

9.0 NOISE

Introduction

- 9.1 This chapter documents the methodology and results of an assessment of potential noise effects associated with the Proposed Development. Construction related noise effects were assessed, taking into account the operation of construction plant and equipment both on- and off-site, including the movement of construction related traffic on the local road network. A quantitative assessment of potential noise effects of the construction works was conducted and, where appropriate, mitigation measures were discussed and the likely residual effects were considered.
- 9.2 This chapter was prepared by Royal Haskoning.

Planning Policy Context

National Legislation / Guidance

The Control of Pollution Act, 1974 (COPA) (Ref. 9.1)

- 9.3 Section 60 of the Act provides powers to local authority officers to serve an abatement notice in respect of noise nuisance from construction works, whilst Section 61 provides a method by which a contractor can avoid such action by applying for consent to conduct construction activities in advance of their occurrence (a 'prior consent'). The prior consent is agreed between the local authority and the contractor and may contain a range of agreed working conditions designed to minimise or prevent the occurrence of noise nuisance from construction activities. The prior consent is usually applied for at a stage in a project when a detailed construction Method Statement is available.

National Planning Policy Framework (NPPF) (Ref. 9.2)

- 9.4 The NPPF, published in March 2012, replaced national planning policy guidance note PPG 24: planning and noise. The NPPF provides the following general guidance relating to noise and development:
- 9.5 Paragraph 123 of the NPPF states that planning policies and decisions should aim to:

- **“avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;**
- **mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;**
- **recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and**
- **identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”**

9.6 The framework also provides advice regarding minerals planning. It states that, policies should ensure that permitted minerals operations do not have unacceptable noise impacts, however any noise limits developed should recognise that *“some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction”* (Section 143).

9.7 The NPPF also states that in determining planning applications Local Planning Authorities should ensure that any unavoidable noise is controlled, mitigated or removed at source, and that noise limits should be set when extraction occurs close to noise sensitive premises. The NPPF also references the *“Technical guidance on minerals”* document. The guidance from that document has not used, because, as discussed below, due to the short nature of the exploratory works it has been assessed as construction noise.

British Standard (BS) 5228: Code of practice for noise and vibration control on construction and open sites - Part 1 (Ref. 9.3)

9.8 BS 5228 Part 1 provides guidance and advice relating recommendations for basic methods of noise control relating to construction and open sites, methods for assessing the effect of noise during different times of day, including noise limits, and calculation

methods for predicting the level of noise affecting noise sensitive premises. Due to the temporary nature of the Proposed Development, it is deemed appropriate that noise arising from the works, including drilling, is assessed using the guidance provided in this Standard.

Regional Planning Policy

The South East Plan (adopted May 2009) (Ref. 9.4)

- 9.9 The South East Plan contains one policy relating directly to noise - Policy NRM10. However, the focus of Policy NRM10 is on the development of new residential and transport schemes, and does not specifically mention new noise generating developments.

Local Planning Policy

Horsham Core Strategy (adopted February 2007) (Ref. 9.5)

- 9.10 The Horsham Core Strategy does not contain any specific policies relating to noise. However the Policy CP 2: 'Environmental Quality' states that development proposals should minimise the emissions of pollutants, including noise.

West Sussex Minerals Local Plan (adopted July 2003) (Ref 9.6)

- 9.11 Policy 19 of the West Sussex Local Minerals Plan 'Residential amenity and the built environment' does not relate directly to noise but states that the effect on residential amenity will be given attention when considering planning applications.
- 9.12 Policy 60 'Noise' discusses the use of planning conditions to impose maximum noise levels are not exceeded at the site boundary or at nearby properties and the selection of appropriate monitoring points, at the site boundary or at locations outside of the site. It does not stipulate whether this applies to short term, temporary operations such as the exploratory drilling which forms the Proposed Development.
- 9.13 Policy 63 relates to hours of work and states that hours of work are traditionally 07:00 to 18:00 Monday to Friday and Saturday mornings but that where residential amenity is likely to be significantly adversely affected, shorter working hours may be required.
- 9.14 Policy 64 'Buffer zones' and states that buffer zones may be required in order to reduce

the effect of the operations on the neighbourhood, particularly in relation to residential and other noise sensitive areas.

Assessment Methodology

Noise: On-site Activity

- 9.15 Receptors sensitive to noise can include residences, schools, hospitals, places of worship, and places of business requiring low levels of noise. Sensitive receptors that may be affected by noise from the Proposed Development include residential properties close to the drilling site and adjacent to traffic access routes.
- 9.16 With regard to noise from on-site activity, four noise sensitive premises, the closest residential properties to the drilling compound, were identified and are shown in **Figure 9.1**. These comprise Homefield Farm, Woodbarn Farm, Gatewick Farm and Gay Street Farm.
- 9.17 With regard to noise from construction traffic, noise sensitive premises adjacent to construction access routes were considered in general, rather than selecting specific properties at which the effect would be assessed.
- 9.18 In order to predict the level of construction noise from the Proposed Development, an indicative list of plant equipment was drawn up for each phase of the works. This list of plant was based on information from drilling contractors and knowledge of other, similar schemes. Source noise levels for the plant/equipment were either taken from Annex C of BS 5228 or, in the case of the drilling rig, from a noise survey conducted at an operating drilling rig similar to the rig that will be used for the Proposed Development (Ref. 9.7). A list of the equipment used within the assessment is presented in **Table 9.1**, showing the source noise level of the equipment and the percentage of a typical working day the equipment would be expected to operate for (on-time).

Table 9.1: Equipment/Plant used for the Construction Noise Calculations

Phase	Activity	Plant	Ref. (BS5228)	L _{Aeq} 10m (dB)	@	No.	% on
1	Access track preparation	Tracked Excavator	C.2.3	78		1	60
		Dozer	C.2.10	80		1	60
		Articulated dump truck	C.2.33	81		1	60
		Roller (Rolling fill)	C.2.39	79		1	60

Phase	Activity	Plant	Ref. (BS5228)	L _{Aeq} 10m (dB) @	No.	% on
	Site compound preparation	Tracked Excavator	C.2.3	78	2	60
		Dozer	C.2.10	80	1	60
		Articulated dump truck	C.2.33	81	1	60
		Roller (Rolling fill)	C.2.39	79	1	60
		Concrete mixer truck	C.4.20	80	1	40
		Poker vibrator	C.4.33	78	2	40
	Traffic	Heavy vehicle	DGMR ¹	103 ²	6 ³	15 ⁴
2a	Installation of drilling rig	Tracked mobile crane	C.4.52	75	2	60
		Telescopic handler	C.4.54	79	1	50
	Traffic	Heavy vehicle	DGMR	103 ²	2 ³	15 ⁴
2b	Drilling	Drilling rig and all ancillary equipment	Report ⁵	109 ²	1	100
	Traffic	Heavy vehicle	DGMR	103 ²	2 ³	15 ⁴
3	Testing	Flare	Datasheet	65 ⁶	1	100
		Generator	Datasheet	70 ⁷	1	100
	Traffic	Heavy vehicle	DGMR	103 ²	<1	15 ⁴
4	Decommissioning	Tracked Excavator	C.2.3	78	2	60
		Tracked mobile crane	C.4.52	75	2	60
		Telescopic handler	C.4.54	79	1	50
	Traffic	Heavy vehicle	DGMR	103 ²	6 ³	15 ⁴

¹ SourceDB/Harmonoise source noise level database (Ref. 9.8)

² Sound Power Level (L_w in dB)

³ Number of hourly vehicle movements

⁴ Vehicle speed on access track (km/h)

⁵ (Ref. 9.7)

⁶ Product datasheet: Bekaert CEB Technologies – CEB 4500. Measured at 200 yards.

⁷ Product datasheet: FG Wilson P156E1 generator. Measured at 7m.

9.19 For the purpose of the noise assessment, the works were split into four phases with associated sub-activities, as listed below:

1. The construction of the drill site, the associated access and drainage ditches around the perimeter of the drilling area;
 - Site clearance involving the excavation and removal of top soil;
 - Temporary screening bunds on the southern and western boundaries of the well site compound to store excavated topsoil and subsoil;
 - Access track constructed using crushed stone;
 - Staff car park constructed, within the compound but outside of the

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- drilling area;
 - Concrete chamber sunk into the ground acting as a Cellar to include large diameter pipework as a starting point for drilling;
- 2a. The mobilisation and placement of drilling equipment at the site;
- Installation of a drilling rig and ancillary drilling equipment for construction of an exploratory borehole;
 - Erection of 7 Portable cabins providing temporary office accommodation and essential 24-hour staff living accommodation and laboratories;
- 2b. Drilling of the exploratory borehole and the carrying out of a short-term test and evaluation programme;
3. Testing and Evaluation - either;
- If gas is found: short drillstem test, separation of gas and water/condensate, flaring of gas; or
 - If oil is found: short drillstem test, storage of extracted material, separation of oil/water/gas, flaring of gas;
4. Restoration;
- Removal of drilling rig and equipment;
 - Either: permanent stopping up of well, restoration of the drilling compound to previous conditions;
 - Or: temporary stopping up of the well.
- 9.20 This phasing plan differs slightly from that used in other sections of the ES, as it was desirable to differentiate between mobilisation and operation of the drilling rig.
- 9.21 Using the equipment list and source noise data, noise levels at the three noise sensitive premises were calculated for each phase of the development. An acoustic modelling software package, SoundPLAN, was used to undertake the calculations, as this uses the calculation Standard ISO 9613 (Ref. 9.9), which provides more complex methods for dealing with factors such as ground attenuation, acoustic screening and atmospheric absorption than the methods provided in BS 5228. In addition, SoundPLAN assumes a light downwind meteorological condition, from the noise source to receptor, which results in a conservative prediction of receptor noise levels.
- 9.22 For each phase, the noise output of all equipment operating within the drilling compound was summed together and represented as a single acoustic point-source at

the centre of the compound. It was assumed that the equipment required to construct the access track would be located at the closest point on the track to nearby receptors Wood Barn Farm and Homefield Farm. Vehicles using the access track were represented in the model as a line-source; the sound power level of the line-source was calculated using the 'haul route' calculation method defined within BS 5228. The number of hourly trips, derived from data in Chapter 10 (Traffic and Access) of this ES, and vehicle speed used for the 'haul route' calculations are shown in **Table 9.1**. The location of the various noise sources can be seen in the noise isopleths created for each phase of the development (**Figure 9.2 to 9.5**).

- 9.23 The predicted noise levels, at the noise sensitive premises, were assessed in the context of fixed noise limits provided in BS 5228. The noise from the operation of the drilling rig has been assessed using construction noise standards because, as it will be temporary and of short duration (between 6 and 10 weeks), it was deemed to be of a similar nature to construction noise. BS 5228 defines the "ABC method", which provides noise limits for daytime, evening, and night time construction noise, which are related to the existing ambient noise level in the area. **Table 9.2**, reproduced from BS 5228, contains the noise limits associated with this method.

Table 9.2: Noise Limits from BS 5228

Assessment category and threshold value period	Threshold value (dB)		
	Category A	Category B	Category C
Night-time (23.00 – 07.00)	45	50	55
Evenings & weekends ¹	55	60	65
Daytime (07.00 – 19.00) and Saturday mornings ²	65	70	75

¹ 19.00 – 23.00 weekdays, 13.00 – 23.00 Saturdays and 07.00 – 23.00 Sundays

² 07.00 – 13.00 Saturdays

- 9.24 Category A is defined as:

“the threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values”.

- 9.25 Taking the nature of the surrounding area into consideration, it is likely that the existing ambient noise levels are lower than those in Category A, therefore the Category A noise limits were used for the assessment.

- 9.26 It is anticipated that night time works will take place during the drilling phase, as the drilling must be conducted continuously. The rest of the works are expected to be conducted during daytime hours only.
- 9.27 However, the scoping response from WSCC suggested that a daytime noise limit of 55dB $L_{Aeq,T}$ discussed in BS 5228 for works involving large scale earth moving and other long term construction works, should be considered due to the tranquillity of the area. This daytime limit has therefore been adopted and the noise limits adopted for the works are presented in **Table 9.3**.

Table 9.3: Noise Limits Adopted for Assessment

Assessment Category and Threshold Value Period	Adopted Noise Limit (dB)
Daytime (07.00 – 19.00) and Saturday mornings ²	55
Evenings & weekends ¹	55
Night-time (23.00 – 07.00)	45

¹ 19.00 – 23.00 weekdays, 13.00 – 23.00 Saturdays and 07.00 – 23.00 Sundays

² 07.00 – 13.00 Saturdays

- 9.28 In order to assign significance of effect to the predicted construction noise level, the criteria contained within **Table 9.4** were derived. The levels of potential effect are determined by exceedance of the construction noise limit for the relevant time of day – day, evening or night. The thresholds at which effect significance change are based on the following concepts: a change of 3dB is generally the smallest detectable change in environmental noise level; an exceedance of 5dB is defined in BS 4142 (Ref. 9.10) as being “of marginal significance”; and an increase of 10dB is perceived as a doubling of the loudness of a sound.

Table 9.4: Significance Criteria for Noise from on-Site Activity

Construction Noise, Compared to Noise Limit	Noise Effect Significance
Less than 3dB above noise limit	Negligible
3dB to 5dB above noise limit	Minor Adverse
5dB to 10dB above noise limit	Moderate Adverse
More than 10dB above noise limit	Major Adverse

Noise: Off-Site Traffic

- 9.29 Potential noise effects from additional road traffic on existing roads was assessed using

baseline and development generated traffic data from Chapter 10 of this ES. The UK calculation methodology Calculation of Road Traffic Noise (CRTN) (Ref. 9.11) was used to predict traffic noise levels for the baseline and baseline-plus-development traffic scenarios, for each phase of the works.

- 9.30 Specific receptors of premises were not taken into account for this assessment; rather the change in noise level adjacent to the affected roads was assessed as all receptors adjacent to a stretch of road would be affected equally.
- 9.31 **Table 9.5** presents the significance criteria for determining road traffic noise effects. These relate to a relative increase in road traffic noise, due to the addition of development generated traffic, and are based on the example criteria provided in the Design Manual for Roads and Bridges (DMRB) (Ref. 9.12).

Table 9.5: Significance Criteria for Off-Site Traffic Noise

Increase in Road Traffic Noise Level Due to Development Traffic	Noise Effect Significance
0dB to 0.9dB	Negligible
1.0dB to 2.9dB	Minor Adverse
3.0dB to 4.9dB	Moderate Adverse
More than 5.0dB	Major Adverse

Baseline Conditions

- 9.32 The Application Site is located in a rural area, surrounded by open farm land and woodland. Properties nearby the Application Site are isolated properties or small groups of properties, some of which are working farms.
- 9.33 It is likely that during the daytime the noise environment comprises a mix of road traffic noise, noise from farming activity and animals, and occasional contributions from other sources such as passing aircraft. Due to the rural nature of the area it would be anticipated that prevailing noise levels are relatively low, particularly at properties away from main roads. During the night noise levels within the surrounding area will decrease as road traffic becomes less frequent and farming activity will cease. Again, due to the nature of the area and the absence of any major roads or commercial activity, night time noise levels would be expect to be relatively low.

Likely Significant Effects

- 9.34 This section provides an assessment of the effects that noise associated with the Proposed Development will have on the surrounding area. The effects of on-site works affecting noise sensitive premises nearby the Application Site and effects from off-site construction traffic have been assessed separately, due to the difference in nature of the noise.
- 9.35 Noise isopleths (contour charts) showing noise from on-site activity, for each phase of the development, are presented in **Figures 9.2 to 9.6**.

Phase 1 - Construction of Access Road and Well Site

- 9.36 **Table 9.6** presents the predicted noise levels from phase 1 works at the closest Noise Sensitive Premises to the Application Site.

Table 9.6: Calculated Noise Levels from On-Site Works at Noise Sensitive Premises – Phase 1

Noise Sensitive Premises	Construction Noise <i>dB L_{Aeq,T}</i>
Gatewick Farm	47
Gay Street Farm	43
Homefield Farm	49
Woodbarn Farm	48

- 9.37 Phase 1 activity is anticipated to occur during typical daytime construction hours. The noise levels in **Table 9.6** do not exceed the daytime noise limit of 55dB, therefore the impact is deemed to be negligible.
- 9.38 **Table 9.7** shows the noise level increase due to the addition of road traffic during phase 1.

Table 9.7: Calculated Road Traffic Noise Effects – Phase 1

Road	Baseline	Phase 1	
	<i>L_{A10,18h}</i>	<i>L_{A10,18h}</i>	Increase
B2133 Adversane, Adversane east of Oakleigh Cottage	63.5	63.8	0.3
B2133 Adversane Lane just south of Woodbarn Farm	64.1	64.4	0.2

- 9.39 **Table 9.7** demonstrates that additional on-road traffic generated by phase 1 is predicted to result in a maximum 0.3dB increase in the noise level adjacent to the

B2133. This is a change in noise level below the threshold of human detection and, based on the criteria defined in **Table 9.5**, is deemed to result in a negligible effect.

Phase 2 - Mobilisation of the Drill Rig and Drilling Operations

- 9.40 **Table 9.8** presents the predicted noise levels from phase 2 works at the closest Noise Sensitive Premises to the Application Site. This phase was split into two phases – 2a and 2b – as the mobilisation and operation of the drill rig will happen sequentially.

Table 9.8: Calculated Noise Levels from On-Site Works at Noise Sensitive Premises – Phase 2

Noise Sensitive Premises	Phase 2a <i>dB L_{Aeq,T}</i>	Phase 2b <i>dB L_{Aeq,T}</i>
Gatewick Farm	39	42
Gay Street Farm	35	38
Homefield Farm	40	42
Woodbarn Farm	36	39

- 9.41 Phase 2a, the mobilisation of the drill rig, activity is anticipated to occur during typical daytime construction hours. The noise levels in **Table 9.8** do not exceed the daytime noise limit of 55dB, therefore the impact is deemed to be negligible.
- 9.42 Phase 2b, the operation of the drill rig, will continue 24 hours per day for the duration of the drilling: 6 to 10 weeks. However, noise from the drilling is predicted to be a maximum of 42dB at Gatewick Farm and Homefield Farm, which is below the proposed night time noise limit of 45dB and thus of negligible significance.
- 9.43 **Table 9.9** shows the noise level increase due to the addition of road traffic during phase 2.

Table 9.9: Calculated Road Traffic Noise Effects – Phase 2

Road	Baseline	Phase 2	
	<i>L_{A10,18h}</i>	<i>L_{A10,18h}</i>	Increase
B2133 Adversane, Oakleigh Cottage east of	63.5	63.7	0.1
B2133 Adversane Lane just south of Woodbarn Farm	64.1	64.3	0.1

- 9.44 The results in the preceding tables demonstrate that additional on-road traffic generated by the Proposed Development is predicted to result in a 0.1dB increase in the noise level adjacent to the B2133. This is deemed to be of negligible significance.

Phase 3 - Testing Operations and Evaluation

9.45 **Table 9.10** presents the predicted noise levels from phase 3 testing operations at the closest Noise Sensitive Premises to the Application Site. Although there are two potential activities, depending whether gas or oil is discovered on site, both potentially include the flaring of gas, which will generate significantly higher noise levels than other on-site operations. As such the worst case scenario with regard to noise, assuming flaring is underway, was taken into account for the noise prediction.

Table 9.10: Calculated Noise Levels from On-Site Works at Noise Sensitive Premises – Phase 3

Noise Sensitive Premises	Testing noise <i>dB L_{Aeq,T}</i>
Gatewick Farm	46
Gay Street Farm	47
Homefield Farm	51
Woodbarn Farm	48

9.46 Phase 3 testing activity is anticipated to occur during daytime hours. The noise levels in **Table 9.10** do not exceed the daytime noise limit of 55dB, therefore the impact is deemed to be negligible.

9.47 **Table 9.11** shows the noise level increase due to the addition of road traffic during phase 3.

Table 9.11: Calculated Road Traffic Noise Effects – Phase 3

Road	Baseline	Phase 3	
	L_{A10,18h}	L_{A10,18h}	Increase
B2133 Adversane, Adversane east of Oakleigh Cottage	63.5	63.5	0.0
B2133 Adversane Lane just south of Woodbarn Farm	64.1	64.2	0.1

9.48 **Table 9.11** demonstrates that additional on-road traffic generated by phase 3 is predicted to result in a maximum 0.1dB increase in the noise level adjacent to the B2133. This is a change in noise level below the threshold of human detection and is deemed to be of negligible significance.

Phase 4 – Restoration/Retention

9.49 **Table 9.12** presents the predicted noise levels from phase 4 works at the closest Noise Sensitive Premises to the Application Site.

Table 9.12: Calculated Noise Levels from On-Site Works at Noise Sensitive Premises – Phase 4

Noise Sensitive Premises	Construction noise <i>dB L_{Aeq,T}</i>
Gatewick Farm	47
Gay Street Farm	43
Homefield Farm	49
Woodbarn Farm	48

9.50 Phase 4 activity is anticipated to occur during typical daytime construction hours. The noise levels in **Table 9.12** do not exceed the daytime noise limit of 55dB, therefore the impact is deemed to be negligible.

9.51 **Table 9.13** shows the noise level increase due to the addition of road traffic during phase 4.

Table 9.13: Calculated Road Traffic Noise Effects – Phase 4

Road	Baseline	Phase 4	
	L_{A10,18h}	L_{A10,18h}	Increase
B2133 Adversane, Adversane east of Oakleigh Cottage	63.5	63.8	0.3
B2133 Adversane Lane just south of Woodbarn Farm	64.1	64.4	0.2

9.52 **Table 9.13** demonstrates that additional on-road traffic generated by phase 4 is predicted to result in a maximum 0.3dB increase in the noise level adjacent to the B2133. This is deemed to be of negligible significance.

Mitigation Measures

9.53 An assessment of effects from both on-site works and on-road development traffic throughout the various phases of the exploration works was provided in the preceding section.

Phase 1 - Construction of Access Road and Well Site

9.54 Although negligible effects were predicted for all elements of the works, to ensure

residential amenity for noise sensitive premises close to the Application Site is protected, this section discusses recommended generic mitigation methods and a potential monitoring strategy.

9.55 The Control of Pollution Act (Ref. 9.1) and British Standard 5228 (Ref. 9.3) define a set of Best Practice working methods and mitigation measures, referred to as Best Practicable Means (BPM). Examples of these measures are:

- Where possible, locating plant so that it is screened from receptors by on-site structures, such as site cabins;
- Using mobile screening to shield receptors from particularly noise equipment/activities;
- Using the modern, quiet equipment and ensuring such equipment is properly maintained and operated by trained staff;
- Applying silencers/enclosures to particularly noise equipment where possible;
- Ensuring that mobile plant is well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Ensuring plant machinery is turned off when not in use;
- Keeping local residents informed of the type and timing of works and any particularly noisy operations expected or out of hours working; and
- Provide local residents with 24-hour contact details for a site representative in the event that disturbance due to noise from the construction works is perceived.

9.56 In addition, it is recommended that noise monitoring is undertaken throughout the lifespan of the Proposed Development, to ensure that noise from the site does not exceed the noise limits used within this assessment. Monitoring should be undertaken during the various phases of the Proposed Development and should include any night-time works. It is recommended that the locations for monitoring are the four noise sensitive premises used within this assessment.

Phase 2 - Mobilisation of the Drill Rig and Drilling Operations

9.57 The same mitigation measures as for phase 1 are recommended.

9.58 Although the operation of the drill rig is not construction works, many of the generic control methods listed can be applied to minimise noise output from operations, such as applying silencers/enclosures to plant exhausts.

Phase 3 - Testing Operations and Evaluation

- 9.59 Provided that flaring is only undertaken during daytime hours, a negligible impact is predicted. However, in order to minimise noise output it is recommended Best Practicable Means are applied, as discussed above.

Phase 4 – Restoration/Retention

- 9.60 The same mitigation measures as for phase 1 are recommended.

Residual Effects**Phase 1 - Construction of Access Road and Well Site**

- 9.61 The residual effects during phase 1 are considered to be negligible.

Phase 2 - Mobilisation of the Drill Rig and Drilling Operations

- 9.62 The residual effects during phase 2 are considered to be negligible.

Phase 3 - Testing Operations and Evaluation

- 9.63 The residual effects during phase 3 are considered to be negligible

Phase 4 – Restoration/Retention

- 9.64 The residual effects during phase 4 are considered to be negligible.

Cumulative Effects

- 9.65 There are not considered to be any projects in the area that need to be assessed cumulatively with this development.

Summary

- 9.66 The existing noise environment around the Application Site is anticipated to be relatively quiet, due to the rural nature of the area. The noise level will be influenced by the proximity of a location to roads and to sources of agricultural noise.

- 9.67 Noise from on-site construction works were assessed against fixed noise limits of 55dB (daytime) and 45dB (night). Due to the large separation distance between the Application Site and the closest noise sensitive premises, the predicted noise levels from on-site operations were below the proposed noise limits, for all phases of the Proposed Development, thus a negligible effect was expected.
- 9.68 Potential effect from noise associated with additional road traffic affecting roadside receptors was assessed separately from on-site activity. The increased traffic flows due to the Proposed Development was predicted to increase road traffic noise levels by a maximum of 0.3dB, which is judged to have a negligible effect.
- 9.69 Although no significant effects were predicted, it was recommended that generic mitigation measures typically referred to as Best Practicable Means, were employed. These measures are generally applied to construction sites, however many of the ideas can be applied to the operational aspects of this development. In addition it was recommended that noise monitoring is undertaken to ensure the noise limits used within this assessment are not exceeded.
- 9.70 **Table 9.14** contains a summary of the likely effects of the Proposed Development.

Table 9.14: Table of Significance – Noise

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	U K	E	R	C	D	L	
Phase 1: Construction of the access road and well site											
Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible	Generic noise/site management methods, e.g. ensuring quietest available equipment is used, silencing exhausts. Undertaking noise monitoring to ensure noise limits are not exceeded.							*	Negligible
Noise effects from on-road development traffic	Temporary	Negligible	No mitigation required							*	Negligible
Phase 2: Mobilisation of the drill rig and drilling operations											
Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible	As for phase 1							*	Negligible
Noise effects from on-road development traffic	Temporary	Negligible	No mitigation required							*	Negligible
Phase 3a/b: Short term testing and evaluation											
Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible	As for phase 1							*	Negligible

Noise effects from on-road development traffic	Temporary	Negligible	No mitigation required							*	Negligible
Phase 4a/b: Restoration and Retention											
Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible	As for phase 1							*	Negligible
Noise effects from on-road development traffic	Temporary	Negligible	No mitigation required							*	Negligible

*** Geographical Level of Importance**

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

References (Ref)

- 9.1 Great Britain (1974) '*Control of Pollution Act*', HMSO, London.
- 9.2 Department for Communities and local Government (2012) '*National Planning Policy Framework*'. DCLG, London.
- 9.3 British Standards Institution (2009) '*British Standard 5228: Code of practice for noise and vibration control on construction and open sites - Part 1: Noise*', BSI, London.
- 9.4 The Government Office for the South East, (2009) The South East Plan Regional Spatial Strategy for the South East of England, TSO (The Stationery Office).
- 9.5 Horsham District Council (2007) Horsham District Local Development Framework: The Core Strategy
- 9.6 West Sussex County Council (2003) West Sussex Minerals Local Plan
- 9.7 K A Worthington (2005) '*British Drilling & Freezing Co Ltd - Noise Assessment of BDF Drilling Rig 28 Sandhills No.22 Site*', Acoustic & Engineering Consultants Limited.
- 9.8 DGMR software GMBH (2007) '*SourceDB noise source database (Version 1.1)*' [software]. DGMR, Arnhem. Available from: <<http://www.dgmr.nl/?id=458>>.
- 9.9 International Organization for Standardization (1996) '*ISO 9613-2: 1996 - Acoustics - Attenuation of sound during propagation outdoors – Part 2: General method of calculation*', ISO.
- 9.10 BSI (1997) '*British Standard 4142:1997 - Method for rating industrial noise affecting mixed residential and industrial areas*', BSI, London.
- 9.11 Department of Transport Welsh Office (1988) '*Calculation of Road Traffic Noise*', HMSO, London.
- 9.12 Highways Agency (2011) '*Design Manual for Roads and Bridges: Volume 11, Section 3, Part 7 Noise and Vibration (HD213/11)*', HA, London.

10.0 TRANSPORT AND ACCESS

Introduction

- 10.1 This chapter assesses the potential environmental effects on and in the vicinity of the Application Site which are attributable to changes in predicted travel patterns associated with the Proposed Development.
- 10.2 The chapter describes the assessment methodology; 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 significant adverse effects; and the likely residual effects after these measures have been employed. This chapter has been prepared by Royal Haskoning.
- 10.3 The assessment has been scoped with, and undertaken in liaison with, officers at WSCC including the submission of a draft Transport and Access chapter for comment. The county's response to the draft assessment was received on the 4th May 2012 and stated:

"Although we wouldn't provide direct comment on the acceptability in terms of the environmental impact, I am satisfied that the figures are representative of the traffic conditions and movements expected of the proposed development. In capacity terms, the thresholds that would require junction analysis are not exceeded and we would not consider the development to have a material impact."

- 10.4 Accordingly a separate full Transport Assessment has not been prepared.

Planning Policy Context

National Planning Policy Framework (Ref. 10.1)

- 10.5 The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied.
- 10.6 Section 13 deals with facilitating the sustainable use of materials and at the 6th bullet of paragraph 143 identifies that local planning authorities should:

“Set out environmental criteria, in line with the policies in this Framework, against which planning applications will be assessed so as to ensure that permitted operations do not have unacceptable adverse impacts on[inter alia]traffic”

West Sussex Transport Plan 2011-2026 (Ref. 10.2)

- 10.7 The West Sussex Transport Plan (TP) sets out the County’s strategy for managing movement within the County as well as the integrity of its transport assets over the next 15 years. It recognises that the main movement of freight is through road haulage, and this will continue to be the case through the lifetime of the TP.
- 10.8 Whilst supporting freight movement the TP seeks to manage movements in order to mitigate the consequences of noise, emissions and rat running.
- 10.9 The key aspects of the County’s approach to freight management include, inter alia:
- Lorry Route Network – maintaining and promoting a lorry route network for main lorry movements in the County; and
 - Minimising Construction Traffic – identifying and assessing lorry routes for construction traffic and sites which require high levels of Heavy Vehicles (HV) movements such as mineral extraction and waste sites.
- 10.10 This policy sets a clear requirement to maintain freight movements on specified routes as far as possible.

Assessment Methodology

Approach

- 10.11 The assessment process comprises three main activities:
- i. Determination of baseline conditions;
 - ii. Determination of baseline conditions with the Proposed Development; and
 - iii. Determination of baseline conditions with the Proposed Development and cumulatively with other planned developments.

10.12 The outcome of activities (i.) and (ii.) in comparison provide an indication of the net potential environmental transport effects of the Proposed Development and therefore the extent to which mitigation measures may be required. The outcome of activities (i.) and (iii.) in comparison determine the extent to which the Proposed Development will integrate with other developments planned for the area and any further design or mitigation measures which may be required to achieve this.

Assessment Criteria

10.13 The assessment of environmental effects has been carried out in accordance with the "Guidelines for the Environmental Assessment of Road Traffic" published by the Institute of Environmental Assessment (IEA) (now Institute of Environmental Management and Assessment) (Ref. 10.3). Reference has also been made to Volume 11 of the Design Manual for Roads and Bridges (DMRB), published by the former DETR, now Department for Transport (DfT) (Ref. 10.4). These are recommended tools for the appraisal of environmental effects of transport and they identify appropriate standards for assessment. Reference has also been made to the "Guidance on Transport Assessment" March 2007 published by DfT (Ref. 10.5).

Methodology

10.14 The approach to determining the nature and extent of effects from the Proposed Development focuses on five main components:

1. Changes in travel patterns arising as a consequence of the Proposed Development for the morning (08:00 – 09:00 hours) and evening (15:00 – 16:00 hours) weekday peak hours and over a 24-hour period in the assessment year which is 2012;
2. Transport Modelling to determine changes in travel demand on key movement corridors arising from the Proposed Development in the assessment year;
3. Capacity Assessments to examine the extent of effects arising from the changes in travel demand on key links;
4. Development of Mitigation Measures which involves the examination of the effects identified and, where these are considered necessary, the development and testing of mitigation measures; and
5. Identification of Residual Effects which remain after mitigation; their quantification and recommendations on possible further measures to minimise these.

10.15 The five components set out above, in combination, provide a robust assessment of the Proposed Development in terms of transport effects.

Assessment Years

10.16 The Proposed Development is temporary in nature and is therefore most likely to commence and be completed in 2013. Should further works be undertaken at the Application Site then these would be the subject of a separate planning application and EIA, if necessary.

Potential Transport Effects

10.17 The main potential transport effects of construction and operational phases arise from changes in travel patterns on routes in the vicinity of the Application Site and associated issues in terms of the following elements:

- Landscape and Visual effects (these have been separately assessed in Chapter 8.0: Landscape and Visual Assessment);
- Air Pollution (this has been scoped out of the ES);
- Noise (this has been separately assessed in Chapter 9.0: Noise);
- Severance;
- Driver delay;
- Pedestrian delay and amenity;
- Fear and intimidation;
- Accidents and road safety; and
- Hazardous Loads (no hazardous loads are expected).

10.18 In considering whether these effects are likely to be significant and therefore should be investigated in greater detail, the IEA Guidelines suggest that the following screening tests should be applied:

- Test 1: include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Test 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more.

10.19 The above guidance is based upon knowledge and experience of environmental effects of traffic and also acknowledges that traffic forecasting is not an exact science. The

30% threshold is based upon research and experience of the environmental effects of traffic, with less than a 30% increase generally resulting in imperceptible changes in the environmental effects of traffic. The Guidance considers that projected changes in traffic flow of less than 10% create no discernible environmental effect, hence the second threshold as set out in Test 2. Notwithstanding this, the IEA guidelines also identify that where significant increases in HVs are predicted, the highway links affected should be considered.

10.20 In addition construction activities could result in the trafficking of mud onto the public highway and slow moving heavy vehicles leading to potential driver delay and accident and road safety effects.

10.21 There may also be the need for abnormal loads to be delivered to the Application Site again leading to potential driver delay and accident and road safety effects.

Magnitude and Significance

10.22 Where the screening test outlined above identifies that transport effects are likely to be significant, a standard approach to expressing the magnitude of these based on guidance contained in DMRB is applied. Environmental effects can be either adverse or beneficial and a description of the magnitude of significance is provided below in **Table 10.1**.

Table 10.1: Magnitude of Significance

Magnitude	Significance
Negligible	No significant effects
Minor	Not noteworthy or material – effects are of low magnitude and frequency and will not exceed relevant quality standards, residual effects will be negligible
Moderate	Noteworthy, material – effects are of moderate magnitude and frequency. Relevant quality standards may be exceeded to limited extent. Possible secondary impacts, residual effects will be minimal.
Major	Effects are likely to be of a high magnitude and frequency with quality standards being exceeded, at times considerably. There may be secondary effects of some magnitude, residual effects will be of some significance.
Substantial	Effects will be of a consistently high magnitude and frequency with Standards exceeded by a significant margin. Secondary impacts also likely to have a high magnitude and frequency. Significant residual effects.

Baseline Conditions

Walking

- 10.23 The importance of walking in contributing towards sustainable travel patterns has been, and continues to be, a central focus of government policy at all levels. The most recent National Travel Survey (Ref. 10.6) reports in table NTS0306 that the average walking trip length is 0.7 miles.
- 10.24 In terms of walking therefore, the location of the Application Site relative to existing centres of activity would tend to limit the use of this mode. Furthermore there is limited infrastructure in place to enable journeys to be safely made by foot.

Cycling

- 10.25 The importance of cycling in contributing towards sustainable travel patterns has been, and continues to be, a central focus of government policy at all levels. The most recent National Travel Survey (Ref. 10.6) reports in table NTS0306 that the average cycle trip length is 2.8 miles. There are a number of settlements within a 2.8 mile cycle ride to the Application Site.
- 10.26 There are no dedicated on or off road cycle routes in the vicinity of the Application Site. However, there is an extensive rural network of roads in the vicinity of the Application Site with low traffic flows, making them suitable for use by cyclists.
- 10.27 In terms of cycling therefore, the location of the Application Site relative to existing centres of activity would lend itself to cycling, providing a reasonable alternative to travelling by private car for some people.

Public Transport

- 10.28 There are no public transport services within access of the Application Site. However given the nature of the activities which form the Proposed Development, it is expected that the majority of journeys will need to be made by private vehicle carrying plant, equipment or materials.

Highway Network

- 10.29 The main local vehicular access routes identified in relation to the Application Site are

illustrated on **Figure 10.1**.

- 10.30 The B2133 Adversane Lane is a single carriageway road that connects the A29 to the northwest with the A24 to the southeast. Adversane Lane joins the A29 at a priority junction at the village of Adversane. Immediately to the southeast of the Application Site access is the village of Broadford Bridge. Adversane Lane is rural in nature being approximately 6m wide and derestricted. It is predominantly unlit and has no footways the exception being within Adversane village.
- 10.31 The A29 connects the A27 in the south and A24 to the north. The A29 is predominantly a single carriageway road with some sections of dual-carriageway. It is predominantly rural in nature being mostly derestricted and unlit. There are no continuous footways along the route.
- 10.32 Beyond these two main routes, other roads in the area are rural in nature being predominantly unlit, derestricted and of varying widths from 6m to narrower.
- 10.33 Traffic survey data were obtained from WSCC for two locations on Adversane Lane. The data comprises speed, volume and classification of traffic. The traffic surveys were undertaken at different times and have been factored to a common base year of 2012 using TEMPRO traffic growth factors. The factors for West Sussex have been used as these result in the highest traffic growth levels. The resulting baseline traffic flows are presented below in **Table 10.2**. TEMPRO data is provided at **Appendix 10.1**.

Table 10.2: Baseline Traffic Flows

Location	Time period	Two-way Traffic Volumes			Speed (mph)	
		Total	LV ² (<1.5t)	HV ³ (>1.5t)	85th %ile	Mean Ave
B2133 Adversane, Adversane east of Oakleigh Cottage	AM Peak (08:00-09:00)	251	242	9	55.8	49.9
	PM Peak (15:00-16:00)	118	110	8	54.2	47.1
	24-hour (AAWT) ¹	1832	1722	110	55.8	49
B2133 Adversane Lane just south of Woodbarn Farm	AM Peak (08:00-09:00)	357	350	8	53.1	47.2
	PM Peak (15:00-16:00)	169	161	8	52.1	45.4
	24-hour (AAWT)	2519	2418	101	53.6	46.8

Note 1: Annual Average Weekday Traffic; Note 2: Light Vehicle; Note 3: Heavy Vehicle

- 10.34 It is noted that the surveys were undertaken at different times however from the data shown in **Table 10.2** it can be seen that traffic flows to the south of the Application Site are generally higher than those nearer Adversane village over the course of the day and at peak times.
- 10.35 Two-way traffic flows along Adversane Road in the vicinity of the Application Site access, during the morning peak hour reach up to 357 vehicles. Of these, eight are HVs which equates to 2.2%. Mean average speeds in the vicinity of the Application Site access amount to 47.2mph with the 85 percentile speeds (the speeds which are most relevant for design purposes) amounting to 53.1mph. In both cases speeds are lower than the legal limit for the road which is 60mph.
- 10.36 During the afternoon the busiest hour is 15:00 – 16:00 which is earlier than the normally expected weekday peak of 17:00-18:00. During this afternoon peak period, two-way traffic flows along Adversane Road in the vicinity of the Application Site access reach up to 169 vehicles. Of these eight HVs which equates to 4.8%. Mean average speeds in the vicinity of the Application Site access amount to 45.4mph with the 85 percentile speeds (the speeds which are most relevant for design purposes) amounting to 52.1mph. In both cases speeds are lower than the legal limit for the road which is 60mph.
- 10.37 Over the 24 hour weekday average, two-way traffic flows along Adversane Road in the vicinity of the Application Site access during the morning peak hour reach up to 2,519 vehicles. Of these 101 are HVs which equates to 4.0%. Mean average speeds in the vicinity of the Application Site access amount to 46.8mph with the 85 percentile speeds (the speeds which are most relevant for design purposes) amounting to 53.6mph. In both cases speeds are lower than the legal limit for the road which is 60mph.

Accidents

- 10.38 Personal Injury Accident (PIA) data was obtained from WSCC for the adjoining highway network for the most recent five year period available which was up to 31st January 2012. The study area includes Adversane Lane, the junction of Adversane Lane / A29 and Broadford Bridge. A summary of the PIAs in terms of their location and severity is provided in **Appendix 10.2**.
- 10.39 During the three year period, there were a total of 19 PIAs in the vicinity of the Application Site, 13 of which resulted in slight injury and five resulted in serious injury. There was one fatal injury accident within the study area which involved the death of a

pedestrian. There were 27 injuries reported all of which related to drivers or car passengers with the exception of the pedestrian fatality. There were no reported accidents involving pedal cycles or motorcycles.

10.40 In terms of accident clusters which might indicate a deficiency in the highway network, there is a cluster of six accidents at and within 50m of the junction of Adversane Lane and the A29.

10.41 Turning to the one fatality recorded within the study area, this occurred on a stretch of the B2133 to the north of Wood Barn Farm which has restricted forward visibility for / to motorists.

Likely Significant Effects

Construction Activities

10.42 The main transport effects of construction are additional traffic (especially HV movements) on roads leading to the Application Site. Details of expected operations and traffic volumes are provided at **Appendix 10.3**.

10.43 Construction activities would comprise four phases which are:

- Phase 1 - Construction of access road and well site;
- Phase 2 - Mobilisation of Drill Rig - set up, drilling mode and dismantling;
- Phase 3a/3b - Short term test and evaluation programme;
- Phase 4a/4b - Restoration / Retention.

10.44 The likely significant effects of each of these phases are discussed in more detail below.

Phase 1 - Construction of the Access Road and Well Site

10.45 Phase 1 is expected to last 6 weeks and comprise the following activities which will require transportation:

- Vegetation and soil clearance, with soil retained on site in separate top and sub soil bunds;
- Construction of access road comprising a tarmac entrance off Adversane Lane with the remainder of consisting of crushed stone with soil bunds to the north

- with drainage where required;
- The internal well site surface will be formed with crushed stone compacted on top of a geotextile layer and to a normal fall to a perimeter interceptor ditch;
- Interceptor ditches will be lined with a Bentomat geomembrane falling to a corner sump area; and
- A concrete “cellar” will be constructed at site level comprising of a reinforced concrete chamber sunk into the ground with its top surface being level with the main site level with an initial section of large diameter pipework built into its base to provide a starting point for operations.

10.46 **Table 10.3** below sets out the forecast construction traffic associated with Phase 1 of the Proposed Development together with an assessment of the change in traffic volumes on Adversane Lane associated with the works. For the purposes of the assessment the traffic flow data for Adversane Lane east of Oakleigh Cottage has been used. Being lower than the traffic volumes south of Woodbarn Farm, the environmental effects of additional road traffic will be proportionately greater than with a higher baseline traffic flow.

Table 10.3: Likely Significant Effects of Phase 1

Phase 1: Construction of Access Road and Well Site	Time Period	Two-way Traffic Volumes		
		Total	LV (<1.5te)	HV (>1.5te)
Forecast traffic associated with Phase 1 of the Proposed Development	AM Peak (08:00-09:00)	9	7	2
	PM Peak (15:00-16:00)	2	0	2
	24-hour (AAWT)	35	13	22
Percentage change in vehicle movements	AM Peak (08:00-09:00)	3.6%	2.9%	22.0%
	PM Peak (15:00-16:00)	1.7%	0.0%	24.8%
	24-hour (AAWT)	1.9%	0.8%	20.0%

10.47 **Table 10.3** shows that the maximum expected number of daily two-way HV movements is expected to be 22 HVs with the corresponding maximum daily two-way Light Vehicle (LV) movements at 13. During the peak hours, two-way HV movements or not expected to exceed three with two-way LV movements not exceeding 13.

10.48 **Table 10.3** demonstrates that during the construction phase there would be a less than 10% increase in LVs compared to baseline traffic volumes. In terms of HV traffic, it is

expected to be less than a 30% increase in HV volumes compared to the 2012 baseline HV volumes. The IEA guidance states that changes in traffic volumes of this magnitude would result in imperceptible changes in the environmental effects of traffic. On this basis, it is concluded that the Phase 1 operations would lead to a negligible impact in terms of road traffic. No further detailed analysis of individual environmental elements with respect to construction traffic is therefore considered necessary.

Phase 2 - Mobilisation of the Drill Rig and Drilling Operations

10.49 Phase 2 is expected to last 6 weeks and comprise the following activities which will require transportation:

- The rig (MR7000 type rig or similar) will be brought onto site in sections and constructed in situ with the associated infrastructure including water tanks, pipe store, mud and fuel tanks, 24 hour staff living accommodation including mess, shower and WC;
- Drilling will be undertaken 24 hours a day, 7 days a week to prevent collapse of the borehole with staff working 12 hours shifts;
- Water supplies delivered by 5,000 gallon capacity tanker to two onsite storage tanks. It is estimated there would be an initial requirement of up to 36,000 gallons per day (eight tanker loads) for the first three days of drilling reducing to 10,000 gallons per day (two tanker loads) thereafter;
- Semi-dry drilling mud and rock cuttings would be collected in purpose built tanks which would be located on either a concrete pad or in skips and transported from the site by road for disposal at an authorised waste disposal facility;
- The contents of the site portaloos would be removed periodically to an approved disposal site;
- The contents of the surface water collection ditch and compound sump would be emptied as necessary and transported by road tanker for disposal at an approved location. A portable skip for refuse collection would be provided and its contents disposed of periodically to a licensed waste disposal site;
- Normally 12 staff will be onsite during drilling operations; and
- Staff car parking will be made available within the Application Site.

10.50 **Table 10.4** below sets out the forecast construction traffic associated with Phase 2 of the Proposed Development together with an assessment of the change in traffic volumes on Adversane Lane associated with the works. For the purposes of the assessment the traffic flow data for Adversane Lane east of Oakleigh Cottage has been

used. Being lower than the traffic volumes to the south of Woodbarn Farm, the environmental effects of additional road traffic will be proportionately greater than with a higher baseline traffic flow.

Table 10.4: Likely Significant Effects of Phase 2

Phase 2 - Mobilisation of Drill Rig - set up, drilling mode and dismantling	Time Period	Two-way Traffic Volumes		
		Total	LV (<1.5te)	HV (>1.5te)
Forecast traffic associated with Phase 1 of the Proposed Development	AM Peak (08:00-09:00)	14	13	1
	PM Peak (15:00-16:00)	1	0	1
	24-hour (AAWT)	35	27	8
Percentage change in vehicle movements	AM Peak (08:00-09:00)	5.6%	5.4%	11.0%
	PM Peak (15:00-16:00)	0.8%	0.0%	12.4%
	24-hour (AAWT)	1.9%	1.6%	7.3%

10.51 **Table 10.4** shows that the maximum expected number of daily two-way HV movements is expected to be eight HVs with the corresponding maximum daily two-way LV movements at 35. During the peak hours, two-way HV movements or not expected to exceed one with two-way LV movements not exceeding 14.

10.52 **Table 10.4** demonstrates that during the construction phase there would be a less than 10% increase in LVs compared to baseline traffic volumes. In terms of HV traffic, it is expected to be less than a 30% increase in HV volumes compared to the 2012 baseline HV volumes. The IEA guidance states that changes in traffic volumes of this magnitude would result in imperceptible changes in the environmental effects of traffic. On this basis, it is concluded that the Phase 2 operations would lead to a negligible impact in terms of road traffic. No further detailed analysis of individual environmental elements with respect to construction traffic is therefore considered necessary.

Phase 3a/3b - Short Term Test and Evaluation

10.53 If hydrocarbons are discovered then short term drilling will be undertaken at the Application Site. The duration of this phase will be dependent on whether it is gas or oil being tested. It is anticipated that gas testing would be carried out over a period of 2 weeks with oil testing lasting for 14 weeks.

10.54 Both Phase 3a and Phase 3b are expected to result in similar traffic volumes during peak activities. **Table 10.5** below sets out the forecast construction traffic associated

with Phases 3a and 3b of the Proposed Development together with an assessment of the change in traffic volumes on Adversane Lane associated with the works. For the purposes of the assessment the traffic flow data for Adversane Lane east of Oakleigh Cottage has been used. Being lower than the traffic volumes to the south of Woodbarn Farm, the environmental effects of additional road traffic will be proportionately greater than with a higher baseline traffic flow.

Table 10.5: Likely Significant Effects of Phases 3a and 3b

Phase 3 - Short term test and evaluation programme	Time Period	Two-way Traffic Volumes		
		Total	LV (<1.5te)	HV (>1.5te)
Forecast traffic associated with Phase 1 of the Proposed Development	AM Peak (08:00-09:00)	3	2	1
	PM Peak (15:00-16:00)	0	0	0
	24-hour (AAWT)	6	4	2
Percentage change in vehicle movements	AM Peak (08:00-09:00)	1.2%	0.8%	11.0%
	PM Peak (15:00-16:00)	0.0%	0.0%	0.0%
	24-hour (AAWT)	0.3%	0.2%	1.8%

10.55 **Table 10.5** shows that the maximum expected number of daily two-way HV movements is expected to be two HVs with the corresponding maximum daily two-way LV movements at four. During the peak hours, two-way HV movements or not expected to exceed 1 with two-way LV movements not exceeding two.

10.56 **Table 10.5** demonstrates that during the construction phase there would be a less than 10% increase in LVs compared to baseline traffic volumes. In terms of HV traffic, it is expected to be less than a 30% increase in HV volumes compared to the 2012 baseline HV volumes. The IEA guidance states that changes in traffic volumes of this magnitude would result in imperceptible changes in the environmental effects of traffic. On this basis, it is concluded that Phase 3a and 3b operations would lead to a negligible impact in terms of road traffic. No further detailed analysis of individual environmental elements with respect to construction traffic is therefore considered necessary.

Phase 4a/4b - Restoration/Retention

10.57 If hydrocarbons are found at Phase 2 then Phase 3 is undertaken, followed by Phase 4b – the retention of the well whilst an application is prepared for production. Should no hydrocarbons be found at Phase 2 then Phase 3 will be omitted and the works will move straight to Phase 4a – restoration of the Application Site. For restoration (Phase 4a)

works are expected to last circa 6 weeks. For retention (Phase 4b) the period could extend to 30 months during which an application is prepared. However the main traffic movements are expected to occur during a 1 month period.

10.58 Phase 4a comprises the following activities which will require transportation:

- The well would be abandoned by plugging the borehole;
- The steel casing would be cut approximately 1.5m below surface and capped with a steel plate;
- Decommissioning of the rig;
- All structures including welfare and support buildings, the drill rig, storage tanks, the well cellar and sump-lining would be removed;
- Any remaining drilling mud and cutting waste would be removed from the site along with the pit liner and perimeter ditch-lining;
- The land would be re-graded and deep scarified in accordance with best silvicultural practice;
- Stored sub-soil and top-soil would be loose spread over the re-graded ground and subsoiled to relieve compaction; and
- The site would be re-contoured and allowed to regenerate naturally without the use of grass seed or planting and possibly replanted with trees in the future.

10.59 Phase 4b comprises the following activities which will require transportation:

- The well could be capped;
- Decommissioning of the rig;
- Welfare and support buildings, the drill rig and storage tanks would be removed;
- Any remaining drilling mud and cutting waste would be removed from the site; and
- The perimeter ditches, pit liner, cellar, security fencing, access road and well site compound including parking would be retained for future use pending the further grant of planning permission for production.

10.60 **Table 10.6** below sets out the forecast construction traffic associated with Phases 4a / 4b of the Proposed Development together with an assessment of the change in traffic volumes on Adversane Lane associated with the works. For the purposes of the assessment the traffic flow data for Adversane Adversane east of Oakleigh Cottage has been used. Being lower than the traffic volumes to the south of Woodbarn Farm, the environmental effects of additional road traffic will be proportionately greater than with

a higher baseline traffic flow.

Table 10.6: Likely Significant Effects of Phases 4a/4b

Phase 4a/4b - Restoration/Retention	Time Period	Two-way Traffic Volumes		
		Total	LV (<1.5te)	HV (>1.5te)
Forecast traffic associated with Phase 1 of the Proposed Development	AM Peak (08:00-09:00)	9	7	2
	PM Peak (15:00-16:00)	3	0	3
	24-hour (AAWT)	35	13	22
Percentage change in vehicle movements	AM Peak (08:00-09:00)	3.6%	2.9%	22.0%
	PM Peak (15:00-16:00)	2.5%	0.0%	37.1%
	24-hour (AAWT)	1.9%	0.8%	20.0%

10.61 **Table 10.6** shows that the maximum expected number of daily two-way HV movements is expected to be 22 HVs with the corresponding maximum daily two-way LV movements at 35. During the peak hours, two-way HV movements or not expected to exceed three with two-way LV movements not exceeding nine.

10.62 **Table 10.6** demonstrates that during the construction phase there would be a less than 10% increase in LVs compared to baseline traffic volumes. In terms of HV traffic, it is expected to be less than a 30% increase in HV volumes compared to the 2012 baseline HV volumes. The IEMA guidance states that changes in traffic volumes of this magnitude would result in imperceptible changes in the environmental effects of traffic. On this basis, it is concluded that the Phases 4a/4b operations would lead to a negligible impact in terms of road traffic. No further detailed analysis of individual environmental elements with respect to construction traffic is therefore considered necessary.

Assessment of Abnormal Loads

10.63 There are no abnormal loads anticipated to be delivered to the Application Site however there may be some loads which need police escort during phases 1 and 4a/4b. In the absence of suitable mitigation measures, the Proposed Development would lead to a temporary minor adverse effect. Mitigation procedures for this will be set out in a Traffic Management Plan prepared for the Proposed Development (see below for further details).

Assessment of Nuisance

10.64 In terms of nuisance arising from construction traffic, it is anticipated that in the absence of suitable mitigation measures, the Proposed Development would lead to a temporary minor adverse effect. Mitigation procedures for this will be set out in a Traffic Management Plan prepared for the Proposed Development (see below for further details).

Cumulative Effects

10.65 There are not considered to be any projects in the area that need to be assessed cumulatively with this development.

Mitigation Measures***Access - All Phases***

10.66 It is proposed to make modifications to the existing field access for the duration of the construction period. The modified access is illustrated in Figure 4.4. The access is designed to safely accommodate the conventional and unconventional Heavy Goods Vehicle (HV) traffic associated with construction of the substation. Located on a long stretch of straight road, visibility in both directions along Adversane Lane meets current design visibility requirements.

10.67 Notwithstanding the good visibility in each direction, the access junction has been designed on the basis that all construction traffic will approach the Application Site from the north. This is to:

- reinforce that construction traffic should be travelling on WSC's advisory lorry route network for as long as possible which means approaching the Application Site from the north; and
- minimise the extent of highway modifications required to gain access which in themselves could lead to permanent adverse environmental effects if not minimised.

10.68 An alternative location for the Application Site access was considered which utilised the existing access into Wood Barn Farm. However this location was considered to be inappropriate as it sits on the inside of a bend and so has restricted visibility along Adversane Lane. The only fatality in the study area was located in the vicinity of Wood

Barn Farm which reinforces the unsuitability of this as a main access to the Application Site.

Construction Management Plan - All Phases

10.69 The Proposed Development is expected to lead to a temporary intensification of use of existing vehicular access points on the A47(T). This would be during the construction phase only with the use of the two vehicular access points reverting back to current traffic levels following the end of construction.

10.70 Notwithstanding the relatively low volumes of traffic movements forecast for the Proposed Development during the construction phase, a Traffic Management Plan (TMP) would be prepared with the focus of minimising disturbance which could potentially arise from construction traffic. The key elements of the TMP would include:

- Where identified as necessary for unconventional HV traffic, police presence and assistance with traffic control will be arranged;
- Routing traffic to the Application Site via the north in order to maintain HV traffic on WSC's advisory lorry route network for as long as possible and thereby minimise the impact of construction traffic on local communities;
- Provision of a hardstanding area within the Application Site in order to stagger vehicle arrivals and departures and therefore prevent queuing on the highway at the site entrance;
- Scheduling of construction traffic movements (equipment and materials), when possible, to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods, in order to minimise any potential disturbance to local traffic or safety impacts at junctions;
- Provision of information to local village councils relating to the construction period, including any unconventional HV traffic which may be scheduled;
- Signage to identify access routes and to inform motorists that the local roads are accommodating construction traffic; and
- Wheel washing on site and road sweeping carried out to keep the local highway clear of mud and debris.

10.71 It is proposed that the preparation of the TMP would be a planning condition and that the TMP would be prepared and agreed with the Highway Authority Agency prior to commencing activities on site.

Residual Effects

All Phases

10.72 The Proposed Development comprises 4 Phases each of which is temporary. On completion of each Phase, the traffic movements associated with that Phase will cease. Accordingly there are no residual effects identified in relation to Transport and Access.

Summary

10.73 This chapter has assessed the potential environmental effects on and in the vicinity of the Application Site which are attributable to changes in predicted travel patterns associated with the Proposed Development.

10.74 The assessment has been carried out in accordance with the "Guidelines for the Environmental Assessment of Road Traffic" published by the IEA (now Institute of Environmental Management and Assessment). Reference has also been made to Volume 11 of the DMRB, published by the former DETR, now DfT. These are recommended tools for the appraisal of environmental effects of transport and they identify appropriate standards for assessment.

10.75 Transport policy recognises that the main movement of freight is through road haulage, and this will continue to be the case into the foreseeable future. However there is a need to manage movements in order to mitigate the consequences of noise, emissions and rat running.

10.76 Construction traffic would access the Application Site via modifications to an existing field access for the duration of the construction period. The access meets current highway standards with respect to layout and safety. Construction traffic would amount to less than 10% of total daily traffic volumes on the identified construction traffic access routes. No significant transport effects are therefore expected to arise as a consequence of traffic volumes.

10.77 There is the potential for adverse impacts to arise as a consequence of nuisance and the delivery of unconventional loads during construction. A Traffic Management Plan (TMP) would be prepared to mitigate this. With mitigation measures in place, there are no residual effects identified in relation to Transport and Access. A summary of the transport and access related effects are provided in **Table 10.7**.

Table 10.7: Table of Significance – Transport and Access

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	B	L	
Phase 1: Construction of the access road and well site											
Changes in traffic volumes	Temporary	Negligible	None required							*	Negligible
Abnormal Loads	Temporary	Minor adverse	Traffic Management Plan							*	Negligible
Changes in HV volumes	Temporary	Negligible	None required							*	Negligible
Phase 2: Mobilisation of the drill rig and access road											
Changes in traffic volumes	Temporary	Negligible	None required							*	Negligible
Changes in HV volumes	Temporary	Negligible	None required							*	Negligible
Phase 3a/3b: Short term testing and evaluation											
Changes in traffic volumes	Temporary	Negligible	None required							*	Negligible
Changes in HV volumes	Temporary	Negligible	None required							*	Negligible
Phase 4a/4b: Restoration/Retention											
Changes in traffic volumes	Temporary	Negligible	None required							*	Negligible
Changes in HV volumes	Temporary	Negligible	None required							*	Negligible
Abnormal Loads	Temporary	Minor adverse	Traffic Management Plan							*	Negligible
All Phases											
Nuisance	Temporary	Minor adverse	Traffic Management Plan							*	Negligible
* Geographical Level of Importance I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local											

References (Ref)

- 10.1 Department for Communities and Local Government (2012) National Planning Policy Framework.
- 10.2 West Sussex County Council (2011) *West Sussex Transport Plan 2011-2026*.
- 10.3 The Institute of Environmental Assessment (1994) "*Guidelines for the Environmental Assessment of Road Traffic.*"
- 10.4 Department for Transport (Various) *the Design Manual for Roads and Bridges*.
- 10.5 Department for Transport (2007) *Guidance on Transport Assessment*.
- 10.6 Department for Transport (2011) National Travel Survey.

11.0 GROUND AND GROUNDWATER PROTECTION

Introduction

11.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development in terms of ground and groundwater protection and is supported by **Appendix 11.1**.

11.2 The Chapter describes the assessment methodology; 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 Hydrock Consultants.

Planning Policy Context

11.3 This assessment has been undertaken with due regard to the following policy and guidance.

National Planning Policy

Department for Communities and Local Government, 2012, National Planning and Policy Framework (Ref.11.1)

11.4 This Planning Policy Framework requires that development plans should minimise pollution and other adverse effects on the local and natural environment. Specific mention is made of the need to protect areas of ancient woodland.

11.5 Pollution is defined as 'anything that affects the quality of land, water or soils'.

Regional Planning Policy

Government Office for the South East 2009; The South East Plan (Regional Spatial Strategy for the South East) (Ref. 11.2)

11.6 Policy NRM1 (Sustainable Water Resources and Groundwater Quality) requires that ground water will be maintained and enhanced through avoiding adverse effects of development on the water environment.

- 11.7 Policy NRM2 of the South East Plan (Water Quality) states that water quality will be maintained and enhanced through avoiding adverse effects of development on the water environment. In determining planning applications, local authorities are instructed not to permit development that presents a risk of pollution or where satisfactory pollution prevention measures are not provided in areas of high groundwater vulnerability (in consultation with the Environment Agency and Natural England).

West Sussex County Council 2003; Minerals Local Plan (Ref. 11.3)

- 11.8 This document sets out the County Council's vision, objectives and strategy for mineral land-use planning in West Sussex and provides a detailed policy framework for determining mineral planning applications.
- 11.9 At 6.13 of the Plan there is a general requirement to produce an Environmental Statement within which the significant environmental effects of the development are to be assessed. The document also includes a brief description of the geology and hydrogeology, noting that the deeper geology (1500m -2100m depth) may contain hydrocarbons.
- 11.10 Policies 15 and 16 of the Plan relate to the protection of the water environment. Policy 15 concerns effects on groundwater levels (and consequential effects on surface waters) and Policy 16 concerns protection of water quality. Whilst the principles are applicable to the Proposed Development, the policy is written with sand and gravel workings in mind.

Local Planning Policy

Horsham District Council 2007; Core Strategy (Ref. 11.4)

- 11.11 This document sets out the key elements of the HDC planning framework by defining the vision and objectives, together with the strategy and 'core policies' for the future. Policy CP2 requires that development proposals have no effect on water quality.
- 11.12 In accordance with the above policy statements and guidance it is expected that HDC's Contaminated Land Officer (the CLO) and the Environment Agency will be consultees to the application as part of the planning process.
- 11.13 The Environment Agency will require assurance that the proposed works will not cause Pollution of Controlled Waters, be they either surface waters or groundwater. Similarly,

the CLO will need to be assured that the works will not result in land contamination and there is a clear and obvious link between these two issues. Specific conditions may be included in the permission to ensure that appropriate action is taken.

- 11.14 It may also be noted that "***causing or knowingly permitting***" poisonous or noxious matter to enter controlled waters is in any case a criminal offence under the Water Industry Act.

Assessment Methodology

General

- 11.15 In the context of an assessment of effects on controlled waters, the area under consideration is the Application Site (as defined in Chapter 3) together with the land beneath which the proposed exploratory borehole will pass, noting that, because the borehole deviates, it terminates north of the drill site itself (**Figure 11.1**).
- 11.16 The assessment process is one of acquiring published and unpublished information pertaining to the geology, hydrology, and hydrogeology of the Application Site and then using it to formulate a conceptual model of current conditions. All aspects of the drilling works, both surface and subsurface, are then reviewed and their potential impact on existing conditions is assessed. Where significant and/or adverse change is anticipated, appropriate mitigation measures are described.
- 11.17 Additional issues to consider are the water-related effect on any protected areas that are potentially affected activities at the Application Site, including the presence of areas of ancient woodland near the proposed drill site.

Conceptual Model

- 11.18 The formulation of a Conceptual Model is a key part of the standard way of assessing the effects of a proposed development on controlled waters and any protected sites that depend on them.
- 11.19 The conceptual model for this Application Site is presented below in the form of a source-pathway-receptor assessment to identify pollution linkages that may be considered to be plausible. Further consideration may subsequently show them not to connect to form a significant pollution linkage, that is, one that causes pollution of controlled waters.

11.20 The principal potential sources of contamination are:

- materials stored at the surface in the well site area;
- substances present in the drilling mud used in the drilling process;
- hydrocarbons and other contaminants present in formations encountered; and
- hydrocarbons stored on site in the event that the borehole is productive.

11.21 The potential pathways are:

- leakage of substances stored at the surface and their downward migration to contaminate groundwater in water bearing horizons;
- as above, directly via entry into the drilled borehole;
- the release of contaminants to surface water via contaminated runoff; and
- the upward escape of hydrocarbons or other contaminants to contaminate aquifers present above them:
 - during drilling;
 - during a potential production phase; and
 - post-abandonment.

11.22 The principal receptors are:

- groundwater resources in underlying aquifers;
- the off-site surface water system; and
- surface waters in hydraulic continuity with either of the above aquifers.

11.23 In addition there is a requirement to consider potential effects in terms of changes to the natural water balance, especially soil moisture issues.

Baseline Conditions

Site History

11.24 A study of previous edition Ordnance Survey maps (**Appendix 11.1** – Groundsure Report) indicates that all of this area is represented by farmland which has no history of contaminative use. There are areas of ancient woodland to the north and east of the Application Site.

Hydrology and Drainage

- 11.25 The features referred to below are shown on **Figure 5d** of the Groundsure EnviroInsight section of the Groundsure report at **Appendix 11.1**.
- 11.26 The Application Site is in the catchment of the River Adur, which has a distinctly dendritic drainage configuration and reaches the sea at Shoreham. A north-east flowing tributary brook of the Adur (marked on maps as a 'drain') is located on lower ground some 400m south east of the Application Site and flows through Broadford Bridge.
- 11.27 In addition, a small pond is located in Prince's Wood with a drainage outflow to the north that connects with another tributary of the River Adur. The pond is 250m east of the drill site.
- 11.28 There are no licensed surface water abstractions within 1km of the drill site.

Protected Sites

- 11.29 A consideration is required of the potential effects of the proposals on Protected Sites.
- 11.30 Reference to the Natural England website indicates that there are no protected sites within 10km of the Application Site. Map 7 of the EnviroInsight section of the Groundsure Report (**Appendix 11.1**) also confirms that there are no environmentally sensitive sites within 500m of the drill site boundary.
- 11.31 However, Prince's Wood (**Figure 11.1**) is designated Ancient and Semi-Natural Woodland with a requirement that the soils moisture conditions in root zones will need to be protected.

Geology

Geological Setting

- 11.32 The Application Site is located on the southern side of the Weald Basin. The geological conditions are illustrated on **Figure 11.2**, which has been compiled from the British Geological Survey (BGS) 1:50,000 sheets 317/332 (Chichester and Bognor) and 318/333 (Brighton and Worthing). Local geological information is provided in the Groundsure GeoInsight section of the Groundsure report presented at **Appendix 11.1**.

11.33 In summary, it is an area where Lower Cretaceous Wealden Beds dip southwards towards the South Downs where they become overlain by younger Lower Greensand and Chalk sequences. There are no superficial deposits in the vicinity of the Application Site, the closest ones being the tracts of alluvium and Head Deposits approximately 3km east of the drill site. The Wealden Beds are underlain by a progressively older sequence of Mesozoic and Palaeozoic strata.

Stratigraphy

11.34 The geological sequence to be penetrated by the proposed borehole is shown in **Table 11.1** below. In practice 'Drilled Depth' is the distance penetrated by the drill bit and because of the deviation it is not the same as depth below ground level i.e. the depth of the borehole at its termination point is approximately 8770 ft (2673m) and not the 10014 ft (3083m) as indicated in **Table 11.1**.

Table 11.1 Proposed Development - Expected Geological Sequence

Unit Name and Age		Estimated Drilled Depth to Top of Formations Shown		Unit Thickness Penetrated			
		ft	m (rounded)	ft	m (rounded)		
Lower Cretaceous (Wealden Beds)		Weald Clay	0		922	281	
	Hastings Beds		Upper Tunbridge Wells Sand	922	281	173	53
			Grinstead Clay	1095	334	97	30
			Lower Tunbridge Wells Sand	1192	363	90	27
			Wadhurst Clay	1282	391	185	56
			Ashdown Beds	1467	447	535	163
Upper Jurassic		Upper Purbeck Beds	2002	610	259	79	
		Middle Purbeck Beds	2261	689	279	85	
		Lower Purbeck Beds	2540	774	457	139	
		Purbeck Anhydrite	2999	914	98	30	
		Portland Beds	3097	944	197	60	
		Kimmeridge Clay	3296	1005	1473	449	
		Corallian Beds	4587	1398	418	129	
		Fault	5356	1633	-	-	
		Oxford Clay	NP		NP		

Unit Name and Age		Estimated Drilled Depth to Top of Formations Shown		Unit Thickness Penetrated	
		ft	m (rounded)	ft	m (rounded)
Middle Jurassic	Kellaways Beds	NP		NP	
	Cornbrash	NP		NP	
	Great Oolite	NP		NP	
	Fullers Earth	NP		NP	
	Inferior Oolite	5355	1632	372	113
Lower Jurassic	Upper Lias	5967	1819	414	126
	Middle Lias	6747	2056	612	187
	Lower Lias	7756	2364	774	236
Triassic	Triassic	8608	2624	840	256
	Sherwood Sandstone	9501	2896	387	387
-	Palaeozoic	9914	3022	189+	58+
	Total Depth	10114	3083		

- 11.35 Available geological mapping shows Weald Clay to be underlying the Application Site and surrounding area with no superficial cover. The Upper Tunbridge Wells Sand formation lies below it but does not crop out in this area, doing so some 10km to the north-west.
- 11.36 BGS Sheet 318/333 differentiates the Wealden Beds stratigraphy in detail and by reference to this map and the BGS Lexicon it is possible to define the stratigraphy more precisely.
- 11.37 The key features are that the Tunbridge Wells Sand Formation is separated into Upper and Lower parts by the Grinstead Clay. The Lower Tunbridge Wells Sand is then underlain by the Wadhurst Clay Formation and the Ashdown Formation, the latter overlying the Purbeck Beds. Beds between the Upper Tunbridge Wells Sands and the Ashdown Beds are collectively known as the Hastings Beds, and these, combined with the Weald Clay, are referred to as the Wealden Beds.

Lithology

- 11.38 The lithological characteristics of the individual units are summarised in **Table 11.2**. The information presented is taken from regional geological mapping referenced above and associated reports.
- 11.39 The Weald Clay formation contains minor and sometimes discontinuous bands of sandstone, the location of which in relation to the drill site is evident on Map 1.3 (Page 9) of the Groundsure GeoInsight section of the Groundsure report at **Appendix 11.1**. The closest outcrops are approximately 500m north and 400m south of the Application Site.

Structure

- 11.40 The geological structure is illustrated by the section shown on **Figure 11.2**. The shallower rock sequence represented by the Wealden Beds dips gently southwards to pass beneath the South Downs. There is no evidence of faulting in the vicinity of the site in the rocks above the Corallian at 1633m depth but there is faulting below that which causes the borehole to avoid penetrating the Corallian and the Upper Lias.

Table 11.2: Lithological Descriptions

Stratigraphic Unit	Lithological Description
Weald Clay	Pale to dark grey clay or mudstone, locally with subordinate lenticular sandstone and limestone layers.
Upper Tunbridge Wells Sand	Interbedded siltstone, silty mudstone and sandstone.
Grinstead Clay	Principally shale and mudstone.
Lower Tunbridge Wells Sand	Coarse-grained quartzose sandstone overlying interbedded siltstone and sandstone.
Wadhurst Clay	Dark grey shale and mudstone plus minor sandstone.
Ashdown Beds	Fine-grained silty sandstone and mudstone.
Purbeck Beds	Calcareous claystones, grading to silty claystone, locally with subordinate interbeds of limestone and coal.
Purbeck Anhydrite	Anhydrite with claystone, fossiliferous limestone and coal interbeds.
Portland Sandstone	Firm to moderately hard fine grained sandstone or siltstone.
Kimmeridge Clay	Thick sequence of moderately calcareous and silty claystone with thin limestone stringers.
Corallian Beds	Argillaceous limestone grading to calcareous claystone, interbedded with siltstone, sandstone and thin limestone stringers.

Stratigraphic Unit	Lithological Description
Oxford Clay	Thick limestone bed in the upper part, followed by interbedded claystone and siltstone with sparse limestone stringers.
Kellaways Beds	Thick sequence of fine-grained sandstones within a weak argillaceous cement and including abundant pyrite.
Cornbrash	Limestone, medium- to fine-grained, predominantly bioclastic wackestone and packstone with sporadic peloids; generally and characteristically intensely bioturbated and consequently poorly bedded, although better bedded, commonly somewhat arenaceous units occur in places, particularly in the upper part. Generally bluish grey when fresh, but weathers to olive or yellowish brown. Thin argillaceous partings or interbeds of calcareous mudstone may occur.
Great Oolite	Oolitic limestone with argillaceous laminations, grading to calcareous claystone.
Fullers Earth	Calcareous claystone.
Inferior Oolite	Shelly limestone, calcareous mudstone and sandy limestone.
Upper Lias	Calcareous mudstone and shale.
Middle Lias	Micaceous mudstone grading upwards into siltstone, sandstone and limestone.
Lower Lias	Alternating shale, mudstone and limestone.
Triassic	Mercia Mudstone overlying Sherwood Sandstone and the Rhaetic.
Palaeozoic	Not known.

Hydrogeology

The Aquifer System

11.41 The stratigraphy and lithology summarised in **Tables 11.1** and **11.2** results in the aquifer system presented in **Table 11.3** below. The Aquifer Designation accords with the latest Environment Agency Groundwater Protection Policy (GP3).

11.42 The geological structure is such that the proposed exploratory borehole:

- will not penetrate any of the Secondary Aquifers formed by the superficial deposits to the east;
- will not encounter the Upper Tunbridge Wells Sand until a drilled depth of approximately 160m bgl has been reached; and
- may penetrate the Secondary Aquifers formed by the sandstone and limestone lenses within the Weald Clay but down-dip or cross-strike of any water supply boreholes that penetrate them.

11.43 Map 5b of the GeoInsight section of the Groundsure Report at **Appendix 11.1** shows the distribution of aquifers within 500mm of the Application Site. The only ones present are the Secondary A aquifers associated with sandstones in the Weald Clay Formation, some of which are clearly discontinuous. The remaining area is classified as 'Unproductive Strata'.

Groundwater Levels and Flow

11.44 There are no data on groundwater levels and flow in the area. However it may be inferred that:

- the Weald Clay materials directly beneath the drill site are likely to be characterised by a low overall permeability with little deep infiltration of rainfall and shallow down-slope interflow only;
- groundwater in the superficial deposits and in the Secondary Aquifer sandstones and in the Weald Clay:
 - is locally recharged and unconfined at outcrop with subsequent down-dip flow into a confined zone;
 - is characterised by a low overall throughput of water;
- groundwater in the deeper Secondary Aquifers, starting with the Upper Tunbridge Wells Sand:
 - will be recharged on the outcrop area, which is some 10km to the north east and beyond;
 - will flow southwards according to the regional dip of the strata; and
 - has no practical connection with groundwater beneath the site or through which the proposed hydrocarbon exploratory borehole will penetrate.

11.45 Regarding the southerly groundwater flow in the deeper Secondary Aquifers, the actual depth of the aquifers beneath the drill site may be such that there is little actual groundwater movement in that area. Hydrochemical processes may then be such that the groundwater is of poor quality.

Table 11.3: The Aquifer System

Stratigraphic Unit	Aquifer Designation	Inferred or Recorded Aquifer Characteristics
Weald Clay Formation	Mostly unproductive strata but includes minor sandstones and limestone which are given Secondary A status (formerly	Sandstone inferred to have moderate primary and secondary porosity and permeability with resource value constrained by limited lateral extent.

Stratigraphic Unit	Aquifer Designation	Inferred or Recorded Aquifer Characteristics
	designated a minor aquifer of low vulnerability)	
Upper Tunbridge Wells Sand	Secondary A	Recorded as sandstone and siltstone. Presumed in parts to have moderate to high primary and secondary porosity and permeability.
Grinstead Clay	Unproductive strata	
Lower Tunbridge Wells Sands	Secondary A	Recorded as sandstone and siltstone. Presumed in parts to have moderate to high primary and secondary porosity and permeability.
Wadhurst Clay	Mostly unproductive strata but includes minor sandstones and limestone which are given Secondary A status.	Sandstone inferred to have moderate primary and secondary porosity and permeability with resource value constrained by limited lateral extent.
Ashdown Beds	Sands and sandstone layers are given Secondary A status.	Sandstone inferred to have moderate primary and secondary porosity and permeability with resource value constrained by limited lateral extent.
Purbeck Beds	Formations below this depth (i.e. > 400m begl) are generally not recognised as aquifers in this region, being too deep to exploit and likely to contain poor quality groundwater.	Mostly low permeability argillaceous formations not used as aquifers.
Purbeck Anhydrite		
Portland Sandstone		
Kimmeridge Clay		
Corallian Beds		
Oxford Clay		
Kellaways Beds		
Cornbrash		
Great Oolite		A Principal Aquifer outside of this region, whose aquifer properties are mainly dependent on extensive secondary porosity and permeability which is unlikely to be extensively developed at the depth at which it occurs below the Broadford Bridge area (> 1500m begl).
Fullers Earth		Mostly low permeability argillaceous formations not used as aquifers.
Inferior Oolite		
Upper Lias		
Middle Lias		
Lower Lias		

Stratigraphic Unit	Aquifer Designation	Inferred or Recorded Aquifer Characteristics
Triassic		Includes the Sherwood Sandstone, which is a Principal Aquifer outside of this region. Unlikely to contain freshwater at this depth (>1500m) and thought to be hydrocarbon-bearing.
Palaeozoic		Too deep to be of significance

Groundwater Utilisation

- 11.46 The EnviroInsight section of the Groundsure Report included at **Appendix 11.1** includes a record of licensed groundwater and surface water abstractions in an area up to 1000m away from the drill site. There are no licensed groundwater abstractions in this area, nor are there any Source Protection Zones, the closest being those associated with the Lower Greensand formations to the south, which are not penetrated by the proposed borehole.
- 11.47 **Figure 11.3** shows the location of a series of water wells in the area as recorded by BGS. None would be expected to be hydraulically connected to the proposed exploratory borehole, being either up-gradient, in different groundwater catchments, or in aquifers not penetrated by the proposed borehole.

Groundwater Vulnerability

- 11.48 The Groundwater Vulnerability Map for the area (Sheet 45, West Sussex and Surrey) indicates the Secondary Aquifers referred to above (termed Minor Aquifers on the map) to be characterised by low vulnerability, which means that they are relatively resistant to pollution occurring at the surface.

Likely Significant Effects

- 11.49 Potential effects have been assessed sequentially in accordance with the Significance Matrix table presented earlier (**Table 2.2**) and in relation to the proposed phasing of the Proposed Development.

Phase 1: Construction of the Access Road and Well Site

Soil Moisture Conditions in Prince's Wood

- 11.50 Specifically in respect of the ancient woodland known as Prince's Wood, there is a potentially adverse effect on soil moisture due to interception of runoff and/or interflow from upstream, mainly as a result of construction of the access road.
- 11.51 Whilst the access road is upstream of the wood in terms of groundwater flow, due to the low permeability soil conditions, this is a very small component of the water balance and no adverse effects would be expected. Soil moisture in the woodland is most likely to be controlled primarily by rainfall falling on it balanced by losses due to evapotranspiration.
- 11.52 On that basis, the anticipated Scale of the Effect is Low, the Magnitude of the effect is also Low, and in the context of Phase 1 only the effect is short-term. The overall significance is therefore Minor.

Phase 2: Mobilisation of the Drill Rig and Drilling Operations

Soil Moisture Conditions in Prince's Wood

- 11.53 In the context of Phase 2, the level of significance of this effect will continue to be negligible.

Land Contamination at the Drill Site and Release of Contaminated Runoff

- 11.54 This is a potentially adverse effect involving uncontrolled surface release (i.e. spillages) of contaminative substances used in connection with the drilling works (chemical additives, lubricants etc), however caused. This process potentially leads to ground contamination, groundwater contamination, and surface water contamination following the off-site migration of run-off from rainfall.
- 11.55 The effect would be direct, short term, but local only, and therefore the Scale of the Effect is Low. The potential magnitude of the effect is considered to be medium because of downstream water pollution impacts and the overall significance is therefore moderate/minor.

Contamination of Aquifers during Drilling

- 11.56 This is a potentially adverse effect caused by the release of drilling fluids into aquifers during drilling and their onward migration to water wells and surface waters. The effect is direct and short to medium term because of the slow sub-surface migration of contaminants.
- 11.57 Hydrogeological conditions are such that the anticipated Scale of the Effect is Low and the magnitude of the effect is also Low. The overall significance is therefore minor.

Consequential Effects on Protected Areas

- 11.58 The lack of any protected areas within 10km of the site is such that this potentially adverse effect is not significant and may be classified as negligible.

Accidental Release of Contaminants into the Borehole during Drilling

- 11.59 This is a potentially adverse effect similar to the above caused by the spillage and release of chemicals (in storage at the site) into the aquifer during drilling, and their onward migration to water wells and surface waters. The effect is direct and short to medium term because of the slow sub-surface migration of contaminants.
- 11.60 Again, hydrogeological conditions are such that the anticipated Scale of the Effect is Low and the magnitude of the effect is also Low. The overall significance is therefore minor.

Phases 3a/3b: Short Term Testing and Evaluation (Gas and Oil)

- 11.61 There are no additional significant effects associated with Phase 3 (either 3a or 3b) that are not evaluated under Phases 1 and 2 activities mentioned above. The effect of stored chemicals for use in drilling fluids is replaced by the temporary storage of hydrocarbons, the effect which is evaluated below.

Land Contamination at the Drill Site and Release of Contaminated Runoff

- 11.62 The potential for land contamination at the drill site and release of contaminated runoff at this stage is mainly associated with the temporary storage of hydrocarbons extracted from the borehole. This is a potentially adverse effect which could lead to ground

contamination, groundwater contamination, and surface water contamination following the off-site migration of run-off from rainfall.

- 11.63 The effect would be direct, short term, but local only, and therefore the Scale of the Effect is Low. Because of the potential surface water impact and the potential onward connection to watercourses of more significance, the Magnitude of the Effect is assessed as Medium so the overall significance is Moderate/Minor.

Phase 4a: Restoration

Contamination of Aquifers following Abandonment

- 11.64 At whatever stage the borehole is abandoned, the potential exists for upward migration of saline waters and hydrocarbons etc into aquifers. This is a potentially long-term adverse effect.
- 11.65 Despite the hydrogeological conditions, in theory, if the escape of these contaminants continued uninterrupted, widespread contaminant migration is a possibility such that the anticipated Scale of the Effect may be regarded as Medium. However, the lack of a reliance on groundwater is such that the magnitude of effect criterion is no more than Medium. The overall significance is therefore assessed as Moderate.

Phase 4b: Retention

- 11.66 In the event of retention of the well site as hydrocarbon production and storage facility, some of the effects mentioned in respect of Phases 1-3 would be maintained in the long term and one new effect will arise. The retained effects and the additional effects are as follows:

Soil Moisture Conditions in Prince's Wood

- 11.67 The potentially adverse effect on Prince's Wood continues to be moisture loss, where the anticipated Scale of the Effect is Low and the magnitude of the effect is also Low, even though the effect is now long-term. The overall significance remains Minor.

Land Contamination at the Drill Site and Release of Contaminated Runoff

- 11.68 The potential for land contamination at the drill site and release of contaminated runoff is now mainly associated with the long-term storage of hydrocarbons extracted from the

borehole. This is a potentially adverse effect which potentially leads to ground contamination, groundwater contamination, and surface water contamination following the off-site migration of run-off from rainfall.

- 11.69 The effect would be direct, long-term, but local only, and therefore the Scale of the Effect is Low. Because of the potential surface water impact and the potential onward connection to watercourses of more significance, the Magnitude of the Effect is assessed as Medium so the overall significance is Moderate/Minor.

Mitigation Measures

Phase 1: Construction of the Access Road and Well Site

Soil Moisture Conditions in Prince's Wood

- 11.70 Detailed design will take into consideration the need to prevent the access road and drill site becoming a barrier to down-slope transmission of surface runoff and shallow infiltration.
- 11.71 The landscape is such that the access track hardly constitutes a break in slope and the depth of ground disturbance to create it is no more than 300mm. As such, the access track will not interrupt either transmission of down-slope run-off or shallow interflow.

Phase 2: Mobilisation of the Drill Rig and Access Road

Soil Moisture Conditions in Prince's Wood

- 11.72 The Phase 1 mitigation measures described above will continue into Phase 2.

Land Contamination at the Drill Site and Release of Contaminated Runoff

- 11.73 As part of site preparation, all parts of it will be underlain by a High Density Polyethylene (HDPE) liner placed on compacted and levelled 6F2 foundation material. In addition, all drilling fluid additives will be stored in a designated bunded area. These arrangements restrict the likelihood of spillages and leaks occurring prevent them contaminating the natural ground present beneath the drill site.

11.74 The site boundaries are a ditch system that that leads to a Class 2 Interceptor so that only uncontaminated run-off water is released from the drill site area. These mitigation measures, such as the size of the interceptor, are to be finalised as part of detailed design.

Contamination of Aquifers during Drilling

11.75 A possible effect of the drilling is migration of the drilling fluids into the rock formations through which the borehole penetrates. In respect of the sandstones in the Wealden Beds that are locally exploited there is an inherently low likelihood of this process occurring to any extent because they are thin, frequently discontinuous, and relatively low permeability. However, deeper geological units such as limestones in the Jurassic strata may have a higher permeability.

11.76 Several factors are incorporated into the design (i.e. the drilling works specification) mitigate this risk, the principal ones being:

- use of a water-based drilling mud with non-toxic additives;
- control of the mud-balance such that lost circulation and invasion of the formations penetrated is minimal; and
- the very short-term exposure of the formation to the drilling mud, given that the hole is quickly cased after drilling.

Accidental Release of Contaminants into the Borehole during Drilling

11.77 The HDPE membrane will be sealed around the concrete rings forming the well-head cellar, which will prevent ingress of contaminated surface water.

Phase 3a/b: Short Term Testing and Evaluation (Gas and Oil)

Soil Moisture Conditions in Princes Wood

11.78 The Phase 1 mitigation measures described above will continue into Phase 3.

Land Contamination at the Drill Site and Release of Contaminated Runoff

11.79 The Phase 2 mitigation measures described above will continue into Phase 3.

Accidental Release of Contaminants into the Borehole during Testing

11.80 The Phase 2 mitigation measures described above applicable to drilling will continue into Phase 3 testing.

Phase 4a: Restoration

Contamination of Aquifers following Abandonment

11.81 Prior to abandonment the well will be fitted with cement plugs to prevent fluid movement between horizons. The theoretical risk of deterioration of the casing and screen, thereby linking the hydrocarbons to the aquifers, will be mitigated by using best practice-industry standards as follows:

- perforated casing sections in the production zones will be plugged with cement, thereby preventing the escape of residual hydrocarbons left in the reservoir (noting that, by that time, production will have removed most of the hydrocarbons present);
- the cement plugs and cement used in the casing will be placed in neutral pH environments, thereby minimising the risk of attack by acidisation;
- where necessary, sulphate-resistant cement will be used to minimise the risk of sulphate attack; and
- the steel casings will be protected:
 - externally by the cement lining; and
 - internally by creation of a pH neutral environment and the development of anaerobic conditions.

Phase 4b: Retention

Soil Moisture Conditions in Prince's Wood

11.82 The Phase 1 mitigation measures described above will continue into Phase 4b.

Land Contamination at the Drill Site and Release of Contaminated Runoff

11.83 The Phase 2 and 3 mitigation measures described above will continue into Phase 4b.

Residual Effects

- 11.84 In respect of the potentially adverse effects identified, following implementation of the proposed mitigation measures, no significant residual effects are anticipated, i.e. all will become negligible.

Cumulative and Interactive Effects

- 11.85 There are no anticipated cumulative or interactive effects connected with ground or groundwater contamination once the mitigation measures have been implemented.

Summary

- 11.86 The Proposed Development is to be drilled through a geological sequence that is well-defined and understood. The inferred and recorded hydrogeological conditions accord with groundwater licensing records to indicate that there are no major aquifers present and a limited local reliance on groundwater for water supplies.
- 11.87 The risk of groundwater pollution is therefore inherently low but is reduced further by the incorporation of mitigation measures such as use of water-based, non-toxic drilling fluids etc, which are industry standard. Well abandonment proposals will ensure no such risk exists in the long-term.
- 11.88 The risk of local ground and surface water contamination will be removed by well-engineered site preparation, including the use of HDPE linings and the capture of all surface runoff via an interceptor ditch system.
- 11.89 The slight risk of an effect on soil moisture in the nearby area of ancient woodland will be mitigated by drainage arrangement that allow upstream runoff to pass beneath the access road.

Table 11.4: Table of Significance – Ground and Groundwater Protection

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)	Mitigation Measures	Geographical Importance*							Residual Effects (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)
				I	U K	E	R	C	D	L	
Phase 1: Construction of the access road and well site											
Loss of soil moisture in Princes Wood	Temporary	Minor	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.							✓	Negligible
Phase 2: Mobilisation of the drill rig and drilling operations											
Loss of soil moisture in Princes Wood	Temporary	Minor	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.							✓	Negligible
Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor	Placement of HDPE line across site and creation of lined ditches leading to interceptor.							✓	Negligible
Consequential effect on protected areas	Temporary	Negligible	Arrangements as above plus distance to nearest water-dependant protected area.							✓	Negligible
Contamination of aquifers during drilling.	Temporary	Minor	Short duration of work on uncased shallow aquifers, mud balance control to reduce formation entry and use of non-toxic drilling fluids							✓	Negligible
Accidental release of contaminants during drilling	Temporary	Minor	HDPE liner is sealed around well cellar preventing entry of spilled contaminants into the borehole							✓	Negligible

Phases 3a/3b: Short term testing and evaluation											
Loss of soil moisture in Princes Wood	Temporary	Minor	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.							✓	Negligible
Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor	Placement of HDPE line across site and creation of lined ditches leading to interceptor.							✓	Negligible
Phase 4a: Restoration											
Contamination of aquifers following well abandonment	Permanent	Moderate	Sealing of well using cement plugs and use of corrosion-resistant materials							✓	Negligible
Phase 4b: Retention											
Loss of soil moisture in Princes Wood	Temporary	Minor	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.							✓	Negligible
Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor	Placement of HDPE line across site and creation of lined ditches leading to interceptor.							✓	Negligible
* Geographical Importance I = International; UK = United Kingdom; E = England; R =Regional; C = County; D = District; L = Local											

References (Ref)

- 11.1 Department for Communities and Local Government, 2012, National Planning and Policy Framework.
- 11.2 Government Office for the South East 2009; The South East Plan (Regional Spatial Strategy for the South East)
- 11.3 West Sussex County Council 2003; Minerals Local Plan
- 11.4 Horsham District Council 2007; Core Strategy

12.0 LIGHTING

Introduction

- 12.1 This chapter of the ES assesses the likely significant effects of the Proposed Development in terms of lighting.
- 12.2 The chapter describes the assessment methodology; 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 Royal Haskoning.

Planning Policy Context

National Legislation

National Planning Policy Framework (Ref 12.1)

- 12.3 The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. Section 11 addresses 'conserving and enhancing the natural environment' and states that:

"The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of....pollution"

Clean Neighbourhoods and Environment Act (CNEA) 2005 (Ref 12.2)

- 12.4 The Clean Neighbourhoods and Environment Act 2005 (Sections 101-103) is the only UK legislation in existence which applies some statutory regulation over the environmental impact of light pollution and nuisance glare. This act extended the statutory monitoring and enforcement duties of WSCC as the local environmental health authority to include monitoring and enforcement of nuisance glare. The Act requires the environmental health authority to complete periodic assessment to identify:

**“artificial light emitted from premises [where]...
prejudicial to health or a nuisance”.**

Regional Planning Policy

The South East Plan (adopted May 2009) (Ref 12.3)

- 12.5 The South East Plan does not contain any specific policies relating to lighting. However the plan does have policies relating to “Countryside and Landscape Management” including Policy C4 which states that:

“...planning authorities and other agencies in their plans and programmes should recognise, and aim to protect and enhance, the diversity and local distinctiveness of the region’s landscape”

Local Planning Policy

Horsham Core Strategy (adopted February 2007) (Ref 12.4)

- 12.6 The Horsham Core Strategy does not contain any specific policies relating to lighting. However the strategy does have policies relating to the protection of the environment (Policy CP1 and CP2). Policy CP1: Landscape and Townscape Character states that the landscape character of the district will be maintained and enhanced and that activities that may influence the character will only take place if protected landscapes are properly protected, conserved or enhanced. Policy CP2: Environmental Quality that states that development proposals should minimise the emissions of pollutants, including light pollution.

West Sussex Minerals Local Plan (adopted July 2003) (Ref 12.5)

- 12.7 The West Sussex Local Plan does not contain any specific policies relating to lighting. However the Plan does contain “saved” policies (policies 10-22) that are relevant for the Proposed Development and aim to protect the environment. The Minerals Local Plan also contains a policy relating directly to the potential exploration of oil and gas (Policy 26) which states that the Local Authority will pay particular attention to the means of protecting nearby residents and amenities from the effects of the operations.

Design Guidance

12.8 Relevant design guidance includes the following documents:

- BS-EN 12464-2:2007 – Lighting of work places. Outdoor work places (Ref 12.6).
- Chartered Institute of Building Services Engineers (CIBSE) Lighting Guide 6:1992 – Outdoor Environment (Ref 12.7). This document provides guidance on workplace lighting requirements.
- Defra (2001) Lighting in the Countryside: Towards Good Practice (Ref 12.8). The guide covers all forms of lighting, including lighting for mineral extraction and lighting of rural roads, junctions, services and parking areas. Its key objectives are to identify good practice in the planning and design of lighting in rural areas, and to advise on how it can be achieved.
- Institution of Lighting Professionals (ILP formerly ILE) Guidance Notes for the reduction of Light Pollution. This is particularly relevant to the design of lighting for rural areas (Ref 12.9). This guidance is used to inform designers of the necessity to minimise light spill from developments, and provides guidance on good practice in use; and
- The Health and Safety at Work Act 1974 (Ref 12.10). This indicates the need to provide lighting for the safe transit and operations around the Application Site.

Guidance for Lighting Effects on Bats

12.9 Bats are protected by the Wildlife and Countryside Act (1981) (Ref 12.11) and the Conservation of Habitats and Species Regulations 2010 (Ref. 12.12). This makes it illegal to kill, injure, capture or disturb bats, obstruct access to bat roosts or damage/destroy bat roosts. Lighting in the vicinity of a bat roost causing disturbance could constitute an offence (Ref 12.13). There is no legislation relating directly to lighting effects on bats; however, there is a guidance document produced by the Bat Conservation Trust (Ref 12.13). The Bat Conservation Trust Guidance states that no bat roost (including access points) should be directly illuminated. If it is considered necessary to illuminate an area known to be used by roosting bats, the lights should be positioned to avoid the sensitive areas. It also states that the height of lighting should be as low as possible. The times during which the lighting is on should be limited to provide some dark periods. Roads or trackways in areas important for foraging bats should contain stretches left unlit to avoid isolation of bat colonies. These unlit stretches should be 10 metres in length either side of commuting route.

12.10 Lighting is not specifically mentioned in planning policies and therefore they do not have a specific implication for the Proposed Development. However regional and local planning documents do have specific policies relating to the protection of the landscape and the environment and the Proposed Development should comply with the planning policy or provide suitable mitigation for any potential effects of the proposed lighting. Any potential effects on bats are discussed in the Ecology Chapter (**Chapter 7**).

Assessment Methodology

General Approach

12.11 A site visit was conducted on 15th February 2012 to ascertain the context of the study area by day and night. This included noting existing sources of illumination. An assessment of relative heights between the Application Site and the local landscape including any existing adjacent properties or structures was made whilst on site.

12.12 The site survey was conducted by assessing the strategic views from the Application Site to the adjacent areas along with any relative views towards the Application Site from adjacent roadways and properties. The photographs utilised are relative to these views selected. They are not 'stitched' panoramic scenes and are not to the same scale. They are used to give context to the lighting assessments.

12.13 Relative heights for photographs include the 1.7m 'eye level' height and have been indicated to the nearest metre. They are not intended as absolutes, but are designed to provide some context relevant to the day and night views illustrated. Distances are similarly quoted to a point roughly central to the Application Site. These are provided using Google Earth for general context and are not intended as absolutes.

12.14 Night-time photographs cannot be compared between different Receptors, owing to differing ambient lighting conditions, exposure times and light sensitivity settings, as well as differing weather and atmospheric conditions.

12.15 General camera settings were left as normal, with auto white balance. No post-processing of photographs has been carried out, other than:

- Amending orientation if needed;
- Cropping to letterbox format; and
- Reduction of JPEG sizes for printing purposes within the Word document.

12.16 Following the site visit, an assessment was made of the effects that the Proposed Development lighting may have on the local landscape, including any potential alterations to longer distance views in adjacent to the Application Site. The survey/assessment was made of potential areas/views that may be affected by the proposed lighting.

Significance Criteria

12.17 The significance criteria used are those outlined in the methodology chapter (**Chapter 2**). The significance level attributed to each impact has been assessed based on the magnitude of change due to the Proposed Development, and the sensitivity of the affected receptor/receiving environment to change. The criteria used to determine the "significance" of any change in baseline lighting levels have been defined qualitatively using professional judgement and best practice guidance. The lighting assessment has been based on "Lighting in the Countryside: Towards Good Practice" (DEFRA, 2001) (Ref. 12.8).

Summary of Terms

12.18 A summary of the terms used in the following sections is provided in **Table 12.1**.

Table 12.1: Summary of terms

Term	Definition
Atmospheric Conditions (for Aura / Sky Glow)	The amount of particle pollution and presence of moisture and other gases in the atmosphere. Light is scattered by the particles and that coming back to an observer below causes the veiling effect of Sky Glow.
Aura	Localised halo of light above a lit area, caused by direct upward light or reflections from the ground and other surfaces. More obvious where light units are grouped relatively close together and / or of high power.
Sky Glow	Wide area of night sky scattering direct and indirect upward light back to an observer. Depends on atmospheric conditions and the amount of upward light. Very typical above urban areas.
Environmental Zone E1 – E4	A classification method developed by the ILE to match appropriate lighting controls to the local environment e.g. an E1 Zone is an ANOB and an E4 Zone a City Centre area

Baseline Conditions

Landscape by Day

- 12.19 The location of the site is described in Chapter 3. The Application Site lies in an area of rural landscape surrounded by woodland and agricultural land accessible only from the B2133 Adversane Lane. The nearest town is Billingshurst, situated approximately 4km north of the site.
- 12.20 The Application Site covers an area of 2.12ha (5.23 acres) comprising of an access road and a drill site. Although neither the Application Site nor the adjoining land is within an internationally designated site (Special Protection Area, Special Area of Conservation or Ramsar) or nationally designated site (Sites of Scientific Special Interest or National Nature Reserve) the Application Site is surrounded by woodland, some of which consists of ancient woodland that is likely to have ecological value. There are also watercourses near the Application Site and some ponds.
- 12.21 Whilst there are a number of residential and agricultural businesses/properties within the locality of the Application Site, these are generally not visible from the site itself owing to the tree cover around the perimeter of the site. From the site itself there are restricted views through trees and woodland of poultry houses and Homefield Farm (south-east of the site). However, these restricted views are through deciduous trees, which at the time of survey had lost their leaves, and it is highly likely that in the spring/summer seasons these properties will be completely screened from view owing to the increased foliage.
- 12.22 From the location of the proposed access road there will be an unrestricted view of the farm house located at Wood Barn Farm and this is therefore considered to be a medium sensitivity receptor. However this property is not visible from the Application Site itself.

Landscape by Night

- 12.23 The rural nature of the immediate vicinity is confirmed by night. The site itself and the surrounding woodland/farmland are in total darkness.
- 12.24 The local network of "B" roads and country lanes has no street/road lighting. There are localised areas of lighting affording to private developments and residential properties along Adversane Lane. However, these are not visible from the site itself.

- 12.25 Whilst there are stretches of the A29 which are illuminated these are not visible from the site.
- 12.26 From the location of the proposed access road there will be an unrestricted view of the farm house located at Wood Barn Farm.

Visual Assessment during the Day

- 12.27 The lighting visual assessment has been undertaken separately to the Landscape and Visual Assessment presented in Chapter 8, as this assessment is streamlined to ensure it remains relevant to making an assessment of the likely effect of lighting. **Figure 12.1** shows the locations and directions of the photographs. Note that the night time plates are not marked on **Figure 12.1** as they follow the same sequence as the daytime photographs.

View 1- Views from North East Corner of the site looking south
Relative Height: + 1.7m
Distance: 0m from site



Plate 12.1



Plate 12.2



Plate 12.3

- 12.28 The views shown in **Plates 12.1 – 12.3** represent views towards the southern east to west corners of the Application Site and show an open view across the flat site. Significant tree coverage can be seen across the southern boundary of the site. The poultry houses associated with Homefield Farm are partially visible through trees in **Plate 12.1**.



Plate 12.4

- 12.29 **Plate 12.4** represents views to the east of the site and shows an open view across the flat Application Site. Significant tree coverage may be seen across the eastern boundary with agricultural land beyond.

View 2-	Views from South East Corner of the Application Site looking north
Relative Height:	+ 1.7m
Distance:	0m from site



Plate 12.5

12.30 **Plate 12.5** shows an open view across the flat open area of agricultural land immediately adjacent to the Application Site. Significant tree coverage to the east and west aspects is provided by both Prince's Wood and Pocock's Wood. The centre of the shot illustrates longer distance views between woodland towards the B2123.



Plate 12.6

12.31 **Plate 12.6** shows an open view across the flat open area of the Application Site. Significant tree coverage is present to the western side of the site boundary and dense woodland to the north of the site afforded by Pocock's Wood.

View 3-	Views from South West Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site



Plate 12.7

12.32 **Plate 12.7** shows an open view across the flat open site. Significant tree coverage to the east and west aspects is provided by both Prince's Wood and Pocock's Wood. There are longer distance views between woodland to agricultural land beyond and trees bordering the B2123.

View 4-	Views from North West Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site



Plate 12.8

12.33 **Plate 12.8** shows open view across the relatively flat site. Some tree coverage can be seen across the southern boundary of the site with further significant woodland coverage beyond.

View 5- Views from Proposed Access Road
Relative Height: + 1.7m
Distance: 0m from site



Plate 12.9

12.34 **Plate 12.9** shows views looking onto the site from the proposed access road. Middle distance views show the proposed site between Pocock's Wood and Prince's Wood. A dense area of trees is visible on the horizon in the longer distance views.



Plate 12.10

12.35 **Plate 12.10** shows views looking north from the proposed access road and shows the proximity of the proposed site/access road to the farm house and agricultural buildings of Wood Barn Farm. A line of trees contouring the B2123 can be seen to the right hand side of the image.

12.36 It was not possible to get a representative daytime view towards the site from the farmhouse at the time of survey. However, it is considered that any direct view towards the site from the farmhouse would be largely restricted due to the tree canopy/shielding

provided by Pocock's Wood.



Plate 12.11

12.37 **Plate 12.11** shows the view looking east of the site from the route of the proposed access road towards the B2123. A line of trees that lines the B2123 can be seen in the middle distance views.

View 6-	Views from Proposed Site Entrance
Relative Height:	+ 1.7m
Distance:	0m from site

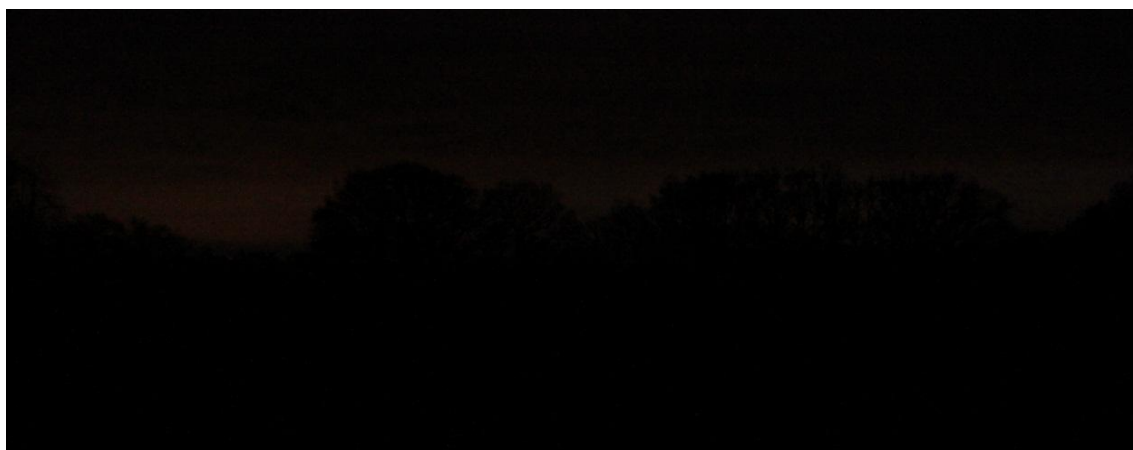


Plate 12.12

12.38 **Plate 12.12** shows views from the proposed site access located on the B2123 towards the Application Site. There are limited views into the Application Site from the access point on the B2123 due to the tree coverage provided by field borders and adjacent woodland.

Night-time Lighting Conditions

View 1-	Views from Northern East Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site
Conditions:	Fair, significant cloud cover, no stars or moon visible.

**Plate 12.14****Plate 12.15**

12.39 Views shown in **Plates 12.14** and **12.15** represent night time views to the southern east to west corners of the site. The dark foreground represents the intrinsically dark area of land which forms the Application Site. Some sky glow can be seen creating a silhouette of trees bordering the south perimeter of the site. Sky glow is likely to be attributed to coastline developments such as Littlehampton and Bognor Regis. There is no direct view of any physical lighting source.

View 2-	Views from South East Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site
Conditions:	Fair, significant cloud cover, no stars or moon visible

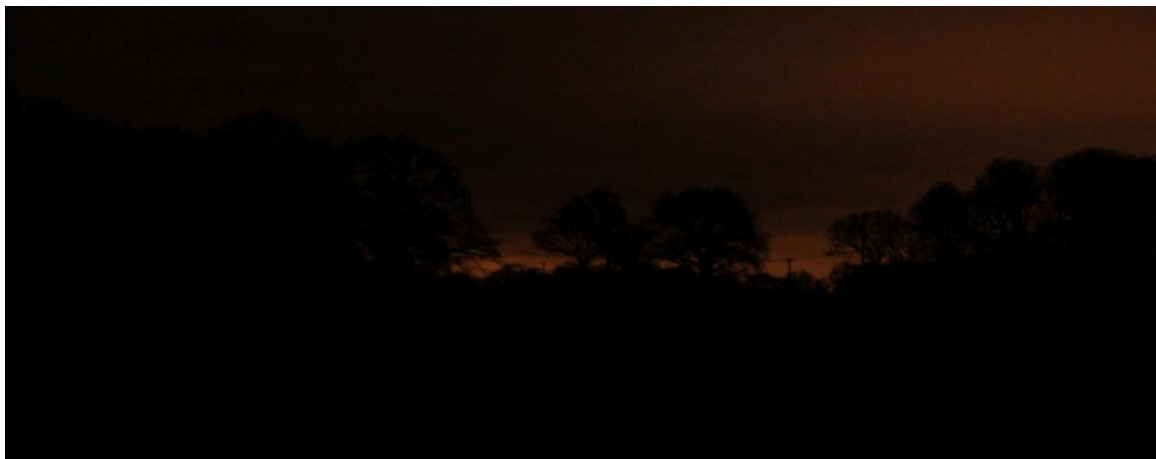


Plate 12.16

12.40 **Plate 12.16** represents the intrinsically dark area of land to the east of the proposed site. Significant sky glow can be seen, creating silhouettes of trees/woodland adjacent to the site. Sky glow is likely to be attributable to the town of Crawley and Gatwick Airport. There is no direct view of any physical lighting source.

12.41 Although not shown in the photograph vehicle headlights from B2123 traffic can be seen from here and aircraft lighting associated with Gatwick Airport.

View 3-	Views from South West Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site
Conditions:	Fair, significant cloud cover, no stars or moon visible

12.42 Informed view due to no night time photograph. Dark foreground and dark sky. No significant view at this location resulted in intrinsically dark photograph with very little exposure/definition therefore no image reproduced.

View 4-	Views from North West Corner of the site
Relative Height:	+ 1.7m
Distance:	0m from site
Conditions:	Fair, significant cloud cover, no stars or moon visible

12.43 Dark foreground and dark sky. No significant view at this location resulted in intrinsically dark photograph with very little exposure/definition therefore no image reproduced.

View 5-	Views from Proposed Access Road
Relative Height:	+ 1.7m
Distance:	0m from site
Conditions:	Fair, significant cloud cover, no stars or moon visible



Plate 12.17

12.44 **Plate 12.17** shows views looking onto the site from the proposed access road. The dark foreground represents the intrinsically dark area of land between the access road and the site. Some sky glow can be seen creating a silhouette of trees/woodland adjacent to the site. Sky glow is likely to be attributable to coastline developments such as Littlehampton and Bognor Regis. There is no direct view of any physical lighting source.

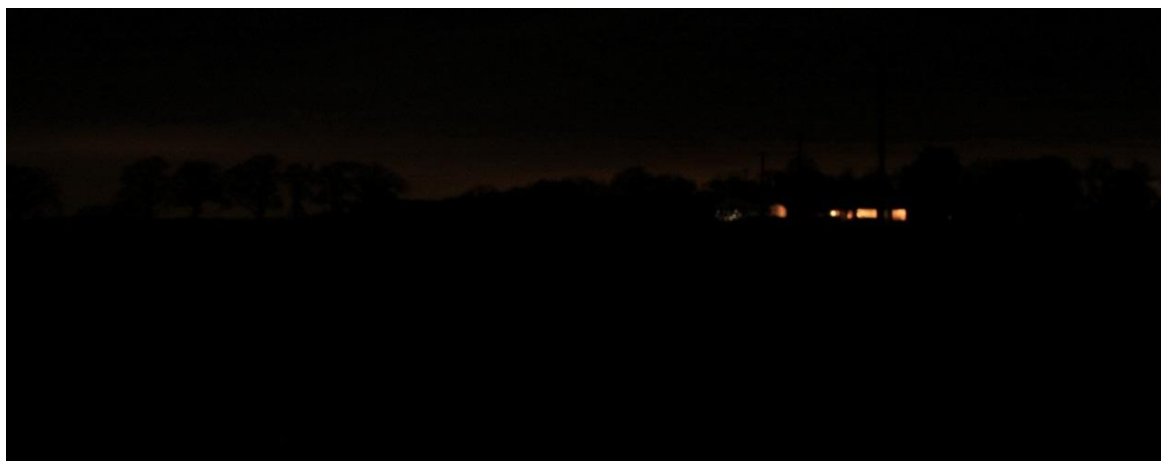


Plate 12.18

- 12.45 **Plate 12.18**, looking north, away from the site, towards the farm house and agricultural buildings of Wood Barn Farm. Internal lighting of the farmhouse is prominent against the dark background and some sky glow is noticeable on the horizon. There is no direct view of any physical lighting source.
- 12.46 It was not possible to get a representative night time view towards the site from the farmhouse at the time of survey. However, it is considered that any direct view towards the Application Site from the farmhouse would be largely restricted due to the tree canopy/shielding provided by Pocock's Wood.



Plate 12.19

- 12.47 **Plate 12.19** shows the view looking east of the site from the route of the proposed access road towards the B2123. The line of trees contouring the B2123 is silhouetted against sky glow in the back ground. Sky glow is likely to be attributable to Crawley town and Gatwick Airport. There is no direct view of any physical lighting source.

View 6-	Views from Proposed Site Entrance
Relative Height:	+ 1.7m
Distance:	0m from site



Plate 12.20

12.48 **Plate 12.20** shows views from the propose site access located on the B2123 towards the main site area. Tree cover surrounding the site is silhouetted against sky glow in the background. There is no direct view of any lighting source

Bat Activity

12.49 Although no bat roosts were identified at the site, social calling by the soprano pipistrelle suggests that a roost might be present in the vicinity of the southern site. Low numbers of brown long-eared and Natterer's bats were also recorded from the southern part of the site. Refer to Chapter 7 (Ecology) for a full assessment of the effects of lighting on bats.

Proposed Development Lighting Strategy

Performance Objectives

12.50 The primary aims of the lighting design are summarised as follows:

- To deliver an efficient lighting design applicable to the exploration processes carried out on site;
- Provide safe and clear routes during the night time for site operatives;
- To create an environment where users feel safe and secure; and
- Be considerate to the sensitive areas of the site with regard to the ecological constraints and attempt to preserve the landscapes and minimise the environmental impact of the lighting installation.

Lighting Obtrusion

12.51 The ILE assessment method for lighting obtrusion is based on classifying landscapes into four Environmental Zones, E1 – E4. The current recommendations are set out in the **Table 12.2**.

Table 12.2 Obtrusive Light Limitations

Environmental Zone	Sky Glow ULR (Max) %	Light Trespass (into windows) Ev Lux		Source Intensity I Kcd		Building Luminance L (cd/m ²)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Pre-curfew
E1 Intrinsically dark landscapes National Parks, AONBs etc	0	2	1*	2.5	0	0
E2 Low distinct brightness Rural, small village, relatively dark urban location	2.5	5	1	7.5	0.5	5
E3 Medium distinct brightness Small town centres or urban location	5	10	2	10	1.0	10
E4 High distinct brightness areas Town / city centres with high night-time activity levels	15	25	5	25	2.5	25
<p>ULR – Upward Light Ratio of Installation (maximum permitted % of luminaire flux for total installation going directly skywards).</p> <p>Ev – Vertical Luminance in Lux (Lumens per square metre) – measured on glazing at centre of window.</p> <p>I – Light source intensity in Kilocandelas (Kcd)</p> <p>L – Luminance in Candelas per square metre (cd/m²)</p> <p>Institution of Lighting Engineers "Guidance Notes for the Reduction of Obtrusive Light" –</p>						

12.52 This assessment is based upon the classification of the project falling within environmental zone E2.

Proposed Development Lighting

- 12.53 The site establishment works (Phase 1) is considered low-level engineering that will be undertaken during daylight hours, with no need to work outside normal working hours. No artificial lighting will be required. In the case of an emergency during the hours of darkness vehicle headlights and one free standing lighting tower may be required.
- 12.54 Throughout the mobilisation, drilling and testing modes (Phases 2 and 3) of the Proposed Development, lighting is to be provided as detailed on **Figure 12.2**.
- 12.55 The proposed lighting comprises of the following:
- Five freestanding 3 metre high fluorescent lights facing inwards towards the site and pointing downwards;
 - Six Tungsten filament bulkhead lights located on site cabins;
 - Two horizontal strip lights at cabin level adjacent to the rig; and
 - Inward facing lighting within the derrick of the drilling rig.
- 12.56 During Phase 4, work will only be undertaken during daylight hours and therefore no lighting will be required during this phase.

Likely Significant Effects

Quantification of Effects

- 12.57 This section sets out to provide an informed assessment of the effects that the lighting installations described above will have on the Application Site itself and the surrounding areas, as well as any alteration to any long distance views where applicable.
- 12.58 In order to provide a clear/concise assessment the effect of the lighting will be considered in accordance with the construction/exploration phases as follows:
- Phase 1 Construction of the access road and well site;
 - Phase 2 Mobilisation of the drill rig and drilling operations;
 - Phase 3a Short term testing and evaluation; (Gas)
 - Phase 3b Short term testing and evaluation; (Oil)
 - Phase 4a Restoration;
 - Phase 4b Retention.

- 12.59 The identification of significant effects covers all effects but does not include mitigation measures, which have been considered as a separate entity.
- 12.60 It is worth noting that the survey of the Application Site was carried out during the winter months when the deciduous trees surrounding the site had lost their leaves. The effects described in the following sections are likely to be dramatically reduced during the spring/summer seasons due to leaf coverage and increased foliage.

Phase 1 – Construction of the Access Road and Well Site

- 12.61 The site establishment works is considered to be low-level engineering that will be undertaken during daylight hours, with no need to work outside normal working hours. No artificial lighting will be required. In the case of an emergency during the hours of darkness vehicle headlights and one free standing lighting tower may be required.
- 12.62 In the unlikely event of an emergency, vehicle lights and the freestanding tower will be largely screened from view by the well-established hedgerows, trees and dense woodland surrounding the site. Views of any lighting will only be visible by those passing the Application Site along the B2123 and the neighbouring property at Wood Barn Farm.
- 12.63 Sky glow arising from any direct lighting sources are not likely to be visible from any locations other than the property at Wood Barn Farm and sections of the B2123. Any aura created by the construction lighting is unlikely to be identifiable beyond the dense screening of woodland and the existing sky glow, as previously identified in the baseline conditions.
- 12.64 The effects of any lighting will be short term, given that the construction period will be for 6 weeks, and lighting will in any case only be permitted in emergencies.
- 12.65 The effects of any lighting used during Phase 1 on Wood Barn Farm would be minor adverse due to the medium sensitivity of this receptor. Effects at a local level and on longer distance views and the surrounding landscape are considered to be negligible.

Phase 2 - Mobilisation of the Drill Rig and Drilling Operations

- 12.66 Further to the completion of the Phase 1 works. The site lighting is expected to be as discussed above and as detailed on **Figure 12.2**. The Phase 2 drilling works will be a 24 hour operation and will therefore require the proposed site lighting to be operational

throughout this period of 10 weeks. The lighting shown in Figure 12.2 on the drilling rig would not extend more than 3m above the internal platform. Aviation lighting, although not mandatory, would be added to the top of the mast as a fail-safe option.

- 12.67 Owing to the flat landscape surrounded by well established hedgerows, trees and dense woodland (Pocock's Wood and Prince's Wood) the majority of the lighting will be screened from direct view from any sensitive receptors. Due to the positioning of the lighting towards the centre of the Application Site, light spill from the Application Site to the surrounding agricultural land and woodland will be minimal.
- 12.68 It is not anticipated that any sky glow or aura resulting from the low level site lighting will be visible from the properties at Wood Barn Farm as it will be screened by the dense tree coverage provided by Pocock's Wood. The effect of the low level site lighting on Wood Barn Farm cottage is therefore considered to be negligible. Inward lighting within the derrick on the drilling rig will minimise any spillage but will be partially visible from Wood Barn Farm as the rig will protrude above the height of the woodland. However this will be a small element of localised lighting to illuminate the rig only. The effect of the rig lighting on Wood Barn Farm Cottage is considered to be low magnitude on a medium sensitive receptor. Given the short term period over which any effect will occur, the overall effect is considered to be minor adverse.
- 12.69 Pedestrians and motorists passing the site access point along the B2123 (Adversane Lane) are likely to have partial distant obstructed views onto the site across the adjacent farmland. Lighting will be largely screened by the dense woodland adjacent to the site and the significant amount of trees/hedges contouring the B2123 and any views are likely to be momentary whilst passing the site access point. The effect of the proposed lighting on passing motorists is therefore considered to be negligible.
- 12.70 Whilst identifying the baseline conditions a view onto the site was observed from an accessible point on Gay Street to gain a representative view of the site from the residential properties and agricultural farm buildings situated within this locality. It was identified that no direct view onto the site was possible from this location. As such it is deemed highly unlikely that any of the low level site lighting will be visible from here. Inward lighting within the derrick on the drilling may be partially visible from here, although this is likely to be screened by further tree coverage. If this lighting is identifiable, the effects will be insignificant owing to the fact that this will be a small element of localised lighting to illuminate the rig only. The effects of the proposed lighting in the surrounding adjacent areas are therefore considered to be negligible.

12.71 The direct lighting sources will not be visible from any other locations other than those discussed above. It is unlikely therefore that this lighting will have any adverse effects on the district scale views and the surrounding landscape. The effect of the proposed lighting at a district scale is considered to be negligible.

Phase 3a: Short Term Testing and Evaluation - Gas

12.72 Further to the completion of the Phase 2 work, if hydrocarbons are encountered Phase 3a works will commence.

12.73 Phase 3 testing for gas will use the same lighting set up provided for the phase 2 works for a period of 2 weeks. The effects will therefore remain the same as those described for the Phase 2 works.

Phase 3b: Short Term Testing and Evaluation - Oil

12.74 Further to the completion of the Phase 2 work, if hydrocarbons are encountered Phase 3b works will commence.

12.75 Phase 3b testing for oil will use the same lighting set up provided for the phase 2 works for a period of 14 weeks. The effects will remain the same as those described for the Phase 2 works as the works remain temporary.

Phase 4a - Restoration

12.76 Should Phases 2 or 3 be unsuccessful then Phase 4a of the operations will commence, which will involve the restoration (for a maximum period of 6 weeks) of the site back to its original state. No lighting would be required because it is not practical to undertake this phase in artificial light.

Phase 4b – Retention

12.77 Should Phase 3 be successful, Phase 4b of the operations will commence, which will involve works to retain the well pending further planning consent. No lighting would be required because it is not practical to undertake this phase in artificial light.

12.78 All ground works will remain in place pending further planning consent; hence no construction lighting will be required throughout this phase and there will be no effect on any receptors.

Mitigation Measures

12.79 The following mitigation techniques will be applicable throughout those phases where lighting is proposed (Phase 2 and 3) and will be implemented through an Environmental Management Plan to be issued to the contractor:

- Lighting on the rig will be inward and downward pointing;
- The target lighting levels for the site to be set according to the relevant standards, Health and Safety and security requirements, but should be kept to a minimum to limit the effects of reflected upward light creating an aura above the site;
- If areas of the site are not used operationally throughout the night, the opportunity to dim fittings or switch some off should be taken, again subject to safety and security needs;
- Lighting should be angled away, and where possible positioned away, from the woodland edges; and
- The power of the lights should be the minimum necessary for purpose.

Residual Effects

12.80 The residual effects which are likely to be unavoidable are the visibility of any lighting used during Phase 1 (construction of the access road) and the rig (derrick) lighting due to its elevated position above the tree canopy surrounding the site. Therefore a minor adverse effect remains to the residents of Wood Barn Farm Cottage.

Cumulative Effects

12.81 There are not considered to be any projects in the area that need to be assessed cumulatively with this development.

Summary

12.82 At present the Application Site is an intrinsically dark site. It is therefore inevitable that there will be an element of alteration to the ambient lighting conditions within the site boundary and the immediate adjacent areas throughout the various phases of the works. However these effects will largely remain localised to the functional lighting provided, applicable to the site and the construction, exploration and decommissioning tasks.

12.83 Alterations to the landscape and the effects of the site lighting within the longer distance views will be negligible. It is unlikely that any lighting other than those located within the derrick will be visible, and even the effects of this will be negligible. **Table 12.3** contains a summary of the likely significant effects of the Proposed Development.

Table 12.3: Table of Significance – Lighting

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 the access road and well site											
Effect of vehicle headlights and freestanding light on landscape, if emergency occurs during construction.	Temporary	Negligible	No mitigation required							*	Negligible
Phase 2: Mobilisation of the drill rig and drilling operations											
Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	Temporary	Negligible	If areas of the site are not used operationally throughout the night, the opportunity to dim fittings or switch some off should be taken							*	Negligible
Effect on residents of Wood Barn Farm Cottage of rig lighting	Temporary	Minor Adverse	All lighting equipment on the site to have luminaires with optics to eliminate any direct upward light and maximise control of spill light. The target lighting levels for the site will be set according to the relevant standards, H&S and security requirements, but will be kept to a minimum							*	Minor adverse

			to limit the effects of reflected upward light creating an aura above the site.										
Effect of rig lighting on passing motorists	Temporary	Negligible	No specific mitigation								*		Negligible
Effect of rig lighting on the surrounding adjacent area	Temporary	Negligible	No specific mitigation								*		Negligible
Effect of rig lighting on the district level views	Temporary	Negligible	No specific mitigation							*			Negligible
Effect on longer distance views and the landscape of proposed rig lighting	Temporary	Negligible	No specific mitigation required							*			Negligible
Phase 3a: Short term testing and evaluation - Gas													
As outlined in Phase 2													
Phase 3b: Short term testing and evaluation - Oil													
As outlined in Phase 2													
Phase 4a: Restoration													
As outlined in Phase 1													
Phase 4b: Retention													
No effects identified													
Cumulative													
No cumulative effects													
* Geographical Level of Importance I = International; UK = United Kingdom; E = England; R = Regional; C = County; D = District; L = Local													

References (Ref)

- 12.1 Department for Communities and Local Government (2012) National Planning Policy Framework.
- 12.2 Clean Neighbourhoods and Environment Act (2005).
- 12.3 The Government Office for the South East, (2009) The South East Plan Regional Spatial Strategy for the South East of England, TSO (The Stationery Office).
- 12.4 Horsham District Council (2007) Horsham District Local Development Framework: The Core Strategy.
- 12.5 West Sussex County Council (2003) West Sussex Minerals Local Plan.
- 12.6 BS EN 12464-2:2007 Lighting of work places. Outdoor work places.
- 12.7 Chartered Institute of Building Services Engineers (CIBSE) Lighting Guide 6:1992 – Outdoor Environment.
- 12.8 Defra (2001) Lighting in the Countryside: Towards Good Practice.
- 12.9 Institution of Lighting Professionals (ILP formerly ILE) Guidance Notes for the reduction of Light Pollution.
- 12.10 The Health and Safety at Work Act 1974.
- 12.11 Wildlife and Countryside Act (1981).
- 12.12 The Conservation of Habitats and Species Regulations (2010).
- 12.13 Bat Conservation Trust (Version 3, May 2009) ILE Bats and Lighting in the UK.

13.0 SOCIO ECONOMICS

Introduction

- 13.1 This chapter of the ES has been prepared by Barton Willmore LLP, and assesses the likely significant socio economic effects of the Proposed Development on the Application Site and surrounding area or "Study Area". These considerations are most commonly related to the effects upon the human population that lives in close proximity to the Application Site. The analysis focuses on current provision and future need for employment and the likely effects on local economy.
- 13.2 The chapter describes the assessment methodology; the baseline conditions currently existing at the Application Site and surroundings; the likely significant economic 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.

Planning Policy Context

- 13.3 The planning policy context is set out in national, regional and local planning policies, which are covered in detail in the accompanying Planning Statement. However, a brief summary of the policies are provided below.

National Energy Policy

- 13.4 The Energy White Paper, *Meeting the Energy Challenge – A White Paper on Energy* (2007) (Ref. 13.1) sets out the UK Government's current international and domestic energy strategy for the Country. The Paper seeks to respond to the two long term energy challenges, namely tackling climate change by reducing carbon emissions and ensuring secure, clean and affordable energy as the UK becomes increasingly dependent on imported fuel. To manage the potential risks associated with higher imports of fossil fuels, the Paper stresses the need to maximise the economic production of the UK's domestic energy sources.
- 13.5 Chapter 4 of the White Paper outlines the Government's strategy for the improvements of the regulatory and policy framework to ensure the economic recovery of the UK's fossil fuel reserves. This strategy seeks to maintain the competitiveness of the UK's gas and oil production by encouraging a high level of investment in new infrastructure and to maintain a supportive environment that attracts a wide range of companies to exploit

existing and prospective fields.

National Planning Policy

National Planning Policy Framework (NPPF) (Ref. 13.2)

13.6 The NPPF was published in March 2012 and sets out the new approach to streamlining the Planning System and encouraging growth. All previous Planning Policy Guidance (PPGs) and Planning Policy Statements (PPSs) listed in Annex 3 of the NPPF are replaced by the NPPF.

13.7 Chapter 13 of the NPPF sets out the Government's policies specifically relating to facilitating the sustainable use of minerals and states that:

“Minerals are essential to support sustainable economic growth and our quality of life. It is therefore important that there is a sufficient supply of material to provide the infrastructure, buildings, energy and goods that the country needs. However, since minerals are a finite natural resource, and can only be worked where they are found, it is important to make best use of them to secure their long-term conservation.”

13.8 In specific reference to the extraction of hydrocarbon based mineral, paragraphs 147 and 148 of the NPPF state that Minerals planning authorities should;

- **“when planning for on-shore oil and gas development, including unconventional hydrocarbons, clearly distinguish between the three phases of development (exploration, appraisal and production) and address constraints on production and processing within areas that are licensed for oil and gas exploration or production;**
- **Encourage underground gas and carbon storage and associated infrastructure if local geological circumstances indicate its feasibility;**

When determining planning applications, minerals planning authorities should ensure that the integrity and safety of underground storage facilities are appropriate, taking into account the maintenance of gas pressure, prevention of leakage of gas and the avoidance of pollution.”

13.9 The NPPF further states that local planning authorities should ensure that their Local Plans are based on adequate, up-to-date and relevant evidence about the economic, social and environmental characteristics and prospects of the area. Local planning authorities should ensure that their assessment of, and strategies for, employment and other uses are integrated and take full account of relevant market and economic signals. In specific reference to minerals, the planning authorities should:

“...work with other relevant organisations to use the best available information to:

- **Develop and maintain an understanding of the extent and location of mineral resource in their areas, and**
- **Assess the projected demand for their use, taking full account of opportunities to use materials from secondary and other sources which could provide suitable alternatives to primary materials.” (NPPF, paragraph 163)**

Regional Planning Policy

The South East Plan – Regional Spatial Strategy (RSS) for the South East, 2009 (Ref. 13.3)

13.10 The South East Plan states that:

‘The Government’s regional policy is focused on enabling every region to perform to its full potential in both economic and employment terms. The contribution of the South East’s economy to the performance of the UK as a whole is of critical importance. The key challenge for the Regional Spatial Strategy is to maintain the region’s

national and international significance as one of the most successful regions in the world and to enable it to make its full contribution to the UK's overall competitiveness, in a way that best respects the principles of sustainable development and improves the quality of life of all those who live and work in the region, for now and in the future.' (Chapter 6, Page 43)

- 13.11 The South East Plan RSS advises that the economic vision of the Regional Economic Strategy 2006 – 2026 (RES) is to be a world class region achieving sustainable prosperity. It further explains that the RSS will assist the implementation of the RES.

Regional Economic Strategy (RES) 2006 – 2026, SEEDA (Ref. 13.4)

- 13.12 Although the Regional Development Agencies closed on 31 March 2012 the underlying philosophy of the RES is still relevant. The Strategy states that sustainable development lies at the heart of the RES and runs through it as a continuous, unifying thread and further states that:

'it forms an objective in its own right, with a focus on what the region can do in practical terms to reduce the ecological footprint while simultaneously tackling the pressing issues of security of water and energy supplies and reducing waste.' (Page 7)

- 13.13 The RES illustrates the key challenges facing the South East not least of all the achievement of sustainable prosperity and on this point it states that:

'Energy is a critical enabler of economic activity in the region. Energy supply has to be viewed in the context of the global need to address climate change; at the same time, there are also major concerns over continuing security of energy supplies in the face of a prospective 'energy gap' in the South East'(Page 18)

- 13.14 Within the context of global competitiveness, the RES believes that there are substantial opportunities to accelerate innovation in the region's land-based industries including support to explore markets for new crops for industry (including fuel and energy crops) (Page 54).

13.15 The RES illustrates that employment rates are generally higher in the South East than other UK and European regions and points out the following:

- **'Economic activity rates for women of all ages, minority ethnic groups and people with disabilities all lag significantly behind the regional average of 82%. Economic activity rates are below the UK average of 79% in most of Kent and in most coastal districts. Across the region, almost 250,000 economically inactive South East residents report themselves as wanting to work' (page 13)**

Local Planning Policy

Horsham Adopted Core Strategy, 2007 (Ref. 13.5)

13.16 The Horsham District Community Partnership has set out its vision for the District as the basis for the Community Strategy and envisions:

'A dynamic district where people care and where individuals from all backgrounds can get involved in their communities and share the benefits of a district that enjoys a high quality of life.'

13.17 Contributing to this, the vision sees Horsham as a district where people:

'...have access to a healthy and sustainable economy that is diverse and supported by a broadly skilled workforce which enables local business to succeed.'

Discussion

13.18 The planning application seeks permission for activity ranging from construction of the drill site, mobilisation and placement of equipment, drilling of the exploratory borehole, testing and evaluation and final restoration, and consequently increases employment opportunities of both a direct and indirect nature and across a range of construction and engineering occupations, thus stimulating improvement of the local economy.

Assessment Methodology

- 13.19 The assessment focuses on those elements of the Proposed Development that are expected to give rise to significant effects and will, therefore, examine changes in labour supply and employment, these comprising the economic elements. Although the Proposed Development relates to commercial use only, the assessment has also considered if there are likely to be any impacts on the local population in terms of housing, education and health.
- 13.20 The Application Site is located on the northern border of the ward of Chanctonbury, in Horsham District and is immediately adjacent to the ward of Billingshurst and Shipley (see **Figure 13.1**). For the purposes of the assessment, these two wards will form the 'Study Area'. In addition to the Study Area and for comparison purposes, demographic analysis will be conducted for Horsham District, West Sussex County, the South East Region and the UK.
- 13.21 To establish baseline conditions in respect of the Application Site and the local area, information has been obtained from the following sources:
- Experian Population Census Estimates (2010) and Projections (2011/2013) (Ref 13.6);
 - Experian based 2001 Census data (Ref 13.7);
 - NOMIS Official Labour Market Statistics (Ref 13.8);
 - Experian based Distance of Travel to Work Patterns (2001 Census) (Ref 13.9);
 - Business Register Employment Survey (BRES) (NOMIS) (Ref 13.10);
 - ONS 2008-based Age Profile Population Projections (Ref 13.11);
 - ONS (NOMIS) Ward Labour Market Profile (Ref 13.12);
 - ONS (NOMIS) Job Seeker Allowance (Ref 13.13); and
 - Annual Survey of Hours and Earnings – Resident Analysis (NOMIS) (Ref 13.14).
- 13.22 In respect of population and employment, information has been obtained at a national, regional, county, district and local level. Population estimates and projections, derived from the Experian Database (Ref 13.6), have been included for the years 2010 (based on Government Derived Estimates) 2011, 2012 and 2013 (when the construction and operational phase of the Proposed Development is anticipated).

Determining Significance of Effects

- 13.23 In this assessment, the Significance Matrix table presented earlier (**Table 2.2**) has been used to define the level of significance of effects.
- 13.24 In the context of the Proposed Development, local effects are those which affect receptors in the wards comprising the Study Area, while effects upon receptors within Horsham are considered to be at a District level.

Baseline Conditions

- 13.25 The baseline economic conditions with regard to population and employment levels are provided below, based largely on ONS 2001 Census information and more recent ONS derived labour market statistics.

Population

- 13.26 In 2001 the population of the District of Horsham totalled 122,088 people with 15,287 residing within the Study Area. The total male population of Horsham was 59,293 (7,526 within the Study Area) with a female population of 62,795 (of which 7,761 within the Study Area).
- 13.27 By 2010, the Experian revised population estimates confirm that the population of the Study Area had increased to 17,252. The Application Site comprises the well site, access road and ancillary infrastructure and, therefore, has no resident population within it.
- 13.28 **Table 13.1** sets out the population projections over the period 2010 to 2013 and demonstrates that the population of the Study Area will increase as a result of natural growth (e.g. births/deaths/migration) by 1.3% between 2010 and 2013. **Table 13.1** demonstrates that the Application Site is located in a District of below average growth. The County, however, is anticipated to grow at a higher than national average rate, matching a 2.3% increase expected throughout the South East.

Table 13.1: Population Projections

Year	Study Area	Horsham	West Sussex	South East	UK
2010 (Estimate)	17,252	130,806	799,913	8,523,200	62,266,602
2011	17,364	131,507	805,809	8,589,810	62,695,469
2012	17,425	132,305	812,116	8,655,965	63,121,021
2013	17,484	133,109	818,203	8,721,906	63,545,551
% Change	1.3%	1.8%	2.3%	2.3%	2.1%

Source: Experian Revised Population Estimates/Projections @2011 Update (Ref 13.6)

Age Profile

13.29 Analysis of age profiles of the area (**Table 13.2**) demonstrate that in 2001 the Study Area and Horsham in general had a lower elderly population but a higher working age population than West Sussex overall. The younger population was commensurate with levels in the County overall thus demonstrating that Horsham, and in particular the Study Area, primarily comprised a young to middle aged, family-based population demographic.

Table 13.2: Population Age Profile @2001 Census (%)

Age Band	Study Area	Horsham	West Sussex	South East	UK
<15	18%	19%	18%	19%	19%
15 – 60/64	65%	64%	62%	65%	65%
65+	17%	17%	20%	16%	16%

Source: Experian derived 2001 Census data (Ref 13.7)

13.30 Population projections categorised by age bands (**Table 13.3**) demonstrate that by 2013 the Study Area and Horsham will have followed the national trend of comprising an increasing elderly population and will be experiencing a higher number of elderly residents than children.

Table 13.3: Population Projections Age Profile @ 2013 (%)

Age Band	Study Area	Horsham	West Sussex	South East	UK
<15	16%	17%	17%	17%	17%
15 – 60/64	62%	63%	61%	64%	65%
65+	22%	21%	22%	18%	18%

Source: Experian derived 2001 Census data (Ref 13.7)

13.31 In summary, between 2010 and 2013 the Study Area is anticipated to have grown by 232 people to 17,484 and Horsham by 2,303 to 133,109 and, while both will continue to be dominated by young to middle aged families, both will experience an increase in elderly population.

Economic Profile

- 13.32 As demonstrated in **Table 13.4**, in 2001 Horsham's labour supply comprised 62,694 economically active people (72.2%) of the 86,879 total population of working age i.e. aged 16 to 74). Of this working age population, 1,356 were unemployed which represented 1.6% of the working age population. This level of unemployment in the District was less than half that of the UK, overall.
- 13.33 Within the Study Area the economically active population totalled 7,796 (which represented 69.5% of the total population of working age). The total figure of unemployed in the Study Area was 171 (1.5% of the working age population).

Table 13.4: Economic Activity of Residential Population @2001 Census (%)

Economic Activity	Study Area	Horsham	West Sussex	South East	UK
Total working age population (WAP)	11,210	86,879	530,622	5,766,552	42,364,079
Total economically active	7,796	62,694	368,301	4,037,705	28,166,755
% of total WAP who are economically active	69.5%	72.2%	69.4%	70.0%	66.5%
% of total WAP who are economically inactive	52.0%	56.9%	54.8%	55.4%	52.3%
% of total WAP who are unemployed	1.5%	1.6%	1.9%	2.3%	3.4%

Source: Experian based 2001 Census (Ref 13.7)

- 13.34 In summary, **Table 13.4** demonstrates that Horsham District, and the Study Area in particular, experienced lower levels of unemployment and higher levels of working age population in employment that was the case at county, regional or national level.
- 13.35 Whilst more recent data on economic activity are not available at ward level, the ONS (via NOMIS) (Ref 14.3) set yearly estimates of economic activity which demonstrate that within the District, from 2004 to 2011 unemployment levels rose from 2.8% to 4.9%, an increase of 2.1%, and representative of 3,200 people unemployed. Horsham have increased unemployment levels at a similar rate to the South East overall who experienced a 2.2% increase in unemployment over the same period (see **Appendix 13.1** for detailed unemployment trend).
- 13.36 An indication of unemployment levels at ward level can be obtained through the examination of economically active residents claiming Job Seeker Allowance (JSA). Data

supplied by the ONS (via NOMIS) demonstrate that both wards comprising the Study Area have experienced an increase in JSA claimants, in the case of Billingshurst and Shipley from 0.8% of working age population in January 2005 to 2.5% in January 2012 and in the case of Chanctonbury from 0.5% in January 2005 to 1.2% in January 2012.

- 13.37 Examination of job seeker statistics by Occupation demonstrates that during the period January 2011 to January 2012 between 55 and 80 residents of Horsham were seeking employment in construction related occupations.
- 13.38 In summary, Horsham District is experiencing increasing levels of unemployment which by mid-2011 had reached 3,200 people (160 of whom were residents of the Study Area). This, coupled with anticipated population growth of the Study Area and District overall, indicates a need for increased employment opportunities in the District.

Distance of Travel to Work

- 13.39 As demonstrated by **Table 13.5**, at the time of the 2001 Census, a high percentage of Horsham residents (20.8%) travelled between 10km and 20km for employment. This represented a particularly high percentage of 'out commuting' compared to West Sussex or the South East overall where the highest percentage of commuters travelled less than 2km for employment. This considerable disparity indicates a need for increased employment opportunities closer to home.

Table 13.5: Distance of Travel to Work @2001 Census (%)

Distance	Study Area	Horsham	West Sussex	South East
Less than 2km %	11.6%	17.3%	21.7%	20.4%
2km to less than 5km %	6.8%	11.5%	17.1%	17.6%
5km to less than 10km %	10.4%	10.7%	13.5%	15.2%
10km to less than 20km %	20.8%	20.6%	14.2%	13.7%
20km to less than 40km %	17.3%	12.7%	8.9%	10.3%
40km to less than 60km %	6.7%	7.0%	5.1%	3.9%
60km and over %	5.4%	3.2%	3.6%	3.6%

Source: Experian 2001 Census data (Ref 13.9) (excludes 'working from home' and 'other')

Employment by Industry

- 13.40 The local economy within the Study Area is primarily driven by the Education, Manufacturing and Construction industries.

- 13.41 Manufacturing as an industry is in general decline in the UK which, for the Study Area and Horsham, will have significant effects given its status as the second largest employing sector in the District. To ensure the future economic viability and vitality of the District it will prove important to boost opportunities within other key employing sectors, not least of all Construction where an experienced labour force already exists.

Table 13.6: Main Sectors of Employment @2010

Location	Largest Employment Sector	Second Largest Employment Sector	Third Largest Employment Sector
Study Area	Education (12.9%)	Manufacturing (12.3%)	Construction (11.8%)
Horsham	Retail (11.0%)	Manufacturing (10.0%)	Education (9.0%)
West Sussex	Health (12.6%)	Retail (10.9%)	Accommodation & Food Services (7.8%)
South East	Health (12.1%)	Retail (10.3%)	Education (9.9%)

Source: ONS (BRES) Employment Survey, 2010 Data (Ref 13.10)

Qualifications

- 13.42 Examination of the qualification levels of those residents aged between 16 and 74 at the time of the 2001 Census (**Table 13.7**), demonstrates that the working age population is, in general, more highly qualified than the overall population at County, Regional or National level.
- 13.43 Higher levels of qualified residents coupled with higher incidences of lengthy commuting distances could indicate a need for increased levels of more professional or technical based employment to be generated locally. This would seem to be substantiated by the BRES data supplied at **Table 13.7** which indicates that the highest volume of occupations available within Horsham tend to be retail or manufacturing based.

Table 13.7: Qualifications @2001 Census

Qualification Level	Study Area	Horsham	West Sussex	South East	UK
No qualifications or Unknown	27%	26%	31%	31%	36%
GCSE/A Level	51%	51%	50%	48%	44%
Degree/NVQ4+/HND/ Professional Grade	22%	23%	19%	22%	20%

Source: Experian derived 2001 Census data (Ref 13.7)

Job Density and Average Earnings

- 13.44 Historically, job densities (i.e. the ratio of jobs available divided by the residential population aged between 16 and 64) within Horsham have, in general, followed a pattern of minor fluctuation and general decline (from a density of 0.79 in 2000 to 0.75 in 2009) and have remained consistently below the densities of West Sussex, the South East and the UK, overall.
- 13.45 Between 2000 and 2009 Horsham, and West Sussex in general, have experienced fluctuating levels of total jobs which has resulted in a net loss of 1,000 (rounded) jobs in Horsham over the ten year period and a net loss of 3,000 (rounded) jobs in West Sussex overall. (See **Appendix 13.2** for detailed job density and total jobs trend).
- 13.46 Comparison of the earning capacity of workers resident in Horsham in 2011 demonstrates that the average weekly and annual income of workers was approximately 3% higher than in West Sussex generally (see **Table 13.8**).

Table 13.8: Average Earnings @2011

Location	Average Weekly Pay – Gross	Average Annual Pay - Gross
Horsham	502.6	26,519
West Sussex	489.1	25,786

Source: Annual Survey of hours and earnings – workplace analysis of full-time workers (Ref 13.4)

Economic Profile Summary

- 13.47 The Application Site is located in a District that demonstrates a rising unemployment trend over time with economically active residents actively seeking employment opportunities in sectors such as Construction. There has been an historical need for residents of Horsham to travel above average distances to reach suitable employment but analysis has shown that employment provided within Horsham is more highly paid than in the County generally.

Likely Significant Effects

Effects on Population, Housing and Community Provision

- 13.48 As the Proposed Development comprises commercial activity only and will not generate an increase in population, there will be negligible effects on housing or community provision such as health or education.

Effects on Industry and Employment

13.49 The land is currently used in association with the existing agricultural operations of Wood Barn Farm, and is maintained and used as pasture land. The Proposed Development does not prohibit the continued use and operation of the farm and provides a suitable method of agricultural diversification which supplements the farms existing income. Should hydrocarbons be discovered the Application Site will provide a steady income for the farm over a long term period, and similarly, if no hydrocarbons are discovered the land will be returned to its former use and therefore the farm will not suffer any loss from the Proposed Development.

Phase 1 – Construction of the access road and well site

13.50 Based on experience of previous schemes, during the construction phase, it is expected that 25 construction workers will be employed. It would be the intention of the Applicant, where practicable, to resource labour from the local community creating 25 new jobs. During this phase, it is envisaged that considerable indirect employment and economic benefit will be experienced through the purchase of local services and products; the most significant being the procurement of locally supplied aggregates, timber, and associated construction materials which will be in addition to the day-to-day needs of the workforce e.g. meals, refreshments etc. It is, therefore, considered that Phase 1 of the Proposed Development will have a moderate/minor beneficial effect.

Phase 2, Phase 3a and Phase 3b – Mobilisation, and short term testing

13.51 Phase 2, Phase 3a and Phase 3b of the Proposed Development will primarily require the employment of specialist engineers and a crew of approximately 22 workers who operate the technical equipment for this phase of the development. These phases will, however, not only provide employment for the crew for the period of drilling and testing but will also provide indirect employment for local businesses such as restaurants, cafes, public houses, foodstores and fuel stations. As, at this juncture, the necessary works will take the form of a 24 hour operation it is envisaged that some, if not all, workers will be accommodated on-site. If however, not all crew are accommodated in this way, an additional boost to the local economy will be in the form of need for Bed and Breakfast or local hotel accommodation.

13.52 In addition to the creation of jobs during the construction and operation phases, the development will also strengthen the local rural economy by providing an alternative means of income for the landowner. The Application Site forms part of a larger

agricultural field which is currently grazed by cattle. In the context of fluctuating prices and the risk of disease to livestock the Proposed Development provides the landowner with a guaranteed source of income. Following the completion of the testing phase, if commercial quantities of hydrocarbons are not discovered the land will be restored back to its former use in accordance with a restoration plan which prior to commencement will be agreed with the landowner and West Sussex County Council. As the landowner owns a number of alternative fields in the local area for the grazing of cattle and will receive an income for the use of the land for a well site, it is considered that the Proposed Development will have a beneficial impact on the economic viability of the farm.

- 13.53 Overall, it is considered that Phase 2, Phase 3a and Phase 3b of the Proposed Development will have a minor beneficial effect on the employment and the local economy.

Phase 4a - Restoration

- 13.54 During the final phase when full restoration of the Application Site will take place, employment for approximately ten workers ranging from construction workers to landscapers will be generated. Once again, local labour and businesses will be sought to complete this phase of development resulting in a direct benefit to local employment and an indirect benefit to local suppliers of construction and landscaping services and products. Overall, it is considered that Phase 4a will have a moderate/minor beneficial effect.

Phase 4b – Retention

- 13.55 Should it prove feasible, following the outcome of Phase 3a or Phase 3b, that the Application Site has potential to become a production site (an outcome which would make a significant contribution to employment and the local economy in general), there will follow a period of retention whilst appropriate planning consent is sought. During this period, it is less likely that the site will generate any significant employment other than any maintenance or security measures that may be required. Phase 4b, therefore, is considered to have a negligible effect.
- 13.56 In summary, an approximate total of 57 temporary jobs will be created by the Proposed Development which will include a wide range of occupations from management to general labour and specialism ranging from engineering to landscaping. In addition, a boost to the local economy will be experienced from the personal needs of the

workforce such as accommodation and meals, to the wide ranging product and service needs of the development such as aggregates, fencing, plant hire and plant maintenance.

- 13.57 The provision of direct employment for 57 people and indirect employment for local businesses in an area identified as experiencing rising unemployment and comprising district-wide unemployment claimants seeking compatible trades is considered to have an overall effect ranging from negligible to moderate/minor beneficial.

Mitigation Measures

Effects on Population, Housing, Health, Education and Employment

All Phases

- 13.58 No mitigation measures are required during the four phases (construction, operation, testing, restoration or retention) as no adverse effects are expected.

Residual Effects

All Phases

- 13.59 During all four phases the effects of the Proposed Development on population, housing, health, education and employment are expected to be either negligible or beneficial. Therefore the residual effects of the proposals are considered to be negligible to moderate beneficial.

Summary

- 13.60 The Proposed Development is anticipated to generate employment for approximately 57 people in trades identified as having a readily available labour force. In addition, considerable indirect economic vitality will be introduced to the District through the procurement of locally supplied services and materials. Moreover, the Proposed Development supports agricultural diversification and provides a steady income to supplement an existing agricultural business.
- 13.61 Overall, the Proposed Development is anticipated to produce a negligible to moderate/minor beneficial effect on the socio economic conditions with the Study Area and Horsham District, generally.

Table 13.9: Table of Significance – Socio Economics

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	B	L	
Phase 1: Construction of the access road and well site											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Moderate/Minor Beneficial	None Required						*	*	Moderate/Minor Beneficial
Phase 2: Mobilisation of the drill rig and drilling operations											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Minor Beneficial	None Required						*	*	Minor Beneficial
Phase 3a: Short term testing and evaluation - gas											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Minor Beneficial	None Required						*	*	Minor Beneficial
Phase 3b – Short term testing and evaluation - oil											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Minor Beneficial	None Required						*	*	Minor Beneficial
Phase 4a: Restoration											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Moderate/Minor Beneficial	None Required						*	*	Moderate/Minor Beneficial

Phase 4b: Retention											
Effects on population, housing, healthcare and Education	Temporary	Negligible	None Required						*	*	Negligible
Effects on Employment	Temporary	Negligible	None Required						*	*	Negligible

*** Geographical Level of Importance**

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

References (Ref)

- 13.1 Meeting the Energy Challenge – A White Paper on Energy (2007).
- 13.2 National Planning Policy Framework (NPPF).
- 13.3 The South East Plan – Regional Spatial Strategy (RSS) for the South East, 2009.
- 13.4 Regional Economic Strategy (RES) 2006 – 2026, SEEDA.
- 13.5 Horsham Adopted Core Strategy, 2007.
- 13.6 Experian Population Census Estimates (2010) and Projections (2011/2013).
- 13.7 Experian based 2001 Census data.
- 13.8 NOMIS Official Labour Market Statistics.
- 13.9 Experian based Distance of Travel to Work Patterns (2001 Census).
- 13.10 Business Register Employment Survey (BRES) (NOMIS).
- 13.11 ONS 2008-based Age Profile Population Projections.
- 13.12 ONS (NOMIS) Ward Labour Market Profile.
- 13.13 ONS (NOMIS) Job Seeker Allowance.
- 13.14 Annual Survey of Hours and Earnings – Resident Analysis (NOMIS).

14.0 SUMMARY OF MITIGATION MEASURES AND MONITORING

14.1 This chapter of the ES presents a summary of the mitigation and monitoring measures identified by the specialist environmental studies in the ES. Full details can be found in the respective ES chapters.

14.2 Schedule 4, part 1 of the EIA Regulations require an ES to include:

“...a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.”

14.3 Where Environmental Impacts have been identified, mitigation measures have been recommended. We provide a summary of these in this chapter.

14.4 The mitigation and enhancement measures included in this ES are considered in relation to the four Phases of the Proposed Development, and include measures which have been incorporated into the development parameters, the detailed design, and controls on construction and operational procedures.

14.5 **Table 14.1** outlines a topic by topic summary of the key issues addressed by the ES and the mitigation measures identified. The mitigation measures are separated into the above categories.

14.6 The Applicant anticipates that, where appropriate, WSCC will attach conditions to the planning permission to ensure commitment to these mitigation measures.

Table 14.1 Summary of Mitigation and Monitoring

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Phase 1: Construction of the access road and well site		
Ecology	Removal of small sections of species-poor habitats	Enhancements recommended to improve hedgerow during the construction stage (H1 in Figure 7.3).
	Damage to woodland edge	As a precaution the site construction (installation of plant and infrastructure) and decommissioning extents would be clearly marked prior to commencement in order to reduce the risk of accidental damage to woodland edge vegetation or compression of tree roots. Trees and woodland would be marked as no go areas for both workers and machinery in order to reduce disturbance. Areas used for materials and storage would be clearly defined within the Application Site and away from the woodland edge.
	Pollution to adjacent habitats through run-off and dust	Standard pollution prevention controls over site establishment, operation and decommissioning would be implemented to avoid surface run-off and dust emissions from the site to the adjacent habitats.
	Potential effects of landtake on badger (See Confidential Appendix 7.3)	-
	Potential effects of landtake on bats	No mitigation required
	Direct disturbance to breeding birds during vegetation removal	No mitigation required
	Impacts on hazel dormouse during landtake. Removal of low quality habitat	Enhancements to hedgerow (H1 on Figure 7.3) would benefit this species.

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	Impacts on great crested newts during migration to and from breeding pond.	No mitigation required
	Effect of noise disturbance on breeding birds	No mitigation required
	Effect of noise disturbance on badger (See Confidential Appendix 7.3)	-
Landscape and Visual Impact	Loss of agricultural land	Careful storage of soils for eventual reinstatement
	Changes to topography	-
	Some encroachment on tree root protection zones; loss of vegetation at access	Additional hedgerow planting; use of no dig construction at access
	Change in landscape character	Strengthening of hedgerow network through additional hedgerow planting
	Site visibility	Strengthening of field patterns through strengthening of hedgerow network
Noise	Noise effects from on-site activity – includes vehicles on site access track	Generic noise/site management methods, e.g. ensuring quietest available equipment is used, silencing exhausts. Undertaking noise monitoring to ensure noise limits are not exceeded.
	Noise effects from on-road development traffic	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Transport and Access	Changes in traffic volumes	No mitigation required
	Abnormal Loads	The implementation of a Traffic Management Plan to manage vehicle movements
	Changes in HV volumes	No mitigation required
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.
Lighting	Effect of construction lighting on local landscape	Construction will take place during daylight hours except in emergencies.
	Effect on longer distance views and the landscape	No specific mitigation required
	Effect on Wood Barn Farm	Construction will take place during daylight hours except in emergencies.
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required
Phase 2: Mobilisation of the drill rig and drilling operations		
Ecology	Effects of noise and lighting disturbance on bats	No mitigation required
	Effects of noise and lighting disturbance on breeding birds	No mitigation required
	Effects of noise and	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	lighting disturbance on hazel dormouse	
	Effects of noise and lighting disturbance on badger (See Confidential Appendix 7.3)	-
	Potential vehicle collision risk with nocturnal wildlife	No mitigation required
Landscape and Visual Impact	Loss of agricultural land	Careful storage of soils in bunds for eventual reinstatement
	Changes to topography	-
	Some encroachment on tree root protection zones; loss of vegetation at access	Additional planting of hedgerows; use of no dig construction at access
	Change in landscape character	Strengthening of hedgerow network
	Change to historic landscape character	Strengthening of field patterns through strengthening of hedgerow network
	Site visibility	Additional hedge planting and bunding to screen the Proposed Development
Noise	Noise effects from on-site activity – includes vehicles on site access track	Generic noise/site management methods, e.g. ensuring quietest available equipment is used, silencing exhausts. Undertaking noise monitoring to ensure noise limits are not exceeded.
	Noise effects from on-road development traffic	No mitigation required
Transport and Access	Changes in traffic volumes	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	Changes in HV volumes	No mitigation required
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.
	Land contamination at the drill site and release of contaminated run off	Placement of HDPE line across site and creation of lined ditches leading to interceptor.
	Consequential effect on protected areas	Placement of HDPE line across site and creation of lined ditches leading to interceptor; plus distance to nearest water-dependant protected area.
	Contamination of aquifers during drilling.	Short duration of work on uncased shallow aquifers, mud balance control to reduce formation entry and use of non-toxic drilling fluids
	Accidental release of contaminants during drilling	HDPE liner is sealed around well cellar preventing entry of spilled contaminants into the borehole
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	If areas of the site are not used operationally throughout the night, the opportunity to dim fittings or switch some off should be taken
	Effect on residents of Wood Barn Farm Cottage of rig lighting	All lighting equipment on the site to have luminaires with optics to eliminate any direct upward light and maximise control of spill light. The target lighting levels for the site will be set according to the relevant standards, H&S and security requirements, but will be kept to a minimum to limit the effects of reflected upward light creating an aura above the site.
	Effect of rig lighting on passing motorists	No specific mitigation
	Effect of rig lighting on the	No specific mitigation

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	surrounding adjacent area	
	Effect of rig lighting on the district level views	No specific mitigation
	Effect on longer distance views and the landscape of proposed rig lighting	No specific mitigation
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required
Phase 3a: Short term testing and evaluation - gas		
Ecology	Effects of noise and lighting disturbance on bats	No mitigation required
	Effects of noise and lighting disturbance on breeding birds	No mitigation required
	Effects of noise and lighting disturbance on hazel dormouse	No mitigation required
	Effects of noise and lighting disturbance on badger (See Confidential Appendix 7.3)	-
Landscape and Visual Impact	Loss of agricultural land	Careful storage of soils in on site bunds for eventual reinstatement
	Changes to topography	-
	Some encroachment on tree root protection zones;	Additional hedgerow planting; use of no dig construction at access

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	loss of vegetation at access	
	Change in landscape character	Strengthening of hedgerow network through additional planting
	Change to historic landscape character	Strengthening of field patterns through strengthening of hedgerow network
	Site visibility	Additional hedge planting and bunding to screen the Proposed Development
Noise	Noise effects from on-site activity – includes vehicles on site access track	Generic noise/site management methods, e.g. ensuring quietest available equipment is used, silencing exhausts. Undertaking noise monitoring to ensure noise limits are not exceeded.
	Noise effects from on-road development traffic	No mitigation required
Transport and Access	Changes in traffic volumes	No mitigation required
	Changes in HV volumes	No mitigation required
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.
	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.	Placement of HDPE line across site and creation of lined ditches leading to interceptor.
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	If areas of the site are not used operationally throughout the night, the opportunity to dim fittings or switch some off should be taken
	Effect on residents of	All lighting equipment on the site to have luminaires with optics to eliminate any direct

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	Wood Barn Farm Cottage of rig lighting	upward light and maximise control of spill light. The target lighting levels for the site will be set according to the relevant standards, H&S and security requirements, but will be kept to a minimum to limit the effects of reflected upward light creating an aura above the site.
	Effect of rig lighting on passing motorists	No specific mitigation
	Effect of rig lighting on the surrounding adjacent area	No specific mitigation
	Effect of rig lighting on the district level views	No specific mitigation
	Effect on longer distance views and the landscape of proposed rig lighting	No specific mitigation required
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required
Phase 3b: Short term testing and evaluation - oil		
Ecology	Effects of noise and lighting disturbance on bats	No mitigation required
	Effects of noise and lighting disturbance on breeding birds	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	Effects of noise and lighting disturbance on hazel dormouse	No mitigation required
	Effects of noise and lighting disturbance on badger (See Confidential Appendix 7.3)	-
Landscape and Visual Impact	Loss of agricultural land	Careful storage of soils
	Changes to topography	-
	Some encroachment on tree root protection zones; loss of vegetation at access	Additional planting; use of no dig construction at access
	Change in landscape character	Strengthening of hedgerow network
	Change to historic landscape character	Strengthening of field patterns through strengthening of hedgerow network
	Site visibility	Additional hedge planting and bunding to screen
Noise	Noise effects from on-site activity – includes vehicles on site access track	As for Phase 1
	Noise effects from on-road development traffic	No mitigation required
Transport and Access	Changes in traffic volumes	No mitigation required
	Changes in HV volumes	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.
	Land contamination at the drill site and release of contaminated run off	Placement of HDPE line across site and creation of lined ditches leading to interceptor.
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	If areas of the site are not used operationally throughout the night, the opportunity to dim fittings or switch some off should be taken
	Effect on residents of Wood Barn Farm Cottage of rig lighting	All lighting equipment on the site to have luminaires with optics to eliminate any direct upward light and maximise control of spill light. The target lighting levels for the site will be set according to the relevant standards, H&S and security requirements, but will be kept to a minimum to limit the effects of reflected upward light creating an aura above the site.
	Effect of rig lighting on passing motorists	No specific mitigation
	Effect of rig lighting on the surrounding adjacent area	No specific mitigation
	Effect of rig lighting on the district level views	No specific mitigation
	Effect on longer distance views and the landscape of proposed rig lighting	No specific mitigation
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Phase 4a: Restoration		
Ecology	Effects on the site's vegetation, habitats and wildlife	Enhancement recommended to improve hedgerow during construction stage (H1 in Figure 7.3).
Landscape and Visual Impact	Restoration of agricultural land	Careful re-use of soils and use of best silvicultural practices
	Restoration of topography	-
	Some encroachment on tree root protection zones; loss of vegetation at access	Additional hedge planting; use and removal of no-dig construction for access
	Change in landscape character	Strengthening of hedgerow network through additional planting
	Change to historic landscape character	Strengthening of field patterns through strengthening of hedgerow network
	Site visibility	Additional hedge planting
Noise	Noise effects from on-site activity – includes vehicles on site access track	As for Phase 1
	Noise effects from on-road development traffic	No mitigation required
Transport and Access	Changes in traffic volumes	No mitigation required
	Abnormal Loads	The implementation of a Traffic Management Plan to manage vehicle movements
	Changes in HV volumes	No mitigation required

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Ground and Groundwater Protection	Contamination of aquifers following well abandonment	Sealing of well using cement plugs and use of corrosion-resistant materials
Lighting	Effect of construction lighting on local landscape	Construction will take place during daylight hours except in emergencies.
	Effect on longer distance views and the landscape	No specific mitigation
	Effect on Wood Barn Farm	Construction will take place during daylight hours except in emergencies.
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required
Phase 4b: Retention		
Ecology	Small loss of ecological value land.	Enhancement recommended to improve hedgerow at construction stage (H1 in Figure 7.3).
Landscape and Visual Impact	Loss of agricultural land	-
	Changes to topography	-
	Some encroachment on tree root protection zones; loss of vegetation at access	Establishment of additional hedge planting

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
	Change in landscape character	Establishment of additional hedge planting: strengthening of hedgerow network
	Change to historic landscape character	Establishment of additional hedge planting: strengthening of field patterns through strengthening of hedgerow network
	Site visibility	Additional hedge planting and retention of bunding
Noise	Noise effects from on-site activity – includes vehicles on site access track	As for Phase 1
	Noise effects from on-road development traffic	No mitigation required
Transport and Access	Changes in traffic volumes	No mitigation required
	Abnormal Loads	The implementation of a Traffic Management Plan to manage vehicle movements
	Changes in HV volumes	No mitigation required
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Land contamination at the drill site and release of contaminated run off
	Construct access track so as to allow down-slope run off and shallow groundwater flow to continue to occur.	Placement of HDPE line across site and creation of lined ditches leading to interceptor.
Lighting	No effects identified	No mitigation required
Socio-Economics	Effects on population, housing, healthcare and Education	No mitigation required
	Effects on Employment	No mitigation required

Conclusion

- 14.7 Having regard to the summary of the potential environmental impacts, the environmental sensitivity of the site is limited and adverse impacts can be mitigated by appropriate well site design, proper site management and best practice procedures during construction and operational phases of the Proposed Development.

15.0 STATEMENT OF SIGNIFICANCE

Residual Effects

- 15.1 The residual effects of the Proposed Development following implementation of the proposed measures outlined in the preceding technical chapters and in Chapter 14 have been assessed. Each technical chapter contains detailed consideration of residual effects, however, **Table 15.1** summarises the main residual effects of the Proposed Development. The significance criteria are set out in Chapter 2 (EIA Methodology) and within relevant technical chapters where a different approach is followed.
- 15.2 The preparation of the ES was undertaken in parallel with the design process. Consequently, many measures to mitigate likely significant adverse environmental effects have been incorporated into the Proposed Development design in order to avoid, reduce or offset such effects. It is anticipated that the mitigation measures identified will be secured by condition, to ensure that the high quality scheme proposed by the Applicant is delivered.

Conclusions

- 15.3 In summary, the Proposed Development will develop an area of agricultural land which is currently used for pasture, for the development of a temporary well site and access road including ancillary infrastructure and equipment, for the purposes of drilling an exploratory borehole and short term testing programme of any hydrocarbons discovered, in the anticipated Willow Prospect. The Proposed Development will generate beneficial effects through the strengthening of hedgerow networks and field boundaries which provide positive visual and biodiversity benefits. Moreover, the Proposed Development will have some benefit to the local economy through jobs, employee spending and the use of local services, as well as meeting a national need to develop energy infrastructure and our native fuel supplies.
- 15.4 The ES has identified a number of effects, the majority of which relate to the construction Phase (Phase 1) and equipment mobilisation and drilling operations (Phase 2). Overall the Proposed Development is considered to have a negligible effect.

Table 15.1: Significance Table

Chapter	Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate /Minor) (Beneficial/ Adverse/ Negligible)	Geographical Importance*							Residual Effects (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)
				I	UK	E	R	C	B / D	L	
Phase 1: Construction of access road and well site											
Ecology	Removal of small sections of species-poor habitats	Temporary	Minor Adverse							✓	Minor Beneficial
	Damage to woodland edge	Permanent	Minor Adverse							✓	Negligible
	Pollution to adjacent habitats through run-off and dust	Temporary	Minor Adverse							✓	Negligible
	Potential effects of land take on badger (See Confidential Appendix 7.3)	-	-								-
	Potential effects of land take on bats	Temporary	Negligible							✓	Negligible
	Direct disturbance to breeding birds during vegetation removal	Temporary	Negligible							✓	Negligible
	Impacts on hazel dormouse during land take. Removal of low quality habitat	Temporary	Negligible							✓	Minor Beneficial
	Impacts on great crested newts during migration to and from breeding pond.	Temporary	Negligible							✓	Negligible
	Effect of noise disturbance on breeding birds	Temporary	Negligible							✓	Negligible

Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Temporary	Minor										✓	Negligible	
Lighting	Effect of construction lighting on local landscape	Temporary	Negligible										✓	Negligible	
	Effect on longer distance views and the landscape	Temporary	Negligible									✓		Negligible	
	Effect on Wood Barn Farm	Temporary	Minor Adverse										✓	Minor adverse	
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible										✓	✓	Negligible
	Effects on Employment	Temporary	Moderate/Minor Beneficial										✓	✓	Moderate/Minor Beneficial
Phase 2: Mobilisation of the drill rig and drilling operations															
Ecology	Effects of noise and lighting disturbance on bats	Temporary	Negligible											✓	Negligible
	Effects of noise and lighting disturbance on breeding birds	Temporary	Negligible											✓	Negligible
	Effects of noise and lighting disturbance on hazel dormouse	Temporary	Negligible based on the current but incomplete surveys.											✓	Negligible
	Effects of noise and lighting disturbance on badger (See Confidential Appendix 7.3)	-	-												-
	Potential vehicle collision risk with nocturnal wildlife	Temporary	Negligible											✓	Negligible
Landscape and Visual	Loss of agricultural	Temporary	Major/moderate										✓	Moderate adverse	

Impact	land		adverse																					
	Changes to topography	Temporary	Moderate/minor adverse																✓	Moderate/minor adverse				
	Some encroachment on tree root protection zones; loss of vegetation at access	Permanent / Temporary	Moderate adverse																	✓	Minor adverse			
	Change in landscape character	Temporary	Major / moderate adverse																		✓	Moderate adverse		
	Change to historic landscape character	Temporary	Major / moderate adverse																			✓	Moderate adverse	
	Site visibility	Temporary	Ranges from major adverse to moderate/minor adverse (some viewpoints nil)																				✓	Ranges from major/moderate adverse to moderate/minor adverse
Noise	Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible																			✓	Negligible	
	Noise effects from on-road development traffic	Temporary	Negligible																				✓	Negligible
Transport and Access	Changes in traffic volumes	Temporary	Negligible																				✓	Negligible
	Changes in HV volumes	Temporary	Negligible																				✓	Negligible
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Temporary	Minor																				✓	Negligible
	Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor																				✓	Negligible

	Consequential effect on protected areas	Temporary	Negligible								✓	Negligible
	Contamination of aquifers during drilling.	Temporary	Minor								✓	Negligible
	Accidental release of contaminants during drilling	Temporary	Minor								✓	Negligible
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	Temporary	Negligible								✓	Negligible
	Effect on residents of Wood Barn Farm Cottage of rig lighting	Temporary	Minor Adverse								✓	Minor adverse
	Effect of rig lighting on passing motorists	Temporary	Negligible								✓	Negligible
	Effect of rig lighting on the surrounding adjacent area	Temporary	Negligible								✓	Negligible
	Effect of rig lighting on the district level views	Temporary	Negligible							✓		Negligible
	Effect on longer distance views and the landscape of proposed rig lighting	Temporary	Negligible							✓		Negligible
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible							✓	✓	Negligible
	Effects on Employment	Temporary	Minor Beneficial							✓	✓	Minor Beneficial
Phase 3a: Short term testing and Evaluation - gas												
Ecology	Effects of noise and lighting disturbance	Temporary	Negligible								✓	Negligible

	Noise effects from on-road development traffic	Temporary	Negligible								✓	Negligible
Transport and Access	Changes in traffic volumes	Temporary	Negligible								✓	Negligible
	Changes in HV volumes	Temporary	Negligible								✓	Negligible
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Temporary	Minor								✓	Negligible
	Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor								✓	Negligible
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	Temporary	Negligible								✓	Negligible
	Effect on residents of Wood Barn Farm Cottage of rig lighting	Temporary	Minor Adverse								✓	Minor adverse
	Effect of rig lighting on passing motorists	Temporary	Negligible								✓	Negligible
	Effect of rig lighting on the surrounding adjacent area	Temporary	Negligible								✓	Negligible
	Effect of rig lighting on the district level views	Temporary	Negligible							✓		Negligible
	Effect on longer distance views and the landscape of proposed rig lighting	Temporary	Negligible							✓		Negligible
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible							✓	✓	Negligible

	Effects on Employment	Temporary	Minor Beneficial							✓	✓	Minor Beneficial
Phase 3b: Short term testing and evaluation – oil												
Ecology	Effects of noise and lighting disturbance on bats	Temporary	Negligible								✓	Negligible
	Effects of noise and lighting disturbance on breeding birds	Temporary	Negligible								✓	Negligible
	Effects of noise and lighting disturbance on hazel dormouse	Temporary	Negligible based on the current but incomplete surveys.								✓	Negligible
	Effects of noise and lighting disturbance on badger (See Confidential Appendix 7.3)	-	-									-
Landscape and Visual Impact	Loss of agricultural land	Temporary	Major/moderate adverse								✓	Moderate adverse
	Changes to topography	Temporary	Moderate/minor adverse								✓	Moderate/minor adverse
	Some encroachment on tree root protection zones; loss of vegetation at access	Permanent / Temporary	Moderate adverse								✓	Minor adverse
	Change in landscape character	Temporary	Major / moderate adverse								✓	Moderate adverse
	Change to historic landscape character	Temporary	Major / moderate adverse								✓	Moderate adverse

	Site visibility	Temporary	Ranges from major adverse to moderate/minor adverse (some viewpoints nil)								✓	Ranges from major/moderate adverse to moderate/minor adverse
Noise	Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible								✓	Negligible
	Noise effects from on-road development traffic	Temporary	Negligible								✓	Negligible
Transport and Access	Changes in traffic volumes	Temporary	Negligible								✓	Negligible
	Changes in HV volumes	Temporary	Negligible								✓	Negligible
Ground and Groundwater Protection	Loss of soil moisture in Princes Wood	Temporary	Minor								✓	Negligible
	Land contamination at the drill site and release of contaminated run off	Temporary	Moderate/Minor								✓	Negligible
Lighting	Effect on residents of Wood Barn Farm Cottage of proposed low level lighting.	Temporary	Negligible								✓	Negligible
	Effect on residents of Wood Barn Farm Cottage of rig lighting	Temporary	Minor Adverse								✓	Minor adverse
	Effect of rig lighting on passing motorists	Temporary	Negligible								✓	Negligible

	Effect of rig lighting on the surrounding adjacent area	Temporary	Negligible								✓	Negligible	
	Effect of rig lighting on the district level views	Temporary	Negligible								✓	Negligible	
	Effect on longer distance views and the landscape of proposed rig lighting	Temporary	Negligible								✓	Negligible	
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible								✓	✓	Negligible
	Effects on Employment	Temporary	Minor Beneficial								✓	✓	Minor Beneficial
Phase 4a: Reinstatement													
Ecology	Effects on the site's vegetation, habitats and wildlife	Permanent	Negligible									✓	Minor Beneficial
Landscape and Visual Impact	Restoration of agricultural land	Temporary	Moderate/minor adverse reducing to nil									✓	Minor adverse reducing to nil
	Restoration of topography	Temporary	Moderate/minor adverse reducing to nil									✓	Moderate / minor adverse reducing to nil
	Some encroachment on tree root protection zones; loss of vegetation at access	Permanent / Temporary	Moderate adverse									✓	Minor adverse
	Change in landscape character	Temporary	Moderate/minor adverse reducing to nil									✓	Minor beneficial
	Change to historic landscape character	Temporary	Moderate adverse reducing to nil									✓	Minor beneficial

	Site visibility	Temporary	Ranges from: Major/moderate and moderate adverse; reducing to nil (some viewpoints nil)								✓	Nil
Noise	Noise effects from on-site activity – includes vehicles on site access track	Temporary	Negligible								✓	Negligible
	Noise effects from on-road development traffic	Temporary	Negligible								✓	Negligible
Transport and Access	Changes in traffic volumes	Temporary	Negligible								✓	Negligible
	Abnormal Loads	Temporary	Minor adverse								✓	Negligible
	Change in HV volumes	Temporary	Negligible								✓	Negligible
Ground and Groundwater Protection	Contamination of aquifers following well abandonment	Permanent	Moderate							✓		Negligible
Lighting	Effect of construction lighting on local landscape	Temporary	Negligible								✓	Negligible
	Effect on longer distance views and the landscape	Temporary	Negligible							✓		Negligible
	Effect on Wood Barn Farm	Temporary	Minor Adverse								✓	Minor adverse
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible							✓	✓	Negligible
	Effects on Employment	Temporary	Moderate/Minor Beneficial							✓	✓	Moderate/Minor Beneficial
Phase 4b: Retention												
Ecology	Small loss of	Permanent/Te	Negligible								✓	Minor Beneficial

	release of contaminated run off											
Lighting	No effects identified	-	-									-
Socio-Economics	Effects on population, housing, healthcare and Education	Temporary	Negligible							✓	✓	Negligible
	Effects on Employment	Temporary	Negligible							✓	✓	Negligible
Notes:												
i) Extent is defined as falling within the following categories: (I) International; (UK) United Kingdom; (E) England; (R)Regional; (C) County; (D) District; (L)Local - no international or national impacts have been identified.												
ii) Type is defined as falling within the following categories: Adverse; Beneficial; Neutral												
iv) Scale is defined as falling within the following categories: Major; Moderate; Minor; Negligible												
v) Where a possible impact has been identified but on consideration any effects are regarded to be minimal, or a potential impact is regulated by statutory environmental controls to which the scheme will be compliant we have indicated this to be 'Not significant'.												

Amenity	The preferable features of a location which contribute to its overall character and the enjoyment of residents or visitors.
Ancient Woodland	Land which has been woodland continuously since at least 1600AD and which has not been cleared other than for underwood or timber production.
Application Site	The development of land at Wood Barn Farm
Aquifer	An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted.
Baseline	Existing environmental conditions present on, or near a site, against which future changes may be measured or predicted.
Biodiversity	Abbreviated form of 'biological diversity' referring to variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.
Biodiversity Action Plan (BAP)	Plans which set specific, measurable, achievable, realistic and time bounded conservation targets for species and habitats. The UK BAP is the UK Government's response to the Convention on Biological Diversity (CBD) signed in 1992. It describes the UK's biological resources and commits a detailed plan for the protection of these resources.
Blow Out Preventer (BOP)	High pressure wellhead valves, designed to shut off the uncontrolled flow of hydrocarbons.
Borehole	The hole as drilled by the drill bit.
Bottom Hole Target	The calculated depth to which the borehole will drill that will hopefully lead into the "target" oil or gas reservoir.
British Standards	The display of a British Standard number shows that the manufacturer claims to have made the product in accordance with the British Standard. A standard is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule or definition. Standards are designed for voluntary use and do not impose any regulations. However, laws and regulations may refer to certain standards and make compliance with them compulsory. Sometimes BS will be accompanied by the letters EN and/or ISO. These mean

that the standard was developed as a European (EN) or International (ISO) standard and then adopted by the UK as a British Standard.

Bronze Age

The period between about 2500BC and 700BC characterised by the use of bronze.

Buffer zone

An area separating two or more types of land use, such as between a residential area and a commercial area, for the purposes of preserving amenity.

Casing

Steel pipe cemented in place during the construction process to stabilise the wellbore.

Catchment Area

A land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge.

Catwalk

A long rectangular platform, usually made of steel and located perpendicular to the drilling rig. It is used as a laying down area for rig and drillstring tools, and components that are about to be used, or have just been used.

Choke

A device incorporating an orifice that is used to control fluid flow rate or downstream system pressure.

Christmas Tree

The assembly of fittings and valves on the top of the casing which control the flow of fluids from the well.

Condition

An obligation attached to a planning permission which circumscribes the manner in which a development may be carried out.

Consultation

Procedures for assessing public opinion about a plan or major development proposal, or in the case of a planning application, the means of obtaining the views of affected neighbours or others with an interest in the proposal.

Consultation bodies

Any body specified in the relevant EIA Regulations which the Competent Authority must consult in respect of an Environmental Statement, and which also has a duty to provide information or advice during the EIA process.

Conservation Status

For habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area; for species,

conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

Core Strategy

A document which sets out the key elements of the planning framework for the area. It should comprise of a spatial vision and strategic objectives for the area, a spatial strategy, core policies and a monitoring and implementation framework.

Curtilage

The land, often enclosed, around a building.

Cuttings

Rock chippings cut from the formation by the drill bit, and brought to the surface with the mud. Used by geologists to obtain formation data.

dB (decibel)

The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).

dB(A)

A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Department of Energy and Climate Change (DECC)

The Government department, created in October 2008, which is responsible for energy policy, including gas storage, and climate change mitigation policy. www.decc.gov.uk

Department for Communities and Local Government (DCLG)

This UK Government Department took over responsibility for planning issues from the Office of the Deputy Prime Minister in May 2006. www.communities.gov.uk

Department for Environment, Food and Rural Affairs (DEFRA)

This is a government department responsible for the regulation of the food industry in the UK, animal welfare and environmental issues as well as flood defence whose aim is sustainable development. www.defra.gov.uk

Department for Transport (DfT)

The government department responsible for transport matters. www.dft.gov.uk.

Development Control

The term commonly employed to describe that part of the Town & Country Planning Act (as amended) which relates to the submission and determination of planning applications.

Development Plan Documents (DPD)	Development plan documents, together with the Regional Spatial Strategy, form the development plan. The DPD include the core strategy, allocations, proposals map and action area plans.
Doghhouse	The steel-sided room adjacent to the rig floor, usually having an access door close to the driller's controls. It has a general purpose use as an office, lunch room, tool shed and meeting room for the driller and crew.
Drill Bit	The tool used to crush or cut rock.
Drilling Mud	A term that encompasses most fluids used in drilling operations, especially fluids that contain significant amounts of suspended solids, emulsified water or oil. Mud includes all types of water-base, oil-base and synthetic-base drilling fluids.
Drill Stem Testing (DST)	A procedure for isolating and testing the surrounding geological formation through the drill stem.
Drillstring	A combination of the drillpipe and other tools used to make the drill bit turn at the bottom of the wellbore.
Ecological Integrity	An ecological term used to describe a site. The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified.
Environmental Assessment (EIA)	Impact The process by which information about the environmental effects of a proposed activity is collected, analysed and presented to decision makers.
Environmental (ES)	Statement A document which presents the findings of an Environmental Impact Assessment together with details of appropriate mitigation.
Effect	A physical or measurable change to the environment attributable to the Proposed Development.
Fauna	Animal life.
Feature (Landscape feature)	(or element) a component part of the landscape (eg hedge, wood, stream)
Flare	The burning of unwanted gas through a pipe (also called a flare).
Floodplain	A strip of relatively flat and normally dry land alongside a stream, river, or lake that is inundated by water during a flood.

Flood risk	The probability of flooding occurring in a particular area.
Flora	Plant life.
Glare	The brightness of a light source when viewed against a dark background.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of geologic formations
Habitat	The environment in which populations or individual species live or grow.
Heavy Goods Vehicle (HGV)	Vehicles over 7.5 tonnes gross weight or where noise calculations are concerned, vehicles of unladen weight exceeding 1,525 kg
Historic Environment Record (HER)	The repository for all archaeological and historical information relating to a county or district.
Hydrocarbons	An organic compound consisting entirely of hydrogen and carbon. May exist as a solid, a liquid or a gas.
Hydrology	The movement, distribution and quality of water throughout the earth.
Impact	A physical or measurable change to the environment attributable to the Proposed Development.
Indirect impacts	Impacts on the environment, which are not a direct result of the development but are often produced away from it or as a result of a complex pathway. Sometimes referred to as secondary impacts.
Internationally protected biological sites	Sites that, in addition to being designated SSSI are designated under European or other international law or treaties. On land these include Special Protection Areas (SPA) for birds and Special Areas of Conservation (SAC) for other fauna, flora and habitats (Sites of [European] Community Importance) and Ramsar wetland sites.
Invertebrate	Any organism that does not have an internal bony or cartilaginous skeleton, such as insects, spiders, snails and related fauna.
Iron Age	The period between about 700BC and AD43 characterised by the use of iron.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
Land use	The primary use of the land, including both rural and urban

		activities.
Landform		Combinations of slope and elevation that produce the shape and form of the land.
Landscape analysis		The process of breaking the landscape down into its component parts to understand how it is made up
Landscape assessment	character	An umbrella term for description, classification and analysis of the landscape.
Landscape effects		Change in the elements, characteristics, character and qualities of the landscape as a result of development. These effects can be positive or negative.
Landscape sensitivity		The extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects on its character
Local Biodiversity Action Plan (LBAP)		The Local Biodiversity Action Plan is the agreed strategy for conservation and enhancement in a particular area which will help meet the UK BAP.
Local Nature Reserve		A statutory designation of a site of local nature conservation significance, declared by local planning authorities under the National Parks and Access to the Countryside Act, 1949. Other non-statutory local nature reserves are established and managed by a variety of public or private bodies (e.g. county wildlife trusts, Royal Society for the Protection of Birds).
Local Planning Authority		The local planning authority is the district, borough, unitary, city or county council which is the body responsible for the preparation of development plans, processing planning applications and guiding development within the administrative area.
Local Development Documents (LDD)	Development	Local development document is the collective name given to all documents within the local development framework.
Local Development Framework (LDF)	Development	The local development framework is the portfolio of local development documents which provide the basis for delivering spatial planning strategy.
Local Transport Plan (LTP)		Local transport plans are developed by partnerships of local authorities, businesses, transport operators and service users as part of the New Deal for Transport initiative and aim to promote integrated local transport systems and to tackle problems of congestion and pollution (Department of Transport Local Government and the

	Regions, 2002).
Luminance (cd/m²)	Luminance expresses the ratio between the <u>intensity</u> emitted in a certain direction and the expanse of the emitting surface. It is indicated with the letter L and is measured in <u>candela per square metre</u> (cd/m ²). A luminance of 1 cd/m ² is that produced in a certain direction by a surface which has, in that direction, an intensity of 1 candela and that appears to the observer with an expanse of 1 metre squared Luminance is the quantity more directly correlated with vision: it takes into account not only the quantity of energy which reaches the eye, but also the sensation of glare or discomfort that it can produce
Magnitude	A combination of the scale, extent and duration of an effect.
Medieval	The period of the Middle Ages between the early 5th century and mid 16th century AD.
Mitigation Measures	Actions proposed to moderate adverse impacts and to enhance beneficial impacts arising from the whole or specific elements of the Proposed Development.
Minerals Planning Statements (MPS)	Documents issued by CLG setting out government policy and advice on minerals planning issues.
National Nature Reserve	An area designated by Natural England under 16 to 29 of the National Parks and Access to the Countryside Act 1949. Typically, NNRs are among the best examples of a particular habitat. NNRs are of national importance.
National Planning Policy Framework (NPPF)	A document issued by the CLG setting out the government planning policies for England and how these are expected to be applied.
Natural Gas	Naturally occurring methane from decomposition of organic matter where no oxygen is present.
Non Technical Summary (NTS)	A report which briefly describes the main points discussed in the Environmental Statement in a clear manner, without the use of technical jargon and phraseology.
Permeability	The property or capacity of a rock, sediment or soil to transmit a fluid; it is a measure of the ease of fluid flow under unequal pressure.
Phase 1 Habitat survey	A qualitative survey, based on mapping (onto standard

templates – OS maps and/or map record sheets) the distribution of habitat types across a site.

Photomontage

A type of visualisation or illustration that is based on photographs and that simulates the likely appearance of a proposed development in the photographic view.

Planning Policy Statements (PPS)

Planning Policy Statements set out the UK Government's national policies on different aspects of planning. Many have been replaced by the National Planning Policy Framework adopted in March 2012.

Post-medieval

The period from the mid 16th century to the end of the 19th century, including the Industrial Revolution in the mid 18th century.

Prehistoric

Referring to anything belonging to or existing in times before recorded history (the Roman period) and including the Mesolithic, Neolithic, Bronze Age and Iron Age.

Proposed Development

The proposal described in the application, comprising the siting and construction of a temporary well site including access track and ancillary infrastructure, for the exploration, testing and evaluation of hydrocarbons.

Quantitative

This refers to something that can be measured in a precise way to give a definite result. This contrasts with qualitative, which is usually a more subjective assessment of the amount of something.

Racks

Also referred to as Pipe Racks, they are elevated truss-like structures having triangular cross sections. The pipe rack supports drillpipe or casing above the ground. These structures are used to keep the pipe above ground level and closer to the level of the catwalk.

Receptor

A component of the natural, created or built environment such as human being, water, air, a building, or a plant that is affected by an impact. Landscape receptors include physical landscape resources such as woods, hedgerows etc, special interests such as areas of landscape designation and visual receptors include viewer groups such as residents, users of public rights of way and roads.

Regional Spatial Strategy (RSS)

A strategy for how a region should look in 15 to 20 years time and possibly longer. It identifies the scale and distribution of new housing in the region, indicates areas for regeneration, expansion or sub-regional planning and

specifies priorities for the environment, transport, infrastructure, economic development, agriculture, minerals and waste treatment and disposal.

Remediation

The treatment of soil / ground water to reduce the level / risk from contamination. There are many forms of remediation that can take place both on and offsite.

Reservoir

A subsurface body of rock having sufficient porosity and permeability to store and transmit fluids.

Residual Effects

Those effects of the Proposed Development that cannot be mitigated following implementation of mitigation proposals.

Risk assessment

An assessment of the likelihood and severity of an occurrence.

Romano-British

The period characterised by the Romanised culture within that part of Britain that became part of the Roman Empire from AD43 until AD410.

Root Protection Areas

The root protection area is a minimum area which should be left undisturbed around retained trees.

Run-off

Precipitation (rain, snow, hail, etc.), snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers.

Scheduled Monuments

Nationally important monuments that are legally protected under the terms of the Ancient Monuments and Archaeological Areas Act 1979.

Scoping Opinion

The formal view of the determining authority on the range of issues and topics to be covered by the Environmental Impact Assessment.

Scoping Report

An exercise undertaken to determine which elements will be covered in an Environmental Statement.

Scrub

Vegetation consisting of stunted trees, bushes, and other plants.

Shale Shakers

The primary device on the rig for removing drilled solids from the mud. This vibrating sieve is simple in concept. A wire-cloth screen vibrates while the drilling fluid flows on top of it. The liquid phase of the mud and solids smaller than the wire mesh pass through the screen, while larger solids are retained on the screen and eventually fall off the back of the device and are discarded.

Significance of Effect

The significance of effect is assessed by taking into consideration the environmental sensitivity and importance

	of a receptor and the nature, magnitude (scale) and duration of the change or effect being assessed.
Site of Importance for Nature Conservation	Non-statutory designation selected at Local Authority level for a site of nature conservation interest.
Site of Special Scientific Interest	A site statutorily notified under the Wildlife and Countryside Act 1981 (as amended) as being of special nature conservation or geological interest. SSSIs include wildlife habitats, geological features and landforms.
Sky Glow	The brightening of the night sky above towns, cities and countryside.
Species	A group of interbreeding organisms that seldom or never interbreed with individuals in other such groups, under natural conditions; most species are made up of subspecies or populations.
Source Intensity	This applies to each source in the potentially obtrusive direction, outside of the area being lit.
Special Protection Area	See 'internationally protected sites'
Special Area of Conservation	See 'internationally protected sites'
Surface water	Water collecting on the ground or in streams, rivers or lakes.
Topography	The natural or artificial features, level and surface form of the ground surface.
Transport Assessment	A quantitative assessment of transport impacts of construction and operational phases of the Proposed Development.
Tree Canopy	A layer or multiple layers of branches and foliage at the crown of a tree.
UK Biodiversity Action Plan	See 'Biodiversity Action Plan'.
Visual amenity	The value of a particular area or view in terms of what is seen
Visual effect	Change in the appearance of the landscape as a result of development. This can be positive (ie beneficial or an improvement) or negative (ie adverse or a detraction)
Watercourse	A flowing body of water such as river, stream or brook.
Well, Wellhead	A well is the hole originally drilled by a drilling rig which is lined with steel casing (i.e. pipe) with cement injected around it at high pressure. The casing is sealed at its bottom end with a casing shoe before drilling out of the bottom with a smaller bit a repeating the casing process.

Thus the well consists of a series of ever smaller concentric casings, with the shoes (casing points) selected for operational reasons and to protect aquifers or to isolate other pressurised formations. The inner pipe is the production tubing which conveys the gas to surface where a casing with valves for isolation and maintenance is mounted. This valve arrangement is the wellhead (the casing on which everything is mounted is often called the 'Christmas Tree'.

Well Site

The area required for drilling the wells and for installation of the production equipment. The area is defined by the possible need to site a drilling rig on the site in order to carry out work-over, rather than the area needed for the production equipment.

AAWT	Annual Average Weekday Traffic
AES	Annual Energy Statement
AOD	Above Ordnance Datum
BAP	Biological Action Plan
BGS	British Geological Survey
BPM	Best Practicable Means
BRES	Business Register Employment Survey
BS	British Standard
BSI	British Standards Institution
BTC	Bat Conservation Trust
CEB	Clean Enclosed Burner
CIBSE	Chartered Institute of Building Services Engineers
CLO	Contaminated Land Officer
CNEA	Clean Neighbourhoods and Environment Act
COPA	The Control of Pollution Act
CPA	County Planning Authority
DCLG	Department for Communities and Local Government
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and Regions
DMRB	Design Manual for Roads and Bridges
DST	Drill Stem Testing
DTI	The Department of Trade and Industry
EIA	Environmental Impact Assessment
ES	Environmental Statement
GCN	Great Crested Newts
GIS	Geographical Information Systems
H₂S	Hydrogen Sulphide
HA	Highways Agency
HDC	Horsham District Council
HDPE	High Density Polyethylene
HGV	Heavy Goods Vehicle
HSI	Habitat Suitability Index
HV	Heavy Vehicles
IEA	Institute of Environmental Assessment
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
ILE	Institute of Lighting Engineers

IPL	Institution of Lighting Professionals
ISO	International Organisation for Standardisation
JNCC	Joint Nature Conservation Committee
JSA	Job Seeker Allowance
LBAP	Local Biodiversity Action Plan
LV	Light Vehicle
LVIA	Landscape and Visual Impact Assessment
MAGIC	Multi Agency Geographic Information Centre
MPS	Minerals Policy Statement
NBN	National Biodiversity Network
NERC	Natural Environment and Rural Communities
NPPF	National Planning Policy Framework
NPS	National Policy Statements
NTS	Non-Technical Summary
ODPM	Office of the Deputy Prime Minister
ONS	Office for National Statistics
PIA	Personal Injury Accident
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
PRoW	Public Rights of Way
RES	Regional Economic Strategy
RPA	Root Protection Area
RSS	Regional Spatial Strategy
SEEDA	South East England Development Agency
SNCI	Site of Nature Conservation Interest
TMP	Traffic Management Plan
TN	Target Notes
TP	Transport Plan
UKBAP	UK Biodiversity Action Plan
UKCS	UK Continental Shelf
WCA	Wildlife and Countryside Act
WSCC	West Sussex County Council