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WASTE RESOURCE MANAGEMENT



**GALLAGHER ESTATES**

**WYKHAM PARK FARM, BANBURY**

**Desk Study Report**

**August 2014**

*your earth our world*



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**Desk Study Report**

**August 2014**

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ENERGY AND CLIMATE CHANGE  
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MINING AND MINERAL PROCESSING  
MINERAL ESTATES AND QUARRYING  
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## APPENDICES

Appendix 1 – GroundSure Report

## 1 INTRODUCTION

Wardell Armstrong LLP has been commissioned by Gallagher Estates to provide engineering consultancy services for the development of the site known as Wykham Park Farm, Banbury, Oxfordshire (approximately 1.7km south of Banbury Town Centre). It is understood that the site is to be developed for residential purposes.

Making reference to the development proposals, Wardell Armstrong LLP has carried out a Phase 1 Geo-Environmental Desk Study of the site in order to identify anticipated ground conditions and environmental risks.

### 1.1 Report Objective

The objective of this report is to detail a desk-based review of the environmental data available for the site. Assessment of this information allows for an overview of the historical and current contaminative setting of the site and its surrounding area. A geo-environmental assessment of the site will ensure the requirements of the proposed development are met. This has facilitated an assessment of the following in particular:

- Geo-environmental conditions at the site;
- Land contamination risks associated with the site; and
- Statutory records in relation to the site (which requires consideration as part of the planning process).

This report describes the historical, geological, hydrogeological and environmental setting of the site. The desk study element of this report has been prepared by reference to sources of information readily available in local archives and Wardell Armstrong in-house records. Information has been obtained from GroundSure and the Environment Agency. A copy of the GroundSure Data and Insight reports are included as Appendix 1.

The results and conclusions of this report should be confirmed at or prior to construction.

## 2 SITE SETTING

### 2.1 Site Location

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. The site location is illustrated in Figure 1 below.

**Figure 1 – Wykham Park Farm, Banbury**



Reproduced from Google Maps

The proposed development area 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.

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, which is indicated to flow west to east, is present within the trees in the eastern section of the southern boundary.

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 by open fields beyond which is residential development and by Wykham Park lodge and open fields in the south.

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).

The Ordnance Survey plans and topography maps for the area indicate the site is generally topographically flat with a gently slope from west to east. The western and majority of the site area is occupied by a plateau at approximately 130m AOD, falling gently south-eastwards from a high point of 133m AOD on the north western corner and steepening towards a low point of approximately 125m AOD on the south-eastern corner. The plateau gradients vary broadly between 1:45 and 1:50, whereas those on the land to the south steepen to 1:8. Inspecting currently available desk based research the site appears to be completely clear apart from areas of vegetation, with no evidence of deposited waste materials on the site.

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.

## **2.2 Site History**

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. The historical plans for the site are included within Appendix 1.

**Table 1: Site History**

Date	Description	Source
1881	<p>The site is within an area of agricultural/undeveloped land. The areas to the north, east, south and west are indicated to be open fields.</p> <p>This 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.</p> <p>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.</p> <p>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 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 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 north-east of the site. Bodicote village is shown approximately 700m to the south-east of the site boundary.</p> <p>In addition further north-west (approximately 550m from the site boundary) a rifle range is shown, behind which a small quarry and brickworks.</p> <p>Sor Brook which meanders in an east west direction is shown 1km to the south of the site. The Oxford Canal is shown 1400m to the north east of the site running in a north-west to south-east direction. The river Cherwell is located 1600m to the north-east of the site running approximately in a north-west to south-east direction.</p>	1:10,560 scale County Series



Date	Description	Source
1899-1900	The site features and surrounding area have not significantly changed. There are tracks, which are now more evident, in the western and eastern section of the site. Both tracks run in a south to north direction, providing access to the fields for the landowners of Wykham Farm and Park Farm. This mapping also records an old clay pit, located approximately 250m to the northwest of the site.	1:10,560 scale County Series
1920-1923	The site features and surrounding area have not significantly changed. However, a lodge has been constructed on the western boundary of the site. Allotments are also now shown to the east of the site.	1:10,560 scale County Series
1938	Mapping now shows an area of residential development in Easington to the north of the site. A school is also shown in this area. Bodicote village has expanded to the east of the site.	1:10,560 scale County Series
1954	The site features and surrounding area have not significantly changed. Further expansion is seen in the Easington residential development.	1:10,560 scale Provisional
1976	The mapping published in 1976 details further development of Easington to the north of the site with large housing estates, schools, playing fields and a hospital recorded on the mapping. Along part of the southern site boundary a drain is now shown flowing in a west to east direction into a stream (which flows north to south) located to the southeast of the site. There are no further changes shown on site.	1:10,000 scale National Grid
1982	Although the site features and surrounding area have not significantly changed, this is the first plan which identifies Tudor Hall School, stables and tennis courts at Wykham Park.	1:10,000 scale National Grid
1992	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.	1:10,000 scale National Grid

Date	Description	Source
1992 (continued)	A pond is shown in the location of the former clay pit noted on the 1882 mapping 250m northwest of the site.	
2002	Although the site features and surrounding area have not significantly changed, the Easington urban sprawl has now reached the pond identified in the 1992 mapping.	1:10,000 scale Raster
2010-2014	The site features and surrounding area have not significantly changed.	1:10,000 scale National Grid

### On-site

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.

### Surrounding Area

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 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 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 700m to the south east of the site boundary.

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.

### **3 RECORDED GEOLOGY, HYDROGEOLOGY & SITE SENSITIVITY**

#### **3.1 Recorded Geology**

##### *3.1.1 Superficial Deposits*

No superficial deposits are recorded to be present on site.

##### *3.1.2 Solid Geology*

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.

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.

The geology of the site is shown on the Geological Mapping contained within the GroundSure GeoInsight Report included in Appendix 1.

##### *3.1.3 BGS Boreholes*

There are no BGS boreholes recorded within the site or its immediate surrounding area.

### 3.2 Hydrogeology

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. 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.

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.

Information published by 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.

The site is not located within a Groundwater Source Protection Zone.

### 3.3 Hydrology

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).

This subsequent 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.

### **3.4 Site Sensitivity**

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.

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

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.

### **3.5 Ground Stability and Mining / Mineral Extraction**

The environmental desk study data report suggests the following stability hazards may apply to 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.

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

### **3.6 Radon Gas**

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.

## 4 ENVIRONMENTAL SETTING

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.

### 4.1 Abstraction Licences

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

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.

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).

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).

There are no potable water abstraction licences within 1km of the site, although this specific licence category is recorded 1.2km to the south-east of site relating to Bodicote Pumping Station using Thames surface water.

## **4.2 Discharge Consents**

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. 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.

## **4.3 Pollution Incidents to Controlled Water**

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

## **4.4 Flooding**

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.

## **4.5 Landfill Sites and Waste Management Facilities**

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.

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.

## **4.6 Pollution Incident / Contaminated Land Register**

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.



#### **4.7 Local Authority Pollution Prevention and Controls**

There are no local authority pollution prevention and controls recorded within 500m of the study site.

#### **4.8 Potential Contaminative Uses**

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.

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.

#### **4.9 Fuel Station**

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

#### **4.10 Underground High Pressure Oil and Gas Pipelines**

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

#### **4.11 Hazardous Substances**

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

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.

## **5 PRELIMINARY LAND CONTAMINATION ASSESSMENT**

### **5.1 Legislative Background**

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. Part 2A applies where there is unacceptable risk, assessed on the basis of the current use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

Revised Part 2A Statutory Guidance was issued by the Secretary of State in April 2012. As part of this guidance, a new category system has been proposed to define whether land should be classified as Contaminated Land. Land falling under Categories 1 and 2 being designated as Contaminated and 3 and 4 as non-contaminated. New Category 4 screening levels are proposed, but are not yet available.

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.

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.

Following a review of the background geo-environmental information for the site, a preliminary conceptual site model has been formulated to identify sources of contamination, potential pathways and potential receptors on and in the immediate vicinity of the site.

It should be noted that some uncertainties exist due to the limited site-specific data available. However, potential contaminants and receptors have been identified based on the desk based site review. Pathways have been established on reasonable scientific knowledge of the behaviour of the contaminants in the ground.

Environment Agency guidance provided in CLR11 indicates conceptual site model (CSM) should identify those contaminants, pathways and receptors which are 'likely' to represent an 'unacceptable' risk either to human health or the surrounding environment.

## **6 CONCEPTUAL SITE MODEL**

### **6.1 Conceptual Site Model**

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.

### **6.2 Sources**

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.

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.

On Site

	Source	Potential Contaminant
1.	<i>Leached Agricultural Inputs</i>	<p><i>Excess Nitrogen / Pesticides and Herbicides</i></p> <p><i>Comments:</i> Soils do not absorb the excess nitrate ions, which then move downward freely with drainage water, and are leached into groundwater, streams and oceans.</p> <p>Until it is possible to confirm that no extensive agricultural processes have taken place on site presently or historically (discussions with land owners, site operatives, occupants or local residents) then excess nitrogen should be considered a potential contaminant. Nitrogen leaching is a major concern in areas of farmland.</p>
2.	<i>Agricultural machinery and other vehicular operation</i>	Fuel and oil based hydrocarbon contamination associated with spills and leakages from agricultural vehicles
3.	<i>Decomposing materials</i>	Potential for ground gas within any made ground and decomposing materials.

Adjacent Sites

	Source	Potential Contaminant
1.	<i>Potential Buildings in Surrounding Area</i>	Possible asbestos containing materials used within construction of buildings (especially at the southern boundary – Wykham Farm Cottage).
2.	<i>Discharge to surface water / groundwater – i.e. sewage pumping stations,</i>	<p>Wide range of potential contamination: Raw sewage, illegal dumping of waste, petrol and diesel fuels, etc.</p> <p>The closest sewage network discharge consent is 158m to the north-west of site. However, there are several sewage network discharge consents in the wider area surrounding site. The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary.</p> <p>Until groundwater flow and direction has been assessed further, throughflow remains a potential pathway from the various sources until confirmed otherwise.</p>
3.	<i>Leached Agricultural Inputs</i>	Excess nitrogen input from surrounding agricultural grounds. Excess pesticides and herbicides should also be considered.
4.	<i>Agricultural machinery and other vehicular operation</i>	Fuel and oil based hydrocarbon contamination associated with spills and leakages from agricultural vehicles

### 6.3 Pathways

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;
- Dermal contact, ingestion or inhalation of soil contaminants by site users;
- Ingestion of contaminated soil;
- Inhalation of contaminated dust and gases;
- Uptake of contaminants from soil by flora;
- Uptake of contaminants into home grown produce; and
- Migration of soil borne contaminants via airborne dust.

### 6.4 Receptors

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

The presence of potential receptors has been evaluated using our understanding of the current and future land use(s) of the site. Consideration of potential receptors in the immediate surrounding area ensures the accurate assessment of potential on-site contamination impacting off-site locations.

Potential receptor	Present?	Reason
Current users of the site and visitors	Possible	The site is generally unoccupied and is unlikely to be securely fenced allowing unauthorised access.
Future users of the site	Possible	Proposed development for new residential area. Site development and subsequent site users/visitors.
Construction workers on site	Possible	Workforce used to construct the development and associated services.
Groundwater	Possible	Sections of the site are underlain by a Secondary A Aquifer.

Potential receptor	Present?	Reason
Surface/Controlled Waters	Yes	The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary. This flows westwards into a ditch. There are also several small ponds located around the site. The closest pond is located 250m to the north west of the site.
Major Ecosystems	No	There are no designated areas within the site or its immediate surroundings.
Flora and Fauna	Yes	Although no major ecosystems are present on site, it is very likely to be a habitat for an array of flora and fauna.
Adjacent Sites	Yes	It should also be reiterated that it is highly likely surrounding areas are used for agricultural processes.



Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Construction Workers	Potential contaminants onsite and migrating from offsite	Dermal contact, ingestion and/or inhalation of soil, dust, vapours	Human Health	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area.  Further intrusive site investigation required to assess actual risk.	Unlikely	Medium
Future Users of proposed residential property located on site.	Potential contaminants onsite and migrating from offsite	Contact and accidental ingestion of surface soils. Inhalation and ingestion of dust.	Residential occupants / visitors.	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area.  Further intrusive site investigation required to assess actual risk.	Unlikely	Medium
Migration of contaminants from the site in to the underlying aquifer	Potential contaminants in the soil on site.	Leaching and/or percolation to underlying strata.	Secondary A Aquifer	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area.  Further intrusive site investigation required to assess actual risk.	Potentially	Medium/ High
Impacted groundwater abstraction and use	Potential geochemistry of underlying groundwater	Abstraction of groundwater	Groundwater use	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area.  The closest recorded groundwater abstraction is located 560m to the west of the site.	Very Unlikely	Low

Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Migration of contamination from site into surface water courses	Potential contaminants in the soil on site	Migration of contamination through surface water runoff.	Surface runoff	<p>No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area.</p> <p>The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary.</p> <p>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.</p>	Potentially	Medium

## 7 CONCLUSIONS & RECOMMENDATIONS

Conclusions are drawn from the preceding information in terms of potential sources of contamination, possible receptors that may be affected by any sources of contamination and any pathways that may exist. The basic risk assessment allows identification of the suitability of the site for its proposed use and evaluation of any environmental liability that may be attached to the site. From the information researched as part of this desk study it is considered that the potential for contamination across the site is low, however confirmation of this should be attained by means of a full site investigation undertaken across the site.

The land use history and review of current site use has indicated that the site has been in use for arable farming since the date of the earliest available published mapping (1881). It is considered unlikely that significant contamination of the site will have resulted from this land use.

Against the background of the desk study research, a summary of the potential development constraints have been detailed. These constraints and potential sources of contamination will need to be considered prior to development of the land at the subject site, Wykham Park Farm, for residential housing:

- The possibility of cohesive soils being at 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.

### 7.1 Access Restrictions

Current access routes should be evaluated with regards to any future works, i.e. large plant.

## **7.2 Groundwater Flow and Direction**

Further hydrogeological and hydrological assessment should be made concerning groundwater flow and direction. This would allow for an evaluation on potential sources of contamination from the wider area (in relation to groundwater and surface water pathways).

## **7.3 Foundations**

Further geotechnical assessment would have to be made to fully evaluate the foundation requirements of any proposed development.

Mature trees and hedges are present at various sections of the site and depending on the results of any geotechnical laboratory testing; there may be a requirement to deepen foundations locally to account for the potential influence of heave / shrinkage. It would therefore be prudent to make reference to the most recent tree survey report to facilitate a plot specific foundation assessment for the site.

## **7.4 Contamination**

The desk study researches have indicated that the site area has remained undeveloped since the first available maps. It is therefore anticipated that much of the site area will comprise natural materials with low contaminant levels.

## **7.5 Ground Gases**

Due to the presence of ditches on site, it may be possible that organic-rich materials may be encountered on site which could potentially give rise to ground gases. During spells of heavy rain organic matter may be transported onto site.

The Local Authority may require gas monitoring to be undertaken as part of the investigation works. Monitoring should be undertaken during varying climatic conditions to satisfy the local authority that the conditions are representative of the gas regime at the site. A subsequent ground gas risk assessment will confirm whether gas precaution measures will be required.

## 7.6 Existing Services

Consideration will need to be given to the water pumping network currently surrounding the wider site area. It is unlikely that there are any services present on site, however, as part of the proposal for an intrusive site investigation, an extensive review of site services should be carried out.

## 7.7 Proposed Investigations

As indicated in the preceding text, there will be a requirement for site investigations, laboratory testing and assessments to be undertaken to provide the necessary information to further assess the development potential of the site. It is considered that future works should include:

- An access assessment, to clearly define access route(s) as being suitable in relation to the proposed works.
- A series of trial pits and boreholes across the proposed development area to investigate the shallow ground conditions.
- In-situ geotechnical tests, to obtain geotechnical data in relation to foundation design. In addition to this, representative samples should be obtained for laboratory geochemical and geotechnical testing to provide valuable data for foundation and infrastructure design. Testing is likely to include grading and plasticity index testing as a minimum to confirm the potential influence of the surrounding trees.
- The most recent tree survey report should be reviewed to facilitate a plot specific foundation assessment for site.
- The installation of gas and groundwater monitoring standpipes to facilitate long-term monitoring of the site.
- Chemical contamination testing for standard Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAHs), asbestos (if required) and any other potential contaminants identified during the course of the works should be undertaken on selected samples of near surface materials.

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