

Proposed Residential Development:

The Hollies

30 Austendyke Road

Weston Hills

Spalding

Lincs

REMEDIATION METHOD STATEMENT – PHASE 3

AUGUST 2022

CONTENTS

1. INTRODUCTION
2. BACKGROUND
3. SCOPE
4. LIMITATIONS
5. CONCEPTUAL MODEL & RISK ASSESSMENT
6. REMEDIATION RECOMMENDATIONS
7. INSPECTIONS
8. VERIFICATION REQUIREMENTS
9. HEALTH & SAFETY
10. CONCLUSIONS

1. INTRODUCTION

Scott Park Developments Ltd (Trading as Scott Park Prestige Homes for this development), proposes to develop a site located off Austendyke Road, Weston Hills, Spalding, Lincolnshire PE126BX, to a residential end use

The purpose of the Remediation Method Statement (RMS) is to provide a strategy for the management (mitigation) of 'unacceptable' risks from 'contamination', as identified in a Phase 2 investigation report, such that the identified risks are reduced to a level that human health is protected in the present and for the future and that the site can be considered 'safe for development'.

A Site location plan has been provided in the appendices with the proposed layout shown also as a separate appendix towards the back of this RMS report to assist the reader.

2. BACKGROUND

2.1 Phase 2 Investigations

2.1.1 Phase 2 – Intrusive Investigation

Dated August 2020, the Phase 2 Investigation Report (Goldfinch Environmental Ltd report reference 0666/2) revealed the following outcomes on testing:

Measured concentrations of inorganic determinants (arsenic and lead) exceeded their guidance values as shown below:

Arsenic

Soil sample reference	Measured concentration (mgkg ⁻¹)
WS5 (depth 0.25-0.45m)	49
WS12 (depth 0.32-0.42m)	48

Lead

Soil sample reference	Measured concentration (mgkg ⁻¹)
WS4a	290
WS5	120
WS10	740
WS12	270

Measured concentrations of organic determinants listed below exceeded their guidance values in the following soil sample references and the approximate depth encountered.

WS3, D1 @ 0.4-0.5m

WS4a, D1 @ 0.25-0.35m

WS5, D1 @ 0.25-0.45m

WS6, D1 @ 0.35-0.45m

The six of the sixteen PAH congeners identified above the guidance values are as follows:

Naphthalene

Benzo[a]anthracene

Chrysene

Benzo[A]ANTHRACENE

Benzo[a]pyrene

Dibenz[a,h]anthracene

The exact results and levels for each of the soil samples can be found in the Goldfinch report in Appendix 1 – Exploratory Location Records [Logs] and also Section 7 of the report, sub section 7.2.1 through to 7.3.1.2

In the context of the proposed end use for the site and the localised distribution, depth, measured concentration values and contaminant type A *Medium-High* risk has been identified and remedial treatment of the soils would be required where the affected areas are coincident with private gardens in the completed development to mitigate the risk to human health. (Areas of permanent hard cover would be excluded, as this would provide a permanent barrier between the source and the End User). This risk assessment is based on the report findings and the Risk Assessment outlined in the Goldfinch Report section 8.2 – 8.2.2

3. SCOPE

This document details the remediation works as highlighted in the Phase 2 investigation report required to prevent of control pollution and the protection of public health as a result of the presence of contamination as outlined above, thus bringing the site into a condition where it can be deemed to be 'suitable for use' and mitigate the current 'unacceptable' environmental risk, thus protecting the future end users of the site and wider environment.

The Environmental Engineer is Goldfinch Environmental Limited

4. Limitations

This report is for the sole reliance and use of the Client. Any third Party coming into possession of this report relies on it at their risk, unless written permission is expressly sought and provided by the Author.

The findings and opinions expressed in this report are based on the Phase 2 report by Goldfinch Environmental Limited, and relevant to the time of the site visit and information review. The assessments and opinions given in the reports are based upon information available at the time of the report. Where additional information comes available which may affect or identify a need to review the conclusions or assessments, Goldfinch may request the opportunity to review the information and where warranted modify the assessment, opinion in part or completely accordingly, and therefore any such amendment would require an amended RMS on the back of any new data received.

This RMS does not include any geotechnical considerations pertaining to the site as these were outside the agreed brief

The recommendations given in this report are based on guidance and best practice in place at the time of the issue of the report, the information available at the time of writing the RMS, the nature of the indicated proposed development and associated end user behaviour patterns.

5. Conceptual Model & Risk Assessment (pre-remediation)

The following Conceptual Model has been incorporated from the referred Phase 2 Investigation report to provide background for the reader. (However they are not intended to replace the referred report wholly which should be read in conjunction with this RMS).

5.1 Conceptual Model & Risk Assessment (Reproduced From The Phase 2 Report – August 2020)

5.1.1 Conceptual Model

Sources (Proven)	Pathway	Target	Risk
<p>Soil:</p> <p>The intrusive investigation has shown six soil samples from the twelve boreholes exceeded the 'residential with home-grown produce' S4UL guidance values as follows:~</p> <ul style="list-style-type: none"> ➤ WS3: naphthalene; benz[a]anthracene; chrysene; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene. ➤ WS4a: lead; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene. ➤ WS5: arsenic; lead; benz[a]anthracene; chrysene; benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene. ➤ WS6: benzo[b]fluoranthene; benzo[a]pyrene; dibenz(a,h)anthracene. ➤ WS10: lead. ➤ WS12: arsenic. <p>as described in Section 7 of this report .</p>	<ul style="list-style-type: none"> ❖ Dermal contact, ingestion and inhalation ❖ Wind erosion and atmospheric dispersion ❖ Leaching 	<ul style="list-style-type: none"> • Present users • End users • Construction workers • General public 	<ul style="list-style-type: none"> • Low-Med • Med-High • Med-High • Neg-Low
		<ul style="list-style-type: none"> • Adjacent properties • General public • Shallow groundwater • Services/construction materials • Plant life • Surface water 	<ul style="list-style-type: none"> • Neg • Neg • Neg • Neg • Neg • Neg
<p>Shallow groundwater:</p> <p>Groundwater was not encountered in any of the exploratory locations. The measured concentrations of all determinants were not considered to pose an 'unacceptable' risk to this medium.</p>	<ul style="list-style-type: none"> ❖ Groundwater migration 	<ul style="list-style-type: none"> • Adjacent properties • Deep groundwater • Services/construction materials • Plant life • Surface Water 	<ul style="list-style-type: none"> • Neg • Neg • Neg • Neg • Neg-Low
	<ul style="list-style-type: none"> ❖ Dermal contact, ingestion and inhalation 	<ul style="list-style-type: none"> • Present users • End users • Construction workers • General public 	<ul style="list-style-type: none"> • Neg • Neg • Neg • Neg

Gas: Chemical laboratory testing showed the soils had a low organic matter content and as the arising soils were assessed there was no evidence of organic material/organic odours. In WS2 the chemical laboratory testing showed that the TPH concentrations were not a 'plausible' risk to human health.	<ul style="list-style-type: none"> ❖ Direct inhalation ❖ Soil migration ❖ Services migration 	<ul style="list-style-type: none"> • End users • Construction workers • Buildings 	<ul style="list-style-type: none"> • Neg • Neg • Neg
Negligible Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.		
Low Risk	Defined as the site should be considered suitable for present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.		
Medium Risk	Defined as the site may not be suitable for present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.		
High Risk	Defined as the site is probably or certainly not suitable for present or future use and environmental setting. Contaminants probably or certainly present and likely to have an unacceptable impact on key targets.		

5.2 - Risk Assessment

5.2.1 – Targets

Potential targets/receptors in the context of the risk assessment where a plausible pathway can be proven are discussed under separate subheadings as follows:

5.2.2 Human Heath (Site users and Construction Workers)

Measured concentrations of inorganic determinants exceeded their guidance values as shown below:

Arsenic

Soil sample reference	Measured concentration (mgkg ⁻¹)
WS5 (depth 0.25-0.45m)	49
WS12 (depth 0.32-0.42m)	48

Lead

Soil sample reference	Measured concentration (mgkg ⁻¹)
WS4a	290
WS5	120
WS10	740
WS12	270

Measured concentrations of organic determinants exceeded their guidance values as shown below:

Measured concentrations of organic determinants listed below exceeded their guidance values in the following soil sample references and the approximate depth encountered.

WS3, D1 @ 0.4-0.5m

WS4a, D1 @ 0.25-0.35m

WS5, D1 @ 0.25-0.45m

WS6, D1 @ 0.35-0.45m

The six of the sixteen PAH congeners identified above the guidance values are as follows:

Naphthalene

Benzo[a]anthracene

Chrysene

Benzo[A]ANTHRACENE

Benzo[a]pyrene

Dibenz[a,h]anthracene

The exact results and levels for each of the soil samples can be found in the Goldfinch report in Appendix 1 – Exploratory Location Records [Logs] and also Section 7 of the report, sub section 7.2.1 through to 7.3.1.2

In the context of the proposed end use for the site and the localised distribution, depth, measured concentration values and contaminant type:

A Medium-High risk has been identified

5.2.3 – Construction Workers

During the opening up and disturbance of the ground at the referred locations, as part of demolition and construction works, construction staff, particularly groundworkers, may likely be exposed to the above identified impacted soils and dusts especially when manually handling soil and working in excavations.

Measured concentrations of arsenic, lead and six of the sixteen PAH congeners variously exceeded the respective guidance S4UL/C4SL values in six of the twelve soil samples for the land use 'residential with home-grown produce'.

Figure 3 and 4 of the Phase 2 report show locations WS6 and WS4a will be in soft landscape or garden areas.

Locations WS3, WS5, WS10 and WS12 will be in areas of permanent hard cover which comprise either the access road, parking areas or footpaths, or even the property footprints themselves.

WS3 and WS12 will be the access road

WS5 will be under the construction of the Western plot (plot 2) on the more detailed site layout drawing, with the sample being taken at 3.8m from the western boundary and the plot external wall being a maximum 3.6m from the boundary as per the layout drawing in the appendices.

WS10 will be within the hard parking areas as per the updated site layout referenced above and available in the appendices

In the context of the proposed end use for the site and the localised distribution, depth, measured concentration values and contaminant type:

A Low-Medium risk to this Receptor (present users, the site is currently unoccupied and 'not in use') has been associated with the site.

A Medium-High risk to Construction Workers (ground Workers) and end users (occupants of the future dwellings) is associated with the site.

5.2.4 – Services and Construction Materials

5.2.4.1 Concrete

Concentrations of determinants are not considered to present an 'unacceptable' risk to this medium

A Negligible risk has been identified

5.2.4.2 Potable Water Supplies

UK Water Industry Research (UKWIR), provides guidance on material selection to prevent water supply lines failing prematurely. The chosen parameters are based on the potential for:

- a) Taste or odour impairment of potable waters by permeation of organic contaminants through polymer-based pipework;
- b) The structural or physical deterioration of pipework materials
- c) The concentration of the interior surfaces pipework when undertaking maintenance
- d) Health and safety of workers when undertaking repairs

Some of these parameters follow other existing guidance, which have either been withdrawn or updated including the WRAS guidance of October 2002 (e.g. ICRCL and BRE Special Digest 1).

The UKWIR report only cites organic determinants as contaminants of concern. The investigation has shown very localised instances of marginally elevated PAHs in soils, and therefore:

A Negligible risk has been identified

5.3 Landscaping & Planting

No signs of stress or unusual staining in plant life was noted. A Negligible risk to plantlife has been identified

6. REMEDIATION RECOMMENDATIONS

6.1 - Land Contamination – Soils

The results of the chemical laboratory testing showed (locally) raised concentrations of determinants in six of the exploratory locations (WS3, WS4a, WS5, WS6, WS10 and WS12) as shown in the Phase 2 report and outlined above in RMS and attached appendices.

Two of the six referred locations (WS4a and WS6) are coincident with private gardens and soft landscaping. The other four falls within a proposed driveway or other permanent hard cover which will provide a physical barrier between the End User and the affected soils.

‘Management’ (remediation) of soils in the affected plots (Plot 2) is warranted where these are coincident with soft landscaping and private gardens in the proposed development in order to bring the site into a condition where the regulator may consider it ‘suitable for use’ and thus consider discharging the relevant planning condition.

6.2– Remediation Strategy

The preferred remediation option as proposed by this RMS comprises replacement of the soils in the soft landscaped and garden areas such that a cover of 600mm depth is provided relative to finished topographic levels

6.3- Contamination Management

6.3.1 – ‘Residential with home-grown produce’ land use

The referred instances of contamination (based upon the 'residential with home-grown produce' land use) have been shown on the proposed site layout in the appendices to the Phase 2 report and also to this RMS report.

It is anticipated that the Regulator will require replacement of the affected soils in the areas identified through testing (WS4a and WS6) such that 500mm of clean cover soils are provided relative to finished topographic levels to provide the appropriate level of human health protection and to provide a suitable growing medium

In the interest of sustainable construction and where planning allows, consideration may be given to:

- Locally raising site topographic levels to minimise soil disposal quantities
- Installation of some permanent hard capping (e.g. hard landscaping, shed bases, patios etc) to provide a physical barrier between the source (affected soils) and the End User thus breaking the existing pollutant linkage.
- Consideration may be given to the installation of a semi permeable membrane ('Terram') at the interface between the residual soils and the new clean cover soils as a marker layer and to prevent any future soil 'mixing'
- Whilst consideration may be given to the above, we will initial look to remove the contaminated soils from the development and replace

On completion, a Verification Report (VR) may also be required to demonstrate that the remedial works have been carried out in accordance with the (LA-Approved) RMS.

To assist the client it should be noted that following LPA-Approval of the Verification Report an application may be made to discharge the relevant Contaminated land planning condition.

6.4– Management of Arisings

The arising soils may be *Temporarily* stored on a membrane nearby until removed off site (or sustainably reused under permanent hard capping as

discussed elsewhere above in this RMS) and where this is the case, it is recommended that they are covered to mitigate run-off and mobilisation of contamination by percolating rainfall. Where this takes place it is the responsibility of the Developer to ensure materials designated as 'contaminated' are not mixed with 'uncontaminated' materials or redistributed in other parts of the site without prior LPA-approval.

Subject to the agreement of the LPA, and in the interest of sustainability, consideration may be given to reusing the contaminated soils where changes in site levels can be accommodated. These arising soils should only be reused only under areas, which are to be *capped with a permanent physical barrier*, e.g. Driveways, parking areas, roads and buildings.

It is recommended that any 'uncontrolled' movement of soil or water beyond the site boundaries is recorded and investigated. Appropriate corrective and preventative action to prevent reoccurrence is also recommended.

Whilst the reusing of the contaminated soils on site may be considered, with the information given in relation to the Phase 2 report and the proposed residential development, this would be unlikely to be useful on site as the topographical levels do not lend themselves to this.

6.5 – Requirements for Clean Cover System & Restoration of Site Levels

Consideration may be given to placement of a permeable geotextile on the residual soil surface prior to upfilling/restoration of site levels.

Where reinstatement of the excavation is required, replacement fill materials shall comprise compliant soils of known provenance, whether 'site-generated' or 'imported' that shall not contain:

1. Contamination exceeding the CLEA SGVs or LQM-CIEH S4ULs, ('C4SL' for lead) or other guidance current at the time of this document as indicated in Section 5.1 of this RMS. (See table 1 below).
2. Demolition waste, made ground or fill materials (crushed and graded concrete from site demolition works is an acceptable exception).

3. Wood, timber, vegetation and other putrescible or biodegradable waste liable to generate hazardous gases
4. Compliance testing of candidate import materials, irrespective of source, would normally be required to satisfy the Regulator that suitable materials are being imported for the proposed end use. However, in this instance, the Developer may wish to consider the use of soils sourced from British Sugar, which is accompanied by a test certificate demonstrating the environmental suitability it will be necessary to seek LPA approval for any soils imported to site for use in soft landscaping and garden areas
5. Importation of soils will be required to replace those taken off-site due to their unsuitability for retention within the proposed residential development. Chemical laboratory criterion have been provided in Table

1 below.

Determinant	Maximum Concentration (mg/kg)		
Arsenic *	32		
Boron	3		
Cadmium*	10		
Chromium*	3000		
Lead***	200		
Mercury*	170		
Nickel****	75		
Selenium*	350		
Copper ****	130		
Zinc ****	200		
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
Benzo(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			
TPH C ₅ -C ₆ **	42	78	160
TPH C ₆ -C ₈ **	100	230	500
TPH C ₈ -C ₁₀ **	27	65	150
TPH C ₁₀ -C ₁₂ **	74	180	380
TPH C ₁₂ -C ₁₈ **	140	330	500
TPH C ₁₈ -C ₂₁	260	500	500
TPH C ₂₁ -C ₃₅	500	500	500
Total TPH C ₅ -C ₃₅	500	500	500

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.]

It is recommended that Regulatory approval of this RMS is sought prior to importing the referred soils to site where this activity is considered 'necessary'

6.5 – Concluding Remarks to Section 5

On completion of these works in accordance with the referred RMS it is anticipated this will further reduce the existing '*Medium-High*' risk to 'Negligible-Low'.

On that basis and on completion of the above works, it is considered that the 'contamination' at the site will have been adequately managed and that the site can be considered "suitable for development".

7 - Inspection

The EE or developer will need to visit the site to verify the depth of the placed cover system and possibly any reused soils and record this photographically via checking internal and external measurements of the excavated areas.

7.1 – Importation of Soils

At the time of this RMS, this author has been provided with photographic evidence that replacement topsoil and demolition waste (crushed brick and concrete) has been stored on site ready for re-use in the areas to bring back to topographic levels is available and this is considered suitable for use at the affected locations subject to the agreement of the Regulator.

7.2 – Possible Membrane Installation

Consideration may be given to placement of a geotextile membrane between the residual soil surface and the [placed cover soils, where this option is included in the works it is anticipated the Regulator will require photographic evidence demonstrating that the membrane has been installed in accordance with the proposal in this RMS together with the appropriate upfill depth of compliant soils

This will require site attendance by the EE or the developer to obtain the photographic records for this aspect of the remediation.

8 – VERIFICATION REQUIREMENTS

8.1 – Overview

The Phase 2 report stated that the RMS should provide details of the work to be undertaken and validation requirements

To support the Validation process is the following information to be collected both as the remedial works progress and on completion or forwarded to by a Third Party to the office of the Environmental Engineer this is anticipated to include:

1. Soil removal documentation – Waste Transfer Notes
2. Soil import documentation – Delivery notes with volume/weight information included
3. The Environmental Engineer or Developer will make the required visits to site as the works progress or on completion of the works to collect and collate depth data for the affected plots and any other required information necessary for satisfactory validation of the remediation
4. The depth of the placed cover system can be verified by placement of vertical sections of drainpipe sections once the residual level has been established and prior to commencement of the upfill/backfill operations
5. The thickness of the placed cover soils will be determined by measurement of internal and external pipe sections depths – the difference between these two measurements should not be less than 600mm. These measurements are relative to the finished/final topographical levels
6. It is recommended that two of those pipe sections are placed in each of the affected areas or plots- where soil replacement is required
7. Photographic records to show the reduced level and placement of the membrane where this option is chosen
8. Upon completion of the remedial works it is anticipated that future monitoring will not be required as the unacceptable soils will have been removed to a less sensitive area and capped with permanent hardstanding in the proposed development

9.1 – HEALTH & SAFETY

9.1 – Overview

The following general measures are recommended to the contractor during ground and construction works and are not intended to replace the Contractors in-house requirements or practices:

To prevent inadvertent ingestion of contaminated soil or water:

- Those working with or manual handling soils should wear gloves with sleeves rolled down (consideration may be given to application of barrier cream)
- Facilities should be available on site for washing hands and face
- These facilities should be used prior to welfare/comfort breaks including mealtimes and leaving the site each day
- Measures shall be put in place to prevent unauthorised access to the site

To prevent inhalation/respiration of contaminated soil dusts:

- Contaminated soils or dusts shall not be discharged onto the public highway
- All vehicles shall be sheeted prior to leaving site to avoid soil dusts becoming airborne/fugitive
- During dry or windy conditions, water suppression measures may be required to prevent soil dusts becoming airborne. Alternatively, consideration may be given to a temporary stoppage of this activity until calmer weather conditions prevail

10 – Conclusions

Scott Park Prestige Homes, via the offices of G R Merchant proposes to develop a site located off Austendyke Road, Spalding, Lincolnshire to a residential end use

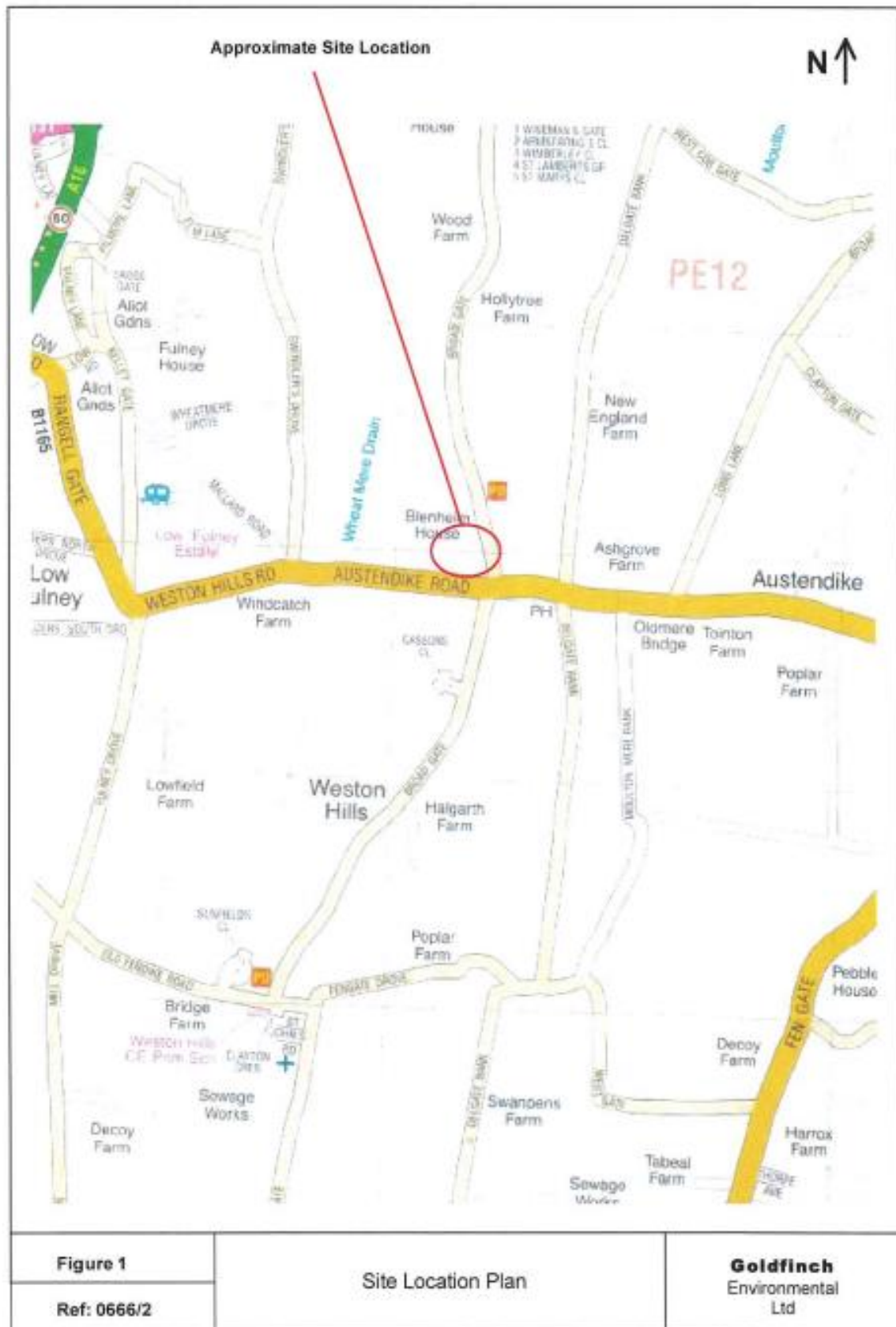
The Phase 2 report showed that soils within the site had been locally impacted by a limited number of determinants thus identifying a need for mitigating action and hence according to the planning regime, the need for the preparation of this Remediation Method Statement (RMS) which provides details of how the risk posed by the referred raised determinant concentrations is to be managed (i.e. remediated) such that the site can be considered 'suitable for use' by the LPA

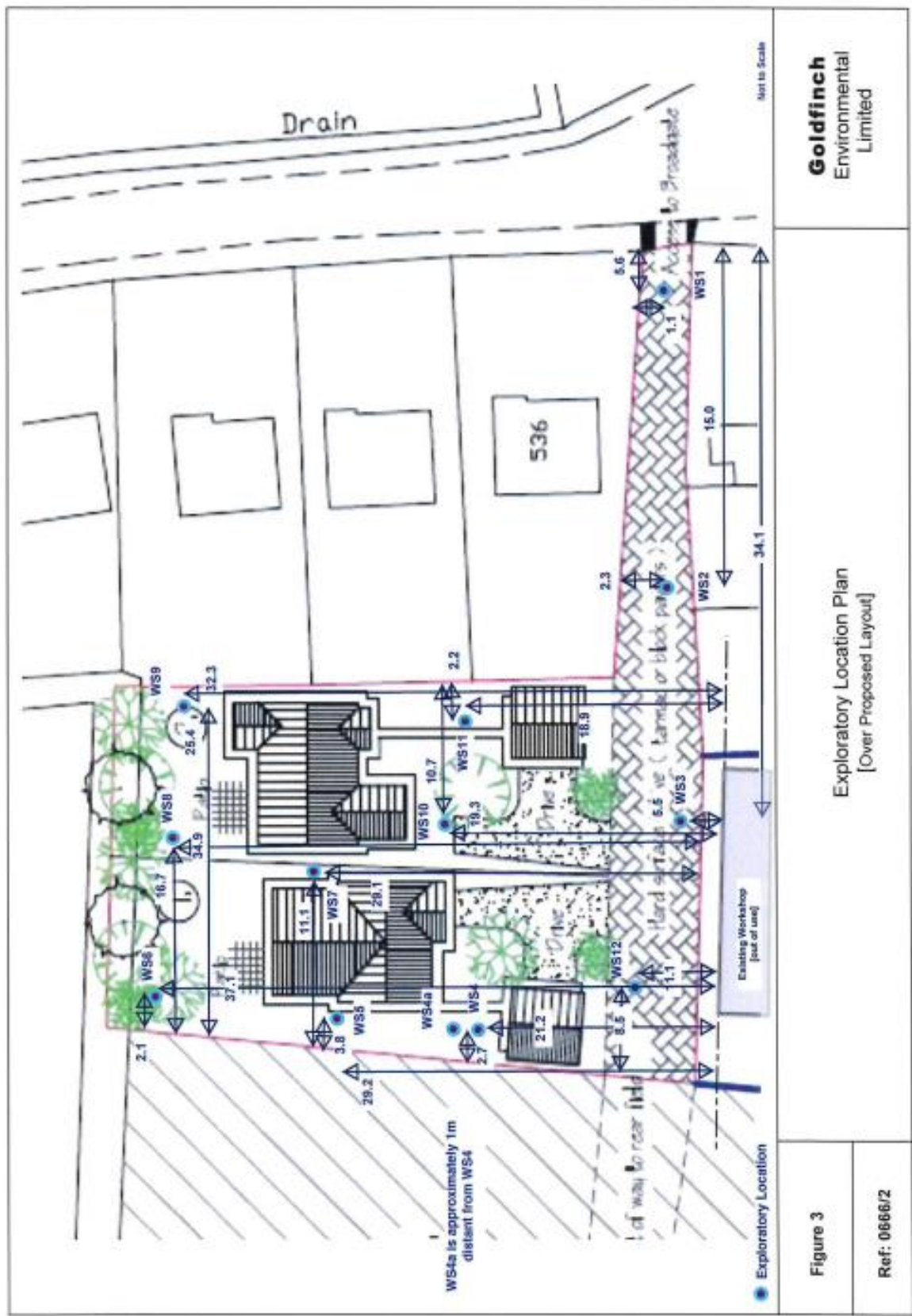
It is recommended that this Remediation Method Statement is read in conjunction with the previously issued report referred above

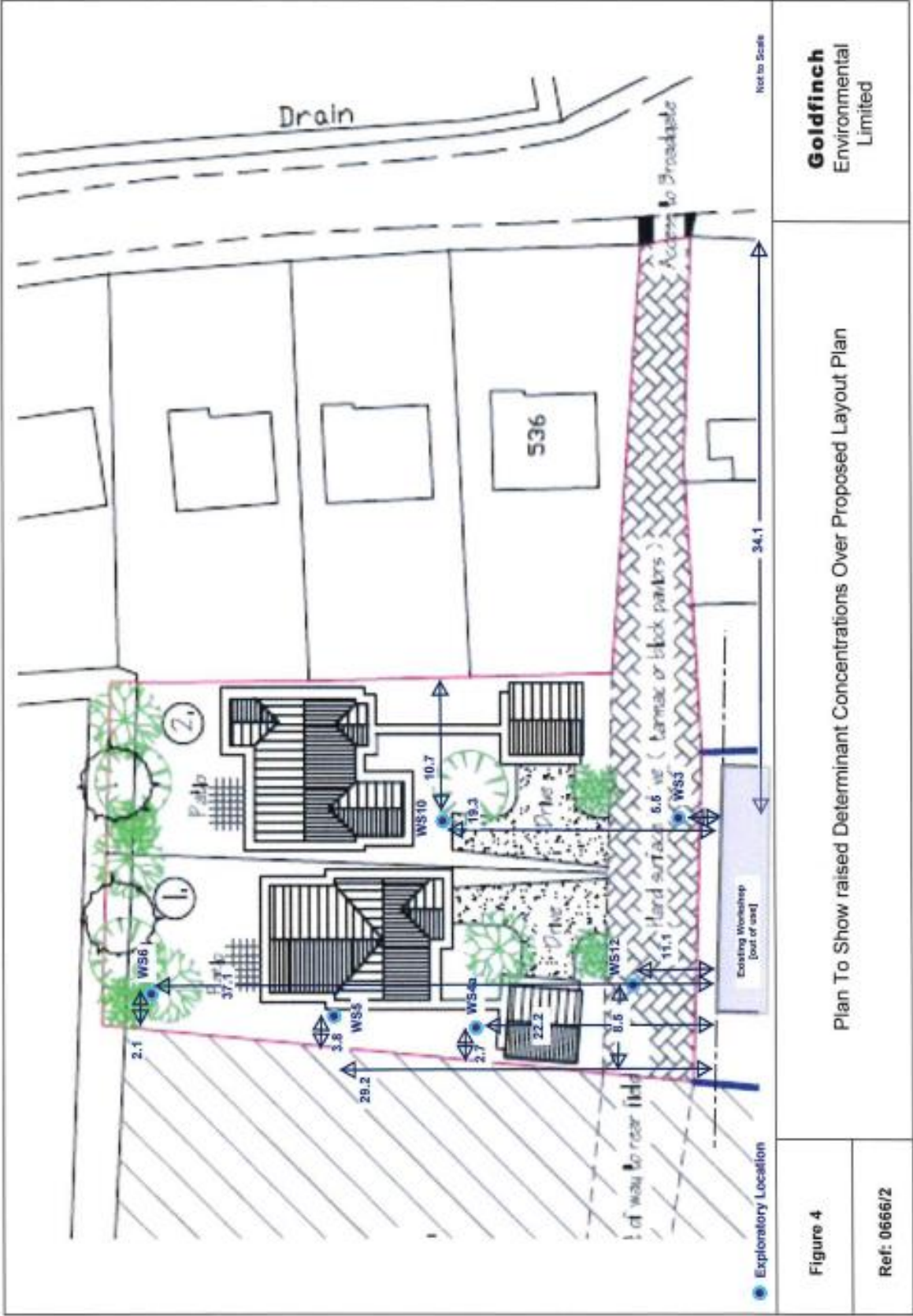
This RMS and its content are subject to the approval of the Regulator, which should be sought prior to implementation of any of the works proposed within this document.

Should unanticipated contamination be suspected, or revealed during any groundworks, then the area should be temporarily isolated and further advice sought by a suitability independent qualified person and a management strategy for these occurrences should be submitted to the Local Authority for their approval prior to proceeding, as required by the Regulatory Offices.

FIGURES / APPENDICIES







**FOR ADDITIONAL FIGURES AND APPENDICIES REFERRED TO IN THIS RMS OR
THE PHASE 2 REPORT FROM GOLDFINCH ENVIRONMENTAL ARE AVAILABLE
ON THE OHASE 2 REPORT TO BE READ IN CONJUNCTION WITH THIS RMS**