**Ground and Environmental Services Limited**

**Unit 2 Montpelier Business Park**
**Dencora Way**
**Ashford**
**Kent**
**TN23 4FG**
**01233 646237**

# Deacon Landscape Management, Wootton Lane, Wootton, Kent, CT4 6RP

## Phase 2 Contamination Risk Assessment

## On behalf of Deacon Landscape Management

**Document Reference: 11490** **October 2015**

# Site: Deacon Landscape Management, Wootton Lane, Wootton, Kent, CT4 6RP

# Document Reference No: 11490

Quality Management

| | |
|---|---|
| **Prepared by:** | **MH** |
| **Reviewed by:** | KM |
| **Authorised by:** | KM |
| **Date** | October 2015 |
| **Revision** | 0 |

## Table of Contents



**Figures**



**Appendices**

2. Soil Gas Survey
3. Analytical Test Results
4. Guidelines on Contamination Levels
5. Statistical Calculator Data Test Results

## 1 INTRODUCTION

Ground and Environmental Services Ltd (GES) was commissioned Deacon Landscape Management to undertake a Phase 2 Contamination Risk Assessment on a proposed redevelopment site at Wootton Lane, Wootton, Kent.

It was understood that the proposed redevelopment of the site would comprise the construction of a residential estate with private garden areas.

The purpose of the Phase 2 Contamination Risk Assessment was to provide an assessment of contamination issues based on current Contaminated Land Legislation. The need for this investigation was based on the findings of the Phase 1 Contamination Risk Assessment undertaken by GES Ltd (report ref: 11430) in April 2015.

## 2 SITE LOCATION AND LAYOUT

The site is located in Wootton approximately 10km north of the town of Folkestone, Kent. The site is centred on approximate ordnance survey grid reference centre: TR 222 461. The site is situated in a predominantly rural setting with land in the surrounding environs predominantly set to agricultural use.

The following features immediately bound the site:

- North, the site is bound by a residential dwelling and associated private gardens;
- East, the site is bound by an agricultural field;
- South, the site is bound by scattered woodland and a residential dwelling; and
- West, the site is bound by Wootton Lane, beyond which is agricultural land.

The site is roughly rectangular in shape and can be divided into three distinct areas: The northern part of the site comprises offices and workshops in the former farm buildings, as well as areas of car parking; the central and southern part of the site is used for materials storage. Materials include metal, wood, brick and other rubble, as well as refuse skips for waste wood/metal etc and the eastern part of the site is former woodland which has now been felled and left as a grass meadow.

## 3 SUMMARY OF PHASE 1 FINDINGS

- The site has a past history of farm usage since the early 1870s and from the 1970s more recent buildings and light commercial/industrial usages.
- There is the potential for hydrocarbon and metal contamination as well as asbestos in the soils underlying the site.
- The geology at the site is Clay and Flint over the Seaford Chalk Formation
- The site is set upon a Principal Aquifer and the superficial clay deposits designated as Unproductive Strata.

- The site is located within an Area of Outstanding Natural Beauty.

## 4 INTRUSIVE INVESTIGATION

### 4.1 FIELDWORK

The site works were carried out on the 9th September 2015 and comprised the following:

- 11 window samples holes
- 4 gas/groundwater monitoring standpipes

The positions of the above works on the site are indicated on Figure 1, Exploratory Hole Location Plan.

*Window Sample Holes*
Eleven window sample holes (WS1 to WS11) were excavated using an Premier Compact 120 window sampling rig to depths ranging between 1.0m and 4.0m. The soils and materials encountered in the holes were logged and representative samples recovered for laboratory analysis.

Window sample hole logs are presented in Appendix 1.

*Soil Gas Survey*
A soil vapour survey was undertaken across the site and comprised the monitoring of the atmosphere within the window sample holes. Portable gas monitoring equipment (GMI Land Surveyor 2) was used to monitor the boreholes for concentrations of carbon dioxide (CO2,), methane (CH4) and oxygen (O2).

The gas monitoring results are presented in Appendix 2.

### 4.2 GROUNDWATER

Groundwater was not encountered. It should be noted that the absence of groundwater is not necessarily indicative of the absence of a groundwater table in view of the short period the window sample holes remained open. Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

# 5 LABORATORY TESTING

## 5.1 ANALYTICAL TESTING

Sixteen samples were selected and scheduled for chemical analysis which was undertaken by QTS Environmental Ltd. Fourteen soil samples were analysed for a general screening suite of contaminants considered appropriate to the current usage and past history of the site and surrounding area and two were composite samples for Waste Acceptance Criteria Testing.

| Toxic Metals | Phytotoxic Metals | Inorganic Compounds | Organic Compounds |
|---|---|---|---|
| Arsenic<br>Cadmium<br>Chromium<br>Lead<br>Mercury<br>Nickel<br>Selenium | Water Soluble Boron<br>Copper<br>Nickel<br>Zinc | Water Soluble Sulphate<br>pH<br>Asbestos | Total Polyaromatic Hydrocarbons (PAH)<br><br>Total Petroleum Hydrocarbons (TPH) |

The results of the analytical testing are presented in Appendix 3.

## 6 GROUND CONTAMINATION ASSESSMENT

Guidelines for contamination levels are presented at Appendix 4. In addition, the guideline values proposed in the DEFRA document SP1010- Development of Category 4 Screening Levels for Assessment of Land affected by Contamination Final Project Report are considered in this report for lead. The provisional category 4 screening value (pc4sl) for lead is more conservative than the CLEA SGV with a limit of 200 mg/kg as opposed to 450 mg/kg.

A pc4sl for benzo(a)pyrene has also been proposed. The pc4sl for benzo(a)pyrene is 5.0 mg/kg for a residential end use with plant uptake compared to the 0.94 mg/kg LQM CIEH GAC level for residential end use and 2.5% soil organic matter. For this assessment the PC4SL value for benzo(a)pyrene (BaP) will be adopted.

| Substance | Residential (with home-grown produce) | Residential (without home-grown produce) | Allotments | Commercial | Public Open Space 1 | Public Open Space 2 |
|---|---|---|---|---|---|---|
| **Arsenic** | 37 | 40 | 49 | 640 | 79 | 170 |
| **Benzene** | 0.87 | 3.3 | 0.18 | 98 | 140 | 230 |
| **Benzo(a)Pyrene** | 5.0 | 5.3 | 5.7 | 77 | 10 | 21 |
| **Cadmium** | 22 | 150 | 3.9 | 410 | 220 | 880 |
| **Chromium VI** | 21 | 21 | 170 | 49 | 21 | 250 |
| **Lead** | 200 | 310 | 80 | 2300 | 630 | 1300 |

### 6.1 SOIL QUALITY

Toxic Metals
Concentrations of toxic metals arsenic, cadmium, chromium, mercury, nickel, selenium and zinc were all below their respective soil guidance values for a residential development under the CLEA/LQM GAC guidelines and the C4SL guideline values for residential with (home-grown produce) end use in all samples tested.

There were however two slightly elevated levels of copper and lead. For the copper exceedance this was located at WS1 (0.3m) with a concentration of 114 mg/kg this is slightly above the CIEH LQM GAC value of 111 mg/kg. Concentrations of copper in all other samples tested were below this limit value.

For the lead exceedance this was located at WS3 (0.5m) with a concentration of 395 mg/kg this is above the C4SL guidance value of 200 mg/kg though below CLEA SGV of 450 mg/kg. Concentrations of lead in all other samples tested were below these limit values.

Phytotoxic Metals

Concentrations of phytotoxic metals copper, nickel and zinc were compared against the maximum permissible concentrations in the Sewage Sludge (Use in Agriculture) Regulations 1989. All samples tested were below their respective levels at their relevant pH levels.

**Organic Compounds**

Polycyclic Aromatic Hydrocarbons (PAH)

Concentrations of total PAH were found to be below the inert waste acceptance criteria of 100 mg/kg as detailed in the Landfill (England and Wales) (Amended) Regulations 2004 in all of the samples tested and were generally below the analytical detection limit of 1.6 mg/kg with the highest value being 23.9 mg/kg at WS11 (0.3m).

Benzo(a)pyrene (B(a)P)

All concentrations of BaP were below the C4SL guideline limit value of 5 mg/kg for a residential (with home-grown produce) end use in all samples tested. WS11 (0.3m) has a slightly elevated level of 1.90 mg/kg above the 0.94 mg/kg LQM CIEH GAC level.

Speciated PAH

Concentrations of all other PAH species were below their LQM CIEH GAC levels in all samples tested.

Total Petroleum Hydrocarbons (TPH)

Concentrations of TPH were significantly below the inert waste acceptance criteria of 500 mg/kg as detailed within the Landfill (England and Wales) Regulations 2004 and also within the UK Water Industry Research (UKWIR) in all soil samples tested other than slightly elevated TPH levels at WS11 (0.3m) and WS3 (0.5m) which did exceed the UKWIR, Thames Water and Anglian Water levels.

**Waste Acceptance Criteria (WAC) Testing**

Two composite soil samples were collected for WAC testing. The first (WAC1) was composited from the bund running north to south along the middle of the southern half of the site from the location of WS6 and collected from 0 – 2 m in depth. The second sample (WAC2) was comprised of soils from the following locations, WS1 (0.6m), WS2 (1.0m), WS3 (0.1m) and WS5 (0.7m).

**Inorganic Compounds**

Asbestos in the form of loose chrysotile fibres were detected within the sample from WS1 (0.3m). The detected asbestos was subsequently quantified at <0.001% by mass.

Concentrations of water soluble sulphate ranged from 13 mg/l to 312 mg/l (as $SO_4$). The pH values ranged from slightly acidic to slightly alkaline with values of 5.9 to 9.3 units.

**Soil Gas**

The results obtained from the soil gas survey indicated levels of soil gases methane and carbon dioxide are not above guidance action levels of 1% and 5% respectively.

The gas regime is considered to be low and gas protection measures would not be required within any buildings constructed on site.

## 7 CONTAMINATION RISK ASSESSMENT

This risk assessment has been undertaken with due regard to the advice relating to groundwater as provided in the Environment Agency's "Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources", the advice provided in the Contaminated Land (England) Regulations 2000, and the associated statutory guidance. The guidance defines contaminated land as any land that is in such a condition that by reason of substances in, on or under the land:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled water is being, or is likely to be caused.

This definition is based on the principles of risk assessment defined as a combination of the probability (or frequency) of occurrence of a defined hazard and the magnitude (including the seriousness) of the consequences. Central to the risk assessment process is the concept of pollutant linkage, that is a linkage between a contaminant and a receptor by means of a pathway.

| **Statutory definitions relating to pollution linkage.** | |
|---|---|
| Contaminant | "a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters." |
| Receptor | "a living organism, a group of living organisms, and ecological system or a piece of property" which meets given criteria. |

| | |
|---|---|
| | "controlled waters which are, or could be, polluted by a contaminant". |
| Pathway | "one or more routes or means by, or through, which a receptor:<br>• is being exposed to, or affected by, a contaminant, or<br>• could be so exposed or affected". |

The relationship between these components is discussed below in order to identify the existence of any source-pathway-receptor linkage on the site, and hence the potential risks associated with any contamination. This risk assessment is based on the proposed redevelopment of the site for the development of residential houses with private garden areas.

The significance of the risks to the receptors/targets identified is based on an evaluation of the potential pathways between the contaminant source and receptors based on residential with plant uptake end use.

Potential receptors/targets at the site and in the area in which the site is located include:

- future occupants and the general public;
- construction/maintenance workers;
- groundwater resources;
- underground services in and around the site;
- plants in proposed garden and landscaped areas.

### 7.1 CONTAMINANT SOURCES

The site has an historic use as a farm since the early 1870s with buildings occupying the northernmost area of the site. At some point between the 1970s and 1990s there was further development at the northern section of the site. The sites most recent usage however has been as a landscaper's yard and more recently for metal works and joinery. The likely contaminants would be from asbestos from old buildings which used to be on site and from possible fuel spillages. The past historic usage may also have seen waste soils imported or stored on site. The area to the south of the site between the storage area and open land housed a bund which anecdotal evidence suggests was created from surface materials in the storage area to enable the storage area to be created. Given past nature of the site this could be a potential source area of contaminants.

### 7.2 RISK TO HUMAN HEALTH

Concentrations of toxic metals arsenic, cadmium, chromium, mercury, nickel, selenium and zinc were all below their respective soil guidance values for a residential with plant

uptake end use. Therefore the risk posed to human health by these contaminants is considered to be low.

In total fourteen soil samples were analysed and of these only two samples revealed slightly elevated heavy metals concentrations above their respective soil guidance values. These were at locations WS1 (0.3m) with a very slightly elevated copper level of 114 mg/kg above the CIEH LQM GAC value of 111 mg/kg. The other exceedance was at WS3 (0.5m) with an elevated lead concentration of 395 mg/kg above the C4SL of 200 mg/kg, though below the CLEA GSV of 450 mg/kg.

The test results have been assessed following the CLAIRE/CIEH (2008) guidance for statistical testing of a data set for planning purposes involving the calculation of the sample mean and sample standard deviation, investigation of the normality of the data distribution and investigation of outliers and the calculation of 95$^{th}$ UCL values. The measured concentrations on site have been statistically analysed using the ESI statistics calculator as described above. The 95$^{th}$ UCL of the test results have been used for subsequent comparison with the CLEA SGVs or CIEH GAC values as appropriate.
The application of the above statistical test was run for both datasets.

The dataset for copper showed that the slightly elevated level was an outlier and that the sample mean (20.357 mg/kg) was below the critical concentration (111 mg/kg) and that there was 99% evidence to reject the null hypothesis of 'the true mean concentration is equal to or greater than the critical concentration'. Therefore the risks posed by this slightly elevated copper level is not considered to pose a significant risk to human health.

The dataset for lead showed that the slightly elevated level was an outlier and that the sample mean (60.286 mg/kg) was below the critical concentration (200 mg/kg) and that there was 96% evidence to reject the null hypothesis of 'the true mean concentration is equal to or greater than the critical concentration'. Therefore the risks posed by this slightly elevated lead level is not considered to pose a significant risk of significant harm to human health.

The test results for these dataset are attached at Appendix 5.

Areas of the site to be covered by buildings and hardstanding would not pose a significant risk of significant harm as they would sever any potential pollutant pathway however it is considered that there is a potential risk to human health under the context of Part IIA in private garden areas and areas of soft landscaping within the areas identified with contamination.

It is noted that suitable growth media for the proposed gardens is present on site in the eastern area of the site and therefore such would not need to be imported, however this soil was very clayey and gardens may benefit from a light covering of clean certified topsoils, typically 150mm topsoil over 150mm free draining subsoils.

**Organic Compounds**

Concentrations of organic compounds total and speciated PAH and total TPH were generally low across the site and would therefore not be considered to pose a significant risk of significant harm to human health.

**Inorganic Compounds**

Asbestos containing material (ACM) in the form of loose chrysotile fibres were detected in the made ground at WS1 (0.3m) the risk posed by exposure to fibre inhalation has been calculated in accordance with guidance in CIRIA 733 – *Asbestos in soil and made ground: a guide to understanding and managing risks*, 2014. This provides two elements to assessing risk: empirical data on airborne fibre levels which may result from soil fibre concentrations and quantitative assessment, where cumulative exposures resulting from those airborne fibre levels can be calculated within a realistic land use scenario (as defined by the risk assessor) for comparison with excess lifetime cancer and mesothelioma risk per 100 000 people exposed.

Only one sample was found to contain asbestos fibres, the mass of which was quantified as <0.001%. There were no unusually high levels which would indicate that the average concentration is not a suitable measure of the soil material asbestos content. From Fig 9.1 in C733, 0.001% (or 10 mg.kg-1) asbestos content of soil could, from empirical field data, generate airborne fibres at approximately 50 fibres/m3 or 0.00005 fibres/ml.

In a residential setting, exposure to measurable asbestos in external air is considered unlikely through normal activities in gardens. Digging garden soils, planting and playing in the garden pose a low risk of generating dust and due to soil moisture content and lawn/vegetation cover. Therefore, it is considered that the primary means of exposure is by tracking back soils into the home where they can become dry and generate dust within relatively enclosed areas. The exposure to fibres in dust from tracking back of soil into the home - in terms of frequency and duration - is very difficult to estimate, as it will depend upon bare soil cover, whether or not footwear are removed and cleaning practices. Conservatively, and to simplify the model, it is assumed that soil-derived dust contains asbestos fibres at the same proportion as detected in soil samples and is permanently present in the house. A conservative exposure assessment is based on the CLEA default 6 year old child receptor, who may be exposed to soil based dust in indoor air 365 days per year for 16 hours per day. It is assumed that the child receptor will be resident for a further 15 years.

Assessment of excess lifetime risks of cancer and mesothelioma requires calculation of annual exposure and cumulative exposure over three time periods, each of five years, adjusted for age-related risk factor. Calculations taken from CIRIA C733 are presented below.

*Annual Exposure Calculation*

Ei = *Ci x Fi x Ti* Ei = 0.00005 x 365 x 16 = **0.292 fibre/ml.hr.**

*Where:*

Ei - annual exposure (fibre/ml.hr)

*Ci* - estimated fibre concentration for the event (fibres/ml)

*Fi* – frequency of the event per year

*Ti* – event duration (hrs)

*Cumulative exposure over five years (CEi).*

*CEi* = *Ei* x *Yi* /2000 hrs *CEi* = 0.292 x 5/2000 = **0.00073** fibres/ml.yr

*Where:*

*Yi* - is number years of exposure converted to mesothelioma/cancer risk data which is based on occupational exposures of 2000 hours/year.

Cumulative exposure for 15 years (<6 years old to adulthood)

0.00073(2.7 age class factor 5-10 years)

0.00073(2.6 age class factor 10-15 years)+

0.00073(2.5 age class factor 15-20 years)+

**0.00569** fibres/ml.yr

*From Table 14.1 C733*

Cumulative exposure of 0.00569 fibres/ml.yr (assuming worse case crocidolite) gives 'about 10' excess lifetime mesothelioma risk per 100 000.

*From Table 14.3 C733*

Cumulative exposure of 0.00569 fibres/ml.yr (assuming worse case crocidolite) excess lifetime lung cancer risk is less than the lowest risk level of 1-3 per 100 000.

Based on the above calculations and that amosite is one of the more frequently occurring asbestos forms, the risks from asbestos are indicated to be very low for mesothelioma risk and no significant risk for lung cancer.

In the event that further ACM is encountered during the site enabling works then the extent of such will be delineated under the supervision of a suitably competent consultant/engineer and the material will be removed from site in accordance with the hazardous waste regulations. Should any such material be encountered it is considered likely that a single dedicated skip provided by a suitably licensed asbestos handling

company would prove sufficient. If further asbestos-containing material is found on site, then all the documentation regarding its remediation including duty of care and waste transfer notes would be forwarded to the appropriate authorities.

On the balance of the toxicological risks posed by the ground contamination encountered as part of the intrusive investigations undertaken by GES, it is considered that the potential risks to site workers and future occupants could be adequately controlled as follows:

Site Workers

- Provision of appropriate personal protective equipment and hygiene facilities.
- Good working practice in line with current legislation for safely handling and disposing of asbestos material.
- Provision of appropriate dust suppression, to minimise the generation of potentially contaminated suspended particulates during site works.

Future Occupants

The level of contaminants found was low and of the two elevated metals found at the time of the site investigation were considered to be isolated hotspots based on the statistical analysis. Should areas without growth media be identified for private gardens or soft landscaping then clean certified sub soils and topsoils should be imported onto site. Typically 150mm topsoil over 150mm free draining subsoils would be sufficient.

Following implementation of the aforementioned remedial measures the site would not be considered to pose a potential risk of significant harm to human health in the context of Part 2A.

### 7.3 RISKS TO WATER RESOURCES

The site is set upon a Principal Aquifer and the superficial clay deposits designated as Unproductive Strata. Significant levels of potentially soluble and therefore mobile organic contaminant sources were not measured on site within the samples tested. It is therefore considered risks to groundwater resources are considered to be classed as low.

### 7.4 RISKS TO PLANTS

Elevated levels of phytotoxic metals which could be considered harmful to plants were not encountered on site within near surface soils. Therefore the risks to plant health posed by contaminants would be considered to be low.

### 7.5 RISKS TO BUILDINGS & SERVICES

Elevated levels of organic contaminants were generally not detected at depths corresponding to likely service run depths across the site however certain TPH

concentrations did exceed stringent UKWIR target concentrations. The risk to services from contamination degrading pipes is considered low to moderate. It is therefore considered prudent to protect services, notably potable water, on this site.

Suitable systems include barrier pipe, iron ductile pipework or placement in trenches backfilled with clean imported material. It is recommended that the advice of the service provider is sought regarding the most suitable options for the site

### 7.6 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a waste classification may be required.

Waste acceptance classification was undertaken on two composite samples collected from samples discussed in section 6.1. in order to give an indication to the soluble component of contaminants and, therefore those most toxic to the environment in the waste. The results are attached at Appendix 3.

Based on the results of materials tested to date, it is considered that the majority of any surplus soils requiring off-site disposal would be classified as EWC 17 05 04 non-hazardous and suitable for a licensed waste management facility which accepts inert waste.

### 7.7 INVASIVE WEEDS

There was evidence of Himalayan Balsam (*Impatiens glandulifera*) growing in the southern most section of the site. This is a non-native plant listed on Schedule 9 of the Wildlife and Countryside Act in England and Wales and is therefore an offence to plant or otherwise cause to grow these species in the wild this can include moving soils contaminated with it, i.e. seeds or plant cuttings.

## 8 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a system diagram identifying contaminant sources, routes of exposure (pathways), and which receptors are affected by contaminants moving along those pathways.

The model is produced to identify the zones of the site with different potential contaminations characteristics (e.g. whether contaminants in the soil are likely to be on the surface or at depth, distributed over an entire area or in localised ‘hot spots’).

The conceptual site model presented in the table below is based on the findings of the site investigation undertaken.

| Source | Pollutant | | Pathway | Hazard | | Receptor | Observations/ Recommendations | Assessed Risk |
|---|---|---|---|---|---|---|---|---|
| **Contaminated ground** | Metals, organic (hydrocarbons) could be present | ➔ | Direct contact, ingestion, inhalation. | Health risks including skin irritation. | ➔ | Humans: site workers | Normal health and safety precautions. Slightly elevated contaminants encountered although these will be removed from site during site preparatory works. | Low following site clearance and importation of clean topsoil. |
| | | | Surface run off. | Lateral movement to surface watercourses. | ➔ | Aquatic resources, ecology and subsequent users including humans. | Significant contamination not encountered on site and there are no surface water courses in immediate vicinity of the site. | Low |
| | | | Leaching/ Dispersion. | Downward migration to groundwater. | ➔ | Aquatic resources – Groundwater, abstraction wells) / surface waters. | Significant mobile contamination not present in soils. | Low |
| | | | Uptake by plants. | Phytotoxic effects. | ➔ | Soft landscaped areas / plants. | No elevated phytotoxic metals on site, placement of shallow clean topsoil required in any proposed garden/soft landscaped areas. | Low |
| | | | Direct contact | Aggressive chemical attack | ➔ | Building structures and services | It is considered that protection of services notably potable water may be required on this site. Suitable systems include barrier pipe, iron ductile pipework or placement in trenches backfilled with clean imported material. To be advised by Statutory Providers. | Low-Moderate |

| Source | Pollutant | | Pathway | Hazard | | Receptor | Observations/ Recommendations | Assessed Risk |
|---|---|---|---|---|---|---|---|---|
| **Liquid contaminant sources** | Diesel, Petrol and Oils. | ➔ | Direct contact; ingestion, inhalation. | Health risks including skin irritation.<br>Lateral and vertical migration of contaminants. | ➔ | Humans: site workers.<br>Groundwater and surface water. | No significant mobile organic contamination identified on site. | Low |
| **Asbestos** | Asbestos fibres within made ground and waste on site | ➔ | Inhalation. | Health risks including asbestosis, mesothelioma, and lung cancer. | ➔ | Humans: site workers and future occupants. | Asbestos has been identified in a single soil sample retrieved on site.<br>Appropriate PPE should be worn when working with asbestos. | low |
| **Landfill, madeground** | Ground Gases ($CO_2$, $CH_4$) | | Inhalation and ingress into buildings | Asphyxiation and explosions | | Buildings/humans/ future site users | Significantly elevated ground gases have not been noted on site. Gas protection measures are not recommended in new development. | Low |
| **Redundant Waste, Demolition Waste** | | | Dermal Contact/ingestion. Potential for migration via surface water run-off | Health Risks | | Humans: Site workers | Any unwanted waste on site is to be removed from site during site preparatory works and disposed of in accordance with current legislation.<br>WAC results indicate soils are non-hazardous.<br>Normal health and safety precautions. | Low |

## 9 CONCLUSIONS AND RECOMMENDATIONS

Based on the intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn up in respect of the site at Wootton Lane, Wootton, Kent.

- The site has a past history of farm usage since the early 1870s and from the 1970s more recent buildings and light commercial/industrial usages.
- There was considered to be the potential for hydrocarbon and metal contamination as well as asbestos in the soils underlying the site.
- The geology at the site is Clay and Flint over the Seaford Chalk Formation
- The site is set upon a Principal Aquifer and the superficial clay deposits designated as Unproductive Strata.
- Concentrations of toxic metals were generally below their respective soil guideline values.
- Concentrations of phytotoxic metals were all below their respective soil guideline values.
- No significantly elevated PAH or mobile organic concentrations, including Benzo(a)Pyrene were encountered across the site and therefore these contaminants do not pose a significant risk of significant harm to human health.
- Asbestos Containing Material (ACM) has been noted in a single made ground sample retrieved on site and therefore it is possible that further ACM may be present on site particularly within any made ground. Good working practice should be adhered to, along with appropriate PPE, in line with current legislation when safely handling and disposing of asbestos material. For the asbestos a very low but not negligible risk has been calculated from the cumulative exposures to a child receptor resulting in excess lifetime risk of asbestos related diseases. Therefore, it is recommended that measures to reduce the potential for tracking back of soil and dust from existing made ground into houses are appropriate together with the importation of clean certified soils to all private garden areas.
- The risks posed to workers involved in any future redevelopment of the site are not considered significant providing standard health and hygiene practices are adopted.
- The risk to flora on site is considered to be low following the importation of the proposed clean growth media.
- The protection of services, notably potable water, will likely be required on this site. Suitable systems include barrier pipe, iron ductile pipework or placement in trenches

backfilled with clean imported material. It is recommended that the advice of the service provider is sought regarding the most suitable options for the site.

- Based on gas monitoring results, the site is classified as green, meaning that significantly elevated gas concentrations have not been encountered on site and therefore no gas protection measures need be incorporated into any new buildings constructed on the site.

- Based on the WAC testing to date the majority of any soils to be taken off site would be classed as non-hazardous.

- Himalayan Balsam was identified in the southern corner of the site.

Based on the principles and definitions outlined under section 57 of the Environment Act 1995, the site would not be considered to be “Contaminated Land” based on its proposed residential redevelopment end use following implementation of the above remedial measures.

**Appendix 1**
**Window Sample Logs**

**Appendix 2**
**Gas Survey Results**

**Appendix 3**
**Analytical Test Results**

**Appendix 4**
**Guidelines on Contamination Levels**

**Appendix 5**
**Statistics Calculator Test Results Sheets**