



REMEDIATION METHOD STATEMENT

**OAK HILL FARM
COXES FARM ROAD
BILLERICAY
CM11 2UA**

**Reference Number 3015/Rpt 3v1
March 2023**

Prepared for

J Keeling and Sons
Oak Hill Farm
Coxes Farm Road
Billericay
CM11 2UA

By

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	Oak Hill Farm Coxes Farm Road Billericay CM11 2UA
Report Title	Remediation Method Statement: Oak Hill Farm, Coxes Farm Road, Billericay, CM11 2UA
Reference Number	3015/Rpt 3v1
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1 INTRODUCTION

1.1 Background

Brown 2 Green Associates Ltd have been commissioned by J Keeling and Sons to prepare a Remediation Method Statement for the redevelopment of Oak Hill Farm, Coxes Farm Road, Billericay, CM11 2UA to residential. The site is located at National Grid Reference 569450, 193640. The site location is presented in Figure 1.

In February 2022, Brown 2 Green Associates prepared a Phase 1 Geo-environmental Desk Study for the site. The Desk Study identified some potentially active pollution linkages. The Phase 2 Site Investigation identified the presence of lead and individual PAHs above the adopted screening levels for human health. Fragments of asbestos containing materials were also identified in a small localised area in the north-eastern corner of the site. No loose fibres were detected within the samples analysed. Also, concentrations of mineral oils were detected across the site that have the potential to impact the water supply infrastructure. From the results of the investigation works, recommendations for remediation have been made.

This Remediation Method Statement presents the measures to be undertaken to mitigate risk from contamination identified at the site.

1.2 Proposed Development

It is proposed to redevelop the site for residential usage consisting of four detached dwellings with associated gardens and parking. The proposed development is shown on drawing number 20.7268/P201, rev. C, dated 28th July 2022 prepared by Smart Planning Ltd. The proposed development layout is presented in Figure 2.

1.3 Objectives

This document provides details of the requirements for remediation. The objectives of the remediation are to:

- Break the pollutant linkages that were identified as being active during the site investigation works.
- Render the site suitable for the intended end use as a residential development with private gardens.
- Render the site incapable of determination as contaminated land under Part 2A.

1.4 Sources of Information

Background information relating to the site was acquired and referenced from the following sources:

A Phase 1 Desk Study and Phase 2 Site Investigation were previously completed by Brown 2 Green Associates Ltd. completed by Resource and Environmental Consultants Ltd. The findings of the Desk Study are presented in the report titled:

- Phase 1 Geo-environmental Desk Study and Preliminary Risk Assessment: Oak Hill Farm, Coxes Farm Road, Billericay, CM11 2UA, dated February 2022; Ref 3015/Rpt 1v2; prepared by Resource and Environmental Consultants Ltd.

- Geo-environmental Site Investigation Report: Oak Hill Farm, Coxes Farm Road, Billericay, CM11 2UA; dated March 2023; Ref: 3015/Rpt 2v1.

During the preparation of this report consideration has been made with regard to the findings of the previous work. These reports should be read in conjunction with this report.

1.5 Limitations and Constraints of the Study

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2 SITE LOCATION AND SETTING

This section presents a summary of the site location and setting. A detailed description can be found in the previous report. Where changes have been identified, these have been noted.

2.1 Site Location

The site is located in a rural area on the western side of New Street. The site location is presented in Figure 1.

The subject parcel of land is rectangular in shape and covers 0.43 hectares. The northern and western boundaries are defined by hedgerows. The southern and eastern boundaries are defined by a track and the northern boundary consists of a fence.

The site consists of a former farm yard that contains four buildings. On the southern side of the site there is a large barn that is constructed using a metal frame. The walls are constructed using cement blocks or clad with wood. The roof is constructed of corrugated cement sheeting suspected to contain asbestos. The floor of the building is concrete. The barn is used for steel fabrication, general storage of equipment used within the building industrial and domestic items.

The northern side of the site contains two rows of buildings that are in a poor state of repair. The buildings are constructed of brick or clad with wood. One of the buildings is used for the storage of cleaning equipment. The others are empty.

Along the eastern boundary of the site there are a series of shipping containers.

The ground surrounding the buildings is either paved with asphalt or concrete or grass. A track runs from a site entrance located in the south west corner, along the southern and eastern side of the site. The track is covered with road scalplings.

A small pond is present next to the western boundary.

2.2 Historic Land Use

The desk study identified that the site had been used as a farm since before 1922. The site owner confirmed that the larger barn was used for agricultural purposes until the 1980's. From the early 1990's the barn was used for commercial activities consisting of an engineering company, car restoration. At the time of the last visit, the tenant used the building for steel fabrication. Historical sources of contamination were identified.

2.3 Geology and Hydrogeology

The British Geological Survey website indicates that the site is underlain by the following geology:

Drift/Solid	Geological Unit	Description	Aquifer Classification
Superficial	Head (western side of the site)	Clay, silt, sand and gravel	Secondary (Undifferentiated)
Solid	London Clay Formation (western side of the site)	Clay, silt and sand	Unproductive
Solid	Claygate Member	Clay, silt and sand	Unproductive

There are no licensed groundwater abstractions within 1km radius of the site. There are no Source Protection Zones within the vicinity of the site.

2.4 Hydrology

The Ordnance Survey Water Network Lines indicates the nearest surface water feature is a stream located 78m to the west.

During the site reconnaissance a pond was noted on site.

There are no licensed surface water abstraction points within 500m radius of the site.

The database indicates that the site does not lie in a fluvial or tidal floodplain. Flood risk rating from flooding from rivers and the sea (RoFRaS) is Very Low.

3 SUMMARY OF RESULTS OF INVESTIGATION

3.1 Ground Conditions

Made Ground

The trial pits indicate that the hardstanding and road scalplings are underlain by up to 0.6m of made ground (TP5). Several types of made ground have been noted on site. The made ground from the eastern part of the site is represented by a dark brownish grey sand and gravel with road scalplings, bricks and concrete. The made ground from the north-central part of the site consists of a dark brownish grey to black slightly gravelly, clayey sand with bricks and concrete. No made ground has been encountered in the western and southern parts of the site.

Natural Strata

The made ground is underlain by orange brown to dark brown mottled orange and grey clay.

Visual and Olfactory Evidence of Contamination

Fragments of asbestos containing materials has been noted at 0.1m within the made ground from TP6 which was located in the north-eastern part of the site.

Groundwater Conditions

During the investigation no groundwater strikes or seepages were recorded. All trial pits were dry on completion.

It should be noted that groundwater levels can fluctuate seasonally and therefore, may be encountered at higher or lower elevations than those recorded in this site investigation.

3.2 Contamination Assessment

The Phase 2 Site Investigation identified:

Concentrations of pesticides and herbicides were all less than the laboratory limit of detection, thus, it is considered these will not pose a risk to human health.

Due to the presence of several types of made ground across the site and taking into consideration the number of samples obtained from each type, it is considered that a statistical assessment is not relevant in this situation.

Within the made ground from TP2 (0.1-0.5m), TP3 (0.0-0.4m) and TP10 (0.1-0.25m) contained concentrations of lead above the GAC threshold limit of 200mg/kg. The made ground from TP5 (0.0-0.5m) also contained a lead concentration equal to the GAC. The made ground samples from the northern part of the site also contained concentrations of lead that were less than the GAC by higher than typical background concentrations. Based on the distribution it is considered that the made ground beneath the northern part of the site, north of the central access road, the made ground contains concentrations of lead at levels that would pose an unacceptable level of risk where active pollution linkages are created. The concentration identified in TP10 is considered to be a localised hot spot. For lead the principal exposure pathways are the inhalation of dust and the ingestion of soil and dust, these pathways would be active in areas of soft landscaping.

Concentrations of individual PAHs above their GAC threshold values were identified in TP1 (0.1-0.25m), TP2 (0.1-0.5m), TP3 (0.0-0.4m), TP4 (0.0-0.2m), TP7 (0.0-0.3m) and TP10 (0.1-0.25m). The likely source of the PAHs is considered to be the road scalpings that have been placed across the site or carbonised material within the made ground. For PAHs the principal exposure pathways are the ingestion of soil and dust. These pathways will be active in areas to be developed as soft landscaping. These pathways would be created by the presence of the proposed gardens across the northern half of the site and along the eastern side of the site. No pathways will be active within the footprints of the building or area covered by hardstanding as these areas will provide a barrier that breaks the pollution linkage.

Asbestos was not identified in any of the soil samples submitted for screening analysis. Asbestos was confirmed in the cement sheeting sent for analysis. From the results of the investigation it is considered that the made ground that contains ACM fragments is restricted to limited localised areas in the north-eastern part of the site, adjacent to the north of the northernmost building.

No evidence of herbicides, fungicides or pesticides were identified in any of the soil samples submitted for screening analysis.

The Tier I Controlled Water Risk Assessment has determined that there are no concentrations of potential contaminants within the underlying soils that would pose an unacceptable risk to controlled waters.

The risk assessment for bio-genic ground gas concluded that there are no concentrations at levels that would pose an unacceptable risk to human health and the proposed development.

The risk assessment in respect to the future planting and towards sensitive ecological receptors identified that the presence of zinc in the made ground across the northern part of the site is at levels that would pose an unacceptable level of risk to future planting and sensitive ecological receptors.

The risk assessment in respect to water supply infrastructure identified that the presence of TPH concentrations that are slightly above the threshold values. However, as the concentrations are likely to be road scalpings identified across the site it is considered that the concentrations will not pose an unacceptable level of risk to the integrity of PE or PVC pipework.

In light of the results of the site investigation, and the results of the chemical analysis and the risk screening assessment presented in the previous reports, a Conceptual Model showing the identified pollution linkages was developed. The Conceptual Model is presented below.

Source	Potential migration pathway	Potential Receptors	Discussion, Remedial or Precautionary Measures and Mitigating Factors
PAHs	Ingestion of contaminated soils	Residents and construction workers	Clean capping private gardens and landscaped areas is required in northern and eastern parts.
Lead	Ingestion of contaminated soils Inhalation of dust	Residents and construction workers	Clean capping private gardens and landscaped areas is required in northern half of the site and localised hotspot in TP10.
Asbestos fragments located in the north-eastern corner	Inhalation of dust should area be disturbed during the construction phase	Construction workers	Pollution linkages active during construction phase. Removal of the fragments is required.

Source	Potential migration pathway	Potential Receptors	Discussion, Remedial or Precautionary Measures and Mitigating Factors
Zinc in made ground	Up-take by plants	Future planting	Within made ground across northern part of the site. Replace with clean top and sub-soil within rooting zone.

4 REMEDIATION STRATEGY

The results of the site investigation have confirmed that the level of contamination at the site has the potential to pose a risk to end users and the environment and that there are active pollution linkages present. Remediation will be required to render the site suitable for the intended end use. The aim of the remediation is to break pollutant linkages that are present and thus mitigate the identified risks to acceptable levels. An appraisal of the remediation options concludes that source removal and pathway interruption are the most appropriate techniques to be adopted.

Following the consideration of the remedial options and objectives it is considered that remediation can be achieved by implementation of the following key elements:

- Removal and off-site disposal of fragments of asbestos containing cement products (ACM);
- Removal of contaminated made ground from across the site;
- Backfilling of excavated hotspot locations with chemically and geotechnically suitable soils;
- Importation of clean suitable sub-soil and topsoil to form a barrier to underlying contamination in appropriate garden and soft standing areas where thickness of made ground extends beneath 600mm below finished garden level (as required);
- Verification and validation testing of the works undertaken.

4.1 Removal of Fragments of ACM

4.1.1 Remediation Action

All fragments of cement-based asbestos containing product will be removed from the site. The extent of the area where fragments of cement bonded products were encountered is presented in Figure 2. The removal will be undertaken by hand picking and if required, localised excavation. All materials that contain asbestos will be disposed off to a licenced waste disposal facility. Copies of the Waste Consignment Notes will be retained and included in the final verification report.

4.1.2 Verification

Following the completion of the removal of the cement-based fragments an inspection will be completed by contaminated land consultant to provide confirmation that all fragments have been removed.

4.1.3 Timetable

The removal of the asbestos will be undertaken prior to the commencement of construction in order to avoid further disturbance of the ground surface.

4.2 Remediation of Contaminated Made Ground

4.2.1 Remediation Action

The site investigation identified concentrations of lead, zinc and individual polycyclic aromatic hydrocarbons within the made ground at levels that would pose an unacceptable level of risk. Within areas of private garden, the made ground will be excavated and removed. The excavation will be taken to either the base of the made ground where the thickness of made ground is less than 600mm below finished garden level, or, to a maximum depth of 600mm below finished garden level where the made ground extends to a depth greater than 600mm below finished garden levels.

The extent of the area that requires excavation is presented in Figure 2.

All excavated soil generated by the remediation will be classified as waste. The soil will be disposed of to a suitable waste disposal facility, treatment facility or other suitable route to enable the soil to be re-used.

4.2.2 Re-instatement

Following the remediation works all areas will be backfilled with suitable clean top and subsoil.

If all the made ground has been removed and confirmation is provided by verification sampling, the area will be reinstated back to the required finished garden level using clean suitable top and sub soil. If contaminated made ground is still present, following the completion of the excavation, a cover system will be placed. Details of the cover system are presented below:

Private Gardens



4.2.3 Verification

Following the reinstatement of the areas that required remediation the following verification of the area that required remediation will be undertaken:

- Excavation of a trial pit to the base of the imported soil to confirm sufficient depth of removal has been undertaken. A minimum of two trial pits per plot will be excavated.
- Where the thickness of the capping layer depth of excavation is less than 600mm and all the made ground has been removed, a sample of the soil immediately beneath the imported soil will be obtained and analysed for lead, zinc and speciated polycyclic aromatic hydrocarbons to ensure the concentrations conform to the chemical specification detailed in Appendix II.
- Verification samples of the imported soil will be obtained for laboratory analysis. A minimum of two samples per plot will be obtained, assuming all the soil is obtained from the same source. Should soil be obtained from more than one source a minimum of three samples per source will be obtained. Should top and sub-soil be placed a sample will be obtained from each type of material.
- Samples will be submitted to a UKAS accredited laboratory and analysed for the determinants presented in Appendix II.

No verification will be undertaken of the parts of the site that does not require remediation.

4.2.4 Timetable

The remediation will be completed as required by the build programme. Verification must be undertaken before occupation.

4.3 Reporting

On completion of the remediation a verification report will be prepared. The verification report will present the following information:

- Site observations and photographs, including plan showing the location of all photographs.
- Chemical analysis of verification samples and imported soils.
- Waste transfer notes.

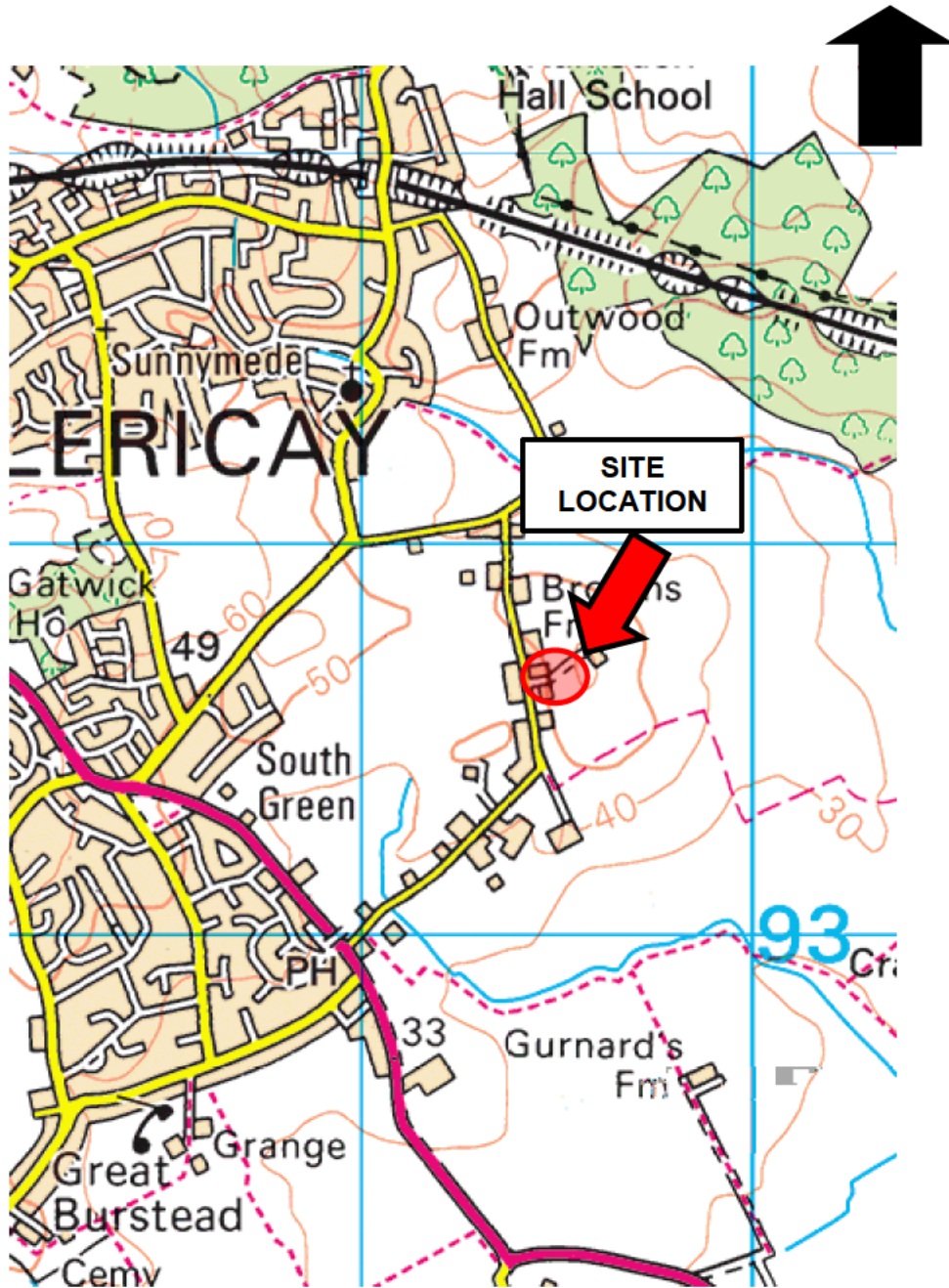
4.4 Unforeseen Contamination

During the construction works, should any evidence of unforeseen visual or olfactory contamination not revealed during the site investigation, underground storage tanks or other underground structures be identified, contact should be made with a suitable qualified Geo-environmental Consultant. Following inspection, suitable action will be taken to assess any risk from contamination. This may include additional investigation or sampling. If contamination is identified contact will be made with the Contaminated Land Officer at the local council and all relevant information submitted.


4.5 Post Development Maintenance/Monitoring

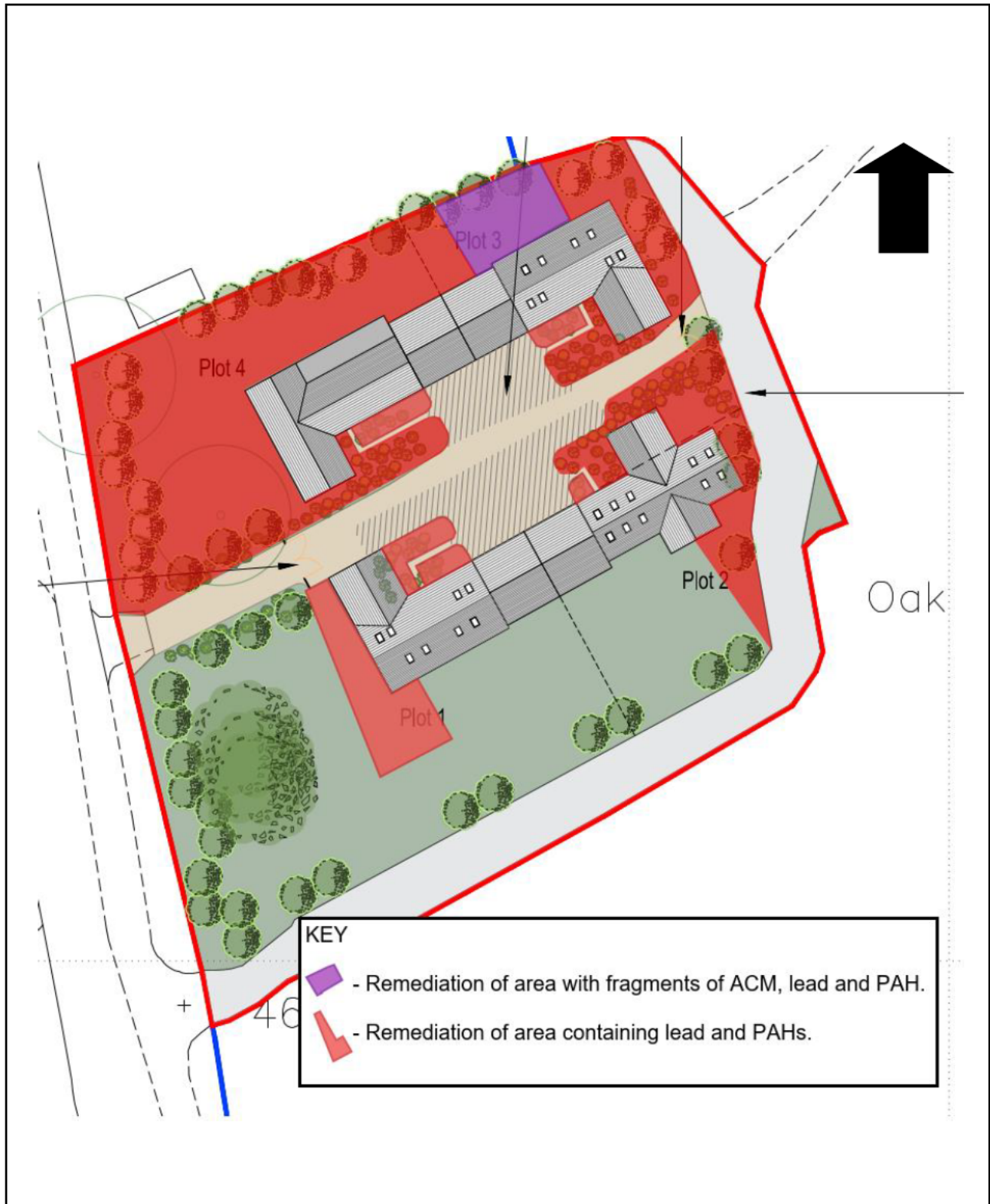
No post development maintenance or monitoring of the remediation measures are required.

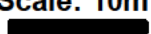

FIGURES



Based on an Ordnance Survey map with permission of HMSO. Crown copy right reserved. Licence number 100053399

Project Number: 3015	Project: Oak Hill Farm, Coxes Farm Road, Billericay	Scale: NTS
Figure 1	Site Location Plan	



<p>Project Number: 3015</p>	<p>Project: Oak Hill Farm, Coxes Farm Road, Billericay</p>	<p>Scale: 10m </p>
<p>Figure 2</p>	<p>Remediation Plan</p>	<p></p>

APPENDICES

APPENDIX I
PROPOSED DEVELOPMENT PLAN

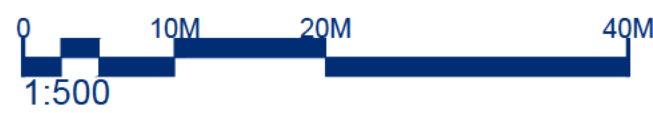
House Types Areas and Volumes		
	Footprint	Volume
Plot 1 3B4P - 1.5 Storey	120.3m ²	670.5m ³
Plot 2 3B5P - 1.5 Storey	126.3m ²	702.4m ³
Plot 3 3B4P - 1.5 Storey	120.3m ²	670.5m ³
Plot 4 3B5P - 1 Storey	145.0m ²	538.1m ³
Double Cartlodges x4	155.2m ²	473.6m ³
Total	667.1m²	3055.1m³

x3 1.5 Storey Dwellings + 1 Bungalow + x4 Double Cartlodges = 3055.1m³ (556.9m³ Remaining of Existing Volume)

Client Name : Mr J Keeling			
Project Title : Oak Hill Farm, Coxes Farm Road, Billericay, Essex, CM11 2UA			
Drawing Name : Proposed Site Plan			
Scale : 1:500 @ A3	Drawn/Checked: MK/HW	Status : Application	Rev: A
Date : 25 Aug 2020	Plot Date : 04 February 2022 08:58:52	Dwg No : 20.7268/P201	



Note:
This drawing is provided for planning application purposes only and should not be used or relied upon for Building Regulations applications or in the use of Construction. All dimensions should be checked on site before the commencement of any works or ordering of materials. Any discrepancies should be reported to Smart Planning Ltd.



No.	Date	Amendment	Initials
A	03.02.22	Site plan revised	MK



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APPENDIX II

CHEMICAL SPECIFICATION FOR TOP AND SUB SOIL

Determinant	Maximum Concentration (mg/kg)		
Arsenic **	37		
Cadmium**	11		
Chromium**	910		
Lead***	200		
Mercury**	40		
Nickel****	75		
Selenium**	250		
Vanadium**	410		
Copper ****	200		
Zinc ****	300		
Asbestos	None detected		
pH	5 - 10		
	1% Soil Organic Matter	2.5% Soil Organic Matter	6% Soil Organic Matter
Polycyclic Aromatic Hydrocarbons			
Naphthalene**	2.3	5.6	13
Acenaphthylene **	170	420	920
Acenaphthene **	210	510	1100
Fluorene **	170	400	860
Phenanthrene **	95	220	440
Anthracene**	2400	5400	11000
Fluoranthene**	280	560	890
Pyrene**	620	1200	2000
Benz(a)anthracene**	7.2	11	13
Chrysene**	15	22	27
Benzo(b)fluoranthene**	2.6	3.3	3.7
Benzo(k)fluoranthene**	77	93	100
Benzo(a)pyrene**	2.2	2.7	3.0
Indeno(123-cd)pyrene**	27	36	41
Dibenzo(a,h)anthracene**	0.24	0.28	0.3
Benzo(ghi)perylene**	320	340	350
Total Petroleum Hydrocarbons Aliphatic			
TPH C ₅ -C ₆ **	42	78	160
TPH C ₆ -C ₈ **	100	230	530
TPH C ₈ -C ₁₀ **	27	65	150
TPH C ₁₀ -C ₁₂ **	130	330	760
TPH C ₁₂ -C ₁₆ **	1100	2400	4300
TPH C ₁₆ -C ₃₅ **	65000	92000	110000
Total Petroleum Hydrocarbons Aromatic			
TPH C ₅ -C ₆ **	70	140	300
TPH C ₆ -C ₈ **	130	290	660
TPH C ₈ -C ₁₀ **	34	83	190
TPH C ₁₀ -C ₁₂ **	74	180	380
TPH C ₁₂ -C ₁₆ **	140	330	660
TPH C ₁₆ -C ₂₁ **	260	540	930
TPH C ₂₁ -C ₃₅ **	1100	1500	1700
No visual or olfactory evidence of hydrocarbons			

Source of Values

- * - Soil guideline value, DEFRA/Environment Agency
- ** - Tier 1 GAC are based on Nathanail, C. P., McCaffrey, C., Gillett, A. G., Ogden, R. C. and Nathanail, J. F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. **Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3086.**
- *** - Category 4 Screening Level.
- **** - BS 3882 British Standards Specification for Top Soil.
- ***** - B2G level to ensure no visible or olfactory evidence.