

# RIDGE

PROPERTY & CONSTRUCTION CONSULTANTS

## HORNIMAN MUSEUM AND GARDENS

### DESK TOP STUDY, PROPOSED BUTTERFLY HOUSE

September 2016

Prepared for

**Horniman Museum and Gardens**

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## 1. INTRODUCTION

### 1.1. Introduction

Ridge and Partners LLP (Ridge) was commissioned by Horniman Museum and Gardens in September 2016 to undertake a Desk Top Study of a site at the former Lodge on Horniman Drive within the grounds of the Horniman Museum and Gardens.

The brief was to use the information provided in an environmental database search relating to the site, information provided by the client and a walkover survey to assess and report on the findings with respect to potential ground contamination and potential associated future liabilities in accordance with the Preliminary Risk Assessment procedure outlined in the Model Procedures for the Management of Land Contamination (CLR 11), published by the Environment Agency.

This report is prepared in line with the agreed brief and is subject to the report conditions shown in Appendix 1.

### 1.2. Legal Context

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from land contamination. In accordance with the Act and the statutory guidance document 'The Contaminated Land (England) Regulations 2000', the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the Regulatory Authority, by reason of substances within or under the land, that:

- Significant harm is being caused, or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused."

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site specific basis, as the potential for harm is determined by the site's end use and its specific environmental setting.

The guidance defines "risk" as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

While Part IIA of the Environmental Protection Act provides a risk based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment, the regime does not take into account future uses. New developments are therefore controlled by the planning regime, with reference to the National Planning Policy Framework (NPPF), rather than directly by Part IIA of the Environmental Protection Act.

The NPPF is based on the principal that the site should be suitable for its new use, taking account of ground conditions, including from natural hazards or former activities and states that “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”. The NPPF also links the planning and Part IIA regimes by stating that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. Key components of the Part IIA regime, such as the definition of Contaminated Land and the associated risk based assessment approach, are therefore considered to also be applicable to the planning regime.

### 1.3. Methodology

This report has been prepared in accordance with published Environment Agency guidance (‘Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11’). CLR 11 provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme (of the former Department of the Environment). CLR 11 has adopted and refined the well recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

#### 1.3.1. Pollutant Linkage Concept

In the context of land contamination, there are three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage.

### 1.3.2. Conceptual Model

An important thread throughout the overall process of risk assessment is the need to formulate and develop a conceptual model for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

### 1.3.3. Risk Assessment

CLR 11 advocates a phased approach to risk assessment comprising the following in order, as necessary:

**Preliminary Risk Assessment** – a desk study consisting of a review of documentary, anecdotal and site walk over evidence.

**Generic Quantitative Risk Assessment (QGRA)** - comparison of contaminant concentrations obtained from site investigation with generic assessment criteria.

**Detailed Quantitative Risk Assessment (DQRA)** - comparison of contaminant concentrations obtained from site investigation with site-specific assessment criteria.

This document constitutes a Preliminary Risk Assessment.

### 1.4. Proposed Use

It is understood that the site is proposed for development as a butterfly house. The Butterfly House will be a publicly accessible single story glasshouse structure to house the Butterfly Garden. A change in the site use from that currently proposed may result in the need for re-assessment of risk criteria and the conclusions and recommendations resulting from the risk assessment could therefore significantly change.

### 1.5. Report Scope and Limitation

This report is based upon a review of readily available historical and current information, a site walkover survey, geological and hydrogeological maps and information from an environmental database search. The assessment is based on the proposed use outlined in Section 1.4. The outcomes of this assessment could change if the end uses change.

The information contained in this report is intended for the use of the Horniman Museum and Gardens and Ridge can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

## 2. HAZARD IDENTIFICATION

### 2.1. Site Location and Description

The site chosen for the Butterfly House is irregular in plan shape and sits next to the Animal Walk and on the footprint of the Lodge (to be demolished) on Horniman Drive. The Lodge is currently not in use and used to be occupied by the Gardens Keeper. The area of the site surrounding the Lodge comprises mainly soft landscaping areas & gardens. It is understood from information provided by the client that the Lodge is likely to contain asbestos containing materials and that the demolition contractor is due to remove the asbestos containing materials during the demolition works.

The area to the west slopes down away from the site and is used for keeping animals as part of the Horniman Museum and Gardens Animal Walk. Horniman Drive is located adjacent to the east of the site with further parts of the Horniman Gardens beyond and to the south of the site. An electrical substation is also located adjacent to the southeast corner of the site. Residential properties outside of the Horniman Museum and Gardens Grounds are located adjacent to the north of the site.

### 2.2. Site History

The Ordnance Survey maps provided and reviewed from 1863 to 2014 (scales 1:2,500, 1:10,000, 1:1,250, 1:10,560) indicate that the site formed part of the landscaped grounds of The Keep (later identified as Surrey Mount) stately home (located to the southwest of the site). Surrey Mount and associated gardens became part of the Horniman Gardens which were donated to the public, along with the Horniman Museum, in 1901. The site appears to have remained a landscaped part of the Gardens until the Lodge was constructed on the site in the 1960s as a dwelling for the Garden Keeper. Since the position of Garden Keeper was made redundant, the Lodge has been vacant and used for various storage.

Residential properties were present adjacent to the north and east of the site from the earliest available maps with the areas to the south and west comprising parts of the landscaped grounds of The Keep (Surrey Mount) and subsequently the Horniman Gardens. The early residential properties to the north of the site appear to have been replaced with the current residential properties during the 1960s and 1970s and the early residential properties to the east appear to have been purchased and redeveloped as part of the Horniman Gardens in the 1960s.

## 2.3. Documented Ground Conditions

Ground conditions recorded in readily available sources are summarised below.

### 2.3.1. Geology

Reference to the British Geological Survey (BGS) Map (See Appendix 2) indicates the site to directly overlie bedrock geology of the London Clay Formation with no recorded superficial deposits.

### 2.3.2. Hydrogeology

The Environment Agency Groundwater Vulnerability Map (See Appendix 2) indicates that the site is underlain by bedrock Unproductive Strata interpreted as the London Clay Formation.

Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The site does not lie within a groundwater source protection zone (SPZ).

### 2.3.3. Hydrology

There are no surface water features in the immediate vicinity of the site.

### 2.3.4. Radon

Radon is a naturally occurring radioactive gas which may be harmful to human health. Radon is generally released into the atmosphere in areas underlain by granite and limestone. Harmful concentrations of radon may build up if it becomes trapped in an enclosed space such as a building.

National Radiological Protection Board data presented within the Groundsure Report indicates that the percentage of houses exceeding the Action Levels for Radon in this area is less than 1%. Therefore the British Geological Survey recommends that no radon protective measures are necessary in the construction of new dwellings or extensions.

## 2.4. Environmental Data Search

A search of an environmental database was undertaken together with information from various other organisations as part of the desk study and is summarised in the following sections. The following summary is generally limited to locations within 250m of the Site boundaries unless it is considered that installations or activities beyond that range could potentially have an impact on the Site or be affected by the redevelopment of the site.

Table 2.1: Data search results

Discharge consents	There are no recorded discharge consents within 250m of the site.
Pollution incidents	There are no recorded pollution incident with impact to controlled waters within 250m of the site.
Water abstractions	There are no recorded water abstractions within 1000m of the site.
Fuel stations	There are no recorded fuel stations within 250m of the site.
Landfill sites	There are no recorded Landfill sites within 250m of the site.

The site is located in an area which may not be affected by mining.

The following ground hazards were identified:

- Compressible ground stability hazards – Negligible hazard
- Collapsible ground stability hazards – Very Low hazard
- Ground dissolution stability hazards – Negligible hazard
- Landslide ground stability hazard – Very Low hazard
- Shrinking or swelling clay ground stability hazard – Moderate hazard
- Running sand ground stability hazards – Negligible hazard

## 2.5. Department of Environment – Industry Profiles

The Department of Environment Industry Profiles do not cover the known existing or historic land uses for the site.

### 3. CONCEPTUAL SITE MODEL

#### 3.1. Sources

The conceptual model, based on information obtained as part of the preliminary risk assessment, identified the following potential contaminant sources:

##### 3.1.1. On-Site – Historic and Current

- Potential for asbestos containing material fragments associated with the construction of the former Lodge.
- Potential for PCBs from the adjacent electrical substation.

##### 3.1.2. Off-Site – Historic and Current

- None

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site

#### 3.2. Pathways

The key environmental pathways and exposure routes by which potentially toxic substances can reach the identified potential receptors are considered to be:

##### 3.2.1. Indirect

- Vertical migration to groundwater
- Lateral migration to surface water
- Vertical migration of gas leading to accumulation in confined spaces

##### 3.2.2. Direct

- Direct contact
- Ingestion
- Inhalation of contaminated dust.

#### 3.3. Receptors

Receptors that may be affected by the potential contamination are:

##### 3.3.1. Human

- Future site users.
- Construction workers.

### 3.3.2. Environmental

- None

## 4. RISK ASSESSMENT

### 4.1. Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS 10175:2011+A1:2013 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential magnitude of the hazard and the sensitivity of the target, based on the categories given overleaf.

Table 4.1: Sensitivity of receptor

Category	Examples
High	Residential with gardens/Groundwater Source Protection Zone
Medium	Residential without gardens/Principal (Major) Aquifer/sensitive watercourse
Low	Commercial and industrial use/Secondary (Minor) Aquifer
Very Low	Construction and maintenance workers/non-sensitive watercourse

Table 4.2: Magnitude of impact

Category	Examples
Gross Impact	Heavily contaminated gasworks or industrial Site, hazardous waste landfill
Moderate Impact	Major leaks and spills from fuel infrastructure (e.g. petrol stations), domestic waste landfills
Slight Impact	Minor leaks and spills from fuel infrastructure, 'inert' waste landfills

Table 4.3: Level of severity of potential hazard

Magnitude of impact	Sensitivity of receptor			
	High	Medium	Low	Very Low
Gross Impact	Severe	Medium	Mild	Minor
Moderate Impact	Medium	Mild	Minor	Minor
Slight Impact	Mild	Minor	Minor	Minor

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 4.4: Probability of risk definition

Category	Examples
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 4.5: Level of risk for potential hazard definition

Probability of risk	Sensitivity of receptor			
	Severe	Medium	Mild	Minor
High likelihood	Very High	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very Low
Unlikely	Low/Moderate	Low	Very Low	Very Low

The assessment is discussed below in terms of plausible pollutant linkages. A complete assessment of the pollutant linkages is presented in Table 4.6.

A description of these risk classifications and likely action required are given in CIRIA 552 as:

Very high risk – 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 substantial liability. Urgent investigation and remediation are likely to be required.

High risk – Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk – 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 is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk – 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 – It is a low possibility that harm could arise to a designated receptor. In the event of such harm being realised it is not likely to be severe.

### 4.2. Pollutant Linkage Assessment

Table 4.6: Pollutant linkage assessment

Source	Pathway	Receptor	Severity	Likelihood	Risk Level
Potential for asbestos containing material fragments associated with the construction of the former Lodge.	Inhalation	Future site users	Medium	Low Likelihood	Low/ Moderate
		Adjacent residents	Medium	Unlikely	Low
		Construction workers	Medium	Low Likelihood	Low/ Moderate
Potential for PCBs associated with adjacent electrical substation	Direct Contact Ingestion Inhalation	Future site users	Minor	Unlikely	Very Low
		Adjacent residents	Minor	Unlikely	Very Low
		Construction workers	Minor	Unlikely	Very Low

## 5. CONCLUSIONS AND RECOMMENDATIONS

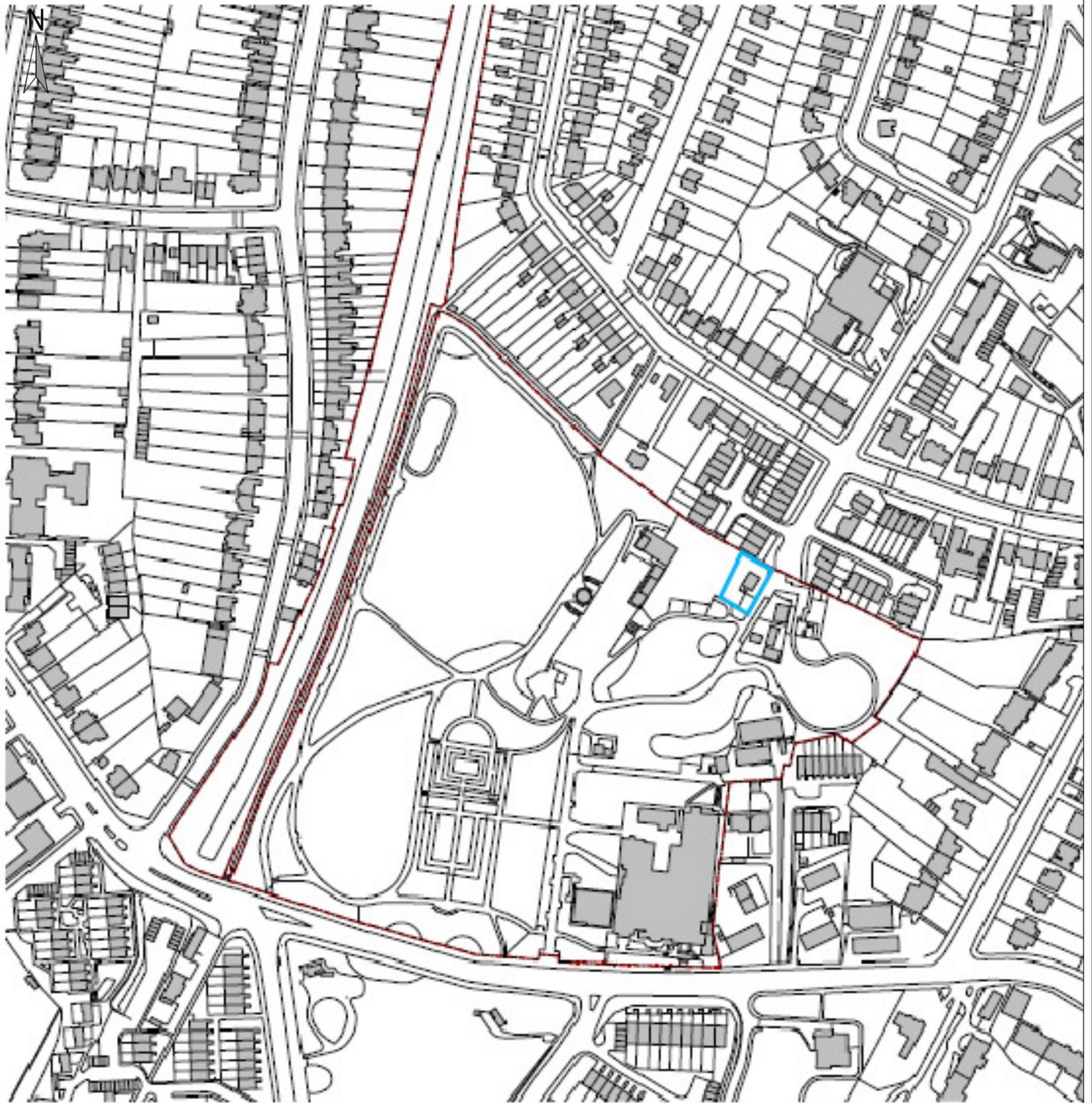
The following potential sources of contamination were identified:

- Potential for asbestos containing material fragments associated with the construction of the former Lodge.
- Potential for PCBs associated with the former adjacent electrical substation

It should be noted that additional sources of contamination may become apparent during any future investigation or development of the site.

The risk of impact to identified receptors from the identified potential PCB source is considered to be **very low** due to the low mobility of PCB contamination in soils and relatively low sensitivity of the end use and therefore is not considered to require further investigation or assessment. The risk of impact to the identified receptors from the identified potential asbestos contamination in soil is considered to be **low/moderate**. A limited intrusive investigation, comprising screening of shallow soil samples for the presence of asbestos, is therefore recommended to further investigate the potential contamination risks to human health from potential asbestos in the soil.

**FIGURE 1 – SITE LOCATION PLAN**



**PROPOSED SITE FOR NEW BUTTERFLY HOUSE**



**RED LINE OWNERSHIP**

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PROJECT  
**BUTTERFLY HOUSE**  
**HORNIMAN MUSEUM AND GARDENS**

DRAWING  
**5001510 - SITE LOCATION PLAN**

**RIDGE**

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**FIGURE 1**

REV

**FIGURE 2 – SITE LAYOUT PLAN**



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PROJECT  
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FIGURE 2

REV

-

**APPENDIX 1 – REPORT CONDITIONS**

This report is produced solely for the benefit of **Horniman Museum and Gardens** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the Site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

This report is based on a visual Site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ridge and Partners LLP. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.

**APPENDIX 2 – GROUNDSURE REPORT**

