

CONTENTS

13.1	INTRODUCTION	3
13.2	ASSESSMENT METHODOLOGY	4
	Scope	4
	Data Sources	4
	Assessment Approach	5
	Significance Criteria	5
	Uncertainties and Limitations	8
13.3	RELEVANT POLICY	10
	National Planning Policy Framework (March 2012)	10
	Cherwell District Local Plan (1996)	12
	The Non-Statutory Cherwell District Local Plan (2011)	13
	Draft Cherwell Local Plan (2014)	14
13.4	BASELINE CONDITIONS	15
	Site Location	15
	Site History	16
	<i>On-site</i>	16
	<i>Surrounding Area</i>	16
	Recorded Geology	17
	<i>Superficial Deposits</i>	17
	<i>Solid Geology</i>	17
	Hydrogeology	18
	Hydrology	19
	Site Sensitivity	19
	Ground Stability and Mining / Mineral Extraction	20
	Radon Gas	20
	Environmental Setting	21
	<i>Abstraction Licences</i>	21
	<i>Discharge Consents</i>	22
	<i>Pollution Incidents to Controlled Water</i>	22
	<i>Flooding</i>	22
	<i>Landfill Sites and Waste Management Facilities</i>	22
	<i>Pollution Incident / Contaminated Land Register</i>	22
	<i>Local Authority Pollution Prevention and Controls</i>	23
	<i>Potential Contaminative Uses</i>	23
	<i>Fuel Station</i>	23
	<i>Underground High Pressure Oil and Gas Pipelines</i>	23
	<i>Hazardous Substances</i>	23
	Conceptual Site Model	24
	<i>Sources</i>	24
	<i>Pathways</i>	25
	<i>Receptors</i>	25
	The Projected Future Baseline	26
13.5	POTENTIAL EFFECTS	27
	Construction Stage	27
	<i>Potential Effects of the Ground Conditions on the Proposed Development</i>	27
	<i>Potential Effects of the Proposed Development on Ground Conditions</i>	27

Outline Planning Application

	Post-completion Stage	28
	<i>Potential Effects of the Ground Conditions on the Proposed Development.....</i>	<i>28</i>
	<i>Potential Effects of the Proposed Development on Ground Conditions.....</i>	<i>28</i>
13.6	MITIGATION MEASURES	30
	Construction Stage.....	30
	Post-completion Stage	30
13.7	RESIDUAL EFFECTS	32
	Construction Stage.....	32
	Post-completion Stage	32
	Summary of Effects	32

Outline Planning Application

13.1 INTRODUCTION

13.1.1 This section has been prepared by Wardell Armstrong LLP (WA) and outlines the assessment of ground conditions at the site. This has been undertaken by review of available desktop information regarding the conjectured geology beneath the Site and current environmental risks associated with the Site.

13.1.2 Making reference to the development proposal, WA has carried out a Phase 1 Geo-Environmental Desk Study of the Site in order to identify anticipated ground conditions and environmental risks. The desk study aims to identify any existing and potential receptors which may be present and the pathways by which the receptors may be exposed to any identified sources of contamination at the Site.

13.2 ASSESSMENT METHODOLOGY

Scope

13.2.1 The desk study assesses the likely geological setting of the Site based on published geological mapping. The results of the desk study have been used to determine the requirement for future site investigation works at the more detailed design stages and to produce this chapter of the Environmental Statement.

13.2.2 This chapter summarises the findings of the desk study. The objective of this chapter is to compile information from a range of sources to provide an assessment of the ground conditions at the Site.

Data Sources

13.2.3 At this time no intrusive investigations have been undertaken within the Site boundary. Available published information has been used to assess the likely ground conditions which may be expected across the Site.

- *GroundSure Environmental Data Reports* – environmental datasets and maps designed to reinforce professional opinion with regards to environmental consulting;
- *Environment Agency (EA)* - utilise the vast amount of data the EA have collected and stored in their databases. Groundwater Vulnerability Map, Aquifer Maps, Groundwater Source Protection Zones, etc.;
- *Geological mapping and memoirs* - published by the British Geological Survey (BGS), these maps have been reviewed as a point of reference for historical layout and land usage;
- *Ordnance Survey Plans* – detailed, up to date mapping which has been referenced in this chapter as evidence of current features of Site and the surrounding area;
- *WA archives* – review of previous work undertaken by WA allows for a more comprehensive understanding of the Site and surrounding area; and
- *BR211 Radon* - guidance on protective measures for new dwellings.

Assessment Approach

13.2.4 Consideration is given to the way in which the Proposed Development may affect the ground conditions at the Site. The evaluation takes into account the effects of the change of land use together with the potential impact of the construction phase and the proposed end use of the land.

13.2.5 The assessment of contamination risk for the Site reviews potential complete pollution linkages between a contaminant source and a sensitive receptor via an exposure pathway. The fundamental concept is that without each of the three elements (contaminant, pathway and receptor) being present on the Site forming a complete pollution linkage there can be no contamination risk. The presence of contamination at a particular location does not necessarily represent an associated risk.

Significance Criteria

13.2.6 In order to assess the risk posed to a receptor by a contaminant, the sensitivity of the receptor exposure duration and Site end-use scenario is taken into consideration. For example, the concentration of contaminants tolerable at a Site to be developed for residential use, with gardens used to grow vegetables and accessible to young children, is lower than that tolerable on a commercial site, where soil is exposed only in minor areas of soft landscaping and where the only long-term users of the Site are adults.

13.2.7 Criteria for assessing the significance of the potential effects are based on a qualitative assessment of the receptor sensitivity and the predicted magnitude of change from the baseline as a result of the Proposed Development.

13.2.8 The magnitude of change predicted and the sensitivity of identified receptors are used to qualitatively assess the impact significance of the Proposed Development. Impacts have the potential to be either adverse or beneficial. The details of impact assessment will be discussed in further detail later on in this ground condition assessment.

Table 13.1: Magnitude

Magnitude	
<i>Typical Description of the Change Predicted</i>	
Large	i.e. Large area of the site contains contamination levels that significantly exceed the intervention levels or Soil Guideline Values. Remediation to a state 'suitable for use' required prior to site development
Moderate	i.e. Proposals cause the release or mobilisation of contaminants through the creation of a pathway to expose receptors to high levels of contamination
Small	i.e. Contaminants identified on site are approaching the Soil Guideline Values, or are between the target and intervention levels. Remediation may be required prior to development
Negligible	i.e. Existing contaminants identified are found in relatively low concentrations that pose no significant risk to receptors, and therefore no remedial action is taken

13.2.9 The magnitude of an effect is to be considered by the nature of change, its severity, the duration of an effect and the likelihood of an effect occurring, therefore, the risk assessment has been based on a qualitative assessment and professional judgement. The magnitude of an impact has been described as either a 'large', 'moderate', 'small' or 'negligible'. Potential effects in terms of ground conditions tend to be local, however, the effects have been considered in relation to different geographical contexts other than the study Site.

Table 13.2: Sensitivity

Receptor	High	Medium	Low	Negligible
Typical Description of Receptor	i.e. Land to be used for allotments or domestic gardens, to grow crops for human consumptions, or upon which animals are	i.e. Parks, playing fields and open spaces	i.e. commercial land uses	i.e. industrial land uses or concrete covered

Outline Planning Application

	reared for human consumption		area
--	------------------------------	--	------

13.2.10 In this case the receptor may be an existing receptor affected by change in mobilisation of a pollutant, or a proposed land use that is potentially sensitive to the existing contamination.

13.2.11 In line with statutory guidance, the proposed land use is a key factor in determining an acceptable level of contamination. Therefore, if more than one land use is proposed for the site, the sensitivity of receptor may be determined according to the levels and locations of contamination identified in relation to the proposed master plan or site use, and the subsequent potential for contamination to affect receptors.

Table 13.3: Significance

MAGNITUDE	SENSITIVITY			
	High	Medium	Low	Negligible
Large	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Small	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

13.2.12 **Major:** Highly sensitive land uses, highly sensitive ecosystems and water receptors and also land uses resulting in human exposure to hazardous concentrations of contaminant (greater than their intervention level, or between intervention and target level). Pathway to release / mobilisation / exposure to contaminant is generated to humans and/or ecosystem. Potential for moderate and major changes to very sensitive ecosystems.

Moderate: Low sensitivity land uses, water receptors and ecosystems exposed to contaminant concentrations greater than their intervention level, or between intervention and target level. Also highly sensitive receptors exposed to contaminants approaching target level. Potential for minor changes to ecosystems.

Minor: Low sensitivity land uses, water receptors and ecosystems exposed to contaminant concentrations approaching target level. Potential for minor changes to ecosystem. High / moderately sensitive receptors are exposed to contaminants found

Outline Planning Application

in relatively low concentrations that pose no significant risk to humans, animals or plants.

Negligible: Non-sensitive land use, water course or ecosystem exposed to contaminants found in relatively low concentrations that pose no significant risk to humans, animals or plants.

13.2.13 With regards to significance, professional judgement can be used to vary the category where specific circumstances dictate, for example due to the vulnerability or condition of the receptor. For example, not all contaminants are harmful to all receptor types, such that a phototoxic contaminant may significantly impact a nature conservation receptor of importance for sensitive plants and not impact fauna. Factors such as chemical absorption and synergistic effects may also moderate the assessment. Impacts shall be reviewed on an overall basis of 'adverse' or 'beneficial', except where negligible magnitudes and sensitivities are noted.

13.2.14 The degree of 'pollution' will be fundamentally affected by, and can be moderated through reference to, the integrity of the pollutant linkage. The category will be dependent on the completeness and nature of the pathways between source and receptor. Other factors may also be deemed to amend the assessment, such as the local, regional or national shortage of a particular receptor resource.

13.2.15 The reason for and nature of any variation will be made clear in the assessment. If the degree of effect is moderate or above, then the effect is considered to be significant.

Uncertainties and Limitations

13.2.16 During the preparation of a ground conditions chapter, there are sometimes circumstances in which the information available to inform the assessment process is limited.

13.2.17 The work undertaken to provide the basis of this chapter comprised a study of available documented information from a variety of sources. The details given in this chapter have been dictated by the finite data on

Outline Planning Application

which it is based and are relevant only to the purpose for which the environmental statement has been commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this chapter, Wardell Armstrong LLP reserves the right to review such information and, if warranted, to modify the opinions accordingly.

13.2.18 As this is an example where a site inspection has not been undertaken, Wardell Armstrong LLP cannot definitively comment on the potential for contamination associated with the current use or structures including the presence of asbestos until further site investigation works are carried out.

13.2.19 It should be noted that any risks identified in this chapter are perceived risks based on the information reviewed; definitive risks can only be assessed following further ground investigation of the Site.

Outline Planning Application

13.3 RELEVANT POLICY**National Planning Policy Framework (March 2012)**

13.3.1 The control of development and land use in the future is the responsibility of the planning system, which is the principal regulatory driver for this Site. In March 2012, the Government released the National Planning Policy Framework (NPPF) which replaced all previous planning policy statements and guideline (PPS/PPG) documents including Planning Policy Statement (PPS) 23 Planning and Pollution Control. However, it should be noted that the NPPF does not change the statutory basis on which planning decisions are founded and emphasises the requirement for sustainable development.

13.3.2 A fundamental principle of sustainable development is that the condition of land, its use and its development should be protected from potential hazards. The NPPF states that:

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. Planning policies and decisions should also ensure that:

the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation; after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is presented.

Outline Planning Application

13.3.3 Today almost all new development in England is constructed either wholly or partly from the products of mineral extraction. Because current and future extraction has the capacity to have significant effects on the environment, both positive and negative, today's minerals industry is highly regulated by planning policy and law.

13.3.4 For England, the key national planning policies for minerals are set out in the NPPF. The focus of the NPPF is a presumption in favour of sustainable development. The NPPF recognises that minerals are essential to support sustainable economic growth and quality of life. As a result it is important that there is a sufficient supply of material to provide the infrastructure, buildings, energy and goods that the country needs whilst ensuring that permitted mineral operations do not have unacceptable adverse impacts on the natural and historic environment or human health.

13.3.5 The NPPF also recognises that, 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 and to secure their long-term conservation through the mechanism of mineral safeguarding.

National Planning Policy Guidance

13.3.6 On 6 March the Government announced the launch of the new Planning Practice Guidance ('PPG'). The guidance has been in draft 'Beta' format since 28 August 2013.

13.3.7 The key PPG features relevant to ground condition assessment have been detailed within this chapter.

13.3.8 **Land Affected by Contamination:** The PPG highlights how failure to deal adequately with contamination could cause harm to human health, property and the wider environment. This could also limit or preclude new development; and undermine compliance with European Directives such as the Water Framework Directive.

13.3.9 **Hazardous Substances:** The PPG explains planning controls for storage of hazardous substances mainly stemming from Seveso

Outline Planning Application

II Directive. The Seveso II Directive is the main piece of EU legislation that deals specifically with the control of on-shore major accident hazards involving dangerous substances.

13.3.10 **Land Stability:** The guidance on land stability provides advice to local authorities and developers to ensure that development is appropriately suited to its location, and that there are no unacceptable risks caused by unstable land or subsidence.

13.3.11 **Flood Risk:** In light of recent weather conditions at the time of producing this chapter, the PPG contains strict guidance on how local authorities should act on flood risk assessments. It states that the tests as set out in the NPPF should be followed and where the tests are not met, new development on flood risk sites should not be allowed.

13.3.12 **Minerals:** The PPG provides guidance on the planning for mineral extraction in plan making and the application process. Mineral resources are defined as natural concentrations of minerals or, in the case of aggregates, bodies of rock that are, or may become, of potential **economic** interest due to their inherent properties. Since minerals are a non-renewable resource, minerals safeguarding is the process of ensuring that non-minerals development does not needlessly prevent the future extraction of mineral resources, of local and national importance.

13.3.13 It is clear that in many areas of planning the PPG takes National Policy a step further. Parts of it are designed as a direct response to issues which have arisen out of the NPPF and have been the subject of much debate at the level of decision taking.

Cherwell District Local Plan (1996)

13.3.14 The policies in Chapter 10 of the Cherwell District Local Plan seek to protect the environment and prevent pollution through the control of development. The plan refers to the relationship between a Council's planning responsibilities and the separate statutory responsibilities exercised by local authorities and other pollution control bodies, principally under the Environmental Protection Act 1990 and the Water Resources Act 1991.

Outline Planning Application

13.3.15 The local plan also details how the Council seeks information on the likely environmental impact of proposals from developers. For certain projects, the Town & Country Planning (Assessment of Environmental Effects) Regulations 1988 require an environmental assessment to be carried out before planning permission may be granted. The Regulations set out lists of projects in two Schedules. For those in Schedule 1 an EA is required in every case; for those in Schedule 2 an EA is required if the particular development proposed is likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

In cases where there is uncertainty over the potential impact of a development the Council will take a precautionary stance.

13.3.16 The Council will seek to ensure that the amenities of the environment, and in particular the amenities of residential properties, are not unduly affected by development proposals which may cause environmental pollution.

13.3.17 Proposals for the redevelopment of sites known or suspected to be contaminated will be considered against the ENV12 policy. Development on land known or suspected to be contaminated must accord with the regulations set out in Circular 21/87.

13.3.18 Oxfordshire County Council is responsible for minerals and waste disposal planning, and the relevant structure plan policies controlling this type of development are contained within the District Local Plan.

The Non-Statutory Cherwell District Local Plan (2011)

13.3.19 The adopted Cherwell Local Plan 1996 covers the period up to 2001. The document known as the 'Non-Statutory Cherwell Local Plan 2011', is the product of a review of that plan and covers the period up to 2011. When adopted it will replace the Cherwell Local Plan 1996. Together with the Oxfordshire Structure Plan 2011 and the Oxfordshire Minerals and Waste Local Plan it will form the Development Plan for the whole of the Cherwell District.

13.3.20 The Cherwell Local Plan 2011 ("the Plan") is a draft local plan prepared by Cherwell District Council under the provisions of the Town and Country Planning Act, 1990 as amended by the Planning and

Outline Planning Application

Compensation Act, 1991. All District Councils are required to produce a single local plan covering their whole administrative area.

13.3.21 Chapter 9 of the Non-Statutory Cherwell Local Plan 2011 sets out the Council's land use planning policies relating to ground conditions, the environment and natural resources. The conservation and enhancement of the environment and the preservation of natural resources are fundamental principles of sustainability. The environment of Cherwell District is of high quality and this is important in helping to contribute to the economic success of the area. The aim of these policies is therefore to protect and enhance the environment and prevent pollution through the control of development.

Draft Cherwell Local Plan (2014)

13.3.22 The draft Local Plan is an important document for Cherwell District. The draft broadly sets out how the District will grow and change in the period up to 2031. The Local Plan sets out the long term spatial vision for the District and contains policies to help deliver that vision.

13.3.23 One of the plan's key challenges to ensuring sustainable development is 'a need to ensure that contamination is addressed effectively on sites through re-development'. The draft plan states that 'appropriate treatment and remediation of contaminated land must be reviewed as part of on-going sustainability.'

Outline Planning Application

13.4 BASELINE CONDITIONS**Site Location**

13.4.1 The Site is located approximately 1.7 kilometres south of Banbury town centre although the residential suburb (known as Easington) associated with Banbury extends to the north western boundary of the Site.

13.4.2 The Site is centred at National Grid Reference 44851, 38674 and comprises five delineated fields and a section of one field, which are all currently being used for arable farming. The field boundaries within the Site are demarcated with mature hedgerows. There is a small wooded area located in the north western corner of the Site and trees are also present along the majority of the Site boundary.

13.4.3 There is a single track which runs through the western section of the Site in a north to south direction from Bloxham Road in the north down to Wykham Lane to the south of the Site. A drainage feature present within the trees in the eastern section of the southern boundary is indicated to flow west to east.

13.4.4 The Site is bound to the north in part by open fields and by a track known as 'Salt Way' beyond which is residential development and school playing fields. The eastern and southern boundaries of the Site are mainly vegetated field boundaries with Wykham Farm Cottage located adjacent to the Site in the south east. The Site is bound to the west by the Bloxham Road (A361) in the north and by Wykham Park lodge and open fields in the south.

13.4.5 In terms of land use, the Site has always historically been associated with undeveloped land and has always been linked with agriculture, aerial photos have indicated some previous cultivation of the land (circa 1945).

13.4.6 The relevant Ordnance Survey plans and maps indicate the Site to be generally topographically flat with a gentle slope west to east. Inspecting currently available desk based research the Site appears to

Outline Planning Application

comprise clear farmland apart from areas of vegetation, with no evidence of deposited waste materials on the Site.

13.4.7 Due to the Site history and the ongoing use of the Site as arable farm land it was not considered necessary to undertake a walkover survey of the Site for this preliminary exercise.

Reference to the most recently published ordnance survey mapping (2014) and information from available online aerial photography of the Site has been used to provide a Site description.

Site History

13.4.8 Past editions of published Ordnance Survey County Series and National Grid plans dating between 1881 and 2014 have been reviewed in order to determine the development history of the Site and the immediate surroundings. A comprehensive breakdown of the Site history is included within the Wardell Armstrong Desk Study Report for the study area. This document is included within Appendix 13.1.

On-site

13.4.9 The earliest available mapping indicates that the Site comprised a number of fields with a few trees recorded along the field boundaries. A small triangular shaped wooded area is marked in the northwest corner of the Site. The Site is bound in part to the west by a road which runs in a northeast southwest direction. This road is crossed by a track named as 'Salt Way' to the north of the Site which forms part of the northern Site boundary. The Site has remained undeveloped to date.

Surrounding Area

13.4.10 Outside the Site boundary several buildings are indicated. A small cluster of buildings are shown adjacent to the south eastern boundary of the Site. Wykham Farm Cottage is located approximately 10m to the south of the Site boundary with other Wykham Farm buildings shown is shown approximately 90m to the south of the Site boundary, and a couple of unnamed buildings are indicated approximately 75m from the Site boundary to the west of

Outline Planning Application

Wykham Farm. Park Farm is located 350m to the south of the Site. Wykham Park is shown 550m to the southeast of the Site comprising several buildings including a chapel surrounded by a wooded area. Horton Infirmary is shown 850m to the northeast of the Site. Bodicote village is shown approximately 800m to the south east of the Site boundary.

13.4.11 The mapping published in 1992 shows further development of Easington and Bodicote. There is now a reservoir shown, 600m from the Site boundary located on the stream to the south of the Site.

There are no other significant changes shown on the recent editions of published mapping to the Site or the surrounding area. A pond is shown in the location of the former clay pit noted on the 1882 mapping 250m northwest of the Site.

Recorded Geology*Superficial Deposits*

13.4.12 No superficial deposits are recorded to be present on Site.

Solid Geology

13.4.13 The published geological mapping for the area (BGS Digital Geological map of Great Britain at 1:10,000 scale and 1:10,560 scale geological map sheets SP 43 NE and SP 43 NW 1973) indicates the Site to be mostly underlain by the Upper Lias now known as the Whitby Mudstone Formation of the Lias Group of Jurassic Age (Toarcian). The Whitby Mudstone Formation generally comprises fossiliferous mudstone, siltstone, sandstone and occasional limestone bands. The eastern section of the Site and the south western corner of the Site is recorded to be underlain by the Marlstone Rock Bed now known as the Marlstone Rock Formation of the Lias Group of Jurassic Age (Toarcian/Pliensbachian). The Marlstone Rock Formation generally comprises ferruginous limestone, interbedded ferruginous sandstone and subordinate ferruginous mudstone. It is known that elevated concentrations of some metals and metalloids, including arsenic, can be associated with soils derived from the Marlstone Rock Formation in the Banbury area.

Outline Planning Application

- 13.4.14 The very most south-western and south-eastern extents of Site are identified to be underlain by the Dyrham Formation of the Lias Group of Jurassic Age (Pliensbachian. The Dyrham Mudstone Formation generally comprises pale to dark grey and greenish grey, silty and sandy mudstone, with interbedded silt or very fine-grained sand (locally muddy or silty), weathering yellow.
- 13.4.15 The geology of the Site is shown on the Geological Mapping contained within the GroundSure GeoInsight Report included in Appendix 13.1.
- 13.4.16 There are no BGS boreholes recorded within the Site or its immediate surrounding area.

Hydrogeology

- 13.4.17 The Environment Agency (EA) Website has been consulted in respect of the underlying aquifer designation. Reference has also been made to the maps provided within the GroundSure Report. The reviewed information indicates that the underlying strata is mainly classified as unproductive strata in the central and northern section of the Site i.e. the Whitby Mudstone Formation and 'Secondary A' aquifer in the southern section of the Site i.e. the Marlstone Rock Formation.
- 13.4.18 The strata classified as a Secondary A aquifer typically contain permeable layers capable of supporting water supplies at a local rather than strategic scale. It is noted that such waters can, in some cases form an important source of base flow to rivers. As such the aquifer beneath the Site can be classed as a potential receptor for any contamination present on Site.
- 13.4.19 The very most south-western and south-eastern extents of Site are identified to be underlain by the Dyrham Formation. The Dyrham Formation is classified as a Secondary Aquifer with undifferentiated layers. This designation has been assigned in cases where it has not been possible to attribute either category Secondary A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

13.4.20 Information published within the GroundSure report indicates that the soils beneath the Site are classified as soils of high to low permeability potential – indicating a minor aquifer with variable permeability. Soils with high permeability potential are likely to readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater. Water flow within the bedrock is identified as being a mix of via pore space and fractures.

13.4.21 The Site is not located within a Groundwater Source Protection Zone.

Hydrology

13.4.22 The nearest hydrological receptor identified is a stream source located on Site, approximately 10m from the southern boundary. This flows westwards into a ditch which feeds into another ditch located to the south of Wykham Farm Cottage (located to the south east of the Site).

13.4.23 The receiving ditch flows southwards into the Sor Brook located approximately 1km to the south of the Site. Approximately 600m to the south of the Site there is a small reservoir. There are also several small ponds located around the Site. The closest ponds are located 250m to the north west of the Site, and 500m to the south of the Site.

Site Sensitivity

13.4.24 Information published by GroundSure indicates that the only aspect of concern regarding site sensitivity is nitrate vulnerability. The entire Site and surrounding area is indicated to be within a nitrate vulnerable zone (NVZ). Farmers with land in NVZs must follow mandatory rules to tackle nitrate loss from agriculture.

13.4.25 The Nitrate Pollution Prevention Regulations bring into force the European Commission nitrates directive. The latest review came into force on 17 May 2013. The regulations mean that land that drains into waters polluted by nitrates are designated as Nitrate Vulnerable Zones. The Nitrates Directive is implemented by separate regulations in England and Wales. The

Outline Planning Application

Environment Agency is responsible for enforcing and assessing farmers' compliance with these regulations in England.

13.4.26 There is no designation of Sites of Special Scientific Interest, Special Areas of Conservation, or Special Protection Areas on Site or in the immediate surrounding area. However, there are records of Environmentally Sensitive Areas identified as Upper Thames Tributaries (Natural England) located 1.5km and 1.7km north-east of the Site.

Ground Stability and Mining / Mineral Extraction

13.4.27 The environmental desk study data report records the following stability information with regard to hazards potentially associated with the Site:

- The potential for collapsible ground at the Site is very low;
- The potential for landslide ground stability hazards on the Site are very low;
- The potential for running sand ground stability hazards on the Site is considered to be negligible; and
- The potential for shrinking or swelling clay ground stability hazards across Site are detailed as being low to negligible.

13.4.28 There are no records of coal mining affected areas or BGS recorded mineral sites on Site or within the immediate surrounding area.

Radon Gas

13.4.29 The Building Research Establishment (BRE) 'Guidance on Protective Measures for New Dwellings' (BR211) has been consulted along with the information provided within the GroundSure report. The documentation indicates that the Site is located within an area where full radon protective measures are required. It is recommended that subsequent to planning consent being awarded a radon protection report from the British Geological Survey (BGS) is obtained which would provide further detailed information on this to assist in the detailed planning and construction of the Proposed Development.

Environmental Setting

13.4.30 Information published by the Environment Agency has been obtained via a GroundSure data report dated 8 July 2014. The data report provides environmental information, the following assessment is undertaken regarding the Site location and a suitable radius around the study area. The information includes details of sites that are recorded to hold abstraction or discharge consents, recorded pollution incidents, licensed waste sites, sites subject to environmental authorisations (air pollution controls etc.) and sites that have, or historically have potentially contaminative uses.

Abstraction Licences

13.4.31 The GroundSure report indicates that there are three recorded groundwater abstractions recorded within 1km of Site.

13.4.32 The closest recorded groundwater abstraction is located 560m to the west of the Site and relates to the use of Thames Groundwater for general farming and domestic use at Crouch Farm, Banbury.

13.4.33 The other two groundwater abstraction licences within 1km of Site refer to a location 864m north-west of the Site and relates to the use of Thames Groundwater for spray irrigation at Crouch Hill Farm and Banbury Self Pick (farm shop).

13.4.34 There are four recorded surface water abstraction licences (at two locations) within 1km of the study Site. Two of the licences are recorded at a location 311m to the south-west of the Site and relates to the use of Thames surface water for spray irrigation at Wykham Park Farm (point A). The remaining two abstraction licences are recorded 570m to the south of the Site and relates to the use of Thames surface water for spray irrigation at Wykham Park Farm (point B).

13.4.35 There are no potable water abstraction licences within 1km of the Site, although this specific licence category is recorded

Outline Planning Application

1.2km to the south-east of Site relating to Bodicote Pumping Station using Thames surface water.

Discharge Consents

13.4.36 There are six recorded discharge consents within 500m of the Site (not including various permit versions of the same licence). The closest consent is located 91m north-west of the Site and is registered to Crouch Farm at Ham Road, Bloxham for discharge of sewage to Marlstone Rock Bed.

13.4.37 There is also a discharge consent located 159m north-west of Site which is registered to a Thames Water pumping station at Broughton Road, Banbury. This is in relation to the sewage discharge to Sor Brook.

Pollution Incidents to Controlled Water

13.4.38 There are no records of pollution incidences to controlled water within 500m of the Site.

Flooding

13.4.39 The Environment Agency website indicates that the Site is located within Flood Zone 1 (an area with little or no risk of flooding). This assessment corresponds with data provided within the GroundSure report obtained for the Site.

Landfill Sites and Waste Management Facilities

13.4.40 There are no BGS recorded, registered landfill sites or licensed waste management facilities within 1km of the Site. In addition there are no registered waste transfer sites, treatment/disposal, or integrated pollution control registered waste sites within 1km of the Site.

13.4.41 However, there is a record of one historical landfill within 1km of Site. This record relates to a Site 911m north of the study Site, located on Broughton Road, Banbury. This historic landfill is detailed to have received inert and industrial waste.

Pollution Incident / Contaminated Land Register

Outline Planning Application

13.4.42 There are no Local Pollution Incidents recorded on the National Incidents Recording System or Contaminated Land Register. There are no entries or notices on either register for the Site or in the wider surrounding area.

Local Authority Pollution Prevention and Controls

13.4.43 There are no Local Authority Pollution Prevention and Controls recorded within 500m of the study Site.

Potential Contaminative Uses

13.4.44 The report identifies no major industrial or contaminative activities on Site; however the report does specify the location of generic tanks (unknown contents) 26m north-east of the Site.

13.4.45 The report identifies five other industrial activities within 250m of the Site area:

- Carpet retailer and fitters (John Winters) located 176m to the north-east of Site;
- Garden centre (Alagra Products) located 182m to the north-east of Site;
- Electricity Substation located 213m to the north-east of Site;
- Water Pumping Station located 222m to the north-east of Site; and
- Electricity Substation located 247m to the north-east of Site.

Fuel Station

13.4.46 There are no fuel station entries within a 500m radius of the Site.

Underground High Pressure Oil and Gas Pipelines

13.4.47 There are no underground high pressure oil and gas pipelines fuel station entries within a 500m radius of the Site.

Hazardous Substances

Outline Planning Application

13.4.48 The desk study research indicates there have been no incidents or indication of hazardous substances on Site or within the immediate surrounding area.

13.4.49 To assess whether there is any history of hazardous materials use/handling which could potentially impact the Site, the desk study research covers records of the following:

- Control of Major Accident Hazards Sites (COMAH);
- Explosive Sites;
- Notification of Installations Handling Hazardous Substances (NIHHS);
- Planning Hazardous Substance Consents; and/or
- Planning Hazardous Substance Enforcements.

Conceptual Site Model

13.4.50 A Conceptual Site Model (CSM) for the Site has been developed and assesses potential contaminants, potential sources of contamination, potential receptors and potential pathways by which the receptors may be exposed. With respect to land contamination, potential receptors include human health, controlled waters, flora and fauna and buildings and structures. A pathway is a route or routes by which a receptor is exposed to a contamination source. Pathways can also determine the likelihood of the contamination source contacting a receptor. It should be noted that some uncertainties exist due to the limited site-specific data available.

Sources

13.4.51 The desk study research did not identify any widespread potential contaminant sources on-site; however a more extensive overview has been taken with considerations for possible sources. No industrial processes or significant material storage has been identified at the Site. Sources of contamination may potentially exist within unforeseen ground conditions.

Outline Planning Application

13.4.52 The historical mapping for the Site identified potential offsite sources of contamination to comprise the following:

- Two electricity substations – one located 213m to the north-east of Site and the other located 247m to the north-east;
- A water pumping station located 222m to the east of Site.

13.4.53 The onsite and offsite potential sources are reviewed and specified in further detail within the Wardell Armstrong Desk Study Report - *Chapter 6.2*. This document is attached as Appendix 13.1

Pathways

13.4.54 A number of possible pathways have been identified whereby potential receptors can be exposed to, or affected by, the identified contaminants:

- Groundwater/perched groundwater;
- Surface water runoff - flooding is a risk of high probability on site;
- Dermal contact, ingestion or inhalation of soil contaminants by site users;
- Ingestion of contaminated soil;
- Inhalation of contaminated dust and gasses;
- Uptake of contaminants from soil by flora;
- Uptake of contaminants into home grown produce; and
- Migration of soil borne contaminants via airborne dust.

Receptors

13.4.55 Receptors are essentially anything or anyone that can be adversely affected by contamination once a source and a pathway have been established.

13.4.56 The presence of potential receptors has been evaluated using our understanding of the current and future land use(s) of the Site.

Outline Planning Application

Consideration of potential receptors in the immediate surrounding area ensures the accurate assessment of potential on-site contamination impacting off-site locations.

13.4.57 The receptors and conceptual model are reviewed and specified in further detail within the Wardell Armstrong Desk Study Report - Chapter 6.4. This document is attached as Appendix 13.1

The Projected Future Baseline

13.4.58 No significant changes to baseline conditions are likely to occur in the future if the Proposed Development does not proceed.

Outline Planning Application

13.5 POTENTIAL EFFECTS**Construction Stage**

13.5.1 The desk study research identified a number of elements which could have a potential effect on the study Site and/or ground conditions at the construction phase of the Proposed Development (in absence of mitigation). These factors are summarised below:

Potential Effects of the Ground Conditions on the Proposed Development

- The possibility of clay being at considerably shallow depths, which have the potential to heave / shrink due to the influence of trees;
- The potential for localised soil contamination associated with agricultural use within the area of site. Leached agricultural inputs, i.e. fertiliser, pesticides, herbicides, etc;
- The possible presence of localised ground gases associated with topsoil materials;
- The presence of the stream source located on site, approximately 10m from the southern boundary;
- Discharge to surface water / groundwater – i.e. sewage pumping stations; and
- Elevated concentrations of metals/metalloids associated with the Marlstone Rock Formation.

Potential Effects of the Proposed Development on Ground Conditions

- The layout of the Proposed Development may have an impact on the ground conditions. Removal or incorporation of trees and shrubs into the development could have an impact on the condition of the silty, clayey material identified as the Marlstone bedrock. This may result in swelling or shrinkage of the ground dependent upon the hydrological conditions at the site. In addition, large areas of hardstanding are likely to reduce the amount of water ingress into the soils and potentially affect the ground conditions;
- Fuel and oil based hydrocarbon contamination associated with plant and machinery activity on site;
- It is possible that contamination of the ground may occur due to activities relating to the developments. This could include spillage

Outline Planning Application

of oils and fuel from plant working at the site, chemical spillages and other contaminants, and potential for construction waste such as broken brick, tiles, waste concrete, cement, etc. to become incorporated into the surface of the ground;

- There are a number of potential impacts which may result from the construction phase of the development;
- Removal of topsoil materials and tracking of plant across uncovered cohesive bedrock material may cause additional weathering and disturbance to the shallow ground conditions and could result in softening and rutting of the surface; and
- Removal of topsoil materials is likely to increase surface run-off.

13.5.2 A working plan should be designed, which will allow excavations to

Post-completion Stage

13.5.3 The desk study research identified a number of elements which could have a potential effect on the study site and/or ground conditions at the post-completion phase of the Proposed Development (in absence of mitigation). These factors are summarised below:

Potential Effects of the Ground Conditions on the Proposed Development

13.5.4 Excluding unforeseen activities/alterations undertaken within the individual housing plots, the effects of the post-completion ground conditions are deemed to be the same as those in the construction stage (this is considered to be accurate if no mitigation procedures have been undertaken).

Potential Effects of the Proposed Development on Ground Conditions

13.5.5 Following development of the Site the ground will be affected by activities undertaken within the individual housing plots. This could include spillages of oils, fuels or other chemicals associated with vehicle and household activities.

Similarly the roads serving the development provide further potential for contamination of the ground. The potential presence of sewerage within the ground also identifies a potential for pollution of the Site due to leakage or overflow from the sewer network.

Table 13.4 – Significance of Potential Impact (without mitigation)

Receptor	Sensitivity	Magnitude of change as a result of development			
		<i>Large</i>	<i>Moderate</i>	<i>Small</i>	<i>Negligible</i>
<i>Human</i>	High	-	-	Moderate	-
<i>Surface Water</i>	Medium	-	-	Minor	-
<i>Groundwater</i>	Medium	-	-	Minor	-
<i>Constructed Development</i>	Medium	-	-	Minor	-

Outline Planning Application

13.6 MITIGATION MEASURES

Construction Stage

13.6.1 As part of the detailed design stages of the development, where relevant, a further assessment to determine the contaminative status of the Site could be undertaken.

13.6.2 This assessment would aim to characterise the general geochemical nature of the Site as well as focusing on particular areas of the Site where potential contaminative uses have been identified as part of the desk study researches, i.e. water pumping stations etc. Assessment of the results of this testing would determine whether mitigation measures would be required.

13.6.3 Assessment of the ground conditions at the Site will inform the design.

13.6.4 An appropriate intrusive Site investigation could be undertaken on the Site if necessary. Mitigation measures should they be deemed appropriate.

13.6.5 In terms of minimising the impact of the Proposed Development on the ground, measures should be in place to deal with accidental spills and any wastes produced during construction. Construction activities would also require material management plans to be prepared and implemented to audit waste materials and minimise potential adverse impacts to the ground.

Post-completion Stage

13.6.6 The Proposed Development has been designed to avoid significant adverse effects resulting during both the construction stage and following completion.

Outline Planning Application

13.7 RESIDUAL EFFECTS

Construction Stage

13.7.1 It is considered that the agricultural land use of the Site provides minimal impact upon the Proposed Development of the Site. The assessments reported above do not identify any significant adverse residual effects.

Post-completion Stage

13.7.2 It is considered that the agricultural land use of the Site provides minimal impact upon the Proposed Development of the Site. The assessments reported above do not identify any significant adverse residual effects.

Summary of Effects

13.7.1 The effects identified are summarised in Table 13.5 overleaf.

Table 13.5: Summary of Effects

Potential effect	Significance (pre-mitigation)	Mitigation measure	Significance of residual effect
Construction stage			
Clay at shallow depths, which have the potential to heave / shrink due to the influence of trees	Minor - Adverse	As part of the detailed design stages of the development, where relevant, it would be beneficial to undertake further assessment to determine the contaminative status of the Site. Specific mitigation measures will be required to reduce significant adverse effects potentially caused by the Proposed Development. In terms of minimising the impact of the Proposed Development on the ground conditions, there would be a requirement during the development/construction phase to ensure that materials and chemicals used during the construction would not impact the ground adversely. This could involve the use of bunded tanks, vehicle maintenance and minimisation of construction related waste. Appropriate measures should be in place to deal with accidental spills and any wastes produced during construction. Construction activities may also require material management plans to be prepared and implemented to audit waste materials and minimise potential adverse impacts to the ground. Mitigation will be achieved through application of a CEMP.	Negligible
Soil contamination associated with agricultural use within the area of Site. Leached agricultural inputs, i.e. fertiliser, pesticides, herbicides, etc;	Moderate - Adverse		Minor
Localised ground gases associated with topsoil materials	Minor - Adverse		Negligible
The presence of the stream source located on Site	Minor		Negligible
Discharge to surface water / groundwater – i.e. sewage pumping stations	Moderate		Minor
Elevated concentrations of metals/metalloids associated with the Marlstone Rock Formation.	Moderate - Adverse		Negligible
Removal or incorporation of trees and shrubs into the development could have an impact on ground conditions.	Minor		Negligible
Fuel and oil based hydrocarbon contamination associated with plant and machinery activity on Site.	Moderate - Adverse		Negligible
Contamination of the ground due to activities relating to the development. This could include spillage of oils and fuel from plant working at the Site, chemical spillages and construction wastes, etc.	Moderate - Adverse		Minor
Removal of topsoil materials and tracking of plant across uncovered cohesive bedrock material	Minor		Negligible

Outline Planning Application

Removal of topsoil materials is likely to increase surface run-off.	Minor		Negligible
Post-completion stage			
Excluding unforeseen activities/alterations undertaken within the individual housing plots, the effects of the post-completion ground conditions are deemed to be the same as those in the construction stage.		A regime of geochemical/geotechnical assessment should be undertaken shortly after the development phase to review the impact of construction activity. The duration of this post-works assessment should be based on the achievement of designated Site criteria. Post-work surveys are carried out to confirm the long-term effectiveness of the mitigation procedures undertaken during the construction phase.	
Activities undertaken within the individual housing plots. This could include spillages of oils, fuels or other chemicals associated with vehicle and household activities.	Minor		Negligible
The roads serving the development provide further potential for contamination of the ground. The potential presence of sewerage within the ground also identifies a potential for pollution of the Site due to leakage or overflow from the sewer network.	Minor	There are few measures that may be put in place to minimise the impact that individuals occupying the Proposed Development may have on the ground conditions, however the predominately clayey nature of the mudstone would help to contain any spillage or contamination within any isolated location and impede transmission.	Negligible