Cannock Chase District Council

Environmental Protection Act 1990, Part 2A: Detailed Site Investigation

Landfill site off Hednesford Road, Norton Canes, Staffordshire

December 2010

Prepared for:

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Document Control

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1 INTRODUCTION

1.1 Terms of Reference

In January 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Part 2A Contaminated Land inspection strategy. Part 2A of the Environmental Protection Act 1990 (Part 2A) requires each local authority to inspect areas of land which it believes may constitute Part 2A Contaminated Land.

Grontmij assisted the Council to prioritise a list of sites which could constitute Part 2A contaminated land for inspection, on the basis of the Council's Part 2A Inspection Strategy. The site subject to this report, located off Hednesford Road, Norton Canes, Staffordshire (hereafter referred to as 'the site') was identified as a priority for inspection as:

- The site comprises an area of land which appears to have been infilled with waste material
- The site is considered to be sensitive as 34 residential properties with gardens overly the inferred extent of landfill and the site is underlain by a secondary A aquifer. Additionally, a surface water receptor is present directly east of the inferred landfill boundary

Following the completion of a desktop study (see Appendix A) and a successful application for funding from DEFRA, Grontmij was subsequently appointed by the Council to implement a site investigation, which was undertaken in July 2010. This report presents the findings of the detailed investigation, assesses the significance of the contaminant concentrations detected, and makes recommendations for further work.

This report is subject to the limitations presented in Appendix B.

2 BACKGROUND INFORMATION

2.1 Site Setting

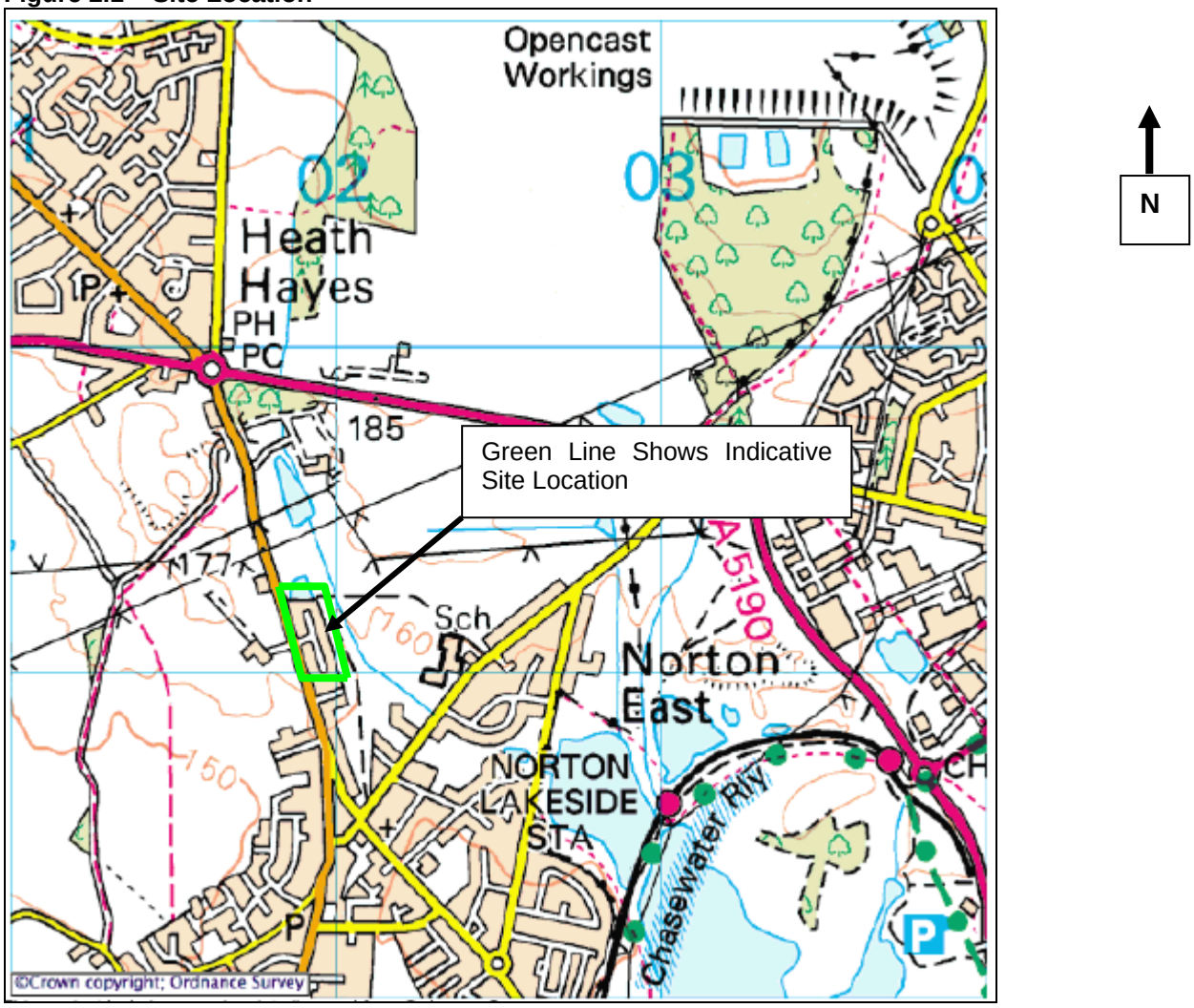
The site's setting and location are summarised in Table 2.1 and Figure 2.1.

During a public consultation exercise, prior to commencement of site work, it was established that the extent of infilling beneath the site may extend further north than historical mapping and Environment Agency records suggest. This increased extent of the site is accounted for in the descriptions below.

Table 2.1 – Site Setting

Data	Information
Address	Landfill site off Hednesford Road, Norton Canes, Staffordshire. Nearest postcode is WS11 9SR
Current site use	Residential houses and gardens.
Grid Reference	Located around 401945, 309053
Site Area	Approximately 0.7 ha
Topography	Site generally slopes towards the south-east at a slight grade
Surrounding land use	North open land, with large pond @ 5m East: open land, with un-named stream @ South: further residential housing adjacent West: Hednesford Road, with open land / residential housing @ 10m
Geology	British Geological Survey (BGS) 1:63,360 map sheet 154 (Lichfield) and the BGS website Geoindex tool indicate the site is underlain by the Middle Coal Measures (interbedded mudstones, siltstones, sandstones and coal seams). The overlying superficial deposits are shown to be Devensian Till; the likely thickness of deposits is not stated.
Hydrogeology	The middle coal measures are regarded as a Secondary A by the Environment Agency
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a source protection zone
Surface Waters	Pond 5m north (upgradient) of site. Unnamed stream is located 10m east of the site and is discharges into Chasewater (man made reservoir) approximately 600m SE
Ecological Receptors	No ecologically sensitive sites, as listed in the Contaminated Land Regulations 2006, identified by a MAGIC search, exist either on, or within a 250m radius of, the site
Historical Land Use	The data provided, including Environment Agency historical landfill site records, indicates that the site was formerly operated as a landfill site from 1938 onwards and was subsequently developed as residential housing around the 1970s. There is no information about the site's operational period or the date the site was developed on Environment Agency "What's In Your Back Yard" website. Infilling of the site probably pre-dates the Control of Pollution Act 1974, meaning that site operations are unlikely to have been subject to licensing.

Figure 2.1 – Site Location



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2.2 Previous Reports

Grontmij has previously completed a desktop assessment of the site, as presented as Appendix A. The assessment included the review of on-line data resources, in-house mapping and records provided by the council, and a site walkover.

The desk study report included an initial Conceptual Site Model (CSM) of potential pollutant linkages, developed in accordance with the model procedures[1] and statutory guidance[2]. The CSM is re-presented as Table 2.2 overleaf.

[1] CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)
[2] DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land:, September 2006.

Table 2.2 - Potential Pollutant Linkages

No.	Receptor	Contaminant(s)	Pathway(s)	Risk of Pollutant Linkage Being Realised	Comments
Human Health					
1	Residents of properties above infilled ground – including children playing in gardens & vegetable consumption	Contaminants including (but not limited to) metals, hydrocarbons, PAHs, VOCs, SVOCs within the made ground.	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium to high risk	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source.
2		Gases arising from decomposition of deleterious elements of the made ground.	Movement into buildings, subsequent asphyxiation (CO2, CH4), explosion (CH4) and toxicity (CO, H2s) risks.	Medium to high risk.	Investigation and monitoring required to determine risk.
Property					
4	Subsurface services serving the buildings (principally water supply)	Contaminants including metals, hydrocarbons, PAHs, VOC, SVOCs within the made ground.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium risk.	Risk will depend on depth and concentration of contaminants and material(s) used for water pipes.
5	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete.	Medium risk	Possible risk but could only reasonably be established if concrete class used to construct buildings can be established (unlikely) – therefore, no testing targeted this area – more relevant for any new planned buildings.
Controlled Waters					
6	Minor aquifer beneath site	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Leaching of chemicals to aquifer	Medium risk	Risk will depend upon depth and concentration of contaminants, presence/absence of confining layers between contaminants and the aquifers, leaching potential etc. Site data needed.
7	Surface waters (pond 5m to north and stream 10m to east)	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Groundwater flow in permeable strata which are in continuity with watercourses	Medium risk	Risk depends upon depth/presence of contaminated groundwater, hydraulic gradient within any impacted groundwater unit, and continuity between impacted groundwater and watercourse. .

3 DETAILED INTRUSIVE INVESTIGATION

In order to further examine the potential pollutant linkages identified in Table 2.2, and following a successful application for DEFRA funding, a detailed site investigation was undertaken on the 5th, 6th and 12th July 2010. This section describes the site investigation undertaken and results obtained.

3.1 Scope and Methodology

The intrusive site investigation included the following:

- A consultation exercise with residents living at the site, including a mailshot and a public open evening;
- Obtaining plans of underground services and CAT-scanning proposed drilling locations, using a Radiodetection CAT1 and signal generator;
- Drilling eight hand held window sample holes (WS1 – WS8) to a maximum depth of 5.0m bgl, at the locations shown on Drawing 1. The window sample holes, which were drilled by Sherwood Drilling Services, were positioned in the rear gardens of housing located above the extent of infill, as indicated on historical mapping and by anecdotal evidence. Borehole positions were selected on the basis of achieving good coverage of the site. The purpose of the window sample holes was to examine shallow and deeper soil conditions, enable the retention of samples for laboratory testing, and facilitate the installation of 50mm diameter dedicated gas monitoring wells in each borehole;
- Logging soil arisings in accordance with BS5930:1999, and additionally noting any visual or olfactory evidence of potential contamination;
- Retaining representative soil samples of the strata encountered, which were selected on the basis of field observations of potential contamination and achieving good spatial and depth coverage of the site
- Submitting retained samples to Alcontrol Geochem in cooled coolboxes and under full chain of custody documentation, and instructing the analysis of samples, and;
- Undertaking four ground gas monitoring rounds, using a Geotechnical Instruments GA2000 gas analyser and flow pod.

3.2 Results

3.2.1 Ground Conditions

The ground conditions encountered at the site generally comprised Made Ground over Glacial Till (encountered as clay) and Glacio – Fluvial deposits (encountered either as sand, or as sand and gravel).

Made Ground
Made Ground was encountered to a maximum depth of 4.0m bgl (in WS2 – borehole termination depth in this hole) and was predominantly granular in nature, consisting of a single sand horizon or interbedded sand, gravel and occasional clay layers and pockets. The gravel content of the Made Ground was highly variable, including fine to coarse ash, burnt shale, glass, mudstone, coal, quartz, coarse grained sandstone, plastic, corroded metal, brick, clinker, ceramic, fabric, wood, slate and leather fragments.

Glacial Till and Glacio – Fluvial Deposits
Encountered within all exploratory holes except WS2 and WS8, from depths ranging between 0.96m and 2.31m bgl, and proven to borehole termination at a maximum of 5.0m bgl. The Glacial Till typically comprised a single horizon of soft to very stiff, sandy slightly gravelly clay. The Glacio - fluvial deposits comprised (variously) sand and gravel, silty sand, clayey sand and gravelly sand. The gravel content of the Glacial Till and Glacio – Fluvial deposits consisted of fine to coarse quartz.

Carboniferous Coal Measures
Weathered residual soils of the solid geology, comprising very stiff clay, were encountered within WS1 only from 3.80m to 5.00m bgl.

Groundwater
Major groundwater ingress was encountered at 0.50m bgl during the excavation of a service inspection pit prior to the drilling of WS6. Moderate groundwater inflow was recorded within WS7 at 1.9m bgl. No other groundwater entries were observed.

The above findings are discussed further in Section 4 (updated CSM). Window sampler hole logs, providing full details of the strata encountered, are included within Appendix C.

3.2.2 Adequacy of Investigation Depth

Superficial deposits (i.e. natural ground) were proven in six of the eight window sampler holes drilled, indicating that the full extent of infill material at the site has been encountered and assessed, and gas monitoring (Section 3.2.5) is likely to be representative of the full body of infill. There is no need to consider further deeper drilling at the site.

3.2.3 Field Evidence of Contamination

The drilling arisings were inspected for visual and olfactory evidence of potential contamination. A summary of field observations recorded is presented in Table 3.1:

Table 3.1 – Field Evidence of Potential Contamination

Exploratory Hole	Visual and Olfactory Evidence of Contamination
WS1	0.23 – 0.68m bgl: burnt shale and ash
WS2	0.76 – 1.09m bgl: burnt shale, clinker and metal 2.54 – 4.00m bgl (EOB): occasional clinker
WS3	0.34 – 0.96m bgl: clinker and metal
WS4	0.00 – 0.96m bgl: ash, slag and burnt shale
WS5	None identified
WS6	0.14 – 1.14m bgl: ash and burnt shale
WS7	0.00 – 2.31m bgl: ash, burnt shale and metal
WS8	0.51 – 1.00m bgl (EOB): ash

EOB = end of borehole

3.2.4 Soil Analysis Results

Twelve samples were submitted for laboratory analysis, under full chain of custody documentation and within chilled coolboxes, to ALcontrol Geochem of Deeside. ALcontrol is UKAS accredited and holds MCERTS accreditation for most analyses performed. The samples were selected for analysis on the basis of the observations of potential contamination made in the field, and to achieve good spatial coverage of the site.

Table 3.1 presents a summary of the analysis results. The results have been compared to screening values protective of human health, assuming the receptor is a residential property where plant uptake of contaminants occurs, and the plants are subsequently ingested by humans. The screening values used in preference comprise:

- 2009 Soil Guideline Values (SGVs) published by the Environment Agency / DEFRA, generated using the latest Contaminated Land Exposure Assessment (CLEA) model, version 1.06
- Generic Assessment Criteria (GAC) published by Land Quality Management Limited (LQM) or the Environmental Industries Commission (EIC), or calculated by Grontmij, all using CLEA 1.06
- SGVs published by the Environment Agency / DEFRA between 2002 and 2007, calculated using prior versions of the CLEA model.

Full analytical testing results are included as Appendix D.

Table 3.1 – Soil Analysis Results Summary

Determinand	No. of Samples Tested	Minimum Value	Maximum Value	SGV / GAC (using 6% SOM where SOM-dependant)[1]	Locations where SGV or GAC are exceeded
Arsenic	**14**	**6.8**	**66**	**32**	**WS7, 0.3m; WS8, 0.6m**
Antimony	14	<0.6	63	550	-
Barium	14	62	660	1300	-
Beryllium	14	1.02	14	51	-
Boron (water-soluble)	14	1.03	10	291	-
Cadmium	14	0.33	4.4	10	-
Chromium, hexavalent	**14**	**<0.60**	**6.0**	**4.3**	**WS7, 0.1m**
Chromium, total	14	8.1	74	3,000	-
Copper	14	21	720	2,330	-
Lead[2]	**14**	**34**	**790**	**450**	**WS7, 0.3m**
Mercury[3]	14	<0.14	<0.14	1	-
Nickel	**14**	**10**	**150**	**130**	**WS7, 0.3m**
Selenium	14	<1	2.3	350	-
Vanadium	**14**	**14**	**89**	**75**	**WS7, 0.3m**
Zinc	14	68	2000	3,750	-
Cyanide	6	<1	<1		-
Thiocyanate	6	<1	<1		-
Asbestos screen	6	No fibres detected in any sample			-
Benzene	6	<0.01	<0.01	0.33	-
Toluene	6	<0.01	<0.01	610	-
Ethyl Benzene	6	<0.01	<0.01	350	-
Xylene[4]	6	<0.01	<0.01	230	-
TPH – CWG[5]	6	11	1800	various	-
Phenols	6	<0.01	<0.01	420	-
Polyaromatic Hydrocarbons (PAHs)[6]	3	2.9	9.9	various	-
Volatile Organic Compounds and Semi-Volatile Organic Compounds (excl above)	3	No screening values exceeded, where such screening values have been published			-

Values presented in mg/kg, correct to two significant figures (screening values presented without any rounding). **Bold values** indicate locations where observed concentrations exceed the screening value.

[1] Six samples were tested for Soil Organic Matter (%SOM) content. A minimum value of 4.79% and a maximum of 55% were recorded, with a mean of 19% and a median of 11%. It is therefore justified, as a minimum, to use the SGVs and GAC generated using a 6% SOM value in CLEA in an initial screen

[2] SGV quoted was generated by DEFRA using earlier version of CLEA. A value using the latest version of CLEA is awaited

[3] Testing results presented represent total mercury. SGV presented is for elemental mercury, the most stringent of the elemental, inorganic and methyl mercury SGVs

[4] SGV for para-xylene quoted (worst case of the three isomers)

[5] Testing values quoted are for total TPH across all aromatic and aliphatic bands (C5-C35). None of the TPH-CWG screening criteria for individual aliphatic and aromatic bands were exceeded by the corresponding banded analyses

[6] Testing values quoted are for total PAHs. None of the individual PAH compound screening criteria were exceeded by the laboratory analyses

The concentrations of heavy metals in soils at the site exceed the generic screening values adopted.

3.2.5 Soil Leachate Analysis Results

Three soil samples were submitted for soil leachate analysis (BS12457 2:1 single stage test) at Alcontrol. Table 3.2 presents a summary of the analysis results. The results have been compared to threshold values quoted in the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 ("WFD values") and, where no WFD standard exists, UK Environmental Quality Standards (EQSs) protective of aquatic plants and animals in surface watercourses.

Full analytical testing results are included in Appendix D.

Table 3.2 – Soil Leachate Analysis Results Summary

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	EQS (freshwater)	WFD values
Arsenic (mg/l)	3	<0.01	0.01	0.05	0.05
Boron (mg/l)	3	0.55	0.93	2.0	n/s
Cadmium	3	0.11	0.59	5	0.45 to 1.5 **
Chromium	***3***	***3.3***	***33***	***5 – 250****	***32******
Copper	***3***	***5.3***	***5.6***	***1 - 28****	***1 - 28****
Lead	3	0.29	1.2	4 - 250**	7.2
Nickel	3	8.8	13	50 - 200**	20
Vanadium	***3***	***3.1***	***25***	***20 – 60****	***n/s***
Zinc	***3***	***26***	***180***	***8 - 500****	***8-125****
Mercury	3	<0.01	<0.01	1	0.07
Volatile Organic Compounds and Semi-Volatile Organic Compounds (incl PAHs)	2	All results <detection limit		Various	

Values are presented as µg/l unless stated, and are rounded as applicable to EQS values. ***Bold and italic values*** indicate testing results in excess of screening values.
** value adopted is dependant upon hardness of the water
*** quoted as a 95th percentile standard, i.e. value can be exceeded up to 5%of the time without being considered a "fail"
n/s – no standard

The maximum concentrations of four metals in leachate exceeded the corresponding screening values (or rather, the exceedances are of the low end of quoted screening value ranges). The absolute EQS value to be adopted at a given site is dependant upon the hardness of surface water at the site.

3.2.6 Ground Gas Monitoring

Four rounds of ground gas monitoring were undertaken, using a Geotechnical Instruments GA2000 gas analyser with flow pod. A summary of the gas monitoring results is presented in Table 3.3, with full monitoring data in Appendix E:

Table 3.3 – Summary of Gas Monitoring Data

Well	Maximum Values Recorded During Monitoring Events:					Gas Screening Value[1] (l/hr)	Situation "A" Characteristic Situation[1]
	Peak CH_4 (%)	*Steady CO_2 (%)*	*Steady CO (ppm)*	*Steady H_2S (ppm)*	*Flow (l/hr)*		
WS1	0	2.2	0	0	0.1	0.002	1
WS2	0	7.3	0	0	0.1	0.007	1 (see text below)
WS3	0	8.1	0	0	0.1	0.008	2 (see text below)
WS4	0	4.1	0	0	0.1	0.004	1
WS5	0	3.6	0	0	0.2	0.007	1
WS6	0	2.0	0	0	0.2	0.004	1
WS7	0	4.0	0	0	- 0.1	0.004	1
WS8	0	3.5	0	0	0.3	0.011	1

Atmospheric Pressure:		
	28/07/2010	996mb (steady trend throughout day)
	11/08/2010	991mb (rising trend throughout day)
	25/08/2010	993mb (falling trend throughout day)
	08/09/2010	982mb (rising trend throughout day)

Readings obtained within a 3 minute measurement period, obtained with a Geotechnical Instruments GA2000plus gas analyser.
CH_4 – methane; O_2 – oxygen; CO_2 carbon dioxide; CO – carbon monoxide;
H_2S – hydrogen sulphide; mbgl – metres below ground level mb – millibars l/hr – litres per hour.
[1]CIRIA Characteristic Situation based on methodology presented in CIRIA Report C665, Assessing Risks Posed by Hazardous Gases to Buildings. Where the flow rate recorded in the field is zero or negative, a flow of 0.01 l/hr is assumed

The summary data presented above indicates that, in regard to methane and carbon dioxide, CIRIA characteristic situation CS1 should be applied to the majority of the wells. This is the lowest risk category (of six) presented in CIRIA report 665, and indicates that no special gas precautions would be required in the construction of new buildings.

In regard to WS2 and WS3 - CIRIA report 665, Table 8.5, indicates that the assessor should consider increasing the applied characteristic situation from CS1 to CS2 if the recorded CO2 concentration is not "typically <5%". The CO2 concentrations recorded on each gas monitoring event (see Appendix E) were as follows:

- WS2: 2.0%, 7.3%, 3.3%, 2.3%
- WS3: 7.8%, 7.0%, 8.0%, 8.1%

The above data indicates that it is reasonable to apply CS1 to WS2, but CS2 should apply to WS3. Where CS2 applies, CIRIA report 665 indicates that basic gas protection measures should be installed when new buildings are constructed. Gas protection to a CS2 standard could comprise, for example, a reinforced concrete slab with a standard 1200g damp proof membrane and underfloor venting.

It is possible that basic gas protection measures such as those outlined above were incorporated when the properties at the site were constructed. As the properties at the site comprise bungalows, constructed around the 1970s, it is unlikely that the properties include cellars, where the risk of CO2 accumulation, and subsequent asphyxiation, is the greatest. Additionally, while the infill material encountered contained ash, burnt shale and some wood fragments, which may generate moderate ground gas concentrations in small quantities, the infill did not contain domestic waste, extensive amounts of wood, paper or similar material that is likely to decay and generate significant concentrations of harmful gases.

On the balance of evidence, methane and carbon dioxide are unlikely to pose a risk to the housing at the site.

Additionally, carbon monoxide and hydrogen sulphide were not detected at concentrations in excess of the gas analyser detection limit, indicating that the toxic inhalation risks posed by these gases is negligible.

3.2.7 Safety of Water Supply Pipes

The soil quality data obtained has been screened against Water Regulations Advisory Scheme (WRAS) thresholds, above which "special consideration of the material used" for the water pipe should be given. The results of the screening exercise are presented in Table 3.4 below.

Table 3.4 – WRAS Threshold Screen

Analyte	Test Result (mg/kg)		WRAS Threshold Value (mg/kg)
	max	Mean (where max>threshold))	
Sulphate	Not analysed	-	2000
Sulphur	Not analysed	-	5000
Sulphide	Not analysed	-	250
pH	5.97 – **8.35**	7.3	<5 or **>8**
Antimony	**63**	**19**	**10**
Arsenic	**66**	**18**	**10**
Cadmium	**4.4**	1.0	**3**
Chromium (hexavalent)	6.0	-	25
Chromium (total)	74	-	600
Cyanide (free)	<1	-	25
Cyanide (complexed)	<1	-	250
Lead	**790**	140	**500**
Mercury	<0.14	-	1
Selenium	2.3	-	3
Thiocyanate	<1	-	50
Coal Tar	Not analysed	-	50
Cyclohexane extractable	Not analysed	-	50
Phenol	<0.01	-	5
Polyaromatic Hydrocarbons	9.9	-	50
Toluene extractable	<0.01	-	50
Petroleum Hydrocarbons	**1800**	**470**	**50**

The maximum concentrations of antimony, arsenic, cadmium, lead and petroleum hydrocarbons, and the maximum soil pH level recorded, exceed the WRAS threshold values. The mean concentrations of antimony, arsenic and petroleum hydrocarbons recorded also exceed the WRAS threshold values

Further investigation of the materials used for water supply pipes at the site, and possibly testing for further analytes, will be required.

The results of the intrusive investigation and monitoring are discussed in more detail in the following section.

4 UPDATED CONCEPTUAL SITE MODEL

4.1 Introduction

The CSM presented in the earlier Grontmij desk study report (Appendix A) was updated, using the findings of the site investigation, as presented in the following sections.

4.2 Contaminants

The “contaminants” term in the conceptual model has been evaluated by comparing the chemical analysis results obtained during the site investigation with published generic screening values (Tables 3.1, 3.2 and 3.4).

The following contaminants were detected in soil at concentrations in excess of the screening values relevant for a residential site with plant uptake:

- Arsenic, hexavalent chromium, lead, nickel, vanadium

The following contaminants were detected in leachate at concentrations in excess of the hardness-dependant UK Environmental Quality Standards for freshwater (EQS).

- Chromium (total), copper, vanadium and zinc

The following contaminants were detected in soil at concentrations in excess of WRAS standards, protective of water distribution pipework:

- Antimony, arsenic, cadmium, lead, petroleum hydrocarbons and soil pH (as site maxima)
- Antimony, arsenic and petroleum hydrocarbons (as mean concentration)

Low concentrations of methane, carbon monoxide and hydrogen sulphide were recorded, along with low gas flow rates. Although localised, slightly elevated carbon dioxide concentrations were recorded, on the balance of available evidence (including the composition of the infill material), it is considered that ground gas poses a negligible risk to residents at the site.

4.3 Receptors

Table 4.1 indicates the receptors considered to be present at the site. The critical human receptor is the on-site resident; while off-site residents and commercial workers are also present, the concentrations of contaminants and, in the case of commercial workers, their exposure frequency and duration, is likely to be less than on-site residents, and are not considered further.

See Appendix A (desk study report) for a detailed discussion of the receptors included in the conceptual model.

4.4 Pathways

Pathways (pollutant linkages) are also examined as part of Table 4.1, overleaf.

Table 4.1 – Pollutant Linkages, Post-Site Investigation

Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage[1]	Probability of Linkage Occuring[1]	Overall Risk[1]	Comments
Residents of properties above infilled ground – including children playing in gardens	Concentrations of metals in made ground, in samples taken from ground level to 0.60m bgl, exceed generic screening values	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium	Likely	Moderate	Risk rating could be refined by site-specific risk assessment, statistical analysis and a sanity check of risk – see Section 5
	Ground gases - generally low concentrations & flows encountered	,Movement into buildings, subsequent asphyxiation (CO2, CH4), explosion (CH4) and toxicity (CO, H2s) risks	Severe	Unlikely	Low/moderate	No further assessment required (risk level of "low/moderate" is the lowest possible rating where the potential severity of the hazard is considered "severe")
Subsurface services serving the buildings (principally water supply)	Concentrations of metals and hydrocarbons, and soil pH value, within made ground exceed WRAS guideline values	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium	Low	Low / Moderate	South Staffordshire Water has confirmed that contaminant resistant pipework is always laid where laboratory testing results (carried out by South Staffordshire Water) indicate the need. The water company also carries out routine testing of water quality at consumer taps (odour and taste assessment), and investigates any problems identified. As a precaution, Cannock Chase District Council has written to South Staffordshire Water to ask that properties within the site are included on a routine testing schedule. The water company has responded to indicate that such testing is not routinely undertaken, but any problem would potentially be detected by routine taste and odour monitoring (particularly in regard to hydrocarbons). To confirm the current exposure to residents, it is proposed that analysis of tap water samples is undertaken, with the results compared to UK drinking water standards. See Section 7

Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage[1]	Probability of Linkage Occuring[1]	Overall Risk[1]	Comments
Secondary A aquifer beneath site (Coal Measures)	Leachable concentrations of metals within made ground exceed the low end of the hardness-dependant EQS ranges	Vertical contaminant migration within unsaturated zone (Made Ground and superficial deposits)	Mild	Low to likely	Low	Logs generally indicate clay (as superficial deposit or weathered coal measures) beneath the made ground. WS2 indicates generally granular made ground to termination (4.0m bgl) so pathway is still possible. However, recorded leachable concentrations are not excessively elevated and adoption of EQSs as screening value for a secondary aquifer is a conservative measure. Thus, due to the low sensitivity of the aquifer, no further assessment is considered necessary
Unnamed stream located directly east of the site; pond 25m to north of site	Leachable concentrations of metals within made ground exceed the low end of the hardness-dependant EQS ranges	Lateral migration of any impacted perched groundwater within Made Ground to watercourses	Medium	Low to likely	Moderate	Pond is up-gradient of site and unlikely to be impacted by dissolved contaminants migrating in any continuous groundwater unit. Stream is likely to be in hydraulic continuity with made ground in parts of the site – especially WS2. Metals could theoretically leach to the stream. Next step of assessment should be hardness testing of surface waters to confirm the absolute screening values to be applied, coupled with testing of samples from stream, to examine actual dissolved contaminant concentrations in the receptor. See section 6

1 Taken from Table 6.3, CIRIA report 552 (Contaminated Land Risk Assessment – A Guide to Good Practice. Severity classified as minor, mild, medium or severe. Probability classified as unlikely, low, likely or high. Overall risk considers both the severity and probability of the linkage (very low, low, moderate, high or very high). See Appendix F for further details

5 STATISTICAL ANALYSIS OF HUMAN HEALTH RISK

The site investigation has established that the concentrations of arsenic, hexavalent chromium, lead, nickel, vanadium (hereafter "contaminants of concern" or "COC") exceed generic screening values applicable to the generic residential housing scenario, where plants are grown for human consumption.

Generic SGVs and GAC are used to examine whether significant possibility of significant harm ("SPOSH" - i.e. unacceptable risk to human health or the environment) *may* be posed at any given site in England or Wales. The SGVs and GAC have been derived using the CLEA model by various parties (see Section 3.2.3), using conservative input parameter values to generate screening values applicable, theoretically, to all UK sites. Therefore, an exceedance of a SGV or GAC does not necessarily mean that SPOSH exists - only that the generic, conservative screening value has been exceeded, and further assessment is required. The first step of detailed analysis taken comprises a statistical assessment of the data obtained.

5.1 Statistics and Part 2A

Guidance regarding how data collection, data review and statistical testing interact to produce defensible conclusions regarding the condition of land is provided within Part 2A of the Environmental Protection Act 1990 and *Guidance on Comparing Soil Contamination Data with a Critical Concentration*[3] *("the guidance")*. The core concept behind this guidance, with respect to potential Part 2A sites, is whether the level of contamination identified on a site can be confidently assessed as high compared to a suitable measure of risk, for example SGVs, GAC or site-specific assessment criteria (SSAC) derived by a quantitative risk assessment.

The statistical testing approach requires that the assessment of the significance of the identified contamination is addressed through the use of formal hypotheses, the Null Hypothesis (H_0) and the Alternative Hypothesis (H_1). Statistical tests are formulated in order to be able to demonstrate, at a particular level of confidence (typically 95%), which of the hypotheses is most likely to be true in a given situation. In the investigation of potential Part 2A sites, the guidance identifies that the Null and Alternative Hypotheses are as follows:

- H_0: the level of contamination at the site is the same as or lower than the critical concentration; and
- H_1: the level of contamination at the site is higher than the critical concentration.

Part 2A decisions can be made on the basis of the 'balance of probabilities'. As a consequence, if the Null Hypothesis cannot be rejected at the 95% confidence level, defensible decisions can still be made at a lower confidence level of 51% or more.

The *Guidance on Comparing Soil Contamination Data with a Critical Concentration* document provides suggested methods of analysing site investigation data, including appropriate statistical tests depending on the distribution of the data.

[3] The Chartered Institute of Environmental Health, CL:AIRE and The Soil and Groundwater Technology Association; May 2008.

5.2 Statistical Testing Methodology

The statistical analysis was completed in accordance with the principles and methods identified in *Guidance on Comparing Soil Contamination Data with a Critical Concentration.*

5.2.1 Averaging Areas

Based on the history and current nature of the site, statistical analysis was completed on all soil chemical data from the site, which was analysed as one dataset.

5.2.2 Contaminants of Concern Analysed

The concentrations of arsenic, hexavalent chromium, lead, nickel, vanadium recorded at the site were subjected to statistical analysis in order to determine their significance.

5.2.3 Dataset Management

In accordance with the guidance, chemical analysis results recorded below the laboratory Method Detection Limit (MDL) were replaced within the dataset with values equal to the MDL in order to be conservative.

5.2.4 Sample Mean and Critical Concentration

The initial stage of the statistical testing involves analysis of the relationship between the dataset sample mean and the critical concentration (C_c) for each CoC. If the CoC sample mean is less than the C_c (equal to the SSAC for the particular CoC), the 95 % lower confidence limit of the sample mean must also be less than the C_c and consequently the Null Hypothesis cannot be rejected.

Comparison of the sample means with the C_c has been completed for each of the CoC using the SSAC calculated for residents at the site with consumption of home-grown vegetables, as summarised in Table 5.1:

Table 5.1 - Comparison of Sample Mean with Critical Concentrations

CoC	Sample Size	Sample mean (mg/kg)	C_c (SGV or GAC) (mg/kg) [2]	Test Result
Arsenic	12	18	32	Sample mean < C_c
Chromium (hexavalent)	12	1.3	4.3	Sample mean < C_c
Lead	12	138	450	Sample mean < C_c
Nickel	12	38	130	Sample mean < C_c
Vanadium	12	38	75	Sample mean < C_c

Notes:
C_c = Critical concentration. All critical concentrations equate to the SGVs or GAC adopted in the initial data screen undertaken in Table 3.2

The initial statistical analysis identified that the sample mean was less than the critical concentration for all CoCs, and thus, the Null Hypothesis cannot be rejected. The average concentration of all CoCs is therefore unlikely to be greater than C_c, and all CoCs can be discounted. No further statistical analysis is required.

5.3 Discussion

Statistical analysis has been completed. The statistical analysis identified that the sample mean is less than the critical concentration for all of the identified CoC, and therefore H_0

should not be rejected for these CoC. Consequently, no further consideration of the CoC, including identification of possible outliers, was necessary.

6 SURACE WATER ANALYSIS

6.1 Introduction

The site investigation identified that the leachable concentrations of metals (chromium, copper, vanadium and zinc) within made ground exceed the low end of the hardness-dependant environmental quality standard (EQS) ranges and/or threshold values quoted in the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 (WFD). The surface watercourse to the east of the site could potentially contain unacceptable concentrations of dissolved metals, if leachate was to reach the groundwater table and migrate to the watercourse. The expected groundwater flow direction would be towards the surface watercourse (i.e. east).

In order to determine whether the predicted (i.e. leachable) concentrations of metals are representative of actual dissolved metal concentrations in the surface watercourse, surface water samples were collected and analysed. This section describes the sampling undertaken and the results obtained.

6.2 Methodology

Surface water grab samples were obtained on 26th October 2010 by a Grontmij consultant. Samples were obtained from two positions, one where the watercourse is closest to the site and another in a location downstream (south) of the majority of the site. The positions where samples were collected are shown on Drawing 1.

The samples were submitted to Alcontrol Geochem of Hawarden for dissolved metals analysis. Hardness analysis was also requested, as the EQS or WFD is in some cases dependant on hardness.

6.3 Results

The analytical testing results are summarised in Table 6.1, along with applicable screening values for surface watercourses. Where possible, the definitive WFD screening values (in some cases based upon water hardness) have been used in preference to the older EQS values, which require the Environment Agency to determine the hardness-specific value to adopt.

Table 6.1 – Surface Water Analysis Results and Screening

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	Screening Value
Arsenic	2	0.71	0.83	50
Boron	2	330	380	2000*
Cadmium	2	<0.10	<0.10	0.25**
Chromium	2	2.3	2.3	3.4
Copper	2	2.1	2.6	10**
Lead	2	0.13	0.15	7.2
Nickel	2	3.7	4.0	20
Vanadium	2	0.79	1.0	20 – 60*
Zinc	2	8.2	9.8	75**
Mercury	2	<0.01	<0.01	0.05
Hardness (**mg/l**)	2	230	260	n/a

Values are presented as µg/l unless stated, and are rounded as applicable to EQS values.
*EQS presented, as there is no corresponding value within WFD document
**Hardness-dependant WFD values, based upon the most stringent hardness testing result (i.e. 230mg/l)

6.4 Conclusion

The analytical testing results were all less than the corresponding screening values, indicating that the concentrations of contaminants within the watercourse are acceptable.

This in turn indicates that unacceptable concentrations of contaminants are not leaching from the site and migrating to the surface watercourse. No further assessment is required.

7 SAMPLING OF WATER AT RESIDENTS' TAPS

7.1 Introduction

One aspect of the investigation was to assess whether the concentrations of contaminants in the ground posed a potential risk to drinking water pipes. Certain contaminants can either attack the pipework or permeate through the pipe material.

Currently, the only available guidance on "safe" contaminant levels in regard to water pipes is held in Water Regulations Advisory Scheme (WRAS) report "The Selection of Materials for water Supply Pipes to be Laid in Contaminated Land", October 2002. An exceedance of the threshold levels published in the above document indicates that careful consideration of the materials used for water pipework is required.

The site investigation identified that the maximum concentrations of antimony, arsenic, cadmium, lead and petroleum hydrocarbons, and the maximum soil pH level recorded, exceed WRAS threshold values. The mean concentrations of antimony, arsenic and petroleum hydrocarbons recorded also exceed the WRAS threshold values.

While South Staffordshire Water are able to confirm the materials used for water distribution pipework in the highway, the water company is not responsible for local connections to their mains, which were probably made at each property by the builder(s) of the houses at the site. As it would be problematic to excavate trial trenches across the site in an attempt to discover the materials used for water pipework (including local connection pipes laid by builders), it was agreed that sampling drinking water was the most appropriate means of evaluating whether unacceptable concentrations of contaminants were entering the drinking water supply.

Cannock Chase Council approached South Staffordshire Water to ask that the site is included in any regime of ongoing planned sampling of drinking water quality. Unfortunately, the water company is unable to accommodate such testing. It was therefore decided that samples of drinking water should be obtained as part of this investigation.

7.2 Methodology

Grontmij visited the site on 10th December 2010 to obtain samples from the kitchen taps of five properties at the site. Wherever possible, samples were taken from the properties where the highest contaminant concentrations had been recorded during the earlier soils investigation.

At each house, the tap was allowed to run for approx 30 seconds, and a sample taken. Samples were collected in phials, glass bottles and plastic bottles provided by the laboratory, Alcontrol Geochem. The samples were dispatched to the lab in chilled coolboxes under full chain of custody documentation. The samples were tested for dissolved metals and hydrocarbons, as these were the contaminants which were recorded in soil at concentrations in excess of the WRAS threshold values. The testing results were compared to guidelines in operation in the UK, comprising drinking water standards (Water Supply Water Quality Regulations 2000) and "Groundwater – Drinking Water Protected Areas" threshold values within the Water Framework Directive (WFD) Directions 2010. While the WFD Directions values are protective of groundwater rather than water at consumer's taps, the WFD values are in some cases more stringent than UK drinking water standards, hence both sets of standards have been used.

7.3 Results

A summary of the laboratory analysis results is presented in Table 7.1, along with details of corresponding UK Drinking Water Standards (DWS) and thresholds published in the Water Framework Directive Directions 2010. Full laboratory results are included in Appendix D.

Table 7.1 – Tap Samples – Chemical Analysis Results Summary

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	UK Drinking Water Standard	WFD Groundwater*
Antimony	5	0.35	1.0	5.0	No standard
Arsenic	5	1.8	2.0	10	7.5
Boron	5	110	130	1000	750
Cadmium	5	<0.10	0.16	5.0	3.75
Chromium	5	11	11	50	37.5
Copper	5	11	120	2000	1500
Lead	5	0.10	0.17	10	19
Nickel	5	1.1	2.1	20	15
Zinc	5	11	16	5000	3750
Mercury	5	<0.01	<0.01	1.0	0.75
Banded Hydrocarbons	5	<detection limit	<detection limit	10**	No standard

Results all expressed as ug/l, correct to two significant figures
* "Groundwater – Drinking Water Protected Areas" from Part 8 of the Water Framework Directive Directions 2010
** The drinking water standard of 10ug/l has been withdrawn, but in the absence of other guidance, we have assumed that 10ug/l would be adopted by regulators

The above results indicate that the water quality at consumer's taps at the site is compliant with current legislation, and therefore contaminants in the soil do not appear to be adversely affecting the water pipes at the site.

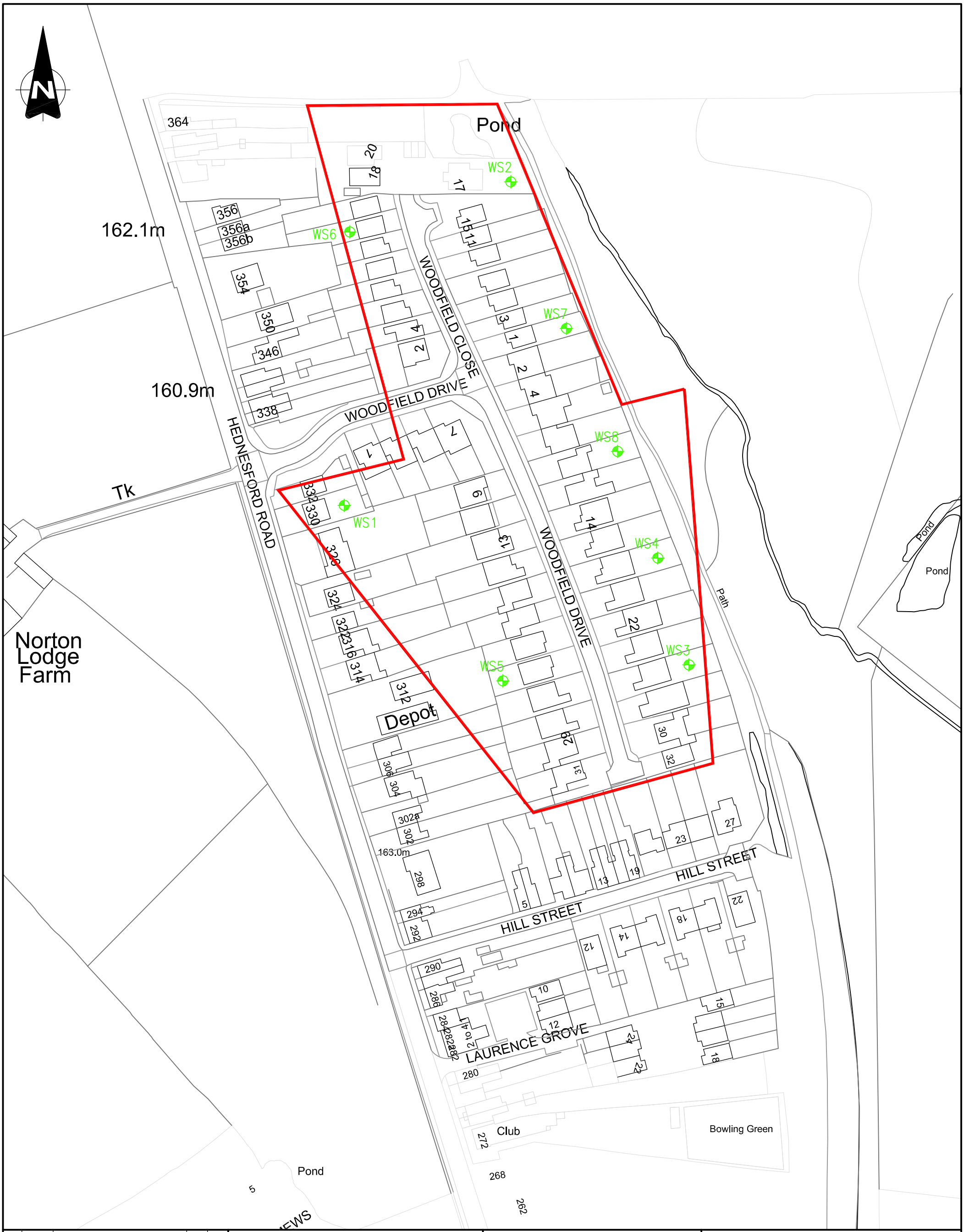
No further assessment is considered necessary.

8 SUMMARY AND CONCLUSION

- Review of historical mapping and EA records provided to Cannock District Council, plus anecdotal evidence obtained during public consultation, identified that land off Hednesford Road in Norton Canes, Staffordshire was infilled with unknown waste material which potentially posed a risk to human health and controlled waters.
- A detailed investigation identified that concentrations of metals in Made Ground exceeded generic human health screening criteria. However, statistical analysis demonstrated that the likely average concentrations of contaminants beneath the site do not exceed the generic human health screening criteria. Therefore, it is unlikely that the concentrations of contaminants beneath the site pose a risk to human health.
- The detailed investigation identified that leachable concentrations of contaminants exceeded screening values protective of groundwater quality. However, the aquifer beneath the site, within coal measures, is of low sensitivity, and the adopted screening values are considered to be overly conservative. Therefore, no further assessment in regard to groundwater is necessary.
- Soil leachate contaminant concentrations also exceed generic screening values protective of aquatic life in surface waters. Contaminants could migrate to a stream, located approximately 10m from the eastern site boundary at its closest point. Surface water samples were collected from the stream and analysed at the laboratory. The dissolved contaminant concentrations did not exceed surface water quality standards. Therefore, it is unlikely that significant concentrations of contaminants are leaching from the site and migrating to the stream, and no further assessment is necessary.
- Concentrations of contaminants within made ground exceed the generic screening criteria for contaminant permeation adopted by water companies. Samples of drinking water were taken from five consumers' taps. Drinking water quality at the site is good, and contaminants in the soil do not appear to be adversely affecting the drinking water supply. No further assessment is considered necessary.
- Gas monitoring has identified that the concentrations and flow rates of hazardous gases beneath the site are unlikely to pose a human health or explosion risk to the housing at the site. No further assessment in regard to gas is necessary.

On the basis of the preceding assessment and the limitations listed in Appendix B, we consider that the site is suitable for its current use, and should not be declared contaminated land under Part 2A of the Environmental Protection Act 1990.

DRAWINGS



No.	Date	Revision	By	Chk
0	15/10/10	First Issue	MC	MH

Drawn:	Checked:	Approved:	Date:
MC	MH	GVT	15/10/10

File Ref : 103912-001	Drawing No : DRAWING 1	
Original Size: 420x297 - A3	Scale : 1:1250	Rev : 0

KEY:

INFERRED EXTENT OF INFILL

WS1 WINDOW SAMPLER BOREHOLE

Client / Project

Cannock Chase Council

Title

BOREHOLE LOCATION PLAN

Drawing Status

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APPENDIX A

Cannock Chase District Council

Environmental Protection Act 1990, Part IIa: Initial Desktop Study and Site Walkover

Landfill site off Hednesford Road, Norton Canes, Staffordshire

January 2010

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Document Control

Report Reference	Issue Date	Reason for Issue		Prepared by	Checked by	Approved by
HedDTS/V1/2010	21/01/10	First Issue	Signature			
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1 INTRODUCTION

1.1 Terms of Reference

In January 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Contaminated Land inspection strategy. Part IIa of the Environmental Protection Act 1990 (Part IIa) requires each local authority to inspect areas of land which it believes may be Part IIa Contaminated Land.

The scope of work agreed between Grontmij and the Council included:

- Prioritisation of an initial list of potentially contaminated sites for intrusive investigation work, based upon the sensitivity of each site, using existing limited desktop study data provided by the Council, and
- Production of Desktop Study reports for priority sites, to improve the understanding of the sites and inform the planning of intrusive site investigations.

This report presents the findings of a desk study review at a site located off Hednesford Road, Norton Canes, Staffordshire. The site location is shown on Drawing 1.

The site comprises an area of land which appears to have been infilled with waste material. The site is considered to be sensitive as 34 residential properties with gardens overly the inferred extent of landfill and the site is underlain by a minor aquifer. Additionally, a surface water receptor is present directly east of the inferred landfill boundary

This report is subject to the limitations presented in Appendix A.

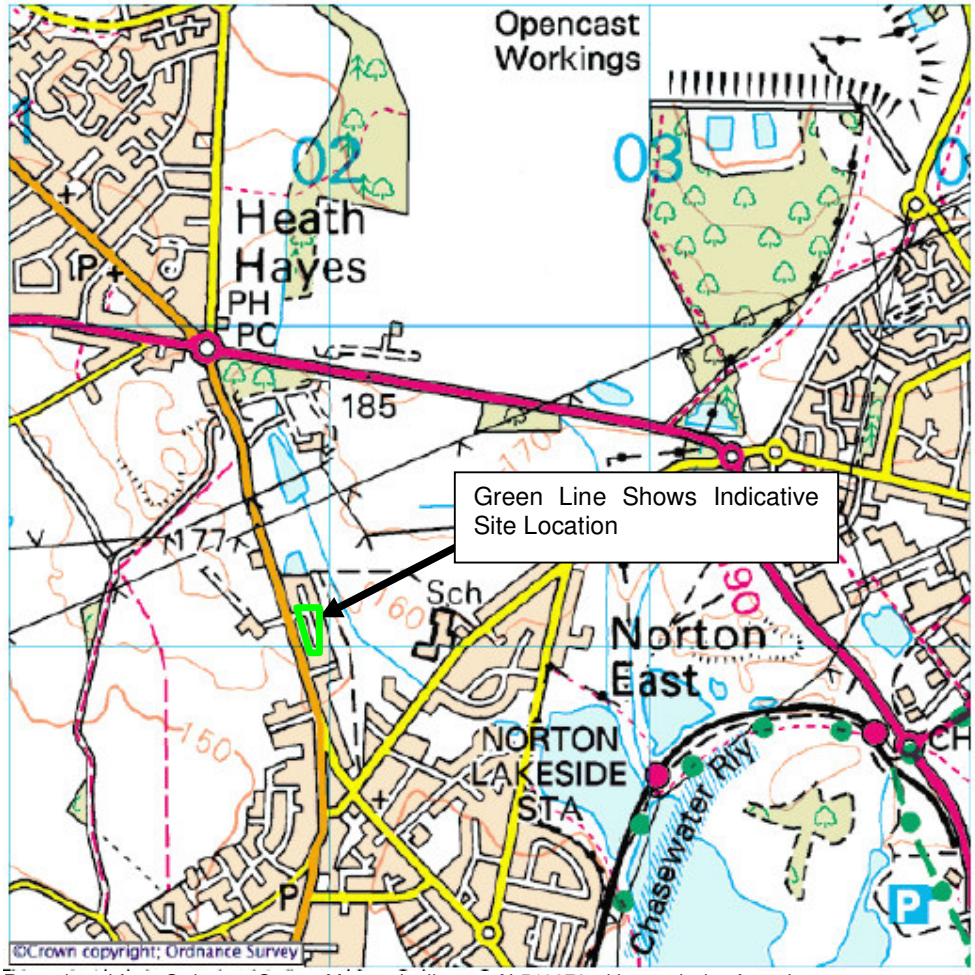
2 SITE SETTING

The site's setting and location are summarised in Table 2.1 and Figure 2.1.

Table 2.1 – Site Setting

Data	Information
Address	Landfill site off Hednesford Road, Norton Canes, Staffordshire. Nearest postcode is WS11 9SR
Current site use:	Residential houses and gardens.
Grid Reference:	Located around 401945, 309053
Site Area:	Approximately 0.7 ha
Topography:	Generally towards the east
Surrounding land use	Residential properties with gardens to north and south. Hednesford Road to the west and a railway (possible disused) and unnamed water course to the west
Geology	British Geological Survey (BGS) 1:63,360 map sheet 154 (Lichfield) and the BGS website Geoindex tool indicate the site is underlain by the Middle Coal Measures (interbedded mudstones, siltstones, sandstones and coal seams). The overlying superficial deposits are shown to be Devensian Till; the likely thickness of deposits is not stated.
Hydrogeology	The middle coal measures are regarded as a minor aquifer, by the Environment Agency
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a source protection zone
Surface Waters	Unnamed stream is located directly east of the site and is discharges into Chasewater (man made reservoir) approximately 600m SE
Historical Land Use	The data provided, including Environment Agency historical landfill site records, indicates that the site was formerly operated as a landfill site from 1938 onwards and was subsequently developed as residential housing around the 1970s. There is no information about the site's license, operational period or the date the site was developed on Environment Agency "What's In Your Back Yard" website.
Walkover	No evidence of contamination evident, although not surprising as the site is fully redeveloped as a residential estate

Figure 2.1 – Site Location



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Plan is not to scale.

3 PRELIMINARY CONCEPTUAL MODEL

3.1 Introduction

This section of the report presents a preliminary contaminated land assessment, on the basis of the available desktop data. The assessment presents an evaluation of the potential risks posed, should contaminants be present in the soil or groundwater beneath the site.

In the context of the Environmental Protection Act 1990 (EPA90), the Water Act 2003 and associated guidance[1,2], a preliminary (contaminated land) risk assessment should focus on whether the land at a subject site meets the statutory definition of Contaminated Land. Part IIA of the EPA90, as amended by the Water Act 2003, defines Contaminated Land as:

- *"any land which appears to the local authority in whose area it is situated to be in such condition by reason of substances in, on or under the land, that:*
- *significant harm is being caused or there is a significant possibility of significant harm being caused; or*
- *significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused*

The procedure for assessing contaminated land involves the development of a Conceptual Site Model (CSM) comprising the assessment of potential Contaminants, Pathways and Receptors.

3.1.1 Sources of Contaminants

The "contaminants" term in the conceptual model has been evaluated by inspection of existing desktop study data provided by Cannock Chase District Council, and a preliminary site walkover. The following potential sources of contaminants have been identified:

- An infilled area of land, which could contain contaminants including (but not limited to) metals, hydrocarbons, polyaromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs)
- Methane and carbon dioxide gas, from the decomposition of any deleterious material within the made ground

[1] CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)
[2] DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land:, September 2006.

3.1.2 Receptors

DEFRA Circular 02/2006 defines a Receptor as:

- *"either (a) a living organism, a group of organisms, an ecological system or a piece of property which (i) is in a category listed in Table A as a type of receptor, and (ii) is being, or could be, harmed, by a contaminant; or (b) controlled waters which are being, or could be, polluted by a contaminant".*

Table 1.1 lists all of the receptors to be considered by a Part IIA or PPS23[3] assessment, and assesses whether the receptors are likely to be present at the site.

Table 3.1 - Potential Receptors

Receptor Type	Receptors	Present (✓ /✖)	Notes
Humans	On-site residents	✓	Residential properties (houses and gardens) above indicative extent of landfill. Assumed to have vegetable patches.
	Construction staff and SI personnel.	X	No known redevelopment proposed
	Future occupants of the site	✓	(level of risk same as current residents so not considered further)
	Off site commercial workers or residents	✓	Possibly exposed to gases migrating off-site through permeable strata
Ecosystems	Any designated ecological system[4], or living organism forming part of such a system	X	Inspection of MAGIC website has identified that the site does not lie within, or within 250m of, an ecologically designated site.
Property (Flora and Fauna)	Crops, including timber	X	Not present
	Produce grown domestically, or on allotments for consumption	✓	Vegetables grown in residential gardens.
	Livestock	X	Not present
	Other owned or domesticated animals	✓	Pets in residential properties.
	Wild animals which are the subject of shooting or fishing rights	X	Not present
Property (Buildings & Structures)	A 'building' means any structure, including any part below ground level, but does not include plant or machinery within a building.	✓	Residential houses above indicative extent of landfill.
Controlled Waters[1]	Territorial waters	✖	None feasibly close enough to be impacted.

[3] Planning Policy Statement (PPS) 23: Planning and Pollution Control, Annex 2: Development on Land Affected by Contamination
[4] Includes sites designated as SSSI or National Nature Reserve by the Wildlife and Countryside Act 1981, Special Area of Conservation (including candidate sites), Special Protection Area or Ramsar Site by the Conservation (Natural Habitats etc) Regulations 1994, and Local Nature Reserve by the National Parks and Access to the Countryside Act 1949.

Receptor Type	Receptors	Present (✓ /✖)	Notes
	Coastal waters	✖	None feasibly close enough to be impacted.
	Inland Freshwaters	✓	Unnamed stream immediately adjacent to the east of the inferred landfill boundary. Chasewater (man made reservoir) 600m SE
	Groundwater	✓	Minor aquifer beneath site

[1] as defined in the Water Resources Act Section 104. Generally includes most surface water bodies excluding drains which discharge into sewers.

3.1.3 Pathways

DEFRA Circular 02/2006 defines a Pathway as:

- *"one or more routes or means by, or through, which a receptor: (a) is being exposed to, or affected by, a contaminant; or (b) could be exposed or affected"*

Pathways are examined as part of Table 3.2, overleaf.

3.1.4 Potential Pollutant Linkages

The pollutant linkages identified are also presented in Table 3.2.

Table 3.2 - Potential Pollutant Linkages

No.	Receptor	Contaminant(s)	Pathway(s)	Risk of Pollutant Linkage Being Realised	Comments
Human Health					
1	Residents of properties above infilled ground – including children playing in gardens & vegetable consumption	Contaminants including (but not limited to) metals, hydrocarbons, PAHs, VOCs, SVOCs within the made ground.	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium to high risk	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source.
2		Methane and carbon dioxide from decomposition of deleterious elements of the made ground.	Movement into buildings, subsequent asphyxiation and explosion risk.	Medium to high risk.	Investigation and monitoring required to determine risk.
Property					
4	Subsurface services serving the buildings (principally water supply)	Contaminants including metals, hydrocarbons, PAHs, VOC, SVOCs within the made ground.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium risk.	Risk will depend on depth and concentration of contaminants and material(s) used for water pipes.
5	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete.	Medium risk	Possible risk but could only reasonably be established if concrete class used to construct buildings can be established (unlikely) – therefore, no testing targeted this area – more relevant for any new planned buildings.
Controlled Waters					
6	Minor aquifer beneath site	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Leaching of chemicals to aquifer	Medium risk	Risk will depend upon depth and concentration of contaminants, presence/absence of confining layers between contaminants and the aquifers, leaching potential etc. Site data needed.
7	Surface waters (closest is unnamed watercourse immediately adjacent to the east of the inferred landfill boundary)	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Groundwater flow in permeable strata which are in continuity with watercourses	Medium risk	Risk depends upon depth/presence of contaminated groundwater, hydraulic gradient within any impacted groundwater unit, and continuity between impacted groundwater and watercourse. .

4 CLOSING REMARKS

Potential pollutant linkages affecting the health of on-site residents, controlled waters, and property have been identified, and therefore an initial intrusive investigation should be carried out to examine the likelihood of pollutant linkages existing at the site.

Cannock Chase Council

Site requiring investigation off Hednesford Road, Norton Canes

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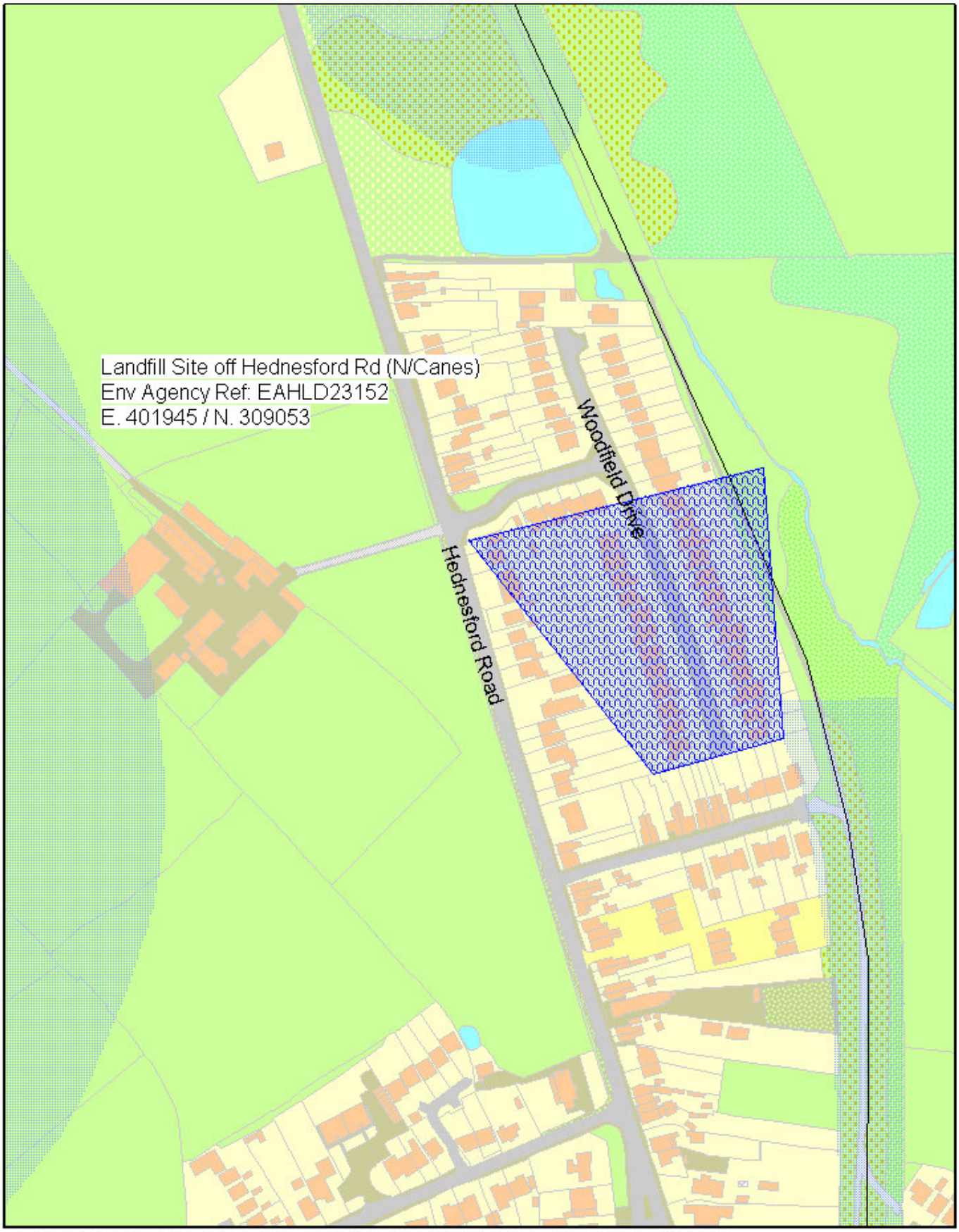

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2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Grontmij Limited.

3. Observations were made of the site and of structures on the site as indicated within the report..

4. Grontmij has relied upon the existing data provided by Cannock Chase District Council to be accurate, and has not taken steps to independently check the accuracy of the data provided.

5. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: '…the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.' We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.

APPENDIX B

Appendix B: Limitations Statement

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2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other purposes or adjacent sites without further reference to Grontmij Limited.

3. Observations were made of the site and soil arisings as indicated within the report. Where access to portions of the site was unavailable or limited, Grontmij Limited renders no opinion as to the environmental status of such parts of the site.

4. Grontmij has relied upon the existing desktop study data provided by Cannock Chase District Council to be accurate, and has not taken steps to independently check the accuracy of the data provided.

5. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) within an earlier report, and relied upon in this report, assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: ' the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.' We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.

6. The conclusions and recommendations submitted in this report are based in part upon the data obtained from soil samples from exploratory holes. The nature and extent of variations between the exploratory holes is inferred in the report and could only be confirmed by further investigation. If variations or other latent conditions become evident, it will be necessary to re-evaluate the recommendations of this report.

7. The generalised soil profile described in the text is intended to convey trends in sub-surface conditions. The boundaries between strata are approximate and idealised and have been developed in interpretations of widely spaced explorations and samples; actual soil transitions may be more gradual. For specific information, refer to the exploration logs.

8. Water levels and/or gas readings have been taken in the borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater or gas may occur due to variations in rainfall, atmospheric pressure and other factors different from those prevailing at the time the measurements were made.

9. The conclusions and recommendations of this report are based in part upon various types of chemical analysis of soil, water or gases, and are contingent upon their validity. These data have been reviewed and interpretations made in the report. Variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors. Should additional analytical or monitoring data

become available in the future, these data should be reviewed and conclusions and recommendations presented herein modified accordingly.

10. Chemical analyses have been performed for specific parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil, groundwater and soil voids at the site.

APPENDIX C

WINDOW SAMPLE LOG

WINDOW SAMPLE No: **WS1**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	05-07-10 05-07-10			GVT

SAMPLES & TESTS			Water	STRATA				Instrument	Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.10	ES					0.23	MADE GROUND: (Turf over) Light brown very clayey very gravelly fine to coarse SAND with occasional roots and rootlets. Gravel is fine to medium angular to rounded quartz, brick and occasional glass and coal.		
0.30-0.30	ES					(0.45)			
0.60-0.60	ES					0.68	MADE GROUND: Brown very clayey very gravelly fine to coarse SAND with occasional firm brown clay pockets. Gravel is fine to medium sub angular to sub rounded quartz, brick, burnt shale and occasional glass and ash.		
0.85-0.85	ES					(1.58)	MADE GROUND: Soft to firm, dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub angular to rounded quartz, brick, ceramic and occasional glass.		
						2.26			
2.30-2.30	ES					(1.54)	Soft becoming firm, orange brown and light grey sandy slightly gravelly CLAY. Gravel is fine to rounded quartz. (Glacial Till)		
						3.80			
						4.00	Very stiff dark grey CLAY. (Coal Measures)		
							End of Hole at 4m bgl.		

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in lawn area	**4m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No: **WS2**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	05-07-10 05-07-10			GVT

SAMPLES & TESTS			Water	STRATA				Instrument	Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.10	ES					(0.76) 0.76	MADE GROUND: (Turf over) Brown very clayey very gravelly fine to coarse SAND with occasional roots and rootlets. Gravel is fine to coarse sub angular to rounded quartz, brick, ceramic, weathered coarse grained sandstone and occasional glass.		
0.30-0.30	ES								
0.60-0.60	ES					1.09	MADE GROUND: Dark grey and brown, very clayey fine to coarse SAND and GRAVEL. Gravel is fine to coarse angular to sub rounded quartz, brick, slate, ceramic, burnt shale, clinker, coarse grained sandstone, occasional glass, wood, metal and plastic.		
1.00-1.00	ES					(0.67) 1.76	MADE GROUND: Firm dark grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular brick, occasional glass and plastic.		
						(0.78) 2.54	MADE GROUND: Dark grey very silty gravelly coarse grained SAND. Gravel is fine to medium rounded quartz and sub angular brick.		
						(1.46) 4.00	MADE GROUND: Dark grey and brown very silty very sandy GRAVEL. Gravel is medium to coarse angular to sub angular brick, quartz and occasional clinker.		
							End of Hole at 4m bgl.		

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in lawn area	**4m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No: **WS3**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	05-07-10 05-07-10			GVT

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					0.34	MADE GROUND: (Turf over) Brown very clayey fine to coarse SAND and GRAVEL. Gravel is fine to coarse angular brick and sub rounded quartz.	
0.35-0.35	ES					(0.62)	MADE GROUND: Dark brown and dark grey very clayey very gravelly coarse grained SAND. Gravel is sub rounded to rounded quartz, brick, occasional clinker and metal	
0.60-0.60	ES					0.96		
1.00-1.00	ES					(1.04)	Very stiff orange brown and light grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub rounded to well rounded quartz. (Glacial Till)	
						2.00	End of Hole at 2m bgl.	

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in lawn area	**2m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No **WS4**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	05-07-10 05-07-10			GVT

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10 0.30-0.30	ES ES					(0.96) 0.96	MADE GROUND: Brown very clayey very gravelly fine to coarse SAND with occasional cobbles. Gravel is fine to coarse sub angular to rounded quartz, brick, ash, slag and burnt shale. Cobbles are angular brick, slag and burnt shale.	
0.60-0.60	ES							
1.00-1.00	ES					(1.04) 2.00	Light brown and light grey very clayey coarse grained SAND and GRAVEL. Gravel is rounded to well rounded quartz. (Glacial Fluvial Deposits)	
							End of Hole at 2m bgl.	

Groundwater Strike Depth: (m) Rising to: (m) Groundwater Remarks	General Remarks Location: Back garden in lawn area	Final Depth
None Encountered		**2m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No: **WS5**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	06-07-10 06-07-10			GVT

SAMPLES & TESTS			Water	STRATA				
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Instrument / Backfill
0.10-0.10	ES					(0.40) 0.40	MADE GROUND: Brown very clayey gravelly fine to coarse SAND with occasional roots and rootlets. Gravel is medium rounded quartz. (Topsoil).	
0.40-0.40	ES							
0.60-0.60	ES					(0.60) 1.00	MADE GROUND: Light brown and orange brown, very clayey very gravelly coarse grained SAND. Gravel is medium to coarse sub rounded to rounded quartz and coarse grained sandstone	
1.00-1.00	ES					(2.00) 3.00	Stiff orange brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse sub rounded to well rounded quartz. (Glacial Till)	
							End of Hole at 3m bgl.	

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in gravel patio area	**3m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No **WS6**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	06-07-10 06-07-10			GVT

SAMPLES & TESTS			Water	STRATA					
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Instrument	Backfill
0.10-0.10	ES					0.14	MADE GROUND: Brown very clayey fine grained SAND with occasional roots and rootlets. (Topsoil)		
0.30-0.30	ES		▼1				MADE GROUND: Dark grey very silty very gravelly fine to coarse SAND with occasional cobbles. Gravel is fine to coarse angular to sub angular ash, ceramic, burnt shale, brick and occasional leather fragments		
0.60-0.60	ES					(1.00)			
1.00-1.00	ES					1.14			
1.20-1.20	ES						Brown very silty gravelly coarse grained SAND. Gravel is fine to coarse rounded to well rounded quartz. (Glacial Fluvial Deposits)		
						(0.86)			
						2.00			
						(0.52)	Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Till)		
						2.52			
						2.69	Orange brown and light grey clayey coarse grained SAND. (Glacial Fluvial Deposits)		
						3.02	Soft orange brown sandy slightly gravelly CLAY. Gravel is medium sub rounded quartz. (Glacial Till)		
						3.32	Orange brown silty coarse grained SAND. (Glacial Fluvial Deposits)		
							Firm brown slightly sandy slightly gravelly CLAY with occasional orange brown silty coarse grained sand bands. Gravel is fine to medium rounded to well rounded quartz. (Glacial Fluvial Deposits)		
						(1.68)			
						5.00			
							End of Hole at 5m bgl.		

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in flower bed	**5m bgl**
0.47		Major inflow		

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

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WINDOW SAMPLE No **WS7**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	06-07-10 06-07-10			GVT

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10 0.30-0.30 0.60-0.60 1.00-1.00	ES ES ES ES		1			(2.31) 2.31	MADE GROUND: Dark grey and dark brown clayey very gravelly coarse grained SAND. Gravel is fine to coarse angular to sub rounded ash, burnt shale, brick, coal, metal and glass. Sand is angular ash.	
						(0.69) 3.00	Light grey very silty coarse grained SAND and GRAVEL. Gravel is medium to coarse sub rounded to well rounded quartz. (Glacial Fluvial Deposits)	
							End of Hole at 3m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in flower bed	**3m bgl**
1.9		Moderate inflow		

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No **WS8**

Project	Client	Logged By
Hednesford Road	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	12-07-10 12-07-10			GVT

SAMPLES & TESTS			Water	STRATA				
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Instrument / Backfill
0.10-0.10 0.30-0.30	ES ES					(0.51) 0.51	MADE GROUND: Brown very clayey gravelly fine to coarse SAND with occasional roots and rootlets. Gravel is medium rounded quartz. (Topsoil).	
0.60-0.60	ES					(0.49) 1.00	MADE GROUND: Dark grey very clayey very gravelly fine to coarse SAND. Gravel is fine to coarse sub angular sub rounded ash, brick quartz, ceramic and glass.	
							End of Hole at 1m bgl.	

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in flower bed	**1m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand Tools	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 103912 HEDNESFORD RD.GPJ AGS3_ALL.GDT 8/3/10

APPENDIX D

ALcontrol Laboratories

		Customer Sample ID			WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS4	WS5	WS6	WS6	WS7	WS7	WS7	WS8	WS8
		Depth			0.10-0.00	0.30-0.00	0.10-0.00	1.00-0.00	0.10-0.00	0.35-0.00	0.10-0.00	0.60-0.00	0.10-0.00	0.10-0.00	0.30-0.00	0.10-0.00	0.30-0.00	0.60-0.00	0.10-0.00	0.60-0.00
Case:	100707-41,100707-28,100709-53,100715-98,10	**AGS Id**			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Customer:	Grontmij Solihull (5731)	**Sample Type**			SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Customer ref:	CANNOCK PORT 2A	**Sampled Date**			05/07/2010	05/07/2010	05/07/2010	05/07/2010	05/07/2010	05/07/2010	05/07/2010	05/07/2010	05/07/2010	06/07/2010	06/07/2010	06/07/2010	06/07/2010	06/07/2010	12/07/2010	12/07/2010
Order no:	,146072	**Sample Received Date**			07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	07/07/2010	09/07/2010	09/07/2010	09/07/2010	15/07/2010	15/07/2010
		Final Instruction Date			26/07/2010	26/07/2010	26/07/2010	27/07/2010	27/07/2010	27/07/2010	27/07/2010	27/07/2010	27/07/2010	27/07/2010	27/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010
All results expressed on a dry weight basis		**Report Completed Date**			05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	05/08/2010	04/08/2010
		Project			100707-28	100707-28	100707-28	100707-28	100707-28	100707-28	100707-41	100707-41	100707-41	100707-41	100707-41	100709-53	100709-53	100709-53	100715-104	100715-104
		Lab Sample Number			1786662	1786510	1786350	1786472	1786125	1786156	1786393	1786462	1786519	1786856	1786868	1799508	1799556	1799611	1827101	1826843
		Sample Temperature																		
Analysis	**Test**	**Method**	**Units**	**LOD**																
Sample Description																				
	Colour	PM024	-		Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
	Grain Size	PM024	-		0.063 - 0.1 mm	0.063 - 0.1 mm	0.063 - 0.1 mm	0.063 - 0.1 mm	0.063 - 0.1 mm	0.063 - 0.1 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	063 - 0.1 mm	063 - 0.1 mm
	Description	PM024	-		Top Soil	Silty Clay	Top Soil	Silty Clay	Sandy Silt Loam	Silty Clay	Sand	Sandy Loam	Sand	Sandy Loam	Sandy Silt Loam	Sand	Loamy Sand	Sand	Top Soil	Sandy Loam
	Inclusions	PM024	-		Stones	Stones	N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	N/A	Stones
	Moisture	PM114	%		-	-	-	18.1	-	-	-	-	-	-	44.3	-	41.4	-	-	-
	Moisture content ratio	PM114	%		-	-	-	22.2	-	-	-	-	-	-	79.4	-	70.6	-	-	-
	Dry matter content ratio	PM114	%		-	-	-	81.9	-	-	-	-	-	-	55.8	-	58.6	-	-	-
Asbestos																				
	Asbestos Containing Material Screen	TM001	-		-	No ACM Detected	-	-	-	No ACM Detected	-	No ACM Detected	No ACM Detected	-	No ACM Detected	-	No ACM Detected	-	-	-
	Date of Analysis	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Analysed by	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Comments	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asbestos, Chrysotile (white)	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asbestos, Amosite (brown)	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asbestos, Crocidolite (blue)	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Anthophyllite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tremolite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Actinolite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Non-asbestos fibre	TM048	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon																				
	Soil Organic Matter (SOM)	TM132	%	<0.3	8.59	10.8	4.79	-	5.52	7.31	10.6	15.3	6.62	7.65	40	55	39.7	-	16.4	32.9
Inorganics																				
	pH	TM133	pH Units	<1	6.14	7.27	8.33	-	6.79	7.04	7.31	7.45	6.64	8.35	7.7	7.68	7.91	-	5.97	7.96
	Cyanide, Total	TM153	mg/kg	<1	-	<1	-	-	-	<1	-	<1	<1	-	<1	-	<1	-	-	-
	Thiocyanate	TM153	mg/kg	<1	-	<1	-	-	-	<1	-	<1	<1	-	<1	-	<1	-	-	-
Metals																				
	Chromium, Hexavalent	TM151	mg/kg	<0.6	<1.2	<1.2	<0.6	-	<1.2	<0.6	<0.6	<1.2	<0.6	<0.6	<0.6	5.98	1.26	-	<1.2	<1.2
	Antimony	TM181	mg/kg	<0.6	-	1.61	-	-	-	3.53	-	<0.6	<0.6	-	7.81	-	62.7	-	-	-
	Arsenic	TM181	mg/kg	<0.6	17.5	16.1	12.4	-	9.55	7.76	8.51	9.7	6.79	8.91	30.6	15.3	65.5	-	12.6	33.8
	Barium	TM181	mg/kg	<0.6	148	174	243	-	156	102	372	132	62	120	400	470	656	-	154	245
	Beryllium	TM181	mg/kg	<0.0	2.17	2.35	2.01	-	1.73	1.02	6.54	1.78	1.12	1.39	7.05	1.18	13.6	-	1.28	3.22
	Cadmium	TM181	mg/kg	<0.0	1.03	1.02	0.824	-	0.518	0.413	0.546	0.876	0.328	0.682	1.61	0.582	4.4	-	0.647	0.777
	Chromium	TM181	mg/kg	<0.9	20.3	19.1	20.2	-	21.9	25.8	23.9	13	8.14	19.6	19.9	27.1	74.2	-	20.6	21.4
	Copper	TM181	mg/kg	<1.4	715	205	43.1	-	53.3	26.7	60.9	65.7	21	37.6	103	47.4	352	-	48.7	95.4
	Lead	TM181	mg/kg	<0.7	121	117	139	-	68.2	52	37	33.6	55.8	59.9	237	79.4	792	-	76.4	61
	Mercury	TM181	mg/kg	<0.1	<0.14	<0.14	<0.14	-	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	-	<0.14	<0.14
	Nickel	TM181	mg/kg	<0.2	31.5	31.7	23.5	-	32.5	17.2	33.5	28	10	18.9	61.1	22.7	146	-	24.4	55.5
	Selenium	TM181	mg/kg	<1	1.11	1.02	1.22	-	1.36	<1	2.3	<1	<1	<1	1.96	1.46	<10	-	1.31	1.52
	Vanadium	TM181	mg/kg	<0.2	31.5	32.5	30.2	-	31.5	17.7	58.3	27.3	14	25.7	60.8	29.4	89.3	-	24.7	60.6
	Zinc	TM181	mg/kg	<1.9	289	281	258	-	136	124	172	211	68.4	188	747	141	1990	-	176	233
	Boron, water soluble	TM222	mg/kg	<1	1.08	1.34	1.56	-	<1	<1	<1	<1	1.03	1.7	5.35	8.43	9.95	-	<1	1.38
Phenols																				
	Phenol	TM062 (S	mg/kg	<0.0	-	<0.01	-	-	-	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	-	-
Gasoline Range Organics (GRO)																				
	Aliphatics >C5-C6	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aliphatics >C6-C8	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aliphatics >C8-C10	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aliphatics >C10-C12	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Total Aliphatics >C5-C12	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aromatics >C6-C7	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aromatics >C7-C8	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Aromatics >EC8-EC10	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-

	Aromatics >EC10-EC12	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Total Aromatics >C6-C12	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	GRO Surrogate % recovery**	TM089	%		-	28	-	68	-	-	34	29	-	-	13	-	-	24	-	-
	Benzene	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Toluene	TM089	µg/kg	<2	-	<2	-	<2	-	-	<2	<2	-	-	<2	-	-	<2	-	-
	Ethylbenzene	TM089	µg/kg	<3	-	<3	-	<3	-	-	<3	<3	-	-	<3	-	-	<3	-	-
	m,p-Xylene	TM089	µg/kg	<6	-	<6	-	<6	-	-	<6	<6	-	-	<6	-	-	<6	-	-
	o-Xylene	TM089	µg/kg	<3	-	<3	-	<3	-	-	<3	<3	-	-	<3	-	-	<3	-	-
	m,p,o-Xylene	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	BTEX, Total	TM089	µg/kg	<10	-	<10	-	<10	-	-	<10	<10	-	-	<10	-	-	<10	-	-
	Methyl tertiary butyl ether (MTBE)	TM089	µg/kg	<5	-	<5	-	<5	-	-	<5	<5	-	-	<5	-	-	<5	-	-
	GRO >C5-C12	TM089	µg/kg	<44	-	<44	-	<44	-	-	<44	<44	-	-	<44	-	-	<44	-	-
Speciated EPH CWG																				
	Aliphatics >C12-C16	TM173	µg/kg	<100	-	5320	-	38600	-	-	<100	1220	-	-	14100	-	-	21100	-	-
	Aliphatics >C16-C21	TM173	µg/kg	<100	-	9780	-	65200	-	-	<100	2280	-	-	16400	-	-	20400	-	-
	Aliphatics >C16-C35	TM173	µg/kg	<100	-	55500	-	247000	-	-	1800	9800	-	-	86400	-	-	81200	-	-
	Aliphatics >C21-C35	TM173	µg/kg	<100	-	45800	-	182000	-	-	1800	7520	-	-	70100	-	-	60800	-	-
	Aliphatics >C35-C44	TM173	µg/kg	<100	-	12500	-	48600	-	-	<100	572	-	-	12200	-	-	6820	-	-
	Total Aliphatics >C12-C44	TM173	µg/kg	<100	-	73400	-	334000	-	-	1800	11600	-	-	113000	-	-	109000	-	-
	Aromatics >EC12-EC16	TM173	µg/kg	<100	-	4710	-	127000	-	-	<100	4520	-	-	27100	-	-	10400	-	-
	Aromatics >EC16-EC21	TM173	µg/kg	<100	-	23800	-	539000	-	-	806	9640	-	-	80300	-	-	35900	-	-
	Aromatics >EC21-EC35	TM173	µg/kg	<100	-	111000	-	876000	-	-	2580	18400	-	-	280000	-	-	90300	-	-
	Aromatics >EC35-EC44	TM173	µg/kg	<100	-	39900	-	241000	-	-	<100	4780	-	-	87500	-	-	20800	-	-
	Aromatics >EC40-EC44	TM173	µg/kg	<100	-	15600	-	86600	-	-	<100	1550	-	-	31500	-	-	6260	-	-
	Total Aromatics >EC12-EC44	TM173	µg/kg	<100	-	180000	-	1780000	-	-	3390	37300	-	-	475000	-	-	157000	-	-
	Aliphatics >C35-C40	TM173	µg/kg	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	6820	-	-
	Aliphatics >C40-C44	TM173	µg/kg	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-
	Total Aliphatics >C12-C35	TM173	µg/kg	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	102000	-	-
	Total Aliphatics >C12-C40	TM173	µg/kg	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	109000	-	-
	Total Aliphatics & Aromatics >C12-C44	TM173	µg/kg	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	266000	-	-
TPH Criteria Working Group (TPH CWG)																				
	Total Aliphatics >C5-C44	TM173	µg/kg	<100	-	73400	-	334000	-	-	1800	11600	-	-	113000	-	-	109000	-	-
	Total Aromatics >C6-C44	TM173	µg/kg	<100	-	180000	-	1780000	-	-	3390	37300	-	-	475000	-	-	157000	-	-
	Total Aliphatics & Aromatics >C5-C44	TM173	µg/kg	<100	-	253000	-	2120000	-	-	5190	48900	-	-	587000	-	-	266000	-	-
	Total Aliphatics >C5-35	TM173	µg/kg	<100	-	60900	-	286000	-	-	1800	11000	-	-	101000	-	-	102000	-	-
	Total Aromatics >C5-35	TM173	µg/kg	<100	-	140000	-	1540000	-	-	3390	32500	-	-	387000	-	-	137000	-	-
	Total Aliphatics & Aromatics >C5-35	TM173	µg/kg	<100	-	201000	-	1830000	-	-	5190	43500	-	-	488000	-	-	239000	-	-
Semi-Volatile Organic Compounds (SVOCs)																				
	Phenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Pentachlorophenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	n-Nitroso-n-dipropylamine	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Nitrobenzene	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Isophorone	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Hexachloroethane	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Hexachlorocyclopentadiene	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Hexachlorobutadiene	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Hexachlorobenzene	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	n-Dioctyl phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Dimethyl phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Diethyl phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	n-Dibutyl phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Dibenzofuran	TM157	µg/kg	<100	-	-	-	365	-	-	-	117	-	-	<100	-	-	-	-	-
	Carbazole	TM157	µg/kg	<100	-	-	-	194	-	-	-	<100	-	-	<100	-	-	-	-	-
	Butylbenzyl phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	bis(2-Ethylhexyl) phthalate	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	bis(2-Chloroethoxy)methane	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	bis(2-Chloroethyl)ether	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	Azobenzene	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Nitrophenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Nitroaniline	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Methylphenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Chlorophenylphenylether	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Chloroaniline	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Chloro-3-methylphenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	4-Bromophenylphenylether	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	3-Nitroaniline	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-
	2-Nitrophenol	TM157	µg/kg	<100	-	-	-	<100	-	-	-	<100	-	-	<100	-	-	-	-	-

	2-Nitroaniline	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2-Methylphenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	1,2,4-Trichlorobenzene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2-Chlorophenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,6-Dinitrotoluene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,4-Dinitrotoluene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,4-Dimethylphenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,4-Dichlorophenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,4,6-Trichlorophenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2,4,5-Trichlorophenol	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	1,4-Dichlorobenzene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	1,3-Dichlorobenzene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	1,2-Dichlorobenzene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2-Chloronaphthalene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	2-Methylnaphthalene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Acenaphthylene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Acenaphthene	TM157	µg/kg	<100	-	-	-	-	758	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Anthracene	TM157	µg/kg	<100	-	-	-	-	589	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Benzo(a)anthracene	TM157	µg/kg	<100	-	-	-	-	645	-	-	-	-	146	-	-	663	-	-	-	-	-	-
	Benzo(b)fluoranthene	TM157	µg/kg	<100	-	-	-	-	419	-	-	-	-	<100	-	-	512	-	-	-	-	-	-
	Benzo(k)fluoranthene	TM157	µg/kg	<100	-	-	-	-	525	-	-	-	-	127	-	-	667	-	-	-	-	-	-
	Benzo(a)pyrene	TM157	µg/kg	<100	-	-	-	-	812	-	-	-	-	121	-	-	959	-	-	-	-	-	-
	Benzo(g,h,i)perylene	TM157	µg/kg	<100	-	-	-	-	417	-	-	-	-	<100	-	-	530	-	-	-	-	-	-
	Chrysene	TM157	µg/kg	<100	-	-	-	-	714	-	-	-	-	223	-	-	770	-	-	-	-	-	-
	Fluoranthene	TM157	µg/kg	<100	-	-	-	-	1820	-	-	-	-	803	-	-	1450	-	-	-	-	-	-
	Fluorene	TM157	µg/kg	<100	-	-	-	-	383	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Indeno(1,2,3-cd)pyrene	TM157	µg/kg	<100	-	-	-	-	371	-	-	-	-	<100	-	-	463	-	-	-	-	-	-
	Phenanthrene	TM157	µg/kg	<100	-	-	-	-	824	-	-	-	-	873	-	-	662	-	-	-	-	-	-
	Pyrene	TM157	µg/kg	<100	-	-	-	-	1590	-	-	-	-	580	-	-	1250	-	-	-	-	-	-
	Naphthalene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
	Dibenzo(a,h)anthracene	TM157	µg/kg	<100	-	-	-	-	<100	-	-	-	-	<100	-	-	<100	-	-	-	-	-	-
Volatile Organic Compounds (VOCs)																						
	Dibromofluoromethane**	TM116	%		-	-	-	-	106	-	-	-	-	112	-	-	136	-	-	-	-	-	-
	Toluene-d8**	TM116	%		-	-	-	-	93.5	-	-	-	-	95.7	-	-	95	-	-	-	-	-	-
	4-Bromofluorobenzene**	TM116	%		-	-	-	-	136	-	-	-	-	121	-	-	154	-	-	-	-	-	-
	Dichlorodifluoromethane	TM116	µg/kg	<4	-	-	-	-	<4	-	-	-	-	<4	-	-	<4	-	-	-	-	-	-
	Chloromethane	TM116	µg/kg	<7	-	-	-	-	<7	-	-	-	-	<7	-	-	<7	-	-	-	-	-	-
	Vinyl Chloride	TM116	µg/kg	<10	-	-	-	-	<10	-	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Bromomethane	TM116	µg/kg	<13	-	-	-	-	<13	-	-	-	-	<13	-	-	<13	-	-	-	-	-	-
	Chloroethane	TM116	µg/kg	<14	-	-	-	-	<14	-	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	Trichlorofluoromethane	TM116	µg/kg	<6	-	-	-	-	<6	-	-	-	-	<6	-	-	<6	-	-	-	-	-	-
	1,1-Dichloroethene	TM116	µg/kg	<10	-	-	-	-	<10	-	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Carbon Disulphide	TM116	µg/kg	<7	-	-	-	-	49.5	-	-	-	-	<7	-	-	22.8	-	-	-	-	-	-
	Dichloromethane	TM116	µg/kg	<10	-	-	-	-	<10	-	-	-	-	<10	-	-	26.3	-	-	-	-	-	-
	Methyl Tertiary Butyl Ether	TM116	µg/kg	<11	-	-	-	-	<11	-	-	-	-	<11	-	-	<11	-	-	-	-	-	-
	trans-1-2-Dichloroethene	TM116	µg/kg	<11	-	-	-	-	<11	-	-	-	-	<11	-	-	<11	-	-	-	-	-	-
	1,1-Dichloroethane	TM116	µg/kg	<8	-	-	-	-	<8	-	-	-	-	<8	-	-	<8	-	-	-	-	-	-
	cis-1-2-Dichloroethene	TM116	µg/kg	<5	-	-	-	-	<5	-	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	2,2-Dichloropropane	TM116	µg/kg	<12	-	-	-	-	<12	-	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	Bromochloromethane	TM116	µg/kg	<14	-	-	-	-	<14	-	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	Chloroform	TM116	µg/kg	<8	-	-	-	-	<8	-	-	-	-	<8	-	-	<8	-	-	-	-	-	-
	1,1,1-Trichloroethane	TM116	µg/kg	<7	-	-	-	-	<7	-	-	-	-	<7	-	-	<7	-	-	-	-	-	-
	1,1-Dichloropropene	TM116	µg/kg	<11	-	-	-	-	<11	-	-	-	-	<11	-	-	<11	-	-	-	-	-	-
	Carbontetrachloride	TM116	µg/kg	<14	-	-	-	-	<14	-	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	1,2-Dichloroethane	TM116	µg/kg	<5	-	-	-	-	<5	-	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	Benzene	TM116	µg/kg	<9	-	-	-	-	<9	-	-	-	-	<9	-	-	49.8	-	-	-	-	-	-
	Trichloroethene	TM116	µg/kg	<9	-	-	-	-	<9	-	-	-	-	<9	-	-	<9	-	-	-	-	-	-
	1,2-Dichloropropane	TM116	µg/kg	<12	-	-	-	-	<12	-	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	Dibromomethane	TM116	µg/kg	<9	-	-	-	-	<9	-	-	-	-	<9	-	-	<9	-	-	-	-	-	-
	Bromodichloromethane	TM116	µg/kg	<7	-	-	-	-	<7	-	-	-	-	<7	-	-	<7	-	-	-	-	-	-
	cis-1-3-Dichloropropene	TM116	µg/kg	<14	-	-	-	-	<14	-	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	Toluene	TM116	µg/kg	<5	-	-	-	-	7.62	-	-	-	-	<5	-	-	24.7	-	-	-	-	-	-
	trans-1-3-Dichloropropene	TM116	µg/kg	<14	-	-	-	-	<14	-	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	1,1,2-Trichloroethane	TM116	µg/kg	<10	-	-	-	-	<10	-	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	1,3-Dichloropropane	TM116	µg/kg	<7	-	-	-	-	<7	-	-	-	-	<7	-	-	<7	-	-	-	-	-	-
	Tetrachloroethene	TM116	µg/kg	<5	-	-	-	-	<5	-	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	Dibromochloromethane	TM116	µg/kg	<13	-	-	-	-	<13	-	-	-	-	<13	-	-	<13	-	-	-	-	-	-

	1.2-Dibromoethane	TM116	µg/kg	<12	-	-	-	<12	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	Chorobenzene	TM116	µg/kg	<5	-	-	-	<5	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	1.1.1.2-Tetrachloroethane	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Ethylbenzene	TM116	µg/kg	<4	-	-	-	<4	-	-	-	<4	-	-	37.1	-	-	-	-	-	-
	p/m-Xylene	TM116	µg/kg	<14	-	-	-	<14	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	o-Xylene	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Styrene	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Bromoform	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Isopropylbenzene	TM116	µg/kg	<5	-	-	-	<5	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	1.1.2.2-Tetrachloroethane	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	1.2.3-Trichloropropane	TM116	µg/kg	<17	-	-	-	<17	-	-	-	<17	-	-	<17	-	-	-	-	-	-
	Bromobenzene	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	Propylbenzene	TM116	µg/kg	<11	-	-	-	<11	-	-	-	<11	-	-	<11	-	-	-	-	-	-
	2-Chlorotoluene	TM116	µg/kg	<9	-	-	-	<9	-	-	-	<9	-	-	<9	-	-	-	-	-	-
	1.3.5-Trimethylbenzene	TM116	µg/kg	<8	-	-	-	<8	-	-	-	<8	-	-	<8	-	-	-	-	-	-
	4-Chlorotoluene	TM116	µg/kg	<12	-	-	-	<12	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	tert-Butylbenzene	TM116	µg/kg	<12	-	-	-	<12	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	1.2.4-Trimethylbenzene	TM116	µg/kg	<9	-	-	-	<9	-	-	-	<9	-	-	<9	-	-	-	-	-	-
	sec-Butylbenzene	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	4-Isopropyltoluene	TM116	µg/kg	<11	-	-	-	<11	-	-	-	<11	-	-	<11	-	-	-	-	-	-
	1.3-Dichlorobenzene	TM116	µg/kg	<6	-	-	-	<6	-	-	-	<6	-	-	<6	-	-	-	-	-	-
	1.4-Dichlorobenzene	TM116	µg/kg	<5	-	-	-	<5	-	-	-	<5	-	-	<5	-	-	-	-	-	-
	n-Butylbenzene	TM116	µg/kg	<10	-	-	-	<10	-	-	-	<10	-	-	<10	-	-	-	-	-	-
	1.2-Dichlorobenzene	TM116	µg/kg	<12	-	-	-	<12	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	1.2-Dibromo-3-chloropropane	TM116	µg/kg	<14	-	-	-	<14	-	-	-	<14	-	-	<14	-	-	-	-	-	-
	Tert-amyl methyl ether	TM116	µg/kg	<15	-	-	-	<15	-	-	-	<15	-	-	<15	-	-	-	-	-	-
	1.2.4-Trichlorobenzene	TM116	µg/kg	<6	-	-	-	<6	-	-	-	<6	-	-	<6	-	-	-	-	-	-
	Hexachlorobutadiene	TM116	µg/kg	<12	-	-	-	<12	-	-	-	<12	-	-	<12	-	-	-	-	-	-
	Naphthalene	TM116	µg/kg	<13	-	-	-	<13	-	-	-	<13	-	-	<13	-	-	-	-	-	-
	1.2.3-Trichlorobenzene	TM116	µg/kg	<6	-	-	-	<6	-	-	-	<6	-	-	<6	-	-	-	-	-	-

ALcontrol Laboratories

				Customer Sample ID	WS2	WS6	WS7
				Depth	1.00-0.00	0.30-0.00	0.30-0.00
Case:	100707-41,100707-28,100709-53			**AGS Id**	NS	NS	NS
Customer:	Grontmij Solihull (5731)			**Sample Type**	SOLID	SOLID	SOLID
Customer ref:	CANNOCK PORT 2A			**Sampled Date**	05/07/2010	06/07/2010	06/07/2010
Order no:	,146072			**Sample Received Date**	07/07/2010	07/07/2010	09/07/2010
				Final Instruction Date	26/07/2010	27/07/2010	27/07/2010
All results expressed on a dry weight basis				**Report Completed Date**	05/08/2010	05/08/2010	05/08/2010
				Project	100707-28	100707-41	100709-53
				Lab Sample Number	1786472	1786868	1799556
				Sample Temperature			
Analysis	**Test**	**Method**	**Units**	**LOD**			
Waste Acceptance Criteria (WAC)							
	CEN 2:1 - Temperature	PM115	°C		18.7	21.9	21.2
	CEN 2:1 - pH	PM115	pH Units		8.07	7.63	7.87
	CEN 2:1 - Conductivity @ 20 deg.C	PM115	µS/cm		1280	538	934
Filtered (Dissolved) Metals							
	CEN 2:1 - Arsenic (diss.filt)	TM152	mg/l	<0.12	0.00429	0.0066	0.000357
	CEN 2:1 - Boron (diss.filt)	TM152	mg/l	<9.4	0.546	0.931	0.719
	CEN 2:1 - Cadmium (diss.filt)	TM152	mg/l	<0.1	0.000106	<0.0001	0.000592
	CEN 2:1 - Chromium (diss.filt)	TM152	mg/l	<0.22	0.0033	0.00679	0.0333
	CEN 2:1 - Copper (diss.filt)	TM152	mg/l	<0.85	0.00529	0.00554	0.00555
	CEN 2:1 - Lead (diss.filt)	TM152	mg/l	<0.02	0.00052	0.000291	0.00119
	CEN 2:1 - Nickel (diss.filt)	TM152	mg/l	<0.15	0.00877	<0.00015	0.0134
	CEN 2:1 - Selenium (diss.filt)	TM152	mg/l	<0.39	0.00178	0.00265	0.000587
	CEN 2:1 - Vanadium (diss.filt)	TM152	mg/l	<0.24	0.00345	0.0249	0.0031
	CEN 2:1 - Zinc (diss.filt)	TM152	mg/l	<0.41	0.0261	0.0485	0.176
	CEN 2:1 - Mercury (diss.filt)	TM183	mg/l	<0.01	<0.00001	<0.00001	<0.00001
Mineral Oil / Oils & Greases							
	CEN 2:1 - TPH / Oil & Greases	TM235	mg/l	<1	<1	-	<1
Semi-Volatile Organic Compounds (SVOCs)							
	CEN 2:1 - 1,2,4-Trichlorobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 1,2-Dichlorobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 1,3-Dichlorobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 1,4-Dichlorobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,4,5-Trichlorophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,4,6-Trichlorophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,4-Dichlorophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,4-Dimethylphenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,4-Dinitrotoluene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2,6-Dinitrotoluene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Chloronaphthalene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Chlorophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Methylnaphthalene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Methylphenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Nitroaniline (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 2-Nitrophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 3-Nitroaniline (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Bromophenylphenylether (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Chloro-3-methylphenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Chloroaniline (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Chlorophenylphenylether (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Methylphenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Nitrophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - 4-Nitroaniline (aq)	TM176	mg/l	<1	-	<0.001	<0.001

	CEN 2:1 - Azobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Acenaphthylene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Acenaphthene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Anthracene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - bis(2-Chloroethyl)ether (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - bis(2-Chloroethoxy)methane (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - bis(2-Ethylhexyl) phthalate (aq)	TM176	mg/l	<2	-	<0.002	<0.002
	CEN 2:1 - Benzo(a)anthracene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Butylbenzyl phthalate (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Benzo(b)fluoranthene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Benzo(k)fluoranthene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Benzo(a)pyrene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Benzo(g,h,i)perylene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Carbazole (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Chrysene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Dibenzofuran (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - n-Dibutyl phthalate (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Diethyl phthalate (aq)	TM176	mg/l	<1	-	<0.004	<0.001
	CEN 2:1 - Dibenzo(a,h)anthracene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Dimethyl phthalate (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - n-Dioctyl phthalate (aq)	TM176	mg/l	<5	-	<0.005	<0.005
	CEN 2:1 - Fluoranthene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Fluorene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Hexachlorobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Hexachlorobutadiene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Pentachlorophenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Phenol (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - n-Nitroso-n-dipropylamine (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Hexachloroethane (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Nitrobenzene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Naphthalene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Isophorone (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Hexachlorocyclopentadiene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Phenanthrene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Indeno(1,2,3-cd)pyrene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
	CEN 2:1 - Pyrene (aq)	TM176	mg/l	<1	-	<0.001	<0.001
Volatile Organic Compounds (VOCs)							
	CEN 2:1 - Dibromofluoromethane**	TM208	mg/l		-	-	-
	CEN 2:1 - Toluene-d8**	TM208	mg/l		-	-	-
	CEN 2:1 - 4-Bromofluorobenzene**	TM208	mg/l		-	-	-
	CEN 2:1 - Dichlorodifluoromethane	TM208	mg/l	<7	<0.007	<0.007	<0.007
	CEN 2:1 - Chloromethane	TM208	mg/l	<9	<0.009	<0.009	<0.009
	CEN 2:1 - Vinyl chloride	TM208	mg/l	<1.2	<0.0012	<0.0012	<0.0012
	CEN 2:1 - Bromomethane	TM208	mg/l	<2	<0.002	<0.002	<0.002
	CEN 2:1 - Chloroethane	TM208	mg/l	<2.5	<0.0025	<0.0025	<0.0025
	CEN 2:1 - Trichlorofluoromethane	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - 1,1-Dichloroethene	TM208	mg/l	<1.2	<0.0012	<0.0012	<0.0012
	CEN 2:1 - Carbon disulphide	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - Dichloromethane	TM208	mg/l	<3.7	<0.0037	<0.0037	<0.0037
	CEN 2:1 - Methyl tertiary butyl ether (MTBE)	TM208	mg/l	<1.6	<0.0016	<0.0016	<0.0016
	CEN 2:1 - trans-1,2-Dichloroethene	TM208	mg/l	<1.9	<0.0019	<0.0019	<0.0019
	CEN 2:1 - 1,1-Dichloroethane	TM208	mg/l	<1.2	<0.0012	<0.0012	<0.0012
	CEN 2:1 - cis-1,2-Dichloroethene	TM208	mg/l	<2.3	<0.0023	<0.0023	<0.0023
	CEN 2:1 - 2,2-Dichloropropane	TM208	mg/l	<3.8	<0.0038	<0.0038	<0.0038
	CEN 2:1 - Bromochloromethane	TM208	mg/l	<1.9	<0.0019	<0.0019	<0.0019
	CEN 2:1 - Chloroform	TM208	mg/l	<1.8	<0.0018	<0.0018	<0.0018

	CEN 2:1 - 1,1,1-Trichloroethane	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - 1,1-Dichloropropene	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - Carbontetrachloride	TM208	mg/l	<1.4	<0.0014	<0.0014	<0.0014
	CEN 2:1 - 1,2-Dichloroethane	TM208	mg/l	<3.3	<0.0033	<0.0033	<0.0033
	CEN 2:1 - Benzene	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - Trichloroethene	TM208	mg/l	<2.5	<0.0025	<0.0025	<0.0025
	CEN 2:1 - 1,2-Dichloropropane	TM208	mg/l	<3	<0.003	<0.003	<0.003
	CEN 2:1 - Dibromomethane	TM208	mg/l	<2.7	<0.0027	<0.0027	<0.0027
	CEN 2:1 - Bromodichloromethane	TM208	mg/l	<0.9	<0.0009	<0.0009	<0.0009
	CEN 2:1 - cis-1,3-Dichloropropene	TM208	mg/l	<1.9	<0.0019	<0.0019	<0.0019
	CEN 2:1 - Toluene	TM208	mg/l	<1.4	<0.0014	<0.0014	<0.0014
	CEN 2:1 - trans-1,3-Dichloropropene	TM208	mg/l	<3.5	<0.0035	<0.0035	<0.0035
	CEN 2:1 - 1,1,2-Trichloroethane	TM208	mg/l	<2.2	<0.0022	<0.0022	<0.0022
	CEN 2:1 - 1,3-Dichloropropane	TM208	mg/l	<2.2	<0.0022	<0.0022	<0.0022
	CEN 2:1 - Tetrachloroethene	TM208	mg/l	<1.5	<0.0015	<0.0015	<0.0015
	CEN 2:1 - Dibromochloromethane	TM208	mg/l	<1.7	<0.0017	<0.0017	<0.0017
	CEN 2:1 - 1,2-Dibromoethane	TM208	mg/l	<2.3	<0.0023	<0.0023	<0.0023
	CEN 2:1 - Chlorobenzene	TM208	mg/l	<3.5	<0.0035	<0.0035	<0.0035
	CEN 2:1 - 1,1,1,2-Tetrachloroethane	TM208	mg/l	<1.3	<0.0013	<0.0013	<0.0013
	CEN 2:1 - Ethylbenzene	TM208	mg/l	<2.5	<0.0025	<0.0025	<0.0025
	CEN 2:1 - m,p-Xylene	TM208	mg/l	<2.5	<0.0025	<0.0025	<0.0025
	CEN 2:1 - o-Xylene	TM208	mg/l	<1.7	<0.0017	<0.0017	<0.0017
	CEN 2:1 - Styrene	TM208	mg/l	<1.2	<0.0012	<0.0012	<0.0012
	CEN 2:1 - Bromoform	TM208	mg/l	<3	<0.003	<0.003	<0.003
	CEN 2:1 - Isopropylbenzene	TM208	mg/l	<1.4	<0.0014	<0.0014	<0.0014
	CEN 2:1 - 1,1,2,2-Tetrachloroethane	TM208	mg/l	<5.2	<0.0052	<0.0052	<0.0052
	CEN 2:1 - 1,2,3-Trichloropropane	TM208	mg/l	<7.8	<0.0078	<0.0078	<0.0078
	CEN 2:1 - Bromobenzene	TM208	mg/l	<2	<0.002	<0.002	<0.002
	CEN 2:1 - Propylbenzene	TM208	mg/l	<2.6	<0.0026	<0.0026	<0.0026
	CEN 2:1 - 2-Chlorotoluene	TM208	mg/l	<1.9	<0.0019	<0.0019	<0.0019
	CEN 2:1 - 1,3,5-Trimethylbenzene	TM208	mg/l	<1.8	<0.0018	<0.0018	<0.0018
	CEN 2:1 - 4-Chlorotoluene	TM208	mg/l	<1.9	<0.0019	<0.0019	<0.0019
	CEN 2:1 - tert-Butylbenzene	TM208	mg/l	<2	<0.002	<0.002	<0.002
	CEN 2:1 - 1,2,4-Trimethylbenzene	TM208	mg/l	<1.7	<0.0017	<0.0017	<0.0017
	CEN 2:1 - sec-Butylbenzene	TM208	mg/l	<1.7	<0.0017	<0.0017	<0.0017
	CEN 2:1 - 4-iso-Propyltoluene	TM208	mg/l	<2.6	<0.0026	<0.0026	<0.0026
	CEN 2:1 - 1,3-Dichlorobenzene	TM208	mg/l	<2.2	<0.0022	<0.0022	<0.0022
	CEN 2:1 - 1,4-Dichlorobenzene	TM208	mg/l	<2.7	<0.0027	<0.0027	<0.0027
	CEN 2:1 - n-Butylbenzene	TM208	mg/l	<2	<0.002	<0.002	<0.002
	CEN 2:1 - 1,2-Dichlorobenzene	TM208	mg/l	<3.7	<0.0037	<0.0037	<0.0037
	CEN 2:1 - 1,2-Dibromo-3-chloropropane	TM208	mg/l	<9.8	<0.0098	<0.0098	<0.0098
	CEN 2:1 - 1,2,4-Trichlorobenzene	TM208	mg/l	<2.3	<0.0023	<0.0023	<0.0023
	CEN 2:1 - Hexachlorobutadiene	TM208	mg/l	<2.5	<0.0025	<0.0025	<0.0025
	CEN 2:1 - tert-Amyl methyl ether (TAME)	TM208	mg/l	<1	<0.001	<0.001	<0.001
	CEN 2:1 - Naphthalene	TM208	mg/l	<3.5	<0.0035	<0.0035	<0.0035
	CEN 2:1 - 1,2,3-Trichlorobenzene	TM208	mg/l	<3.1	<0.0031	<0.0031	<0.0031
	CEN 2:1 - 1,3,5-Trichlorobenzene	TM208	mg/l	<10	<0.01	<0.01	<0.01

ALcontrol Laboratories

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Grontmij
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Blenheim Court, Lode lane
Solihull
West Midlands
B912AA

Attention: Gareth Taylor

CERTIFICATE OF ANALYSIS

Date:	08 November 2010		
Customer:	H_GRONTMIJ_SOL-35		
Sample Delivery Group (SDG):	101028-122	**Report No.:**	102623
Your Reference:			
Location:	Woodfield		

We received 2 samples on Thursday October 28, 2010 and 2 of these samples were scheduled for analysis which was completed on Monday November 08, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Business Director - Land, UK & Ireland

UKAS TESTING
1291

GROUP

Validated

ALcontrol Laboratories Analytical Services

SDG:	101028-122	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-35	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:	Woodfield	**Report No:**	102623

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2309371	A			26/10/2010
2309384	B			26/10/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	101028-122	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-35	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:	Woodfield	**Report No:**	102623

LIQUID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	2309371		2309384	
			Customer Sample Ref.	A		B	
			AGS Ref.				
			Depth (m)				
			Container	1l green glass bottle	1lplastic	1l green glass bottle	1lplastic
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2			X		X
Mercury Dissolved	All	NDPs: 0 Tests: 2		X		X	
Metals by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 2			X		X

Validated

ALcontrol Laboratories Analytical Services

SDG:	101028-122	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-35	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:	Woodfield	**Report No:**	102623

Test Completion Dates

Lab Sample No(s)	2309371	2309384
Customer Sample Ref.	A	B
AGS Ref.		
Depth		
Type	LIQUID	LIQUID
Dissolved Metals by ICP-MS	03/11/2010	03/11/2010
Mercury Dissolved	03/11/2010	03/11/2010
Metals by iCap-OES Dissolved (W)	08/11/2010	08/11/2010

Validated

ALcontrol Laboratories Analytical Services

SDG:	101028-122	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-35	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:	Woodfield	**Report No:**	102623

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	A	B
Customer Sample Ref.				
Depth (m)				
Sample Type			Water(GW/SW)	Water(GW/SW)
Date Sampled			26/10/2010	26/10/2010
Date Received			28/10/2010	28/10/2010
SDG Ref			101028-122	101028-122
Lab Sample No.(s)			2309371	2309384
AGS Reference				
Arsenic (diss.filt)	<0.12 µg/l	TM152	0.833 #	0.712 #
Boron (diss.filt)	<9.4 µg/l	TM152	332 #	375 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152	2.27 #	2.27 #
Copper (diss.filt)	<0.85 µg/l	TM152	2.55 #	2.13 #
Lead (diss.filt)	<0.02 µg/l	TM152	0.133 #	0.147 #
Nickel (diss.filt)	<0.15 µg/l	TM152	3.74 #	3.98 #
Vanadium (diss.filt)	<0.24 µg/l	TM152	1.02 #	0.792 #
Zinc (diss.filt)	<0.41 µg/l	TM152	9.79 #	8.15 #
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #
Hardness, Total as CaCO3	<1 mg/l	TM228	230	260

Table of Results - Appendix

SDG Number : 101028-122 **Client :** H_GRONTMIJ_SOL **Client Ref :**

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

ALcontrol Laboratories

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Radcliffe House
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West Midlands
B912AA

Attention: Gareth Taylor

CERTIFICATE OF ANALYSIS

Date:	21 December 2010
Customer:	H_GRONTMIJ_SOL
Sample Delivery Group (SDG):	101214-15
Your Reference:	
Location:	Woodfield
Report No:	108696

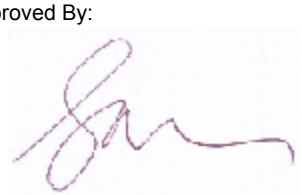
We received 5 samples on Tuesday December 14, 2010 and 5 of these samples were scheduled for analysis which was completed on Tuesday December 21, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:



Sonia McWhan

Laboratory Manager

1291

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2575468	1 WOODFIELD CLOSE			10/12/2010
2575471	10 WOODFIELD DRIVE			10/12/2010
2575469	14 WOODFIELD CLOSE			10/12/2010
2575470	17 WOODFIELD CLOSE			10/12/2010
2575472	23 WOODFIELD DRIVE			10/12/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Schedule

LIQUID

Results Legend

X — Test

N — No Determination Possible

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			2575468	1 WOODFIELD CLOSE			1l green glass bottle
			2575471	10 WOODFIELD DRIVE			Vial
			2575469	14 WOODFIELD CLOSE			1l green glass bottle
			2575470	17 WOODFIELD CLOSE			Vial
			2575472	23 WOODFIELD DRIVE			1l green glass bottle
							Vial
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 5	X	X	X	X	X
EPH (DRO) (C10-C40) Aqueous (W)	All	NDPs: 0 Tests: 5	X	X	X	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 5	X	X	X	X	X
Mercury Dissolved	All	NDPs: 0 Tests: 5	X	X	X	X	X
pH Value	All	NDPs: 0 Tests: 5	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	1 WOODFIELD CLOSE	14 WOODFIELD CLOSE	17 WOODFIELD CLOSE	10 WOODFIELD DRIVE	23 WOODFIELD DRIVE
			Depth (m)	.	.	.	.	.
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
			Date Received	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010
			SDG Ref	101214-15	101214-15	101214-15	101214-15	101214-15
			Lab Sample No.(s)	2575468	2575469	2575470	2575471	2575472
			AGS Reference	TAP	TAP	TAP	TAP	TAP
Antimony (diss.filt)	<0.16 µg/l	TM152		0.346 #	0.512 #	0.534 #	0.684 #	1 #
Arsenic (diss.filt)	<0.12 µg/l	TM152		1.79 #	1.99 #	1.86 #	2.04 #	2.01 #
Boron (diss.filt)	<9.4 µg/l	TM152		114 #	108 #	111 #	112 #	127 #
Cadmium (diss.filt)	<0.1 µg/l	TM152		0.128 #	0.11 #	0.122 #	<0.1 #	0.157 #
Chromium (diss.filt)	<0.22 µg/l	TM152		11.1 #	11 #	10.8 #	11 #	11.2 #
Copper (diss.filt)	<0.85 µg/l	TM152		11.4 #	122 #	122 #	21.1 #	93.6 #
Lead (diss.filt)	<0.02 µg/l	TM152		0.103 #	0.167 #	0.174 #	0.105 #	0.169 #
Nickel (diss.filt)	<0.15 µg/l	TM152		1.08 #	1.34 #	1.23 #	1.36 #	2.14 #
Zinc (diss.filt)	<0.41 µg/l	TM152		13.1 #	15.6 #	10.7 #	10.6 #	16.2 #
EPH Range >C10 - C40 (aq)	<46 µg/l	TM172		<46 #	<46 #	<46 #	<46 #	<46 #
EPH Band >C10-C12 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C12-C16 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C16-C21 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C21-C28 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C35-C40 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C28-C35 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #
pH	<1 pH Units	TM256		8.16 #	8.1 #	8.14 #	8.28 #	8.17 #

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

GRO by GC-FID (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	1 WOODFIELD CLOSE	14 WOODFIELD CLOSE	17 WOODFIELD CLOSE	10 WOODFIELD DRIVE	23 WOODFIELD DRIVE
			Depth (m)	.	.	.	.	.
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
			Date Received	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010
			SDG Ref	101214-15	101214-15	101214-15	101214-15	101214-15
			Lab Sample No.(s)	2575468	2575469	2575470	2575471	2575472
			AGS Reference	TAP	TAP	TAP	TAP	TAP
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
m,p,o-Xylene	<10 µg/l	TM245		<10	<10	<10	<10	<10
BTEX, Total	<10 µg/l	TM245		<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	2575468	2575469	2575470	2575471	2575472
Customer Sample Ref.	1 WOODFIELD CLOSE	14 WOODFIELD CLOSE	17 WOODFIELD CLOSE	10 WOODFIELD DRIVE	23 WOODFIELD DRIVE
AGS Ref.					
Depth					
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Dissolved Metals by ICP-MS	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010
EPH (DRO) (C10-C40) Aqueous (W)	21-Dec-2010	21-Dec-2010	21-Dec-2010	21-Dec-2010	21-Dec-2010
GRO by GC-FID (W)	17-Dec-2010	17-Dec-2010	17-Dec-2010	17-Dec-2010	17-Dec-2010
Mercury Dissolved	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010
pH Value	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010

SDG:	101214-15	**Location:**	Woodfield	**Order Number:**	
Job:	H_GRONTMIJ_SOL-35	**Customer:**	Grontmij	**Report Number:**	108696
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not
accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GC-MS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GC-FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GC-MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GC-MS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC-EZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GC-MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH-MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC-MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC-MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC-MS
PHENOLS-MS	DCM	SOLID PHASE EXTRACTION	GC-MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX E

Appendix E – Gas Monitoring Data

Well	Monitoring Date	Peak CH_4 (%)	Steady O_2 (%)	Steady CO_2 (%)	Steady CO (ppm)	Steady H_2S (ppm)	Average Flow (l/hr)
WS1	28/07/2010	0	16.6	1.3	0	0	- 0.2
	11/08/2010	0	16.9	1	0	0	0.1
	25/08/2010	0	16.4	2.2	0	0	0.0
	08/09/2010	0	16.4	2	0	0	- 0.1
WS2	28/07/2010	0	16.2	2	0	0	- 0.1
	11/08/2010	0	16.8	7.3	0	0	0.1
	25/08/2010	0	16.3	3.3	0	0	0.0
	08/09/2010	0	16.3	2.3	0	0	- 0.1
WS3	28/07/2010	0	17.1	7.8	0	0	0.1
	11/08/2010	0	17.4	7	0	0	- 0.1
	25/08/2010	0	16.7	8	0	0	0.1
	08/09/2010	0	16.5	8.1	0	0	0.1
WS4	28/07/2010	0	17	2.7	0	0	0.1
	11/08/2010	0	16.8	2.5	0	0	- 0.1
	25/08/2010	0	16.6	3.6	0	0	0.0
	08/09/2010	0	16.4	4.1	0	0	0.1
WS5	28/07/2010	0	17.1	2.9	0	0	0.2
	11/08/2010	0	17.4	2.4	0	0	- 0.1
	25/08/2010	0	16.5	3.6	0	0	0.1
	08/09/2010	0	16.6	3.2	0	0	0.1
WS6	28/07/2010	0	16.7	2	0	0	0.2
	11/08/2010	0	16.9	0.2	0	0	0.1
	25/08/2010	0	16.4	0.2	0	0	- 0.1
	08/09/2010	0	16.3	0.1	0	0	- 0.1
WS7	28/07/2010	0	14.7	3.7	0	0	- 0.2
	11/08/2010	0	Not accessible				
	25/08/2010	0	17.4	3.8	0	0	- 0.1
	08/09/2010	0	17.5	4	0	0	- 0.1
WS8	28/07/2010	0	17.0	3.5	0	0	0.3
	11/08/2010	0	17.1	3.2	0	0	-0.1
	25/08/2010	0	16.5	3	0	0	0
	08/09/2010	0	16.9	2.1	0	0	0.1

Atmospheric Pressure:	28/07/2010	996mb (steady trend throughout day)
	11/08/2010	991mb (rising trend throughout day)
	25/08/2010	993mb (falling trend throughout day)
	08/09/2010	982mb (rising trend throughout day)

Readings obtained with a Geotechnical Instruments GA2000 gas analyser plus flow pod.
CH_4 – methane; O_2 – oxygen; CO_2 carbon dioxide; CO – carbon monoxide;
H_2S – hydrogen sulphide; mbgl – metres below ground level mb – millibars l/hr – litres per hour.

APPENDIX F

Appendix F: Severity and Probability of Risk in Conceptual Site Models (after CIRIA552, Tables 6.3 to 6.5)

This report draws on guidance presented in CIRIA report 552, "Contaminated Land Risk Assessment, A Guide for Good Practice", wherein the "severity" term in the Conceptual Site Model is classified with reference to the sensitivity of the hazard and the receptor, as follows:

Situation	Severity Category	Description	Examples
ACUTE PROBLEM	Severe	Acute risk to human health likely to result in "significant harm" as defined in EPA90, catastrophic damage to buildings or property, acute risk of major pollution of controlled waters, acute risk of harm to ecosystems (as defined in Contaminated Land Regulations 2006)	High cyanide concentrations at the surface of a recreation area Major spillage into controlled waters Explosion, causing building collapse
SIGNIFICANT HARM TO SENSITIVE RECEPTOR	Medium	Chronic risk to human health likely to result in "significant harm" as defined in EPA90, chronic pollution of sensitive controlled waters, significant change at a sensitive ecosystems or species, significant damage to buildings or structures	Contaminant concentrations at a site in excess of SGVs, GAC or similar screening values Leaching of contaminants to sensitive aquifer Death of a species within a nature reserve
SIGNIFICANT HARM TO LESS SENSITIVE RECEPTOR	Mild	Pollution of non-sensitive waters, significant damage to buildings, structures, services or crops, damage to sensitive buildings, structures, services or the environment, which nonetheless result in "significant harm"	Pollution to (former) non-aquifer or to non-controlled surface watercourse. Damage to building rendering it unsafe to occupy (e.g. foundation or structural damage)
NON-SIGNIFICANT HARM	Minor	Harm, not necessarily resulting in "significant harm" but probably requiring expenditure to resolve or financial loss. Non-permanent risks to human health that are easily mitigated, e.g. by wearing PPE. Easily-repairable damage to structures or services	Contaminant concentrations requiring the wearing of PPE during site work, but no other long-term mitigation. Discolouration of concrete

The likelihood of an event (probability) takes into account both the presence of hazard and receptor and the integrity of the pathway between hazard and receptor, and is assessed as follows:

Category	There is a pollution linkage and:
High	Event is likely in the short term and almost inevitable over the long term. Or, there is evidence of actual harm at/to the receptor
Likely	Event is possible in the short term and likely over the long term
Low	Event is unlikely in the short term and possible over the long term
Unlikely	Event is unlikely, even in the long term

Potential severity and probability have been assessed in the following matrix, to give an overall risk rating:

	Severity			
Probability	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Low/moderate
Likely	High	Moderate	Low/moderate	Low
Low	Moderate	Low/moderate	Low	Very low
Unlikely	Low/moderate	Low	Very low	Very low

The above risk categories are likely to result in the following actions:

- Very high: urgent intervention / investigation needed, remediation likely to be required
- High: urgent intervention / investigation needed, remediation possibly required in short term and probably required in long term
- Moderate: investigation needed to clarify and refine risk; remediation may be required over the long term
- Low: it is possible that harm could arise to a receptor, but if realised, such harm is likely to be, at worst, mild
- Very low: it is possible that harm could arise to a receptor, but if realised, such harm is unlikely to be severe