OAKSHIRE
ENVIRONMENTAL

Quantum Intelligent Trading Ltd
Company No: 06537088
VAT No: 369 2662 60
Tel: 0800 433 2906
oakshireenvironmental.co.uk

Phase 3 Remediation Options Appraisal

27 September 2025

Stephan North
Land between Nasza Chata and Fairlawns, Jericho Lane, East Halton, DN40 3PZ

Report by Mr Louis Turner BSc (Hons)
Supervised by Mr Joseph Turner

CONTENTS

1. Introduction

The following document is a Phase 3 Remediation Options Appraisal carried out by Oakshire Environmental, and includes details of the site, environmental setting, contaminant linkages and an evaluation of risk.

1.1 Project Overview

The client's proposed project involves the Construction of a two-storey house and detached double garage at Land between Nasza Chata and Fairlawns, Jericho Lane, East Halton, DN40 3PZ. Following the identification of contaminant linkages at the site, remediation has been recommended. Oakshire Environmental will carry out a Phase 3 Remediation Options Appraisal & Strategy, as described below.

1.2 Purpose of Investigation

The objectives of the Phase 3 Remediation Options Appraisal & Strategy will be to:

- Assess the nature and extent of contamination risk at the site.
- Identify suitable remediation option(s).
- Outline a strategy for the implementation of suitable remediation option(s).
- Determine the scope of required verification work.

1.3 Scope of Work

- Assess the nature and extent of contamination risk, identified as part of previous investigations.
- Identify initial feasible options for remediation at the site, including assessment of potential constraints and generic remediation objectives, based on the costs involved and the practicality of their application. Remediation methods to be considered include civil engineering, biological, chemical, physical and thermal methods.
- Conduct a detailed evaluation of remediation options, including development of site-specific remediation objectives, in order to determine which option(s) are most appropriate for the site.
- Outline a strategy for the implementation of suitable remediation option(s).
- Recommended remediation option(s) will be assessed to determine the scope of required verification work at the site.
- Supporting appendix to include photographs, maps and plans of the site.

1.4 Limitations

Quantum Intelligent Trading Ltd is previously and hereafter referred to as “Oakshire Environmental” or “the company”. Oakshire Environmental has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. This report is only valid when used in its entirety and any information or advice contained within the report should not be relied upon until considered in the context of the whole report. Oakshire Environmental disclaims any responsibility to the client, as named on the front of this report (“the client”), and others in respect of any matters outside the scope of this work. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate. This report has been prepared solely for the benefit of the client and any other party using or placing reliance upon any information contained in this report does so at their own risk. Oakshire Environmental accepts no responsibility or liability for the contents of this report being used for any purpose or project for which it was not commissioned. Oakshire Environmental accepts no liability whatsoever for any loss or damage arising from the interpretation or use of this report and in no event shall the company be liable for any punitive, exemplary or other special damages, or for any indirect, incidental or consequential damages, including with respect to the performance or non-performance of any services, whether arising under breach of contract, tort or any other legal theory, and regardless of whether the company has been advised of, knew of, or should have known of the possibility of such damages. Furthermore, Oakshire Environmental does not accept any liability for the consequences of any legislative changes or the release of subsequent guidance documentation and following delivery of the report has no obligation to advise the client or any other party of such changes or their repercussions.

This report excludes consideration of potential hazards arising from any activities at the site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities. Oakshire Environmental does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions. It should be noted that this report has been produced for environmental purposes only.

2. Site

The following section provides a description of the site, location and previous investigations, utilising information obtained from the client and publicly available sources.

2.1 Site Description and Location

The site is located at Jericho Farm on Jericho Lane in East Halton, North Lincolnshire, and is approximately 0.45ha. The site is comprised of a concrete and gravel yard at the south with a barn ('Shed 3') in the centre constructed with metal sheet cladding and a suspected asbestos sheet roof along with several metal storage containers and lorry trailers situated around the yard. Adjacent to 'Shed 3', there is a single skinned metal fuel tank situated on a concrete block plinth. At the south west of the yard there are two additional barn buildings, one of which ('Shed 2') is of similar construction to 'Shed 3' while the other ('Shed 1') is constructed with bricks and a tiled roof. The north of the site is comprised of grass and bare soil where it is understood that trees have recently been removed.

A walkover survey of the site, carried out on the 26th April 2024, identified various waste materials and demolition rubble stored inside the on-site structures on the site and across the yard area as well as on adjacent areas of soil. Waste materials included domestic and commercial waste comprising metal, wood and plastic. Several gas canisters were also identified adjacent to 'Shed 1'at the south west of the site and burnt materials were identified at the south east along with evidence of a bonfire on the grassed area at the north east. No obvious visible or olfactory evidence of hydrocarbon contamination was identified around the fuel tank adjacent to 'Shed 3'.

The site is bordered by a residential dwelling and an area of woodland to the north, an agricultural field to the east, an additional dwelling and gardens to the west and a commercial yard to the south comprised of several concrete block and metal sheet clad buildings with potential asbestos sheet roofs. Two fuel tanks were identified in this area including a disused single skinned tank adjacent to one of the buildings and a modern bunded red diesel tank situated on a metal platform adjacent to a concrete block wall of a demolished building. The red diesel tank appears to be in use and there is visible staining on the concrete beneath the tank. Based on anecdotal evidence, the buildings and yard area to the south are used as a vehicle workshop. The surrounding area is predominantly agricultural with some isolated residential dwellings and villages.

National Grid Reference: TA 13619 20243

2.2 Previous Investigations

A Phase 1 Preliminary Risk Assessment was carried out by Oakshire Environmental in June 2024. This assessment considered there to be a moderate risk to residential end users and a low to moderate risk to groundwater from waste materials on the site. There was also considered to be a low to moderate risk to residential end users from asbestos containing materials on the site and the adjacent vehicle workshop. The assessment recommended that a Phase 2 Intrusive Site Investigation should be undertaken, including sampling of shallow soil at the site to be tested for a suite of contaminants including heavy metals, hydrocarbons and asbestos.

Following the findings of the Phase 1 Preliminary Risk Assessment, Oakshire Environmental has carried out sampling of soil at the site, which has been tested for a comprehensive suite of contaminants including Metals (As,Be,Cd,Cu,Pb,Hg,Ni,Se,V,Zn), Chromium (III & VI), Phenols, Polycyclic Aromatic Hydrocarbons (PAHs), BTEX & MTBE, Total Petroleum Hydrocarbons (TPHs) CWG (Aliphatic/ Aromatic), pH, Organic Matter and Asbestos (Qualitative).

Based on laboratory testing of soil samples from the site, the proposed development plan and the updated conceptual site model, the risk at the site to residential end users was considered to be moderate, while the risk to groundwater is considered to be low, therefore, remediation was considered necessary to mitigate the risk to residential end users in areas of identified contamination.

As per the recommendations of the Phase 2 Intrusive Site Investigation, Oakshire Environmental has carried out a Phase 3 Remediation Options Appraisal to include an assessment of the feasible remediation options available.

3. Remediation Options

The Environment Agency's Land Contamination: Risk Management guidance for the development of an options appraisal requires the initial identification of feasible options for remediation at a site, based on the costs involved and the practicality of their application. There are a number of remediation methods available including civil engineering, biological, chemical, physical and thermal methods. Some methods may not be appropriate to a particular site as some can only be used on certain types of media and some may not be cost effective. Other site-specific constraints such as time and access can also determine the feasibility of a particular remediation option. The following section outlines the generic remediation objectives for the site, taking into account potential constraints, and includes a selection of feasible remediation options.

3.1 Site Context and Objectives

The proposed development involves the removal of the existing barns and containers and the construction of a two-storey dwelling at the west of the site with a detached double garage to the south east, a patio to the east, a driveway to the west and a grass garden at the east of the site. This report, therefore, considers the feasibility of redeveloping the site for residential use.

3.2 Potential Constraints

There are sensitive human receptors bordering the site, however, the site is currently predominantly used for storage so there is not considered to be sensitive receptors on site, in addition, the on-site contamination is not expected to be ongoing so there are no specific time constraints with regards the implementation of remediation.

3.3 Generic Remediation Objectives

The following table outlines the generic objectives of remediation at the site.

Table 1: Summary of Generic Objectives

Remediation Objective	Objective Type
Enable the site to be redeveloped for residential end use	General
Enable development of a remediation strategy that meets regulatory requirements	Management
Enable development of a remediation strategy that meets the developers' requirements	Management
Avoid unacceptable environmental impacts from implementation of remediation strategy	Management
Avoid long term monitoring requirements	Management

3.4 Feasible Remediation Options

Contamination risk from asbestos, heavy metal, PAH and TPH contaminants has been identified in shallow soil and made ground, therefore, a number of remediation options have been discounted as they are inappropriate for the site and the identified contamination risk, in addition, soil flushing, soil washing, and hydraulic binders are likely to be too costly and unnecessarily extensive for the site and development proposal.

The following remediation options are considered appropriate for the site and will be subject to a more detailed evaluation in the following section.

Table 2: Summary of Feasible Remediation Options

Remediation Option	Method	Linkage Element Addressed
Excavation and Disposal	Civil Engineering	Source Management
Containment - Cover System	Civil Engineering	Pathway Interruption
Hardstanding	Civil Engineering	Pathway Interruption

4. Evaluation of Remediation Options

Following the identification of feasible remediation options, a detailed evaluation of options, including development of site-specific remediation objectives, is required to determine which option(s) are most appropriate for the site.

Table 3: Summary of Site-Specific Objectives

Remediation Objective	Objective Type	Evaluation Criteria
Enable the site to be redeveloped for residential end use without risk to human health	General/Technical	Contaminant concentrations in shallow soils on site to be below relevant screening values after remediation
Enable development of a remediation strategy that meets regulatory requirements	Management	Remediation strategy to be agreed with Local Authority and carried out in accordance with relevant regulations
Enable development of a remediation strategy that meets the developers' requirements	Management	Remediation strategy to be agreed with developer
Avoid unacceptable environmental impacts from implementation of remediation strategy	Management	Compliance with regulations on the control of noise, dust odour, traffic and generation of waste
Utilise remediation option with a proven track record	Management	Selected option to have proven success on sites with similar contamination issues
Avoid long term monitoring requirements	Management	No site-specific evaluation criteria

4.1 Excavation and Off-Site Disposal and Containment

Excavation and off-site disposal of contaminated made ground in all areas of proposed soft landscaping should be carried out to remove the source of contamination and enable the site to be redeveloped for residential use without risk to human health. The Phase 2 Intrusive Site Investigation found the depth of made ground in contaminated areas to be a maximum of 300mm across the site.

Containment should then be carried out, through placement of imported clean material, to protect against potential residual contamination risk and re-instate site levels. In addition, where a localised area of hydrocarbon contamination was identified (around TP08), the minimum required depth of clean cover is 600mm, therefore, further excavations may be required to facilitate the additional clean cover depth and maintain even site levels.

Site-won material will not likely be suitable for use as cover material due to the extent of shallow made ground across the site, however, where site-won soil is appropriately verified and found to be free of contamination it can be considered suitable for re-use.

Excavation should be carried out to ensure all made ground in proposed soft landscaping is removed. There is no minimum requirement for the depth of clean cover provided that it allows for an adequate depth for growth of plants, however, a minimum depth of 600mm clean cover is required where a localised area of hydrocarbon contamination was identified (around TP08), as shown on plans in the Appendix.

This remediation option meets all the relevant objectives outlined in this report and is appropriate for the site. Excavation and off-site disposal and containment would be most cost effective if conducted alongside the proposed development at the site. There are not likely to be excessive environmental nuisances, such as noise and dust, assuming groundwork best practices are followed, in addition, excavation and containment are very common remediation techniques, successfully used on multiple sites with similar contamination issues, and is not likely to need extensive post-remediation verification work.

4.2 Hardstanding

Considering site access, parking and building areas are located at the south west of the site, it is recommended to install hardstanding instead of soft landscaping in this area, as shown on plans in the Appendix.

This approach is preferred as it would likely be more cost-effective than the excavation and off-site disposal and containment remediation methods. Hardstanding will limit the need for extensive excavation and the associated disposal costs, particularly as areas at the south west of the site are already covered by hardstanding, while still providing a stable and clean surface for access and construction activities.

The installation of hardstanding will minimise the risk of contamination exposure during construction and reduces long-term maintenance requirements. Hardstanding will reduce the infiltration of water, which can spread contaminants, and provide a barrier against the migration of pollutants. Additionally, hardstanding is less susceptible to wear and erosion, making it a practical and sustainable solution for areas with high traffic and frequent use.

As an addition measure, a hi-vis non-woven geotextile membrane should be installed below the hardstanding layer to warn future developers and site users.

This remediation option meets all the relevant objectives outlined in this report and is appropriate for the south west of the site. There are not likely to be excessive environmental nuisances, such as noise and dust, assuming groundwork best practices are followed, in addition, containment is a very common remediation technique, successfully used on multiple sites with similar contamination issues, and is not likely to need extensive post-remediation verification work.

5. Recommendations

Based on the detailed evaluation of feasible remediation options in this report, the most appropriate remediation options are considered to be via source management and pathway interruption by way of excavation and off-site disposal of contaminated soil and made ground and containment through the placement of a clean cover layer. The details regarding this remediation are outlined below.

5.1 Remediation Strategy

Excavation and off-site disposal of contaminated made ground in all areas of proposed soft landscaping should be carried out, as shown on plans in the Appendix, following this, containment should be carried out, through placement of imported clean material. The Phase 2 Intrusive Site Investigation found the depth of made ground to be approximately 300mm across the contaminated areas at the site. Following the removal of made ground, there is no minimum requirement for the depth of clean cover provided that it allows for an adequate depth for growth of plants, however, a minimum depth of 600mm clean cover is required where a localised area of hydrocarbon contamination was identified (around TP08), as shown on plans in the Appendix.

Considering site access, parking and building areas are located at the south west of the site, it is recommended to install hardstanding instead of soft landscaping in this area, as shown on plans in the Appendix, in addition, a hi-vis non-woven geotextile membrane should be installed below the hardstanding layer to warn future developers and site users.

Excavations should be carried out by a suitability qualified groundworks contractor and a photographic record of the excavation works should be kept, including the base and faces of each excavation.

It is important that cover soil is appropriately quarantined prior to placement or placed in its intended area straight away to ensure that cross-contamination does not occur.

Imported soil to be utilised as soft landscaping cover material must be shown to be uncontaminated and compliant with British Standard 8601:2013 for subsoil and British Standard 3882:2015 for topsoil. Photographic evidence of the base and faces of each excavation is required to verify that all made ground has been removed and photographic evidence of the depth of clean cover should also be provided.

If unforeseen visible or olfactory evidence of contamination is identified during excavations at the site, work should cease in order to allow further investigation to be carried out.

5.2 Verification

Following the implementation of remediation, verification will be required, to ensure remediation has been successful and the site is safe for its proposed use and should include the following.

In order to identify contamination of natural strata below the excavated contaminated made ground in proposed soft landscaped areas, soil samples should be taken and analysed for Metals (As,Cd,Cr,Cu,Pb,Hg,Ni,Se,Zn), Chromium (III & VI), PAHs (16 USEPA speciation), pH, Organic Matter and Asbestos in a UKAS accredited laboratory, as per the recommendations in YALPAG Technical Guidance.

In addition, imported soil to be used as cover will be classified as ‘greenfield’ or ‘manufactured’ soil and in order to identify contamination of this imported cover soil, 5 x samples should be taken and analysed for Metals (As,Cd,Cr,Cu,Pb,Hg,Ni,Se,Zn), Chromium (III & VI), PAHs (16 USEPA speciation), pH, Organic Matter and Asbestos in a UKAS accredited laboratory, as per the recommendations in YALPAG Technical Guidance.

Cover soil samples can be collected from stockpiled soil prior to placement or in-situ cover soil after placement. If cover soil is to be stockpiled prior to placement, it should be appropriately quarantined on a polythene sheet or similar protective membrane to avoid contamination prior to placement. Cover soil may be delivered in bags and these are considered to be an appropriate means of quarantine. Alternatively, cover soil can be placed immediately upon arrival at the site.

Ground conditions encountered at the site during the sampling process should be noted, with photographic evidence taken throughout. This information will be used to inform recommendations and conclusions. Results of laboratory testing should be assessed with reference to LQM/CIEH Suitable 4 Use Levels (S4ULs) and CL:AIRE Category 4 Screening Levels (C4SLs), to assess the risk to human health and the environment.

A supporting appendix should be produced, including photographic evidence of the depth of excavation and clean cover using a tape measure or staff, to verify that all made ground has been removed from proposed soft landscaping areas, a depth of 600mm of clean cover has been placed in the area of localised hydrocarbon contamination at the centre of the site and a hi-vis non-woven geotextile membrane has been appropriately installed below proposed hardstanding, as shown on plans in the Appendix, in addition to, copies of waste transfer notes and certificates for imported material.

The findings of this validation assessment should be used to update the Conceptual Site Model, produced as part of the Phase 2 Intrusive Site Investigation, to identify contaminant linkages at the site, in order to determine the efficacy of remediation and the requirement for any further investigations or remediation work.

6. References

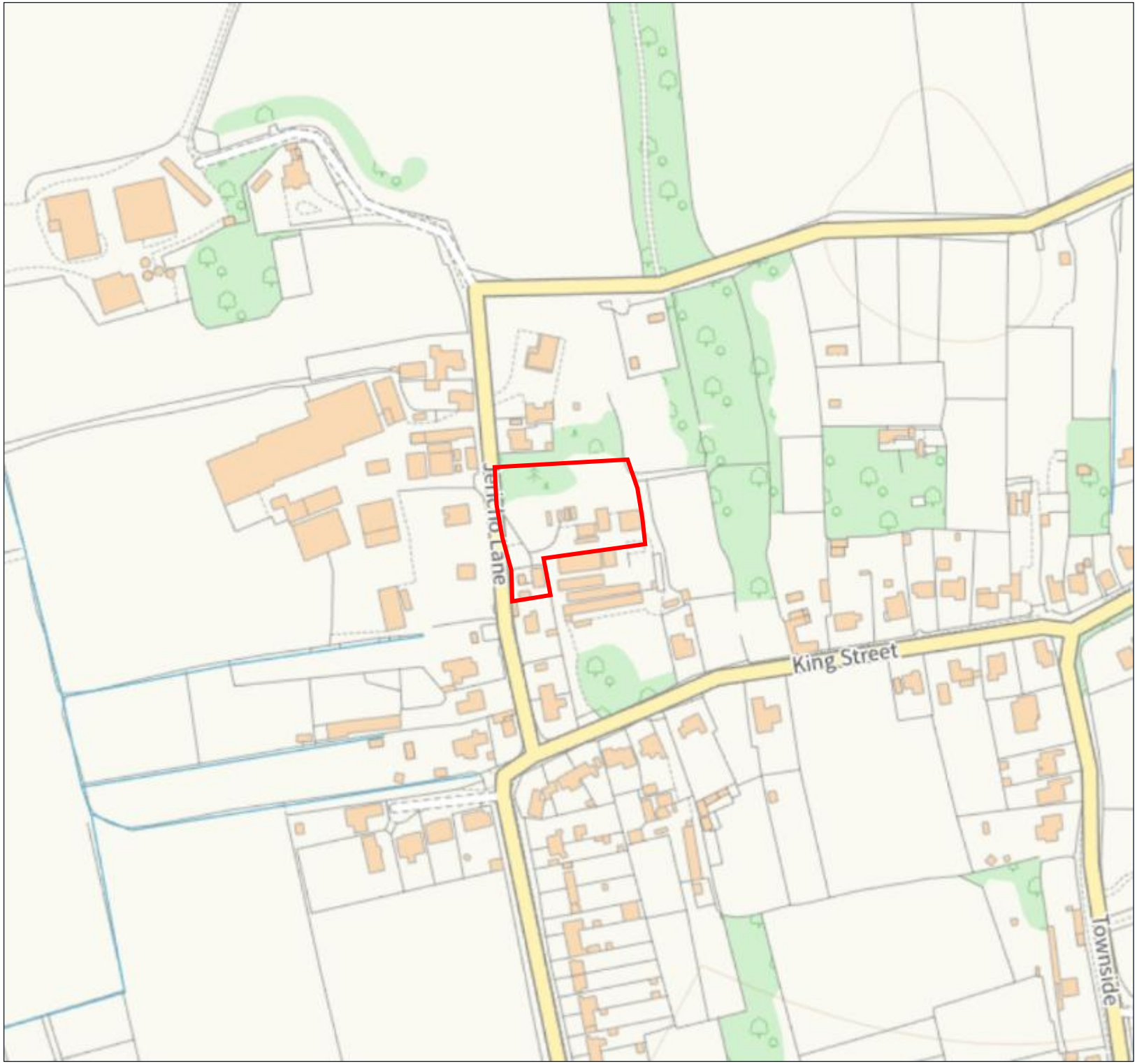
Environment Agency. *Land contamination: risk management*. [online] Available at: gov.uk/guidance/land-contamination-how-to-manage-the-risks

Oakshire Environmental, June 2024. *Phase 1 Preliminary Risk Assessment.*

Oakshire Environmental, November 2024. *Phase 2 Intrusive Site Investigation.*

Yorkshire and Lincolnshire Pollution Advisory Group, 2021. *Technical Guidance for Developers, Landowners and Consultants - Verification Requirements for Cover Systems.*

Oakshire Environmental. Available at: <oakshireenvironmental.co.uk>.



Appendix - Site Maps & Plans	
Description	
Site location plan	
Sources	
Contains OS data © Crown copyright and database rights	
Key	
	Site boundary
▲	North

Appendix - Site Maps & Plans	
Description	
Proposed site plan showing required excavation, clean cover and additional hardstanding areas	
Sources	
Tony Vessey	
Key	
	Site boundary
	Extent of required 600mm clean cover
	Extent of required made ground excavation (in areas of proposed soft landscaping only)
	Extent of required hardstanding
▲	North

Appendix - Site Maps & Plans	
Description	
Proposed site plan showing required excavation, clean cover and additional hardstanding areas	
Sources	
Tony Vessey	
Key	
	Site boundary
	Extent of required 600mm clean cover
	Extent of required made ground excavation (in areas of proposed soft landscaping only)
	Extent of required hardstanding
▲	North