
Phase 1 Geo-Environmental Investigation (Desk Study) Draft Report

Land Adjacent to,
28 Venetia Close,
Emmer Green,
Reading,
Berkshire,
RG4 8UG

Project Reference J166



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NOTES TO THE REPORT

Draft Report

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The Company

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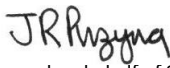
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Limitations

This assessment has been carried out with reasonable skill, diligence and care with reference to applicable guidance and accepted practice, the agreed scope of investigations with limitations on unexpected or exceptional circumstances, limits to liability and professional indemnity insurance, all as set out in the estimate and the terms of engagement.

Contaminated land investigations require forethought regarding the types and nature of any contaminants, as well as the nature of the ground and groundwater. It is not always possible to predict the exact nature of the historical use of any site or the full geological or hydrological setting from the available records. From a wider perspective, it is not always possible to turn over each and every stone during physical investigations within expected timeframes and within normal financial, logistical and sensible constraints.

It should therefore be understood that a level of uncertainty will always remain after any investigation, no matter how extensive the scope of that investigation or the diligence with which it was carried out. Issues may therefore remain which were undisclosed by the investigations documented in this report, due to being outside the scope of the investigation outlined in the associated estimate, and could not have been sensibly anticipated, predicted or found.

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Executive Summary Draft Copy

Initial desk based investigations showed that the site and surrounding residential area was formerly occupied by clay pits. This report therefore identified potential risks from a history of clay excavation and brick making, contamination in any imported soils used to fill former excavations and some limited potential for lead shot and other ammunition from a rifle club which used the clay pits.

Evidence from mapping, LIDAR and physical trial holes has not however, uncovered evidence for any infill of the ground below this property, nor has any evidence for ash, malformed or shattered bricks been found in the shallow soils. Contamination analysis of the shallow soils below the site to which new homeowners will be exposed, both laboratory and insitu, have not revealed any of the identified contaminants.

On this basis this site is not expected to pose any unacceptable contamination risks to new occupants. Further work to assess contamination in the soils below the site is not at this stage considered necessary.

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1.0 Introduction

1.1 Appointment

This report was commissioned by Mr Muammer Kenan Mursaloglu to provide an environmental assessment of the soils underlying the proposed development site at land adjacent to 28 Venetia Close Emmer Green.

The work was carried out on the basis of Sackedgate Ltd estimate No E197, provided to the clients agent and is subject to the provisions set out in the estimate and the terms of engagement included with that estimate.

1.2 Proposed Development

This site is set in a residential area and comprises a new dwelling added to an existing line of dwellings along Venetia Close.

1.3 Scope of Investigation

The work carried out by Sackedgate Ltd to produce this report comprised a phase 1 qualitative contaminated land assessment or desk study with some preliminary physical investigations.

1.3.1 Concept

The investigation involves a qualitative search for available information that may identify potential contamination sources, both on and off site and how the ground or groundwater could be accumulating or transporting those contaminants with respect to the site area in question, as well as the surrounding land.

Historical mapping, aerial pictures, geology and hydrology maps are the first investigation steps, followed by a review of assembled environmental data from local authorities and Environment Agency etc. More focussed searches or physical investigations are then carried out that follow the leads or blanks identified from mapping and the environmental database reviews where necessary.

The assessment of the information is then carried out on the basis of the well-established source-pathway-receptor linkage assessment described in a number of guidance documents. If any of the three parts is missing, the linkage is not considered plausible. Without any identified unacceptable risks, the assessment process can be exited. Where a plausible linkage can be made, further consideration of information or detailed quantitative physical investigations will be required.

1.3.2 Limitations

All information sourced by this investigation is considered carefully with respect to its validity and accuracy however Sackedgate Ltd cannot accept responsibility for incorrect information provided in good faith by any third parties.

Discussions are made in this report about geology and ground conditions and some geological and geotechnical information from third parties is also appended to this report. This is solely with respect to an environmental assessment. This report should not therefore, be used or relied upon in any way for the assessment of, or for the design of foundations, slopes, substructures or drainage etc. Nor should it be used or relied upon in any way for the assessment of liabilities from ground stability, including but not exclusively, shrinkable clays, swallow holes, dissolution features or mine workings etc.

1.4 Good Practice & Applicable Guidance

The investigations and methods used were carried out with reference to the Environment Agency Land Contamination Risk Management (LCRM) system which itself lists many other guidance and standards such as BS EN ISO 21365:2020 (Conceptual site models for potentially contaminated sites), BS 10175 (Code of Practice for the Investigation of Potentially Contaminated Sites) and BS 5930:2015 (Code of practice for ground investigations).

Other applicable guidances have also been referred to where appropriate and where stated, such as Environment Agency Framework for the Use of Rapid Measurement Techniques (RMT) in the Risk Management of Land Contamination (March 2008), BS EN ISO 13196- Soil Quality — Screening Soils For Selected Elements By Energy-Dispersive X-Ray Fluorescence Spectrometry Using A Handheld Or Portable Instrument (2015) and BS ISO 18227:2014 Soil Quality — Determination Of Elemental Composition By X-Ray Fluorescence.

A new standard is currently being drafted by the British Standards Institute possibly titled BS10177(?) Guidance on the Use of [Handheld/Portable] Energy Dispersive X-Ray Fluorescence Spectrometers in Soil and Soil-like Materials Quality Assessments. I am the writer and project leader for this new guidance.

The XRF analyser used for this investigation is a source of ionising radiation and subject to the Ionising Radiation Regulations (IRR2017). Although the analyser is designed for handheld use, in order to operate the analyser as safely as is reasonably possible it is mounted on a tripod. This allows the operator to stand clear when in it is in use, thus avoiding any X-Ray backscatter and allowing the operator to be recovering or preparing the next sample for analysis while the analyser is performing tests.

Where particular safety requirements need to be implemented such as shielding, personnel barriers at the minimum safe distance (3m), warning signs or tool box talks to site personnel are required, this will be documented and issued as a dynamic risk assessment in accordance with IRR2017

1.5 Investigator and Author of this Report

The investigations, either desk based or physical examinations of this site were carried out and documented by myself, Julian Puzyna. I have an Honours degree in Civil Engineering (BEng Hons) from Kingston University (Kingston Upon Thames) and I am a member of the Chartered Institute of Environmental Health (MCIEH).

I am also a member of the British Standards Institute (BSI) Soil Quality Committee (EH/4) representing the Chartered Institute of Environmental Health on that committee. I am currently project leading a new standard for the use of XRF analysers in contamination investigations as discussed above and I am on the panel for review of BS 10175 Code of Practice for the Investigation of Contaminated Sites.

My first contaminated land investigation as lead engineer was carried out in 1998 however my first involvement with contaminated land investigations was in 1989 with Exploration Associates Ltd. at the Bell Green Gas Works in east London. Since then, I have carried out approximately 858 ground investigations (as of March 2023).

2.0 Site Details

2.1 Site Location

Emmer Green is located within the northern outskirts of Caversham which itself is a northerly suburb of Reading, to the north of the River Thames. The site area lies about 3.95km north of central Reading (Civic Centre) and 6.7km south west of central Henley on Thames (measured from the library).

Venetia Close is a small cul-de-sac road off Kiln Road which connects Emmer Green with Henley further to the north east. A location plan is presented in Figure 1.

The site comprises land adjacent to 28 Venetia Close (rear of 49 Kiln Road) and the most modern map actually shows the dwelling to be numbered 26 Venetia Close.

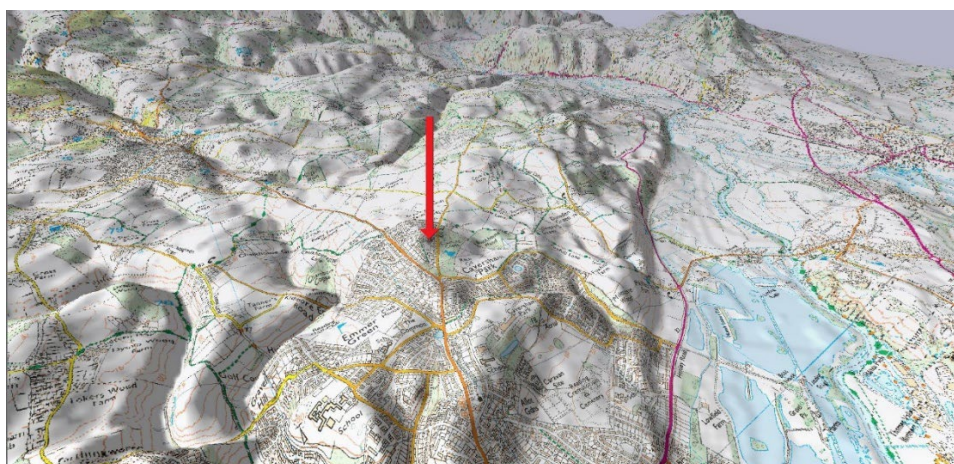
The centre of the proposed development site is at grid reference SU72370,77210. The postcode reference for the site is RG4 8UG.

2.2 Site Description

The site is currently occupied by a single detached dwelling with a small rear garden, small front garden and a gravel driveway. The dwelling is built very much in the same style as the existing dwellings on Venetia Close almost appearing to have been built at the same time.

3.0 Geological and Hydrological Setting

3.1 Topography



Above, a 3d view greatly exaggerated to allow the topography to be visualised.

The site lies on the northern side of the Thames Valley. This area is part of the Chiltern Hills through which the River Thames was diverted by ice sheets millennia in the past. This undulating landscape is typical of areas underlain by Chalk deposits which was variably weathered before the overlying deposits were laid down.

This side of the Thames Valley is steeper than the southern side of the valley and is cut by a number of gullies leading down to the river. These gullies are marked by roads (St Peters Hill, Buckingham Drive and Church Lane), which probably originated as tracks which followed the easiest route downhill to the river.

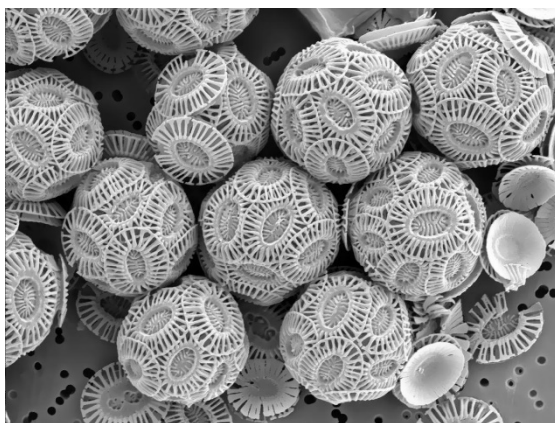
The site area itself is almost at the top of a hill which forms part of the valley side. This elevated location was used to site a water tower.

3.2 Published Geology

Data from the British Geological Survey shows the geological sequence to be Winter Hill Gravel, over London Clay Formation (a deep sea deposit), over the Lambeth Group of deposits (shallow estuary deposit), all underlain by the Chalk Group (shallow sea deposit).

The mapped extents show that the site lies at the very edge of the hilltop's capping of Winter Hill Gravel. This river terrace deposit was laid down by floods of the River Thames in pre history when the river was a mile wide white-water torrent from the ice sheets to the north which carried with it flint from all the chalk the ice sheet destroyed.

Below the gravel capping, the maps show that the hill on which the site lies comprises a remnant of the Lambeth Group of deposits together with a triangle of the London Clay Formation downthrown by geological faults. The surrounding London Clay that was not downthrown by the faults was eroded away in pre-history thus revealing the Lambeth Group below. The chalk deposits are then shown below and generally to be underlying the wider area.



The chalk limestone comprises plankton skeletons or coccoliths (left) and was laid down in wide, shallow, tropical seas. The rock is very pure white and not generally discoloured by the products of nearby land erosion when it was deposited.

The Chalk is a significant aquifer containing very clean water due in part to the chemical and physical nature of this rock.

The southern part of the site overlies a large area between Kiln Road and the Kidmore End Road which is marked as worked and infilled ground. An area of worked ground, i.e. not infilled, is shown below Russet Glade immediately to the north west of the site. The road name Kiln Road suggests that was due to brickworks and clay pits historically lying along that road.

3.3 Published Hydrogeology

Hydrological maps of the area show that the site area is mostly underlain by unproductive strata with the very norther edge of the site underlain by a superficial secondary (A) aquifer. The bedrock aquifer designations show the site to wholly be underlain by unproductive strata (downthrown) London Clay Formation. The underlying Chalk is designated a high vulnerability principal aquifer.

The appended site sensitivity mapping shows that the site area lies in a Source Protection Zone (SPZ Zone 3) around a large abstraction or series of abstractions for direct potable public supply to the 2km south east of the site at Playhatch.

Hydrogeological Map of the South West Chilterns and the Berkshire and Marlborough Downs shows groundwater to be moving south east in the chalk below the site. The maps also suggest that the groundwater lies about 40m AOD (Above Ordnance Datum). Given the site elevation at about 96m AOD, the groundwater would be expected to lie some 56m below ground level at the site.

3.4 Hydrology

Few watercourses are shown on the appended OS Water Network map within 1km of the however, the surface water maps pick out the bases of the valleys and gullies that cross the area around the hill top on which the site lies.

The closest appears to originate in Clayfield Copse to the south east of the site. This leads down to the south east, below urban areas, toward the River Thames. Given the clayey soils indicated by geology maps, many drains and streams with intermittent flow are probably present which are now hidden in culverts and storm sewers below the residential developments covering the areas to the south east.

3.5 Migration of Contaminants

Any mobile contamination in the site area, either floating (fuel or lubricants) or dissolved would be expected to move with surface waters in 1) the streams, drains and culverts and 2) within the flow of shallow groundwater, in made ground or surface topsoils down to the south east. This water, from drainage systems or from the shallow soils, together with its potential mobile contamination, would eventually either enter the chalk at the edges of the Lambeth Group or feed into the River Thames to the south.

On this basis of the hilltop location, it is considered that 'catchment' for mobile contaminants which could migrate onto the site is very limited and solely occupied by residential dwellings, no heavy industry or commerce is shown on maps in this catchment.

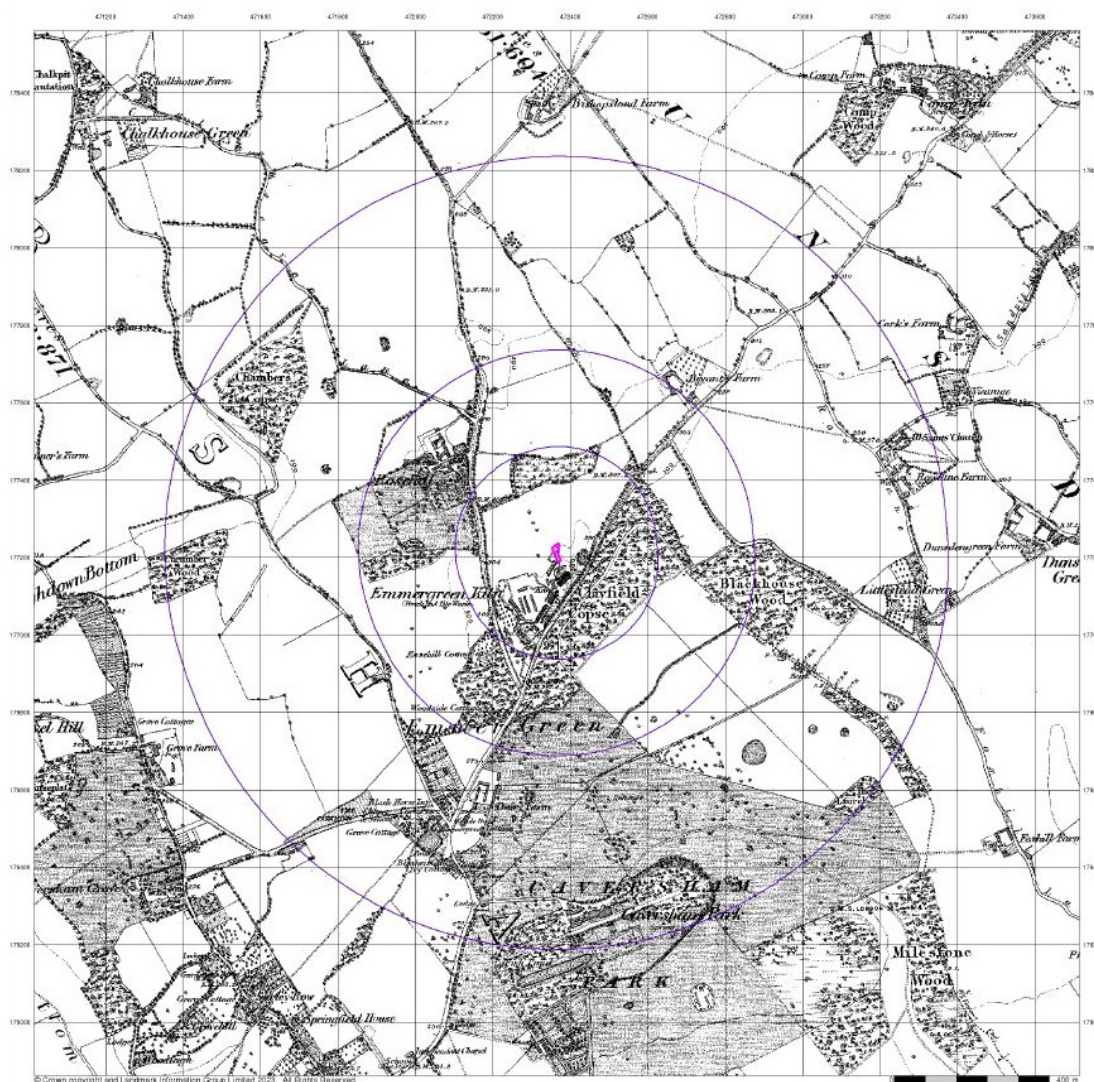
4.0 Site History

4.1 Historical Ordnance Survey maps

The available historical Ordnance Survey maps have been ordered from the Landmark Information Group and reviewed for this site. The maps are appended. The maps are at two scales.

Firstly, are the six inches to one mile maps (1 in 10,560 scale) that was updated to 1 in 10,000 scale in the post war years, these show an area of just over 1km radius around the site only.

The second set of maps (extracts following) is at 1 in 1,250 and 1 in 2,500 scale and shows an area of about 250m in radius around the site. Readers should note that the outline reproduced on the maps in the report text below may have required adjustment where there are aberrations in the mapping grid between editions. The appended map packs have not had the site outline shifted in any way.



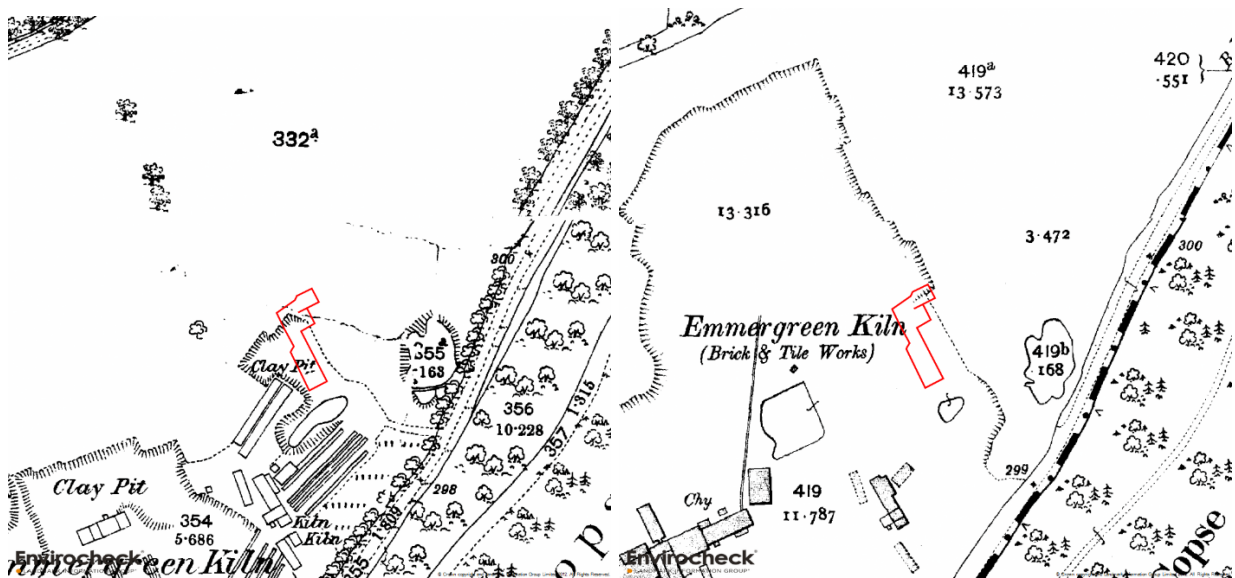
Above, the 1 in 10,560 scale map of 1882.

The earliest of the six inches to one mile maps (1:10560 scale) is dated 1882 and this shows that the mapped area is occupied by farms, woodlands and parkland. Emmer Green is shown to be a village comprising a cluster of buildings at the junction of Peppard Road, Lowfield Road and Kidmore End Road. The only other developments are a brickworks and clay pits which underlie most of the site area and Caversham Park to the south east, a Victorian era stately home with an extensive parkland estate.

Although the extents of the clay pits change with each map, the first new housing developments appear on the 1938 map which shows new housing to the west of the site. The first post war map is dated 1961 and shows this area of housing to expand on its south western side. This map also shows a large excavation just to the north west of the site and that the kilns and long drying sheds have been replaced with new houses.

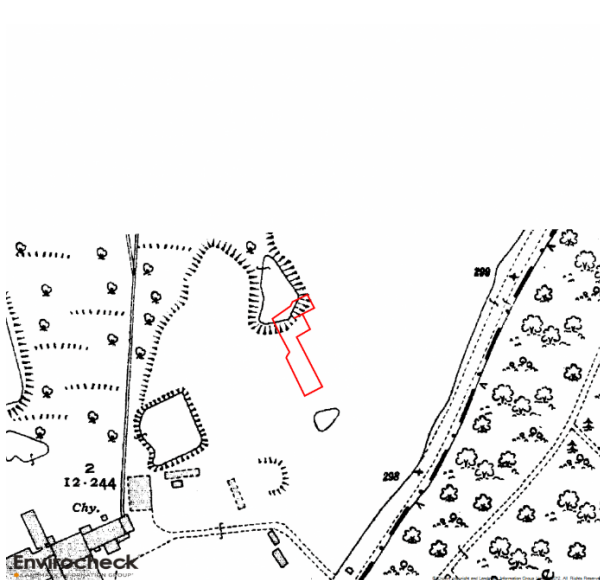
Large areas of new housing appear on the 1973 map on the former Caversham Park area also to the south west of the site by the wider growth of Caversham and around the site area to the north west. The 1999 map shows Russet Glade, a new road with new houses to have appeared in the area of the excavation (clay pit) to the north west of the site.

The outline of housing development in this area then changes little apart from small infill housing developments. Apart from the former brickworks and clay pits, these maps do not show any industrial areas.

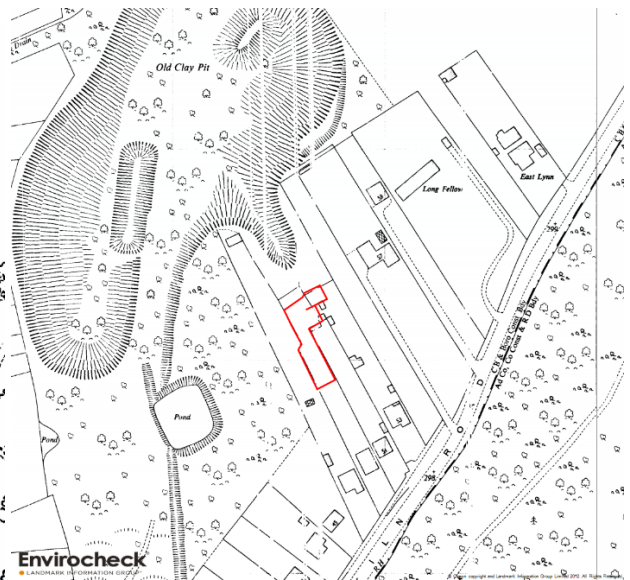


1878

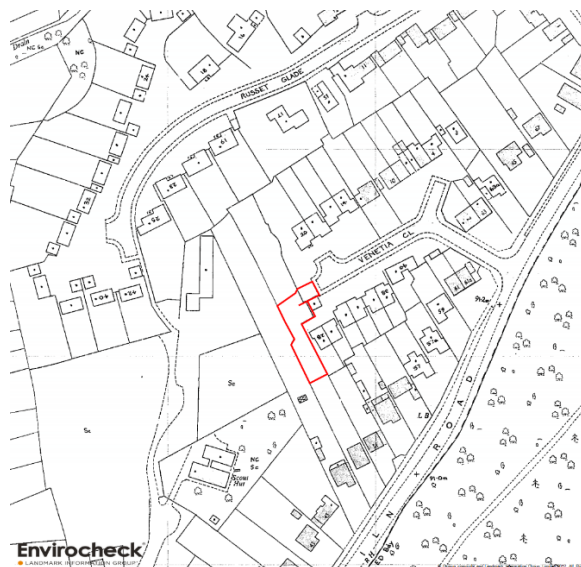
1913



1936



1956



1974



1996

The 1 in 2500 scale maps show the site area in more detail. The earliest extents of brickworks and clay pits shown on the 1878 map can be seen to underlie most of the site however, the extents of these clay pits are then completely obliterated by further excavation shown on the 1898 and 1913 maps. These new excavations appear to underlie the whole site area and extend to the north and west.

The rows of long drying sheds shown on the 1878 map immediately to the south and south west of the site are no longer present on the 1898 and 1913 maps however the kiln building just over 100m south west of the site remains but with a large new extension. This includes three long drying sheds to the south of the new kilns and a tramway to bring clay from the pits to the north. The extents of the new excavations are then shown on the 1936 map to be hatched as rough pasture with trees suggesting those excavations were now abandoned. The kiln buildings and conveyor remain suggesting that clay excavation is now taking place solely to the north of the kiln, off map.

The large clay pit to the north west of the site, noted partially on the six inches to one mile map dated 1938, is then labelled as an old clay pit on the 1956 map. The brickwork kilns and drying sheds are no longer shown, all replaced by housing off Peppard Road and Kiln Road. The houses off No.47 to No.65 Kiln Road all appear to have extremely long gardens and the site area almost completely lies in the new garden to No.49 Kiln Road.

The pit to the north west remains in place on the 1968 map however, the next map dated 1984 shows that a new cul-de-sac road named Russet Glade now lies in the clay pit location. Inspection of that area showed that Russet Grove and dwellings all lie within a visible depression.

These maps show that the excavations for clay have reshaped this area and carried on since at least 1878 until sometime just before world war 2. The earliest pits were wide and very shallow and don't appear to have been infilled. The final rounds of clay extraction appear to have focussed on the deeper excavation to the north west.

4.2 Aerial Pictures



Above, the 1947 aerial picture

The 1947 aerial picture (left) is very blurry but shows the length of the garden to No.49 Kiln Road.

The picture does show that the large clay pit excavation to the north west of the site and now below the houses on Russet Glade, is now abandoned and overgrown.

The kiln building with its three long drying sheds is just about visible (bottom left hand corner) as well as the line of the tramway between the clay pit and the kiln.

The 1947 aerial picture also shows that the northern end of the conveyor appears to terminate at a rectangular building which is not visible on the pre war maps. This may have been a mill where clay was mixed with sand or pulverised flint and probably lime before being sent to the brickworks for forming, drying and then firing.



Above, aerial pictures dated 1999 (left) and 2023 (right)

Three aerial pictures were provided by Envirocheck dated 1947, 1999 and 2022 and these are presented in this report. Nine aerial pictures are available on Google Earth dated between 2003 and 2022 and have also been reviewed however, copies of the pictures are not presented in this report.

The aerial pictures between 1999 and 2014 show the long garden to No.49 Kiln Road to be intact and well-tended with large deciduous trees. Open areas of lawn are shown and hedges dividing the long garden.

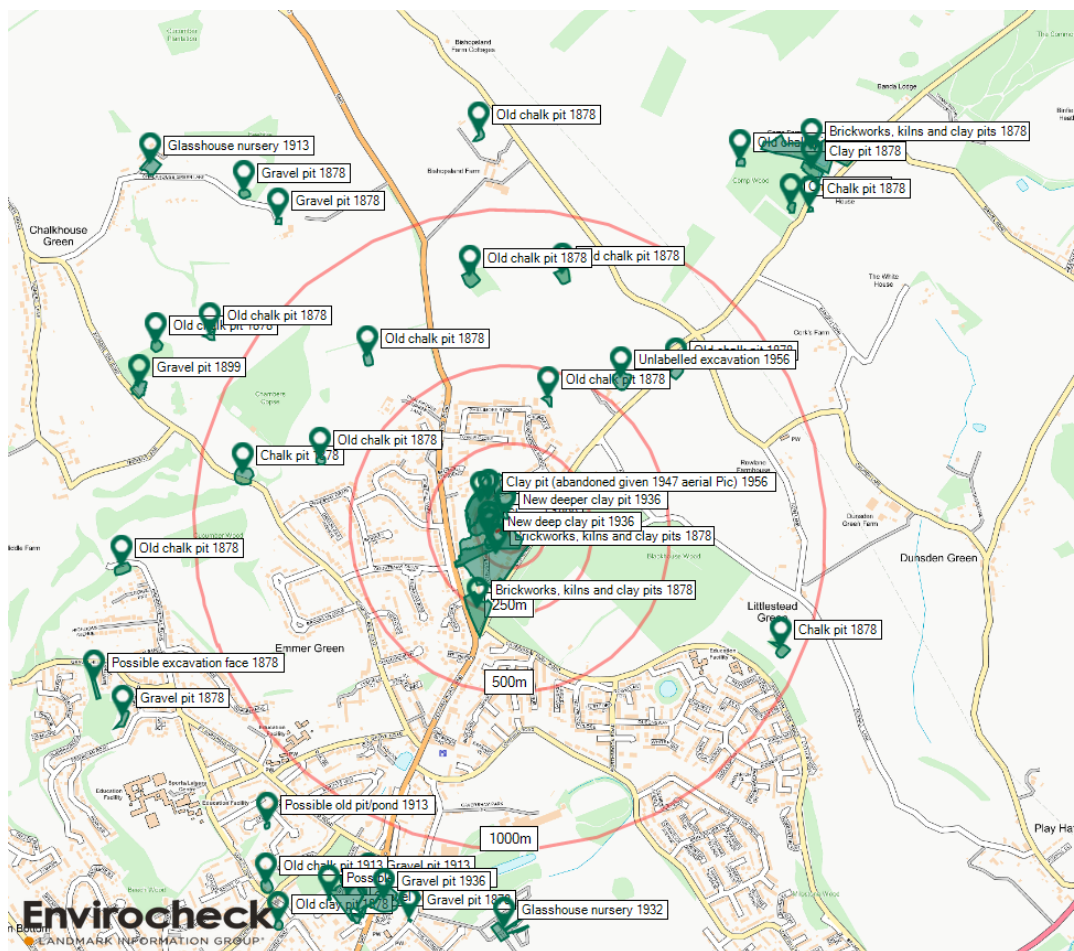
The 2017 picture then shows that the site area has now been separated off from the garden of No.49 Kiln Road with what appears to be close boarded timber fencing forming the site boundaries.

The truncated remainder of the garden to No.49 Kiln Road to the north of the site then appears to contain sheds and other features. Notably this ground was seen to be underlain by a 'lobe' of the large excavation shown on the 1938 and 1956 historical maps.

The 2018 picture now shows a new dwelling to be present on the site with what appears to be builders equipment and materials present in the driveway area, suggesting that the dwelling had recently been completed.

The remaining pictures dated 2020, 2021 and 2022 all show turfed front and back gardens and a tidy looking gravel coloured driveway.

4.3 Summary of Map and Aerial Picture Review



The features found on the historic maps between 1875 and 2020 are presented above.

The maps and aerial pictures have shown that the site and the area around the site was formerly an industrial hive of activity. From Victorian times through to world war 2 the maps show extensive brickworks were present and the site area lies in former clay pits (earliest recorded brickmaking at this site was actually in 1654). The maps show that the clay pits kept getting wider and each time this would remove the surface features left by previous stages of excavation.

It appears that the final stages of work for the Emmergreen Brickworks used clay from the large deep excavation to the north of the kilns shown on the 1956 map. The clay was brought south along the tramway to the kilns. The remnants of the older pits were probably very shallow (excavated by hand) and just abandoned to colonial weeds shrubs and trees before houses were built on the land.

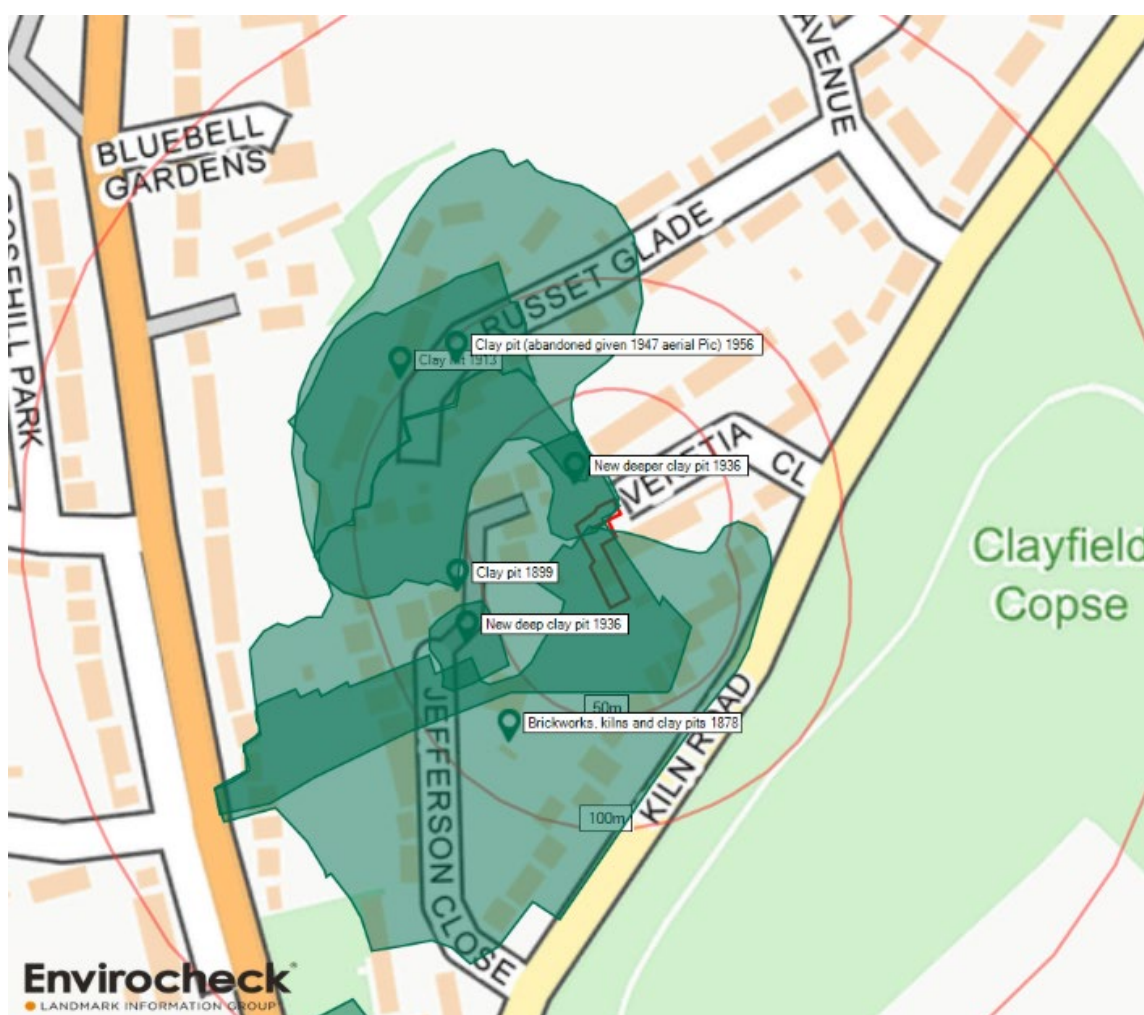
Almost no industrial activities were found in this area apart from some minor workshops after the area's brickmaking heyday. After world war 2 the Emmer Green area becomes entirely residential.

The amount of subsequent infill of the pits in order to allow many houses to be built is unknown. This is a particular concern for the site area since it appears to be on land repeatedly quarried for clay. However, also of note is that the garden of No.49 Kiln Road first appears on the 1947 aerial picture, any infill therefore took place over 76 years ago. Active gas generation from organic matter after such a long period after burial is not really plausible.

Other gravel chalk and clay pits also litter the area. Some are associated with brickworks such as the Comp Kiln brick, tile and pipe works over 1m to the north east. Small gravel pits alongside roads are expected to be shallow pits where gravel was excavated by hand for road repairs. These pits seldom represent a risk of large amounts of any buried waste.

Isolated chalk pits in fields were usually where chalk was excavated for spreading in the fields to help break up heavy clay soils but also to pH condition the soils. Many such pits are marked, but the maps also note many isolated patches of trees in field areas which are also likely to be remnants of similar unmapped pits for agricultural use of the chalk. Again, these pits seldom represent a risk of large amounts of any buried waste.

Chalk was also required for brick making for roasting in kilns to make lime which was mixed with the clay to obtain harder bricks. The Comp Kiln brick, tile and pipe works just over 1m to the north east has both clay pits and chalk pits nearby.



Above, a closer look at the features identified on the historical maps

5.0 Available Information

5.1 Environmental Database Search

This database of information is assembled by the Landmark group in their Envirocheck package which includes the historic maps, geological and hydrogeological maps etc. already reviewed. The information is summarised and considered with respect to development of this site in the table below.

The update cycles and the organisations (generally Local Authorities and the Environment Agency) who provided the data are presented in the appended Envirocheck datasheet. This information is solely provided by third parties and Sackedgate Ltd cannot guarantee its accuracy or completeness.

Data Type		0-250m	250-500	Database Description And Notes.	Further Investigation Required
Regulators	Contaminated Land Register	No	ne	None within 1km	No
	Discharges Consents	No	1	Closest 308m NE for domestic sewage effluent discharges into a borehole (within a source protection zone). Groundwater flow is SE Migration of bacteriological and ammoniacal nitrogen etc. onto the site is not considered plausible. Further afield the discharges were too distant to pose a plausible risk to the site.	No
	Pollution Incidents	No	ne	4 noted between 500m and 1km of the site. All four were minor incidents and all four locations were significantly distant and downhill from the site.	No
	Pollution Controls	No	ne	Just 1 noted 511m NE for a waste oil burner at an automotive garage at Bryant's Farm. Waste oil burning pollutes the atmosphere and not the ground however, automotive workshops can be significant sources of ground contamination. Notably this workshop lies downhill from the site and any migration of contaminants via surface waters or shallow groundwater would be to the SE and away from the site.	No
	Enforcements	No	ne	None within 1km	No
	Prosecutions	No	ne	None within 1km	No
Waste Treatment and Landfill	BGS Recorded / Historical Landfill Sites	None	None	Closest at Chambers Copse 980m NW Deposited waste included inert, industrial, commercial and household waste, and liquid sludge. Last input date December 1981. This landfill is noted to be a risk to groundwater. This landfill lies downhill (70m AOD) almost 1km away and on bare chalk according to geological maps. Any impacted groundwater would however, be expected to move SE through the chalk that underlies the whole London Clay and Lambeth Group hilltop. Upward migration (56m up) from the chalk is considered implausible. The migration of ground gases, generated by the buried waste, through 980m of soil was not considered plausible.	No
	Local Authority Recorded Landfill Sites	None	None	Chambers Copse ditto above	No
	Registered Waste Treatment Sites	None	None	None within 1km	No
	Registered Waste Transfer Sites	None	None	None within 1km	No
	Licensed Waste Management Facilities	None	None	None within 1km	No
	Other Made Ground	1	None	The whole area of workings visible on historical maps from 1878 until 1968 are shown as potentially infilled land and as mineral sites (quarries).	Yes Further consideration required.

Data Type		0-250m	250-500	Database Description And Notes.	Further Investigation Required
Industrial / Commerce	Light-Heavy Industry (trade directory)	None	4	(15 more beyond 500m) All were small businesses at residential home locations. Only one was for an electrical components business premises which was at Bryant's Farm, along with the garage presumably. All were considered too small and too distant to pose a plausible risk to the site	No
	Radioactive Substances	None	None	None within 1km	No
	Areas under remedial Action	None	None	None within 1km	No
Fuel	Road Fuel Dispensing Forecourts	None	None	Closest fuel station was Emmer Green garage 587m south west. However this is now shown to be obsolete. Visiting the area revealed that the garage is now a car sales showroom. Buried tanks are probably still present but grout or foam filled for fire regulations. Significant ground contamination could be present but given the topography and location, the risks to the site are not plausible.	No
	Fuel Storage Areas	None	None	None within 1km	No
Hazardous Substances /Activities	Control of Major Accident Hazards	None	None	None within 1km	No
	Notification of Installations Handling Hazardous Substances	None	None	None within 1km	No
	Explosives Sites	None	None	None within 1km	No
	Planning Hazardous Substances Consents or Enforcements	None	None	None within 1km	No
Radon Gas	Mandatory protection required	No radon protective measures are necessary in the construction of new dwellings or extensions (British Geological Survey, National Geoscience Information Service)			No
	BGS report required	No			No

5.2 Findings of the Environmental Database Search

The environmental database search has shown that there were few commercial or industrial works in the area apart from various activities at Bryant's Farm 511m north east of the site. None of the minor activities shown were considered to pose plausible risks to the site area.

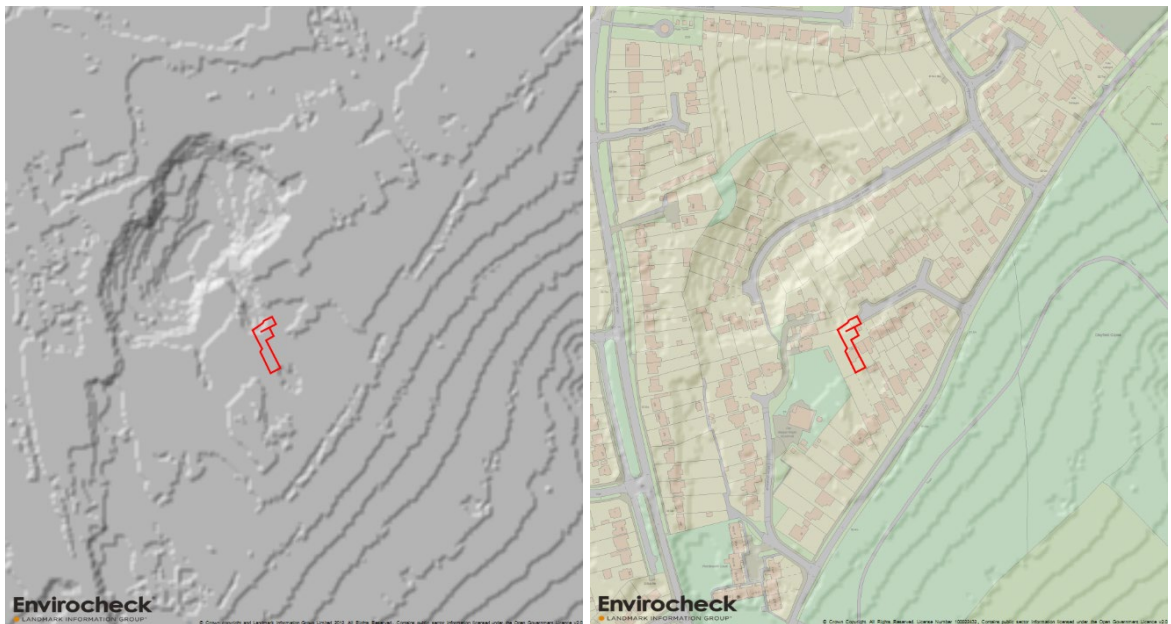
The database information has noted the presence of worked ground and possible made ground in the historical area of brickwork clay pits within which the site lies. The database did not indicate that the clay pits were registered as landfills.

6.0 Additional Information

6.1 Clay Pits

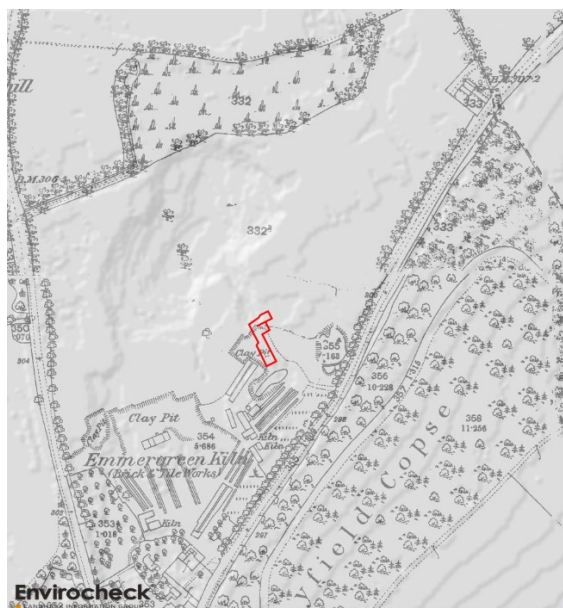
The historical maps for the area have highlighted the presence of brick and tile kilns with extensive clay pits as discussed. The main concern with such old pits or mine workings, is that they have been infilled with waste at some time in the past. This might be kiln waste or imported waste.

Buried waste can be expected to decay and generate gases. The type of gas will depend on the presence of organic matter and the availability or lack of oxygen particularly if the waste lies below groundwater level.



Above left LIDAR topography, Above right, LIDAR data overlain on a modern map

The LIDAR data above shows the most recent topographic survey of the area using airplane mounted lasers. Various overlays with Ordnance Survey mapping are presented. As discussed above with regard to the historic maps, the site area appears to have been excavated for brick making clay in stages. The resulting topography can be seen above.

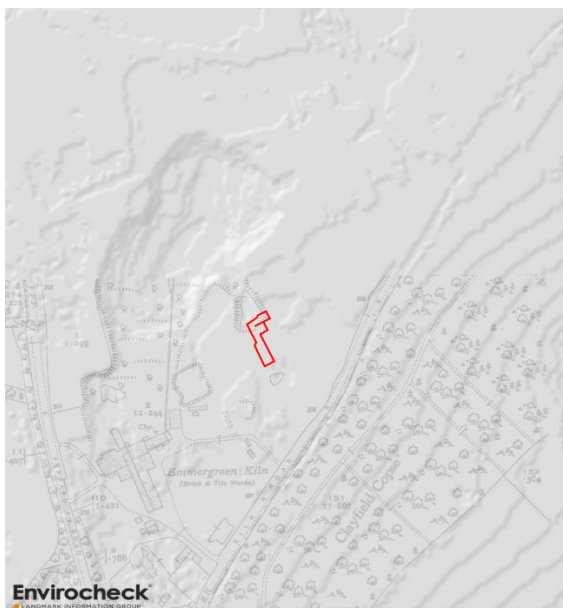


1878 & LIDAR



1913 & LIDAR

The first stage of works shown on the 1878 map has left behind only a very small remnant topographical feature visible today which is marked clay pit on the map and lies just 40m to the west of the kilns (150m south east of the site). These excavations appear to have been widened and deepened on the next map dated 1913. LIDAR shows that small section of the edge of this larger clay pit, just 50m to the north of the kilns, appears to still be present on the LIDAR image.



1936 & LIDAR



1956 & LIDAR

The 1936 map has partial coverage of a much larger clay pit to the north of the site whose boundary extends below the very northern section of the site (driveway) the rest of the pit is not shown on the map.

The overlay of LIDAR data with the 1956 map then shows that the large topographical depression revealed by LIDAR, almost exactly matches the mapped extent of a large excavation labelled old clay pit. This is a testament to the accurate post war work of the Ordnance Survey.

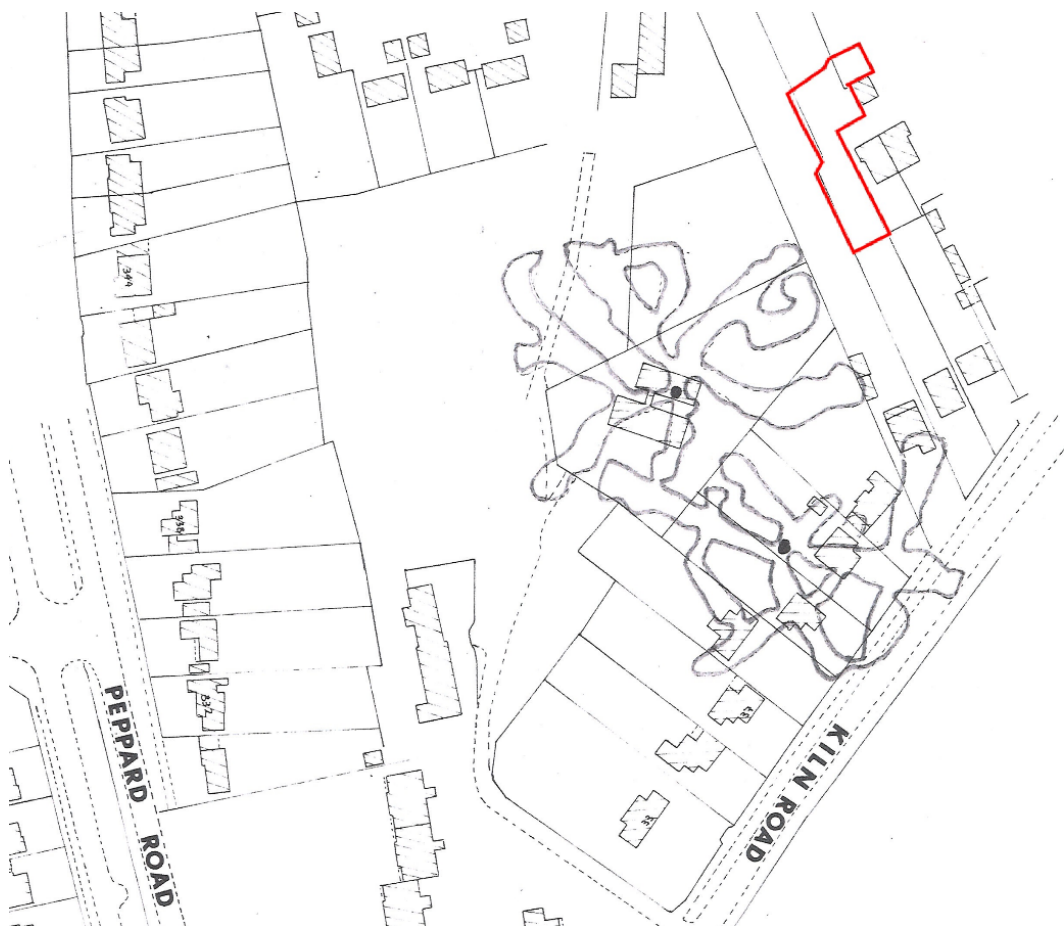
As discussed above, this pit appears to be largely abandoned and overgrown on the 1947 aerial picture.

On this basis it is considered that the site area lies on ground that was excavated in the first stage of earthworks shown on the 1878 map and then excavated further during creation of the pits shown on the 1898 and 1913 maps. This excavation is believed to have been abandoned at this stage and now forms the current ground surface at the site. The subsequent large excavations to the north of the site only appear to have affected the very northern edge of the site.

When considering the original topography it appears that much of the early excavation work (seen on 1878-1913 maps) did not create very deep pits. This is consistent with the methods of this era where the clay was excavated by hand and moved by hand cart or barrow to the mixing mill. These early excavations probably resourced thin clay layers within the Winter Hill Gravel.

Lifting clay out of deep excavations was generally avoided at all cost, this was until a tramway was constructed. Early excavations probably only skimmed off the cap of the hill that underlies the area. The only deep excavation took place just to the northwest of the site where a tramway enabled moving the clay up and out of the excavation. This allowed the downthrown London Clay to be excavated to greater depth. On this basis it appears unlikely that the site area was infilled however, this will need to be confirmed by some basic physical investigation.

6.2 Chalk Mining



As discussed, chalk was often needed for brickmaking and the Emmer Green Kilns included deep adit chalk mines.

The map above was obtained from Reading Borough Council and shows the extents of the adits below ground from where chalk was extracted. These old chalk workings at depth are of concern regarding the channelling of ground gases toward the site area that are being generated by waste or old timbering left in the adits.



However, I have visited this mine myself and the workings are well mapped and do not appear to have extended below the site area. Also, decaying matter was not present and carbon dioxide monitoring carried out in the mines (research project into breathability limits when working short adits) showed that the atmosphere in the mines was breathable and not therefore a ground gas pathway of any kind. Notably, the mines are being monitored for stability issues.

6.3 Rifle Club

The entrance way from Kiln Road to the former Emmergreen brickworks kilns area, some 250m south east of the site, is now marked by the Jefferson Close. Although the brick kilns and drying shed were removed just after world war 2, the area remained undeveloped until the 1994 map which shows the entrance way to have been extended, lined with houses and named Jefferson Close.

Prior to 1994 this former kiln area is understood to have been used by a rifle club. No records could readily found to see what types of guns were used, or if soil banks or backstops for targets were present (marked 'butts' on O/S maps).

7.0 Site Inspection

7.1 Description

The site walkover and sampling were carried out on the 16th March 2023. The site was seen to be mostly level with the exception of the very northern end of the driveway which visibly lower than the rest of the site. Beyond the northern fence boundary, this low lying ground was seen to be the tip of a larger gully leading northward.

Trees growing in the gully area to the north of the site, as well as those in neighbouring properties, appeared to be mature deciduous varieties. This suggests that ground levels where the trees are growing, have not been altered in the lifetime of those trees. Using guidance from the Forestry Commission (Estimating the Age of Large and Veteran Trees in Britain), albeit with poor species identification of beech and oak, the trees were thought to be at least 60 to 80 years old.

A single detached dwelling was present of traditional brick construction with a clay tile roof and very much in the same style as the existing dwellings on Venetia Close. The building itself was not inspected in any way by Sackedgate :Ltd.

A small rectangular rear garden was present that was mostly grassed but included a patio area against the house. The grass was patchy with moss present in places, probably due to overshadowing by trees. Brambles were also seen intruding through the close boarded fencing at the garden boundary.

A larger front garden and driveway was present on the northern side of the house. The driveway was gravel surfaced and curved around from the front of the house to an eastward facing entrance onto the end of Venetia Close. The remainder of the front garden was laid to lawn.

Given that the property appeared to be occupied, detailed photographs were not taken in order to respect the occupant's privacy.

7.2 Preliminary Trial Pits and Soil Analysis

The historical mapping showed that many stages of excavations took place to extract clay below this property. LIDAR imaging shows that some of the historical clay pit features remain and that the site area still appears to lie in the base of an excavation first seen on the map dated 1898.

In order to check for the presence of infilled ground, simple hand excavated trial pits were carried out in the rear garden area. This was considered to be the most critical area with respect to exposure to potential contaminants. The pits were excavated using scissor or post hole spades and were extended to depths of no more than 0.6m.



Above left, a trial hole being excavated and sampled. Above right, inside the trial hole

A further twelve very shallow pits were excavated to depths of no more than 0.3m in order to examine and test the surface topsoil for potential contaminants.

7.3 Ground Conditions Observed

The deepest two pits excavated were referenced HD1 and HD2. They both encountered a thick layer of very homogeneous topsoil to depths of 0.6m and 0.4m respectively. This topsoil comprised a dark brown clayey sand with a moderate organic content, very occasional flint gravel and many rootlets. No evidence was seen whatsoever for any man made materials such as concrete, masonry or brick fragments.

This topsoil material was damp and easily excavated in both pits however, at depths of 0.6m and 0.4m the pits found the base of the topsoil layer. There was no gradual gradation from topsoil into the underlying subsoil in terms of colour, just a clean interface with a marked increase in density when encountering the subsoil.

In both hand excavated pits HD1 and HD2 the subsoil layer comprised an orange brown (ochre) clayey slightly gravelly sand. The sand was fine to medium grain sized rounded quartz and the gravel comprised fine to medium sub rounded flint. High natural iron and chromium give the material its ochre colour. Again, no evidence was seen whatsoever of any man made materials such as concrete, masonry or brick fragments.

This material was entirely consistent with natural river terrace deposits shown on geological maps to underlie the northern side of the site (at the very least) and did not bear any evidence of being placed by man.

The additional twelve shallow trial pits (HD3 to HD14) all showed a remarkably homogeneous topsoil (comparing the material from all 14 pits) which comprised a dark brown clayey sand with a moderate organic content, very occasional flint gravel and many rootlets. The uniformity of the topsoil across fourteen trial pits, two garden areas and with depth in the two deeper pits, suggests that this topsoil material was imported and placed as part of the development of this site.

With respect to the underlying orange brown clayey sand, to the best of my experience this layer appears to be the top of the natural soil sequence however, this layer was not penetrated to any significant depth by these trial pits to prove that the London Clay lay immediately below. For full confidence that the top of the natural has been found, alternative methods such as boreholes will be required.

However, the critical environmental issue with respect to this ground in a residential garden will be the presence or not of any contaminants in the most critical surface layers to which occupants will be exposed. If contamination is found in samples of these upper layers, then further deeper investigations via boreholes or trial pits will be required.

7.4 Insitu Analysis and Sampling

Imported soils can contain a variety of contaminants and the presence of nearby brickwork kilns and also a nearby rifle range also suggests a further list of potential contaminants, as discussed later in this report. Metals such as lead and arsenic repeatedly appear in the assessment therefore some preliminary insitu testing for metals was carried out using an XRF analyser (X-Ray Fluorescence).

Three samples were also recovered for laboratory analysis from this small garden to confirm the XRF analysis and as a preliminary check on other identified potential contaminants such as tarry combustion residues, petroleum hydrocarbons and asbestos fibres.

8.0 Preliminary Quantitative Analysis

8.1 Sampling Protocols

The samples recovered at this site were placed in laboratory supplied containers suitable for the proposed analysis.

Where Hydrocarbons especially volatiles are to be assessed, glass jars and vials are used and the samples are placed in a cool box with ice packs and kept at a temperature below 9 degrees C for transport to the laboratory.

Holding times for samples are also applicable since some contaminants can degrade quickly once sampled. This is of great concern with regard to samples of groundwater or surface water. No deviating samples were noted by the laboratory indicating that the samples arrived sealed and at a temperature below 9°C.

All laboratory work is carried out by a UKAS accredited MCERTS laboratory firm. The laboratory certificates referenced EMT-23-4323-Batch-1-Report-202303300917 - is appended.

8.2 Generic Assessment Criteria

The measured concentrations were assessed against published guideline values for generic exposure scenarios. Various guidelines are applicable all based on various revisions of the Environment Agency CLEA model.

The Environment Agency produced soil guideline values or SGVs for a limited number of contaminants, the model was then taken up the Chartered Institute of Environmental Health and Land Quality Management (CIEH/LQM) who produced guideline values for a large list of contaminants presented in their S4UL publication (Copyright Land Quality Management Ltd. reproduced with permission Publication Number S4UL3813, All rights reserved).

The Department for the Environment Farming and Rural Affairs (DEFRA) also used a modified version of the CLEA model to provide guideline values for a very limited number of contaminants using a revised version of the model which introduced a new 'lower level of toxicological concern' in their SP1010 C4SL report. The most notable contaminant in the DEFRA publication is Lead which was not considered by the Environment Agency or the Chartered Institute of Environmental Health and Land Quality Management.

8.3 Exposure Scenario

For assessment of measured soil concentrations, the generic exposure scenario for residential gardens where home grown produce would be grown and consumed by the new site residents, has been selected.

8.4 Comparison of Measurements with Guideline Values

The measured values from the samples collected on the site and from the insitu testing have been compared with the guideline values for the generic exposure scenario set out above.

8.4.1 Metals

The preliminary laboratory analysis showed that all of the metals considered in the analysis were within acceptable limits for residential gardens where homegrown produce will be consumed by new residents, in all samples. Most of the metals are at concentrations that could be expected in natural soils with the exception of the lead concentrations which are slightly higher than would be expected.

On this basis the primary metal of concern was lead with an XRF average of 85mg/kg (43mg/kg min 111mg/kg max) and lab values of 52mg/kg and 86mg/kg compared to the guideline concentration of 200mg/kg. These were remarkably consistent concentrations and evident throughout the results for the topsoil. This further confirms suspicion that this topsoil was imported.

Lead levels in the underlying orange brown sands were very low (XRF 22mg/kg Lab 18mg/kg laboratory) and probably natural in origin alongside the natural high iron and chromium values. The laboratory analysis confirmed that the chrome was not in its hexavalent and most toxic form. These metals are present naturally in these subsoils and their presence is harmless and to be expected.

The XRF analysis recorded a single arsenic reading of 52mg/kg in the sample from HD1 at 0.35m. The other readings on this sample were 47mg/kg and 17mg/kg giving an average of 39mg/kg. The laboratory result for this potentially unreliable sample (due to the deviation between results) was 14.9mg/kg and consistent with the 17mg/kg XRF result (exposure No.5). Overall, no widely elevated arsenic values were detected.

8.4.2 Poly-cyclic Aromatic Hydrocarbons or PAH

The preliminary analysis of all samples included an assessment of these tarry hydrocarbons. PAH compounds are common contaminants in the UK and a group of 16 of the most toxic or the most prolific have been selected for analysis.

Petrogenic PAH compounds can be present naturally as coal tars in coal measures or tars in crude oil. Pyrogenic PAH compounds created by low temperature low oxygen availability combustion where instead of completely oxidising, clusters of hydrocarbon (benzene) rings can form. The compounds often contaminate ash, bonfire sites and demolition materials. Phytogenic PAH compounds are created by plants such as pine or lavender for example and can be extracted in a retort for use as a solvent (Turpentine).

The preliminary analysis showed that all of the 16 compounds considered were below detection limits or well below their respective guideline values in all of the samples.

8.4.3 Petroleum Hydrocarbons

In the first instance the analysis has included a basic hydrocarbons test where the total value is divided into weight bands. This analysis does not split the band totals into their aliphatic (open ended chain molecules) or aromatic groups (clustered ringed molecules). The guideline concentrations however, do split the band totals into their aliphatic or aromatic groups.

The aromatics have the lowest acceptability limits and if the unsplit band totals are lower than the limits for the Aromatic or Aliphatic bands, the split values would not exceed the limits either.

If the measured concentrations in any one band exceed the limits for that aromatic band (or aliphatic band if a lesser value is published), then more detailed analysis will be required that does split the hydrocarbon band totals into the aliphatic or aromatic groups.

The preliminary analysis of the samples recovered from this site has not revealed any concentration in any one band that exceeds limits for aliphatic or aromatic hydrocarbons in the respective bands for residential gardens.

8.4.4 Asbestos

The samples were all screened for asbestos, no fibres were detected.

9.0 Potential Contamination Sources

Following the assessment of maps and aerial photographs, as well as available environmental data for the site and preliminary ground exploration, the following potential sources of contamination have been identified. These are not proven sources at this stage and they do not represent any form of allegation against any persons historically or currently involved with the identified areas or locations.

9.1 Made Ground

Soil import may have taken place at this site to raise ground levels within clay pits prior to the original construction of the dwellings on Venetia Close. However, comparing features from LIDAR data with historic mapping, the excavated surface abandoned by the brickmakers appears to still be present below Venetia Close, including the site area.

Imported soils normally arise from demolition or construction, perhaps at old industrial sites and such materials could therefore contain a variety of potential contaminants ranging from those associated with old building materials such as Lead and Asbestos, or contaminants associated with the activities at the source industrial site.

However, preliminary analysis has not revealed any of these identified contaminants in samples or insitu analysis of the apparently natural subsoil or the imported topsoil.

9.2 Brick Works

The main waste output from brick kilns and possibly lime kilns was ash. Charcoal from coppiced wood did not provide the best fuel, coal was preferred and allowed hotter and larger kilns to be built. Both these fuels originate from plant matter which accumulates and concentrates the metals naturally present in the soils in which the plants grew.

In coal measures the metals accumulate as Pyrites (sulphides) of lead, iron, copper, arsenic. and others. Combustion of the fuel releases the carbon but concentrates these metals in the ash taken out of the kiln. Some metals may have been carried with the soot leaving the kiln's large chimney (1913 map 100m south west of the site). A plume of soot fallout with associated metals could therefore be present spreading north east from that chimney.

Large quantities of ash were produced which was either disposed of in the oldest of the clay pits near the kiln or reused for dressing tracks and muddy paths within the clay pits. There is potential for the ash to have been exported for making cinder tracks elsewhere in the area. Typical kiln waste also included remnants of shattered or malformed bricks which didn't survive the firing process, as well as the ash.

Glazes for pipes and tiles can be a problem if for example interior tiles were being fired. This could have involved the use of white lead oxide pigments, cadmium orange and red pigments or green arsenic pigments. The Emmergreen works however, appears to have solely fired bricks and roof tiles.

Old industrial buildings of this era which housed hot kilns, such as brickworks or gas works, where brick built with chrysotile asbestos cement roofs. Installation of the roof often involved the sawing of the roof panels which created dust with asbestos fibres. Dust would then be generated during the life of the building and then finally during demolition of the building. Rubble which includes broken up roof boards, that was left behind after demolition could have left a future hazard.

9.3 Rifle Club

This area is understood to have been used by a rifle club. Such banked clay pits (notably the large pit now below Russet Grove) were ideal locations for recreational shooting. No records could readily found to see what types of guns were used, or if soil banks or backstops for targets were present (normally marked 'butts' on O/S maps). The greatest risk is for clay pigeon or clay rabbit (clay disk rolled along the ground) shooting which can affect large areas behind targets.

Lead from the ammunition is an obvious contaminant however, the lead used for shot and bullets was often alloyed with antimony. Shot guns with fine shot sizes (No.9) cause the greatest levels of contamination however, the butts or backstops behind targets can become significantly contaminated by simple air-rifles.

10.0 Conceptual Model

Qualitatively identified potential linkages between sources of contamination and sensitive receptors are presented below in a tabular format. The layout is set up to allow it to subsequently be expanded into a number of separate tables if quantitative investigations are required and to allow separate potential contaminants to be considered individually.

The risks are then assessed on the basis of being acceptable, unacceptable or needing further assessment, with respect to the proposed end use of the site, as formerly set out in Environment Agency CLR11.

10.1 Source-Pathway-Receptor Preamble

10.1.1 Source

Potential contamination/pollutant sources have been identified from the accumulated knowledge about the site and assessed with respect to the potential risks they pose to sensitive receptors. It is seldom possible at desk study stage to identify all potential sources on and around every site.

10.1.2 Migration Pathways

Hotspots or plumes of contamination on and around any site may not be the point of origin and may just represent one or more areas of accumulation. If pollution at the point of origin is active, it will be very important to define if the pathway is active, dormant and awaiting some exceptional and hopefully foreseeable event, or a dead pathway from a former contamination source.

10.1.3 Absorption Pathways

For human health protection, the pathway is the route that the contaminants take into the human body. For assessing human health risk, absorption pathways generally fall into the following categories: Direct soil ingestion, consumption of homegrown produce and attached soil, dermal contact indoors, dermal contact outdoors, inhalation of dust indoors, inhalation of dust outdoor, inhalation of vapours indoors and inhalation of vapours outdoors.

Absorption pathways for radiological contamination vary significantly from alpha sources which pose the greatest risk when ingested or inhaled to gamma sources which cause harm from outside and potentially some distance from the human body.

10.1.4 Receptors

Receptors of unwanted contamination may be people, farm animals, crops, the surface water network, aquifer groundwater or buildings themselves which can suffer chemical attack.

Other receptors are also revealed by the desk study investigations such as Clayfield Copse and Blackhouse Wood covering a large area downhill to the east. These are local nature reserves and designated ancient woodland which could be affected by nearby building work however, the work is now complete without any apparent detriment to these sensitive areas.

10.1.5 Exposure Scenario

The applicability of these sources, pathways and identification of receptors depends on the exposure scenario for the proposed use of the land. Scenarios where site occupants will not be exposed to any of the underlying soils such as the commercial land scenario differ greatly from the scenario where the land use is residential and close contact with the soil can be expected.

Generic exposure scenarios are used initially which assume various exposure durations and activity types. For this site the private gardens residential scenario, where homegrown garden produce will be consumed, has been selected.

10.2 Tabulated Conceptual Model

10.2.1 Made Ground (On Site)

Location	Associated Contaminants	Dismissed?	Migration Pathway	Dismissed?	Absorption Pathway	Dismissed?	Receptor	Dismissed?
On site	(Buried waste was not identified by desk study and buried waste was not found by trial pits)	LIDAR and mapping evidence suggests the site lies on natural soils at the base of the old workings. Topsoil over river terrace gravels was found by preliminary trial holes Preliminary analysis did not find any of the identified contaminants in the underlying shallow soils	Present at surface on site	<u>Yes</u> Source dismissed	Ingestion of Soil and dust	<u>Yes</u> Source dismissed	Construction Workers	<u>Yes</u> Source dismissed
	Imported soils containing metals from old construction material such as lead flashing or red lead paint on steelwork.		Migrating off site via the surface or via porous soils	<u>Yes</u> Source dismissed	Consumption of homegrown produce and attached soil	<u>Yes</u> Source dismissed	Service and Maintenance Workers	
	Cadmium, nickel, copper, chrome and zinc anti corrosion plating on screws, bolts and other fixings.				Dermal contact indoor	<u>Yes</u> Source dismissed	Site Occupiers	<u>Yes</u> Source dismissed
	Elemental copper and zinc items (sheets).				Dermal contact outdoor	<u>Yes</u> Source dismissed	Wider public	<u>Yes</u> Source dismissed
	Asbestos from old building materials (normally in rubble)				Inhalation of Dust Indoor	<u>Yes</u> Source dismissed	Groundwater	<u>Yes</u> Source dismissed
	Combustion residues such as tarry PAH compounds and cyanides				Inhalation of Dust Outdoor	<u>Yes</u> Source dismissed		
	Other contaminants present in buildings that were demolished.				Inhalation of Vapour Indoor	<u>Yes</u> Source dismissed		
	Gases generated by made ground variably in the wider clay pit area were considered unlikely given the year that houses first appear over the pit areas (i.e. before 1947).				Inhalation of Vapour Outdoor	<u>Yes</u> Source dismissed		
	Kiln ash on site as waste, path dressing or soot fallout:				Groundwater			
	Arsenic, lead, cadmium, vanadium, nickel.							
	Combustion residues such as tarry hydrocarbons (PAH) and cyanides							
	Asbestos from the kiln roofs.							

10.2.2 Brickworks (Off Site)

Location	Associated Contaminants	Dismissed?	Migration Pathway	Dismissed?	Absorption Pathway	Dismissed?	Receptor	Dismissed?
100m south west	Kiln ash for paths or soot fallout containing Arsenic, lead, cadmium, vanadium, nickel. Combustion residues such as tarry hydrocarbons (PAH) and cyanides Asbestos from the kiln roofs. Ash or waste filled clay pit (source) on site, migration pathway n/r Airborne (soot fallout) Leached contaminants could migrate through natural gravels or made ground. Ground gases such as methane and carbon dioxide could be present.	Ash layers were not disclosed by the two trial holes and evidence of brick fragments and ash were not found within the topsoils. If any infilling of the wider clay pit areas did indeed take place before dwellings were built in the area (first seen on 1947 aerial picture) this infill would be over 76 years old and not a plausible active generator of ground gases. The presence of brickworks waste has not been investigated over the wider brickworks area and cannot therefore be dismissed	Leached, onto site surface area by groundwater through porous soils	Yes Contaminants not found on site, migration pathway dismissed	Ingestion of Soil and dust	Yes Contaminants not found on site, migration pathway dismissed	Construction Workers	Yes Contaminants not found on site, migration pathway dismissed
			Leached, onto site surface area by surface water flow	Yes Contaminants not found on site, migration pathway dismissed	Consumption of homegrown produce and attached soil	Yes Contaminants not found on site, migration pathway dismissed	Service and Maintenance Workers	
			Direct migration of volatiles/gases onto site surface area through porous soils.	Yes Contaminants not found on site, migration pathway dismissed	Dermal contact indoor	Yes Contaminants not found on site, migration pathway dismissed	Site Occupiers	Yes Contaminants not found on site, migration pathway dismissed
			Surface contaminants trafficked onto site	Yes Contaminants not found on site, migration pathway dismissed	Dermal contact outdoor	Yes Contaminants not found on site, migration pathway dismissed	Wider public	No
			Airborne dust containing contaminants or fibres	Yes Contaminants not found on site, migration pathway dismissed	Inhalation of Dust Indoor	Yes Contaminants not found on site, migration pathway dismissed	Groundwater	No
			Gas Migration through porous soils	Yes Contaminants not found on site, migration pathway dismissed	Inhalation of Dust Outdoor	Yes Contaminants not found on site, migration pathway dismissed		
			Directly to groundwater	No The area of wider brickworks site has not been investigated	Inhalation of Gas or Vapour Indoor	Yes Contaminants not found on site, migration pathway dismissed		
			Direct migration of fluids/volatiles/gas ses from source area through porous soils onto other land.	No The area of wider brickworks site has not been investigated	Inhalation of Gas or Vapour Outdoor	Yes Contaminants not found on site, migration pathway dismissed		
								Groundwater & Other Land

10.2.3 Rifle Club (Off site)

Location	Associated Contaminants	Dismissed?	Migration Pathway	Dismissed?	Absorption Pathway	Dismissed?	Receptor	Dismissed?
100m south west	Antimony copper, and lead No plausible pathway from rifle butts to the site area identified, Scattered lead shot on site is possible depending on the history of gun use in the clay pits.	Lead, copper and antimony were not found at high concentrations in the surface soils on site. <i>The presence of ammunition waste has not been investigated over the wider brickworks area and cannot therefore be dismissed</i>	Leached, onto site surface area by groundwater through porous soils	Yes Contaminants not found on site, migration pathway dismissed	Ingestion of Soil and dust	Yes Contaminants not found on site, migration pathway dismissed	Construction Workers	Yes Contaminants not found on site, migration pathway dismissed
			Leached, onto site surface area by surface water flow	Yes Contaminants not found on site, migration pathway dismissed	Consumption of homegrown produce and attached soil	Yes Contaminants not found on site, migration pathway dismissed	Service and Maintenance Workers	Yes Contaminants not found on site, migration pathway dismissed
			Direct migration of volatiles/gases onto site surface area through porous soils.	Yes Contaminants not found on site, migration pathway dismissed	Dermal contact indoor	Yes Contaminants not found on site, migration pathway dismissed	Site Occupiers	Yes Contaminants not found on site, migration pathway dismissed
			Surface contaminants trafficked onto site	Yes Contaminants not found on site, migration pathway dismissed	Dermal contact outdoor	Yes Contaminants not found on site, migration pathway dismissed	Wider public	No
			Airborne dust containing contaminants or fibres	Yes Contaminants not found on site, migration pathway dismissed	Inhalation of Dust Indoor	Yes Contaminants not found on site, migration pathway dismissed	Groundwater	No
			Gas Migration through porous soils	Yes Contaminants not found on site, migration pathway dismissed	Inhalation of Dust Outdoor	Yes Contaminants not found on site, migration pathway dismissed		
			Directly to groundwater	No <i>The area of wider rifle range use of the brickworks site has not been investigated</i>	Inhalation of Gas or Vapour Indoor	Yes Contaminants not found on site, migration pathway dismissed		
			Direct migration of fluids/volatiles/gases from source area through porous soils onto other land.	No <i>The area of wider rifle range use of the brickworks site has not been investigated</i>	Inhalation of Gas or Vapour Outdoor	Yes Contaminants not found on site, migration pathway dismissed		
					Groundwater & Other Land			

11.0 Qualitative Assessment

11.1 Plausible Linkages Between Sources and Receptors

Analysis of samples and insitu tests did not reveal any of the identified potential contaminants from any of the proposed linkages in the underlying soils. The assembled conceptual model suggests that the potential links between sources of contamination and receptors such as new residents can generally be dismissed.

The physical examination of soils considered only the upper 0.6m depth of soil critical with respect to human exposure. At this depth natural soils were encountered and are expected to be present below. However, the trial pits could not be extended further to expose the full expected sequence of soils. The actual materials present are therefore unknown but are at least capped by 0.6m depth of clean soil where examined. Given the findings of the LIDAR and historical map comparisons, there appears to be little evidence to support further, deeper investigations using drilling equipment.

If any infilling of the wider clay pit areas did indeed take place before dwellings were built in the area (first seen on 1947 aerial picture) this infill would be over 76 years old and not a plausible active generator of ground gases.

12.0 Summary & Recommendations

Evidence from mapping, LIDAR and physical trial holes has not uncovered evidence for any infill of the ground below this property, nor has any evidence for ash, malformed or shattered bricks been found in the shallow soils. Contamination analysis of the shallow soils below the site to which new homeowners will be exposed, both laboratory and insitu, have not revealed any of the identified contaminants.

On this basis this site is not expected to pose any unacceptable contamination risks to new occupants. Further work to assess contamination in the soils below the site is not considered necessary unless other evidence comes to light.

