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Phase 1 Desk Study

Proposed Residential Development,

Butterfly Park,

Little London,

Long Sutton,

South Holland,

Lincolnshire.

30th May 2023

T. L. P. Ground Investigations.

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, South Holland, Lincolnshire

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Phase 1 Desk Study

Site: Proposed Residential Development, Butterfly Park, Little London, Long Sutton, South Holland, Lincolnshire.

Client: D. Brown Builders Ltd.

Architects: William Saunders Architecture.

Date: 30th May 2023.

1.0 INTRODUCTION

1.1 General

Following the instructions of D. Brown Builders Ltd., a preliminary environmental assessment was undertaken in connection with land located at Butterfly Park, Little London, Long Sutton, South Holland, Lincolnshire, which is under consideration for residential development. The brief for the investigation was to undertake a preliminary 'Phase 1 Desk Study' in general accordance with the Model Procedures for the Management of Land Contamination (CLR 11)', the relevant Planning Practice Guidance (Land Affected by Contamination) and the Development on Land Affected by Contamination (Yorkshire and Lincolnshire Pollution Advisory Group) and the requirements of BS 10175 (2011) – Code of Practice for the Investigation of Potentially Contaminated Sites'.

The objective of the study was to:-

- Provide information on the past activities at the site and in the immediate surrounding area which may have impacted on its contamination status.
- Identify potential sources of contamination, likely pathways and receptors of such contamination and any other features which may have constraints on the proposed development.
- Provide information on the geology, hydrogeology and hydrology of the site.
- To develop an initial conceptual site model of the nature and extent of potential contamination.
- To provide recommendations for a Phase 2 intrusive site investigation, if it was considered appropriate.

The **Desk Study** involved: -

- A general visual appraisal of the site.
- An examination of archive TLP sources and contemporary / historical Ordnance Survey Maps.
- A review of other surveys undertaken in the near vicinity, together with data published by the British Geological Survey.
- A review of the site's, hydrology and hydrogeology.
- An environmental data search, using information held in databases of the Environment Agency, British Geological Survey, Ordnance Survey, English Nature and The Coal Authority etc.

1.2 Current Site Use

For a number of years the site of the proposed new residential development has been used as a wildlife and nature sanctuary known as the 'Long Sutton Butterfly & Wildlife Park'. In 2012, after 25 years of trading, the park became unviable and since this time the site has remained disused but largely unchanged. According to the current site layout, the proposed development will involve the construction of approximately 125 detached and semi-detached residential dwellings, each with individual private garden areas. The development will also include the construction of new access roads, private driveways, an area of public open space. A large foul water pumping station and other infrastructure associated with a development of this size and nature are also anticipated.

2.0 SITE DESCRIPTION

The area of land under consideration is situated in the northeast outskirts of village of Long Sutton in the South Holland district of Lincolnshire. The roughly rectangular site has an approximate area of 5.45 Ha and is centred at National Grid Reference 543833, 323623. The site comprises a former wildlife park, which has remained disused for approximately ten years.

The site is currently accessible directly from a private road leading eastwards from Little London. The road extends onto a small tar macadam car park that was previously utilised by the former Wildlife Park. In the north western part of the site, adjacent to the tar macadam car park the ground surface has been disturbed in an area former buildings have been demolished at some point between 2016 and 2018. This part of the site is currently covered with bare earth with traces of brick and building rubble on the site surface. The area has recently been excavated to a slightly lower level than the surrounding car park and main road (Little London) and although the area is generally flat, the surface is uneven.

The road leading into the site also extends southwards onto a narrow track which extends around the south eastern boundary of the site. This track provides access to a number of agricultural fields situated to the south and east of the site, an orchard located to the east and two, large solar power generation farms, also located to the east and southeast of the site.

The remainder of the site comprises an undeveloped area of land, which has previously been used as a large wildlife park. The majority of the area is now overgrown with weeds and meadow grasses with occasional wild flowers and herbs. Occasional self seeded saplings and semi-mature trees are scattered around the open areas of the site. In these areas of the site, the ground surface is also generally level but slightly uneven in places. The north western quarter of the site is more densely wooded and contains a variety of semi-mature and mature tree specimens including Silver Birch, Poplar, Eucalyptus, Willow, Sycamore, Oak and other species. In some areas, the site quite densely wooded and the ground covered with nettles or briars, which prevented access on foot. Along the eastern boundary of the site is a band of trees, formerly an orchard which current plans show as to be retained, this area has been recorded as homing badgers which is a protected species.

Along the north western site boundary is a narrow water course, which at the time of the walkover survey contained a small amount of running water. An easement is in place protecting this drain. Beyond the north / northwest boundary is a medium sized Leisure Centre with playing fields, all weather pitches, a Day Nursery and other amenities. Open fields extend beyond the southern site boundary and to the west of the site are a number of residential properties and two agricultural structures used for storage purposes.

The site is situated within a rural residential setting with residential dwellings located in the areas to the west of the site along the road named Little London. To the north is a Leisure Centre, Day Nursery and Secondary School and to the south and east is agricultural farmland and solar farms.

At the time of the walkover survey, no potential sources of contamination were identified and no areas of staining or standing groundwater were identified on the ground surface.

3.0 SITE HISTORY

In order to help establish whether any previous uses of the site or activities in the surrounding area may have impacted on the contamination status of the site, historical and contemporary Ordnance Survey Maps of the area have been consulted, ranging from circa 1887 to 2023. In the following paragraphs 'the site' is defined as the approximate areas under consideration for potential residential development.

In the earliest extracts from 1887/88, the site is depicted as a largely undeveloped area known as Hall Marsh Farm. An 'L' shaped collection of buildings is located in the north western corner of the site associated with the main farmhouse located just beyond the site boundary to the south. Areas of hard standing are also depicted in the northwest corner of the site. The remainder of the site is depicted as open scrubland containing occasional trees. A small elliptical pond is located in the central eastern part of the site. At this time the site is depicted beyond the north eastern outskirts of the village of Long Sutton with open fields extending to the north east and south of the site. Drainage ditches are depicted along or very close to the northern and southern site boundaries and a Sheepfold is depicted very close to the southern site boundary. Small and medium sized ponds are also depicted within the open fields to the north, south and west of the site. Sporadic residential development is indicated along the main road to the west of the site, which at this time was designated as Roman Bank. A small Smithy is depicted a short distance to the south of the site at the southern end of Roman Bank.

In the extracts from 1903/04, subtle changes are indicated to the collection of structures in the north western corner of the site and an additional structure is also indicated. Other than the removal of the small elliptical pond is located in the central eastern part of the site, the remainder of the site remains largely unchanged although the occasional trees are no longer indicated. A small Dovecot is now depicted close to the centre of the site and a small new structure is now depicted midway along the northern site boundary. Just beyond the western site boundary a collection of new structures are now depicted adjacent to a medium sized pond. These include a collection of medium sized glass houses. No other significant changes are noted in the areas surrounding the site.

In the extract from 1929 additional structures are depicted within the collection of buildings comprising Hall Marsh Farm. A narrow belt of trees is shown along the central part of the site and more trees are indicated at the eastern end of the site extending eastwards into a large Orchard. Additional Orchards are also depicted in the wider areas surrounding the site to the east and south of the site. The small Smithy is no longer indicated on Roman Bank to the south of the site, however, an area of Allotment Gardens have been created on the corner of Roman Bank and Park Road.

On the extract from 1938, no significant changes are noted at the site or in the immediate surrounding areas.

In the extract from 1950, the belt of (orchard) trees is no longer depicted along the central part of the site and in the areas to the south and east a reduction in the size of the Orchards is noted. A short distance to the southwest of the site, a new residential development is depicted. A slight increase in residential in-filling is noted along the main road and also to the south of the site.

In the extract from 1958, no significant changes are noted at the site or in the areas immediately surrounding the site.

In the extract from 1965, no significant changes are noted at the site. In the wider area to the northwest, west and southwest of the site, an increase in residential infilling is depicted and a small pond formerly indicated to the north is no longer depicted. Roman Bank has been re-named Little London. A short distance to the north of the site, The Peele School has been constructed.

In the extracts between 1972 and 1979, no significant changes are noted at the site. On the extract from 1975, a small Sewage Works is shown approximately 100m to the west of the site.

In the extract from 1981, no significant changes are noted at the site. Additional residential development is noted to the northwest and west of the site.

In the extracts from 1990/91, alterations are indicated to the collection of structures in the north western corner of the site. In the areas to the east and south of the site, the extent of the Orchards has been reduced even further.

From 1999 onwards, historical aerial photography has been used to establish changes to the site and surrounding areas. In the image from 1999, the former Butterfly and Wildlife Park can be seen in detail. In the north western part of the site, the main collection of buildings appear to be of traditional construction with a trio of glasshouses attached. A number of smaller structures are noted over the remainder of the site, however, these appear to be temporary buildings, such as poly tunnels, a pergola and static caravans. From the appearance of the terrain, different parts of the site appear to have been designated for different purposes. Car parking is noted on the grassed area along the northern boundary. Orchards are still present at the eastern end of the site.

On the image from 2005, no significant changes are noted at the site. To the north, the Day Nursery building has been constructed and the new Leisure Centre is undergoing construction. On the image from 2006, no significant changes are noted at the site. To the north the Leisure Centre is shown to have been completed with associated playing fields and all weather pitches.

On the images from 2016, no significant changes are noted at the site, however, on the second image the site appears to be disused. Off site, to the east and southeast, large solar panel arrays have been constructed within the areas once used as Orchards.

In the image from 2018, the structures once located in the north western corner of the site have all been demolished leaving only the area of tar macadam, which appears to have become slightly overgrown.

In the remaining extracts to 2023, the site remains largely unchanged other than the presence of more self seeded saplings and areas of the site becoming increasingly overgrown. No significant changes are noted in the areas surrounding the site.

4.0 GEOLOGY HYDROLOGY AND HYDROGEOLOGY

Maps published by British Geological Survey indicate that the natural superficial deposits overlying the site are represented by Tidal Flat Deposits of clay and silt. The underlying natural bedrock is represented by the Ampthill Clay Formation (Mudstone), which is of Oxfordian age.

The Groundsure report for the site indicates that the maximum permeability of the superficial deposits is ‘low’ and that of the underlying bedrock, also as ‘low’.

The Groundsure report for the site indicates that no geological faults or linear features are situated within 500m of the site.

The Groundsure report indicates that the superficial deposits overlying the area are designated as an Unproductive Aquifer. The solid / bedrock geology is also designated as an Unproductive Aquifer.

The Groundsure report indicates that there are no records of groundwater or potable water abstraction points located within 2000m of the site. The nearest surface water abstraction is situated 1382m northeast of the site. **The site is <u>not</u> located within 500m of a Groundwater Source Protection Zone**.

The Groundsure Report indicates that the nearest surface water feature is an inland river not influenced by normal tidal action, which flows approximately 7m to the south of the site. The site is situated within the Coastal Catchment and is not listed within a designated WFD Groundwater body.

According to the EA RoFRaS database, the site is located within an area with a 'low' risk of flooding from rivers and the sea. There are no flood defences situated within 250m of the sites and the site is not located within 250m of an area benefitting from flood defences. No flood storage areas are located within 250m.

According to Ambiental Risk Analytics, the sites lies within an area with a negligible 1 in 30 year, 0.10-0.3m risk from surface water flooding and a 'negligible' risk from groundwater flooding.

5.0 ENVIRONMENTAL SEARCHES

Information gathered from environmental searches is contained within the enclosed Groundsure Report No EMS-869950_1113884. The salient details of the report are as follows: -

5.1 Environmental Permits, Incidents and Registers

A number of historical discharge consents have been highlighted, the nearest of which was located 89m west of the site, which allowed the release of sewage discharges onto land. The permit was revoked in 1997.

5.2 Landfill and other Waste Sites

There are no records of current or historical landfill sites situated within 500m of the study site.

No licensed current waste sites have been identified within 500m of the site.

5.3 Current & Historical Land Uses

There are on 10 No. records of recent potentially contaminative industrial sites situated within 250m including historical tanks. Within 100m of the site, the only one listed is a historical sewage works once located 91m southwest of the site.

There are 55 No. records of historical potentially contaminative industrial land uses situated within 250m of the site, including historical tanks and energy features. The only features situated within 100m of the study site are the solar photovoltaic farm situated 20m southeast of the site and 72m northeast of the site.

5.4 Designated Environmentally Sensitive Areas

There are no records of any specific environmentally sensitive areas situated within 2000m of the study site.

5.5 Natural Hazards Findings

According to the Groundsure report, the site lies within an area with a moderate hazard rating from subsidence caused by running sands and compressible deposits, a low hazard rating from subsidence caused by shrink / swell clay, a very low hazard rating from subsidence caused by landslides and a negligible hazard rating from subsidence caused by collapsible deposits and soluble rocks.

The site is not located within a coal mining area or a brine affected area.

The HPA indicates that the site is not located in a Radon Affected Area as less than 1% of homes, are anticipated to be above the Action Level for homes of 200Bqm^{-3}. The Groundsure Report indicates that within this category **No radon protective measures are necessary at the site** for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment.

More detailed information on environmental issues and contemporary trade directory entries can be obtained by consulting the enclosed **Emap**site Groundsure Reports.

5.6 Land Use Summary

- According to historical mapping, the site of the proposed development has only ever been used as an operational farm and later as Wildlife Sanctuary Visitors Attraction. Available historical data would indicate that it is highly unlikely that significant widespread contamination will be present within the site boundaries from historical activities undertaken on site. During the historical use of the site as a working farm, activities could have taken place which may have given rise to the release of minor contamination. These include the use of farming plant and equipment and other activities undertaken both inside and outside the former farm structures. Owing to the construction and subsequent demolition of structures in the north western parts of the site, it is possible that deposits of made ground could be present which may contain contaminated residues. Historical aerial photography indicates that vehicles were routinely parked in certain parts of the site, which may have accidentally released contaminants onto the site.

- From the earliest extract of 1887 to the present day, the areas surrounding the site have mainly been used for agricultural and residential purposes. Sporadic commercial land use activities have been identified in the wider areas surrounding the site including a small Smithy and Sewage Works, however, these are considered to be at such a distance as to have had no significant impact on the contamination status of the soils beneath the study site. Other notable land use activities within influencing distance of the development include a number of agricultural storage buildings located just beyond the western site boundary, a solar photovoltaic farm to the northeast and southeast and a leisure centre and playing fields to the north, none of which are considered to represent a significant risk to the study site.

- Narrow drainage ditches have been identified flowing very close to the boundaries of the study site, which may represent a source of contamination, however bearing in mind the rural setting this is considered highly unlikely.

6.0 PRELIMINARY CONCEPTUAL SITE MODEL

Guidance published by the Department of the Environment, Transport and Regions (DETR Circular 02/2000) indicates that before the Local Authority can make a judgement that any land appears to be ‘contaminated land’, on the basis ‘that significant harm is being caused, or there is a significant possibility of such harm being caused’, the authority must identify a significant pollution linkage. This means that each of the following has been identified:-

- a contaminant (Source)
- a relevant receptor and
- a pathway

Regarding this relationship (source-pathway-receptor SPR), if any of the three elements are not present, there is no risk and therefore land cannot be classified as statutory ‘contaminated land’.

With respect to ‘controlled waters’, before determining that pollution of controlled waters is being, or is likely to be, caused, the Local Authority should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters.

6.1 Potential Sources of Contamination

- From an examination of the site’s history, potential sources of ‘on site’ contamination could be associated with the activities that have taken place within the site boundaries during its

history. From the earliest historical extracts, the site appears to have been used as an operational farm with a number of farm buildings located in the north western part of the site. Later the site was utilised as a Wildlife Sanctuary Public Attraction for a period of approximately 25 years. Potential contamination could be associated with historical agricultural activities include the use of farm vehicles and equipment, the possible storage of potentially contaminative materials and the construction and construction / demolition of farm buildings. Contamination may also have been released as a consequence of the parking of visitor's vehicles in certain parts of the study site. A number of narrow drainage ditches flow along or very close to the site boundaries. These conduits may represent a means by which contamination may have migrated onto the study site.

- Historically, since the 19th Century, the areas surrounding the site have been used predominantly for agricultural and residential purposes, however, a small number of industrial and commercial activities have also been identified. The most significant of these are a small Smithy once located to the south and a small Sewage Works once designated to the west of the site. Neither of these are considered to be located close enough to represent a significant risk to the site. Other notable land use activities include a number of agricultural storage buildings located just beyond the western site boundary, the nearby solar photovoltaic farm to the northeast and southeast and the former Sewage Works indicated to the west of the site. It is considered relatively unlikely that significant contamination could migrate onto the study site from these areas.

- Weathering of the natural geological stratum can occasionally cause enrichment of certain metals in the near surface strata, however, this is considered unlikely bearing in mind the information given in the 'Groundsure' report which in 'Section 20' (Estimated Background Soil Chemistry) shows very low anticipated levels of Arsenic, Cadmium, Chromium, Nickel and Lead.

Potential Contaminants

The potential contaminants that might be associated with the past uses of the site and activities in the surrounding area have been tabulated below:-

- **Metals, metalloids and asbestos** associated with any agricultural activities that have taken place on the site or within deposits of 'made or disturbed ground' that may have been placed on the site surface in the historical past. Contamination that may have been generated as a consequence of the activities associated with the construction and subsequent demolition of the structures that are / were once located on the site. Contamination derived from the various commercial / industrial activities that have taken place in the vicinity of the site. Contamination from natural weathering of the geological stratum. Possible contamination that may have migrated onto the study site during the development of the nearby residential properties and other structures located within the vicinity of the site.

- **Polycyclic Aromatic Hydrocarbons (PAH's)** derived from the incomplete combustion of organic materials, i.e. from the burning of organic materials that may have taken place in the historical past. PAH's contained within deposits of made ground or derived from the use of plant machinery or the parking of visitor's vehicles.

- **Total Petroleum Hydrocarbon (TPH)** contamination from the historical use, storage and possible maintenance of vehicles, or the possible use of agricultural plant and machinery. TPH from any imported made ground or accidental spillages within the structures once located on site. TPH contamination that may have migrated onto the site from other commercial / industrial sites in the near vicinity, although this is considered remote.

- The Groundsure Report has not revealed any areas of landfill, in-filled ground or surface ground workings that could represent a credible source of harmful ground gas emissions. It is therefore considered that there is no requirement for a quantitative ground gas risk assessment at the study site. The site is not located within a radon affected area as less than 1% of properties within the specified search area recorded above the action level. The

Groundsure report indicates that within this Radon range, no radon protection measures are required for new buildings or extensions to those already existing.

Table 1

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Sources							
Sources Description	Contaminants Associated with Source						
	Metals	PAH	TPH/BTEX	Asbestos	Pesticides & Fertilizers	Harmful Ground Gasses CH4, CO2, CO, H2S	TPH Vapours
On Site							
Contamination resulting from the possible use of agricultural plant and machinery in the historical past. The possible presence of deposits of made up or disturbed ground across the site. The construction and subsequent demolition of the structures that have occupied various parts of the site. Potentially contaminative activities that may have taken place in the structures that have once occupied the site or in the external areas of the site. The possible storage or use of fuels, lubricants and other hydrocarbons during the sites history.	✓	✓	✓	✓			✓
Burning processes that have taken place within the site boundaries, such as the burning of organic matter or the possible presence of PAH within any deposits of made ground that may be present over the site surface. PAH compounds that may have been released as a consequence of using plant and machinery or through the parking of vehicles on the study site.	✓	✓					
Residual contamination from natural weathering of geological strata.	✓						
Off Site							
Contamination that may have migrated onto the site from agricultural or commercial activities that have taken place in the areas surrounding the site.	✓	✓	✓	✓			✓
Contamination that may have migrated onto the site through the narrow drainage ditches that pass along or very close to the site boundaries.	✓	✓	✓	✓			✓

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Key for Table 1
Metals
Includes - Metals and metalloids (Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, Arsenic, Boron, Selenium and inorganic chemicals such as Cyanide
PAH
Includes – EA16 – Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene.

6.2 Potential Receptors

Potential receptors for any contamination at the site have been identified as: -

- Any shallow groundwater within the superficial deposits overlying the site.
- The Unproductive Aquifers underlying the site.
- Ground workers involved in any redevelopment of the site.
- Flora and Fauna including produce that may be grown on site.
- Future occupiers of the site including human receptors.

- The properties located adjacent to the site boundaries.
- The fabric of the structures to be constructed at the site.
- Any drainage ditches located in the areas surrounding the site.

6.3 Potential Pathways

- Any groundwater underlying the site may represent a pathway via which water-soluble contamination may migrate laterally or vertically.
- Highly permeable strata at shallow depth, which has little ability to attenuate diffuse source pollutants.
- Any drainage ditches, service conduits or land drains and any permeable natural deposits beneath the site may represent pathways via which contamination, if present, may be able to migrate.
- The trafficking of plant and machinery across the site in the historical past or during construction of the development.
- Dermal absorption, ingestion and inhalation represent pathways via which ground workers during redevelopment works at the site and future occupiers, may become exposed to contaminated soil, groundwater, dust or vapours.

Table 2

Pathways		**Receptors**	
Human Health		**Human Health**	
Dermal Contact with soil	✓	End users and construction workers	✓
Ingestion of soil	✓	End users and construction workers	✓
Inhalation of Contaminated Dust and Harmful Gasses	✓	End users and construction workers	✓
Ingestion of site grown vegetables	✓	End users	✓
Ingestion of water from affected service pipes	✓	End users	✓
Buildings		**Buildings**	
Mobile water soluble sulphates	✓	Concrete foundations	✓
Controlled Waters		**Controlled Waters**	
Lateral and vertical migration	✓	Surface water receptors & shallow / deeper groundwater regime	✓
Infiltration	✓	Surface water receptors & shallow / deeper groundwater regime	✓

Table 2 - details the potential pathways with receptors identified for any contaminants that may be present in the ground at the site during and following the proposed development.

Preliminary Conceptual Site Model - CIRIA C552 Risk Assessment Matrix

Potential Source	Potential Pathway	Potential Receptor	Probability	Consequence	Risk Classification
Contamination resulting from the possible use of agricultural plant and machinery in the historical past. The possible presence of deposits of made up or disturbed ground across the site. The construction and subsequent demolition of the structures that have occupied various parts of the site. Potentially contaminative activities that may have taken place in the structures that have occupied the site or in the external areas of the site. The possible storage or use of fuels, lubricants and other hydrocarbons during the sites history. Burning processes that have taken place within the site boundaries, such as the burning of organic matter or the possible presence of PAH within any deposits of made ground that may be present over the site surface. PAH compounds that may have been released as a consequence of using plant and machinery or through the parking of vehicles on the study site. Residual contamination from natural weathering of geological strata. Contamination that may have migrated onto the site from agricultural or commercial activities that have taken place in the areas surrounding the site. Contamination that may have migrated onto the site through the narrow drainage ditches that pass along or very close to the site boundaries. Potential Contaminants Include – PAH, TPH, B-TEX, metals, semi-metals and asbestos. Vapours include hydrocarbon vapours.	Ingestion, inhalation (dust) and dermal contact	Construction Workers	Low Likelihood	Medium	Moderate / Low - Previous uses of site suggests that there is potential for contamination to be present at the study site. Exposure to any contamination would be temporary. Risks could be mitigated by the use of appropriate PPE and good hygiene practices. Where excavation is undertaken, dust suppression techniques and covered wagons during earth works would help reduce the potential for the release of potentially contaminated airborne particulates. Chemical analysis of the near surface soils could determine the risks posed to ground / construction workers where this was deemed necessary.
		End users	Low Likelihood	Medium	Moderate / Low – Previous uses of site suggest potential for contamination to be present. Any proposed residential development would be considered a sensitive end use, with the most sensitive areas corresponding to the proposed garden areas where produce could be grown for human consumption and also landscaped areas. Chemical analysis is likely to be considered necessary by insurers and planning authorities to determine the nature and extent of any contamination in the near surface soils and groundwater.
	Migration of gas / vapours through voids into confined spaces	Construction Workers During Excavation	Low Likelihood	Medium	Moderate / Low – The Groundsure Report has not revealed any landfills or significant areas of in-filled ground or surface ground workings that could represent a credible source of harmful ground gas emissions. It is therefore considered that there is no requirement for a quantitative ground gas risk assessment at the study site. It is possible that hydrocarbons could be identified within the near surface soils. Construction workers should be made aware of the potential risks and provided with appropriate PPE. Samples should be submitted for testing to quantify the risk.
		End users	Low Likelihood	Medium	Moderate / Low – The Groundsure Report has not revealed any landfills or significant areas of in-filled ground or surface ground workings that could represent a credible source of harmful ground gas emissions. It is therefore considered that there is no requirement for a quantitative ground gas risk assessment at the study site. It is possible that hydrocarbons could be identified within the near surface soils in certain parts of the site. Samples should be submitted for testing to quantify the current risk.
	Migration of Radon into buildings	End users	Unlikely	Medium	Low – The site is not located within a radon affected area as less than 1% of properties within the specified search area recorded above the action level. The Groundsure report indicates that within this Radon range **No** radon protection

					measures are required for new buildings or extensions to those already existing.
	Plant uptake	Landscaping Plants	Low Likelihood	Minor	Very Low – Previous uses of site suggest limited potential for contamination to be present. Trees and vegetation growing within and adjacent to the site boundaries appear to be thriving.
	Chemical Attack	Water Supply Pipes	Low Likelihood	Mild	Low – Previous uses of site suggest potential for some contamination to be present at this site. Soil analysis may be required by the local water company to assess the possible risk to new potable water supply pipes (WIR and Speciated Hydrocarbon Testing).
	Chemical Attack	Underground Structures	Low likelihood	Mild	Low – The potential for sulphate attack at this site has not been assessed. Testing may be required if concrete structures / foundations are intended.
	Vertical Migration	Groundwater in superficial deposits (Tidal Flat Deposits – Unproductive Aquifer)	Low Likelihood	Medium	Moderate / Low - Previous uses of site suggest limited potential for contamination to be present at this site. Local available BGS borehole records indicate that the upper superficial deposits should be represented by Tidal Flat Deposits of clay and silt. Although it was considered likely that these deposits would be of moderate permeability, these soils are designated as an Unproductive Aquifer and as such would not be considered highly sensitive. The site is not situated within 500m of a groundwater source protection zone and no groundwater abstractions have been identified within 200m of the site.
		Groundwater (Ampthill Clay Formation– Unproductive Aquifer)	Low Likelihood	Medium	Moderate / Low – The deposits of mudstone underlying the site are designated as an Unproductive Aquifer and therefore would not be considered highly sensitive if exposed to contamination. The site is not situated within 500m of a groundwater source protection zone and the nearest abstraction is located over 2000m from the site. The overlying deposits are likely to be of variable permeability.
	Lateral Migration in groundwater or surface water	Surface Water (Off Site Drainage)	Low likelihood	Medium	Moderate / Low – The Groundsure Report and walkover inspection has established that the nearest surface water features are a number of narrow drainage ditches (inland rivers not influenced by normal tidal action). If any contamination is ultimately revealed at the study site, then these features are unlikely to be considered at significant risk. No surface water abstractions have been identified within 1000m of the study site.

7.0 RISK OVERVIEW

The desk study and site observations have led to the conclusion that there is potential for limited contamination to be present at the site. From a review of the information gathered in this preliminary appraisal, it is considered that the site poses a generally 'Very Low' to 'Moderate / Low' environmental risk, i.e. it is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised would, at worst, be mild. Investigation is normally required to assess the risk and determine any liability.

8.0 RECOMMENDATIONS FOR FURTHER INVESTIGATION

- It is recommended that an exploratory ground investigation is undertaken. The purpose of the investigation would be to obtain information on contamination issues in order to determine whether mitigation measures or remediation is required to make the site suitable for its proposed reseidential end use. Information on contamination is also likely to be required as part of the planning process for any proposed redevelopment of the site.

- The contamination survey should provide analysis for contaminants likely to be associated with the historical uses of the site and activities in the immediate surrounding area. These would include metals, semi-metals and general contaminants as well as characterized total petroleum hydrocarbons, BTEX contaminants, speciated poly-aromatic hydrocarbons (EPA16) and asbestos.

8.1 Other Considerations

There are several other areas of research beyond the scope of this report that may or may not be applicable to the site. These factors are generally identified within specific planning conditions and can include:

- **Archaeology** – The site may possibly be of some archaeological interest to the local authority which is likely to be covered as part of specific planning conditions.

- **Ecology** – There may be a requirement for an ecological report which may have already been undertaken for the site. The developer has indicated an area where badgers may be present and this area of the site has already been excluded from development. Any constraints are likely to be part of specific planning conditions.

- **Underground Services** –These should be fully investigated prior to any redevelopment.

The opinions expressed in this report assume that the site conditions do not vary beyond the range revealed by the scope of the investigation. There may, however, be conditions at the site, which have not been identified by the investigation and therefore will not have been considered in this report. Accordingly, a careful watch should be maintained during any future site / ground works and this report and its conclusions reviewed and /or modified accordingly. The conclusions and assumptions made in this report rely on information provided by third party suppliers. TLP cannot be held responsible for the accuracy of data provided by any third party and / or any conclusions based on third part information.

TLP Ground Investigations Ltd.

Prepared by S. P. Trattles

Reviewed by R. L. Trattles

Site Location Plan

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



Site Location Plan

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



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Site Location Plan

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View of current site entrance in north western corner of site - looking generally east



View up Little London with site entrance on left - looking generally north



View up Little London - looking generally south

Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View inside site of north western corner where buildings once occupied - looking generally northwest





View of paved areas in north western corner of site

Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View along the western boundary track - looking generally south



View along the western boundary track - looking generally north towards off site farm buildings



View along southern boundary track - looking generally east

Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



Grass clearing in north central part of the site



Wooded area in central part of the site



View from central clearing - looking generally north east.

Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View from near north eastern corner of site looking generally south with orchard (badgers) area to the left of shot



View from just outside the south eastern corner of site looking generally east towards solar farm

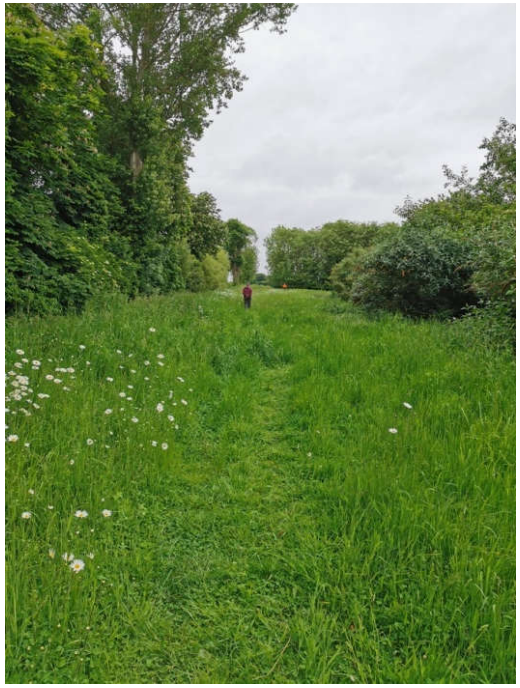
Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View of central eastern open area







Views along northern boundary showing overgrown drain

Photographic Log

Proposed Residential Development, Butterfly Park, Little London, Long Sutton, Lincolnshire



View from central southern part of site – looking generally north