summary

7.119 Receptors that have been valued at Local value or above will be assessed further to determine whether there is the potential for significant effects as a result of the Proposed Development. Where a receptor has been assessed as being of less than Local value, but receives a degree of statutory protection (as is the case with breeding birds,

reptiles and dormouse and badger), recommendations are made to ensure the scheme complies with relevant wildlife legislation.

7.120 These receptors include:

- The Mens and Ebernoe Common SSSI/SACs;
- Dunhurst & Northup Copses SNCI/Ancient Woodland and Trees; and
- Bats.

Proposed Development Description, Embedded Avoidance and Mitigation Measures

7.121 A description of the Proposed Development including details on the engineering operations, equipment and infrastructure along with phasing and timescales can be found in Chapter 4: Project Description.

7.122 The Proposed Development involves the, construction, operation and decommissioning of a temporary (exploration) well site, including an access track and ancillary infrastructure. In response to the presence of barbastelle and other bats, and the woodland habitats and SNCI to the north of the Application Site, the design has been revised to provide a buffer of 15m between the Proposed Development and the woodland edge in order to reduce potential impacts on these receptors. This scale of buffer is consistent with the Natural England Standing Advice for Ancient Woodland (Ref. 7.25). Furthermore, two temporary soil bunds of 2½ - 3m in height will be constructed between the well site and the woodland to the north and east of the site to screen the woodland from visual, noise and light disturbance. Please refer to Chapter 6: Construction Programme & Management for details of construction.

7.123 If exploration of the Application Site reveals minerals worthy of extraction on a commercial scale, then the Application Site is likely to be retained without the drilling rig and ancillary drilling equipment, and would remain inactive whilst awaiting a further planning application. However, if the exploration is unsuccessful then the land would be

restored to its previous habitats with all of the car park, drilling equipment, lighting and bunds removed and it is expected that the current farming practices will recommence.

7.124 A Construction Environmental Management Plan (CEMP) will be compiled prior to works commencing on site to ensure best environmental working practice during construction (refer to Chapter 6 for more information).

Lighting

7.125 The lighting scheme has been designed to minimise unnecessary illumination and avoid adverse effects from light spill onto adjacent habitats (See Chapter 4: Project Description and the assessment within Chapter 12: Lighting). The access route will not be lit at any time during construction, operation or decommissioning.

7.126 There will be no lighting in Phases 1 and 4a. During Phases 2, 3a and 3b lighting will comprise of six freestanding 3m high fluorescent lights facing inwards towards the site and pointing downwards, eight tungsten filament bulkhead lights located on site cabins, two horizontal strip lights at cabin level adjacent to the rig; and inward and downward facing lighting within the derrick of the drilling rig.

7.127 In addition to the design of the lighting scheme above, the following measures will be implemented to further reduce light spill from the Application Site:

- areas of the site that are not operational will not be lit;
- the power of the lights will be the minimum necessary for purpose;
- bunds of *c.*2½ - 3m will be created between the site and the woodland edge.

7.128 Consequently, the level of light spill into surrounding woodland would be negligible (estimated to be 0 lux beyond 10m from the Application Site) owing to good design.

Noise Attenuation

7.129 Noise attenuation and dust control procedures will operate on site including effective silencers and damping down runways as the weather dictates. Please refer to Chapter 9: Noise and Chapter 6: construction Programme and Management for further details of noise control measures.

7.130 During construction, noise levels will vary according to the works being undertaken, but short-term events during this phase could generate noise of up to 70 d(B)A at the source. This would be equivalent to the noise of a tractor. There will be no construction activity at night.

7.131 During operation, the noise level at the woodland edge is predicted to be c.45 d(B)A, which is comparable to noise levels in a quiet suburb. Operational activity will be undertaken for 24 hours a day.

Protection of Water Resources

7.132 The risk of pollution incidents is low and the incorporation of mitigation measures such as use of water-based, non-toxic drilling fluids and installation of pollution interceptors further reduces this risk (see Chapter 11: Ground and Groundwater Protection).

7.133 Due to the distance between Boxal Brook and the site (approximately 50m), this watercourse is not considered to be at risk from contaminated run-off.

Nesting birds

7.134 The surrounding woodland will be checked for nesting Schedule 1 birds prior to any works beginning on the Application Site. Should any active nests be located then an assessment will be made as to whether the works would disturb them. Any types of work deemed disturbing will be delayed until any dependent young have left the area.

7.135 Soil stripping of the arable land and removal of vegetation will be undertaken outside of the bird nesting season (March-September). If this is not possible, a suitably qualified ecologist will check the area for nesting birds. Should an active bird nest be found, then works in the area will be postponed until the chicks have fledged. A suitably qualified ecologist will supervise all vegetation clearance and will move any reptiles or small mammals to a safe location.

7.136 Any trenches/pits created during the construction process will include a means of escape to prevent animals becoming trapped in them.

Woodland and Other Trees (Root Protection)

7.137 Prior to the commencement of any construction activities the extent of Root Protection Area (RPA) of retained trees will be accurately set out and marked on the ground.

7.138 The construction site compound, bunds, offices and materials storage will be positioned outside the canopy spread and RPA of trees. The proposed access track impinges upon the RPAs of five trees or tree groups and a suitable load-bearing ground protection system will be instated to avoid compaction impacts upon the RPA of these trees (see Appendix 7.5).

7.139 A total of two trees will require crown lifting to 5m above ground level over the proposed access track to facilitate the movement of high-sided vehicles. All works will be undertaken by an Arboricultural Association Approved Contractor in accordance with BS3998 (2010).

7.140 One of these trees one was considered to have some features, with limited potential to support roosting bats. A tree climb and inspection survey will be undertaken to determine if bats are present immediately prior to any arboricultural works on the tree. If bats are found a Natural England licence will be obtained to ensure that the bats are protected and suitable compensatory roost sites are provided.

Likely Significant Effects

7.141 In order to assess ecological effects the phases of the Proposed Development have been grouped into Construction Impacts (Phase 1), Operational Impacts (Phase 2 and 3) and Decommissioning Impacts (Phase 4a and 4b). For a full description of each of the phases of the Proposed Development see Chapter 4: Project Description and Chapter 6: Construction Programme and Management.

Construction Effects (Phase 1)

The Mens SSSI/SAC

7.142 The primary reason for the designation of The Mens SAC is the presence of Atlantic acidophilous beech forests. The Mens SSSI is also designated for its habitats. No direct impacts on these habitats (such as habitat loss, pollution or disturbance from noise) are predicted during this phase of works due to the distance between the SSSI/SACs and the Application Site.

7.143 It is likely that barbastelle bats (which are qualifying feature, but not a primary reason for the designation of The Mens SAC) from The Mens forage around the boundary of the field in which the Application Site is located; however, there will be no night time working or illumination of the Application Site or its surrounds during the Construction Phase and no adverse effects on the conservation status of bats or the integrity of The Mens SSSI/SAC is predicted (see Appendix 7.4 for Habitat Regulations Assessment). The effect on The Mens SSSI/SAC is therefore Negligible and of Neutral significance (non-significant)(Table 7.1).

Ebernoe Common SSSI/SAC

7.144 The primary reasons for the designation of Ebernoe Common SAC are Atlantic acidophilous beech forests and the populations of Bechstein's bat and barbastelle. No direct impacts on the habitats (such as habitat loss, pollution or disturbance from noise)

are predicted during this phase of works due to the distance between the SAC and the Application Site.

7.145 Studies on Bechstein's bats indicate that they forage within 1.5km of the SAC (Ref. 7.23) and are unlikely to use land in the vicinity of the Application Site. Whilst barbastelle bats from the SAC may forage around the boundary of the field in which the Application Site is located; there will be no night time working or illumination of the Application Site, or its surrounds during the Construction Phase and no adverse effects on the conservation status of bats or the integrity of Ebernoe Common SAC are predicted (see Appendix 7.4 for Habitat Regulations Assessment).

7.146 Ebernoe Common is also and SSSI and is of national importance as an example of a large ancient woodland and holds nationally important maternity roosts for barbastelle bat and Bechstein's bat occur within the woodland. Due to the distance from the Application Site and the nature and diurnal timing of the works. No adverse effects on the habitats or bats, for which the site, is designated are predicted.

7.147 The effect on Ebernoe Common SSSI/SAC is therefore Negligible and of Neutral significance (non-significant)(Table 7.1).

Dunhurst & Northup Copses SNCI/Ancient Woodland and Trees

7.148 There will be no loss of woodland or trees during the Construction Phase. Two trees at the site entrance will require minor crown lifts. With the proposed embedded mitigation measures, there will be no impacts from pollution or damage to woodland or tree roots. A 15m buffer and the soil bund between the Application Site and the woodland edge will reduce visual or noise disturbance.

7.149 Noise levels will vary during the construction phase depending on the operation being conducted, but short-term events could generate noise of up to 70 d(B)A at the source (see Chapter 9: Noise). However, the 15m buffer between the Application Site and the woodland edge, together with the bunds will reduce the noise levels at the woodland

edge. Whilst there could be some localised disturbance, this will be short-lived and reversible and the ecological integrity of the SNCI and Ancient woodland is not likely to be adversely affected.

7.150 Due to the distance between Boxal Brook and the Application Site and the pollution control measures which will be instated, no adverse effects on the brook are predicted.

7.151 The effects on Dunhurst & Northup Copses SNCI, the ancient woodland and trees is predicted to be Negligible and of Neutral significance (non-significant)(Table 7.1).

Bats

7.152 The arable land within the Application Site is not considered an important bat foraging habitat. Bats were recorded using the woodland edge for foraging and commuting; however, there will be no night time working or illumination of the Application Site or its surrounds during the Construction Phase and no adverse effects on the conservation status bats are likely to occur.

7.153 One tree, which has low potential to support roosting bats will require some minor arboriculture works. As part of good construction practice, the tree will be inspected prior to such works to determine whether bats are present. If bats are found, a Natural England licence will be obtained to ensure that the bats are protected and suitable compensatory roost sites are provided. No other trees that have the potential to support roosting bats will be impacted by the works.

7.154 The effect is therefore Negligible and of Neutral significance (non-significant) (Table 7.1).

Operational Impacts (Phase 2 and 3)

The Mens SSSI/SAC

7.155 The primary reason for the designation of The Mens SAC is the presence of Atlantic acidophilous beech forests. The Mens SSSI is also designated for its habitats. No direct impacts on these habitats (such as habitat loss, pollution or disturbance from noise) are predicted during this phase of works due to the distance between the SSSI/SACs and the Application Site.

7.156 It is likely that barbastelle bats (which are qualifying feature, but not a primary reason for the designation of The Mens SAC) from The Mens forage around the boundary of the field in which the Application Site is located. Whilst operations will continue during the night, noise levels at the woodland edge will be attenuated to c. 45dB(A). There has been limited research conducted on the effects of noise on bats, but a recent study concerning the greater mouse-eared bat Myotis myotis showed that various types of noise did affect the foraging behaviour of the species (and in some cases reduced the ability of the bat to forage) (Ref. 7.26). However, the effect of noise on the bat was not directly related to the amplitude of the sound (volume), but rather to nature (frequency and time structure) of the sound and how this interacted with the bat's echolocation. For example 'vegetation noise', which was at a lower volume to the traffic noise, had a more disruptive effect on the bats' foraging behaviour due to its similarity in sound character to the bat's prey species.

7.157 Furthermore, the scheme has been designed to reduce artificial light spill levels at the woodland edge, which is the main commuting and foraging route for bats, to 0 lux.

7.158 Overall the effects will be localised, temporary, and reversible and therefore no adverse effects on the conservation status of barbastelle bats are likely. Furthermore, no adverse effects on the Integrity of the SSSI or SAC are likely to occur. The effects are Negligible and of Neutral significance (non-significant) (Table 7.1).

Ebernoe Common SSSI/SAC

7.159 The primary reasons for the designation of Ebernoe Common SAC are Atlantic acidophilous beech forests and the populations of Bechstein's bat and barbastelle.

Ebernoe Common is also and SSSI and is of national importance as an example of a large ancient woodland and holds nationally important maternity roosts for barbastelle bat and Bechstein's bat occur within the woodland. No direct impacts on the habitats (such as habitat loss, pollution or disturbance from noise) are predicted during this phase of works due to the distance between the SAC and the Application Site.

7.160 Studies on Bechstein's bats indicate that they forage within 1.5km of the SAC (Ref. 7.24) and are unlikely to use land in the vicinity of the Application Site. Barbastelle bats from the SAC may forage around the boundary of the field in which the Application Site is located; however, whilst operations will continue during the night, noise levels at the woodland edge will be attenuated to c. 45dB(A). Furthermore, the scheme has been designed to reduce artificial light spill levels at the woodland edge, which is the main commuting and foraging route for bats, to 0 lux.

7.161 No adverse effects on the conservation status of bats or the integrity of Ebernoe SSSI/SAC is predicted (see Appendix 7.4 for Habitat Regulations Assessment). The effect on Ebernoe Common SSSI/SAC is therefore Negligible and of Neutral significance (non-significant)(Table 7.1).

Dunhurst & Northup Copses SNCI/Ancient Woodland and Trees

7.162 A small stretch of the woodland edge may be subject to some disturbance from noise during the daytime and night time, during this phase of works. However, the 15m buffer between the Application Site and the woodland edge, together with the bunds will reduce this to 45dB(A) at the nearest point of the woodland. Any effects will be localised and temporary in nature, and will be reversed when the operations cease.

7.163 Due to the distance between Boxal Brook and the Application Site and the pollution control measures which will be instated, no adverse effects on the brook are predicted.

7.164 For these reasons the overall effects on the integrity of SNCI and woodland is assessed as being Negligible and of Neutral significance (non-significant) (Table 7.1).

Bats

7.165 Activity surveys revealed that a number of bats, including barbastelle, use the woodland edge for foraging and commuting. Furthermore, studies of the foraging behaviour of barbastelle bats have revealed that there preferred foraging habitat is wetlands and aquatic habitats and occasionally woodland. Arable land provides few invertebrates for foraging bats and is rarely used by barbastelle (Ref. 7.24).

7.166 Whilst the activities of bats using the woodland edge could be disrupted by illumination of their habitats, the scheme has been designed to avoid illumination of the woodland edge. Furthermore, noise levels will be attenuated to around 45 d(B)A at the woodland edge. For these reason no adverse effects on the conservation status of bats is predicted. The effect is Negligible and of Neutral significance (non-significant) (Table 7.1)

Decommissioning and Restoration (Phase 4a and 4b)

The Mens and Ebernoe SSSI/SACs

7.167 No direct impacts on the SSSI/SACs are predicted during this phase of works due to the distance between the SACs and the Application Site.

7.168 It is likely that barbastelle bats from The Mens and possibly Ebernoe Common forage around the boundary of the field in which the Application Site is located; however, there will be no night time working or illumination of the site or its surrounds during the Restoration Phase and no adverse effects on the conservation status of bats or the integrity of the Mens or Ebernoe SSSI/SAC designated areas are predicted.

7.169 The effect on both sites is therefore Negligible and of Neutral significance (non-significant) (see Table 7.1).

Dunhurst & Northup Copses SNCI/Ancient Woodland and Trees

7.170 There will be no loss of woodland or trees during the Restoration Phase. With the proposed embedded mitigation measures, there will be no impacts from pollution or damage to woodland or tree roots. A 15m buffer and the soil bund between the Application Site and the woodland edge will reduce visual or noise disturbance.

7.171 Noise levels could reach 70 d(B)A at the source (see Chapter 9: Noise). However, the 15m buffer between the Application Site and the woodland edge, together with the bunds will reduce the noise levels at the woodland edge.

7.172 Whilst there could be some localised disturbance, this will be short-lived and reversible and the ecological integrity of the SNCI and Ancient woodland is not likely to be adversely affected.

7.173 Due to the distance between Boxal Brook and the Application Site and the pollution control measures which will be instated, no adverse effects on the brook are predicted.

7.174 The effects on Dunhurst & Northup Copses SNCI, the ancient woodland and trees is predicted to be Negligible and of Neutral significance (non-significant)(Table 7.1).

Bats

7.175 The arable land within the Application Site is not considered an important bat foraging habitat. Bats were recorded using the woodland edge for foraging and commuting; however, there will be no night time working or illumination of the site or its surrounds during the Construction Phase and no adverse effects on the conservation status bats are likely to occur.

7.176 The effect is therefore Negligible and of Neutral significance (non-significant)(Table 7.1)

Cumulative Effects

7.177 Two schemes within 4km of the Application Site have been identified as relevant for the cumulative assessment, these are described below;

1. 31ha solar farm *c.*3.5km northwest.
2. 30 houses *c.*1.4km southeast.

7.178 Due to the nature of these projects, the distance from the Application Site and the intervening habitats, no cumulative impacts are predicted.

Summary of Effects

7.179 Due the careful design of the Proposed Development, its small scale and temporary nature, no significant adverse effects are predicted.

Mitigation and Enhancement Measures

7.180 As no significant effects are predicted, no mitigation measures are proposed beyond those already designed into the Proposed Development. In line with current planning policy, enhancements will be made to benefit ecology. Fifteen bat boxes will provided to West Sussex County Council to be installed in the area. These will include at least five boxes designed to specifically support barbastelle bats. The boxes will be installed during the construction phase of the project and left in situ in perpetuity.

7.181 Ongoing monitoring of badgers will be undertaken, so that any new setts can be identified and suitable protection measures put in place, where necessary.

Residual Effects

7.182 A minor beneficial impact on bats is predicted as a result of the enhancement measures (Table 7.2). The majority of residual effects are negligible with minor adverse effects on

the Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees during construction and operation.

Table 7.2: Table of Significance – Ecology

Potential Effect	Nature of Effect (Permanent/Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	D	L	
Phase 1: Construction of access road and well site											
The Mens and Ebernoe Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None	-	-	-	-	*	-	-	Negligible
Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial
Phase 2: Mobilisation of the drill rig and drilling operations											
The Mens and Ebernoe Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None	-	-	-	-	*	-	-	Negligible
Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial
Phase 3a: Short term testing and evaluation (gas)											
The Mens and Ebernoe Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None	-	-	-	-	*	-	-	Negligible
Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial
Phase 3b: Short term testing and evaluation (oil)											
The Mens and Ebernoe Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None	-	-	-	-	*	-	-	Negligible

Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial
Phase 4a: Restoration											
The Mens and Eberno Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None required	-	-	-	-	*	-	-	Negligible
Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial
Phase 4b: Retention											
The Mens and Ebernoe Common SAC/SSSI	No effects	Negligible	None required	*	*	-	-	-	-	-	Negligible
Durnhurst and Northup Copses SNCI, Ancient Woodland and Trees	No effects	Negligible	None	-	-	-	-	*	-	-	Negligible
Bats	No effects	Negligible	Bat boxes installed on trees	-	-	-	-	*	-	-	Minor beneficial

*** Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; D = District; L = Local

References (Ref)

7.1 Department for Communities and Local Government (2012) National Planning Policy Framework

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8.0 LANDSCAPE AND VISUAL IMPACT

Introduction

8.1 This chapter of the ES assesses the likely significant effects of the Proposed Development (Wisborough Green-1) in terms of Landscape and Visual Impact.

8.2 The chapter describes the baseline conditions currently existing at the Application Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. This chapter has been prepared by The Terra Firma Consultancy.

8.3 The chapter should be read in conjunction with **Figures 8.1**-**8.16** and the following:

- **Appendix 8.1** LVIA Methodology
- **Appendix 8.2** Landscape Effects Assessment
- **Appendix 8.3** Visual Effects Assessment

Planning Policy Context

8.4 A study has been made of the relevant policies providing the context for landscape and visual effect at National and Local level that apply to the Application Site and its surroundings. This is summarised as follows.

National Planning Policy

National Planning Policy Framework, 2012 (Ref. 8.1)

8.5 In reference to sustainable development, the framework states the environmental role of the planning system is to protect and enhance the natural environment through the

improvement of biodiversity and through positive improvements in quality of the natural and built environment.

8.6 It states that core planning principles should take into account the character of different areas and recognise the intrinsic character and beauty of the countryside, contribute and enhance the natural environment.

8.7 It states that the planning system should contribute and enhance the natural and local environment by protecting and enhancing valued landscapes and soils, minimising effects on biodiversity, providing net gains where possible.

8.8 It refers to the aim for planning policy to minimise adverse effects on local and natural environment, through comprehensive assessment of ecological networks, provision of adequate mitigation where harm cannot be avoided, and the encouragement of opportunities for increased biodiversity.

8.9 In relation to the sustainable use of minerals, the framework states the need for policy criteria to ensure that permitted developments do not have unacceptable adverse effects on the natural environment and that worked lands is subject to high quality restoration.

Technical Guidance to the National Planning Policy Framework, 2012 (Ref. 8.2)

8.10 In the Minerals Policy section, the guidance refers to the need for landscape strategies to define key landscape opportunities and constraints, identify visual exposure and need for screening, and the preferred character of the restored landscape.

8.11 The strategy should address effects on the existing landscape, including working operations and haul roads. It suggests that careful consideration of phasing, provision of screening can minimise visual and landscape effect and that key stages of restoration should be fully considered and detailed.

Local Planning Policy

Chichester District Council Local Plan First Review, 1999 (Ref. 8.3)

8.12 One of the three objectives of the Local Plan is to secure the protection and enhancement of the physical environment (built and natural) of the District.

8.13 The Local Plan also sets out the need to work towards ensuring that development and growth are sustainable through regard for environmental considerations.

8.14 Policy RE5 includes reference to the need to give special protection to the north eastern area of Chichester District due to its historic character, by only permitting development where it would not be detrimental to the areas landscape character of historic features.

8.15 Policy RE8 refers to the need to protect non-designated (in terms of nature conservation) areas such as corridors or other features important to nature conservation from development likely to damage, destroy or adversely affect these areas.

8.16 Policy BE11 states that new development must not detract from its surroundings in term of effect on local environment and setting in the landscape.

8.17 Policy BE14 requires applications to have appropriate landscaping proposals that include the use of native species, a design and layout that minimises effects on features of nature conservation and takes opportunities for habitat enhancement and creation. Proposals are required to show locations of existing trees being removed and new proposals, along with protection measures for existing trees retained.

West Sussex Minerals Local Plan, 2003 (Ref 8.4)

8.18 The Plan accepts that there may be areas that can accommodate mineral extraction without permanent harm and with possible opportunities for enhancement and habitat

creation but that in areas of local environmental significance without statutory protection, benefits should outweigh detrimental effects.

West Sussex County Council 'A strategy for the West Sussex Landscape', 2003 (Ref 8.5)

8.19 The strategy is based on West Sussex County Council Landscape Character Assessment character areas. In respect of the Low Weald, which the Application Site lies within, it refers to the vision of a characteristic mix of pastures, woodlands, hedges and shaws providing an intimate and secluded landscape, the characteristic agricultural landscape and the flourishing woodland cover of the area.

8.20 The strategy sets out guidelines for development that include the need to: protect areas valued for their natural beauty; retain key landscape features to aid setting of development; minimise modification to existing landforms and vegetation; conserve and enhance trees and hedgerows; secure, where appropriate, landscape and habitat enhancement, in particular to screen and integrate development, and plant native species; respect character of rural roads by minimising alteration, ensuring entrances fit in the landscape and utilising discreet signage; minimising impact of lighting; identify and conserve surviving historic landscapes and field patterns, in particular those showing little change and greater time depth, incorporating within landscape schemes; protect, conserve and enhance ancient woodlands and trees of historic importance.

Summary

8.21 In summary, the key themes running through from national planning policy, minerals policy and landscape strategy at a county level and local level policy are the importance of sustainable development, respect for landscape character and protection of important landscapes and features. In landscape terms these themes can be summarised as the need:

- To contribute and enhance the natural and local environment;
- To respect local landscape character and distinctiveness;

- To respect local historic landscape character;
- To protect designated landscapes, wildlife habitats and good quality agricultural land;
- To minimise and mitigate the effect of any proposed development through considered design and the enhancement of existing habitats or creation of new habitats.

There are various implications of the policies on the Proposed Development.

Assessment Methodology

EIA Regulations

8.22 Under 'The Town and Country Planning (Environmental Impact Assessment) Regulations 2011' the development requires a full Environmental Impact Assessment.

Scope of Study

8.23 The geographical scope of the landscape and visual impact assessment element of the report includes the Application Site itself and a surrounding area of up to 3 km with potential to be impacted by the proposals. The extent of the study area has been agreed in discussions with West Sussex County Council to be appropriate to assess the effects of the Proposed Development.

Methodology guidance

8.24 General guidance for the methodology for this study is from two key documents:

- 'Landscape Character Assessment' (The Countryside Agency, 2002);
- 'Guidelines for Landscape and Visual Impact Assessment' (Landscape Institute and IEMA, 2002); Note: This LVIA study has been carried out prior to the publication of the new 'Guidelines for Landscape and Visual Impact Assessment' in April 2013. (Ref 8.6).

Desktop Research

8.25 The desktop survey has involved the review of OS mapping data, aerial photographs, landscape character assessment documents and related planning policy, as well as the development proposals.

Landscape Effects Assessment

Methodology

8.26 A site visit has been made and physical aspects and landscape characteristics of the site and surrounding area noted. Study has been made of available landscape character assessments.

Evaluation criteria for landscape effects

8.27 Sensitivity of the landscape or feature of the landscape as a resource is dependent on:

- Character: the extent to which a distinct and recognisable pattern of elements occur in a particular type of landscape and how these are perceived; a sense of place.
- Quality: a judgement on the physical state, intactness and state of repair of the landscape or feature.
- Value : this can be based on landscape designations of an area, or values without formal designation recognising perceptual aspects (scenic beauty or tranquillity), special cultural associations, the influence or presence of other conservation interests or the existence of a consensus about importance either nationally or locally.
- Capacity: the scope for change in character with the existing landscape

8.28 The level of sensitivity of a landscape character or landscape feature can be defined as:

High Importance

- Positive character and quality, with valued features
- Particularly sensitive to change in general; change may be detrimental if inappropriately dealt with.
- Area or feature of high importance or rarity on a national, regional or local scale.

Medium Importance

- Generally positive in character and quality, but which may have alteration to, degradation or erosion of features resulting in areas of more mixed character and diminished value.
- Moderately sensitive to change in general; change may be detrimental if inappropriately dealt with; tolerant of some change.
- Area of feature of medium importance or rarity on a regional or local scale

Low Importance

- Generally negative in character and quality, with few if any valued features
- Tolerant of substantial change
- Area or feature of low importance and rarity at a local scale.

8.29 Scale or magnitude of landscape effects is described by reference to the:

- Loss or addition of key elements of the baseline pre-development landscape character or feature
- Introduction of elements in the landscape and resultant changes in character

8.30 The quantification of the magnitude of landscape effects can be defined as high, medium, low or negligible and can be either adverse or beneficial. This is defined more fully below:

Adverse	**High**	Total loss of or major alteration to key elements of the baseline pre-development landscape character or feature, or introduction of elements considered to be uncharacteristic when set within the attributes of the receiving landscape.
	Medium	Partial loss of or alteration to one or more key elements of the baseline pre-development landscape character or feature, or introduction of elements that may be prominent but may not necessarily be considered substantially uncharacteristic when set within the attributes of the receiving landscape.
	Low	Minor loss or alteration to one or more key elements of baseline pre-development landscape character or feature, or introduction of elements that are not uncharacteristic when set within the attributes of the receiving landscape.
Neutral	**Negligible**	No perceptible change to key elements of the baseline pre-development landscape character or feature.
Beneficial	**Low**	Minor beneficial change to one or more key elements of the baseline pre-development landscape character or feature.
	Medium	Medium beneficial change to one or more key elements of the baseline pre-development landscape character or feature, or introduction of elements that may have a moderate beneficial benefit to the receiving landscape.
	High	Large beneficial improvement created by loss or reduction of adverse key elements of baseline pre-development landscape character or feature, or addition of beneficial landscape features.

8.31 The criteria determining the significance of landscape effects are the sensitivity of the landscape receptors, and the magnitude of landscape effect as described above. The table below shows how the significance is assessed and encompasses both adverse and beneficial significance.

		Sensitivity of Landscape		
		High	**Medium**	**Low**
Magnitude of landscape effect	**High**	Major adverse significance	Major / Moderate adverse significance	Moderate adverse significance
	Medium	Major / Moderate adverse significance	Moderate adverse significance	Moderate / Minor adverse significance
	Low	Moderate adverse significance	Moderate / Minor adverse significance	Minor adverse significance
	Negligible	Negligible significance	Negligible significance	Negligible significance
	Low beneficial	Minor beneficial significance	Minor beneficial significance	Minor beneficial significance
	Medium beneficial	Moderate beneficial significance	Moderate beneficial significance	Moderate beneficial significance
	High beneficial	Major beneficial significance	Major beneficial significance	Major beneficial significance

Visual Effects Assessment

Methodology

8.32 A set of photographs were taken to represent viewpoints in the surrounding area. These were taken using a Nikon D60 digital SLR camera. Most photographs were taken with the lens set at a focal length of 35mm. This is equivalent to 50mm on a non-digital SLR, which is generally accepted to most closely represent views seen with the naked eye. Photographs are noted where a wide-angle focal length setting was used in order to show close up foreground views, or where a zoom setting was used to show more detail in a distant view.

8.33 The aperture used for all photography was f/11 and the camera was set to automatically determine the appropriate shutter speed using a film speed setting of ISO-100.

8.34 An exercise has been undertaken to establish the visibility of the drilling rig from viewpoint where there are blocks of woodland between the viewer and the site. This was undertaken by plotting the viewer at 1.5m height on the correct AOD height and distance from site, with the site plotted at the correct AOD and the rig located at 45m height and with the intervening blocks of woodland plotted at the correct AOD. These diagrams can be seen at **Figure 8.16**.

8.35 Other viewpoints are assumed to have a view of the rig, however there maybe intervening hedgerows, hedgerow trees and individual trees that may restrict views.

Evaluation Criteria

8.36 Sensitivity of visual receptors is dependent on the:

- Location, angle and context of the viewpoint
- Activity or occupation of the receptor and the expectation of view that brings

- Importance of the view; this can be determined by number of people affected and popularity i.e. appearance in guidebooks, tourism maps, facilities provided for its enjoyment or references in art or literature.

8.37 The level of sensitivity can be defined as:

High Sensitivity

- Viewpoints within a high quality landscape.
- A recognised viewpoint referred to on maps and guidebooks.
- View receptors with a high interest in their environment and prolonged viewing opportunities i.e. where engaged in leisurely pursuits that involve aesthetic appreciation of their surroundings such as walking and cycling.
- Occupiers of residential properties, where there are a large number of properties with similar views.

Medium Sensitivity

- Viewpoints within a medium quality landscape.
- View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
- Occupiers of residential properties, where there are a small number of properties with similar views.

Low Sensitivity

- Viewpoints within a low quality landscape.
- View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.

8.38 Scale or magnitude of visual change is described by reference to the:

- Loss or addition of features in a view

- Changes in the composition of the view, including the proportion of the view occupied by the proposed development
- Degree of contrast or integration of changes with the existing landscape in terms of scale, mass, line, height, colour and texture,
- Duration of change i.e. permanent or temporary, intermittent or continuous
- Distance of viewpoint from the proposed development
- Extent of area over which the changes would be visible.
- Angle of view in relation to main activity of receptor

8.39 Quantification of the magnitude of change of visual effects can be defined as high, medium, low or and can be either adverse or beneficial. This is defined more fully below:

Adverse	**High**	The proposals form an immediately apparent total loss of or major alteration to key elements of scene that are substantially uncharacteristic in the overall scene and change its character detrimentally.
	Medium	The proposals form a partial loss of or alteration to one or more key elements of the scene, or introduce elements to the scene, that may be prominent and readily noticed and uncharacteristic in the overall visual character.
	Low	The proposals form a minor loss or alteration to one or more key elements of the scene, or introduction of elements that are uncharacteristic when set in the overall visual character.
Neutral	**Negligible**	No perceptible change to elements of the scene or overall visual character.
Beneficial	**Low**	Minor changes to one or more key elements of the scene that may change the scene or overall visual character beneficially.
	Medium	Moderate changes to one or more key elements of the scene, or introduction of elements, that may change the scene or overall visual character beneficially.
	High	Large changes to one or more of the key elements of the scene, or introduction of prominent elements, that may change the scene or overall visual character beneficially.

8.40 The criteria determining the significance of visual effects are the sensitivity of receptors and the magnitude of visual effect as described above. The table below shows how the significance is assessed and encompasses both adverse and beneficial significance.

		Sensitivity of receptor		
		High	**Medium**	**Low**
Magnitude of visual effect	**High**	Major adverse significance	Major / Moderate adverse significance	Moderate adverse significance
	Medium	Major / Moderate adverse significance	Moderate adverse significance	Moderate / Minor adverse significance
	Low	Moderate adverse significance	Moderate / Minor adverse significance	Minor adverse significance
	Negligible	Negligible significance	Negligible significance	Negligible significance
	Low beneficial	Minor beneficial significance	Minor beneficial significance	Minor beneficial significance
	Medium beneficial	Moderate beneficial significance	Moderate beneficial significance	Moderate beneficial significance
	High beneficial	Major beneficial significance	Major beneficial significance	Major beneficial significance

Limitations and Assumptions

8.41 In the production of the LVIA the following limitation and assumptions apply:

- elevations of viewpoints are estimated from OS data;
- distance of viewpoints are approximated from the centre of the Application Site.
- in the interests of consistency the term 'negligible' has been used in this report. However, this has also been used to include instances where the effect is 'nil' or there is 'no effect'.

Baseline Conditions

8.42 A full description of the Proposed Development, including phasing and timescales, is provided in Chapter 4 of the ES – Project Description.

Baseline Landscape

8.43 A comprehensive study of the landscape features and character of the Application Site and immediate surrounding area has been undertaken.

Landscape sensitivity

8.44 Sensitivity of the features and character has been assessed using the criteria set out in **Appendix 8.1**, and is set out in the Landscape Effects Assessment Table at **Appendix 8.2**.

Site Location and setting

8.45 The Application Site is set on 1.56 hectares of land that forms part of Hookhurst Farm (which is set to the east of Skiff Lane to the north east of the site), to the south of Kirdford Road within a rural landscape with scattered settlements and strong patterns of woodland and pasture, interspersed with more open arable fields. The closest settlements are dwellings at Barkfold Manor to the west, Old Farm to the south east and buildings on Kirdford Road to the north west of Wisborough Green (see **Figure 8.1**).

8.46 The Application Site is agricultural land, of a Grade 3 classification, used for arable. It should be noted that the ALC information is unclear for this site. There is no subdivision of the Grade 3 classification and there appears to be an area of Grade 4 classification slightly further to the south east. The Application Site is set within an open field that extends further than the site area.

8.47 The main site area is set to the north eastern section of a large arable field that is approximately 0.5km from north to south and the same east to west. To the immediate north west is a section of woodland that juts southwards into the arable field. This woodland is part of a larger area of woodland that lies to the north and east of the wider field the site is set within. To the south and west the wider field is open with a few scattered mature trees. The access track to the site runs from Kirdford Road to the north west to the south west corner of the of the site (see **Figures 8.5**, and **8.7**-**8.9**).

8.48 The sensitivity of the land use of the Application Site is assessed as of medium importance; the agricultural nature of the land use is part of a wider extent of similar land use patterns, without designation, but characteristic of the surrounding area.

Statutory Designations

8.49 There are no statutory designations covering the Application Site itself, but other designations lie within the study area (see **Figure 8.2**).

8.50 Northup Copse is designated in part as ancient woodland, along with other woodlands and parts of woodland not abutting the Application Site in the study area.

8.51 There are three Sites of Nature Conservation Interest (SNCI) designations within the LVIA study area; part of Northup Copse to the north of the stream (not the section of woodland adjacent to the wider field the Application Site is set within); Dunhurst Copse to the north within 1 km of the Application Site and Mackerel's Common and Great Common between 2 and 3km to the north west of the Application Site.

8.52 There are 2 Sites of Special Scientific Interest (SSSI) in the study area; The Mens, a woodland designated for size, structural diversity and fungal and lichen species diversity which runs southwards from the southern edge of the wider field the Application Site is set within beyond the extent of the study area and the Upper Arun a site designated for flora and a diverse dragonfly population. These are also Special Area of Conservation.

8.53 The South Downs National Park (SDNP) lies in part within the study area to the south of the Application Site, at its closest approximately 600m from the Application Site.

8.54 There are two Scheduled Monuments (SMs) with the study area; Wephurst Glass House sited approximately 2.8km to the north west of the Application Site and Brownings Moated Site approximately 2.5km to the south west of the Application Site. There are no trees covered by tree preservation orders on or adjacent to the Application Site.

Topography

8.55 The main Application Site area slopes downwards from south to north, lying at between approx. 20.5m AOD on the southern boundary and 16.5m AOD the northern boundary. It falls relatively evenly along the west and east boundaries. The road level at the access

point is 18m AOD and the access track rises gently to 19.5m AOD at the compound boundary.

8.56 To the north the land falls downwards to Boxal Brook rising up beyond within woodland. To the east the land falls to a stream before rising gradually to the south the rises gently to a higher point with the wider field before falling to a stream beyond. Further to the south the land rises gradually. To the west land is relatively flat. (See **Figure 8.3**).

8.57 The sensitivity of the topography of the Application Site is assessed as of medium importance; the nature of the landform is part of a wider extent of similarly land, without designation, but characteristic of surrounding area.

Access and Public Rights of Way

8.58 The Application Site is not open to public access, but the LVIA study area contains a good network of public rights of way (PROW) to the west, north and east. To the south there is a large area without public rights of way between the Application Site and a 2km radius, but there are public rights of way beyond this (see **Figure 8.4**).

8.59 The closest PROWs to the Application Site are as follows. A footpath *(PROW ref. 768)* lies at approx. 100m to the north, and runs in a westerly direction, from its junction with Kirdford Road towards Kirdford. A second PROW, a bridleway *(PROW ref. 2851/1)* is 625m to the west, and runs west for 125m and then turns to run northwards. A third PROW lies at approx. 625m from the Application Site and runs between Kirdford Road and a small lane off the A272 on the western edge of Wisborough Green.

8.60 The sensitivity of the access and public right of way in relation to the Application Site is assessed as of low importance as there are none directly running through or adjacent to the Application Site.

Vegetation

8.61 To the immediate west, to the north and south of the Application Site lies Northup Copse, the southern section of a larger woodland area, Dunhurst Copse which covers a large area of land to the north of the Application Site. Adjacent to the Application Site the woodland is comprised mainly of mature Oak and Ash trees, with a dense understory of holly, blackthorn, hazel and field maple. The wood is dense and, even without leaf cover, it is only possible to see into the understory a very short distance. The wood is designated in part as Ancient and Semi-natural Woodland (see **Figure 8.2**), with the area to the west and east designated but the area to the north adjacent to the stream not.

8.62 Within the arable field to the south of the Application Site there are two individual mature oak trees.

8.63 The entrance to the Application Site is through an existing field gate sited in an unmanaged native hedgeline with mature trees either side of the entrance.

Arboricultural survey

8.64 A full arboricultural assessment has been undertaken in line with BS5837: 2012. This gives advice on tree condition, root protection zones and management recommendations and is included as **Appendix 7.5**.

8.65 A summary of the key points is as follows:

- There are no freestanding trees within the site itself; all trees are entirely contained within the site boundaries;
- No trees are lost as a result of the Proposed Development.

8.66 The sensitivity of the vegetation of the Application Site and directly bounding the Application Site is assessed as of medium importance due to the positive value of the

surrounding trees and woodland, their importance on a local scale and the part ancient woodland designation of Northup Copse.

Ecology

8.67 The effects of the Proposed Development on the ecology of the Application Site and surrounding area are dealt with in Chapter 7 Ecology.

Landscape Character

8.68 There are two levels of landscape character assessment that cover the Application Site: national and county.

8.69 In the *'National Landscape Character Assessment', 2005*, (Ref 8.7) the Application Site lies within Character Area 121: Low Weald.

8.70 In the *'West Sussex: Landscape Character Assessment', 2003* (Ref 8.8), the Application Site lies within Character Area LW2: North Western Low Weald.

8.71 There is no Landscape Character Assessment available at District (local) Level.

8.72 The main characteristics of the landscape character running through from national to local assessment can be summarised as:

- Land is low lying with gentle undulation
- Mix of small to medium size fields with some larger arable fields
- Mix of woodlands, copses and shaws creating a well wooded character and semi-enclosed landscape, allowing only occasional longer views
- Variable hedgerow network with mature trees within

8.73 The key issues relating to the change and the landscape character can be summarised as:

- Removal of hedgerows
- Decline of individual trees in hedgerows and fields
- Lack of management of woodlands and hedgerows
- PROW vulnerable to increased use and poor drainage
- Effect of pylons and introduction of modern farm buildings

8.74 The key opportunities identified as relating to the landscape character can be summarised as the:

- Conservation of rural character
- Conservation and management of existing trees, woodland and hedgerows
- Strengthening of hedgerow network, with planting of hedgerow trees and restoration of historic field patterns
- Increase tree cover around agriculture, village and development.
- Protect character of rural lanes

8.75 The sensitivity of the landscape character of the Application Site is assessed as of medium importance as, when its features are assessed as a whole, it is representative of the key characteristics that define the Landscape Character Area it lies within, but forms part of a wider extent of area with similar landscape character.

Historic landscape character

8.76 West Sussex County Council's Historic Landscape Characterisation provides information on time depth, broad character type and character type. *(Ref 8.9 Excerpt from West Sussex Historic Landscape Character, undated)*

8.77 The Application Site is set within the broad character type 'fieldscapes'. It is part of a larger area of fields with a character type classified as 'Informal fieldscapes' of 'Modern to WWII' time depth dating from 1914 - 1945 AD.

8.78 The former broad character type is also 'fieldscapes'; with a former character type of 'Informal Fieldscapes' dating from Post-medieval 1800 – 1914 AD).

8.79 The field patterns on the Application Site have been consistently classified as informal fieldscapes since 1800. The wider area they are set within is a mix of woodland and fieldscapes of a medieval (1066 - 1499 AD) time depth and a mix of woodland and fieldscapes of a Post-medieval 1800 - 1914 AD) time depth.

8.80 The sensitivity of the historic landscape character of the Application Site is assessed as of low importance due the recent time depth broadly uncharacteristic of the surrounding area of older historic landscape character and historic field patterns that the Application Site lies within.

Visibility

8.81 A comprehensive photographic appraisal was undertaken from public footpaths and roads in the possible zone of visual influence, out to a radius of approximately 3km from the Application Site. The extent of the study area has been agreed in discussions with West Sussex County Council to be appropriate to assess the effects of the Proposed Development. The main aim of the photographic survey was to establish an understanding of the visibility of the Application Site.

8.82 The visual effects assessment survey was undertaken in winter, with deciduous trees and shrubs without leaf.

8.83 **Figures 8.5** and **8.6** show the location of viewpoint photographs; viewpoints are colour-coded to show visibility during Phase 2: Mobilisation and drilling. **Figures 8.5a** and **8.6a** show the location of viewpoint photographs; viewpoints are colour-coded to show visibility during Phase 4b: Retention.

8.84 **Figures 8.10** – **8.15** show the photographs taken from the viewpoints located on **Figures 8.5** and **8.6**, along with text to indicate their direction and approximate distance from

the centre of Application Site and a description of the view and visibility of the Application Site.

Viewpoint receptors and sensitivity

8.85 Sensitivity of receptors has been assessed using the criteria set out in sections 8.36-8.37 and this is set out in the Visual Effects Assessment at **Appendix 8.3**.

Viewpoint categorisation

8.86 Within the zone of visual influence views of the Application Site fall broadly into 9 categories, with viewpoints being described in each category to include receptor sensitivity as assessed against criteria set out in sections 8.36-8.37.

Close views within 1 km of the Application Site from public rights of way

8.87 The land immediately surrounding the Application Site is broadly flat to the west, falling down to a shallow valley and rising again to the north and east and gently undulating to the south.

8.88 Viewpoints 6, 7 and 10 are set within and look through woodland to the north and north-west of the Application Site, with the dense woodland screening the Application Site from view.

8.89 Viewpoint 11 is set adjacent to commercial development to the north of Barkfold Manor and again looks through woodland to the north west of the Application Site, with the dense woodland screening it from view.

8.90 Viewpoint 12 is set adjacent to the complex of buildings at Barkfold Manor and looks across a paddock towards the Application Site; views of the Application Site ground plane are restricted by the intervening hedges along Kirdford Road with mature trees set within. Viewpoint 13 is set at the entrance of the access road to Barkfold Manor and,

again, views of the Application Site ground plane are restricted by the hedges to the access track and roadside vegetation.

8.91 Viewpoint 34 is set on slightly higher ground to the north of the Application Site and looks across pastoral land towards woodland to the north of the Application Site, with views of the ground plane restricted by intervening vegetation adjacent to the footpath and the woodland beyond.

8.92 Viewpoint 49 is set in a field on slightly higher ground to the west of the Application Site; views of the ground plane of the Application Site are restricted by the intervening woodland of Northup Copse.

8.93 Receptor sensitivity is medium from these viewpoints.

Close views within 1 km of the Application Site from roads

8.94 The land immediately surrounding the Application Site is broadly flat to the west, falling down to a shallow valley and rising again to the north and east and gently undulating to the south.

8.95 Viewpoint 1 looks directly at the access to the Application Site from Kirdford Road and partial views of the Application Site ground plane are possible, however intervening woodland to the immediate west of the Application Site restricts views of the majority of the ground plane. The access track route is clearly visible.

8.96 Viewpoints 2 and 3 look east along Kirdford Road towards the Application Site access; views of the Application Site ground plane are restricted by the intervening hedges along Kirdford Road with mature trees set within.

8.97 Viewpoints 4 and 5 look west from lower ground along Kirdford Road towards the Application Site access; views of the ground plane of the Application Site are restricted by intervening woodland. The Application Site access is partially visible but is restricted by the angle of the view and roadside vegetation.

8.98 Viewpoint 8 is set on Kirdford Road looking east towards the Application Site; there are partial views of the ground plane of the Application Site, however intervening woodland to the immediate west of the Application Site restricts views of the majority of the ground plane. Part of the access track route is partially visible. Pylons are clearly visible in this view.

8.99 Viewpoint 9 is set on Kirdford Road looking east towards the Application Site through an opening in the roadside hedge; views of the Application Site ground plane are restricted by the intervening field hedge set within the arable fieldscape to the west of the Application Site. Pylons are clearly visible in this view.

8.100 Viewpoint 48 is set on Kirdford Road and looks west through a field gate towards the Application Site; views of the Application Site ground plane are restricted by the intervening vegetation and Northup Copse woodland.

8.101 Viewpoint 50 is set at the road junction between Kirdford Road and Skiff Lane and looks west towards the Application Site; views of the Application Site ground plane are restricted by the intervening vegetation of Northup Copse woodland.

8.102 Receptor sensitivity is low from these viewpoints.

Middle distance views from between 1 and 2 km from the Application Site from public rights of way

8.103 The land rises to the south west, north and northeast and in part to the east at 2km distance, but falls to a valley to the southeast, which links to the River Arun valley beyond.

8.104 Viewpoints 35 and 37 are set on higher ground to the northeast of the Application Site and look across pastoral land; views of the Application Site ground plane are restricted by the intervening vegetation, in the case of viewpoint 35 adjacent to the footpath, and Dunhurst Copse woodland closer to the Application Site.

8.105 Viewpoint 40 is set on slightly higher ground to the east of the Application Site and looks across pastoral land towards development to the north of Wisborough Green on Durbans Road; views of the Application Site are restricted by intervening development, vegetation and Northup Copse woodland closer to the Application Site. Pylons are clearly visible in the view.

8.106 Receptor sensitivity is medium from these viewpoints.

Middle distance views from between 1 and 2 km from the Application Site from roads

8.107 The land rises to the south west, north and northeast and in part to the east at 2km distance, but falls to a valley to the southeast, which links to the River Arun valley beyond.

8.108 Viewpoints 14 and 25 are set on Kirdford Road and Viewpoint 26 within Kirdford Village, and look east towards the Application Site; there are no views of the ground plane of the Application Site due to intervening vegetation and, from the village green, development as well.

8.109 Viewpoint 38 is set on higher ground looking south west towards the Application Site; views of the Application Site are restricted by intervening vegetation and Northup Copse woodland closer to the Application Site.

8.110 Viewpoints 44 and 45 are set on the A272 looking northwest towards the Application Site; views from 44 are restricted by roadside vegetation and views from 45 look across a low lying field towards intervening vegetation which restricts views of the Application Site.

8.111 Viewpoints 46 and 47 are set within Wisborough Green and look northwest towards the Application Site; views from 46 are restricted by development with the village itself and views from 47 look across pastoral land towards intervening vegetation which restricts views of the Application Site. Pylons are clearly visible in view 47.

8.112 Receptor sensitivity is low from all these viewpoints.

Long distance views from between 2km and 3km from the Application Site from public rights of way

8.113 Land rises to the southwest, west, and north, with a lower valley to the west where the River Kird runs westwards, and lower land to the southwest along the Upper Arun River valley.

8.114 Viewpoints 28, 29, 30 and 32 are set on slightly higher ground and look southeast across pastoral land towards the Application Site; views of the Application Site are restricted by distance and intervening vegetation.

8.115 Viewpoints 33 and 36 are set on higher ground and look southwest across pastoral land towards the Application Site; views of the Application Site are restricted by distance, landform and intervening vegetation.

8.116 Viewpoint 39 is set on higher ground to the north of Newpound Common Green looking southwest towards the Application Site; views of the Application Site are restricted by intervening vegetation running between the footpath and the adjacent road running parallel to it.

8.117 Viewpoint 41 is set on slightly higher ground looking west towards the Application Site; views of the Application Site are restricted by distance, landform and intervening vegetation.

8.118 Viewpoints 42 and 43 are set on lower ground looking northwest towards the Application Site; views of the Application Site are restricted by distance, landform and intervening vegetation.

8.119 Receptor sensitivity is medium from these viewpoints.

Long distance views from between 2km and 3km from the Application Site from roads

8.120 Land rises to the southwest, west, and north, with a lower valley to the west where the River Kird runs westwards, and lower land to the southwest along the Upper Arun River valley.

8.121 Viewpoint 24 is set on higher ground looking northeast towards the Application Site; views of the Application Site are restricted by distance and intervening vegetation. Pylons are clearly visible in the view.

8.122 Viewpoint 27 is set on slightly higher ground to the west of Kirdford looking east towards the Application Site; views of the Application Site are restricted by intervening vegetation on the immediate roadside.

8.123 Receptor sensitivity is low from these viewpoints.

Views from the South Downs National Park from public rights of way

8.124 Land rises to the southwest within the SDNP boundary.

8.125 Viewpoints 15, 19, 20 and 23 are set on higher ground looking northeast towards the Application Site; views of the Application Site are restricted by distance and intervening vegetation. Pylons are clearly visible from Viewpoints 15 and 23.

8.126 Receptor sensitivity is high from these viewpoints.

Views from the South Downs National Park from roads

8.127 Land rises to the southwest within the SDNP boundary.

8.128 Viewpoints 16, 17, 18 and 21 are set on higher ground looking northeast towards the Application Site; views of the Application Site are restricted by distance and intervening vegetation.

8.129 Receptor sensitivity is low from these viewpoints.

Views from SMs

8.130 Viewpoint 22 is set on higher ground looking northeast towards the Application Site and is the closest point on publically accessible land to the Brownings Moat SM, which is set at around 10m lower than the viewpoint itself; views of the Application Site are restricted by distance and intervening vegetation.

8.131 Receptor sensitivity is low from this viewpoint.

8.132 Viewpoint 31 is set on higher ground looking southwest towards the Application Site and is the closest point on publically accessible land to the Wephurst Glass House SM, which is set within dense woodland; views of the Application Site are restricted by landform, distance and intervening vegetation.

8.133 Receptor sensitivity is medium from this viewpoint.

Summary of visibility

8.134 The Application Site is generally well screened by the surrounding woodlands, trees and hedgerows. This strong existing vegetation framework to the Application Site and surrounding area also serves to prevent views of the ground plane of the Application Site from the majority of viewpoints, including from the part of the study area set within the South Downs National Park. However there are partial views available of the Application Site itself and the entrance from close viewpoints on Kirdford Road.

8.135 The table below summarises the sensitivities of the visual receptors assessed using the criteria outlined in 8.36-8.36.

Viewpoint numbers	Position	Assessed sensitivity of receptor	Reasons
1- 5	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
6	Public Right of Way (Ancient and semi-natural woodland & Site of Nature Conservation Interest)	Medium	View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business
7	Public Right of Way (Ancient and semi-natural woodland)	Medium	View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business
8-9	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
10-11	Public Right of Way (Ancient and semi-natural woodland)	Medium	View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business
12-13	Public Right of Way	Medium	View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business
14	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
15	Public Right of Way (South Downs National Park)	High	Viewpoints within a high quality landscape. View receptors with a high interest in their environment and prolonged viewing opportunities i.e. where engaged in leisurely pursuits that involve aesthetic appreciation of their surroundings such as walking and cycling.
16-18	Road (South Downs National Park)	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
19-20	Public Right of Way (South Downs National Park)	High	Viewpoints within a high quality landscape. View receptors with a high interest in their environment and prolonged viewing opportunities i.e. where engaged in leisurely pursuits that involve aesthetic appreciation of their surroundings such as walking and cycling.
21	Road (South Downs National Park)	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.

22	Road (Nearest publicly accessible point to Scheduled Monument)	Medium	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis. However, sensitivity raised to Medium to reflect position on SDNP boundary and proximity to Scheduled Monument.
23	Public Right of Way (South Downs National Park & Ancient and semi-natural woodland)	High	Viewpoints within a high quality landscape. View receptors with a high interest in their environment and prolonged viewing opportunities i.e. where engaged in leisurely pursuits that involve aesthetic appreciation of their surroundings such as walking and cycling.
24-27	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
28-29	Public Right of Way (Site of Nature Conservation Interest)	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
30	Public Right of Way	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
31	Public Right of Way (Nearest publicly accessible point to Scheduled Monument)	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
32-37	Public Right of Way	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
38	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.
39-43	Public Right of Way	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
44-48	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.

49	Public Right of Way	Medium	Viewpoints within a medium quality landscape. View receptors with a moderate interest in their environment i.e. where engaged in outdoor sport or recreation activities (other than appreciation of the landscape), or travelling through engaged in daily business.
50	Road	Low	View receptors with a passing or momentary interest in their environment i.e. where attention is focused on work or some similar activity or travelling through at speed on occasional basis.

Assessment of effects

8.136 The effects of the Proposed Development have been assessed with regard to four phases of development:

- Phase 1. Construction of access road and well site
- Phase 2. Mobilisation of drill rig and drilling operations
- Phase 3a. Testing (vertical; gas) (omitted if no hydrocarbons found); or
- Phase 3b. Testing (vertical; oil) (omitted if no hydrocarbons found); or
- Phase 3a. Contingent testing (lateral; gas) (omitted if no hydrocarbons found); or
- Phase 3b. Contingent testing (lateral; oil) (omitted if no hydrocarbons found); and then either
- Phase 4a. Restoration; or
- Phase 4b. Retention.

8.137 In line with the methodology set out in sections 8.22-8.41, the assessment of each phase has looked at the sensitivity of landscape features, landscape character, historic landscape character or viewpoint categories, the magnitude of change the Proposed Development brings to each, likely significant landscape and visual effects of that change in relation to the sensitivity, the mitigation measures required to prevent, reduce or offset those effects and the likely residual landscape and visual effects after the mitigation measures have been implemented.

8.138 An assessment of the rig visibility has been undertaken, as this is the tallest structure onsite and as such determines the zone of visual influence (see Plan 3582 P08), and is

included as **Figure 8.16**. The rig visibility diagram assesses the potential visibility of the upper section of the drilling rig from all viewpoints where there are substantial blocks of woodland in the possible line of sight to the Proposed Development. The assessment of visibility is carried out with the assumption that there are no views possible through blocks of woodland to the bunding, portacabins and lower section of the rig, but that the angle and elevation of the view may allow views of the rig over woodlands in some cases. The assessment does not take account of smaller or narrower shelterbelts or hedgerow trees. Therefore it is assumed that the resultant rig visibility indicated is the worst case scenario.

8.139 Descriptions of the significance of the effects, details of the proposed mitigation and the significance of the residual effects are set out in the sections below (8.142 to 8.231). These, along with the assessment of sensitivity and magnitude of change, are also tabulated in the Effects Assessment Tables in Appendices 8.2 and 8.3.

Likely Significant Effects

8.140 In this section, an assessment of the landscape and visual effects of the Proposed Development without mitigation has been undertaken for the predicted effects during all phases. In later sections the mitigation proposals and residual effects of the Proposed Development after mitigation are described.

Phase 1: Construction of access road and well site

Landscape Effects

8.141 During the construction phase there will be physical alteration of the Application Site. The sensitivity of landscape features and character varies, as does the magnitude of change.

8.142 With the assessed medium sensitivity, the high magnitude of change through the loss of agricultural land and soils has a major/moderate adverse effect on the land use.

8.143 The storage of soils in bunds and the creation of a ditch brings a low magnitude of change to the topography of the Application Site. With an assessed medium sensitivity, this has a moderate/minor adverse effect on topography.

8.144 Access, assessed as having low sensitivity, is not affected by the Proposed Development.

8.145 The encroachment of the access track on the root protection zones of 5 trees, the crown-lifting of two trees and the loss of a 1.5m length of hedge at the entrance to the access track to allow for minor widening will bring a low magnitude of change to the vegetation of the Application Site. With an assessed medium sensitivity, this has a moderate/minor adverse effect on vegetation.

8.146 The introduction of elements of an industrial nature into the otherwise agricultural landscape of the surrounding area brings a medium magnitude of change to landscape character. With an assessed medium sensitivity, this has a moderate adverse effect on landscape character.

8.147 The loss of agricultural land with a significant time depth and historic landscape character brings a medium magnitude of change to historic landscape character. With an assessed low sensitivity, this has a moderate/minor adverse effect on historic landscape character.

Visual Effects

8.148 During construction, views of the Proposed Development will only be available from some of the close viewpoints on Kirdford Road.

8.149 Where these close views are from the road to the west and at the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 1 & 8), the magnitude of change is low, with partial views of the construction traffic and partial views of the south western corner of the built elements of the Proposed Development

through the existing field gate (viewpoint 1) and over the intervening hedgeline (viewpoint 8) having a minor adverse effect.

8.150 Where these close views are from the road to the east of the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 4 & 5), the magnitude of change is low, with partial views of the construction traffic and entrance to the Application Site with increased signage, having a minor adverse effect.

8.151 Views from the other viewpoints are not affected due to lack of visibility of the Application Site and the Proposed Development the effects are therefore negligible.

Phase 2: Mobilisation of drill rig and drilling operations (vertical and contingent lateral)

Landscape Effects

8.152 During the mobilisation and drilling phase the effects on the landscape features and the historic character of the Application Site remain the same as in the previous phase.

8.153 The presence of the drill rig will introduce more elements of an industrial nature into the otherwise agricultural landscape of the surrounding area, bringing a high magnitude of change to landscape character. With an assessed medium sensitivity, this has a major/moderate adverse effect on landscape character

Visual Effects

8.154 During this phase the presence of the drilling rig increases the height of the Proposed Development. The visibility of the rig has been assessed (see section 8.139) and the magnitude of change for all viewpoints from which the rig is visible (**Appendix 8.2**) has increased.

8.155 Where close views are from PROW, to the west, north and east of the Application Site, with clear views of the upper sections of the rig, over the top of vegetation, with medium receptor sensitivity (viewpoints 12, 13, 34 and 49), the magnitude of change is low, having a moderate/minor adverse effect.

8.156 Where close views are from the road to the west and east of the Application Site, with partial views of the construction traffic, partial views of the south western corner of the built elements of the Proposed Development, and clear views of the upper sections of the rig, over the top of vegetation through the existing field gate (viewpoint 1) and over the intervening hedgeline (viewpoint 8) having a minor adverse effect, with low receptor sensitivity, the magnitude of change is medium, having a moderate/minor adverse effect.

8.157 Where these close views are from the road to the east of the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 4 & 5), the magnitude of change is low, with partial views of the construction traffic and entrance to the Application Site with increased signage, having a minor adverse effect.

8.158 Where close views are from roads, from the west and east of the Application Site, with clear views of the upper sections of the rig only over the top of vegetation, with low receptor sensitivity (viewpoints 2, 3, 9 and 48), the magnitude of change is low, having a minor adverse effect.

8.159 Where middle distance views are from PROW to the north east of the Application Site, with clear views of the upper sections of the rig only over the top of vegetation, with medium receptor sensitivity (viewpoints 35 and 37), the magnitude of change is low, having a moderate/minor adverse effect.

8.160 Where middle distance views are from roads to the west, northeast and southeast of the Application Site, with clear views of the upper sections of the rig only over the top of vegetation, with low receptor sensitivity (viewpoints 14, 25, 38, 44 and 45), the magnitude of change is low, having a minor adverse effect.

8.161 Where long distance views are from PROW to the northwest, northeast and east of the Application Site, with views of the upper sections of the rig only over the top of vegetation, with medium receptor sensitivity (viewpoints 28, 30, 32, 36, 39 and 41), the magnitude of change is low, having a moderate/minor adverse effect.

8.162 Where long distance views are from roads to the west of the Application Site, with views of the upper sections of the rig only over the top of vegetation, with low receptor sensitivity (viewpoint 27), the magnitude of change is low, having a minor adverse effect.

8.163 Where views are from roads within the SDNP, with views of the upper sections of the rig only over the top of vegetation, with low receptor sensitivity (viewpoint 17), the magnitude of change is low, having a minor adverse effect.

8.164 Views from the other viewpoints are not affected due to lack of visibility of the Application Site and the Proposed Development and therefore the effects are negligible.

Phase 3a: Testing (vertical; gas)

Landscape Effects

8.165 Effects remain the same as Phase 2 due to the presence on site of the drilling rig.

Visual Effects

8.166 Effects remain the same as Phase 2 due to the presence on site of the drilling rig.

Phase 3b: Testing (vertical; oil)

Landscape Effects

8.167 Effects remain the same as Phase 2 due to the presence on site of the drilling rig.

Visual Effects

8.168 Effects remain the same as Phase 2 due to the presence on site of the drilling rig.

Phase 3a: Testing (lateral; gas)

Landscape Effects

8.169 Effects revert to the same as Phase 1 due to the removal of the drilling rig but the continued presence of the bunding and portacabins.

Visual Effects

8.170 Effects revert to the same as Phase 1 due to the removal of the drilling rig but the continued presence of the bunding and portacabins.

Phase 3b: Testing (lateral; oil)

Landscape Effects

8.171 Effects revert to the same as Phase 1 due to the removal of the drilling rig but the continued presence of the bunding and portacabins.

Visual Effects

8.172 Effects revert to the same as Phase 1 due to the removal of the drilling rig but the continued presence of the bunding and portacabins.

Phase 4a: Restoration

Landscape Effects

8.173 With the assessed medium sensitivity of the land use, the medium magnitude of change through the restoration of agricultural land and soils has a moderate adverse effect reducing over time through the re-establishment of agricultural use to negligible.

8.174 With the assessed medium sensitivity of the topography, the low magnitude of change through the removal of all bunding and restoration of all levels has a moderate/minor adverse effect reducing with the completion of the restoration to negligible.

8.175 Access, assessed as having low sensitivity, is not affected by the Proposed Development.

8.176 The encroachment of the access track on the root protection zones of 5 trees and the removal of 1.5m hedge at the entrance to the access track will bring a low magnitude of change to the vegetation of the Application Site. With an assessed medium sensitivity, this has a moderate/ minor adverse effect on vegetation reducing with the completion of the restoration to negligible.

8.177 The removal of all elements of an industrial nature into the otherwise agricultural landscape of the surrounding area and the removal of all bunding and restoration of existing levels brings a low magnitude of change to landscape character. With an assessed medium sensitivity, this has a moderate/minor adverse effect on landscape character reducing over time through the re-establishment of agricultural use to negligible.

8.178 The restoration of the agricultural land brings a low magnitude of change to historic landscape character. With an assessed low sensitivity, this has a minor adverse effect on historic landscape character reducing over time through the re-establishment of agricultural use to negligible.

Visual Effects

8.179 During restoration views of the Proposed Development will only be available from close viewpoints due to the removal of the drilling rig.

8.180 Where these close views are from the road to the west and at the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 1 & 8), the magnitude of change is low, with partial views of the de-construction traffic and partial views of the south western corner of the built elements of the Proposed Development through the existing field gate (viewpoint 1) and over the intervening hedgeline (viewpoint 8) reducing throughout the restoration process, having a minor adverse effect reducing to negligible.

8.181 Where these close views are from the road to the east of the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 4 & 5), the magnitude of change is low, with partial views of the de-construction traffic and entrance to the Application Site with increased signage reducing throughout the restoration process, having a minor adverse effect reducing to negligible.

8.182 Views from the other viewpoints are not affected due to lack of visibility of the Application Site and the Proposed Development.

Phase 4b: Retention

Landscape Effects

8.183 With the assessed medium sensitivity, the high magnitude of change through the continued loss of agricultural land and soils has a major/moderate adverse effect on the land use.

8.184 The continued storage of soils in bunds and the presence of a ditch brings a low magnitude of change to the topography of the Application Site. With an assessed medium sensitivity, this has a moderate/minor adverse effect on topography. Access, assessed as having low sensitivity, is not affected by the Proposed Development.

8.185 The encroachment of the access track on the root protection zones of 5 trees and the removal of 1.5m hedge at the entrance to the access track will bring a low magnitude of

change to the vegetation of the Application Site. With an assessed medium sensitivity, this has a moderate/minor adverse effect on vegetation.

8.186 The retention of changes to levels through bunding and the loss of agricultural land brings a medium magnitude of change to landscape character. With an assessed medium sensitivity, this has a moderate adverse effect on landscape character.

8.187 The loss of agricultural land with a significant time depth and historic landscape character brings a medium magnitude of change to historic landscape character. With an assessed low sensitivity, this has a moderate/minor adverse effect on historic landscape character.

Visual Effects

8.188 During retention views of the Proposed Development will only be available from close viewpoints.

8.189 Where these close views are from the road to the west and at the entrance to the Application Site access track, with low receptor sensitivity (viewpoints 1 & 8), the magnitude of change is low, with partial views of the de-construction traffic and partial views of the south western corner of the retained built elements of the Proposed Development through the existing field gate (viewpoint 1) and over the intervening hedgeline (viewpoint 8) having a minor adverse effect.

8.190 Views from the other viewpoints are not affected due to lack of visibility of the Application Site and the Proposed Development.

Mitigation Measures

Phase 1: Construction of access road and well site

8.191 Soil stripping and storage will be carefully managed; topsoil and subsoil will be stored separately to avoid contamination, bunding will be carefully shaped to ensure soils are free draining and not compacted.

8.192 The compound and access track will be carefully sited to minimise encroachment into tree root protection zones, with a root protection measures along the access track and no dig construction used for bitmac surfacing at the Application Site access entrance. Tree protection fencing will be erected to protect existing trees and woodland. (See Construction Environmental Management Plan in Chapter 6)

Phase 2: Mobilisation of drill rig and drilling operations

8.193 No additional mitigation is proposed.

Phase 3a: Testing (vertical; gas)

8.194 No additional mitigation is proposed.

Phase 3b: Testing (vertical; oil)

8.195 No additional mitigation is proposed.

Phase 3a: Testing (lateral; gas)

8.196 No additional mitigation is proposed.

Phase 3b: Testing (lateral; oil)

8.197 No additional mitigation is proposed.

Phase 4a: Restoration

8.198 The careful reuse of the stored site soils is proposed. The 1.5m length of hedge removed at the site entrance will be replanted.

Phase 4b: Retention

8.199 No additional mitigation is proposed.

Residual Effects

Phase 1: Construction of access road and well site

Residual Landscape Effects

8.200 The loss of agricultural land and soils gives a major/moderate adverse effect on the land use which can be partly mitigated. This alters the residual effect to moderate adverse.

8.201 The storage of soils in bunds and the creation of a ditch brings a low magnitude of change to the topography of the Application Site. With an assessed medium sensitivity, this gives a moderate adverse effect on topography character. These effects cannot be mitigated against and the residual effect remains the same.

8.202 Access, assessed as having low sensitivity, is not affected by the Proposed Development.

8.203 The encroachment of access track on the root protection zone of trees gives a moderate/minor adverse effect on vegetation, which can be partly mitigated, altering the residual effect to minor adverse.

8.204 The introduction of elements of an industrial nature into the otherwise agricultural landscape of the surrounding area has a moderate adverse effect on landscape character, which cannot be mitigated against and the residual effect remains the same.

8.205 The loss of agricultural land has a moderate/minor adverse effect on historic landscape character, which cannot be mitigated against and the residual effect remains the same.

Residual Visual Effects

8.206 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect remains the same.

Phase 2: Mobilisation of drill rig and drilling operations

Residual Landscape Effects

8.207 The residual landscape effects remain the same as Phase 1.

Residual Visual Effects

8.208 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect remains the same.

Phase 3a: Testing (vertical; gas)

Residual Landscape Effects

8.209 The residual landscape effects remain the same as Phase 2.

Residual Visual Effects

8.210 The residual visual effects remain the same as Phase 2.

Phase 3b: Testing (vertical; oil)

Residual Landscape Effects

8.211 The residual landscape effects remain the same as Phase 2.

Residual Visual Effects

8.212 The residual visual effects remain the same as Phase 2.

Phase 3a: Testing (lateral; gas)

Residual Landscape Effects

8.213 The residual landscape effects revert to the same as Phase 1.

Residual Visual Effects

8.214 The residual visual effects revert to the same as Phase 1.

Phase 3b: Testing (vertical; oil)

Residual Landscape Effects

8.215 The residual landscape effects revert to the same as Phase 1.

Residual Visual Effects

8.216 The residual visual effects revert to the same as Phase 1.

Phase 4a: Restoration

Residual Landscape Effects

8.217 With restoration of the agricultural land, the moderate adverse effect reducing to negligible can be partly. This alters the residual effect to moderate/minor adverse reducing over time through the re-establishment of agricultural use to negligible.

8.218 Adverse effects of the Proposed Development on topography cannot be mitigated against and therefore the residual effect on the topography of the Application Site remains moderate/minor adverse reducing to negligible with the completion of the restoration. Access is not affected by the Proposed Development.

8.219 The encroachment of access track on the root protection zone of trees and the removal of 1.5m hedge at the entrance to the access track gives a moderate/minor adverse effect on vegetation, which can be partly mitigated, altering the residual effect to minor adverse reducing to negligible with the removal of the access and the replanting of the hedge during restoration.

8.220 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect on landscape character of the Application Site remains moderate/minor adverse reducing to negligible with the completion of the restoration.

8.221 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect on historic character of the Application Site remains minor adverse reducing to negligible with the completion of the restoration.

Visual Effects

8.222 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect remains the same.

Phase 4b: Retention

Residual Landscape Effects

8.223 With the careful storage of soils on site the major/moderate adverse effects of the Proposed Development on land use can be partly mitigated. This alters the residual effect to moderate adverse.

8.224 The adverse effects of the Proposed Development on the topography through the continued storage of soils in bunds and the presence of a ditch cannot be mitigated against, therefore the effect remains moderate adverse.

8.225 Access is not affected by the Proposed Development.

8.226 The encroachment of access track on the root protection zone of trees and the removal of 1.5m hedge at the entrance to the access track gives a moderate/minor adverse effect on vegetation, which can be partly mitigated, altering the residual effect to minor adverse.

8.227 The adverse effects of the Proposed Development on landscape character cannot be mitigated against and the residual effect remains moderate adverse.

8.228 The adverse effects of the Proposed Development on historic character cannot be mitigated against and the residual effect remains moderate/minor adverse.

Residual Visual Effects

8.229 Adverse effects of the Proposed Development cannot be mitigated against and therefore the residual effect on close viewpoints remains the same.

Cumulative Effects

8.230 It is not anticipated that there are any cumulative effects of the Proposed Development.

Summary

8.231 In carrying out assessments on most developments, the permanent effects of the development are usually more significant than the temporary effects during construction. However, in the case of the Proposed Development, many of the effects are temporary. The most significant adverse landscape and visual effects are during the construction and operational phases.

8.232 Whilst the Proposed Development has adverse landscape effects, these are most significant during the construction and mobilisation and drilling phases, due to loss of the agricultural landscape affecting both land use and landscape character. The scheme also respects the existing field patterns rather having an adverse effect on these. The proposals also take care to respect the majority of the root protection zones of existing trees to the Application Site boundary and within the Application Site itself.

8.233 With the benefit of the well wooded surrounding landscape there is no single clear view into the Application Site. However the Proposed Development has adverse visual effects, these are most significant in close views from Kirdford Road during the mobilisation and drilling phase, due to the height of the rig, which cannot be mitigated.

8.234 In the restoration of the Application Site to existing landscape conditions, all adverse effects are reversed, returning the Application Site to greenfield.

8.235 If retention of the Application Site is required following the finding of hydrocarbons, the removal of much of the operational structure and equipment from the Application Site reduces the adverse landscape and visual effects of the construction and operational phases.

8.236 If the Application Site achieves permission and goes into production, the long term aim will be to restore the Application Site to greenfield once production ceases, also mitigating the significant adverse landscape and visual effects of the production site.

8.237 **Table 8.2** contains a summary of the likely significant landscape and visual effects of the Proposed Development.

Table 8.2: Table of Significance – Landscape and Visual Impact

Potential Effect	**Nature of Effect** (Permanent/ Temporary)	**Significance** (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	**Mitigation / Enhancement Measures**	**Geographical Importance***							**Residual Effects** (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	D	L	
Phase 1: Construction of access road and well site											
Loss of agricultural land	Temporary	Major/moderate adverse	Careful storage of soils						✓		Moderate adverse
Changes to topography	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Temporary	Moderate/minor adverse	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Temporary	Moderate adverse	-						✓		Moderate adverse
Change to historic landscape character	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Site visibility	Temporary	Minor adverse (majority viewpoints negligible)	-							✓	Minor adverse (majority viewpoints negligible)
Phase 2: Mobilisation of drill rig and drilling operations											
Loss of agricultural land	Temporary	Major/moderate adverse	Careful storage of soils						✓		Moderate adverse
Changes to topography	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Temporary	Moderate/minor adverse	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Temporary	Major/moderate adverse	-						✓		Major/moderate adverse
Change to historic landscape character	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Site visibility	Temporary	Ranges from moderate/minor adverse to minor adverse (some viewpoints negligible)	-							✓	Ranges from moderate/minor adverse to minor adverse (some viewpoints negligible)

Phase 3a / 3b: Testing (vertical; gas and oil)											
Loss of agricultural land	Temporary	Major/moderate adverse	Careful storage of soils						✓		Moderate adverse
Changes to topography	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Temporary	Moderate/minor adverse	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Temporary	Major / moderate adverse	-						✓		Major / moderate adverse
Change to historic landscape character	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Site visibility	Temporary	Ranges from moderate/minor adverse to minor adverse (some viewpoints negligible)	-							✓	Ranges from moderate/minor adverse to minor adverse (some viewpoints negligible)
Phase 3a / 3b: Testing (lateral; gas and oil)											
Loss of agricultural land	Contingent/temporary	Major/moderate adverse	Careful storage of soils						✓		Moderate adverse
Changes to topography	Contingent/temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Contingent/temporary	Moderate/minor adverse	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Contingent/temporary	Major / moderate adverse	-						✓		Major / moderate adverse
Change to historic landscape character	Contingent/temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Site visibility	Contingent/temporary	Minor adverse (most viewpoints negligible)	-							✓	Minor adverse (most viewpoints negligible)

Phase 4a: Restoration											
Restoration of agricultural land	Temporary	Moderate adverse reducing to negligible	Careful re-use of soils						✓		Moderate/minor adverse reducing to negligible
Restoration of topography	Temporary	Moderate/minor adverse reducing to negligible	-						✓		Moderate / minor adverse reducing to negligible
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Temporary	Moderate/minor adverse reducing to negligible	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Temporary	Moderate/minor adverse reducing to negligible	-						✓		Moderate/minor adverse reducing to negligible
Change to historic landscape character	Temporary	Minor adverse reducing to negligible	-						✓		Minor adverse reducing to negligible
Site visibility	Temporary	Minor adverse; reducing to negligible (majority viewpoints negligible)	-							✓	Negligible
Phase 4b: Retention											
Loss of agricultural land	Temporary	Major/moderate adverse	Careful storage of soils						✓		Moderate adverse
Changes to topography	Temporary	Moderate/minor adverse	-						✓		Moderate/minor adverse
Some encroachment on tree root protection zones along access. Loss of small section of hedge at entrance.	Temporary	Moderate/minor adverse	Use of root protection measures along access track and no dig construction at entrance						✓		Minor adverse
Change in landscape character	Temporary	Moderate adverse	-						✓		Moderate adverse
Change to historic landscape character	Temporary	Moderate/minor adverse	-								Moderate/minor adverse
Site visibility	Temporary	Minor adverse (majority viewpoints negligible)	-							✓	Minor adverse (majority viewpoints negligible)
*** Geographical Level of Importance** I = International; UK = United Kingdom; E = England; R = Regional; C = County; D = District; L = Local											

References (Ref)

8.1 National Planning Policy Framework (2012)

8.2 Technical Guidance to the National Planning Policy Framework (2012)

8.3 The South East Plan (adopted May 2009)

8.4 Chichester District Council (Adopted April 1999) '*Local Plan First Review*'

8.5 Chichester District Council (Adopted April 1999) '*General Development Control Policies*'

8.6 West Sussex County Council (2003) '*Minerals Local Plan'*

8.7 West Sussex County Council (2005) *'A Strategy for the West Sussex Landscape'*

8.8 Landscape Institute and the Institute of Environmental Management and Assessment (2002) '*Guidelines for Landscape and Visual Impact Assessment'*, Spon Press

8.9 Natural England (2005) '*National Landscape Character Assessment*'

8.10 West Sussex County Council (2003) '*West Sussex: Landscape Character Assessment'*

8.11 West Sussex County Council (undated) 'Excerpt from West Sussex Historic Landscape Character'

9.0 NOISE AND VIBRATION

Introduction

9.1 This chapter of the ES assesses the likely significant effects of the Proposed Development in terms of noise and vibration, and is supported by the accompanying Figures.

9.2 The chapter describes the assessment methodology; the baseline conditions currently existing at the Assessment Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. This chapter has been prepared by ACIA Engineering Acoustics, Stockport.

Planning Policy Context

National Planning Policy

National Planning Policy Framework, 2012 (Ref. 9.1)

9.3 The National Planning Policy Framework (NPPF) was published in 2012 and replaced Planning Policy Guidance (PPG) 24: Planning and Noise, and Minerals Policy Statement (MPS) 2: Controlling and Mitigating the Environmental Effects of Mineral Extraction in England. The NPPF provides the following guidance on noise, planning and minerals.

9.4 The NPPF states at paragraph 123 that planning policies and decisions should avoid noise giving rise to 'significant adverse impacts … on … quality of life', and mitigate the adverse impacts through the use of conditions, but recognise that development will often create some noise.

9.5 Under Section 13 – Facilitating the sustainable use of minerals, paragraph 143 says that when developing noise limits local planning authorities should;

> **"recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction".**

9.6 The NPPF also states at paragraph 144, that when determining applications local planning authorities should;

> **"ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source".**

Technical Guidance to the NPPF, 2012 (Ref 9.2)

9.7 The Technical Guidance to the NPPF deals with noise emissions from mineral workings at paragraphs 28 and 29. Paragraph 30 defines noise standards for minerals sites as follows.

9.8 Subject to a maximum of 55dB $L_{Aeq,1h}$, mineral planning authorities should aim to establish a noise limit that does not exceed the background noise level by more than 10dB.

9.9 Recognising that this may impose unreasonable burdens on mineral operators, the daytime noise limit should be set as near that level as practicable (07.00h – 19.00h). Evening limits (19.00h – 22.00h) should not exceed background noise by more than 10dB, and night-time limits should not exceed 42dB $L_{Aeq,1h}$ (free field) at noise-sensitive dwellings.

9.10 This night-time limit is identical to that in the previous MPG11 and MPS2 guidance, and is also based on the assumption of permanent night-time working.

Local Planning Policy

The West Sussex Minerals Local Plan, 2003 (Ref 9.3)

9.11 Policies within the Minerals Local Plan have been saved until they are replaced by new documents to be prepared as part of the Minerals and Waste Development Framework. Saved Policy 19 of the Minerals Local Plan deals with residential amenity and the built environment. It states that in considering planning applications for mineral extraction, attention will be given to the effect upon residential and other amenity, and measures to mitigate the impact.

9.12 Saved Policy 60 states that conditions will be imposed requiring that acceptable maximum levels of noise are not exceeded, and appropriate monitoring points will be identified on site boundaries and/or at appropriate locations outside the site. However, the preceding explanatory paragraph 6.53 refers to MPG11, dating from April 1993, which was replaced by MPS2 Annex 2 — Noise, 23 May 2005, which in turn was specifically replaced by the NPPF.

9.13 Saved Policy 64 states that buffer zones to reduce the impact of operations upon the neighbourhood may be required, particularly in relation to residential areas and other noise-sensitive areas.

9.14 The implication of applying the provisions of the Minerals Local Plan to the Proposed Development is that a noise limit will be imposed by planning condition. Such a limit would be determined primarily with reference to the NPPF Guidance

Chichester District Council Local Plan, 1999 (Ref 9.4)

9.15 Policy B5 of the saved Chichester Local Plan states that proposals in rural areas should not generate noise from machinery, vehicle movements or other activity which, when measured against the existing ambient noise levels, would be likely to unduly disturb

adjacent residents (as assessed in relation to BS.4142) or the quiet enjoyment of the countryside.

National standards and legislation

BS.5228 part 1: 2009 (Ref 9.5)

9.16 BS.5228-1: 2009 gives recommendations for basic methods of noise control relating to construction and open sites where work activities or operations generate significant noise levels. The legislative background to noise control is described and recommendations are given for procedure for the establishment of effective liaison between developers, site operators and local authorities. Part 1 provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it. It is applicable to the construction phase of the proposed development, but greater protection of amenity is normally considered appropriate for the 24-hour, seven-day production and testing phases of well site operations.

ISO 9613-2:1996 (Ref 9.6)

9.17 This international standard, *Attenuation of sound during propagation outdoors* provides a general method for the calculation of environmental noise levels at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions favourable to propagation from sources of known sound emission. The method consists of octave-band algorithms (with nominal midband frequencies from 63Hz to 8kHz) for calculating the attenuation of sound which originates from a group of point sources. The physical effects of geometrical divergence, atmospheric absorption, ground effect attenuation, reflection from surfaces, and screening by obstacles are allowed for. The method is applicable to most situations concerning industrial noise sources, construction activities and many other ground-based noise sources.

Report of the Noise Review Working Party, Department of the Environment, October 1990 (Ref. 9.7)

9.18 The points addressed in the 1990 Department of the Environment report, wherein the transitory nature of noise from onshore oil and gas exploration sites was discussed, included a view that noise from such sites may be best controlled by the use of Section 60 of the Control of Pollution Act, in conjunction with a specific Code of Practice for such sites.

Environmental Protection Act, 1990 (Ref 9.8)

9.19 Section 79 of the EPA defines statutory nuisances caused by (*inter alia*) noise emitted from premises so as to be prejudicial to health or a nuisance. Where a local authority is satisfied that a statutory nuisance exists, it is to serve an abatement notice requiring the abatement of the nuisance, restricting its occurrence or recurrence, or requiring steps to be taken as necessary.

9.20 Subject to some other provisions, it is a defence to prove that the best practicable means have been used to prevent or counteract the effects of the nuisance. The relevant parts of the Act would apply to all phases of the proposed development.

Control of Pollution Act, 1974 (Ref 9.9)

9.21 Some of the provisions of the Control of Pollution Act relating to construction noise are still in effect: Section 60 allows a local authority to require construction works to be carried out in a particular way in order to control noise as far as is reasonably practicable.

9.22 Section 61 allows for a developer to apply for prior consent for construction works in respect of the method by which the works are to be carried out, and the steps proposed in order that noise arising from the works is minimised.

Hampshire County Council ISVR Report

9.23 In the 1980s the Wolfson Unit of the ISVR prepared an internal report for Hampshire County Council which recommended a noise limit of 35dB L_{A90} for a long-term oilfield development in a rural area with nearby housing. The report was never published but saw wide use at the time.

9.24 For short-term drilling, the ISVR determined that noise levels up to 5dB noisier than the long-term criterion would probably not cause significant nuisance, so values of 40dB L_{A90} were therefore acceptable outside local residential properties.

9.25 It is a characteristic of conventional rotary drilling that for the typical rig the L_{Aeq} emitted is generally 3 to 4 dB numerically higher than the L_{A90}. Thus, making an appropriate adjustment, it follows that the environmental noise limit for noise levels during drilling would be in the range 43 to 44 dB L_{Aeq} at the nearest properties at night. This is in step with the provisions of the NPPF guidance.

Assessment Methodology

Significance

9.26 The significance criteria adopted for this assessment are set out in **Table 9.1**. These were formulated with regard to the National Planning Policy Framework (NPPF) which states that the planning system has an environmental role to help use natural resources prudently and minimise pollution.

9.27 Minerals planning authorities are expected to ensure that plan proposals do not have an unacceptable adverse effect on the natural environment.

Table 9.1: Significance criteria

Significance	Criterion
CRITICAL	These effects are generally, but not exclusively, associated with sites and features of national or regional importance. A change in a regional or district scale feature may also enter this category. Mitigation measures are unlikely to remove such effects. It is inconceivable that noise impact would ever fall within this category.
MAJOR	These effects are likely to be important considerations at a local or district scale, but if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
MODERATE	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects would be experienced but mitigation measures and detailed design work would ameliorate/enhance some of the consequences upon affected communities or interests so that the adverse effects are not unacceptable.
MINOR	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in enhancing the subsequent design of the proposed development the consideration of mitigation measures, and the imposition of planning conditions.
NEGLIGIBLE	No effects or those which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. A change in noise level less than 1dB is regarded as a negligible effect.

9.28 The public response to noise arising from the Proposed Development depends on the pre-existing level of background noise, the amount by which the 'new' noise exceeds it, and the duration of any increase in noise levels. Noise from short-term activities is more acceptable than noise at the same level from more permanent activities. Noise during the evening and at night is less acceptable than the same noise occurring during the normal working day.

Noise limits

9.29 Achieving an appropriate noise limit is a way of determining the significance of an effect. All phases of the Proposed Development described in Chapter 4 have been assessed. Nevertheless, all noise sources can be regarded as temporary, with drilling expected to

take place over a period of a few weeks only. The four phases of the Proposed Development are (1) construction; (2) mobilisation and drilling; (3) testing and (4) aftercare. A different noise limit is appropriate for each phase.

9.30 Noise limits would normally be applicable at the nearest point on the curtilage of neighbouring properties, or another appropriate location where local circumstances dictate.

9.31 Noise from permanent installations, in contrast, should not give rise to increases in environmental noise levels outside local noise-sensitive properties. This means that in order to constitute valid planning conditions any noise limits imposed should be applicable at a location where compliance can be monitored and verified: in the case of well testing a noise limit at the Proposed Development site boundary would be appropriate.

9.32 In order to keep conditions as simple and effective as possible, an identical noise limit should apply to all noise-sensitive locations. The noise level resulting from drilling operations on the proposed well site should, according to various recommendations, not exceed 45dB $L_{Aeq,5min}$ at night. The NPPF Technical Guidance suggests a night-time noise limit of 42dB for long-term or permanent minerals extraction operations. The definition of 'night-time' is sometimes a matter of local preference, but 22:00h to 07:00h can be regarded as the night-time period when most residents expect undisturbed sleep.

9.33 The NPPF Technical Guidance recommends that the daytime noise limit should not be set higher than 55dB $L_{Aeq,5min}$. This is in step with the well-established BS.5228-1 standard and in view of the expected duration of drilling activities which is comparable with a small construction project the same limit is appropriate here. The same daytime noise limit is applicable to the restoration phase of the Proposed Development.

9.34 The construction and drilling noise limits are appropriate for the assessment of the possible short-term test phase if hydrocarbons are found, but in the event that the

contingent horizontal well is drilled, and the worst case scenario of 26 weeks of testing occurs, the extended well test noise limits would be applicable.

9.35 The noise limits adopted for this assessment are shown in **Table 9.2**.

Table 9.2: Proposed noise limits at noise-sensitive locations, dB

activity	daytime $L_{Aeq,1h}$	evening $L_{Aeq,5min}$	night $L_{Aeq,5min}$
construction	55	N/A	N/A
drilling	55	42	42
short-term testing	55	42	42
extended well test*	40*	35*	35*
site reinstatement	55	N/A	N/A

* applicable at site boundary

Vibration

9.36 Given that the separation distances between the Proposed Development and the nearest residential properties are of the order of hundreds of metres, only a brief qualitative vibration assessment was conducted. The levels of vibration depend not only on the input excitation, but also on the ground conditions close to the surface (in the unconsolidated layer) and the nature of the property in which vibration might be detected. None of these can be predicted other than in terms of the order of magnitude.

Calculation of construction noise

9.37 The aggregate noise levels at neighbouring noise-sensitive properties resulting from the operation of earthmoving machinery were calculated in terms of the overall A-weighted equivalent continuous noise levels. Corrections were then applied to allow for the 'on-time' of each machine in a given hour of operation, as recommended by BS.5228 part1: 2009 (ref.9.5), and the total equivalent continuous noise level calculated on the assumption that the equipment was operating at the well location. No allowance was made for any screening effects, but geometrical effects (separation distances), soft

ground attenuation and atmospheric absorption were included as set out in BS EN ISO 9613-2:1996 (ref 9.6).

9.38 The resulting sound pressure levels L_p at each of the noise prediction locations were calculated from the expression:

$$L_p = L_w - 20 \log r - 11 + DI + \Sigma A \text{ [dB]}$$

9.39 Where r is the separation distance in metres between the noise source and the receiver; DI is the directivity index, assumed to be +3dB for sound propagation over a reflecting plane surface; and ΣA is the aggregate excess attenuation resulting from the ground effects attenuation A_G and the atmospheric absorption A_A. The source height was assumed to be 1m, which is typical for diesel-engined plant, and the reception points were each taken to be 1.2m above ground, this being a conventional microphone height for compliance measurements.

Calculation of drilling noise

9.40 Assuming that all the noise sources on the drilling site are contributors to the overall noise level, the decay of sound levels with distance (geometric effects) was taken into account according to the basic acoustical principle of hemispherical radiation. The attenuation effects as sound passes over soft ground, and the absorption of high frequencies by the atmosphere, were also taken into account using the well-established base data for open country shown in ISO.9613-2:1996 (ref.9.6). Calm weather was assumed, as this is generally the condition under which sound propagates most readily, and thus the worst case was modelled. A direct line of sight was assumed between the drilling site and each of the residential locations.

9.41 Input sound power information for a typical drilling rig of appropriate power was obtained from previous measurements by ACIA at various sites. Noise survey reports by others are also available. The resulting sound pressure levels L_p at each of the noise prediction locations were again calculated from the expression:

$$L_p = L_w - 20 \log r - 11 + DI + \Sigma A \text{ [dB]}$$

9.42 Where r is the separation distance in metres between the noise source and the receiver; DI is the directivity index, assumed to be +3dB for sound propagation over a reflecting plane surface; and ΣA is the aggregate excess attenuation resulting from the ground effects attenuation A_G and the atmospheric absorption A_A. The source height for drilling noise was assumed to be 2.5m, this being the typical height of noise-emitting equipment on the rig, and the reception points were each taken to be 1.2m above ground, this being a conventional microphone height for compliance measurements.

Road traffic noise

9.43 Noise from road traffic movements is often predicted with reference to the Department of Transport's 1988 document Calculation of Road Traffic Noise (CRTN) (Ref. 9.7) which is designed to assess the changes in road traffic noise arising from a new road or a modified carriageway.

9.44 The noise from a traffic stream is not constant but varies from one moment to the next, and it is necessary to use an idex to arrive at a single-figure estimate of traffic noise for assessment purposes. CRTN uses the $L_{A10,18h}$ index which is the noise level exceeded for 10% of an eighteen-hour period during the daytime and evening (06.00h – midnight). This has been used for road traffic noise for more than 25 years because it correlates well with subjective responses. However, the $L_{Aeq,16h}$, the parameter in more general use nowadays because it can readily be compared with WHO guideline noise limits inside dwellings.

9.45 The usefulness of CRTN in the present project is limited, because it relates to the noise resulting from steady traffic flows rather than sporadic vehicle movements, although equations are given in CRTN which relate the resulting noise levels at housing to the number of vehicle movements expected. No changes in the highway layout are proposed as part of the Proposed Development, so the only potential changes in noise level from

the road network are those arising from increases in the numbers of vehicle movements during the construction and drilling phases.

9.46 The Design Manual for Roads and Bridges (DMRB) volume 11 (ref. 9.8) gives advice on the environmental assessment of noise from changes in road traffic. Its objective is to establish the magnitude of significance for noise changes where the current traffic levels are likely to increase by 25% or reduce by 20%. These changes are equivalent to an increase or decrease of 1dB in traffic noise levels. For DMRB purposes there is not necessity to quantify changes of less than 1dB, the inference being that such slight changes in noise level are so small as to be imperceptible. This would be an effect of negligible significance.

9.47 In order to assess road traffic noise resulting from each phase of the Proposed Development, the expected numbers of vehicle movements were superimposed on present traffic volumes and the likely increases in the $L_{Aeq,16h}$ index calculated.

Baseline Conditions

Noise survey details

9.48 Surveys of ambient noise levels were undertaken during the night in the area of the proposed well site. The survey took place in the small hours of Friday 22 February 2013.

9.49 As the proposed well site is a considerable distance from any residential property, noise measurements were made at three locations chosen to represent the nearest residential properties to each side of the proposed drilling site. N1 was directly opposite Skiff Farm, Kirdford Road, at the entrance to a trailer storage area. N3 was outside the gate to Barkfold Manor, Kirdford Road. N3 was at the entrance to Lower Sparr Farm, Skiff Lane (**Figure 9.1**). Although the measurements were attended by a qualified acoustical engineer throughout, the results were noted automatically by the equipment without any need for further intervention. The measurement locations are shown in **Table 9.3** and **Figure 9.1**.

Table 9.3: Noise measurement locations

ref	location	OS grid reference	m from well
N1	opposite Skiff Farm	504161 E, 126915 N	514
N2	gate to Barkfold Manor	502992 E, 126470 N	738
N3	Lower Sparr Farm	503947 E, 127199 N	551
	well location	503689 E, 126712 N	-

Instrumentation and method

9.50 A Rion type NL-32 sound analyser was used to monitor the background noise levels affecting the areas of potentially noise-sensitive dwellings. It was used in conjunction with a Rion type UC-53A half-inch condenser microphone, and a foam windshield was fitted for all measurements. The unit was mounted on a tripod with the microphone 1.2m above the ground. The entire measurement chain was subject to calibration checks before and after the surveys by means of a Bruel and Kjaer type 4231 electronic calibrator: no drift was observed. The meter is subject to regular laboratory calibration, the most recent having been on 23 March 2012.

9.51 Five-minute measurement periods were monitored from 00:30h to 03:15h on 22 February 2013, at the three locations in sequence. The equivalent continuous sound pressure level L_{Aeq}, together with the statistical indices L_{A90} and L_{A10} were noted for each five-minute period. Sample daytime measurements were also made in the late morning of 22 February 2013.

Weather and other observations during measurements

9.52 The weather throughout the night-time survey was dry, with an air temperature of 1°C. There was no measurable wind, full cloud cover, but no precipitation. There were no vehicle movements whatsoever past the microphone.

9.53 The daytime sample measurements also took place in calm conditions and the air temperature reached 5°C. It was found that passing vehicles were the predominant

noise source, and these controlled the measured L_{Aeq} values, but the volume of traffic was judged insufficient to affect the underlying L_{A90} index.

Results of noise measurements

9.54 The results of the night-time noise surveys are presented in **Table 9.4** below and in **Figures 9.2, 9.3** and **9.4**.

Table 9.4: Night-time ambient noise levels, dB

start, h	end, h	L_{Aeq} dB	L_{A90} dB	L_{A10} dB
R1 Skiff Farm				
00:30	00:35	24.1	19.5	25.3
00:35	00:40	23.4	19.4	27.0
00:40	00:45	23.0	19.6	25.1
R2 Barkfold Manor				
00:50	00:55	27.9	25.4	29.7
00:55	01:00	27.6	25.1	29.0
01:00	01:05	27.6	25.2	29.1
R3 Lower Sparr Farm				
01:10	01:15	23.9	20.9	24.7
01:15	01:20	24.2	20.7	24.6
01:20	01:25	24.4	21.4	25.4
R1 Skiff Farm				
01:35	01:40	23.7	21.4	25.3
01:40	01:45	24.4	21.3	25.4
01:45	01:50	23.8	20.7	24.7
R2 Barkfold Manor				
01:55	02:00	27.2	25.4	28.4
02:00	02:05	27.4	25.0	28.8
02:05	02:10	27.7	25.2	29.0
R3 Lower Sparr Farm				
02:20	02:25	24.0	21.1	24.6
02:25	02:30	23.8	20.7	25.3
02:30	02:35	24.5	20.9	25.3
R1 Skiff Farm				
02:40	02:45	24.1	20.9	25.0
02:45	02:50	25.2	19.8	26.0
R2 Barkfold Manor				
03:00	03:05	27.6	25.5	29.0
03:05	03:10	28.0	25.3	29.5
R3 Lower Sparr Farm				
03:20	03:25	24.1	21.8	25.1
03:25	03:30	23.8	20.5	24.3

9.55 The noise levels outside Skiff Farm and Barkfold Manor in the late morning were very dependent on passing road traffic, but the underlying background noise level was approximately 35dB $L_{A90,5min}$.

Assessment of effects

Phase 1: Construction of the access road and well site

9.56 Noise levels arising during site construction were calculated for the six neighbouring residential properties which are shown in **Figure 9.1**. In each case the OS grid coordinates chosen, as identified in **Table 9.5**, represent the nearest point on the façade of the building that faces the well site.

Table 9.5: Noise prediction locations

ref	location	OS grid reference	m from well
R1	Skiff Farm	504125 E, 126889 N	471
R2	Apple Tree Cottage	504234 E, 126795 N	551
R3	Wisborough Villa	504292 E, 126715 N	603
R4	Barkfold Manor	502828 E, 126467 N	895
R5	Stud Bungalow	502882 E, 126617 N	813
R6	Barkfold Farmhouse	502844 E, 126843 N	855
R7	Lower Sparr Farm	504003 E, 127188 N	570
	well location	503689 E, 126712 N	-

9.57 Construction of the drilling site, in terms of the noise produced, is mainly a matter of levelling the site and laying loose stone chippings over the area. The equipment used will typically consist of a tracked excavator, with a sound power level of 112dB(A), a dozer, 114dB(A), and a road roller, 108dB(A). The sound power levels were taken from Table D.3 of BS.5228-1:2009. There will also be deliveries of stone and other materials by roadgoing dumper truck. Construction would normally occur during an extended working day only which is anticipated to be between 7am and 7pm (Monday to Friday) and 8am-1pm on Saturdays. The aggregate noise levels at each of the noise-sensitive properties identified in **Table 9.5**, resulting from the operation of all three earthmoving machines individually and concurrently, were calculated in terms of the overall A-

weighted equivalent continuous noise levels assuming the source noise spectrum shape to be that of a typical large turbocharged diesel engine and exhaust. Corrections were then applied to allow for the 'on-time' of each machine in a given hour of operation, as recommended by BS.5228 part1: 2009, and the total equivalent continuous noise level calculated on the assumption that the equipment was operating at the well location. No allowance was made for any screening effects.

9.58 Construction noise levels (L_{Aeq}) at the noise-sensitive properties nearest to the proposed sites were calculated using octave band sound power levels as shown in **Table 9.6** to the nearest whole decibel. These source levels represent the equivalent continuous sound power propagating from the machine in each case.

Table 9.6: Construction equipment noise level spectra $L_{eq,T}$ dB

	31.5	63	125	250	500	1k	2k	4k	8k	'A'
excavator	127	114	112	102	114	105	98	85	77	112
dozer	129	116	114	104	116	107	100	87	79	114
roller	123	110	108	98	110	1001	94	81	73	108

9.59 The instantaneous levels experienced would change over time but the values used enable the equivalent continuous noise levels $L_{Aeq,1h}$ to be calculated. The results are shown in **Table 9.7**.

Table 9.7: Predicted noise levels during construction

	location	excavator	dozer	roller	all plant*
R1	Skiff Farm	42	44	38	**41**
R2	Apple Tree Cottage	40	42	36	**40**
R3	Wisborough Villa	39	41	35	**39**
R4	Barkfold Manor	35	37	31	**34**
R5	Stud Bungalow	36	38	32	**35**
R6	Barkfold Farmhouse	35	37	31	**35**
R7	Lower Sparr Farm	40	42	36	**39**

* The figures in the individual machine columns assume continuous operation. The figures in the 'all plant' column allow for 30% 'on-time' of each of the three types of machinery in a given one-hour period.

9.60 Noise during construction is potentially of moderate significance, in that operations may sometimes be audible during the daytime at local noise-sensitive properties. The

predicted maximum noise levels in terms of $L_{Aeq,1h}$ are in the range 35 to 41 dB, which are comfortably within a 55dB parameter advised in BS.5228-1.

9.61 There will be no sources of significant ground vibration during construction which will be detectable inside neighbouring properties.

Road traffic movements

9.62 Some noise during the construction period, from heavy goods vehicles travelling on the public highway, is unavoidable. There will be an average of one additional vehicle movement per hour during the normal working day (8am to 5pm) and on Saturday mornings (8am to 1pm) during the 6 - 10 week construction period.

9.63 The increase in traffic noise in terms of $L_{Aeq,16h}$ (the usual parameter) resulting from these movements is less than 1dB and therefore negligible, although individual vehicle movements will give rise to localised increases in noise level for a matter of seconds.

Phase 2: Mobilisation of drill rig and drilling operations

9.64 During the mobilisation of the rig, site work will occur between 8am and 8pm daily, but not at night. Noise levels will not exceed those occurring during site construction. Thereafter the rig will operate 24 hours a day, seven days a week.

9.65 Noise levels from the drilling phase were calculated for the six neighbouring residential properties identified in **Table 9.5**. The OS grid coordinates chosen in each case represent the nearest point on the façade of the building that faces the well site. This basis was adopted, rather than the more usual closest point within the curtilage of the property (in the garden) because drilling is a continuous 24-hour operation and night-time noise levels are almost invariably found to be more critical.

9.66 It is the Applicant's intention to use a rotary drilling rig of which the British Drilling and Freezing Rig 28 and Edeco Rig 10 are typical examples. The BDF 28 is the noisiest under

most conditions and has been used for the purposes of this assessment thus representing the worst case. The sound power level L_{wA} emitted in any given direction is between 104 and 110 dB. Drilling rigs have directional characteristics, so the actual value measured at a particular point will vary according to the actual rig used, and its orientation. For prediction purposes it was assumed that the rig orientation will be with its pipe racks directed just north of west (289°), meaning that the maximum sound power level will be directed towards the south-west.

9.67 Noise levels (L_{Aeq}) at the noise-sensitive properties nearest to the proposed sites were calculated using the octave band sound power levels in **Table 9.8**. These source levels represent the maximum equivalent continuous sound power propagating from the rig towards the receiver location in each case. The actual levels experienced would vary slightly depending on weather and wind direction, but the values used are for drilling ahead in calm weather using standard solids control equipment and two diesel-driven mud pumps, as measured by ACIA on a drilling site in north-west England.

Table 9.8: Average sound power emitted by drilling rig BDF 28, L_{eq} dB

Hz	31.5	63	125	250	500	1k	2k	4k	8k	'A'
$L_{eq,T}$	131	122	120	108	107	104	96	85	81	110

9.68 The attenuation due to the effects of separation distance only at each receptor is shown in **Table 9.9**.

Table 9.9: Geometrical attenuation dB

	receptor	distance m	-20 log *r* dB
R1	Skiff Farm	471	53.5
R2	Apple Tree Cottage	551	54.8
R3	Wisborough Villa	603	55.6
R4	Barkfold Manor	895	59.0
R5	Stud Bungalow	813	58.2
R6	Barkfold Farmhouse	855	58.6
R7	Lower Sparr Farm	570	55.1

9.69 **Table 9.10** shows the predicted overall noise level, L_{Aeq}, and the octave equivalent continuous levels produced by the rig itself (in the absence of background noise) at each of these locations. The levels indicated take account of the directivity (effects of orientation) of the rig, soft ground attenuation and atmospheric absorption, but disregard the screening effects which might result from the presence of physical barriers between the noise source and a receiver.

Table 9.10: Predicted worst case noise levels from drilling (screening ignored)

Hz	31.5	63	125	250	500	1k	2k	4k	8k	'A'
R1	59	52	42	24	31	36	30	6	-	**38**
R2	57	51	41	22	30	34	28	2	-	**36**
R3	57	50	40	21	29	33	27	-	-	**35**
R4	51	44	38	24	26	32	27	-	-	**34**
R5	51	45	39	24	27	33	29	-	-	**35**
R6	51	45	38	24	27	32	28	-	-	**35**
R7	57	53	37	17	23	29	21	-	-	**32**

9.70 Since drilling will continue 24 hours a day, seven days a week, noise is generally more likely to be noticed at night than during the daytime, not least because daytime background noise will be considerably greater. The predicted levels at night (in terms of the $L_{Aeq,T}$ emitted by the rig) may significantly exceed the current levels of background noise on a calm night, as described below. However, the levels would remain within a night-time noise limit of 42dB $L_{Aeq,5min}$ (as appropriate for permanent installations) even at the closest noise-sensitive properties. A daytime noise limit of 55dB $L_{Aeq,1h}$ as recommended by the NPPF Technical Guidance will always be met.

9.71 The maximum predicted level of 38dB L_{Aeq} produced by the rig itself (in the absence of background noise) at the nearest noise-sensitive location (R1 Skiff Farm) can be compared with the minimum ambient noise level of 20dB $L_{A90,5min}$ and 24dB $L_{Aeq,5min}$. This level will be in excess of the pre-existing minimum background noise level of 23dB $L_{Aeq,5min}$ so noise from the drilling site will cause a temporary increase of up to 14dB in night-time noise. Given the relatively short-term nature of drilling operations (typically six weeks, maximum ten weeks) these levels of noise are of moderate adverse significance.

9.72 The shale shakers located next to the drilling rig itself, and forming part of the solids control equipment, are significant sources of vibrational energy since their operation, as the name implies, depends on passing the returned drilling fluids through a set of reciprocating (vibrating) screens. This vibration is detectable on the solids control structure itself, and can sometimes just be detected by an observer standing on the ground next to the machinery. This vibration is dissipated within a matter of a few metres and is undetectable beyond the confines of the site. There will be no sources of significant ground vibration during rig operations which will be detectable inside neighbouring properties.

Road traffic movements

9.73 Some noise from heavy goods vehicles travelling on the public highway will arise during the rig mobilisation period of 3 – 4 days. There will be 140 additional vehicle movements, mainly HGVs, equating to approximately 3 per hour during the normal working day and on Saturday mornings.

9.74 The increase in traffic noise in terms of $L_{Aeq,\ 16h}$ resulting from these movements is negligible, although individual vehicle movements will give rise to localised increases in noise level for a matter of several seconds at a time.

9.75 During drilling there will be 4 to 6 movements of HGVs daily, with up to 30 movements of light vehicles at shift changes (8am and 8pm daily). The increase in traffic noise in terms of $L_{Aeq,\ 16h}$ resulting from these movements less than 1dB and thus negligible.

Phase 3: Short-term testing (gas and oil)

9.76 Noise levels during short-term testing will be similar to, but will not exceed, those during the drilling phase, as the drilling rig will remain on site. These levels of noise are of moderate adverse significance.

Phase 3b: Extended Well Test (EWT)

9.77 In the event that the initial short term testing provides encouraging results, Celtique may decide to run an Extended Well Test (EWT) which could run for up to 180 days.

9.78 An EWT would involve the removal of the drilling rig from site and the installation of temporary production facilities including:

- Storage tanks for produced oil and formation water contained in a bunded area;
- An oil/water/gas separator for the separation of the produced well stream, also contained within the bunded area;
- Transfer pumps to transfer fluids between the storage tanks and also to road tankers for export;
- A flare stack to vent or flare any produced gases;
- A pumping unit on the well to produce (it is unlikely that the oil will flow to surface naturally);
- An emergency shutdown system on the well to stop production and shut-in the well in the event of an emergency;
- Portacabin offices to house the pumping unit control equipment and provide an office and facilities for the well operators;
- A packaged electrical generator.

9.79 Once this equipment has been installed and commissioned, production operations would continue 24 hours a day, seven days a week throughout the designated period. Production and pressure data would be gathered to allow the Applicant to evaluate the long term production potential of the well and collect bottom hole fluid samples for analysis.

9.80 The only significant noise sources involved in the EWT are the well head pump, which would operate continuously, the transfer pumps, which would operate intermittently when required, the generator and the flare stack. The well head pump is likely to be a

linear rod pump, which operates by means of a small electric motor driving reciprocating pump via a rack and pinion. The electric motor is the only source of noise, and this will not exceed 60dB(A) at a distance of 1m. Transfer pumps will be small units mounted at ground level and are unlikely to emit more than 55dB(A) at 1m: for the great majority of the time they will not operate, and will therefore be silent. The electrical generator will be a relatively small packaged unit complete with acoustic enclosure, silenced exhaust system and air intake and outlet attenuators. The typical noise output of such a unit is approximately 65 to 70dB(A) at 1m. The total sound power level emanating from the site during the extended well test is therefore 84dB(A).

9.81 The resulting contributions of such operations at the nearest noise-sensitive locations will be noise levels ($L_{Aeq,5min}$) well below the expected minimum ambient noise levels. The results, which include the effects of local screening on site, are shown in **Table 9.11**.

Table 9.11: Predicted noise levels from extended well testing

Hz	receptor	dB $L_{Aeq,5min}$
R1	Skiff Farm	16
R2	Apple Tree Cottage	16
R3	Wisborough Villa	14
R4	Barkfold Manor	11
R5	Stud Bungalow	11
R6	Barkfold Farmhouse	11
R7	Lower Sparr Farm	14

9.82 Noise during extended well testing is potentially of minor significance, and operations will not be audible at local noise-sensitive properties.

9.83 None of the equipment described above is capable of transmitting significant levels of vibration into the ground, and no vibration will be detectable within neighbouring residential properties.

Site reinstatement

9.84 Noise levels during site reinstatement will not exceed those from construction. Conventional earthmoving machinery and roadgoing dumper trucks will again be required although the scale of operations will be less.

9.85 The site landowner may choose to retain some or all of the stone brought onto site, which will reduce the number of lorry movements necessary during reinstatement compared with those during construction.

9.86 Noise during site restoration is potentially of minor significance. Operations may occasionally be audible during the daytime at local noise-sensitive properties but will in general be unnoticeable.

Site retention

9.87 There are no ongoing activities in the event of site retention which will give rise to noise audible beyond the site boundary. This effect is of negligible significance.

Mitigation Measures

Phase 1 – Construction

9.88 Noise from construction will be controlled primarily by the restriction of working hours. It would be usual practice to allow potentially noisy activities only during the normal working week and on Saturday mornings, subject to local practice.

9.89 BS.5228-1 states that good relations with people living and working in the vicinity of the site operations are of paramount importance. Surrounding residents would be kept informed of the progress of works via regular correspondence from Celtique issued to coincide with key project and operational milestones. A notice would also be erected next to the entrance to the Application Site. On both materials a Freephone contact

number would be available for any residents who wished to contact Celtique during works.

9.90 Quiet working methods should be adopted including the use of the most suitable plant and reasonable hours of working for noisy operations. Noise should be controlled at source and on-site noise levels monitored regularly. Local authorities may consider it appropriate to lay down or agree work programmes and periods of use of certain equipment.

9.91 General measures that can reduce noise levels at source include the avoidance of unnecessary revving of engines, switching off equipment when it is not required, minimising the drop height of materials, and starting up plant and vehicles sequentially rather than all together. Audible reversing alarms should be of types that have a minimum noise effect on persons outside the site.

Phase 2 – Mobilisation and Drilling

9.92 There will be additional screening effects on drilling rig noise as a result of the intervening topsoil bund to the north side of the Application Site, and the subsoil bund to the east of the Application Site. No screening was allowed for in the noise assessment because it cannot be guaranteed that any individual noise-sensitive receptor will in fact benefit from the loss of line of sight between itself and a noise source on the Proposed Development. Therefore a “worst case” has been assessed. The volume of topsoil and subsoil available for the construction of bunds may vary owing to site conditions, which might affect the overall length and height of a bund. Moreover, different drilling rigs have slightly different configurations when mobilised on site, so that a particular noise source that would be screened by a bund for one rig might just be visible for a different rig.

9.93 The identity of the rig to be contracted for the drilling phase is not yet known. This depends on the suitability and availability of the drilling rigs on the market at a future time. Although a worst-case scenario was assumed for the noise predictions, noise

survey reports on candidate rigs will be requested at the procurement stage in order to ensure that their noise emissions do not exceed the assumed levels in this chapter of the ES.

9.94 As the predicted background noise levels at nearby residential properties are acceptably low, further noise mitigation measures are not expected to be required, but any decrease in noise level is regarded as beneficial and further noise control measures may be practicable. It will be necessary in any event to confirm that the noise control measures on the individual rig, including diesel exhaust silencers, attenuators allowing cooling air into and out of acoustically-enclosed machinery, and the enclosures themselves, are all kept in good repair in order to ensure that the overall sound power levels used for the acoustical modelling are valid.

9.95 When the rig is fully mobilised on site, access doors to all noisy equipment must be kept closed at all times. No detailed proposals are presented at this stage, but good site management practice will maintain acceptably low drilling rig noise throughout the life of the project.

9.96 Some of the fields in the locality of the Application Site are used to provide grazing for horses and other animals, and horse-riding activities also take place. There are no standards for acceptable noise levels in relation to equine species although it is a matter of observation that noises perceived by horses to be non-threatening are simply disregarded. For example, horses are frequently seen grazing at the side of a motorway at locations where the noise level can exceed 60dB(A).

9.97 The British Horse Society has guideline limits for separation distance between horses and wind turbines, although this is more concerned with visual than aural stimuli. A steady noise source such as a drill rig has little potential to startle or ‘spook’ an animal. Nevertheless, good site management practice will minimise any sudden noise from the drill site.

Phase 3a/3b – Testing (gas and oil)

9.98 No noise mitigation measures are necessary during the possible extended well test programme.

Phase 4a – Restoration

9.99 Similarly to the construction phase, noise from site restoration can also be controlled by the restriction of working hours. It would be usual practice to allow potentially noisy activities only during the normal working week and Saturday mornings.

Phase 4b - Retention

9.100 No noise mitigation measures are necessary.

Residual Effects

Phase 1 – Construction

9.101 Residual noise effects as a result of construction activities would be negligible.

Phase 2 – Mobilisation and Drilling

9.102 Residual noise effects of rig mobilisation and drilling would be negligible.

Phase 3a/3b – Testing (gas and oil)

9.103 Residual noise effects of extended well testing would be negligible.

Phase 4a – Restoration

9.104 Residual noise effects of site restoration would be negligible.

Phase 4b – Retention

9.105 Residual noise effects of site retention would be negligible

Cumulative Effects

9.106 The two committed developments set out in Chapter 2 have been considered in the assessment of likely significant cumulative effects. The solar park would be located 3.5km to the north-west, and 30 new dwellings would be located off Billingshurst Road, 1.4km to the south-east.

9.107 The solar park will not produce any noise audible beyond its own site boundary and can be disregarded.

9.108 There may be noise during construction of the new dwellings but this will occur only during the working day assuming that normal working hours are enforced by the LPA as is usual practice. It will not make any contribution to the noise levels at neighbour noise-sensitive receptors to the Proposed Development.

9.109 Road traffic concerned with any of the above may give rise to temporary increases in road traffic noise level at a given moment. However, it remains the case that the overall increase in traffic noise in terms of $L_{Aeq,16h}$ will be less than 1dB because of the likely infrequency of vehicle movements even when these are concurrent with the Proposed Development.

9.110 Cumulative noise effects in terms of noise would therefore be negligible.

Summary

9.111 Noise levels arising during site construction will sometimes be audible outside local noise-sensitive dwellings during the daytime only. This will not be a cause of noise

nuisance and the amenity of residents will be unaffected provided that construction activities are limited to the normal working day and Saturday mornings.

9.112 The noise from 24-hour drilling operations will inevitably cause a temporary increase in ambient noise. The predicted noise levels at local dwellings are based on the noisiest rig likely to be used for the Proposed Development, and alternative rigs may be available for contract at the time. Specific noise control measures will be applied as necessary and appropriate.

9.113 Extended well testing is unlikely to be audible beyond the site boundary at any time.

9.114 Site restoration is similar to construction in terms of the noise emitted, but activity will be less intensive and mostly at lower levels.

Table 9.12: Table of Significance – Noise and Vibration

Potential Effect	Nature of Effect (Permanent/Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	D	L	
Phase 1: Construction of access road and well site											
Noise nuisance at local noise-sensitive properties	Temporary	Moderate adverse	Restriction of operating hours	-	-	-	-	-	-	*	Negligible
Phase 2: Mobilisation of the drill rig and drilling operations											
Noise nuisance at local noise-sensitive properties	Temporary	Moderate adverse	Restriction of operating hours	-	-	-	-	-	-	*	Negligible
Phase 3a: Short term testing and evaluation (gas)											
Noise nuisance at local noise-sensitive properties	Temporary	Negligible	None	-	-	-	-	-	-	*	Negligible
Phase 3b: Short term testing and evaluation (oil)											
Noise nuisance at local noise-sensitive properties	Temporary	Negligible	None	-	-	-	-	-	-	*	Negligible
Phase 4a: Restoration											
Noise nuisance at local noise-sensitive properties	Temporary	Minor adverse	Restriction of operating hours	-	-	-	-	-	-	*	Negligible
Phase 4b: Retention											
Noise nuisance at local noise-sensitive properties	Temporary	Negligible	None	-	-	-	-	-	-	*	Negligible

*** Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; D = District; L = Local

References (Ref)

9.1 National Planning Policy Framework, 2012

9.2 Technical Guidance to the NPPF, 2012

9.3 The West Sussex Minerals Local Plan, 2003

9.4 Chichester District Council Local Plan, 1999

9.5 BS.5228 part 1: 2009

9.6 ISO 9613-2:1996

9.7 Report of the Noise Review Working Party, Department of the Environment, October 1990

9.8 Environmental Protection Act, 1990

9.9 Control of Pollution Act, 1974