



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 2 Land Contamination Risk Assessment

for

Proposed Residential Development – Erection of 5 No. Dwellings

on land off

River Bank / Cradge Bank, Spalding PE11 3AA

Date: October 2022

Status:

Final Report

Reference:

3377D P2 Bates - Spalding

Date:

05/10/2022

Executive Summary

Previous reporting identified potential sources of contamination on site, as such, a Phase 2 Intrusive Site Investigation has been carried out.

Laboratory analysis has identified no exceedances of metals, metalloids, PAH nor TPH nor has elevated phenol nor asbestos been detected

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** level of risk with respect to the proposed development.

A watching brief (as outlined in Appendix F) should be carried out by the site supervisor during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material). Should previously unreported or undiscovered contamination be identified, then development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

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1.0 QUALITY ASSURANCE

Castledine Environmental can confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental.

Kevin Castledine

(Director)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental have been appointed by Ms. A. R. Bates to undertake a Phase 2 investigation of off Riverbank and Cradge Bank, Spalding PE11 3AA.

A Phase 1 report was carried out by Castledine Environmental:

- Phase 1 Land Contamination Risk Assessment for site at River Bank / Cradge Bank, Spalding – Produced by Castledine Environmental in August of 2022 and referenced: 3352D

The report is attached as Appendix A

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Ms. A. R. Bates and appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- part C1 of the building regulations.
- Condition No.5 of the South Holland District Council planning approval reference H16-0239-22
<https://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0239-22&from=planningSearch>

5. The development hereby permitted shall not be commenced until a scheme to deal with any contamination of land or pollution of controlled waters has been submitted to and approved in writing by the Local Planning Authority (LPA). The scheme shall include all of the following measures unless the LPA dispenses with any such requirement in writing:

- *A preliminary risk assessment (desk study) shall be carried out to identify and evaluate all potential sources of contamination and the impacts on land and/or controlled waters, relevant to the site. The desk-top study shall establish a 'conceptual site model' and identify all plausible pollutant*

linkages. Furthermore, the assessment shall set objectives for intrusive site investigation works/Quantitative Risk Assessment (or state if none required). A full copy of the desk-top study and a non-technical summary shall be submitted to the LPA without delay upon completion.

- If identified as being required following the completion of the desk-top study, an exploratory site investigation shall be carried out to characterise the nature and extent of any land contamination fully and effectively and/or pollution of controlled waters. It shall specifically include a risk assessment that adopts the Source-Pathway-Receptor principle, in order that any potential risks are adequately assessed taking into account the sites*
- existing status and proposed end use. A full copy of the site investigation and findings shall be forwarded to the LPA without delay upon completion.*
- Thereafter, a written method statement detailing the remediation strategy for land contamination and/or pollution of controlled waters affecting the site and a timetable for their completion shall be submitted to and approved in writing by the LPA. This shall include details of the proposed verification plan including compliance criteria and monitoring details.*

No deviation shall be made from this scheme without the express written agreement of the LPA. If during redevelopment contamination not previously considered is identified, then the LPA shall be notified immediately and no further work shall be carried out until a method statement detailing a scheme for dealing with the suspected contamination has been submitted to and agreed in writing by the LPA.

Reason: To assess whether the site is polluted and to address any pollution to ensure a satisfactory development. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.

This Condition is imposed in accordance with Policy 30 of the South East Lincolnshire Local Plan, 2019.

This report should be read in conjunction with the reports listed in section 3.0

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental.

The report consists of a risk assessment in accordance with BS10175:2011+A2:2017, CLR11 “Model Procedures for the Management of Land Contamination” and LCRM “Land Contamination Risk Management”.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Spalding at National Grid Reference: 524143,321166 and is approximately 0.09ha in area.

The site is an irregular rectangle in shape and is orientated east to west. The site is located in a predominantly residential area and is directly bounded by neighbouring dwellings and their gardens to the north and south, Cradge Bank roadside to the west and River Bank roadside to the east, with the River Welland located approximately 26m east of site.

The site interior comprises a series of buildings and exterior spaces for parking and storage. Access to site was provided via a large double gate leading west off River Bank, east of site. A brick-built, concrete floored and slate roofed workshop building was noted in the far north eastern corner of

site, with the interior noted to be in use for the storage of a vehicle chassis, parts and equipment. South of the workshop is a sloped exterior area, leading west to the central area of site and bypassing a covered storage area on the western face of the workshop. Construction machinery such as cement mixers, gas bottles, pallets, sand and insulation were noted in the sloped area; and furniture, parts and a vehicle body were noted stored in the covered area. Moving west again from this area to the central area of site, a large pool-house for canine-hydrotherapy was noted, along with a single-storey dwelling and small garden area. The pool-room is located inside and parallel with the northern boundary, the dwelling inside the southern boundary, with pedestrian access between the buildings and the small garden area on the eastern face of the dwelling. Both structures here were noted to be constructed of a mix of materials including metals and timber structuring and cladding and felt-roofing. The westernmost extent of site was accessed via the central pedestrian walkway and leads to an open, gravelled parking area, a second covered storage area (timber-constructed with metal corrugated roofing) and a metal shed on a concrete base, for the storage of motorcycles and associated parts and tools. A second double gate was noted on the westernmost boundary, leading east off Cradge Bank, west of site.

Potential sources of contamination noted on the walkover include the former workshop usage and vehicle storage, both in the workshop, adjacent to it, the parking area and in the metal shed in the west of site. Topographically, Cradge Bank to the west of site sits below the level of River Bank to the east, with a sloped ramp leading west off River Bank to the main site level, which is level with the roadside west of site.

6.0 FINDINGS IN PREVIOUS REPORT

The previous report for the site found that, historically, the site remained unoccupied field located between two access tracks from at least circa.1887 through until circa.1903 when the workshop unit seen in the present-day was erected in the north east of site. The site interior then changed little on historical mapping, other than the workshop unit being marked as a 'store', of which the storage was unknown. Historical mapping then shows the area immediately south and south west of site to have been in use for an unknown industrial usage, with a nearby oil store and unspecified tanks noted just south of the feature. By circa.2003 the workshop unit was marked as a 'garage' and satellite imagery then showed the site as occupied by a large number of vehicles under maintenance from this date until circa.2014-2016. Following removal of the vehicles, the site has been in use for domestic purposes and canine hydrotherapy, with any vehicle maintenance taking place being small-scale. The report found that the historical development of the site with the workshop, store and subsequent garage and vehicle maintenance usage, along with the adjacent light-industrial area to be potential sources of soil contamination. The previous report found no significant potential sources of ground gas and the site was identified to be located in an area where both superficial and bedrock geologies are predominantly low to very low in permeability, thus inhibiting migration of ground gases. Potential sources of onsite and immediately adjacent VOC's were identified in the form of multiple vehicle storages over time and their maintenance along with associated tools and materials; a nearby industrial area located immediately south to approximately 77m south west of site and an oil store and tanks noted on historical mapping. Whilst the risks from offsite VOC's are lesser than those on site, both potentials should be investigated. As such, a Phase 2 Intrusive Site Investigation was planned and carried out on site.

7.0 CHEMICAL ASSESSMENT CRITERIA

On establishing the presence of pollutant linkages, it is then necessary to assess whether or not any of the linkages are significant, whereby significant harm is being caused or there is significant possibility of significant harm being caused to human health or the environment. In the absence of any evidence of 'significant harm', the risks will be assessed on the basis of a 'significant possibility of significant harm' being caused. In order to initially assess the risks, appropriate Tier 1 assessment criteria are derived which represent benchmark contamination concentrations with respect to relevant receptors. Concentrations recorded in excess of these levels **may** represent a significant risk to a specific receptor when considered as part of a pollutant linkage.

7.1 HUMAN HEALTH

The Environment Agency, through its Contaminated Land Exposure Assessment (CLEA) framework, published toxicological reports (TOX) and soil guideline values (SGVs).

SGVs are science-based generic assessment criteria that indicate human health risks from long-term exposure to soil contaminants. They are set at levels where there are 'no appreciable' or 'minimal' risks to human health. For each substance, different SGVs are applicable according to land use, for example, whether residential, allotment or commercial. They have been widely seen as over precautionary and offering councils a very weak indication of whether sites represent a "significant possibility of significant harm" (SPOSH) requiring determination under the contaminated land regime.

Following publication of the revised Part IIa Statutory Guidance DEFRA has commissioned the creation of Category 4 Screening levels (C4SL's). They are set at levels where there is a "Low" risk to Human Health (i.e. higher than that of SGV's but still sufficiently low to defiantly not be "Contaminated Land" as defined by section 78A of the Environmental Protection Act 1990 as amended). The C4SL's are calculated using the

CLEA model using less conservative exposure and toxicological assumptions than the SGV's. C4SL's have also been calculated for Open Space land use.

LQM in association with the CIEH have produced S4UL's are reproduced with permission; Publication Number S4UL3693

The pathways considered for the standard land uses include:

- Ingestion of soils;
- Ingestion of household dust;
- Ingestion of contaminated vegetables (residential with plant uptake only);
- Ingestion of soil attached to vegetables (residential with plant uptake only);
- Dermal contact with soils;
- Dermal contact with household dust;
- Inhalation of fugitive dusts from soils;
- Inhalation of fugitive household dust;
- Inhalation of vapours in outdoor air; and
- Inhalation of vapours in buildings.

These exposure routes have been evaluated independently of one another to identify the most sensitive exposure route. The SSV adopted for a given land use scenario is the most stringent screening value of all those relevant to the site.

The current proposals are to redevelop the site for a residential use with gardens. It is considered appropriate to compare the chemical testing results to those SGVs/SSVs with the appropriate 'residential with plant uptake' settings. Selected Tier 1 Human Health Assessment Criteria Values are detailed in the following table.

8.0 SITE WORKS AND FINDINGS**8.1 FIELDWORK 20TH SEPT 2022**

Castledine Environmental attended site on the 20th of September 2022 with the intention of forming trial pits across the site. The trial pit formation was to facilitate the assessment of ground conditions on site (i.e. made ground, natural or reworked natural deposits, their depth, extent and nature) and the taking of environmental samples, for laboratory analysis. To achieve this, a total of 4 No. trial pits were formed across the site and designated TP01 to TP04. Environmental samples were then taken from each locality, surface level and deeper deposits and any distinct, separate strata.

8.2 GROUND CONDITIONS ENCOUNTERED

The ground conditions on site can be broadly summarised as made ground deposits overlying natural deposits. The made ground deposits comprised dark brown to grey, sandy to clayey Gravels of road planings, brick fragments, building stone, pea gravels with elements of plastic and woven textiles noted at TP03 and TP04. The greatest depth of made ground was encountered at TP01 and extended from surface level to 0.50m depth. Additional wood-chippings were noted at surface level at TP02. The natural deposits encountered comprised a clayey, slightly gravelly Sand at TP01 with flint gravels noted in the deposits' and a dark grey, clayey Silt was noted at the remaining 3 No. locations. Clayey silt was noted to a maximum confirmed depth of 1.30m at TP02. The natural deposits encountered tally well with the known superficial geological deposits in the area (Tidal Flat Deposits - including mud flat and sand flat deposits, consisting of unconsolidated mud / sand sediments).

8.3 SAMPLE RESULTS

Sample results have been compared with generic screening criteria (GAC). Sample results are attached as Appendix E.

Metals and Semi Metals - Residential with Plant Uptake (1% SOM):

Determinant	Units	Accreditation	S4UL	Highest Value	Location of Highest value	Exceedance? Y/N
Arsenic	(mg/kg)	MCERTS	37	19	TP02 0.10m	N
Cadmium	(mg/kg)	MCERTS	11	0.7	TP01 0.20m	N
Chromium (total)	(mg/kg)	UKAS	910	81	TP04 0.40m	N
Copper	(mg/kg)	MCERTS	2400	27	TP04 0.40m	N
Lead	(mg/kg)	MCERTS	200	141	TP04 0.40m	N
Mercury	(mg/kg)	UKAS	1.2	<0.5	All	N
Nickel	(mg/kg)	MCERTS	180	36	TP04 0.40m	N
Zinc	(mg/kg)	MCERTS	3700	190	TP04 0.40m	N
Selenium	(mg/kg)	MCERTS	250	1.5	TP04 0.40m	N
Total Phenols	(mg/kg)	MCERTS	280	<0.5	All	N
Chromium (Hexavalent)	(mg/kg)	U	6	<1	All	N
pH	pH units	MCERTS	-	7.7 - 8.4	TP02 – TP03	-
Asbestos				NAD	All Tested	N

Non-Metals - Residential with Plant Uptake (1% SOM):

Determinant	Units	Accreditation	S4UL	Highest Value	Location of Highest value	Exceedance? Y/N
Acenaphthene	(mg/kg)	UKAS	210	0.05	TP02 0.10m	N
Acenaphthylene	(mg/kg)	UKAS	170	0.13	TP02 0.10m	N
Anthracene	(mg/kg)	MCERTS	2400	0.15	TP02 & TP04	N
Benzo(a)anthracene	(mg/kg)	MCERTS	7.2	1.12	TP02 0.10m	N
Benzo(a)pyrene	(mg/kg)	MCERTS	2.2	1.33	TP02 0.10m	N
Benzo(b)fluoranthene	(mg/kg)	MCERTS	2.6	1.91	TP02 0.10m	N
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	320	1.00	TP02 0.10m	N
Benzo (k) fluoranthene	(mg/kg)	MCERTS	77	0.65	TP02 0.10m	N
Chrysene	(mg/kg)	MCERTS	15	0.86	TP02 0.10m	N
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.24	0.20	TP02 0.10m	N
Fluoranthene	(mg/kg)	MCERTS	280	2.16	TP02 0.10m	N
Fluorene	(mg/kg)	MCERTS	170	0.05	TP02 0.10m	N
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	27	1.06	TP02 0.10m	N
Naphthalene	(mg/kg)	MCERTS	2.3	0.06	TP02 & TP03	N
Phenanthrene	(mg/kg)	MCERTS	95	0.88	TP02 0.10m	N
Pyrene	(mg/kg)	MCERTS	620	2.04	TP04 0.40m	N
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	NC	13.50	TP02 0.10m	-

Determinant	S4UL (mg/kg)	Highest Value (mg/kg)	Location of Highest value	Exceedance? Y/N
Aliphatic				
EC 5-6	42	<0.1	All	N
EC >6-8	100	<0.1	All	N
EC >8-10	27	<0.1	All	N
EC >10-12	130	<6	All	N
EC >12-16	1100	<6	All	N
EC >16-35	65000	314	TP01 0.20m	N
EC >35-44	65000	49	TP01 0.20m	N
Aromatic				
EC 5-7 (Benzene)	70	<0.01	All	N
EC >7-8 (Toluene)	130	<0.01	All	N
EC >8-10	34	<0.01	All	N
EC >10-12	74	<1	All	N
EC >12-16	140	1	TP03 0.20m	N
EC >16-21	260	8	TP01 0.20m	N
EC >21-35	1100	178	TP01 0.20m	N
EC >35-44	1100	104	TP01 0.20m	N

8.4 ANALYSIS OF RESULTS

Laboratory analysis has identified no exceedances of metals, metalloids, PAH nor TPH nor has elevated phenol nor asbestos been detected.

TABLE 1 SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils	Direct Ingestion & Direct Contact	Site Workers	UI	Md	L	Site workers to wear appropriate PPE for health and safety reasons
Contaminated Soils	Inhalation of Dust	Site Workers	UI	Md	L	
Contaminated Soils	Direct Ingestion & Direct Contact	End Users	UI	Md	L	No exceedances of metals, metalloids, PAH nor TPH nor has elevated phenol nor asbestos been detected. Recommend a Watching Brief (inline with Appendix F) be had during site works.
Contaminated Soils	Inhalation of Dust	End Users	UI	Md	L	
Contaminated Soils	Direct Ingestion	Flora and Fauna	UI	Md	L	
Contaminated Soils	Vertical and lateral migration	Controlled Waters	UI	Md	L	
Contaminated Soils	Direct contact	Services	UI	Md	L	No significant sources identified during previous reporting.
Ground Gases (Methane and CO ₂)	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	No contamination capable of giving rise to hazardous vapours identified.
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
 Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
 Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2 RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/ Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3 CLASSIFICATION OF RISK

Very high risk (Vh)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (Hi)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (Lw)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (VI)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 REVISED ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** level of risk with respect to the proposed development.

A watching brief (as outlined in Appendix F) should be carried out by the site supervisor during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material). Should previously unreported or undiscovered contamination be identified, then development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

10.0 SUMMARY OF RISKS**10.1.1 SOIL CONTAMINATION**

Laboratory analysis has identified no exceedances of metals, metalloids, PAH nor TPH nor has elevated phenol nor asbestos been detected, as such, the risks from soil contamination are considered to be LOW.

10.1.2 GROUND GASSES AND VAPOURS

Previous reporting for the site found no significant potential sources of ground gas generation and the potential for hazardous vapour generation, associated with historical vehicle maintenance on site. Subsequent environmental sampling and laboratory testing has shown no elevated contamination capable of giving rise to hazardous vapours. As such, the risks from ground gases and vapours are considered to be LOW.

11.0 RECOMMENDATIONS

It is recommended that a watching brief (as outlined in Appendix F) should be carried out by the site supervisor during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material). Should previously unreported or undiscovered contamination be identified, then development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

12.0 FURTHER ENVIRONMENTAL INVESTIGATION

It is not envisaged that further testing will be required.

13.0 REFERENCES**13.1 LEGISLATION AND REGULATIONS****13.1.1 ACTS**

- [1]. Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

13.1.2 PLANNING REGULATIONS

- [2]. The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3]. The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

13.1.3 CONTAMINATED LAND REGULATIONS

- [4]. The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5]. The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6]. The Contaminated Land (England) Regulations 2006 SI2006/No.1380

13.2 STATUTORY GUIDANCE

- [7]. Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8]. Communities and local Government, 2012: National Planning Policy Framework.

13.3 BRITISH STANDARDS

- [9]. BS 5930:2015 Code of practice for site investigations

[10]. BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice

[11]. BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

[12]. BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

13.4 NON STATUTORY TECHNICAL GUIDANCE

13.4.1 ENVIRONMENT AGENCY

[13]. Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

13.4.2 CIRIA PUBLICATIONS

[14]. Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association

13.4.3 CL:AIRE

[15]. Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment*. CL:AIRE Research Bulletin RB17. CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

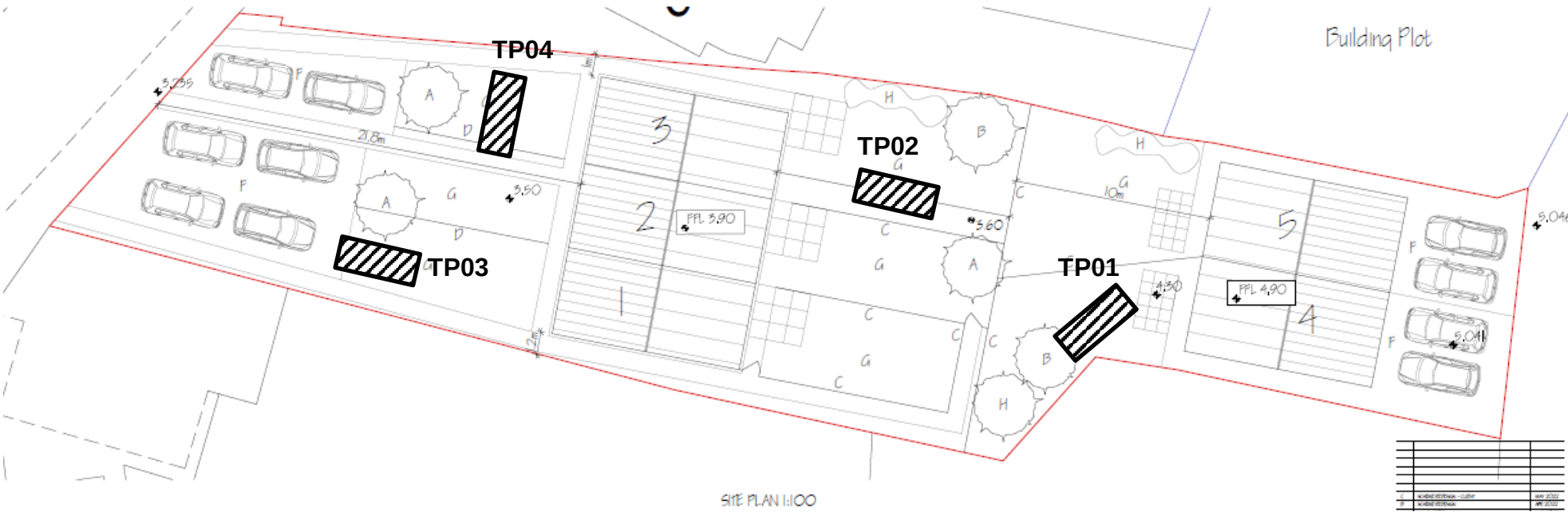
14.0 APPENDICES

APPENDIX A

PHASE 1 REPORT

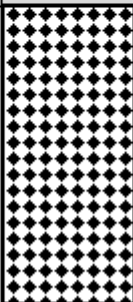
APPENDIX B

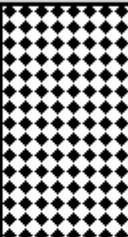
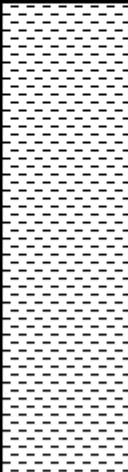
SITE PLAN INCLUDING TRIAL PIT LOCATIONS

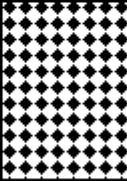
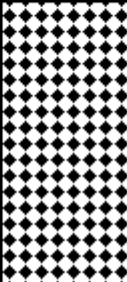
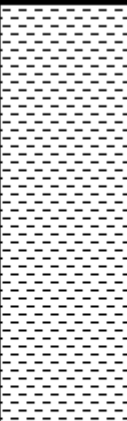


APPENDIX C

TRIAL PIT LOGS

Project.	Riverbank / Cradge Bank, Spalding		Trial Pit			
			TP01			
Client.	Ms. A. R. Bates		Date			
			20/09/2022			
Method.			Project Reference.			
Machine-excavated			3377D			
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m)	
					From	To
No groundwater encountered	0.50	Dark brown very sandy, very gravelly, slightly clayey MADE GROUND with gravel sized fragments of angular to subangular, fine to coarse of brick, concrete, building stone, rare full brick and road planings.		ES01	0.20	0.25
	1.20	Brown clayey, slightly gravelly SAND, gravel is angular, medium of flint.		ES02	0.60	0.65
		End of pit at 1.20m				
Remarks		Key			 Castledine Environmental LAND CONTAMINATION SURVEYS	
		Logged By	Scale	Sheet		
		DW	Not to Scale	1 of 1		

Project.		Riverbank / Cradge Bank, Spalding		Trial Pit		
Client.		Ms. A. R. Bates		TP02		
Method.		Machine-excavated		Date		
				20/09/2022		
				Project Reference.		
				3377D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m)	
No groundwater encountered	0.30	Dark brown very gravelly, very sandy, slightly clayey MADE GROUND with gravel sized fragments of angular to subangular, fine to medium of tarmac, brick, wire, plastic, wood chipping at surface.		ES01	0.10	0.15
	1.30	Dark grey clayey SILT.		ES02	0.50	0.55
		End of pit at 1.30m				
Remarks		Key				
		Logged By	Scale			
		DW	Not to Scale			
		Sheet		1 of 1		

Project.		Riverbank / Cradge Bank, Spalding		Trial Pit		
				TP03		
Client.		Ms. A. R. Bates		Date		
				20/09/2022		
Method.				Project Reference.		
Machine-excavated				3377D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m)	
					From	To
No groundwater encountered	0.10	Grey very gravelly, sandy MADE GROUND with gravel sized fragments of angular to rounded, fine to coarse of road planings, rolled pea gravels, brick and chert.				
	0.40	Light brown slightly clayey, sandy, very gravelly MADE GROUND with gravel sized fragments of angular to subrounded, fine to coarse of full brick, brick, concrete, woven textile, plastic, pea gravels and wood fragments.		ES01	0.20	0.25
	1.10	Dark grey clayey SILT.				
		End of pit at 1.10m				
Remarks		Key				
		Logged By	Scale	Sheet		
		DW	Not to Scale	1 of 1		
 Castledine Environmental LAND CONTAMINATION SURVEY						

Project.	Riverbank / Cradge Bank, Spalding			Trial Pit		
				TP04		
Client.	Ms. A. R. Bates			Date		
				20/09/2022		
Method.				Project Reference.		
	Machine-excavated			3377D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m)	
					From	To
No groundwater encountered	0.30	Light brown clayey, sandy, very gravelly MADE GROUND with gravel sized fragments of angular to subangular, fine to coarse of brick, concrete, twine and fabric.				
		Dark grey clayey SILT.		ES01	0.40	0.45
	0.90					
		End of pit at 0.90m				
Remarks	Key			 Castledine Environmental LAND CONTAMINATION SURVEYS		
	Logged By	Scale	Sheet			
	DW	Not to Scale	1 of 1			

APPENDIX D

TRIAL PIT PHOTOGRAPHS



Trial Pit Photographs

Photo No.1: TP01 located in the eastern extent of site



Address: Land off Riverbank & Cradge Bank, Spalding
Client: Ms. A. R. Bates

Photo No.2: TP01 pit sides and base



Trial Pit Photographs

Photo No.3: TP02 located centrally on site



Address: Land off Riverbank & Cradge Bank, Spalding

Client: Ms. A. R. Bates

Photo No.4: TP02 pit sides and base



Trial Pit Photographs

Photo No.5: TP03 located in the south western extent of site



Address: Land off Riverbank & Cradge Bank, Spalding
Client: Ms. A. R. Bates

Photo No.6: TP03 pit sides and base





Trial Pit Photographs

Address: Land off Riverbank & Cradge Bank, Spalding

Client: Ms. A. R. Bates

Photo No.7: TP04 located in the north western extent of site



Photo No.8: TP04 pit sides and base



Castledine Environmental, 4 Wymeswold Road, Hoton, Loughborough, Leicestershire. LE12 5SN

Telephone: 01509 880399

Mobile: 07779 305682

kevin@castledineenvironmental.co.uk

APPENDIX E

TEST RESULTS

Found as separate PDF.

APPENDIX F**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.
Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

