

ENVIRONMENTAL

Kennet Properties
Harborough Hill Road,
Barnsley Interchange.

Phase II Geo-Environmental Risk
Assessment.

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Ref: LDS126/02/v1

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EXECUTIVE SUMMARY

Current Site Status	The site is located approximately at grid reference (NGR) 434810 406640 between Barnsley Bus Station to the west and Harborough Hill Road to the East. The site is on the outskirts of Barnsley town centre and is currently occupied by a large derelict depot comprising one central building approximately 35m by 35m, concrete and asphalt surfaces and several small structures including storage rooms and one above ground storage tank.
Information Sources	A Phase I "Environmental Risk Assessment" desk study report has been compiled by BWB and is reported in the document, Ref. LDS126/01/V1, dated May 2006.
Soil Profile	Shallow thicknesses of made ground have been recorded by all exploratory holes overlying either reworked or weathered lower coal measure bedrock directly at depths of between 0.30m and 3.2m. The site is known to be located within an area that may have been affected by past mining activities. Two coal seams are known to outcrop beneath the site. It is anticipated that the rock beneath the site will dip approximately towards the southeast. Typically between Ground level and 0.30m to 3.2m made ground has been recorded over the site. These soils typically comprise loose fill material overlying stiff clay soils that derive from the reworked natural coal measure mudstone below.
Hydrogeology	The site comprises a minor aquifer (Variable permeability) These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers. The site soils are classified as 'U', Soils of High Leaching Potential. These have little or no resistance to migration of contaminants through the soil matrix.
Hydrology	The nearest surface water feature is located approximately 160m north of the site boundary. The site lies approximately 0.5Km South of the River Dearne and former Barnsley Canal an open and culverted watercourse passing through the centre of Barnsley, in a northwest to southeast direction. The site is not deemed susceptible to flooding.
Key Historical Uses	The site has undergone gradual development from small buildings that were first documented in 1855. A club house and allotments have been developed by 1931 and the first evidence of a depot complex (The Electricity Board Depot) exists from 1968.
Review of Third Party Reports	This report supersedes information obtained by an earlier Phase I Environmental Risk Assessment (ERA) undertaken by BWB in May 2006.

Review of Third Party Reports	Three further reports have been reviewed in relation to an earlier 2001 geo-environmental site investigation at the site as part of this study. The providence and protocols used within these earlier reports are believed to be outdated.
Geotechnical issues	Structures, car parking areas and access roads are currently proposed over parts of the site that are underlain by the zone of potential instability associated with shallow coal mining and will require appropriate remedial measures prior to construction. Several options with relation to construction over these particular areas are given these option include; Grouting and Ground Improvement, piled foundations/slab, cellular raft foundations beneath smaller retail units, Incorporation of a high strength geo-textile/grid beneath pavement areas. Cut and fill earthworks are proposed in order to accommodate the proposed development formation levels. It has been identified that there is a potential to re-use materials won from these earthworks albeit requiring further modification.
Contamination Issues	None of the contaminants tested exceeded the relevant screening criteria and therefore presents no risk to human health. Leachate testing indicates that the analysed contaminants are not leachable. On the basis of three gas monitoring events, it is concluded that due to the inconsistent profile of CO2 concentration from the boreholes, it is recommended to carryout further gas monitoring of at least 4 rounds to identify the need of any gas protection measures required at the site. Slightly elevated levels of PAH have been recorded in localised samples of groundwater and this is analysed to be due to the presents of shallow coal seams that extend below part of the site and are potentially rich in PAH type compounds. The processes of natural attenuating, dilution and dispersion will limit PAH contamination of adjacent water courses which are between 500m and 1000m north and east of the site.
Environmental Risk	As a result of the investigation the site has been given an overall risk rating of NEGLIGIBLE, although this could be reduced further through dQRA work. It is considered that the site does not require any remediation prior to the proposed development as the commercial end use. No contamination issues have been identified at the site, therefore, no environmental liabilities towards contamination exists.
This summary should be read in conjunction with BWB's report (ref.LDS126/02/v1) and reflects an assessment of the Site based on information received by BWB at the time of production. The contents and format have been produced to meet the client's needs at the time of production and should not be regarded as a full assessment of Site conditions associated with detailed development proposals. All comments should be regarded as provisional, subject to confirmation by intrusive investigation works.	

CONTENTS PAGE

1.0	INTRODUCTION	2
1.1	Instruction	2
1.2	Objectives	2
1.3	Limitations	2
1.4	Guidance	3
1.5	Judicial Precedents and Legislation	3
1.6	Technical Competence	4
1.7	Scope of Work	4
2.0	THE SITE	6
2.1	Site Location	6
2.2	Site Description	6
2.3	Site Reconnaissance Visit	7
2.4	Proposed Redevelopment	9
3.0	AVAILABLE INFORMATION	10
3.1	Historical Ordnance Survey Plans	10
3.2	Previous Reports	10
3.3	Regulatory Review	12
3.4	Published Geology	13
3.5	Hydrogeology	13
3.6	Hydrology	14
3.7	Ground Gas	14
3.8	Mining	14
4.0	PHASE I ENVIRONMENTAL RISK ASSESSMENT	16
4.1	Pollutant Sources	16
4.2	Pathways	18
4.3	Receptors	18
4.4	Preliminary Conceptual Site Model (CSM)	19
4.5	Hazard Identified by Phase I ERA	19
4.6	Preliminary Risk Evaluation	20
4.7	Risk to Human Health	20
4.8	Risk to Controlled Waters	20
4.9	Risk to Buildings and Services	21
4.10	Risk Categorisation	21

CONTENTS PAGE

5.0	PHASE II GEO-ENVIRONMENTAL SITE INVESTIGATION	23
5.1	General	23
5.2	Trial Pits	24
5.3	Shell And Auger Boreholes with Rotary Core Drilling Follow on.	24
5.4	Sampling Strategy	25
5.5	Chemical Analysis	25
5.6	Soil Classification Testing	26
5.7	Gas and Groundwater Monitoring	26
6.0	GROUND CONDITIONS	27
6.1	General	27
6.2	Pavement Layers	28
6.3	Made Ground	28
6.4	Completely Weathered Mudstone	29
6.5	Weathered Middle Coal Measure Bedrock	31
6.6	Groundwater	33
6.7	Obstructions	33
6.8	Visual and Olfactory Evidence of Contamination	33
7.0	GENERIC QUANTITATIVE RISK ASSESSMENT	34
7.1	CLEA Soil Guideline Values	34
7.2	Results of Soil Analysis	34
7.3	Leachate Analysis	36
7.4	Groundwater	36
7.5	Chemical Analysis: Groundwater	37
7.6	Ground Gas	37
7.7	Refined Pollutant Linkages	39
7.8	Revised Conceptual Site Model (CSM)	40
7.9	Outline Remediation Statement	41
7.10	ENVIRONMENTAL LIABILITY ASSESSMENT	41
8.0	GEOTECHNICAL ASSESSMENT	42
8.1	Limitations	42
8.2	Mining	42
8.3	Foundations to Structures	46
8.4	Earthworks	47
8.5	Pavements	48
8.7	Excavations	49
8.8	Retaining Structures	49

CONTENTS PAGE

9.0	CONCLUSIONS AND RECOMMENDATIONS	52
9.1	Environmental Issues	52
9.2	Geotechnical Issues	53
9.3	Further Work	54

CONTENTS PAGE

TABLES

Table 1	Pollutant linkages Associated with the Site
Table 2	Risk Evaluation Matrix
Table 3	DoE Risk Categorisations
Table 4	Summary of Ground Conditions Recorded By site Investigations to Date.
Table 5	Summary Geotechnical soils Testing – MADE GROUND
Table 6	Summary Geotechnical Soils Testing –WEATHERED MUDSTONE
Table 7	Characteristic Situations and Gas Protection
Table 8	Gas Protection Measures Applicable to each Characteristic Situation
Table 9	Retaining Wall design Parameters

FIGURES

Figure 1	Site Location Plan (included in main text)
Figure 2	Site Layout and Exploratory Hole Location
Figure 3	Proposed Development Plan (architects drawing)
Figure 4	Proposed cut and Fill Earthworks (preliminary)
Figure 5	Diagrammatic cross section of the underlying strata (included in main test)
Figure 6	Areas of Potential Undermining

APPENDICES

Appendix 1	Site Photos
Appendix 2	Trial Pit Logs
Appendix 3	Borehole Logs
Appendix 4	Chemical Testing Results
Appendix 5	Soil Classification Testing Results
Appendix 6	Gas and Groundwater Monitoring Sheets

1.0 INTRODUCTION

1.1 Instruction

BWB Consulting (BWB) was instructed by Kennet Properties (the 'Client') to carry out a Phase II Geo-Environmental Risk Assessment following an earlier Phase I environmental Risk Assessment (ERA) dated May 2006.

1.2 Objectives

It is understood that the client is looking to redevelop the site for an extension of the Barnsley Interchange with an associated retail complex.

This second, Phase II, study incorporates intrusive works to determine the soil and groundwater profile and its geotechnical implications with regards to any proposed development. This investigation also aims to target potential sources of contamination suggested by the initial Phase I study.

The objectives of this intrusive investigation are as follows:

- o Provide outline design advice with respects to foundations to the proposed development.
- o Refine the CSM through chemical assessment of soil conditions.
- o Provide preliminary recommendations with respects to potentially contaminated soils and possible outline remedial measures.
- o Advise on the need for any further intrusive investigation work which may be considered necessary.

1.3 Limitations

All of the comments and opinions contained in this report, including any conclusions, are based on the information obtained by BWB during our investigations. The conclusions drawn by BWB could therefore differ if the information obtained is found to be misrepresentative, inaccurate, or misleading.

Except as otherwise requested by the Client, BWB is not obliged and disclaims any obligation to update the report for events taking place after:

- a) the date on which this assessment was undertaken; and
- b) The date on which the final report is delivered

BWB makes no representation whatsoever concerning the legal significance of its findings or to other legal matters referred to in the following report.

This investigation is limited to those areas accessible to the chosen investigation method (core drilling and trial pitting) causing the least impact to the current occupation of the site.

1.4 Guidance

BWB Consulting Ltd is a registered Engineering Practice and is regulated by the Institute of Civil Engineers.

This report has been prepared in accordance with:

- o CLR11 – Model Procedures
- o PPS23: Annex 1
- o Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003)
- o Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002
- o DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002
- o DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990
- o Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002

And any other protocols advised by DEFRA and the EA and guidance's prepared by BSI, CERTA, BURA, and other industry advisory bodies including BS5930 and BS10175.

1.5 Judicial Precedents and Legislation

The following non-exhaustive list of legislative framework documents has been considered in the compilation of this document.

- o The Environment Act (1995)
- o The Environment Protection Act (1990)
- o The Water Resources Act (1991)
- o The Radioactive Substances Act (1993)
- o The Pollution Prevention and Control (England and Wales) Regulations (2000)
- o The Contaminated Land (England) Act (2000)
- o The Environment Act 1995 (Commencement No.16 and Saving Provision) (England) Order (2000)
- o The Contaminated Land (England) (Amendment) Regulations (2001)
- o The Landfill Regulations (England and Wales) Regulations (2002)
- o The Landfill (England and Wales) (Amendment) Regulations (2004)
- o Rylands v Fletcher - Private Nuisance, Escape
- o Health and Safety at Work Act
- o The Building Regulations 1991, Part C of Schedule 1

- o The controlled Waste Regulations 1992
- o Special Waste Regulations 1996.

Neither the list of guidance documents nor the list of judicial precedents and legislation should be considered exclusive or comprehensive. There are approximately 85 individual items of legislation regulating contaminated land work. BWB makes every effort to ensure that all are adhered to in the preparation and presentation of this report.

1.6 Technical Competence

BWB is a leading specialist multi-disciplinary engineering practice working in the contaminated land market. Most of the workload undertaken by BWB is within the commercial property development market dealing with brownfield re-development and associated environmental and geotechnical issues.

Established in 1990, BWB is at the forefront of environmental asset management providing expertise in Environmental Risk Assessments, Environmental Site Investigations, Geotechnical Site Investigations and Remediation Strategies.

BWB's staff come from a wide variety of backgrounds within the geotechnical and environmental sectors and are all degree qualified. Specialists include Geotechnical Engineers, Geologists, Environmental Engineers, IEMA Auditors, Chartered Environmental Surveyors, Chartered Engineers; up to SiLC (Specialist in Land Condition) accreditation.

BWB's technical protocols are described in our reports and are strictly adhered to by quality control checks in the field and in the laboratory. BWB only uses UKAS and MCERTS accredited laboratories for all methods used to derive determinant concentrations.

BWB operates a quality assurance process under ISO9001:2000 which facilitates rigorous in-house administrative and technical protocols and is assessed externally every 6 months. BWB also initiates a robust health and safety program for each site and are an Investor in People ensuring the regular training of staff in new guidance's and techniques.

1.7 Scope of Work

The following scope of work has been followed as part of this Phase II Geo-Environmental Risk Assessment:

- o Perform a site services survey prior to commencement of field work.
- o Excavate, log and photograph 15 No. Trial Pits.

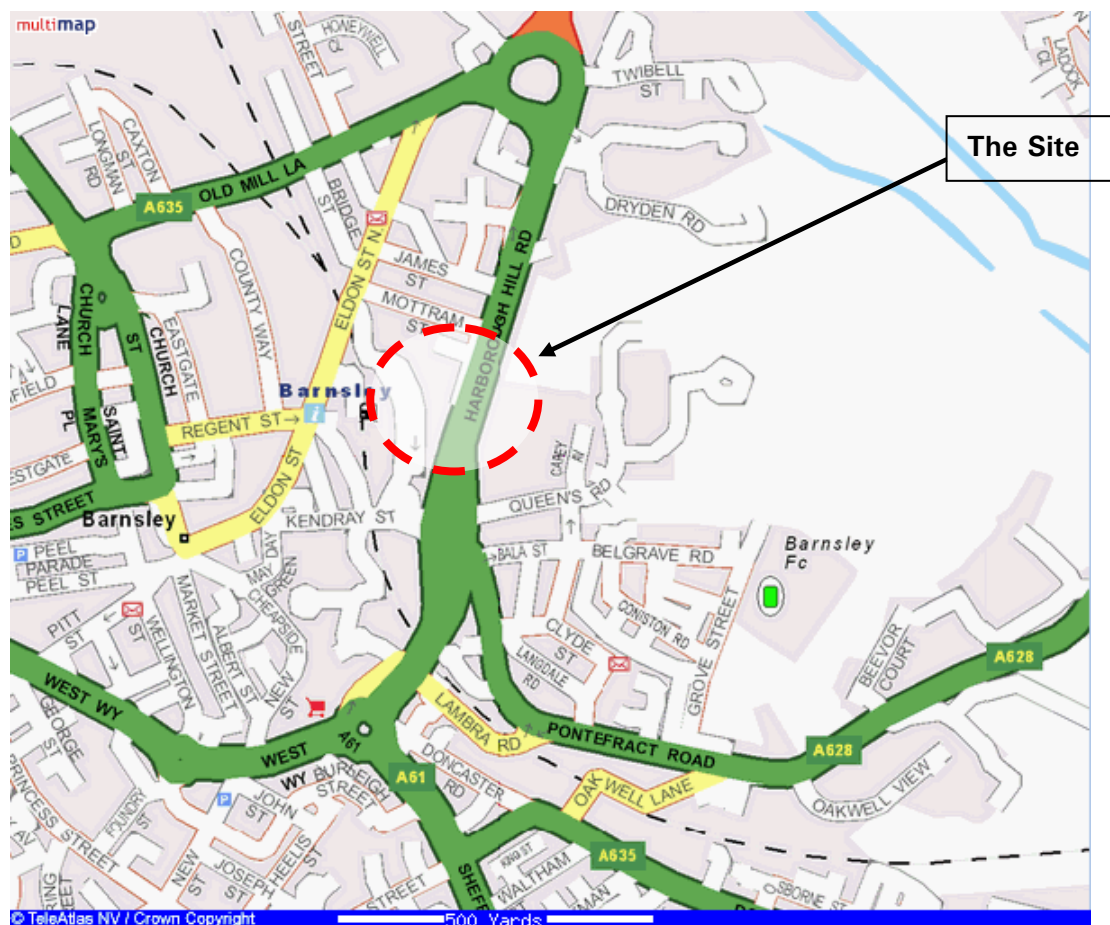
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- o Advance and log 5 No. boreholes to a depth not exceeding 30m bgl to establish geotechnical conditions of the underlying strata.
 - o Perform SPT testing in all drilled locations.
 - o Collect soils samples from 0.5m bgl at 1.0m intervals in the drift deposits, thereafter at 1.0m intervals and/or at changes in strata.
 - o If no groundwater is present all boreholes will be converted to enable gas monitoring to take place.
 - o If groundwater is encountered, all boreholes will be converted to combined gas and groundwater monitoring points.
 - o Select a sub-set of samples for geotechnical laboratory testing as determined by the Site Engineer.
 - o Select a sub-set of samples for chemical laboratory testing.
 - o Laboratory chemical analysis to include those potential contaminants identified in the Phase I investigation. A representative sub-set of samples will be pre-screened for asbestos.
 - o Should ground water be confirmed two return visits will be undertaken for groundwater sampling and levelling to be undertaken.
 - o Gas sampling will take place over a set of eight visits at approximately weekly intervals.
 - o Geotechnical assessment using field and laboratory data related to the proposed development.
 - o Chemical assessment of soil conditions using field and laboratory data related to the proposed development.
 - o A refined SCM.
 - o An outline review of contamination remediation.

2.0 THE SITE

2.1 Site Location

The site is located at National Grid Reference (NGR) 434810, 406640; geographical positioned between Harborough Hill Road to the East and the Barnsley Interchange to the West, as presented in **Figure 1** below.

Figure 1: Site Location Plan



Reproduced from the Ordnance Survey 1:10,000 Scale map with the permission of the controller of Her Majesty's Stationery Office crown copyright reserved. OS Licence number 100013665

The site covers an area of approximately 2.25 Hectares varies in ground level over the site varies between 92m Above Ordnance Datum (AOD) in the north west to 98m AOD in the south east.

2.2 Site Description

The site is located between Barnsley Bus Station to the west and Harborough Hill Road, a dual carriage to the east. Mottram Street forms the northern boundary of the site with some of its houses numbers 17 - 61 backing onto the site.

At the southern boundary of the site are an electricity sub-station and a club. Access to the site is off of the northern bound carriage way of Harborough Hill Road. Barnsley Bus Station is located to the west of the site boundary. The site is elevated approximately 4.0m higher than the bus station.

The current site layout is provided as **Figure 2**.

2.3 Site Reconnaissance Visit

A site walkover was carried out by BWB on Friday 5th May 2006. Photographs taken during the site walkover are presented in **Appendix 1**.

The site is approximately triangular with one side due north running parallel with a footpath behind the houses of Mottram Street. The Eastern face of the site runs parallel Harborough Hill Road. The South of the site is bound by an electricity sub-station, with associated heavy cabling. From the North West corner of the site running half way down the western side of the site the soil has recently been engineered as part of a new access road to the adjacent bus station. As a result a sharp slope of approximately 45 degrees and in the order of 2m in height forms the site boundary here.

Access to the site is from two metal gates situated in the north east corner. These gates connect the site to Harborough Hill Road via a small tarmac car park. The area between Harborough Hill Road up to and including the site is formerly of light industrial and domestic usage.

The site surface is predominantly hard stand, concrete with some asphalt covering evident to the North. This pavement has been broken in parts of the site, assumed to relate to the previous site investigation works undertaken in 2001.

These holes suggest that the concrete is reinforced and of circa 30mm in thickness. This area of the site also has had two new manholes fitted adjacent to the site boundary. These manholes may suggest an, as yet, unrecorded drainage pathway on or near the site.

A single story building, approximately 35m x 35m in plan is located centrally within the site. Numerous manholes are dispersed across the site and around the perimeter of the central building. A lean-to shelter is also present on site.

There is an "L" shaped terrace of garage sized storage buildings delineate the south western corner of the site in front of the sub station. Some small brick built sheds house works associated with the sub-station at the most southern point of the site. North of this and east of the terrace of storage buildings is a bunded tank complex comprising one elevated 4m long barrel shaped tank with associated pipework. A 1m high bund surrounds this and an adjacent plant room.

The site is generally thinly dispersed with domestic rubbish and contains several neat piles of building materials.

2.3.1 The above ground storage tank

A diesel above ground storage tank (UST) with secondary containment has been located at the south western part of the site. Visually, several rust patches are evident on the tank. No information is available regarding the presents of any product inside the tanks. The adjacent plant room to the UST which appeared to be the control room consists of broken disused pipe works and several valves systems and an electronic box mounted on the wall. The pipe works and the valves have been found to be connected to the adjacent tanks which may have been used to control the flow of hydrocarbons from the UST to the unknown delivery system at the site.

2.3.2 The lean-to shelter

This is constructed of metal and concrete and covers a row of three large square manholes suggesting that possibly this was used as an area for servicing vehicles or a machine sump.

2.3.3 The "L" Shaped Terrace of Garage Sized Storage Buildings

These are generally in a poor state of repair with cracks in the concrete construction evident. Broken wiring and light fittings cover the surface features and general rubbish and shelving are dispersed throughout. Signage indicates that these were used to store oils and propane gas.

2.3.4 The Central Building

The central building is approximately 35m square and has an elevated floor of approximately 1.0 to 1.50m above ground level it is brick built with a metal roof that extends half way down the southern wall. The roof is further extended upwards by two building long sky lights of glass and fibreglass. These are commonly broken and the inside of the building while predominantly empty is covered with broken glass, fibreglass and numerous lengths of metal caballing. A small partitioned area exists to the western side of this building that is built from breeze blocks this houses some derelict office furniture and filing cabinets. There is no machinery present but for one redundant photocopier. The building appears to have suffered fire damage. Adjacent to the entrance on the eastern side of the building is an area of what appears to be solidified bitumen tar. There are three former points of entry on the northern side of the building and these all have signage that state the building contains asbestos. This exterior wall also has one head high window of some half meter depth with fitted fans and a security grill. The building has a loading bay on its western side.

2.4 Proposed Redevelopment

It is currently proposed to develop the site in order to accommodate a 45,000 ft² retail unit with associated car parking over the majority of the site. A smaller 3,000 ft² retail/restraint unit is proposed over the south east part of the site.

A plan showing the proposed development is presented as **Figure 3**. It is this layout that has been used for the human health risk assessment.

The existing site structures are to be demolished as part of the proposed development. Proposed cut and fill earthworks are shown on the BWB drawing LDS/126/SK100 rev P1, reproduced as **Figure 4**.

For preliminary purposes, proposed site levels will be created by cutting into existing ground levels over the southern half of the site by up to 1m depth. It is proposed to up fill from existing site levels over the northern part of the site by up to 3m.

The footprint of the larger retail unit is shown to be situated over part cut (<1.2m deep) and part filled ground (<3.4m of fill).

The footprint of the smaller retail unit is shown to be situated entirely over an area of cut (0.6m to 1.0m).

Minor retaining structures up to 1m in height are envisaged over the southern part of the site where it is proposed to cut into the existing ground levels adjacent to the site boundary and Harborough Hill Road.

Retaining structures will be required over northern site boundary to accommodate the proposed up-filling.

At this stage no design loads are known.

3.0 AVAILABLE INFORMATION

3.1 Historical Ordnance Survey Plans

All readily available historical Ordnance Survey (OS) mapping for the site area have been obtained and reviewed as part of the Phase I ERA.

In summary, the site has undergone gradual development from small buildings that were first documented in 1855. A club house and allotments have been developed by 1931 and the first evidence of a depot complex (The Electricity Board Depot) exists from 1968.

3.2 Previous Reports

The following documents have been reviewed as part of this study:

- "Site Investigation for a Site at Harborough hill Road, Barnsley, South Yorkshire", Soil Mechanics for Waterman BBT, report Ref. 101009 Rev 2, May 2001.
- "Mining Report" Wardell Armstrong for Waterman BBT, Ref. SD01-0058-Rep, June 2001.
- "Summary of Site Investigation Reports and Assessment of Abnormal Geotechnical and Contamination Issues at Harborough Hill Road, Barnsley" Waterman BBT for Bett Properties, Ref ANP/SEF/9211 Draft, August 2001.
- Phase 1 Environmental Risk Assessment (Ref. LDS126, BWB, May 2006)

These reports relate to a previous geo-environmental site investigation at the site undertaken in January 2001. These reports should be read in conjunction with this document. The findings of these reports are summarised in the proceeding sections:

3.2.1 Soil Mechanics "Site Investigation" Report May 2001

This report documents the factual information obtained as part of the January 2001 site investigation. This investigation comprised the following works:

- 5 No. Shell and Auger boreholes to depths of between 3.3m to 5.0m.
- 6 No. Rotary "open holed" boreholes to depths of between 20.5m to 60m.
- 3 No. Window sampler boreholes to depths of between 1.5m to 2.4m.
- 9 No. Trial Pits to depths of between 1.5m to 2.0m.
- In situ CBR testing.
- Soil classification testing (LL, PL, MC, PSD)
- Soil strength testing (Cu)
- Compaction testing (MDD, OMC)

- Soil sulphate testing (pH, SO₄ (soluble))
- Contaminant testing.

This investigation recorded made ground/pavement layers overlying weathered mudstone and siltstone bedrock at depths of between 0.3m to 3.2m below existing ground level.

Deep drilling into the underlying bedrock recorded up to 7 No. coal seams beneath the site at between 0.1m and 1.3m thickness. No evidence to suggest previous workings was recorded by the investigation.

Exploratory works suggested that the bedrock beneath the site dips between 4° to 5° to the east, in general agreement with published geological maps.

No groundwater was recorded in shallow exploratory holes (trial pits and window sampler boreholes) undertaken to depths of between 1.5m and 3.6m depth. Deep exploratory methods recorded groundwater strikes during drilling of boreholes at depths of between 15.9m and 29.7m below existing ground level.

Subsequent groundwater monitoring recorded water levels within standpipes at between 5.7m and 15.7m depth.

This report concluded that shallow coal seams extend below part of the site that could potentially have been historically mined.

3.2.2 Wardell Armstrong Consulting "Mining Report" June 2001

This report was written on behalf of Waterman BBT in order to address the mining setting on or in the immediate vicinity of the site with a view to redevelopment.

The following sources of information were consulting as part of this study:

- Published geological and Coal Authority Records
- The Soil Mechanics 2001 Site Investigation Report.

This report reinterprets the conjectured sub-crop of two shallow coal seams beneath the site and estimates that bedrock should dip approximately 7° to the east.

The site is considered stable with respects to past deep coal mining.

This report concludes that there is a potential for unrecorded shallow mine workings across the eastern third of the site. Wardell Armstrong recommended that further investigation and stabilisation is carried out by drilling and pressure grouting over the construction footprint and a 3m additional perimeter.

3.2.3 Waterman Environmental "Short Summary of Site Investigations Report" August 2001

This report summarises the findings of the two preceding studies and in particular abnormal geotechnical issues relating to the site.

In summary the report states that:

- Cut and fill earthworks will be required to create a level formation. Weathered mudstone and clays are considered unsuitable for re-use.
- Shallow foundations bearing upon the weathered bedrock, and a minimum of 0.9m below ground, will sustain bearing pressures of 150kN/m². Where bedrock is locally up to 3m in depth, foundations should be over-excavated and backfilled with mass concrete.
- No special precautions are required with regards to sulphate resistant concrete.
- Grouting should be undertaken beneath structure over areas of potential shallow coal mining.
- Coal within 1m of formation level must be removed and replaced with inert blinding as a precaution to the risk of combustion.
- Gas protection membrane should be incorporated beneath the ground slab to buildings as a result of measured radon concentrations within boreholes.

3.2.4 BWB Phase I Environmental Risk Assessment 2006

A Phase I "Environmental Risk Assessment" desk study report has been compiled by BWB and is reported in the document, Ref. LDS126/01/V1, dated May 2006. This study is limited to the data collected from proprietary sources, the contacted Statutory Authorities and observations made during the site walkover.

3.3 Regulatory Review

An Envirocheck® report was commissioned by BWB as part of the initial Phase I study.

In addition, Barnsley County Council's Environmental Health Department and Planning Department were also contacted in relation to records relating to environmental issues at the site. None of this information has been forthcoming to date.

Key points of the regulatory review include discharge consents, water abstraction licences, and pollution incidents that are recorded on or near the site.

3.4 Published Geology

The following published geological information has been obtained as part of the Phase I study:

- o 1:50 000 series solid and drift geological map sheet 86, "Barnsley" published by the British Geological Survey (BGS).
- o 1:10,000 scale sheet SE30SW, published by the British Geological Survey (BGS).

The 1:50,000 series geological map of this area indicates that the site is underlain directly mudstones of the Upper Carboniferous Middle Coal Measures.

Two coal seams are shown exposed at the surface, at or around the surface of the site.

The 1:10,000 scale geological plan confirms the geology as suggested by the smaller scale plan. A coal seam is shown bisecting the site and is indicated to be the Winter or Abby Coal. This coal is recorded at thicknesses of between 1.2m and 1.4m in this area. Notes on the map indicate that this coal was previously exposed at the surface nearby. A second coal seam is shown approximately 200m to 300m further west of the site boundary and is indicated as being the Top Beamshaw Coal. This coal seam is present at between 1.2m to 1.4m and is overlain by a sandstone band.

The bedrock in this area is shown dipping to the east.

A colliery is shown to the east of Harborborough Hill Road. The Wardell Armstrong mining report contains further details relating to a Mottram Wood Colliery located similarly to the east of Harborborough Hill Road. This colliery is believed to have worked the Winter Coal known to underlie part of the site.

3.5 Hydrogeology

The Environment Agency has classified the underlying strata as a Minor Aquifer (Very Permeable). These are formations can be fractured or potentially fractured rocks, which do not have high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers.

The site soils are classified as 'U', Soils of High Leaching Potential. These have little or no resistance to migration of contaminants through the soil matrix.

Both the Envirocheck® report states that the site is not located within an Environment Agency designated Source Protection Zone.

There are no recorded groundwater abstractions within 400m of the site.

3.6 Hydrology

The nearest surface water feature is located approximately 160m north of the site boundary.

The site lies approximately 0.5Km South of the River Dearne and former Barnsley Canal an open and culverted watercourse passing through the centre of Barnsley, in a northwest to southeast direction.

The site is not deemed susceptible to flooding.

3.7 Ground Gas

NRPB-W26, Radon Atlas of England and Wales, identifies the site as being in an area where between 1% and 3% of homes are above the action level for Radon Gas.

BRE211, Radon: guidance on protective measures for new dwellings, identifies the site as overlying an area where basic radon protective measures may be required and that a geological assessment should be made.

A geological assessment involves checking whether a site is on or close to a geological unit with elevated radon potential. This is usually compiled in a Radon Protective Measures (RPM) reports from the British Geological Survey (BGS).

The Radon Protective Measures Geographical Information System (RPM-GIS) dataset held by the BGS is leased by Envirocheck® and summarised in their report.

The Envirocheck® report states that basic radon protection measures will be required.

The site was occupied in part by a former registered waste transfer site. There is no recorded input data, but a licence for between 10000 and 25000 tonnes per year; as such landfill gas may present an elevated risk to any development.

3.8 Mining

A Coal Authority Report ref 10193292-06 was commissioned by BWB in May 2006 as part of the Phase I ERA.

The Coal Authority holds records that indicate the site is within the likely zone of influence from the working of four deep seams, at depths of between 50m and 350m although ground movement relating to these workings should now have ceased. This report also states that reserves of coal exist near surface that may have been worked in the past.

The site does not lie within the zone of influence of present underground or surface mine working. No licence to extract coal exists for this area, although the reserves of coal present beneath the site could be worked in the future, subject to feasibility, licenses and planning.

There are no known shafts or adits within the site or within 20m of the site boundary.

No records of faults or other lines of weakness that may affect the stability of the property are kept by the Coal Authority.

The Coal Authority holds no records of any damage notice or claim having been made in respects of the property since 1984.

The Coal Authority report recommends, *"in view of the mining circumstances a prudent developer should seek appropriate technical advice before works are undertaken on site"*.

A "Mining Report" was undertaken by Wardell Armstrong (June 2001) specifically relating to mining issues in relation to development of the site. This report concluded that the site is considered stable with respects to past deep coal mining.

This mining report concluded that the shallowest seam is known locally as the Winter (Abdy) and the lower seam is known as the Top Beamshaw. Mine abandonment plans relating to an adjacent colliery indicate that the Winter Seam has been worked as far west as Harborough Hill Road. The Beamshaw seam is not known to have been worked. The mining report concluded that "the Beamshaw Seam(s) are thin, inconsistent and/or poor quality and very unlikely to have been worked beneath the site".

This report concludes that there is a potential for unrecorded shallow mine workings across the eastern third of the site associated with areas underlain by the Winter Seam. Wardell Armstrong recommended that further investigation and stabilisation is carried out by drilling and pressure grouting over the construction footprint and a 3m additional perimeter.

4.0 PHASE I ENVIRONMENTAL RISK ASSESSMENT

A Phase I ERA has been previously undertaken and is reported separately in the BWB document Ref. LDS126/01/V1, dated May 2006. This document should be read in conjunction with this report.

The following sections discuss all the identified potential sources, pathways and receptors in the context of the site and plausible pollutant linkages which may represent a risk to human health and/or controlled waters from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- o The site impacting upon itself;
- o The site impacting on its surroundings, and;
- o The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

4.1 Pollutant Sources

The then Department of the Environment produced a Consultation Paper in dated May 1991: entitled 'Public Registers of Land which may be Contaminated'. This document provided a schedule of contaminative uses.

From this list the following contaminative uses are associated with the site.

Sub Station

C.3e) Electricity and sub-station.

Fuel Tanks

C.14c) Dismantling, repairing or maintenance of road transport and road haulage;
Garages and filling stations.

Demolition

C.16c) Demolition of buildings, plant or equipment used for any of the activities included in the schedule.

From this list the following contaminative uses are associated with the surrounding area.

Colliery & Coal Yard

C.2a) Extracting, handling and storage of carbonaceous materials such as coal, lignite, petroleum, natural gas, or bituminous shale (not including the underground workings).

Timber Yard

C.11a) Chemical treatment and coating of timber and timber products.

Railway Land

C.14a) Marshalling, dismantling, repairing or maintenance of railway rolling stock.

Railway Foundry

C.8a) Manufacture of metal goods, including mechanical engineering industrial plant or steelworks, motor vehicles, ships, railway or tramway vehicles, aircraft, aerospace equipment or similar equipment.

Bus Depot

C.14c) Dismantling, repairing or maintenance of road transport and road haulage; Garages and filling stations.

The main sources of contaminants at the site are likely to be associated with the presence of the former waist transfer. The neighbouring properties are not deemed to be of influence to the site.

In 2002, as part of the CLEA programme, DEFRA produced a series of Contaminated Land Reports (CLR's). CLR8 entitled 'Potential Contaminants for the Assessment of Land' lists the likely contaminants that can be expected from a variety of contaminative industries.

There are also a set of documents produced by the then Department of the Environment entitled Industry Profiles. These have also been consulted in determining which contaminants may be associated with these industries.

From these documents the following contaminants associated with the various activities identified above along have a potential to be encountered. These have been combined with a general suite of contaminants that may be encountered from a variety of sources.

This list is not exhaustive, nor is it definitive, that is to say, listed contaminants only have a potential to be present, their presence is not assured, nor does this list exclude other contaminants from being present.

Arsenic, barium, boron, cadmium, chromium, copper, lead, mercury, nickel, vanadium, zinc, cyanide, sulphates, asbestos, phenols, oil/fuel hydrocarbons, PAH's, and total organic carbon. In addition, landfill gas monitoring should be undertaken.

Any intrusive testing programme should include these contaminants as a minimum requirement.

4.2 Pathways

Potential pathways by which human receptors may be impacted upon are identified as follows:

- o Ingestion
- o Skin contact
- o Inhalation

These pathways arise through direct contact with contaminated soils, contact with contaminated groundwater or inhalation of airborne dusts, fibres or gases.

Potential pathways that could impact site structures are through direct contact with contaminated soils or contact with contaminated groundwater.

Potential pathways that could impact controlled waters are through direct contact with contaminated soils or percolation of contaminated surface waters.

4.3 Receptors

The potential human receptors at the site are:

- o Current occupiers of the site
- o Future occupants of the site
- o Neighbouring residents
- o Construction workers
- o Services personnel working in trenches

Construction materials may be affected by contaminants. These receptors are:

- o Plastic water pipes, which may be attacked by organic compounds such as PAH and TPH
- o Buried concrete, which may be affected by high levels of sulphate and/or low pH in site soils or groundwater

Potential water receptors include:

- o The local water courses
- o The underlying ground water (if present)

An assessment of these pollutant linkages has been made and is presented in **Section 6.4**.

4.4 Preliminary Conceptual Site Model (CSM)

The preliminary CSM is formulated on the basis of potential sources of contamination identified on site, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist, thus creating a source-pathway-receptor (target) pollutant linkage.

The following pollutant linkages have been identified as being attributed to this CSM.

The preliminary CSM is formulated on the basis of potential sources of contamination identified on site, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist, thus creating a source-pathway-receptor (target) pollutant linkage.

The following pollutant linkages have been identified as being attributed to this CSM and are presented in **Table 1** below:

Table 1: Pollutant Linkages Associated With The Site

	Source	Pathway	Receptor
1	Contaminants contained within the made ground.	Vertical migration through site soils	Underlying Minor Aquifer
2	Contaminants contained within the made ground.	Direct contact	Existing site users
3	Contaminants contained within the made ground.	Direct contact	Ground workers
4	Contaminants contained within the made ground.	Surface run off	On and off site drainage system
5	Contaminants contained within the made ground.	Lateral migration through site soils	Existing buildings on site

No significance or uncertainty is attributed to any pollutant linkage identified.

4.5 Hazard Identified by Phase I ERA

The Hazard Assessment has identified two significant hazards associated with the site.

These hazards are:

- o Potential contamination associated with the presence of a landfill on site.

- o Potential contamination from off-site sources in the site soils.

4.6 Preliminary Risk Evaluation

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

Table 2 – Risk Evaluation Matrix

	CONSEQUENCES			
	Severe	Medium	Mild	Negligible
PROBABILITY				
High	Very High	Very High/High	Moderate/Low	Negligible
Medium	Very High/High	Moderate	Low	Negligible
Slight	High/Moderate	Moderate/Low	Low	Negligible
Negligible	High/Moderate/Low	Moderate/Low	Low	Negligible

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring.

The following evaluations have therefore been made:

4.7 Risk to Human Health

4.7.1 Contamination in the Soils

Due to the historical use of the site, they have been attributed a MEDIUM probability with MEDIUM consequences resulting in a **MODERATE** risk.

4.7.2 Contamination in the Surface and Groundwater

Due to the historical use of the site, they have been attributed a MEDIUM probability with MEDIUM consequences resulting in a **MODERATE** risk.

4.8 Risk to Controlled Waters

4.8.1 Contamination in the Soils

Due to the historical use of the site, they have been attributed a MEDIUM probability with MEDIUM consequences resulting in a **MODERATE** risk.

4.8.2 Contamination in the Surface and Ground Water

Due to the historical use of the site, they have been attributed a MEDIUM probability with MEDIUM consequences resulting in a **MODERATE** risk.

4.9 Risk to Buildings and Services

4.9.1 Contamination in the Soils

Due to the historical use of the site, they have been attributed a MEDIUM probability with MEDIUM consequences resulting in a **MODERATE** risk.

4.9.2 Contamination in the Surface and Ground Water

Due to the historical use of the site, they have been attributed a MEDIUM probability with MILD consequences resulting in a **LOW to MODERATE** risk.

4.10 Risk Categorisation

The pollutant linkages assessment combined with the historical use of the site indicates that in its present state the site represents a **MODERATE** human health risk, a **MODERATE** risk controlled waters risk and a **LOW to MODERATE** risk to site structures.

During redevelopment the risk to human health will rise to **HIGH to MODERATE** due to demolition activities associated with earthworks and construction activities over the site.

Post development, all risks should be reduced to no greater than **LOW**.

These ratings are set against the following categories provided in **Table 3** as defined by, the then, Department of the Environment in CLR2 and subsequently amended.

Table 3: DoE Risk Categorisations

RATING	DEFINITION
Very High Risk	This is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High Risk	<i>Harm</i> is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate Risk	It is possible that without appropriate remedial action <i>harm</i> could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.

RATING	DEFINITION
Low Risk	It is possible that <i>harm</i> could arise to a designated receptor from an identified hazard. It is likely that, at worst, if any harm was realised any effect would be mild.
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause <i>harm</i> to a designated receptor.
No Potential Risk	There is no potential risk if no pollution linkage has been established.

5.0 PHASE II GEO-ENVIRONMENTAL SITE INVESTIGATION

5.1 General

An intrusive site investigation was undertaken between the 26th June and 04th of July 2006 and comprised of:

- 15 No. trial pits to depths of between 1.5m and 3.4m;
- 5 No. shell and auger boreholes to depths of between 2.0m and 4.0m
- 5 No rotary continuation boreholes from shell and auger borehole depth to 30.00m

Soil samples were collected at regular intervals throughout all exploratory holes and submitted to an MCERTS accredited soils laboratory for further chemical analysis. Further sub-samples of representative soils types were collected and submitted to a UKAS accredited soils laboratory for geotechnical classification testing.

In-situ Standard Penetration Testing (SPT) has been undertaken at regular intervals throughout shell and auger boreholes. These exploratory holes are located adjacent to the footprint of the proposed building and at the extremities of the site.

On completion, shell and auger boreholes and rotary continuation the resulting boreholes were converted to combined gas and water installations.

Subsequently, gas and water monitoring has been undertaken on five separate occasions over a period of two months following completion of the site works.

Groundwater samples were also obtained on two separate visits for further chemical analysis.

The site work was carried out in general accordance with BS5930 (1999) 'Code of Practice for Site Investigations', the Association of Geotechnical and Geo-Environmental Specialist Guidelines for Good Practice in Site Investigations (August 1998) and BS10175 2001 'Code of Practice for the Investigating of Potentially Contaminated Sites'. The work was supervised by a suitably qualified geo-environmental engineer.

All BWB environmental investigation work is undertaken in accordance with CLR11 Model Procedures.

An exploratory hole location plan is presented as **Figure 2**. Exploratory hole records can be found in **Appendix 2, 3** and **4**. Laboratory chemical analysis and geotechnical soil testing can be found in **Appendix 5**. Gas and groundwater monitoring records can be found in **Appendix 6**.

5.2 Trial Pits

Total fifteen trial pits (TP001 to TP015) were excavated using an eight tonne, JCB 3CX backhoe fitted with a 600mm wide bucket fitted with ripping teeth. Pits locations were broken out through hard pavement layers using a hydraulic breaker.

Trial pits were distributed over the entire site and adjacent to areas of potential sources of contamination.

Trial pits were extended to target depths of around 4.0m or until refusal on hard layers. Refusal of the excavator was deemed as slow progress and repeated scraping of the bucket on hard layers.

Trial pits were excavated to depths of between 1.5m and 3.4m.

Samples of soil were taken at regular intervals and representative soil types during excavation. Records were kept that detail soil types, consistency and the absence of water strikes.

Pits were backfilled with arisings on completion. No additional reinstatement measures were requested by the client.

The location of trial pits are shown on **Figure 2**. Trial pit Photographs can be found in **Appendix 1**. Trial pit logs can be found in **Appendix 2**.

5.3 Shell And Auger Boreholes with Rotary Core Drilling Follow on.

Five shell and auger boreholes (BH01, BH02, BH03, BH04 and BH05) were bored through superficial soil deposits to effective refusal at depths of between 2.0m and 4.0m. Effective refusal was deemed as chiselling through hard ground with minimal progress for up to 0.5 hour.

These boreholes were positioned in and around the footprint of the proposed building and the extremities of the site. On completion of the shell and auger boreholes were progressed further using rotary follow to a target depth of 30m.

Standard penetration testing (SPT) was undertaken at 1m intervals during shell and auger boring.

Soil samples were collected at regular intervals within this upper layer for further chemical and soil classification laboratory analysis.

Rotary drilling was progressed through bedrock using coring techniques. Typically total core recoveries in excess of 70% were achieved during drilling. A period of no recovery was recorded in borehole BH02 from 29.00 to 30.00m depth as a result of a blocked core barrel.

Rock core was retrieved photographed and logged by a qualified engineering geologist in accordance with BS5930.

A 50mm diameter combined gas and water monitoring standpipes were installed with response zones sealed below superficial deposits.

Borehole logs can be found in **Appendix 3**. Site location plan showing the position of exploratory holes is presented as **Figure 2**.

5.4 Sampling Strategy

Soil samples were collected from the trial pits, probe holes and boreholes at 0.5m intervals within the first metre and thereafter at 1.0m intervals thereafter for further chemical laboratory analysis. Samples of representative soil types were also taken for further geotechnical classification testing.

The combined gas and groundwater monitoring installations were installed in BH01, BH02, BH03, BH04 and BH05.

Exploratory holes were positioned adjacent to potential sources of contamination present on site, in addition they were positioned in and around the footprint of the proposed building and the extremities of the site.

This sampling regime was intended to provide an outline indication of the contamination potential of the land. Further, confirmatory sampling and or testing, may be required prior to development.

5.5 Chemical Analysis

The potential risks that may be associated with the site relate to human health and buried structures and controlled waters. As such samples were collected for chemical analysis.

A total of 19 No. samples were submitted for the following the general suite of contaminants:

Metals and metalloids	Boron (water soluble), arsenic, barium, beryllium, cadmium, chromium, selenium, copper, mercury, nickel, lead, vanadium, and zinc.
Inorganic	Sulphate (water soluble), total free and complex cyanide, and pH.
Organic	Phenols (total monohydric), FOC, TPH (total) and PAH (total).

Other Asbestos

5.6 Soil Classification Testing

5.7 Gas and Groundwater Monitoring

6.0 GROUND CONDITIONS

6.1 General

Ground conditions have been interpreted from the combined exploratory records of the previous Soil Mechanics 2001, site investigation and the supplementary 2006 BWB site investigation.

Typically, between 0.3m and 1.3m of made ground comprising pavement materials and reworked natural soils have been recorded overlying completely to highly weathered Middle Coal Measures mudstone.

A localised area of made ground up to 3.2m depth has been recorded over the north east part of the site comprising gravelly clay with gravel and cobbles of brick, and sandstone and occasional glass, coal, polythene, ash and slag (see **Figure 2**).

Several coal seams have been recorded beneath the site at between 0.4m and 1.5m thickness. Two of these seams are present within 15m of the existing site surface. These seams sub-crop beneath superficial site soils and dip approximately 6° to 8° to the east beneath the site. No evidence of workings was recorded in these shallow coal seams by the exploratory holes undertaken to date.

Table 4: Summary of Ground Conditions Recorded By Investigations to Date

Soil Type	Description	Depth encountered (bgl)	Thickness Proven (m)
PAVEMENT	Asphalt/Reinforced Concrete typically over Limestone or brick and sandstone gravel Base.	GL	0.15m to 0.9m
MADE GROUND	Gravelly clay with gravel and cobbles of brick, limestone and sandstone and occasional glass, coal, polythene, ash and slag	0.15m to 0.6m	NP to 2.7m
COMPLETELY WEATHERED MUDSTONE	Firm to very stiff thinly laminated CLAY	0.3m to 3.2m	NP to 2.3m
WEATHERED MIDDLE COAL MEASURES	Very weak to weak thinly laminated mudstones and siltstones with coal seams and sandstone bands at depth.	0.3m to 5.2m	Proven up to 60m b.g.l
	Coal Seam 1 – intact where encountered.	0.5m to 6.4m	NP to 1.0m
	Coal Seam 2 – intact where encountered, split in two by a thin mudstone band.	5.2m to 18.6m	0.4m to 1.5m

Soil Type	Description	Depth encountered (bgl)	Thickness Proven (m)
	Coal Seam 3 – intact where encountered.	12.6m to 30.9m	0.1m to 1.5m
	Coal Seam 4 – BH5/RC3 (soil mechanics 2001) records quick penetration through seam.	38.8m (BH5/RC3 only)	Possibly up to 1.2m
	Coal Seam 5 – drillers description only (open holed borehole)	58.4m (BH5/RC3 only)	1.3m
GROUNDWATER	1. No groundwater strikes have been recorded by trial pits and window sampler boreholes excavate/driven to depths of between 1.5m and 3.6m depth. 2. Minor seepage recorded at or just below pavement base 0.9m to 0.7m (TP1, TP7 and TP8 -2001). Soils described as wet throughout (TP6). 3. Deep drilling recorded ground water strikes at between 4.5m and 29.7m depth, rising to 12.9m to 4.4m depth after 20 minutes. 4. Subsequent groundwater monitoring has recorded groundwater levels between 5.8m and 20m depth.		
NP =	Not present in all exploratory holes (localised)		

6.2 Pavement Layers

Pavement layers have been recorded at between 0.15m to 0.9m thickness and comprise asphalt or concrete surfacing overlying limestone of mixed sandstone/brick base materials.

Asphalt and concrete encountered by all exploratory holes over the site at thicknesses of between 0.1m and 0.35m. Concrete pavement is reinforced in areas.

Pavement materials have been recorded overlying base materials are typically recorded as limestone gravel although can be locally sandstone and brick gravel.

Limestone gravel backfill to drainage was encountered by TP07 up to 1.2m depth.

6.3 Made Ground

Made ground comprising gravelly clay with gravel and cobbles of brick, limestone and sandstone has been recorded in localised areas of the site underlying pavement materials.

Where encountered, these soils are typically less than 1.2m in thickness. However, a localised area of the northeast part of the site recorded made ground soils up to depths of between 1.3m to 3.2m depth as recorded by TP11, TP12, BH05 (BWB 2006) and TP5, BH02/RC5 and BH03/RC2 (Soil Mechanics 2001).

Made ground soils over this localised area also included; ash, clinker, coal, polythene and glass fragments.

In situ testing in this material recorded SPT N values of between 8 and 109.

Particle size distribution testing on samples of this made ground (TP12 and BH05) recorded silt and clay sized material contents of 38% and 73%.

A summary of the combined laboratory soils testing undertaken to date is presented as **Table 5**.

Table 5: Summary Geotechnical soils Testing – MADE GROUND

Made Ground – Geotechnical Soil Test summary			
	Max	Min	No. of tests
Natural MC %	46%	17%	4
LL %	66%	63%	2
PL%	48%	31%	2
PI%	32%	18%	2
% silt and clay	56%	30%	4
% sand	32%	22%	4
% gravel	33%	22%	4
% cobbles	9%	0%	4
Bulk Density mg/m ³	2.26 mg/m ³	1.98 mg/m ³	2
<i>Sulphate Testing</i>			
pH	7.9	5.9	3
SO ₄ g/l	0.06 g/l	0.01 g/l	3
<i>Soil Strength Testing</i>			
Cu ((UUT)	124 kN/m ²	62 kN/m ²	2

6.4 Completely Weathered Mudstone

Mudstone bedrock was encountered by all exploratory holes at depths of between 0.3m and 3.2m below ground level. However mudstone bedrock is typically encountered over the majority of the site at depths of less than 1.8m.

Locally the underlying bedrock is completely weathered to a firm to very stiff thinly laminated clay.

Shell and Auger boreholes refused within the mudstone at depths of between 2.5m to 4.0m. Boreholes where progressed further by rotary coring (BWB 2006) or open hole boring (Soil Mechanics 2001) techniques.

Standard penetration testing (SPT) within completely weathered mudstone bedrock recorded N300 values of between 7 and refusal. In all cases SPT values increased with depth.

Soil classification testing suggests these soils are of an intermediate to high plasticity. Soil moisture contents vary between 6% and 46% although generally decrease with depth. Typically soil moisture contents are below 18% below 1m depth.

Consolidation testing has been undertaken on a sample of firm laminated clay recovered from BH05 at 2.0m depth. The coefficient of volume compressibility (m_v) of 0.18 m^2/MN was measured over a pressure increment 100kPa in excess of the assumed affective overburden.

A summary of the combined laboratory soils testing undertaken to date is presented as **Table 6**.

Table 6: Summary Geotechnical Soils Testing – COMPLETELY WEATHERED MUDSTONE

Completely Weathered Mudstone – Geotechnical Soil Test summary			
	Max	Min	No. of tests
Classification testing			
Natural MC %	46%	6%	22
LL%	66%	33%	9
PL%	48%	19%	9
PI%	34%	14%	9
% silt and clay	91%	68%	4
% sand	22%	3%	4
% gravel	21%	5%	4
% cobbles	0%	0%	4
Bulk Density mg/m^3	2.22 mg/m^3	1.96 mg/m^3	3
Soil Sulphate Testing			
pH	7.6	4.5	6
SO4 g/l	0.08 g/l	0.02 g/l	6
Soil Strength Testing			
Cu (UUT)	133 kN/m^2	71 kN/m^2	2
Consolidation Testing			
m_v (oedometer)	0.18 m^2/MN	-	1
Compaction Testing			
Std MDD mg/m^3	1.99 mg/m^3	1.77 mg/m^3	3
Std OMC	17%	12%	3
HeavyMDD mg/m^3	2.1 mg/m^3	2.08 mg/m^3	2
HeavyOMC	9.5%	7.8%	2

6.5 Weathered Middle Coal Measure Bedrock

Very weak to moderately weak thinly laminated mudstone bedrock has been recorded at depths of between 0.3m and 5.2m below existing ground level. The underlying Middle Coal Measures bedrock has been proven up to 60.0m bgl.

Shell and auger boreholes were bored through superficial soil deposits/completely weathered mudstone to effective refusal at depths of between 2.0m and 4.0m upon less weathered mudstone bedrock.

In all cases bedrock comprised very weak grey brown thinly laminated mudstone which becomes weak to moderately weak with depth.

Several coal seams were recorded below the site at between 0.4m and 1.5m thickness. Two of these seams are present within 15m of the existing site surface these seams sub-crop beneath thin superficial cover on site. Correlation between boreholes suggests that the bedrock dips approximately 6° to 8° to the east beneath the site.

Boreholes BH05 (BWB 2006) and BH3/RC2 (Soil mechanics 2001) were drilled over the anticipated location of the shallowest seam, as suggested by published geological information and correlation with adjacent drilling.

This seam was not encountered in BH05 and only a 0.4m band of coal was recorded by BH03/RC2 at the anticipated depth of the shallowest seam.

Boreholes BH01, BH02, BH03 and BH05 recorded that the second shallowest seam recorded on site (seam 2) was split by a 0.2m to 0.4m mudstone band.

Predominantly sandstone bedrock was encountered beneath the site at depth of between 9m and 26m depth and was proven up to 19.6m thickness in BH04.

A diagrammatic cross section showing the estimated extent of coal seams beneath the site is presented in **Figure 5** (overleaf), **Figure 6** shows the estimated extent of the potential instability caused by mining.

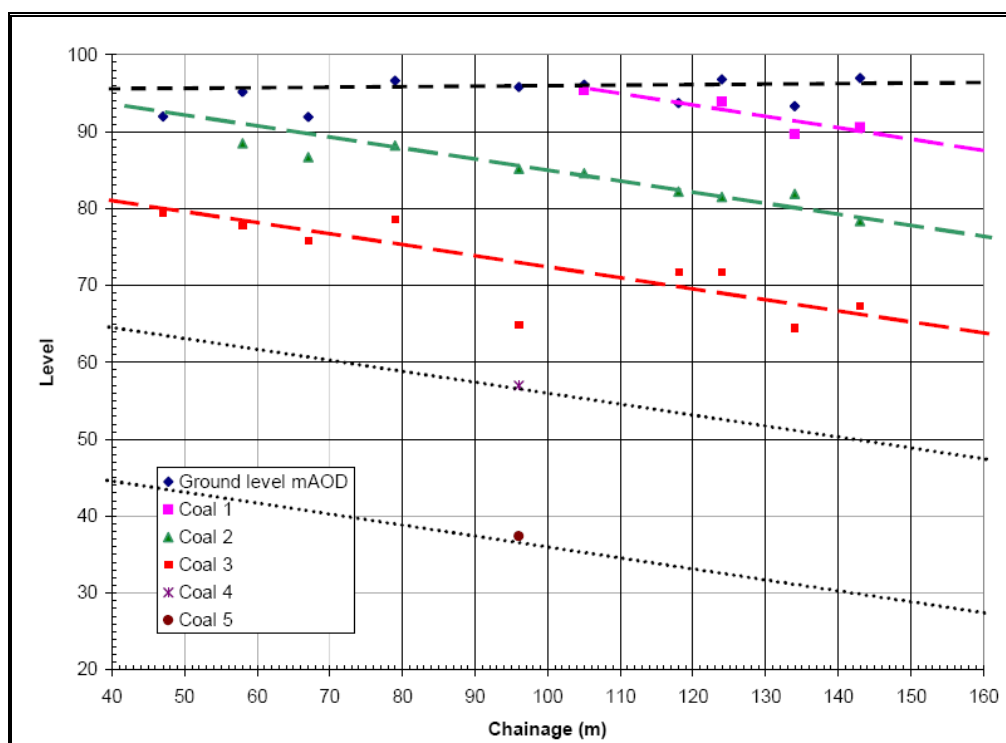
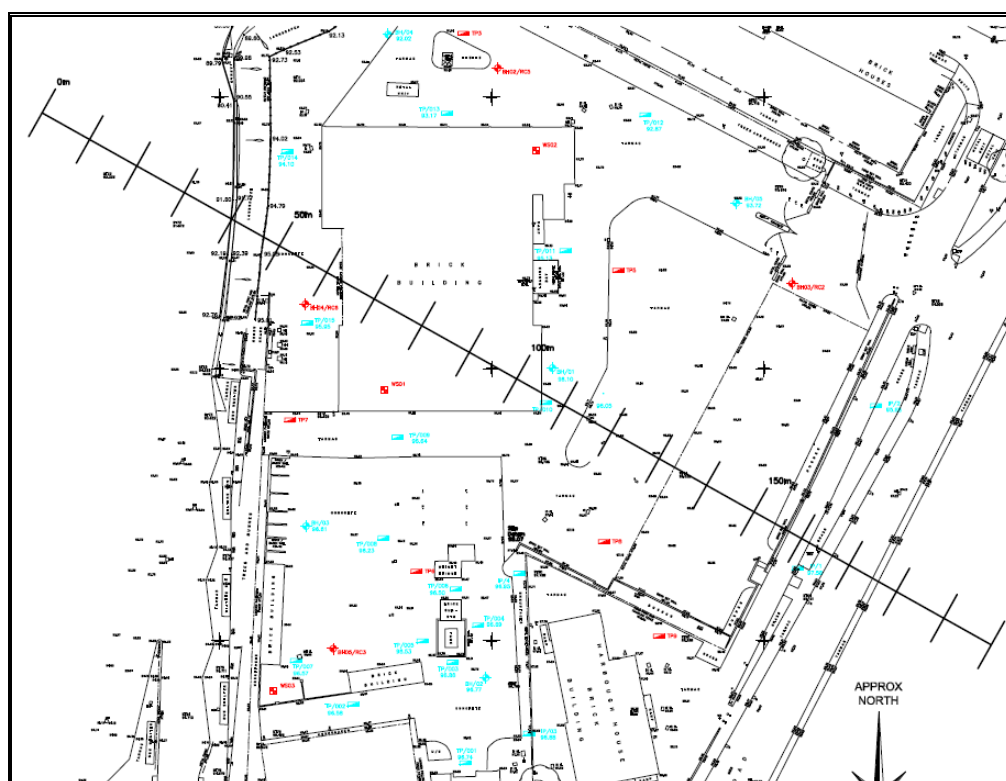
In most cases recovery was good and occasionally coal was recovered intact. No recovered evidence of mine workings, such as; fragments of prop, artificial fill, or grouting recorded during drilling.

All drill progress was reasonably unimpeded with no loss of flush or voids encountered with the exception of Soil Mechanics borehole BH5/RC3 which notes "quick penetration" through ground coincident with coal recorded at 38.8m below ground level.

Standard penetration test N_{300} values of between 66 and in excess of 100 have been recorded. Typically SPT's refused before achieving full penetration.

Bedrock natural moisture contents were found to be generally less than 10%.

Figure 5 – Diagrammatic Cross Section through Site



6.6 Groundwater

No groundwater strikes have been recorded by trial pits and window sampler boreholes excavate/driven to depths of between 1.5m and 3.6m depth. Only minor seepage recorded at or just below pavement base 0.9m to 0.7m (TP1, TP7 and TP8 -2001). Soils were described as wet throughout (TP6).

Water strikes were recorded in all boreholes. In boreholes BH02, 03, 04 and 05 this was at depths of 12.50m rising to 9.90 and 14.50m rising to 9.60m after 20 minutes, 12.50m rising to 11.90m after one days drilling and 12.90 rising to 14.00m bgl after 20 minutes respectively.

Locally, borehole BH01 recorded a water strike during drilling at 4.50m bgl which rose to 4.10m bgl after 20 minutes. This level was noted to be 4.00m bgl at the end of the day but had fallen to 6.10 by the following day.

6.7 Obstructions

In addition several sewer mains and culverts are known to exist upon the site and are known to cross the proposed development area. Utilities drawings and historical Ordnance Survey plans show the approximate position of these structures.

Minor obstructions have been encountered in associated with the presence of backfilled material that is especially present in the north east part of the site. This comprised cobbles and boulders of brick, sandstone, concrete and slag and was documented in trial pits TP012 and TP011 and borehole BH05.

6.8 Visual and Olfactory Evidence of Contamination

Backfill material was recorded in three exploratory holes undertaken over the site.

These soils comprise loose clayey gravel and sand, comprising, sandstone, brick, slag, glass, concrete, drain fragments and plastic.

These soils are typically recorded at between 1.5m and 2.0m thickness and are predominantly in the North east part of the site. Trial pit 011 was adjacent to the existing central building and Trial pit TP012 joined the east side of the north perimeter of the site.

An organic odour was noticed between depths of 0.60m and 1.20m bgl in trial pit TP011. This was possibly related to the drain that had been unearthed by this excavation.

7.0 GENERIC QUANTITATIVE RISK ASSESSMENT

Chemical test results on soils have been assessed using the CLEA Soil Guideline Values published by the Department for Environment, Food and Rural Affairs (DEFRA) and, where no CLEA soil guideline values are available; reference is made to the BWB generic site assessment criteria (GSAC).

7.1 CLEA Soil Guideline Values

The CLEA documents quote soil guideline values (SGVs) for use as generic criteria for assessing risks to human health from exposure to contaminated soil for four potential exposure pathway scenarios. The approach is that provided the sample set is shown statistically to be within the same population and the 95 percentile upper bound of the mean is below the SGV then individual exceedances of the SGV do not cause a problem because the mean exposure will be below the prescribed level of risk. To date guideline values have been derived for arsenic, cadmium, chromium, lead, inorganic mercury, selenium, nickel, phenol, toluene and ethylbenzene. These values have formally replaced the ICRCL trigger concentrations, which have been officially withdrawn by the government and are no longer acceptable for use in assessing land contamination.

For free and complex cyanides, in accordance with the CLEA guidance, screening criteria have been derived by BWB using the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) framework for acute risk from cyanides as these values are more conservative than the equivalent chronic exposure screening criteria derived by CLEA.

Groundwater samples have been compared to the UK Drinking Water Standards (2000) (UKDWS) and surface water samples to the UK Environmental Quality Standards for Fresh Water (EQS).

Gas protection measures are usually assessed against CIRIA 149 'Protecting Development for Methane'. This offers a series of "Characteristic Situations".

7.2 Results of Soil Analysis

7.2.1 CLEA Contaminants

The CLEA assessment is made in four stages:

Stage 1 – The site is split into what is known as Averaging Areas, these are those sections of the site as determined by the assessor as being of a similar nature, this can be defined by strata, contaminant impact, location, development zones, etc.

- Stage 2 – The samples are determined in a statistical calculation whereby all the samples (per contaminant) are combined to establish whether or not any particular sample is representative or not of the Averaging Area as a whole. This is known as the Maximum Value Test. A sample that is considered as representative of the whole is referred to as an '*inlier*' and one which is considered unrepresentative as an '*outlier*'.
- Stage 3 – The samples are determined in a statistical calculation whereby all the samples (per contaminant) are considered against the mean value to determine whether or not the Averaging Area, as a whole meets the CLEA guidance value (known as the SGV). The mean value is considered against the four categories as described in CLEA as to whether or not a risk exists. This is known as the Mean Value Test.
- Stage 4 – The outliers in Stage 2 are considered against the mean values in Stage 3 to determine if removing that (or those) samples from the Averaging Area render the balance acceptable from a risk perspective. Thus indicating that those removed samples represent an Anomalous Zone (or hotspot).

In the first instance the whole site is considered to be one Averaging Area. Following the initial review, redefining of the Averaging Areas on site may be undertaken.

The normalised upper bound concentrations for each determinand have been compared to the relevant soil guideline value. Values for residential with plant uptake end use have been used. The results of soil testing are presented in **Appendix 5**.

CLEA Contaminants

The results of the CLEA assessment indicate that the majority of the inorganic compounds pass the mean value test, having normalised upper bound concentrations below the relevant screening criteria.

7.2.2 Non CLEA Metals and Metalloids

Where no SGV exists an assessment has been made against the BWB generic site assessment criteria (GSAC) calculated using the CLEA model.

Contaminants assessed in this way are:

Copper, zinc, beryllium and vanadium.

All contaminants passes the mean value test, having normalised the upper bound concentrations below the relevant screening criteria.

Non CLEA Inorganic Compounds

Where no SGV exists an assessment has been made against the SNIFFER GSAC and calculated against the CLEA model.

Contaminants tested in this way are:

Cyanide compounds and sulphur compounds

None of these contaminants exceeded their GSAC and none returned *outlier* results.

7.2.3 Non CLEA Organic Compounds

Where no SGV exists an assessment has been made against the SNIFFER GSAC and calculated against the CLEA model.

PAH

Of the organic compounds considered, none of elements of PAH's, exceeded their GSCA, having normalised upper bound concentrations below the relevant screening criteria.

TPH

TPH (banded) were tested for hydrocarbon contamination. TPH (banded) were tested in the areas of above ground storage tanks (UST's) and TPH fraction (C6-C40) were generally tested from across the site to delineate it in terms of hydrocarbon contamination. Analysis has indicated that none of the TPH species considered exceed the relevant screening criteria.

Asbestos

No Asbestos fibres were detected from any of the investigation locations.

7.3 Leachate Analysis

Results of the leachability testing indicate none of the contaminants tested are leachable.

7.4 Groundwater

The nearest watercourse is the River Dearne that becomes the Barnsley canal located approximately 500m north and 1.00Km East of the site.

There are five discharges to surface water within 250m of the site. The nearest of these is located at Yorkshire Water Services Ltd, Kendray Street and is estimated as 184m from the site to an accuracy of 100m.

There is one recorded groundwater abstraction within 400m of the site. This is located at C Cooper Limited with an unspecified location that is an estimated distance of 391m from the site but this distance is within 100m of accuracy.

Environmental Quality Standards (EQS) have been used as the screening criteria for the assessment of ground quality. Where there are no EQS values available, the UK Drinking Water Standard (DWS) have been used. The analytical results for groundwater samples collected from boreholes BH02, 03, 04 and 05 are presented in **Appendix 4**.

7.5 Chemical Analysis: Groundwater

The results of the groundwater assessment has indicated that the slightly elevated level of PAH (0.4 µg/l) when compared to the drinking water standard (0.1 µg/l) of PAH was recorded from BH03. Considering the nearest watercourse is the River Dearne approximately 500m north and 1.00Km East of the site, it is unlikely that marginally elevated level of PAH will have any effect on these watercourses because of the distance and other natural attenuating processes of dilution and dispersions of contaminants. All other analytes were recorded below the screening criteria of specific element and presents no risk to groundwater and surface water receptors.

7.6 Ground Gas

Total three grounds of gas monitoring were carried out during the period of July 14 2006 to August 14 2006 from BH01, BH02, BH03, BH04, and BH05. The results of the gas monitoring are presented in **Appendix 6**.

Gas protection measures are usually considered against CIRIA 149 'Protecting Development for Methane'. This offers a series of "Characteristic Situations".

Characteristic Situations 2, 3 and 4 are used to identify the appropriate gas protection measures required for a development. The 'Characteristic Situations' were originally formulated from Table 28 of Construction Industry Research and Information Association (CIRIA) Report 149. However, Table 4 of the 'Wilson and Card' paper, 'Reliability and Risk in Gas Protection Design' re-writes the criteria, which is used to formulate the 'Characteristic Situations'.

Table 28 of CIRIA 149 does not take into account the flow rates of Methane and Carbon Dioxide at levels less than 20% by volume in air. Table 5 'Wilson and Card', reproduced as **Table 7** below, takes into account the flow rate of both Carbon Dioxide and Methane.

Table 7: Characteristic Situation for Gas Protection

Characteristic situation (CIRIA 149)	Partners in Technology gas regime	Limiting borehole gas flow of CH ₄ or CO ₂ (litre / hour)	Additional limiting factors	Typical source of generation
1	A	<0.07	Methane not to exceed 1% by volume and Carbon Dioxide not to exceed 5% by volume	Natural soils with low organic content
2	B	<0.7	Borehole air flow rate not to exceed 70 litre/hour otherwise increase to characteristic situation 3	Natural soil high peat/organic content
3	C	<35		Old landfill, inert waste, mine working flooded
4	D	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mine working susceptible to flooding, completed landfill, inert waste (WMP 26b criteria)
5	E	<70		Mine working flooded inactive
6	F	>70		Recent landfill site

A site which has recorded elevated levels of ground gas with low flow rates poses little risk, however a site which has recorded moderately elevated levels of ground gas with high flow rates poses a much greater risk.

A typical scope of measures for the 'Characteristic Situations' from CIRIA 149 is presented in Table 6 of the Wilson and Card paper, reproduced as **Table 8**.

Table 8: Gas Protection Measures Applicable to Each Characteristic Situation

Characteristic situation (CIRIA 149)	Office / Commercial / Industrial Development
1	No special precautions
2	Reinforced concrete cast in-situ ground slab. All joints and penetration sealed. Waterproofing membrane and passively ventilated under floor sub-space.
3	Reinforced cast in-situ ground slab. All joints and penetration sealed. Possibly waterproofing membrane. Granular layer below slab passively vented to atmosphere with interleaved geo-composite strips or pipes
4	Reinforced concrete cast in-situ ground slab. All joints and penetration sealed. Gas resistant membrane and passively ventilated under floor sub-space.
5	Reinforced concrete cast in-situ ground slab. All joints and penetration sealed. Gas resistant membrane and passively ventilated under floor sub-space. In ground venting wells.
6	Reinforced concrete cast in-situ ground slab. All joints and penetration sealed. Gas resistant membrane and actively ventilated under floor sub-space, with monitoring. In ground venting wells.

Generally, CO₂ was recorded elevated from BH01 in all monitoring events of which maximum of 3.4% was recorded in August 14 monitoring. BH05 and BH04 have recorded elevated of CO₂ (>1.5% but <5%) with low to moderate flow rates than the detection limit, no H₂S were detected in any of the boreholes, however carbon monoxide at 25ppm was detected from BH01 in one of the monitoring periods (July 14 2006) only. No methane along with other gases was detected in any of the monitoring periods.

On the basis of the data collected from three monitoring events, it is concluded that due to the inconsistent concentration of CO₂ recorded from the boreholes it is recommended to carryout further gas monitoring of at least 4 rounds and on the basis of the results, it will be analysed whether the need of any gas protection measures are required.

7.7 Refined Pollutant Linkages

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined in the Contaminated Land Exposure Assessment model (CLEA) as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified sources, pathways and potential receptors in the context of the site and pollutant linkages which may represent a risk to human health and/or controlled waters and the building from the data gained from the Phase I ERA and the Phase II ground investigation.

7.7.1 Human Health

No source/sources of contamination have been identified and therefore presents no risk to human health receptors.

7.7.2 Buildings

No source of contamination detrimental to the building foundation structures have been identified and therefore present no risk to building receptor.

7.7.3 Controlled Waters

No contamination sources were found in exceedance of the environmental quality standard (EQS) for fresh water, or detrimental to the groundwater receptor, indicating no pollution linkages between source, pathway and receptor and presents no risk to controlled water receptor.

7.8 Revised Conceptual Site Model (CSM)

The risk from contaminated land [as defined by the Environment Act 1995] is *'that significant harm is being caused or there is a significant possibility of such harm being caused; or pollution of controlled waters is being, or is likely to be caused'*.

Risks presented by contaminated land depend not only on the nature of the potential contaminants, but also on the receptors at risk of pollution or harm, and the pathways by which contaminants may reach such receptors. Harm to human health may be directly or indirectly caused: directly through access to the site and exposure to contaminants; indirectly when contaminants are released or emitted from a site to the surrounding environment.

The environment, particularly water, may be harmed by emissions, discharges or other migration of contaminants in sufficient quantities from a site. A source - pathway - receptor approach should therefore be adopted for the assessment of harm to human health and the environment.

The site remained relatively undeveloped until the late 1960's to early 1970's. The site use up to this period was residential with open gardens and plantations. This was replaced with an electricity board depot the buildings of which still remain today.

The surrounding area to the west has been developed since the mid nineteenth century. The land immediately adjacent to the site has been railway land up to about 1987 with associated heavy industries existing into the mid twentieth century. Industrial works known to have existed were a foundry and a timber yard. A small colliery "Boro Colliery" existed from the 1930's until the 1960's located approximately 150m east of the site.

The collation of the data obtained from 2006 intrusive investigation have enabled the delineation of the area of the site in terms of potential contamination issues identified in the desk study, the chemical testing and analysis has indicated no presents of such contaminants (organic & inorganic) elevated than the generic site assessment criteria (GSAC) and presents no detrimental risk to the environment and in particular to the future site users as commercial/industrial purposes.

7.9 Outline Remediation Statement

It is considered that the site does not require any remediation prior to the proposed development as the commercial end use.

7.10 ENVIRONMENTAL LIABILITY ASSESSMENT

No contamination issues have been identified at the site, therefore, no environmental liabilities towards contamination exists.

8.0 GEOTECHNICAL ASSESSMENT

8.1 Limitations

The following geotechnical assessment may need to be revised if the forms of development or ground conditions are subsequently found to vary from those assumed by this report.

8.2 Mining

A Coal Authority report has been commissioned by BWB which indicates that the site lies in an area where coal exists near surface that may have been worked in the past. Published geological information and subsequent site investigation works suggest that two coal seams are present beneath the site within 15m of the existing ground surface.

The Coal Authority holds records that indicate the site is within the likely zone of influence from the working of four deep seams, at depths of between 50m and 350m although ground movement relating to these workings should now have ceased. No records of any mine entries within 20 metres of, the boundary of the property are held by Coal Authority. The Coal Authority report recommends, "in view of the mining circumstances a prudent developer should seek appropriate technical advice before works are undertaken on site".

As a result a "Mining Report" was undertaken by Wardell Armstrong (June 2001) specifically relating to mining issues in relation to development of the site. This report concluded that the site is considered stable with respects to past deep coal mining.

This mining report concluded that the shallowest seam is known locally as the Winter (Abdy) and the lower seam is known as the Top Beamshaw. Mine abandonment plans relating to an adjacent colliery indicate that the Winter Seam has been worked as far west as Harborough Hill Road. The Beamshaw seam is not known to have been worked. The mining report concluded that "the Beamshaw Seam(s) are thin, inconsistent and/or poor quality and very unlikely to have been worked beneath the site".

Site investigation works suggest that the second shallowest seam recorded on site is split in two by a thin mudstone band.

This report concludes that there is a potential for unrecorded shallow mine workings across the eastern third of the site. Wardell Armstrong recommended that further investigation and stabilisation is carried out by drilling and pressure grouting over the construction footprint and a 3m additional perimeter.

The shallowest coal seam (seam 1) as been proven within up to 6.4m (90.6m AOD) of the existing ground surface and has been recorded at between 0.4m to 1.0m thickness.

The site investigations undertaken to date have recorded an over-deepened area of backfilled ground in the northeast of the site (as indicated on **Figure 2**). In addition only a 0.4m thickness layer of coal was proven by one of the two boreholes drilled in this area over the anticipated level of the shallowest coal seam.

In summary:

- There is a high risk of voids migrating to the surface from unrecorded older mine workings is present over areas of the site underlain by the Winter Seam (assumed to be Seam 1).
- There is a low risk of voids migrating to the surface from unrecorded older mine workings is present over areas of the site underlain by the Beamshaw Seam (assumed to be seam 2).
- An area of over-deepened made ground in the north east of the site may represent historical shallow opencast/bell pit excavation associated with the Winter Seam.

The eastern half of the footprint of the proposed 45,000 ft² retail unit is currently shown to be underlain by a potential zone of instability associated with shallow coal mining of the Winter Seam and an area of over-deepened made ground possibly associated with older mining activities.

The smaller 3,000 ft² retail/restaurant unit is also positioned over a potential zone of instability associated with the Winter Seam estimated to be between 3m to 6.4m below existing ground level in the area of the building.

In addition site access roads and part of the car parking areas are also shown to be underlain by potential zone of instability associated with shallow coal mining of the Winter Seam and an area of over-deepened made ground possibly associated with older mining activities.

These areas will require appropriate remedial measures prior to construction of pavements and structures.

The following options are available with respects to possible remedial works to these areas:

45,000 ft² Retail unit

<u>Foundation Issues</u>	• Part Cut (<1m) Part Fill (<3.0m) finished formation level. • Localised area of made ground over eastern part of building footprint (up to 3.2m deep below existing ground level) • Eastern half of building over zone of potential mining instability
Option 1 – Grouting and Ground Improvement • No piling required • Imported structural fill required. • Deep ground improvement required. • Further investigation required.	• Over-excavate where coal seam present within 2m of existing ground level and backfill with structural fill. • Trial grout remaining area of potential instability below and within 3m of the footprint of the building. • Ground improvement of remaining area of made ground beneath slab. • Up fill beneath building using suitably compacted structural fill. • Ground bearing slab bearing upon improved ground/structural fill. • Large shallow pad foundations bearing upon structural fill/improved ground/weathered mudstone bedrock, with limited bearing pressures.
NB Further investigations should be undertaken to determine the extent of over-deepened made ground over these areas and depth and thickness of voids over this area in order to provide the most cost effective solution.	
Option 2 – Part Piled Foundations/Slab with transition zone • No grouting required. • No Deep ground improvement required. • Options to incorporate general bulk fill beneath piled slab.	• Piled columns and slab bored into bedrock below level of coal seam over zone of potential mining instability. • Deep trench/pad foundations bearing onto weathered mudstone bedrock/structural fill material over remaining area. • Transition zone between two areas comprising structural fill and piled slab/columns at larger spacing.
<u>Option 3 – relocate building</u>	• It may be feasible to relocate the footprint of the proposed structure further west to avoid adverse foundation conditions.

3,000 ft² retail/restaurant unit

<u>Foundation Issues</u>	• All cut (<1m) • All building over zone of potential mining instability within coal seam 3m to 6m below existing ground level.
Option 1 – Grouting • No piling required • Ground bearing slab.	• Trial grout area of potential instability below and within 3m of the footprint of the building. • Ground bearing slab. • Large shallow pad foundations bearing upon weathered mudstone bedrock.
Option 2 – Part Piled Foundations with cellular raft/ ground beams supporting slab • No grouting required.	• Piled columns bored into bedrock below level of coal seam over zone of potential mining instability. • Building slab supported of ground beams between piles or a cellular raft construction.
<u>Option 3 – relocate building</u>	• It may be feasible to relocate the footprint of the proposed structure further west to avoid adverse foundation conditions.

Access Roads/Car parking areas

<u>Foundation Issues</u>	• over zone of potential mining instability within coal seam 0m to 6m below existing ground level.
Option 1 – Do nothing	• Accept risk of potential void migration beneath pavement areas.
Option 2 – High strength geotextile/geo-grid. • Cost effective risk management.	• Incorporate high strength geotextile/geo-grid beneath pavement construction/areas of embankment to prevent sudden catastrophic collapse of ground and allow time for further remedial works to be undertaken.
Option 3 – Grouting • Limits risk • No further maintenance costs / remedial works required.	• Over-excavate where coal seam present within 2m of existing ground level and backfill with structural fill. • Trial grout over remaining areas of potential instability beneath pavements and access roads.

8.3 Foundations to Structures

No design foundation loads/ required slab bearing pressures are available at the time of writing.

A localised area of made ground comprising gravelly clay with gravel and cobbles of brick, limestone and sandstone with ash, clinker, coal, polythene and glass fragments has been recorded between 1.5m to 3.2m depth over the north east part of the site.

These soils are of a variable composition and consistency and will not be suitable as a founding stratum without further ground improvement.

As outlined in **Section 8.2**, alternate foundation options exist which are primarily driven by the appropriate remedial works adopted over areas of potential mining instability.

Foundations should bear upon natural weathered mudstone soils. Shallow foundations bearing upon firm to stiff clay a minimum of 1m below existing ground level (completely weathered mudstone) should be limited to allowable bearing pressures of less than 150kN/m² in order to limit estimated total settlements to less than 25mm. higher bearing pressures can be achieved by taking foundations deeper onto very weak mudstone bedrock. Shallow thicknesses (<1m) of made ground soil beneath ground bearing slabs should be suitably improved by compaction.

It may be required to found shallow foundations upon localised areas of over-deepened made ground. These areas of made ground should be suitably improved by deep vibro-compaction or installation of vibro-stone/concrete columns. Consultation with specialist ground improvement contractors should be undertaken in order to establish the appropriate allowable bearing pressures of improved ground. For preliminary purposes an allowable bearing pressures in the order of 80 kN/m² should be assumed achievable following suitable ground improvement.

The base of shallow foundations should be inspected prior to placement of any concrete and any unsuitable made ground soils should be over excavated and backfilled with mass concrete or suitable compacted structural fill. Buried structures should be over excavated and similarly backfilled beneath footings. Care should be taken to prevent footings becoming wet prior to concreting. Foundation excavations should not be left open overnight they have been previously blinded with lean mix concrete.

Piled foundations may be required to support column loads and piled slabs/ground beams. Piles will be required to be installed to minimum depths below the level of potentially undermined shallow coal seam on site. It is not anticipated that a driven piled solution will be appropriate due to the risk of premature refusal within the mudstone bedrock.

A bored pile solution will be required to achieve the required embedment depths. For preliminary purposes the allowable load capacity of a range of 300mm diameter to 600mm diameter bored piles driven to depths of between 5m to 10m depth can be expected to be between 300 kN to 1000 kN per pile.

Consultation with a specialist piling contractor should be undertaken in order to establish actual pile capacities and settlement tolerances for the chosen method of installation.

8.4 Earthworks

Cut and fill earthworks are proposed in order to accommodate the proposed development formation levels.

It is estimated that approximately 50% of material won from areas of cut will comprise asphalt/concrete surface materials and granular limestone/sandstone gravel base materials.

The remaining soils won from excavations are anticipated to comprise completely weathered mudstone bedrock/firm to very stiff clay soils.

In addition a significant amount of demolition material will arise from the subsequent demolition of the exiting buildings.

Subject to any environmental preclusions to their re-use it is anticipated that demolition and pavement material can be crushed and graded and re-incorporated back into the scheme as capping beneath pavements.

A limited amount of soil classification and compaction testing has been undertaken on weathered mudstone soils which indicate that these soils could be classified as Class 2C stony cohesive fill in accordance with DOT, Specification for Highway Works, series 600 document. These soils have recorded optimum moisture contents (OMC) between 12% and 17% under standard (2.5kg) compaction. Heavy compaction (4.5kg) has yielded OMC's of between 8% and 10%. The natural moisture contents measured in these soils ranged between 6% and 46% although generally decrease with depth. Typically soil moisture contents are below 18% below 1m depth.

Soil testing suggests that completely weathered firm to stiff clay soils at shallow depth may be too wet in their current condition to be re-incorporated back into the scheme as bulk general fill.

However these materials could be modified by addition of lime and or spreading and drying prior to use as general bulk fill. These materials should not be used as structural fill materials beneath structures.

Fines contents (less than 63 microns) of between 56% and 90% have been recorded in samples of weathered mudstone. Class 7C and 7D materials, "fill to reinforced earth structures" (DOT SHW, series 600) limits fines contents to less than 45%. This suggests that these soils will be unsuitable for re-use within reinforced earth slopes along the northern boundary of the site. This should be confirmed by consultation with a specialist reinforced earth contractor.

The suitability of earthworks materials has been assessed on the basis of the testing carried out as part of this investigation. The materials encountered on site may vary from those analysed; furthermore, inclement weather or winter working may result in materials being unsuitable for incorporation within the works without modification by lime, cement or other methods. In particular, cohesive soils are very susceptible to 'wet weathering working' and we strongly recommend that consideration should be given to lime and/or cement stabilisation of these materials if the earthworks are undertaken during inclement weather or the winter period.

Stockpiled materials often deteriorate due to water infiltration and they may become unsuitable for incorporation in the works; further testing and re-assessment should be made prior to the finalisation and implementation of the earthworks design.

8.5 Pavements

Car parking areas and access roads are shown associated with the proposed development.

Pavements are to be constructed in part upon areas of cut and areas of fill.

In-situ Californian Bearing Ratio (CBR) testing has been undertaken on weathered mudstone sub-grade soils as part of the 2001 Soil Mechanics investigation. CBR values of between 4% and 7% were recorded during this investigation.

On consideration of the material properties and groundwater conditions prevalent over the site a preliminary design CBR of 4% has been assessed (in accordance with the Design Manual for Roads and Bridges, Volume 7, Section 2, Part 2) for use in pavement design.

Confirmatory CBR testing should be undertaken on both sub-grade soils and areas of fill prior to finalisation of the pavement design.

Sub-grade soils are predominantly cohesive and will deteriorate if water is allowed to collect beneath pavements. All paved areas should have suitable cross falls and appropriate surface drainage incorporated into the pavement design.

Formation levels should be proof rolled prior to pavement construction and placement of fill materials, any soft spots should be over-excavated and replaced with suitably compacted structural fill material.

8.6 Buried Concrete

Soil sulphate testing was undertaken as part of the soil Mechanics 2001 and BWB 2006 site investigations.

Water sulphate testing has also been undertaken on samples of groundwater as part of this study.

This information suggests that a design sulphate class for this site of DS-1 would appear to be appropriate to this site, in accordance with BRE special digest 1 (2005) "Concrete in Aggressive Ground".

8.7 Excavations

Excavations for services and footings up to 2m depth are anticipated to be within the capacity of typical earthmoving plant through made ground.

Locally, less weathered areas of rock and localised obstructions within the made ground may require breaking and loosening before excavation using a hydraulic pecker or equivalent.

Excavations in excess of 4.00m depth may encounter seepage and/or groundwater inflows. Such excavations are not currently proposed.

Excavations should remain open in the short term although it is not recommended that site personnel enter any excavation deeper than 1.2m without further proprietary support. Continuous support to the face of the excavation will be required to prevent slumping of the pit sides into the excavation.

Earthmoving plant and machinery should be prevented from trafficking within a distance of equivalent to the depth of the excavation.

8.8 Retaining Structures

Minor (<1m) retaining structures are proposed along the southern boundaries of the site where it is proposed to cut into existing ground to create formation levels.

Reinforced concrete/brick cavity walls should be suitable along these areas. The soil mechanics 2001 report gave suggested design parameters to be used in retaining wall design (**Table 9**).

Table 9 Retaining Wall Design Parameters

Preliminary Design Parameter	Mudstone bedrock
Shear strength (total stress)	50kPa increasing to 200kPa directly above bedrock
Shear strength (effective stress)	Completely weathered $c' = 0$ kPa $\phi' = 28^\circ$ Bedrock $c' = 0$ kPa $\phi' = 35^\circ$
Bulk density	Completely weathered = 19 kN/m ² Bedrock = 21 kN/m ²
As recommended in r Soil Mechanics 2001 geotechnical report page, section 7.4 page 13. Values should be confirmed in-situ during or prior to construction once position/type of wall is confirmed.	

It is proposed to up-fill adjacent to the northern boundary of the site by up to 3.5m. As a result the site will require a retaining structure up to 3.3m in height along the northern boundary of the site.

An existing 2m to 3m high slope currently bounds the north-west part of the site. This slope has been created by cutting into the existing ground level to create side slopes of between 1V:3H to 1V:2H.

The existing surface of this slope surface has been gullied and eroded by water runoff to expose the underlying weathered mudstone bedrock.

The proposed ground level can be retained by one of the following methods:

- Reinforced earth slope.
- Crib /gabion wall
- Reinforced concrete wall.

It may be required to found these structures on or near the crest of the existing slope in the northeast of the site. If so it should be established that the existing slope has sufficient strength to support the proposed structure. Stability analysis of the overall slope plus proposed structure should be undertaken in addition to the local design of the structure itself. This is beyond the scope of this report.

In addition construction/drainage details should be implemented to prevent further erosion of the slope surface and possible undermining of any proposed structure founded above.

As stated in **Section 11.4**, the limited laboratory soils testing undertaken to date suggests that no materials won from cut excavations on site will be suitable as class 7C and 7D materials, "fill to reinforced earth structures" (DOT SHW, series 600). The potential to re-use of site materials within reinforced earth slopes should be explored through consultation with a specialist reinforced earth contractor.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Environmental Issues

The Phase I assessment indicates that the site represents a **MODERATE** human health risk, a **LOW** risk to future buried structures and a **LOW** risk controlled waters risk.

The Phase II ground investigation and risk assessment, based upon the source-pathway-receptor has been undertaken in order to identify potential human health contamination issues associated with the proposed redevelopment of the site.

Testing for a range of contaminants was undertaken on the soil samples from trial pits/boreholes located across the site. None of the contaminants tested exceeded the relevant screening criteria. As a result no source/sources of contamination have been identified and therefore presents no risk to human health or building receptors.

Environmental Quality Standards (EQS) have been used as the screening criteria for the assessment of ground quality. Where there are no EQS values available, the UK Drinking Water Standard (DWS) have been used. Slightly elevated levels of PAH (above levels recommended by the drinking water standard recorded from BH03. However, as the nearest water course is approximately 500m north and 1000m east of the site it is considered that natural attenuating processes of dilution and dispersion will limit PAH contamination of these water courses.

Five grounds of gas monitoring were carried out during the period of July 14 2006 to August 14 2006. Only slightly elevated CO₂ concentrations and flow rates have been recorded corresponding to CIRIA 149 Characteristic Situation 1 is present within the monitoring areas, indicating that no special precautions are required.

It is considered that the site does not require any remediation prior to the proposed development as the commercial end use.

No contamination issues have been identified at the site, therefore, no environmental liabilities towards contamination exists.

The environmental risk assessment has therefore been reduced to an overall rating of NEGLIGIBLE.

A waste criteria assessment should be carried out should any material be identified for disposal off-site.

9.2 Geotechnical Issues

The site is known to be located within an area that may have been affected by past mining activities. Two coal seams are known to sub-crop beneath the site. It is anticipated that the rock beneath the site will dip approximately towards the southeast. There is a high risk of voids migrating to the surface from unrecorded older mine workings within the shallowest of these seams known to underlie the eastern part of the site. Furthermore, area of over-deepened made ground in the north east of the site may represent historical shallow opencast/bell pit excavation associated with this seam.

Structures, car parking areas and access roads currently proposed over parts of the site are underlain by this zone of potential instability and will require appropriate remedial measures prior to construction of pavements and structures.

Several options with relation to construction over these particular areas are given, these options include:

- Grouting and Ground Improvement
- Partially piled foundations/slab
- Cellular raft foundations beneath smaller retail units
- Incorporation of a high strength geo-textile/grid beneath pavement areas.

A localised area of made ground has been recorded between 1.5m to 3.2m depth over the north east part of the site overlying weathered mudstones of the underlying Middle Coal Measures rocks.

It is not recommended that foundations to column or conventional ground bearing slabs be constructed directly upon unimproved made ground soils. Shallow foundations should bearing upon natural firm to stiff clay a minimum of 1m below existing ground level (completely weathered mudstone) should be limited to allowable bearing pressures of less than 150kN/m². Shallow thicknesses (<1m) of made ground soil beneath ground bearing slabs should be suitably improved by compaction.

Deeper areas of made ground may require deep ground improvement such as vibro-compaction or installation of vibro-stone/concrete columns. Consultation with specialist ground improvement contractors should be undertaken in order to establish the appropriate allowable bearing pressures of improved ground.

Piled foundations may be required to support column loads and piled slabs/ground beams. Consultation with a specialist piling contractor should be undertaken in order to establish actual pile capacities and settlement tolerances for the chosen method of installation.

Cut and fill earthworks are proposed in order to accommodate the proposed development formation levels. It is estimated that approximately 50% of material won from areas of cut will comprise asphalt/concrete surface materials and granular limestone/sandstone gravel base materials. The remaining soils won from excavations are anticipated to comprise completely weathered mudstone bedrock/firm to very stiff clay soils.

Subject to any environmental preclusions to their re-use it is anticipated that demolition and pavement material can be crushed and graded and re-incorporated back into the scheme as capping beneath pavements.

Soil testing suggests that completely weathered firm to stiff clay soils at shallow depth may be too wet in their current condition to be re-incorporated back into the scheme as bulk general fill.

However these materials could be modified by addition of lime and or spreading and drying prior to use as general bulk fill. These materials should not be used as structural fill materials beneath structures.

Excessive fines contents (less than 63 microns) of have been recorded in samples of weathered mudstone compared with the requirements reinforced earth fill (Class 7C and 7D materials, DOT SHW, series 600). The re-use of this material as reinforced earth fill should only be considered following consultation with a specialist reinforced earth contractor.

Sub-grade soils are predominantly cohesive and will deteriorate if water is allow to collect beneath pavements. All paved areas should have suitable cross falls and appropriate surface drainage incorporated into the pavement design.

Soil sulphate testing suggests that a design sulphate class for this site of DS-1 would appear to be appropriate to this site, in accordance with BRE special digest 1 (2005) "Concrete in Aggressive Ground".

It is proposed to up-fill adjacent to the northern boundary of the site by up to 3.5m. As a result the site will require a retaining structure up to 3.3m in height along the northern boundary of the site. Stability analysis of the overall slope plus proposed structure should be undertaken in addition to the local design of the structure itself. This is beyond the scope of this report.

In addition construction/drainage details should be implemented to prevent further erosion of the slope surface and possible undermining of any proposed structure founded above.

9.3 Further Work

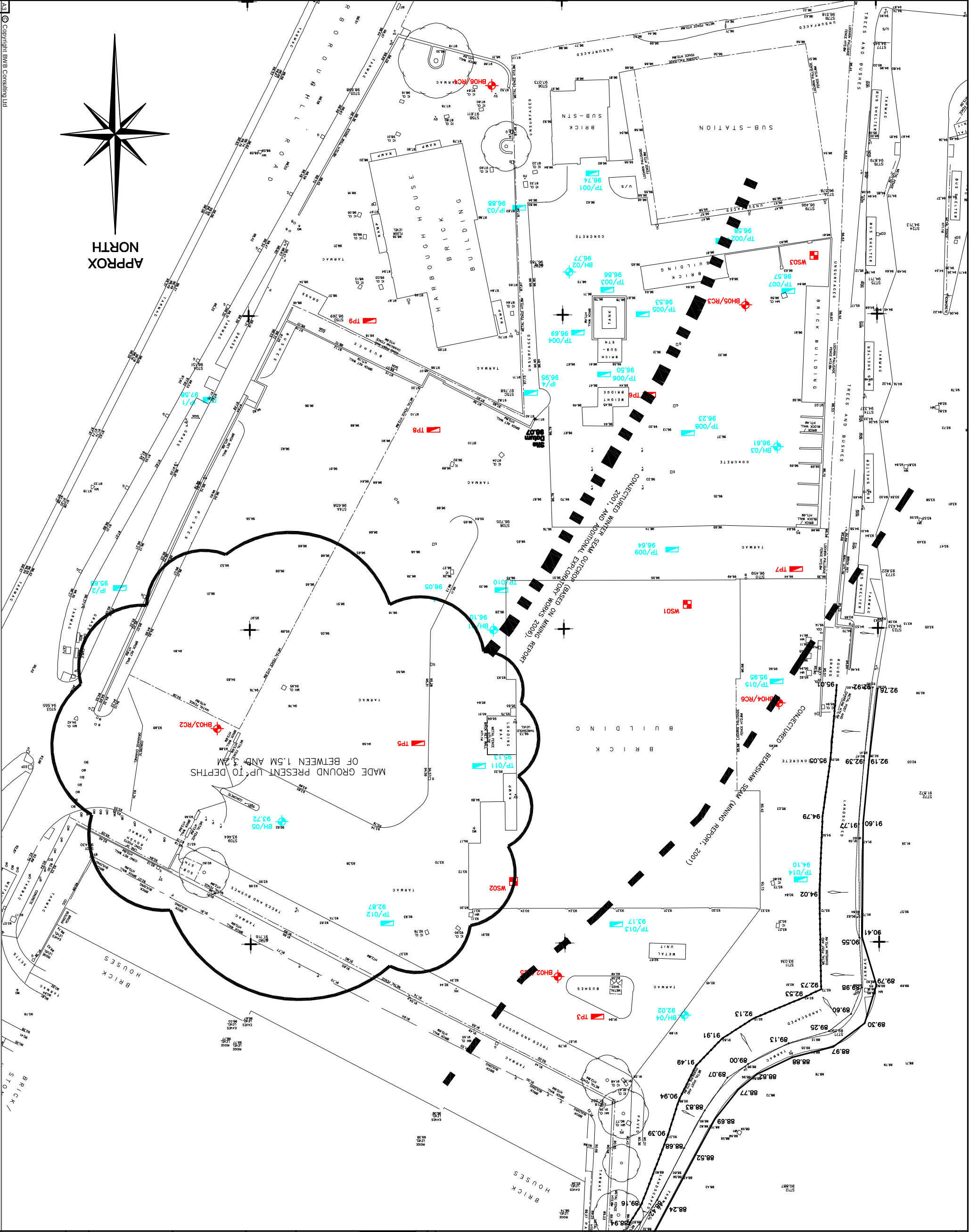
- Options to relocate proposed buildings should be explored.

- Further confirmatory drilling to determine the potential for worked coal seams beneath the footprint of the proposed building should be undertaken prior to any development.
- Further trial pitting should be undertaken to determine the extent of the localised area of made ground over the north east of the site.
- Global stability of retaining structures overlying existing slopes along the northwest boundary should be undertaken.
- Consultation with specialist contractors should be undertaken to establish the potential to re-use won materials within reinforced earth structures.
- Consultation with specialist bored pile contractors should be undertaken to establish pile capacities and settlement tolerances if piled foundations required.
- Trial grouting/further open hole drilling may be required beneath areas where it is proposed to stabilise potential mine workings.

FIGURES

FIGURE 2

SITE LAYOUT PLAN



- NOTES
1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS MUST BE CHECKED/ VERIFIED ON SITE. IF IN DOUBT ASK.
 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS.
 3. ALL DIMENSIONS IN MILLIMETRES (UNLESS NOTED OTHERWISE. ALL LEVELS IN METRES (UNLESS NOTED OTHERWISE).
 4. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

LEGEND

BWB Geoenvironmental Site Investigation 2006

BOREHOLE/PIEZOMETER

TRIAL PIT

INSPECTION PIT

Soil Mechanics Site Investigation 2001
(Approximate Positions Only)

BOREHOLE/PIEZOMETER

TRIAL PIT

WINDOW SAMPLER

REV	DATE	DESCRIPTION	DRAWN	AUTH'D
AMENDMENTS				

BWB
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KENNET PROPERTIES

Project file
**HARBOROUGH HILL ROAD
BARNSELEY**

Drawing title
**EXPLORATORY HOLE
EXISTING SITE LAYOUT
PLAN**

Scale	Date	Drawn	Authorised
NTS	01.01.02	AMB	
Drawing Status			
DRAFT			

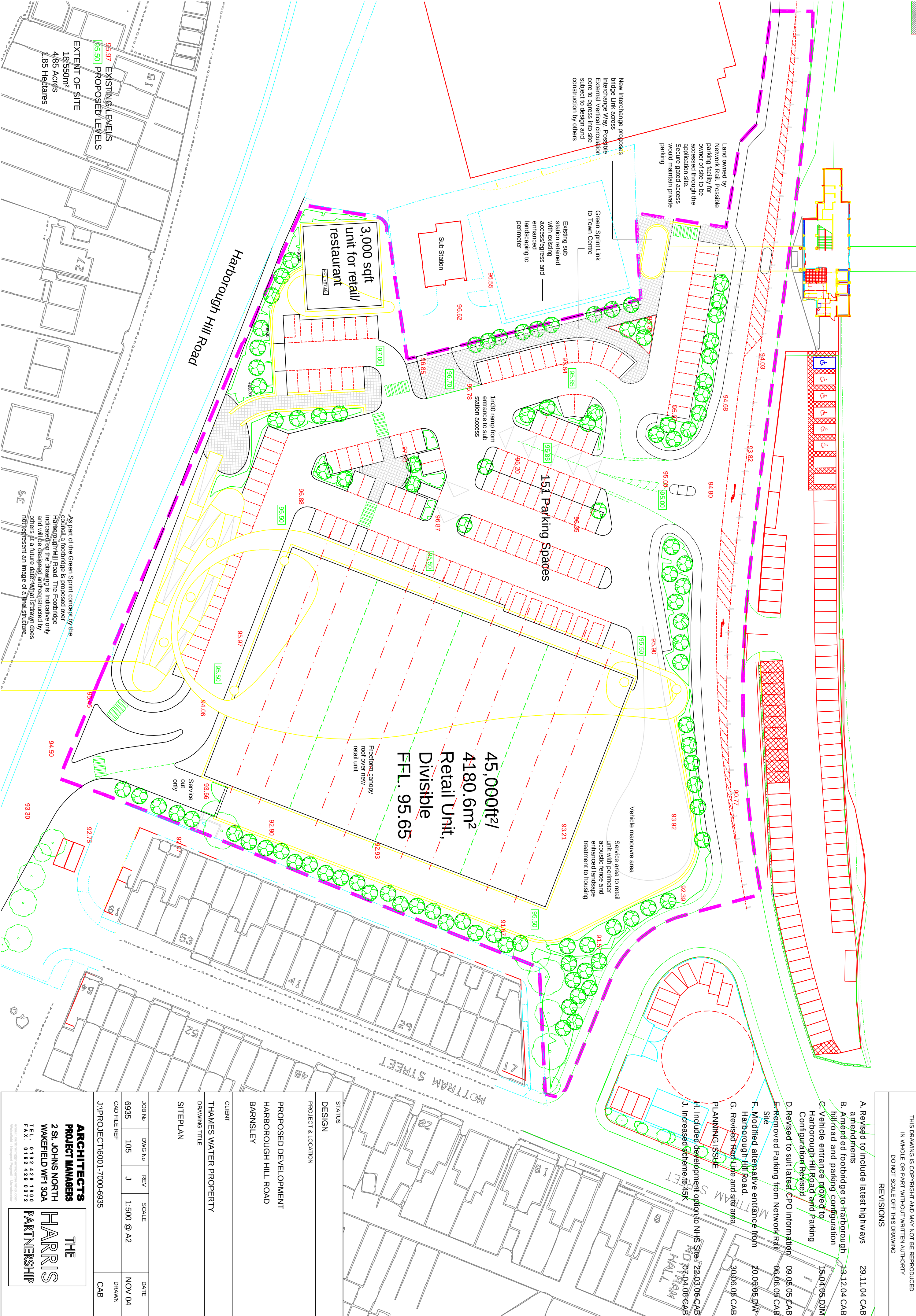
Drawing No:	Revision
FIGURE 2	

FIGURE 3

PROPOSED DEVELOPMENT PLAN

REVISIONS

- A. Revised to include latest highways amendments 29.11.04 CAB
- B. Amended footbridge to harborough hill road and parking configuration 23.12.04 CAB
- C. Vehicle entrance moved to Harborough Hill Road and Parking Configuration Revised 15.04.05 DJM
- D. Revised to suit latest CPO information 09.05.05 CAB
- E. Removed Parking from Network Rail 06.06.05 CAB
- F. Modified alternative entrance from Harborough Hill Road. 20.06.05 DM
- G. Revised Red Line and site area 30.06.05 CAB
- H. Included development option to NHS Site 23.03.06 CAB
- I. Increased scheme to 45K 07.04.06 CAB
- J. Increased scheme to 45K 07.04.06 CAB



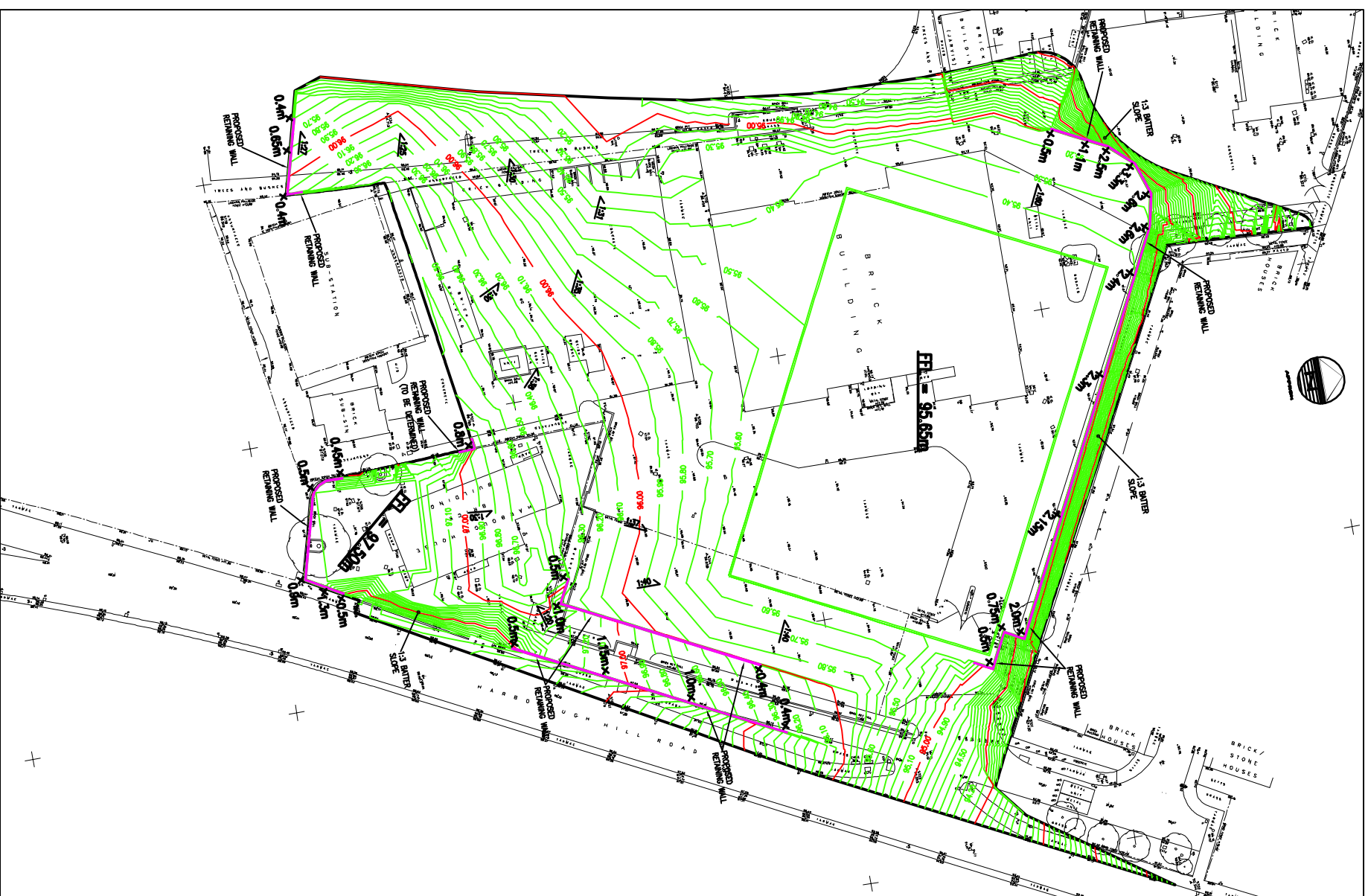
STATUS				
DESIGN				
PROJECT & LOCATION				
PROPOSED DEVELOPMENT				
HARBOROUGH HILL ROAD				
BARN斯LEY				
CLIENT				
THAMES WATER PROPERTY				
DRAWING TITLE				
SITEPLAN				
JOB No	DWG No	REV	SCALE	DATE
6935	105	J	1:500 @ A2	NOV 04
CAD FILE REF				DRAWN
J:\PROJECT\6001-7000-6935				CAB

ARCHITECTS
PROJECT MANAGERS
2 St. Johns North
Wakefield WF1 3QA
TEL. 01924 29 1800
FAX. 01924 29 0172

THE HARRIS PARTNERSHIP

FIGURE 4

PROPOSED CUT AND FILL EARTHWORKS



PROPOSED DEVELOPMENT - HARBOROUGH HILLS ROAD - BARKSEY VILLAGE/REAR PARKWAY (13040)		
EXISTING LAND AREA: SET STOPS AT 10' FROM (DRAINAGE) TO BE CARRIED AND REISED AS 8% CROWN. DITCH AND MATERIALS TO BE CARRIED)		
HAND PAVED STRIP AREA: 14650^{sq} ft HAND PAVED STRIP VOLUME: 4550^{cu} yd		
CUT/FILL VOLUMES	CUT (cu)	FILL (cu)
PROPOSED ROADWAY LEAKS	8055	8271
TO EXISTING DRAINAGE LINES		
NETT		812

- [illegible]

KEY		
— \$1.00 —	PHASED MAJOR CONTINGENT LEVEL	
— \$2.50 —	PHASED MAJOR CONTINGENT LEVEL	
— 1.00 —	DEFENDS DEPTH OF FILL	
— 0.80 —	DEFENDS DEPTH OF FILL	
— 1.00 —	DEFENDS DEPTH OF CUT	
— -0.80 —	DEFENDS DEPTH OF CUT	
— 0.00 —	DEFENDS DEPTH OF ZERO CUT/FILL	

***2.0m**

PROPOSED RETAINING WALL AND PROPOSED FILL

PT	130408	PREGNANTY ISSUE	ST	30
REV	DATE	DESCRIPTION	DRWY	DATE
AMENDMENTS				

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e/mraccidental | writer | transcription | ovi | structural | highways | infrastructure

THAMES WATER
PROPERTY

PROPOSED DEVELOPMENT HARBOROUGH HILL ROAD BARNSELEY

PROPOSED EARTHWORKS INFORMATION

PRELIMINARY

FIGURE 4

A1 © Copyright BWB Consulting Ltd

FIGURE 6

**ESTIMATED EXTENT OF POTENTIAL
INSTABILITY**

APPENDICES



Plate 1 – Centre of Site facing north.



Plate 2 – View from site facing Harbour Hill Road



Plate 3 – South of the site with outbuildings and derelict tank.



Plate 4- Derelict buildings in the south of the site.



Plate 5 – Redundant tank close up with electricity sub-station in the background.



Plate 6 – The south of the site viewing from the west.



Plate 7 – West of the site between central building and perimeter with bus depot.



Plate 8 – North of the site behind central building viewing east.

Considerations of Slope Stability



Plate 9 – Slope behind the south west corner of the site and the new road.



Plate 10 – Fractures in the roadway above the slope.



Plate 11 - Fractures in the roadway above the slope.



Plate 12 – Outwash from the slope below.



Plate 13 – Fractured bedrock immediately under the slope surface.



Plate 14 – Outwash was at frequent intervals along the slope.

Trial Pit and Inspection Pit Photographs



Plate 15 – Inspection Pit 4 where services were less than 0.50m from ground level.



Plate 16 – Trial Pit 6 For much of the site pavement consisted of reinforced concrete above a plastic sheet and limestone or sandstone fill.



Plate 17 – Drain chamber unearthed at the side of face A Trial Pit 7 The area was unfilled with pavement material.



Plate 18 – Made ground of cobbles and boulders to 1.50m bgL and sandy gravelly clay to 2.00m bgL. This contained brick glass and fragments of polyethylene.



Plate 19 – Trial Pit 11 Made ground from faces A and D angular cobbles and boulders of sandstone and rare concrete to 1.90m bgL.



Plate 20 – Made ground was commonly above rockhead.



Plate 21 – Trial Pit 2 – Organic clay below made ground.



Plate 22 – Near surface coal extracted from Trial Pit 3



Plate 23 – Intact Coal in Trial Pit 6



Plate 24 – Near surface rockhead Trial Pit 14. The pit was complete at 2.40m bgL.



Plate 25 – Near surface rockhead Trial Pit 13. The pit was complete at 3.10m bgL.



Plate 26 – Bedrock recovered as sandy gravelly cobbles of MUDSTONE.



Plate 27 – Near surface rockhead Trial Pit 08. The pit was complete at 1.50m bgL.

Core Logs



Plate 28 – BH01 Core Run 3.50 to 7.50 Box 1 of 9



Plate 29 – BH01 Core Run 6.00 to 10.00 Box 2 of 9



Plate 30 – BH01 Core Run 10.00 to 14.00 Box 3 of 9



Plate 31 – BH01 Core Run 12.50 to 18.50 Box 4 of 9



Plate 32 – BH01 Core Run 15.50 to 20.50 Box 5 of 9



Plate 33 – BH01 Core run 18.50 to 24.50 Box 6 of 9



Plate 34 – BH01 Core Run 20.50 to 24.50 Box 7 of 9



Plate 35 – BH01 Core Run 26.50 to 29.50 Box 8 of 9



Plate 36 – BH01 Core Run 29.50 to 30.50 Box 9 of 9



Plate 37 – BH02 Core Run 3.50 to 6.50 Box 1 of 8



Plate 38 – BH02 Core Run 6.50 to 9.50 Box 2 of 8



Plate 39 – BH02 Core Run 9.50 to 14.00 Box 3 of 8



Plate 40 – BH02 Core Run 12.50 – 17.00 Box 4 of 8



Plate 41 – BH02 Core Run 15.50 to 20.00 Box 5 of 8



Plate 42 – BH02 Core Run 15.50 to 23.00 Box 6 of 8



Plate 43 – BH02 Core Run 20.00 to 27.00 Box 7 of 8



Plate 44 – BH02 Core Run 25.00 to 29.00 Box 8 of 8



Plate 45 – BH03 Core Run 2.50 to 6.50 Box 1 of 9



Plate 46 – BH03 Core run 5.00 to 10.00 Box 2 of 9



Plate 47 – BH03 Core Run 8.50 to 13.00 Box 3 of 9



Plate 48 – BH03 Core Run 13.00 to 16.00 Box 4 of 9



Plate 49 – BH03 Core Run 16.00 to 19.00 Box 5 of 9



Plate 50 – BH03 Core Run 19.00 to 23.00 Box 6 of 9



Plate 51 – BH03 Core Run 23.00 to 26.00 Box 7 of 9



Plate 52 – BH03 Core Run 24.50 to 29.00 Box 8 of 9



Plate 53 – BH03 Core Run 27.50 to 30.50 Box 9 of 9



Plate 54 – BH04 Core Run 4.00 to 8.00 Box 1 of 9



Plate 55 – BH04 Core Run 6.50 to 11.00 Box 2 of 9



Plate 56 – BH04 Core run 9.50 to 14.00 Box 3 of 9



Plate 57 – BH04 Core run 12.50 to 17.00 Box 4 of 9



Plate 58 – BH04 Core Run 17.00 to 20.00 Box 5 of 9



Plate 59 – BH04 Core Run 20.00 to 23.00 Box 6 of 9



Plate 60 – BH04 Core Run 23.00 to 26.00 Box 7 of 9



Plate 61 – BH04 Core Run 26.00 to 29.00 Box 8 of 9



Plate 62 – BH04 Core Run 29.00 to 30.00 Box 9 of 9



Plate 63 – BH05 Core Run 4.00 to 8.00 Box 1 of 8



Plate 64 – BH05 Core Run 5.50 to 11.50 Box 2 of 8



Plate 65 – BH05 Core Run 11.50 to 15.50 Box 3 of 8



Plate 66 – BH05 Core Run 14.00 to 18.50 Box 4 of 8



Plate 67 – BH05 Core Run 17.00 to 21.50 Box 5 of 8



Plate 68 – BH05 Core Run 18.50 to 24.50 Box 6 of 8



Plate 69 – BH05 Core Run 23.50 to 27.50 Box 7 of 8



Plate 70 – BH05 Core Run 24.50 to 30.00 Box 8 of 8

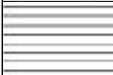
APPENDIX 1

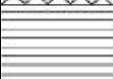
SITE PHOTOGRAPHS

APPENDIX 2

TRIAL PIT LOGS

PROJECT Harbourhill Road (Barnsley)				TP No. 004				
CLIENT Kennet Properties				DATE 27/06/2006				
METHOD JCB 3CX				PROJ No. LDS126				
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result	
0.30	MADE GROUND (Reinforced CONCRETE) With blue plastic sheet below.							
0.60	MADE GROUND(Yellow very sandy gravel. Gravel is fine to coarse, angular to sub-angular and predominantly consists of limestone)(Base layer)			C	0.60			
				C	1.10			
1.50	Stiff thinly laminated Gravelly CLAY. Gravel is fine to coarse sub-rounded to rounded and consists of mudstone sandstone and quartzite.							
2.20	Very weak thinly laminated gray brown MUDSTONE. Recovered as fine to medium angular and tabular clay gravel. (Strata becomes organic cerca 1.90m bgL)			C	2.10			
2.40	Black COAL with lustre.							
End of Trial Pit at 2.40 m (Maximum depth)								
REMARKS Shoring / support (None), Stability (Slight spawling throughtout), Groundwater (Pit dry) Sample C = 1X Vial 1X Glass Jar 1X Plastic Tub				KEY SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS : D - Disturbed ∇ Water Strike SV - Hand Shear Vane B - Bulk PP - Pocket Penetrometer U - Undisturbed J - Glass Jar V - Septum Vial				
EASTING -		NORTHING -		GROUND LEVEL 96.690				
LOGGED BY CE		SCALE 1:50		SHEET Sheet 1 of 1				

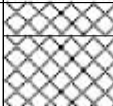
PROJECT Harbourhill Road (Barnsley)				TP No. 003			
CLIENT Kennet Properties				DATE 27/06/2006			
METHOD JCB 3CX				PROJ No.LDS126			
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result
0.20	MADE GROUND (Reinforced CONCRETE) With blue plastic sheet at the base.						
0.70	Made Ground (Yellow very sandy gravel. Gravel is fine to coarse angular to sub angular and predominantly consists of limestone)(Base layer).			C	0.80		
1.20	Very Stiff thinly laminated grey brown CLAY.(Weathered mudstone)			C	1.60		
2.00	Very weak thinly laminated grey brown MUDSTONE becoming very organic from 1.60m bgL.			C	2.00		
2.10	Black COAL with lustre.						
	End of Trial Pit at 2.10 m (Maximum depth)						
REMARKS				KEY			
Shoring / support (None), Stability (Good), Groundwater (Pit Dry), Sample C = 1X Vial 1X Glass Jar 1X Plastic Tub				SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS :			
				D - Disturbed ☒ Water Strike SV - Hand Shear Vane			
				B - Bulk PP - Pocket Penetrometer			
				EASTING	NORTHING	GROUND LEVEL	
				-	-	96.860	
				LOGGED BY	SCALE	SHEET	
				CE	1:50	Sheet 1 of 1	
							

PROJECT Harbourhill Road (Barnsley)					TP No. 005			
CLIENT Kennet Properties					DATE 27/06/2006			
METHOD JCB 3CX					PROJ No. LDS126			
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result	
0.30	MADE GROUND (Reinforced Concrete) With blue plastic sheet at the base.							
0.90	MADE GROUND (Yellow very sandy gravel. Gravel is fine to coarse angular to sub-angular and predominantly consists of limestone)(Base layer).			C	0.50			
				C	1.00			
	Very weak thinly laminated grey brown MUDSTONE highly and compleetly weathered above 1.30. Moderatly or highly weathered below 1.30 with destinct orange mottling. Becoming organic below 2.20.			C	2.00			
2.40	Black COAL with lustre.							
2.80	Weak thinly laminated grey brown MUDSTONE moderatly weathered.			C	3.00			
3.10	Recovered as: angular, tabular cobbles. End of Trial Pit at 3.10 m (Maximum depth)							

REMARKS Shoring / support (None), Stability (Poor), Groundwater (Slight seepage 0.70 m bgL), Sample C = 1X Vial 1X Glass Jar 1X Plastic Tub	KEY SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS : D - Disturbed ∇ Water Strike SV - Hand Shear Vane B - Bulk PP - Pocket Penetrometer U - Undisturbed J - Glass Jar V - Septum Vial			
	EASTING	NORTHING	GROUND LEVEL	
	-	-	96.530	
	LOGGED BY	SCALE	SHEET	
CE	1:50	Sheet 1 of 1		

PROJECT Harbourhill Road (Barnsley)					TP No. 002			
CLIENT Kennet Properties					DATE 27/06/2006			
METHOD JCB 3CX					PROJ No. LDS126			
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result	
0.26 0.46	MADE GROUND (Reinforced CONCRETE) With blue plastic sheet at the base.			B D	0.30	0.30		
0.80	MADE GROUND (Yellow very sandy Gravel. Gravel is fine to coarse angular to sub-angular and predominantly consists of limestone.)(Base Layer).			B C D	0.70			
1.40	Firm thinly laminated gray brown slightly organic CLAY.(Weathered mudstone)			B C D	1.50			
2.00	Black COAL with lustre.							
	Very weak thinly laminated grey brown MUDSTONE highly and compleetly weathered recovered as a sandy gravel.							
	End of Trial Pit at 2.00 m (Maximum depth)							
REMARKS Shoring / Support (None), Stability (Good), Groundwater (Dry), Sample C = 1XVial, 1XGlass Jar, 1X Plastic Tub			KEY SAMPLE TYPE : D - Disturbed B - Bulk U - Undisturbed J - Glass Jar V - Septum Vial WATER LEVEL : ☒ Water Strike IN-SITU TESTS : SV - Hand Shear Vane PP - Pocket Penetrometer					
EASTING -		NORTHING -		GROUND LEVEL 96.580				
LOGGED BY CE		SCALE 1:50		SHEET Sheet 1 of 1				

PROJECT Harbourhill Road (Barnsley)				TP No. 001					
CLIENT Kennet Properties				DATE 27/06/2006					
METHOD JCB 3CX				PROJ No.LDS126					
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing		
				Type	Depth From To	Depth (m)	Result		
0.25	MADE GROUND (Reinforced Concrete) MADE GROUND (Red Brown and yellow clay VERY SANDY VERY GRAVELY COBBLES AND BOULDERS. Gravel is fine to coarse angular to subangular and consists of brick sandstone and land drain fragments. Cobbles / Boulders angular brick, sandstone and land drain)(Base and Capping layer). Stiff yellow brown CLAY(Compleetly weathered mudstone) Very weak thinly laminated grey brown MUDSTONE highly and compleetly weathered down to 2.00m bgL recovered as fine to medium angular gravel. Below 2.00 moderatly or highly weathered compitent rock becoming organic from 2.60m bgL with traces of coal from 2.80m bgL End of Trial Pit at 2.90 m (Maximum depth)								
0.50				C	0.60				
				B	0.70				
				D					
1.10				C	1.20				
				B	1.40				
				D					
				C	2.20				
				B	2.40				
				D					
2.90									

PROJECT Harbourhill Road (Barnsley)				TP No. 006				
CLIENT Kennet Properties				DATE 27/06/2006				
METHOD JCB 3CX				PROJ No.LDS126				
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From	To	Depth (m)	Result
0.22	MADE GROUND(Reinforced concrete)			C	0.00	2.90		
0.70	MADE GROUND Yellow very sandy gravel. gravel was fine to coarse angular to sub-angular and predominantly consisted of limestone.(Base layer)			C	0.50			
1.10	Stiff grey brown CLAY on the south side of the pit. Ground as above on the North side of the pit.			C	0.80			
1.80	Black COAL with lustre. cerca 1.70m bgL Pit was widened to define previous trial pit that went to 1.80m bgL.			C	1.70			
	Weak thinly laminated MUDSTONE moderately weathered.							
3.20	End of Trial Pit at 3.20 m (Maximum depth)							

PROJECT Harbourhill Road (Barnsley)				TP No. 007			
CLIENT Kennet Properties				DATE 27/06/2006			
METHOD JCB 3CX				PROJ No. LDS126			

Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result	
0.30	MADE GROUND (Reinforced concrete) With blue plastic sheet at the base.							
0.60	MADE GROUND (Yellow sandy gravel. Gravel is fine to coarse angular to sub-angular and predominantly consists of limestone with occasional brick)(Base layer). This layer extended down to 1.20m bgl adjacent to concrete chambour that was located in the east side of the trial pit..			C	0.70			
1.20				C	1.30			
2.10								
	Very weak grey brown MUDSTONE highly to compleetly weathered.							
	Very weak grey brown MUDSTONE moderatly or highly weathered.							
	End of Trial Pit at 2.10 m (Maximum depth)							

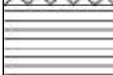
REMARKS

Shoring / Support (None)
 Stability (Poor) Ground Water (Dry)
 Sample C = 1X Vial, 1X Glass Jar, 1 X Plastic Tub. The trial pit unearthed a concrete chambour on the east side that was located below a ground level manhole.

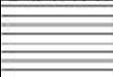
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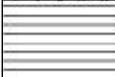
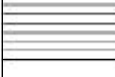
SAMPLE TYPE :	WATER LEVEL :	IN-SITU TESTS :
D - Disturbed	☒ Water Strike	SV - Hand Shear Vane
B - Bulk		PP - Pocket Penetrometer
U - Undisturbed		
J - Glass Jar		
V - Septum Vial		

EASTING	NORTHING	GROUND LEVEL
-	-	96.570
LOGGED BY	SCALE	SHEET
CE	1:50	Sheet 1 of 1

PROJECT Harbourhill Road (Barnsley)				TP No. 008							
CLIENT Kennet Properties				DATE 27/06/2006							
METHOD JCB 3CX				PROJ No.LDS126							
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing					
				Type	Depth From To	Depth (m)	Result				
0.20	MADE GROUND (Reinforced concrete) With blue plastic sheet below				0.60	0.60					
0.50								MADE GROUND(Yellow very sandy gravel. Gravel is fine to coarse angular to sub-angular and predominantly consists of limestone)(Base layer)	B		
									C		
									D		
											
				B	1.10						
				C							
				D							
1.50	Weak thinly laminated gray brown MUDSTONE moderatley or highly weathered. Recovered as angular and tabular gravely cobbles.										
	End of Trial Pit at 1.50 m (Maximum depth)										
REMARKS Shoring / Support (None) Stability (Good) Groundwater (Dry) Sample C = 1X Vial 1X Glass Jar 1X Plastic Tub				KEY SAMPLE TYPE : D - Disturbed B - Bulk U - Undisturbed J - Glass Jar V - Septum Vial WATER LEVEL : ☒ Water Strike IN-SITU TESTS : SV - Hand Shear Vane PP - Pocket Penetrometer							
				EASTING		NORTHING		GROUND LEVEL			
				-		-		96.230			
				LOGGED BY		SCALE		SHEET			
CE		1:50		Sheet 1 of 1							
				BWB CONSULTING							

PROJECT Harbourhill Road (Barnsley)				TP No. 009					
CLIENT Kennet Properties				DATE 27/06/2006					
METHOD JCB 3CX				PROJ No.LDS126					
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing			
				Type	Depth From To	Depth (m)	Result		
0.05	MADE GROUND(Tarmac) MADE GROUND(Yellow very sandy gravel. Gravel is fine to coarse angular to subangular and predominantly consists of limestone)(Base layer). MADE GROUND (Firm gray brown VERY GRAVELY CLAY WITH OCCASIONAL COBBLES. Gravel is fine to coarse angular to subangular and consists of limestone sandstone and brick. Cobbles angular brick or sandstone)(Capping layer). Weak thinly laminated gray brown MUDSTONE moderatly weatered with ironstaining through.								
0.15			C	0.50					
0.30			C	1.00					
			C	2.00					
			C	3.00					
3.40	End of Trial Pit at 3.40 m (Maximum depth)								
REMARKS				KEY					
Shoring Support (None), Stability (Good), Groundwater (Dry), Sample C = 1X Vial, 1X Glass Jar, 1X Plastic Tub				SAMPLE TYPE :		WATER LEVEL :		IN-SITU TESTS :	
				D - Disturbed		☒ Water Strike		SV - Hand Shear Vane	
				B - Bulk				PP - Pocket Penetrometer	
				U - Undisturbed					
				J - Glass Jar					
				V - Septum Vial					
EASTING		NORTHING		GROUND LEVEL					
-		-		96.640					
LOGGED BY		SCALE		SHEET					
CE		1:50		Sheet 1 of 1					

PROJECT Harbourhill Road (Barnsley)				TP No. 015				
CLIENT Kennet Properties				DATE 27/06/2006				
METHOD JCB 3CX				PROJ No. LDS126				
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result	
0.15	MADE GROUND (Reinforced concrete) with blue plastic sheet below.							
0.50	MADE GROUND(Brown very sandy gravel with many cobbles and some boulders. Gravel is fine to coarse angular to sub-angular and predominantly consist of sandstone. Cobbles/Boulders sub-angular sandstone)(Base layer).			C	0.60			
				C	1.10			
1.70	Weak thinly laminated grey brown MUDSTONE moderately or highly weathered. Recovered as angular gravel with many cobbles and boulders. End of Trial Pit at 1.70 m (Maximum depth)							
REMARKS Shoring support (None), Stability (Good), Groundwater (Dry), Sample C = 1XVial, 1X Glass Jar, 1X Plastic Tub,				KEY SAMPLE TYPE : D - Disturbed B - Bulk U - Undisturbed J - Glass Jar V - Septum Vial WATER LEVEL :  Water Strike IN-SITU TESTS : SV - Hand Shear Vane PP - Pocket Penetrometer				
EASTING -		NORTHING -		GROUND LEVEL 95.950				
LOGGED BY CE		SCALE 1:50		SHEET Sheet 1 of 1				

PROJECT Harbourhill Road (Barnsley)					TP No. 014								
CLIENT Kennet Properties					DATE 27/06/2006								
METHOD JCB 3CX					PROJ No. LDS126								
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing							
				Type	Depth From To	Depth (m)	Result						
0.14	MADE GROUND(Concrete with blue plastic sheet below) MADE GROUND(Brown very sandy gravel with some cobbles. Gravel is fine to coarse angular to sub-angular and consists of brick and sandstone. Cobbles angular brick and sandstone)(Base layer). Very weak thinly laminated grey brown MUDSTONE highly or compleetly weathered).		    										
0.50				C	0.60								
				C	1.00								
				C	2.00								
2.40	End of Trial Pit at 2.40 m (Maximum depth)												
REMARKS Shoring / support (None), Stability (Good), Groundwater (Dry), Sample C = 1X vial, 1X Glass Jar, 1X Plastic Tub					KEY SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS : D - Disturbed ∇ Water Strike SV - Hand Shear Vane B - Bulk PP - Pocket Penetrometer U - Undisturbed J - Glass Jar V - Septum Vial								
					EASTING -			NORTHING -			GROUND LEVEL 94.100		
					LOGGED BY CE			SCALE 1:50			SHEET Sheet 1 of 1		
													

PROJECT Harbourhill Road (Barnsley)				TP No. 010			
CLIENT Kennet Properties				DATE 27/06/2006			
METHOD JCB 3CX				PROJ No.LDS126			
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result
0.15	MADE GROUND(Tarmac)						
0.60	MADE GROUND (Yellow very sandy gravel. Gravel is fine to coarse angular to sub-angular and predominantly consts of limestone)(Base layer).			B	0.50		
0.80				C	0.70		
1.10	MADE GROUND (Brown CLAY BOUND COBBLES AND BOULDERS. Cobbles/boulders angular sandstone with rare brick)(Capping layer)			C			
	Stiff gray brown mottled CLAY (Weathered mudstone)			B	1.20		
				C			
				D			
	Very weak thinly laminated grey brown MUDSTONE highly or compleetly weathered. Recovered as fine to medium angular gravel. Below 2.30m bgL becoming very organic.			B	2.20		
2.50				C			
2.60	Black COAL with lustre.			D			
	End of Trial Pit at 2.60 m (Maximum depth)						
REMARKS				KEY			
Shoring / support (None), Stability (Good), Groundwater (Dry), Sample C = 1X Vial, 1X Glass jar, 1X Plastic Tub,				SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS :			
				D - Disturbed ∇ Water Strike SV - Hand Shear Vane			
				B - Bulk PP - Pocket Penetrometer			
				EASTING		NORTHING	
				-		-	
				LOGGED BY		SCALE	
				CE		1:50	
				SHEET		Sheet 1 of 1	
				BWB CONSULTING			

PROJECT Harbourhill Road (Barnsley)					TP No. 011		
CLIENT Kennet Properties					DATE 27/06/2006		
METHOD JCB 3CX					PROJ No. LDS126		

Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing	
				Type	Depth From To	Depth (m)	Result
0.09	MADE GROUND(Tarmac)			C	0.20		
0.30	MADE GROUND (Yellow very sandy gravel. gravel is fine to coarse angular to sub-angular and predominantly consists of limestone)(Base layer).			C	0.80		
0.60				C	1.40		
1.20				C	2.00		
1.90				C			
2.10	MADE GROUND(Stiff dark grey SANDY GRAVELY CLAY with many cobbles and boulders. Gravel is fine to coarse angular to subangular and consists of brick sandstone ash and slag. Cobbles / boulders angular brick and sandstone).						
	MADE GROUND(Stiff dark grey sandy gravelly clay. Gravel is fine to coarse angular to subangular and consists of brick sandstone ash and slag. Strata has an organic odour).						
	MADE GROUND(Faces B and C only Very weak thinly laminated grey brown mudstone highly and completely weathered to gravelly clay. Faces A and D angular cobbles and boulders of sandstone with rare concrete). Cerca 1.10 to 1.20m bgL in face A located at 0.5m in from the corner with face B one number drain pipe ran into the pit its exit was unlocated. see photograph.						
	Weak thinly laminated grey brown MUDSTONE Highly weathered.						
	End of Trial Pit at 2.10 m (Maximum depth)						

REMARKS

Shoring / support (None)
 Stability (Heavy spawling through) Groundwater (Dry)
 Sample C = 1X vial 1X Glass jar 1X Plastic Tub

KEY

SAMPLE TYPE :
 D - Disturbed
 B - Bulk
 U - Undisturbed
 J - Glass Jar
 V - Septum Vial

WATER LEVEL :
 ☒ Water Strike

IN-SITU TESTS :
 SV - Hand Shear Vane
 PP - Pocket Penetrometer

EASTING
-

NORTHING
-

GROUND LEVEL
95.130

LOGGED BY
CE

SCALE
1:50

SHEET
Sheet 1 of 1



PROJECT Harbourhill Road (Barnsley)				TP No. 012				
CLIENT Kennet Properties				DATE 27/06/2006				
METHOD JCB 3CX				PROJ No.LDS126				
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples		In-situ Shear Vane Testing		
				Type	Depth From	Depth To	Depth (m)	Result
0.07 0.15	MADE GROUND(Tarmac)							
	MADE GROUND (Yellow very sandy gravel. Gravel is fine to coarse angular to sub-angular and predominantly consists of limestone)(Base layer).			B C D	0.50	0.50		
1.00	MADE GROUND (Cobbles and boulders with much sand and gravel and gravel sized clasts of sandy clay. Gravel is fine to coarse angular to sub-angular and consists of brick sandstone slag and fragments of polythene. Cobbles boulders angular sandstone with rare bricks).			B C D	1.10			
1.50				B C D	1.70			
2.00				B C D	2.30			
	MADE GROUND(Firm dark grey sandy gravely clay. Gravel is fine to coarse angular to sub-angular and consists of sandstone, mudstone, glass, brick).							
3.10	Stiff fissured grey brown mottled orangesandy gravely CLAY. Gravel is fine to coarse angular and predominantly consists of mudstone.							
	Very weak thinly laminated grey brown MUDSTONE with organic traces occurring on laminations highly and compleetly weathered.							
	End of Trial Pit at 3.10 m (Maximum depth)							
REMARKS				KEY				
Shoring / support (None), Stability (Spawling thought), Groundwater (Dry), Sample C = 1X Vial , 1X Glass Jar, 1X Plastic Tub,				SAMPLE TYPE : WATER LEVEL : IN-SITU TESTS :				
				D - Disturbed ☒ Water Strike SV - Hand Shear Vane				
				B - Bulk U - Undisturbed PP - Pocket Penetrometer J - Glass Jar V - Septum Vial				
EASTING		NORTHING		GROUND LEVEL				
-		-		92.870				
LOGGED BY		SCALE		SHEET				
CE		1:50		Sheet 1 of 1				
				BWB CONSULTING				

PROJECT Harbourhill Road (Barnsley)					TP No. 013			
CLIENT Kennet Properties					DATE 27/06/2006			
METHOD JCB 3CX					PROJ No. LDS126			
Depth (m)	Description of Strata	Level (mAOD)	Legend	Samples			In-situ Shear Vane Testing	
				Type	Depth From To		Depth (m)	Result
0.06	MADE GROUND(Tarmac)							
0.35	MADE GROUND(Dark brown slightly sandy gravel with rare gravel sized pockets of firm clay. Gravel is fine to coarse and predominantly consists of sandstone)(Base layer).			C	0.50			
				C	1.00			
	Very weak thinly laminated grey brown MUDSTONE moderately or highly weathered with occasional subrounded carstones situated interstitially within laminations.							
				C	2.00			
								
								
								
3.10	End of Trial Pit at 3.10 m (Maximum depth)							
REMARKS Shoring / support (None), Stability (Good), Groundwater (Dry), Sample C = 1 X Vial, 1X Glass Jar, 1X Plastic Tub,				KEY SAMPLE TYPE : D - Disturbed B - Bulk U - Undisturbed J - Glass Jar V - Septum Vial WATER LEVEL : ☒ Water Strike IN-SITU TESTS : SV - Hand Shear Vane PP - Pocket Penetrometer				
EASTING -		NORTHING -		GROUND LEVEL 93.170				
LOGGED BY CE		SCALE 1:50		SHEET Sheet 1 of 1				

APPENDIX 3

BOREHOLE LOGS



Project Harbourhill Road (Barnsley)		Client Kennet Properties		Borehole 04
Project No LDS126	Start 10/07/2006 End 10/07/2006	Ground Level 92.020	Co ordinates - -	Sheet 1 of 4

Drilling Records			Depth (m)	Description of Strata	(Level)	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To	Samples/In-situ Tests			mAOD	% TCR	% SCR	% RQD				
			0.08	MADE GROUND(Tarmac)	(91.94)							
0.50 0.60	0.50 0.90	C B	0.40	MADE GROUND(Yellow brown fine to coarse angular to sub-angular limestone)(Base Layer)	(91.62)							
1.00	1.30	50 (25 for 41mm/41,9 for 19mm) G		Very weak gray brown MUDSTONE highly to completely weathered. 4.00 to 9.50 With much orange iron staining. 2.50 to 4.00 No Recovery								
1.80	2.00	50 (25 for 44mm/50 for 70mm) G										
4.00	5.00			Fractures are Extreemly and very close rough planar and irregular open andclosed claen breccia filled and iron stained discontinuities. 5.00 to 5.28 / 5.83 to 5.87 / 6.35 to 6.50 Non Intact.		70	28	0		12		
5.00	6.50					87	63	53				
6.50	8.00			Fractures are: Extreemly and very closely spaced rough planar and irregular open and closed clean, breccia filled and ironained discontinuities.		99	50	42		NI		
8.00	9.50									16		
				Continued next sheet		84	12	0		NI		

Drilling Progress and Water Observations						General Remarks				
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth					
04/07/2006		2.00	1.50		-	C = One sample containing 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.				
10/07/2006		30.00	3.50		11.90					
Scale 1:50				Method Sa Follow by Rotary		Drilled By GB + CJ		Logged By CE		Checked By



Project Harbourhill Road (Barnsley)		Client Kennet Properties		Borehole 04
Project No LDS126	Start 10/07/2006 End 10/07/2006	Ground Level 92.020	Co ordinates - -	Sheet 2 of 4

Drilling Records		Depth (m)	Description of Strata	(Level)	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To			mAOD	% TCR	% SCR	% RQD				
9.50	11.00	12.58	Very weak gray brown MUDSTONE highly to completely weathered. 4.00 to 9.50 With much orange iron staining. 2.50 to 4.00 No Recovery Fractures are: Very closely and closely spaced rough planar and irregular open and closed clean breccia filled and iron stained discontinuities. 9.80 to 9.89 / 9.95 to 10.00 / 10.12 to 10.27 Non Intact Fractures are: Extremely and very close rough planar and irregular open and closed clean and breccia filled discontinuities. 10.38 to 10.42 / 10.54 to 10.74 / 10.85 to 11.00 / 11.17 to 11.21 / 11.31 to 11.41 / 11.63 to 11.68 Non Intact. 11.00 to 11.41 One number planar closed discontinuity 12.07 to 12.32 One number planar closed discontinuity.	(79.44)					9		
					97	50	37				
					93	80	39				
					47	16	13				
12.50	14.00	14.08	Very weak thinly laminated grey slightly sandy MUDSTONE highly or completely weathered. Fractures are: Very closely to medium spaced rough planar and irregular open and closed clean breccia filled and iron stained discontinuities. 14.34 15.57 One number impersistant irregular closed discontinuity 15.14 to 15.20 / 15.26 to 15.40 / 16.80 to 16.90 / Non intact.	(77.94)	98	74	62		8		
15.50	17.00	95	76	57							
							NI				
			Continued next sheet						NI		

Drilling Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	
04/07/2006		2.00	1.50		-	C = One sample containing 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.
10/07/2006		30.00	3.50		11.90	
Scale 1:50				Method Sa Follow by Rotary	Drilled By GB + CJ	Logged By CE Checked By

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	04
Project No	LDS126			Start	10/07/2006	Ground Level	92.020	Co ordinates	- -
				End	10/07/2006				Sheet 3 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
		17.87	Very weak thinly laminated grey slightly sandy MUDSTONE highly or compleetly weathered.	(74.15)							
17.00	20.00		Moderately weak thinly laminated grey slightly sandy in places MUDSTONE moderatly or highly weathered. Fractures are: Extremely and very closely spaced planar and irregular open and closed clay filled discontinuities.		99	49	30		12		
		20.36	Fractures are: Medium and closely spaced planar and irregular open and closed clean breccia filled ironstained and clay filled discontinuities. 20.23 to 20.36 / 20.50 to 20.60 / 22.49 to 22.53 / 23.24 to 23.47 / 24.32 to 24.38 Non Intact. 24.78 to 24.89 One number impersistant irregular open breccia filled discontinuity.	(71.66)					NI		
20.00	23.00		Moderatly weak thinly laminated grey brown slightly micacious SANDSTONE moderatly or highly weathered.		92	82	70				
23.00	26.00				94	84	50		5		

Continued next sheet

Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth						
04/07/2006		2.00	1.50		-	C = One sample containing 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.					
10/07/2006		30.00	3.50		11.90						
Scale 1:50				Method	Sa Follow by Rotary		Drilled By	GB + CJ	Logged By	CE	Checked By

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 04		
Project No LDS126		Start 10/07/2006	Ground Level 92.020		Co ordinates - -		Sheet 4 of 4	
		End 10/07/2006						

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Installation
Depth From	To				% TCR	% SCR	% RQD				
26.00	29.00		Moderatly weak thinly laminated grey brown slightly micacious SANDSTONE moderatly or highly weathered.		99	90	71				
29.00	30.00		Fracture is: Planar open clean.		90	90	84		1		
		30.00	End of Borehole at 30.00 m								

Drilling Progress and Water Observations						General Remarks		
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth			
04/07/2006		2.00	1.50		-	C = One sample containing 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.		
10/07/2006		30.00	3.50		11.90			
Scale 1:50				Method Sa Follow by Rotary	Drilled By GB + CJ	Logged By CE	Checked By	

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 05	
Project No LDS126		Start 27/06/2006	Ground Level 93.720		Co ordinates - -		Sheet 1 of 4
		End 27/06/2006					

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
		0.30	MADE GROUND (Reinforced Concrete)	(93.42)							
0.50	0.60	0.50	MADE GROUND (Yellow brown fine to coarse dominantly coarse angular to subangular limestone gravel)(Base Layer)	(93.22)							
1.00	1.45		MADE GROUND(Firm brown sandy very GRAVELY CLAY. Gravel is fine to coarse angular to subangular and predominantly consists of sandstone with rare brick fragments)(Capping layer).								
1.50											
2.00	2.45	2.00	Firm grey brow Sandy CLAY	(91.72)							
2.50	2.60	2.50	Very weak grey brown slightly sandy in places MUDSTONE highly and compleetly weathered Occasionally interbedded with thin bands (cerca 20mm) of moderatly weak yellow brown iron stained sandstone mderately or highly weathered.	(91.22)							
3.00	3.45										
3.50											
3.80	4.00										
4.00											
4.00	5.00				90	15	0				
									NI		
5.00	8.00		Fractures are: Closely spaced rough planar and irregular open and closed iron stained discontinuities. 7.00 to 7.76 No recovery.		74	31	16			8	
8.00	9.00				88	26	16				

Continued next sheet

Drilling Progress and Water Observations						General Remarks				
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth					
05/06/2006	0000	5.00	-		-	C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.				
03/07/2006	0000	4.00	3.00		0.00					
03/07/2006	0000	10.00	4.00		-					
04/07/2006	0130	14.00	4.00		12.90					
Scale 1:50			Method SA Follow by Rotary		Drilled By GB +CJ	Logged By CE	Checked By			

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 05		
Project No LDS126		Start 27/06/2006	Ground Level 93.720		Co ordinates - -		Sheet 2 of 4	
		End 27/06/2006						

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
9.00	10.00		Very weak grey brown slightly sandy in places MUDSTONE highly and compleetly weathered Occasionally interbedded with thin bands (cerca 20mm) of moderatly weak yellow brown iron stained sandstone mderately or highly weathered.		34	0	0		NI		
10.00	11.50				80	10	10				
11.50	12.50	11.50	Black COAL with lustre.	(82.22)							
		11.95	Compleetly weathered grey MUDSTONE Recovered as clay.	(81.77)	88	0	0				
		12.30	Black COAL with lustre.	(81.42)							
		12.50	Very weak thinly laminated sandy in places MUDSTONE moderately or highly weathered. Fractures are: Medium spaced rough planar and irregular open and closed clean and breccia filled discontinuities.	(81.22)							
12.50	14.00				83	61	54		5		
14.00	15.50		Fractures are: Very closely to medium spaced rough planar and irregular open and closed clean, breccia filled and iron stained discontinuities. 14.00 to 14.10 / 14.26 to 14.30 / 14.90 to 14.98 Non intact. 15.15 to 15.25 One number sub-verticle irregular open iron coated discontinuity. (Iron coating cerca 2mm in thickness) 15.58 to 15.64 Non intact. 15.68 to 15.80 Two number sub-verticle smooth planar 10* open iron coated dicontinuities. (Iron coating cerca 2mm in thickness) 15.80 to 15.90 / 16.13 to 16.23 / 17.00 to 17.45 Non intact 17.51 to 17.58 One number sub verticle closed discontinuity. 17.95 to 18.25 Non intact.		98	81	33				
15.50	17.00				99	81	44		9		

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	Casing in all cases was 150mm diameter.			
05/06/2006	0000	5.00	-		-				
03/07/2006	0000	4.00	3.00		0.00				
03/07/2006	0000	10.00	4.00		-				
04/07/2006	0130	14.00	4.00		12.90				
Scale 1:50				Method	SA Follow by Rotary	Drilled By	GB +CJ	Logged By	CE
						Checked By			

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	05
Project No	LDS126		Start	27/06/2006	Ground Level	93.720		Co ordinates	- -
			End	27/06/2006				Sheet 3 of 4	

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
17.00	18.50		Very weak thinly laminated sandy in places MUDSTONE moderately or highly weathered.		80	49	35				
									NI		
18.50	21.50		Fractures are: Closely to medium spaced rough planar and irregular open and closed clean and breccia filled discontinuities. 19.15 to 21.00 One number impersistant sub-virticle irregular open clean discontinuity. 20.24 to 20.37 Non intact.		99	72	54		6		
		21.90	Where intact: Fractures are: Open and closed clean breccia filled and iron stained discontinuities. 24.88 to 25.02 One number verticle planar open clean discontinuity. 25.25 to 26.00 One number sub-virticle impersistant rough irregular open iron stained and breccia filled discontinuity.	(71.82)							
		22.25		(71.47)							
21.50	23.50	22.55	Black COAL with lustre.	(71.17)	99	18	15				
			Completely weathered MUDSTONE. Recovered as very soft grey clay.								
			Very weak grey brown MUDSTONE highly and completely weathered.						NI		
23.50	24.50				97	13	0				
24.50	27.50				99	56	30				

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.			
05/06/2006	0000	5.00	-		-				
03/07/2006	0000	4.00	3.00		0.00				
03/07/2006	0000	10.00	4.00		-				
04/07/2006	0130	14.00	4.00		12.90				
Scale 1:50			Method SA Follwe by Rotary		Drilled By GB +CJ	Logged By CE	Checked By		

Project Harbourhill Road (Barnsley)		Client Kennet Properties			Borehole 05
Project No LDS126	Start 27/06/2006 End 27/06/2006	Ground Level 93.720	Co ordinates - -		Sheet 4 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Installation
Depth From	To				% TCR	% SCR	% RQD				
		27.42	Very weak grey brown MUDSTONE highly and compleetly weathered. Fractures are: Medium spaced rough planar and irregular open and closed clean, breccia filled and iron stained discontionuities. 26.20 to 27.00 One number impersistant sub-verticle irregular iron stained and breccia filled dicontinuity. 27.28 to 27.35 One number planar 40* open clean dicontinuity. 27.28 to 27.35 One number sub-verticle planar 40* open clean dicontinuity.	(66.30)					5		
27.50	30.00		Very weak thinly laminated grey brown slightly sandy MUDSTONE highly or compleetly weathered. Fractures are: Closely to medium spaced planar and irregular open and closed clean breccia filled and iron stained dicontinuityes. 28.30 to 28.80 One number sub-verticle undulating tight breccia filled and iron stained dicontinuity.		98	66	42		6		
		30.00	End of Borehole at 30.00 m	(63.72)					NI		

Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	Casing in all cases was 150mm diameter.					
05/06/2006	0000	5.00	-		-						
03/07/2006	0000	4.00	3.00		0.00						
03/07/2006	0000	10.00	4.00		-						
04/07/2006	0130	14.00	4.00		12.90						
Scale 1:50				Method SA Follow by Rotary	Drilled By GB +CJ	Logged By CE	Checked By				

Drilling Records			Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Insulation
Depth From	To	Samples/In-situ Tests				% TCR	% SCR	% RQD				
			0.08	MADE GROUND(Tarmac)	(96.02)							
			0.30	MADE GROUND(Yellow brown fine to coarse angular to sub-angular limestone)(Base layer)	(95.80)							
-0.50	0.50	C	0.70	MADE GROUND(Brown SANDY GRAVELLY CLAY. Gravel is fine to coarse angular to sub-angular and consists of sandstone limestone and brick)(Capping layer)	(95.40)							
-0.60		B		Black COAL desicated and recovered as medium dense sand.								
-1.00		C										
-1.10		N=22 (3,3/3,5,6,8)										
		G										
		B										
-1.70		C	1.70	Very weak grey brown slightly sandy in places MUDSTONE highly and compleetly weathered. With heavy orange iron staining cerca 3.50 to 4.50. and Slight orange iron staining cerca 4.50 to 9.00. Cerca 5.80 to 6.00 Moderately weak thinly laminated grey SANDSTONE moderately weathered	(94.40)							
-2.00		N=35 (4,6/7,8,9,11)										
		G										
		B										
-3.00		50 (13,12 for 51mm/30,20 for 33mm)										
		G										
-3.50	4.50					90	15	11		NI		
				Fractures are Wide and midiumly spaced rough planar open and clean discontinuities.								
-4.50	6.00					80	53	53		3		
				Fractures are: Very closely and closely spaced rough planar and irregulor open and closed clean and breccia filled discontinuities. 6.00 to 6.65 / 6.84 to 6.90 / 7.13 to 7.27 Non intact.								
-6.00	7.50					25	43	23		12		
				Where intact: Fractures are rough planar and irregular open and closed clean breccia filled and iron stained discontinuities.								
-7.50	9.00					92	23	9				

Continued next sheet

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth		
03/07/2006		3.30	1.50		-		
04/07/2006		10.00	3.50		4.00		
05/07/2006		30.50	3.50		5.90		
						C = One sample containing. 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub. G = Sample taken from SPT. Water depth is that after 20 minutes standing.	
Scale 1:50				Method SA Follow by Rotary	Drilled By GB + C J	Logged By CE	Checked By

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 01	
Project No LDS126		Start 03/07/2006	Ground Level 96.100		Co ordinates - -		Sheet 2 of 4
		End 05/07/2006					

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
9.00	10.00		Very weak grey brown slightly sandy in places MUDSTONE highly and compleetly weathered. With heavy orange iron staining cerca 3.50 to 4.50. and Slight orange iron staining cerca 4.50 to 9.00. Cerca 5.80 to 6.00 Moderately weak thinly laminated grey SANDSTONE moderately weathered		97	17	10		NI		
10.00	11.00				69	8	0				
11.00	12.50	11.46	Fractures are: Medium and closely spaced rough planar and irregular open and closed clean and breccia filled discontinuities. 12.16 to 12.94 Non intact.	(84.64)							
		11.82	Black COAL with lustre. (Recovered intact)	(84.28)	99	59	30				
		12.16	Compleetly weathered grey MUDSTONE Recovered as clay. Black COAL with lustre.	(83.94)					6		
12.50	14.00	12.60	Very weak grey brown slightly sandy in places MUDSTONE highly and compleetly weathered Occasionally interbedded with thin bands (cerca 200mm) of moderatly weak thinly laminated grey SANDSTONE moderately weathered. Fractures are: Medium and closely spaced rough planar and irregular open and closed clean and breccia filled discontinuities. 13.82 to 13.92 / 14.90 to 15.00 / 15.99 to 16.07 Non intact.	(83.50)	71	50	29				
14.00	15.50				87	73	13		8		
15.50	18.50		Fractures are: Medium and closely spaced rough planar and irregular open and closed clean breccia filled and iron stained discontinuities.		99	93	67				

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth				
03/07/2006		3.30	1.50		-	Casing in all cases was 150 mm diameter.			
04/07/2006		10.00	3.50		4.00				
05/07/2006		30.50	3.50		5.90				
Scale 1:50				Method	SA Follow by Rotary		Drilled By	GB + C J	
							Logged By	CE	
							Checked By		

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	01
Project No	LDS126		Start	03/07/2006	Ground Level	96.100		Co ordinates	-
			End	05/07/2006					Sheet 3 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
18.50	20.50		Remaining Detail : 16.80m - 18.50m : 15.40 to 15.48 Non Intact. 17.72 to 17.90 One number verticle planar iron stained discontinuity. 17.97 to 18.05 Non Intact. 18.37 to 18.50 One number verticle planar open iron stained discontinuity.						6		
		20.50	Black COAL with lustre.	(75.60)					NI		
20.50	22.50				83	36	20				
		21.74	MUDSTONE (As above 12.60 to 20.50)	(74.36)							
					82	3	0				
22.50	24.50		Fractures are Medium and closely spaced planar and irregular open breccia filled discontinuities. 23.09 to 23.22 Non intact.						6		
					82	36	22				
24.50	26.50								NI		
					99	60	29				

Continued next sheet

Drilling Progress and Water Observations						General Remarks							
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth								
03/07/2006		3.30	1.50		-	C = One sample containing. 1 X Phial 1 X Glass Amber Jar 1 X Plastic Tub. G = Sample taken from SPT. Water depth is that after 20 minutes standing.							
04/07/2006		10.00	3.50		4.00								
05/07/2006		30.50	3.50		5.90								
Scale 1:50				Method	SA Follow by Rotary		Drilled By	GB + C J		Logged By	CE		Checked By

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	01
Project No	LDS126		Start	03/07/2006	Ground Level	96.100		Co ordinates	-
			End	05/07/2006					Sheet 4 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
26.50	27.50	26.50	Remaining Detail : 25.94m - 28.50m : Fractures are: Medium and closely spaced rough planar and irregular open and closed clean, breccia filled and clay filled discontinuities. 27.66 to 27.87 Non intact. 27.31 29.50 One number planar verticle open iron stained discontinuity. 28.04 to 28.09 Non Intact.	(69.60)	99	98	48		8		
27.50	29.50		Moderately weak thinly laminated in places grey slightly micacious SANDSTONE moderately in places highly weathered.		96	82	48				
29.50	30.50	30.00	Fractures are: Medium spaced rough planar and irregular open and closed clean and breccia filled discontinuities.						4		
			End of Borehole at 30.50 m	(66.10)	100	98	98				

Drilling Progress and Water Observations						General Remarks							
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth								
03/07/2006		3.30	1.50		-	Casing in all cases was 150 mm diameter.							
04/07/2006		10.00	3.50		4.00								
05/07/2006		30.50	3.50		5.90								
Scale 1:50				Method	SA Follow by Rotary		Drilled By	GB + C J		Logged By	CE		Checked By

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 03	
Project No LDS126		Start 04/07/2006	Ground Level 96.610		Co ordinates - -		Sheet 1 of 4
		End 07/07/2006					

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
		0.30	MADE GROUND(Reinforced Concrete)	(96.31)							
0.50		0.40	MADE GROUND(Yellow brown fine to coarse angular slightly sandy gravel that predominantly consists of limestone)(Base Layer).	(96.21)							
1.00	1.45	1.00	Very weak gray brown MUDSTONE completely weathered to stiff clay.	(95.61)							
1.50			Weak thinly laminated grey brown MUDSTONE highly and completely weathered. occasionally interbedded with thin measures (Cerca 200mm) of weak thinly laminated grey brown slightly micacious fine grained SANDSTONE moderatly or highly weathered.								
2.00											
2.50	3.50		Where intact: Fractures are. Planar and irregular open and closed clean and breccia filled.		87	27	0				
3.50	5.00				79	26	8				
5.00	6.50				78	24	12				
6.50	7.00				16	0	0				
7.00	8.50				83	24	15				
		8.40	Black COAL with lustre.	(88.21)							

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth				
04/07/2006		2.20	1.50		-	C = One sample containing 1 x Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.			
06/07/2006		16.00	2.50		16.00				
07/07/2006		30.50	2.50		14.60				
Scale 1:50				Method	SA Follow by Rotary		Drilled By	GB +CJ	
							Logged By	CE	
							Checked By		

Project Harbourhill Road (Barnsley)		Client Kennet Properties			Borehole 03
Project No LDS126	Start 04/07/2006 End 07/07/2006	Ground Level 96.610	Co ordinates - -		Sheet 2 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
8.50	10.00	9.23	Black COAL with lustre.	(87.38)	81	41	15				
		9.40	Highly weathered MUDSTONE recovered as dark grey clay.	(87.21)							
			Black COAL with lustre. (Recovered intact)								
		9.95	Very weak thinly laminated in places grey brown MUDSTONE highly or completely weathered. Cerca 17.50 Rock is stained black and organic	(86.66)							
10.00	11.50		Fractures are: Medium to very closely spaced planar and irregular open and closed clean, breccia filled and iron stained discontinuities. 10.61 to 10.68 Non Intact. 11.02 to 11.08 One number sub-verticle irregular closed discontinuity. 11.69 to 11.87 One number sub-verticle irregular closed discontinuity. 11.87 to 11.92 Non-intact. 12.58 to 12.80 One number impersistant sub-verticle planar open breccia filled discontinuity. 13.54 to 13.60 Non intact 1400 to 14.28 one number sub-verticle irregular open breccia filled discontinuity. 14.32 to 14.45 One number impersistant sub - verticle planar 20* closed discontinuity. 14.45 to 14.50 / 14.97 to 15.00 / 15.48 to 15.51 / 15.60 to 15.63 / 15.93 to 16.20Non intact		79	38	30				
11.50	13.00				87	83	81				
13.00	14.50				82	75	62				
14.50	16.00				95	83	58				
16.00	17.50				96	73	48				
Continued next sheet											

Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	C = One sample containing 1 x Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.					
04/07/2006		2.20	1.50		-						
06/07/2006		16.00	2.50		16.00						
07/07/2006		30.50	2.50		14.60						
Scale 1:50				Method SA Follow by Rotary	Drilled By GB +CJ	Logged By CE	Checked By				

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	03
Project No	LDS126		Start	04/07/2006	Ground Level	96.610		Co ordinates	-
			End	07/07/2006				Sheet 3 of 4	

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
17.50	19.00	18.03	Remaining Detail : 15.95m - 26.00m : 20.86 to 20.90 Non intact 21.18 to 21.28 One number sub-verticle undulating open clean discontinuity. 21.28 to 21.33 Non intact 22.15 to 22.20 One number sub-verticle planar 45* open iron stained discontinuity. 23.33 to 23.38 / 23.68 to 23.84 non intact 23.84 to 24.28 One number impersistant irregular open breccia filled discontinuity. 24.28 to 24.34 non intact. 25.30 to 25.66 One number sub-verticle irregular open breccia filled discontinuity. 25.90 to 26.00 Non intact. Black COAL with lustre (Recovered intact) MUDSTONE(AS above 9.95 to 18.03)	(78.58)	97	70	69				
		18.59		(78.02)							
19.00	20.00				100	90	90		6		
20.00	21.50				97	84	77				
21.50	23.00				99	89	67				
23.00	24.50				96	78	29				
24.50	26.00	25.00	Moderately weak thinly laminated grey brown SANDSTONE moderately or highly weathered.	(71.61)	99	85	55				

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	C = One sample containing 1 x Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.			
04/07/2006		2.20	1.50		-				
06/07/2006		16.00	2.50		16.00				
07/07/2006		30.50	2.50		14.60				
Scale 1:50			Method SA Follow by Rotary		Drilled By GB +CJ	Logged By CE	Checked By		

Project Harbourhill Road (Barnsley)			Client Kennet Properties			Borehole 03	
Project No LDS126		Start 04/07/2006	Ground Level 96.610		Co ordinates - -		Sheet 4 of 4
		End 07/07/2006					

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
26.00	27.50		Remaining Detail : 26.00m - 30.00m : Fractures are: Medium spaced planar and irregular open clean discontinuities 26.00 to 26.26 One number verticle planar open iron stained discontinuity. 27.63 to 28.00 One number impersistant verticle planar open clean discontinuity		98	98	98				
27.50	29.00				98	98	87		3		
29.00	30.50				98	98	69				
		30.50	Rock is dark stained and slightly organic: Fractures are: Very closely spaced planar and irregular open clean discontinuities.						14		
			End of Borehole at 30.50 m	(66.11)							

Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth						
04/07/2006		2.20	1.50		-	C = One sample containing 1 x Phial 1 X Glass Amber Jar 1 X Plastic Tub G = Sample taken from SPT Water depth is that after 20 minutes standing.					
06/07/2006		16.00	2.50		16.00						
07/07/2006		30.50	2.50		14.60						
Scale 1:50				Method	SA Follow by Rotary		Drilled By	GB +CJ	Logged By	CE	Checked By

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	02
Project No	LDS126		Start	04/07/2006	Ground Level	96.770		Co ordinates	-
			End	07/07/2006					Sheet 1 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
		0.30	MADE GROUND(Reinforced concrete)	(96.47)							
0.50		0.50	MADE GROUND(Yellow brown sandy gravel. gravel is fine to coarse angular to subangular and predominantly consists of limestone)(Base layer).	(96.27)							
1.00		1.00	MADE GROUND(Light brown SANDY GRAVEL. Gravel is fine to coarse angular to subangular and predominantly consists of sandstone with occasional limestone)(Capping layer).	(95.77)							
			Very weak grey brown MUDSTONE completely weathered to clay.								
2.00		2.90	Black COAL with lustre.	(93.87)							
3.20		3.68	Very weak grey MUDSTONE highly weathered.	(93.09)							
3.50	5.00	4.76	Black coal with lustre COAL recovered intact.	(92.01)	82	23	16		NI		
		5.00	MUDSTONE(As above 3.68 to 4.76)	(91.77)							
5.00	6.50	5.36	Weak grey brown MUDSTONE highly and completely weathered thinly interbedded with much, Weak thinly laminated in places grey brown slightly micacious SANDSTONE moderately or highly weathered. Fractures are: Closely spaced planar and irregular open and closed clean , breccia filled and iron stained discontinuities. 5.48 to 5.52 / 5.72 to 5.75 Non intact.	(91.41)	95	42	35		4		
6.50	8.00				77	33	27		NI		
8.00	9.50				85	13	9				

Continued next sheet

Drilling Progress and Water Observations						General Remarks		
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth			
04/07/2006		3.50	1.50		-			
05/07/2006		17.00	3.50		10.20			
06/07/2006		30.00	3.50		9.90			
						C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = sample taken from SPT Water depth is that after 20 minutes standing.		
Scale 1:50					Method SA follow by Rotary	Drilled By GB + CJ	Logged By CE	Checked By

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	02
Project No	LDS126			Start	04/07/2006	Ground Level	96.770	Co ordinates	-
				End	07/07/2006				Sheet 2 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
			Weak grey brown MUDSTONE highly and completely weathered thinly interbedded with much, Weak thinly laminated in places grey brown slightly micacious SANDSTONE moderatly or highly weathered.								
9.50	11.00		Fractures are: Closely and very closely spaced planar and irregular open and closed clean breccia filled and iron stained discontinuities. 10.45 to 10.75 One number impersistant sub-verticle undulating open iron stained discontinuity. 10.85 to 11.45 / 11.63 to 11.79 / 11.99 to 12.04 / 12.11 to 12.33 Non intact 13.20 to 13.34 One number verticle planar open clean discontinuity. 14.34 to 14.39 / 14.68 to 14.75 / 14.85 to 14.90 Non intact 14.90 to 15.02 One number verticle planar closed discontinuity.		91	45	31			9.90	
11.00	12.50				78	35	15			12.50	
12.50	14.00				88	64	38		8		
14.00	15.50				91	65	40				
		15.25	Black COAL with lustre	(81.52)							
		16.00	Very weak dark grey MUDSTONE highly weathered.	(80.77)							
15.50	17.00	16.20	Black COAL with lustre.	(80.57)	93	23	15				
		16.76	Very weak grey brown MUDSTONE highly and completely weathered occasionally thinly interbedded with Weak thinly laminated in places grey brown slightly micacious SANDSTONE	(80.01)					NI		

Continued next sheet

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth				
04/07/2006		3.50	1.50		-	C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = sample taken from SPT Water depth is that after 20 minutes standing.			
05/07/2006		17.00	3.50		10.20				
06/07/2006		30.00	3.50		9.90				
Scale 1:50				Method	SA follow by Rotary		Drilled By	GB + CJ	
							Logged By	CE	
							Checked By		

Project Harbourhill Road (Barnsley)		Client Kennet Properties			Borehole 02
Project No LDS126	Start 04/07/2006 End 07/07/2006	Ground Level 96.770	Co ordinates - -		Sheet 3 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
17.00	20.00		highly weathered. Fractures are: Medium to very closely spaced planar and irregular open and closed clean and breccia filled discontinuities. 18.45 to 18.67 / 18.92 to 18.96 / 19.38 to 19.50 Non intact.		90	55	39				
20.00	23.00		Where intact: Fractures are, closely and very closely spaced planar and irregular open and closed clean, breccia and clay filled. 22.40 to 22.64 One number imopersistant sub-verticle irregular closed discontinuity.		97	42	30				
23.00	25.00				85	7	7				
		25.00	Black COAL with lustre.	(71.77)							
		25.83	MUDSTONE (As above 16.76 to 25.00)	(70.94)							

Continued next sheet

Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth	C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = sample taken from SPT Water depth is that after 20 minutes standing.					
04/07/2006		3.50	1.50		-						
05/07/2006		17.00	3.50		10.20						
06/07/2006		30.00	3.50		9.90						
Scale 1:50				Method SA follow by Rotary	Drilled By GB + CJ	Logged By CE	Checked By				

Project	Harbourhill Road (Barnsley)			Client	Kennet Properties			Borehole	02
Project No	LDS126			Start	04/07/2006	Ground Level	96.770	Co ordinates	- -
				End	07/07/2006				Sheet 4 of 4

Drilling Records		Depth (m)	Description of Strata	(Level) mAOD	Mechanical Log			Legend	FI Min Average Max (mm)	Water Strikes	Instillation
Depth From	To				% TCR	% SCR	% RQD				
			MUDSTONE (As above 16.76 to 25.00)								
			Fractures are: Medium to closely spaced planar and irregular open and closed clean breccia and clay filled discontinuities. 27.45 to 27.59 / 28.62 to 28.70 / 28.80 to 28.85 Non intact								
		29.00	End of Borehole at 30.00 m	(67.77)					5		
									NR		

Drilling Progress and Water Observations						General Remarks		
Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth			
04/07/2006		3.50	1.50		-			
05/07/2006		17.00	3.50		10.20			
06/07/2006		30.00	3.50		9.90			
						C = One sample containing 1X Phial 1 X Glass Amber Jar 1 X Plastic Tub G = sample taken from SPT Water depth is that after 20 minutes standing.		
Scale 1:50				Method	SA follow by Rotary	Drilled By GB + CJ	Logged By CE	Checked By

APPENDIX 4

CHEMICAL TESTING RESULTS

ALcontrol Geochem - Table Of Results										
Job Number: 06/10818/02/01										
Client: BWB Consulting										
Client Ref: LDS126										
Matrix: SOLID										
All results expressed on a dry weight basis.										
		Sample Identity		TP01	TP02	TP03	TP03	TP04	TP04	TP05
		Depth		0.60	0.70	0.80	2.00	0.60	2.10	1.00
		Sample Type		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Sample Received Date		28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006
		Sampled Date								
		Batch		1	1	1	1	1	1	1
		Sample Number(s)		1-2	9-11	16-18	22-24	26-28	32-34	37-39
	Method	Units	Method Detection Limit							
Boron Water Soluble	TM129	mg/kg	<1	4	1	<1	<1	<1	<1	<1
Arsenic	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Barium	TM129	mg/kg	<2	<2	<2	5	<2	<2	<2	<2
Beryllium	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Copper	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Lead	TM129	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Mercury	TM129	mg/kg	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Nickel	TM129	mg/kg	<1	<1	<1	1	<1	<1	<1	<1
Selenium	TM129	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3
Vanadium	TM129	mg/kg	<1	<1	2	<1	<1	<1	<1	<1
Zinc	TM129	mg/kg	<1	1	<1	2	<1	2	2	<1
Water Soluble Sulphate as SO4 2:1 Extra	TM098	g/l	<0.003	0.076	0.088	0.187	0.010	0.033	0.010	<0.003
Phenols Monohydric	TM062	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Cyanide	TM153	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Free Cyanide	TM153	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Complex Cyanide	TM153	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1
Asbestos Presence Screen	TM001	NONE	No Fibres Detec			Fibres Detec	-	Fibres Detec	-	-
Fraction of Organic Carbon	TM050	NONE	<0.001	0.004	0.039	0.004	0.765	0.006	0.006	0.028

pH Value	TM133	pH Units	<1.00	6.78	5.73	6.98	4.88	7.83	7.31	7.70
GRO (C4-C12)	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
MTBE	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Benzene	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Toluene	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Ethyl benzene	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
m & p Xylene	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
o Xylene	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aliphatics C5-C6	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aliphatics >C6-C8	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aliphatics >C8-C10	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aliphatics >C10-C12	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aliphatics >C12-C16	TM061	ug/kg	<100	-	-	3391	66346	147	1297	2743
Aliphatics >C16-C21	TM061	ug/kg	<100	-	-	116	24269	<100	2150	<100
Aliphatics >C21-C35	TM061	ug/kg	<100	-	-	171	32267	<100	3830	104
Total Aliphatics C5-C35	TM61/89	ug/kg	<100	-	-	3678	122882	147	7277	2847
Aromatics C6-C7	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aromatics >C7-C8	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	TM089	ug/kg	<10	-	-	<10	<10	<10	<10	<10
Aromatics >EC12-EC16	TM061	ug/kg	<100	-	-	<100	27913	<100	235	1110
Aromatics >EC16-EC21	TM061	ug/kg	<100	-	-	186	80334	<100	<100	484
Aromatics >EC21-EC35	TM061	ug/kg	<100	-	-	<100	136752	<100	<100	<100
Total Aromatics C6-C35	TM61/89	ug/kg	<100	-	-	186	244999	<100	235	1594
TPH (Aliphatics and Aromatics C5-C35)	TM61/89	ug/kg	<100	-	-	3864	367881	147	7512	4441
Rapid Assessment Package										
Total Extractable Hydrocarbons	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C6-C8	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C8-C10	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C10-C12	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C12-C16	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C16-C21	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C21-C35	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aliphatics >C35-C40	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aromatics >C6-C7	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aromatics >C7-C8	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aromatics >C8-C10	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10
Aromatics >C10-C12	TM154	mg/kg	<10	<10	-	<10	-	<10	<10	<10

[illegible]

TP05	TP05	TP06	TP06	TP07	TP10	TP11	TP11	TP11	TP13	TP15	TP15
2.00	3.00	0.5	2.9	0.7	0.5	0.2	0.8	1.4	0.5	0.6	1.1
SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
28/06/2006	28/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006	29/06/2006
		28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006	28/06/2006
1	1	2	2	2	2	2	2	2	2	2	2
40-42	43-45	46-48	55-57	58-60	81-83	94-95,141	96-98	99-101	118-120	135-137	138-140
<1	<1	<1	<1	2	<1	-	1	<1	3	<1	4
<1	<1	<1	4	1	<1	-	26	6	5	5	5
<2	<2	80	73	79	92	-	182	95	74	56	61
<1	<1	<1	<1	<1	<1	-	2	<1	<1	<1	<1
<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
<1	<1	7	14	14	4	-	21	21	21	23	20
<1	<1	1	20	10	4	-	60	9	26	29	20
<1	<1	11	17	13	26	-	205	21	16	22	20
<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	-	<1.2	<1.2	<1.2	<1.2	<1.2
<1	<1	1	19	22	2	-	25	14	32	32	26
<3	<3	<3	<3	<3	<3	-	<3	<3	<3	<3	<3
<1	<1	4	17	15	5	-	37	26	17	19	20
2	<1	27	50	74	72	-	216	67	91	99	84
0.035	0.059	0.026	0.027	0.006	0.011	-	0.410	0.010	0.031	0.008	0.032
<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.01	<0.01	<0.01	<0.01	<0.01
<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
-	-	-	-	Fibres Detec	Fibres Detec	Fibres Detec	-	-	Fibres Detec	Fibres Detec	-
0.008	0.077	0.005	0.137	0.002	0.001	-	0.104	0.008	0.003	0.004	0.003

7.76	5.05	10.41	7.89	8.43	9.04	-	7.28	8.23	7.79	8.05	8.70
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	24289	2346	74802	-	-	-	-	-	-	-	-
-	16012	469	71338	-	-	-	-	-	-	-	-
-	112	138	84177	-	-	-	-	-	-	-	-
-	40413	2953	230317	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	<10	<10	<10	-	-	-	-	-	-	-	-
-	4935	2151	12507	-	-	-	-	-	-	-	-
-	16842	4475	38154	-	-	-	-	-	-	-	-
-	35314	43186	109617	-	-	-	-	-	-	-	-
-	57091	49812	160278	-	-	-	-	-	-	-	-
-	97504	52765	390595	-	-	-	-	-	-	-	-
<10	28	22	576	-	-	-	377	-	-	17	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	14	-	-	-	<10	-	-	<10	-
<10	<10	<10	30	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	44	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	<10	-	-	-	<10	-	-	<10	-

<10	<10	<10	<10	-	-	-	<10	-	-	<10	-
<10	<10	<10	30	-	-	-	14	-	-	<10	-
<10	<10	<10	157	-	-	-	99	-	-	<10	-
<10	<10	<10	187	-	-	-	113	-	-	<10	-
<10	<10	<10	230	-	-	-	113	-	-	<10	-
<10	28	22	576	<10	423	-	377	<10	<10	17	<10
<0.05	0.66	<0.05	0.91	<0.05	<0.05	-	0.30	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.21	<0.05	<0.05	-	0.11	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.25	<0.05	<0.05	-	0.18	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.23	<0.05	<0.05	-	0.57	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	3.55	<0.05	<0.05	-	5.00	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.70	<0.05	<0.05	-	1.26	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.84	<0.05	<0.05	-	7.14	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.50	<0.05	<0.05	-	5.35	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.38	<0.05	<0.05	-	3.11	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	0.37	<0.05	<0.05	-	3.52	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	2.47	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	0.84	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	2.58	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	1.21	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	0.30	<0.05	<0.05	<0.05	<0.05
<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	1.17	<0.05	<0.05	<0.05	<0.05
<0.05	0.66	<0.05	7.94	<0.05	<0.05	-	35.11	<0.05	<0.05	<0.05	<0.05

ALcontrol Geochem Analytical Services

Sample Descriptions

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref : LDS126

Grain sizes	
<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

[illegible]

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

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 materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

¹ Sample Description supplied by client

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Matrix: SOLID
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

Sample Identity	TP01	TP02	TP03	TP03	TP04	TP04	TP05	TP05	TP05	Method Code	LoD/Units
Depth (m)	0.60	0.70	0.80	2.00	0.60	2.10	1.00	2.00	3.00		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date											
Sample Received Date	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	1-2	9-11	16-18	22-24	26-28	32-34	37-39	40-42	43-45		
Rapid Assessment Package											
Total Extractable Hydrocarbons	<10	-	<10	-	<10	<10	<10	<10	28	TM154 [#]	<10 mg/kg
Aliphatics >C6-C8	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C8-C10	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C10-C12	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C12-C16	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C16-C21	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C21-C35	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aliphatics >C35-C40	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C6-C7	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C7-C8	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C8-C10	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C10-C12	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C12-C16	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C16-C21	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Aromatics >C21-C40	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Total Aromatics >C6-C40	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
Total TPH >C6-C40	<10	-	<10	-	<10	<10	<10	<10	<10	TM154 [#]	<10 mg/kg
TPH C6-40	<10	82	<10	1093	<10	<10	<10	<10	28	TM154 [#]	<10 mg/kg
PAH by GC-FID											
Naphthalene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.66	TM142	<0.05 mg/kg
Acenaphthylene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Acenaphthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Fluorene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Phenanthrene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Anthracene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Pyrene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 07.09.2006

☒

1

» Shown on prev. report

Client Contact: Chris Evans

[illegible]

Date 07.09.2006

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Matrix: SOLID
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

Sample Identity	TP06	TP06	TP07	TP10	TP11	TP11	TP11	TP13	TP15	Method Code	LoD/Units
Depth (m)	0.5	2.9	0.7	0.5	0.2	0.8	1.4	0.5	0.6		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06	28.06.06		
Sample Received Date	29.06.06	29.06.06	29.06.06	29.06.06	29.06.06	29.06.06	29.06.06	29.06.06	29.06.06		
Batch	2	2	2	2	2	2	2	2	2		
Sample Number(s)	46-48	55-57	58-60	81-83	94-95,141	96-98	99-101	118-120	135-137		
Rapid Assessment Package											
Total Extractable Hydrocarbons	22	576	-	-	-	377	-	-	17	TM154 [#]	<10 mg/kg
Aliphatics >C6-C8	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C8-C10	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C10-C12	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C12-C16	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C16-C21	<10	14	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C21-C35	<10	30	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aliphatics >C35-C40	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	<10	44	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C6-C7	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C7-C8	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C8-C10	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C10-C12	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C12-C16	<10	<10	-	-	-	<10	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C16-C21	<10	30	-	-	-	14	-	-	<10	TM154 [#]	<10 mg/kg
Aromatics >C21-C40	<10	157	-	-	-	99	-	-	<10	TM154 [#]	<10 mg/kg
Total Aromatics >C6-C40	<10	187	-	-	-	113	-	-	<10	TM154 [#]	<10 mg/kg
Total TPH >C6-C40	<10	230	-	-	-	113	-	-	<10	TM154 [#]	<10 mg/kg
TPH C6-40	22	576	<10	423	-	377	<10	<10	17	TM154 [#]	<10 mg/kg
PAH by GC-FID											
Naphthalene	<0.05	0.91	<0.05	<0.05	-	0.30	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Acenaphthylene	<0.05	0.21	<0.05	<0.05	-	0.11	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Acenaphthene	<0.05	0.25	<0.05	<0.05	-	0.18	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Fluorene	<0.05	0.23	<0.05	<0.05	-	0.57	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Phenanthrene	<0.05	3.55	<0.05	<0.05	-	5.00	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Anthracene	<0.05	0.70	<0.05	<0.05	-	1.26	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Fluoranthene	<0.05	0.84	<0.05	<0.05	-	7.14	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg
Pyrene	<0.05	0.50	<0.05	<0.05	-	5.35	<0.05	<0.05	<0.05	TM142	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 07.09.2006

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» Shown on prev. report

Matrix: SOLID
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

[illegible]

Date 07.09.2006

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Matrix: SOLID
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

Sample Identity	TP15										
Depth (m)	1.1										
Sample Type	SOIL										
Sampled Date	28.06.06										
Sample Received Date	29.06.06										
Batch	2										
Sample Number(s)	138-140										
Rapid Assessment Package											
Total Extractable Hydrocarbons	-									TM154 [#]	<10 mg/kg
Aliphatics >C6-C8	-									TM154 [#]	<10 mg/kg
Aliphatics >C8-C10	-									TM154 [#]	<10 mg/kg
Aliphatics >C10-C12	-									TM154 [#]	<10 mg/kg
Aliphatics >C12-C16	-									TM154 [#]	<10 mg/kg
Aliphatics >C16-C21	-									TM154 [#]	<10 mg/kg
Aliphatics >C21-C35	-									TM154 [#]	<10 mg/kg
Aliphatics >C35-C40	-									TM154 [#]	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	-									TM154 [#]	<10 mg/kg
Aromatics >C6-C7	-									TM154 [#]	<10 mg/kg
Aromatics >C7-C8	-									TM154 [#]	<10 mg/kg
Aromatics >C8-C10	-									TM154 [#]	<10 mg/kg
Aromatics >C10-C12	-									TM154 [#]	<10 mg/kg
Aromatics >C12-C16	-									TM154 [#]	<10 mg/kg
Aromatics >C16-C21	-									TM154 [#]	<10 mg/kg
Aromatics >C21-C40	-									TM154 [#]	<10 mg/kg
Total Aromatics >C6-C40	-									TM154 [#]	<10 mg/kg
Total TPH >C6-C40	-									TM154 [#]	<10 mg/kg
TPH C6-40	<10									TM154 [#]	<10 mg/kg
PAH by GC-FID											
Naphthalene	<0.05									TM142	<0.05 mg/kg
Acenaphthylene	<0.05									TM142	<0.05 mg/kg
Acenaphthene	<0.05									TM142	<0.05 mg/kg
Fluorene	<0.05									TM142	<0.05 mg/kg
Phenanthrene	<0.05									TM142	<0.05 mg/kg
Anthracene	<0.05									TM142	<0.05 mg/kg
Fluoranthene	<0.05									TM142	<0.05 mg/kg
Pyrene	<0.05									TM142	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 07.09.2006

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- # ISO 17025 accredited
- ^M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: SOLID
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

[illegible]

Date 07.09.2006

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11

» Shown on prev. report

Matrix: LEACHATE
Location: HARBOUR HILL ROAD
Client Contact: Chris Evans

Date 07.09.2006

Date 07.09.2006

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Report Key :

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

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM001	In - house Method	Screening of Soils for Fibres			WET	
TM050	Method 5310B, AWWA/APHA, 20th Ed., 1999 / DIN EN 13137	Total Organic Carbon determination by combustion method	✓		DRY	
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	✓		DRY	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection			WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)			WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓		WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓	✓	WET	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser			NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓	✓	DRY	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy			NA	
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓	✓	WET	
TM142	In house method	Analysis of Polynuclear Aromatic Hydrocarbons (PAH) by GC-FID			DRY	

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

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

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

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

Summary of Method Codes contained within report :

[illegible]

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

ALcontrol Geochem Analytical Services Table Of Results - Appendix

Job Number: 06/10818/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Summary of Coolbox temperatures

[illegible]

ALcontrol Geochem - Table Of Results					
Job Number:	06/11378/02/01				
Client:	BWB Consulting				
Client Ref:	LDS126				
Matrix:	SOLID				
All results expressed on a dry weight basis.					
		Sample Identity		BH5	
		Depth		0.50	
		Sample Type		SOLID	
		Sample Received Date		05/07/2006	
		Sampled Date			
		Batch		1	
		Sample Number(s)		28-30	
	Method	Units	Method Detection Limit		
Boron Water Soluble	TM129	mg/kg	<1	<1	
Arsenic	TM129	mg/kg	<1	<1	
Barium	TM129	mg/kg	<2	70	
Beryllium	TM129	mg/kg	<1	<1	
Cadmium	TM129	mg/kg	<1	<1	
Chromium	TM129	mg/kg	<1	12	
Copper	TM129	mg/kg	<1	<1	
Lead	TM129	mg/kg	<1	8	
Mercury	TM129	mg/kg	<1.2	<1.2	
Nickel	TM129	mg/kg	<1	11	
Selenium	TM129	mg/kg	<3	<3	
Vanadium	TM129	mg/kg	<1	9	
Zinc	TM129	mg/kg	<1	19	
Water Soluble Sulphate as SO4 2:1 Extra	TM098	g/l	<0.003	0.008	
Phenols Monohydric	TM062	mg/kg	<0.01	<0.01	
Total Cyanide	TM153	mg/kg	<1	<1	
Free Cyanide	TM153	mg/kg	<1	<1	
Complex Cyanide	TM153	mg/kg	<1	<1	
Asbestos Presence Screen	TM001	NONE	No Fibres Detected		
Fraction of Organic Carbon	TM050	NONE	<0.001	0.001	

pH Value	TM133	pH Units	<1.00	8.75	
TPH C6-40	TM154	mg/kg	<10	81	
PAH by GC-FID					
Naphthalene	TM142	mg/kg	<0.05	<0.05	
Acenaphthylene	TM142	mg/kg	<0.05	<0.05	
Acenaphthene	TM142	mg/kg	<0.05	<0.05	
Fluorene	TM142	mg/kg	<0.05	<0.05	
Phenanthrene	TM142	mg/kg	<0.05	<0.05	
Anthracene	TM142	mg/kg	<0.05	<0.05	
Fluoranthene	TM142	mg/kg	<0.05	<0.05	
Pyrene	TM142	mg/kg	<0.05	<0.05	
Benz(a)anthracene	TM142	mg/kg	<0.05	<0.05	
Chrysene	TM142	mg/kg	<0.05	<0.05	
Benzo(b)fluoranthene	TM142	mg/kg	<0.05	<0.05	
Benzo(k)fluoranthene	TM142	mg/kg	<0.05	<0.05	
Benzo(a)pyrene	TM142	mg/kg	<0.05	<0.05	
Indeno(123cd)pyrene	TM142	mg/kg	<0.05	<0.05	
Dibenzo(ah)anthracene	TM142	mg/kg	<0.05	<0.05	
Benzo(ghi)perylene	TM142	mg/kg	<0.05	<0.05	
PAH 16 Total	TM142	mg/kg	<0.05	<0.05	

ALcontrol Geochem Analytical Services Sample Descriptions

Job Number: 06/11378/02/01
Client: BWB Consulting
Client Ref : LDS126

Grain sizes	
<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

[illegible]

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

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 materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

¹ Sample Description supplied by client

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/11378/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Matrix: SOLID
Location: HARBOROUGH ROAD, BARNSELEY
Client Contact: Chris Evans

Sample Identity	BH5										
Depth (m)	0.50										
Sample Type	SOLID										
Sampled Date											
Sample Received Date	05.07.06										
Batch	1										
Sample Number(s)	28-30										
										Method Code	LoD/Units
Boron Water Soluble	<1									TM129 [#] _M	<1 mg/kg
Arsenic	<1									TM129 [#] _M	<1 mg/kg
Barium	70									TM129 [#] _M	<2 mg/kg
Beryllium	<1									TM129 [#] _M	<1 mg/kg
Cadmium	<1									TM129 [#] _M	<1 mg/kg
Chromium	12									TM129 [#] _M	<1 mg/kg
Copper	<1									TM129 [#] _M	<1 mg/kg
Lead	8									TM129 [#] _M	<1 mg/kg
Mercury	<1.2									TM129 [#] _M	<1.2 mg/kg
Nickel	11									TM129 [#] _M	<1 mg/kg
Selenium	<3									TM129 [#] _M	<3 mg/kg
Vanadium	9									TM129 [#] _M	<1 mg/kg
Zinc	19									TM129 [#] _M	<1 mg/kg
Water Soluble Sulphate as SO4 2:1 Extract	0.008									TM098 [#] _M	<0.003 g/l
Phenols Monohydric	<0.01									TM062	<0.01 mg/kg
Total Cyanide	<1									TM153 [#] _M	<1 mg/kg
Free Cyanide	<1									TM153 [#] _M	<1 mg/kg
Complex Cyanide	<1									TM153 [#] _M	<1 mg/kg
Asbestos Presence Screen	No Fibres Detected									TM001	NONE
Fraction of Organic Carbon	0.001									TM050 [#]	<0.001 NONE
pH Value	8.75									TM133 [#] _M	<1.00 pH Units
TPH C6-40	81									TM154 [#]	<10 mg/kg
PAH by GC-FID											
Naphthalene	<0.05									TM142	<0.05 mg/kg
Acenaphthylene	<0.05									TM142	<0.05 mg/kg
Acenaphthene	<0.05									TM142	<0.05 mg/kg
Fluorene	<0.05									TM142	<0.05 mg/kg
Phenanthrene	<0.05									TM142	<0.05 mg/kg
Anthracene	<0.05									TM142	<0.05 mg/kg
Fluoranthene	<0.05									TM142	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 07.09.2006

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» Shown on prev. report

Client Contact: Chris Evans

Date 07.09.2006

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 06/11378/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Report Key :

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

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited ISO 17025	Accredited MCERTS	Wet/Dry Sample ¹	Surrogate Corrected
TM001	In - house Method	Screening of Soils for Fibres			WET	
TM050	Method 5310B, AWWA/APHA, 20th Ed., 1999 / DIN EN 13137	Total Organic Carbon determination by combustion method	✓		DRY	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection			WET	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓	✓	DRY	
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓	✓	WET	
TM142	In house method	Analysis of Polynuclear Aromatic Hydrocarbons (PAH) by GC-FID			DRY	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	✓	✓	WET	
TM154	In - house Method	Determination of Petroleum Hydrocarbons by EZ Flash GC-FID in the Carbon range C6- C40	✓		WET	

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

ALcontrol Geochem Analytical Services Table Of Results - Appendix

Job Number: 06/11378/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Summary of Coolbox temperatures

[illegible]

ALcontrol Geochem - Table Of Results							
Job Number:	06/12451/02/01						
Client:	BWB Consulting						
Client Ref:	LDS126						
Matrix:	LIQUID						
		Sample Identity		BH02	BH03	BH04	BH05
		Depth		-	-	-	-
		Sample Type		LIQUID	LIQUID	LIQUID	LIQUID
		Sample Received Date		22/07/2006	22/07/2006	22/07/2006	22/07/2006
		Sampled Date		21/07/2006	21/07/2006	21/07/2006	21/07/2006
		Batch		1	1	1	1
		Sample Number(s)		1-2	3-4	5-6	7-8
	Method	Units	Method Detection Limit				
Arsenic Dissolved (ICP-MS)	TM152	ug/l	<1	<1	<1	1	<1
Barium Dissolved (ICP-MS)	TM152	ug/l	<1	50	41	26	32
Beryllium Dissolved (ICP-MS)	TM152	ug/l	<1	<1	<1	<1	<1
Boron Dissolved (ICP-MS)	TM152	ug/l	<10	49	66	67	47
Cadmium Dissolved (ICP-MS)	TM152	ug/l	<0.4	<0.4	0.7	<0.4	<0.4
Chromium Dissolved (ICP-MS)	TM152	ug/l	<1	<1	<1	<1	<1
Copper Dissolved (ICP-MS)	TM152	ug/l	<1	<1	1	<1	<1
Lead Dissolved (ICP-MS)	TM152	ug/l	<1	<1	<1	<1	<1
Nickel Dissolved (ICP-MS)	TM152	ug/l	<1	28	46	11	12
Selenium Dissolved (ICP-MS)	TM152	ug/l	<1	<1	<1	3	<1
Vanadium Dissolved (ICP-MS)	TM152	ug/l	<1	<1	4	<1	<1
Zinc Dissolved (ICP-MS)	TM152	ug/l	<3	7	5	5	7
Mercury Dissolved (CVAA)	TM127	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05
Conductivity (at 25 deg.C)	TM120	mS/cm	<0.014	1.327	1.912	1.200	1.102
Sulphate (soluble)	TM098	mg/l	<3	181	290	227	214
Ammoniacal Nitrogen as N	TM099	mg/l	<0.2	0.3	<0.2	<0.2	<0.2
Phenols Monohydric	TM062	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Total Cyanide	TM153	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
pH Value	TM133	pH Units	<1.00	8.01	8.30	8.12	8.25
EPH (DRO) (C10-C40)	TM061	ug/l	<10	<10	<10	<10	<10

PAH by GCMS							
Naphthalene	TM074	ng/l	<10	109	210	126	<10
Acenaphthylene	TM074	ng/l	<10	<10	<10	<10	<10
Acenaphthene	TM074	ng/l	<10	<10	47	<10	<10
Fluorene	TM074	ng/l	<10	<10	42	<10	<10
Phenanthrene	TM074	ng/l	<10	<10	98	<10	<10
Anthracene	TM074	ng/l	<10	<10	<10	<10	<10
Fluoranthene	TM074	ng/l	<10	<10	15	<10	<10
Pyrene	TM074	ng/l	<10	<10	15	<10	<10
Benz(a)anthracene	TM074	ng/l	<10	<10	<10	<10	<10
Chrysene	TM074	ng/l	<10	<10	10	<10	<10
Benzo(b)fluoranthene	TM074	ng/l	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	TM074	ng/l	<10	<10	<10	<10	<10
Benzo(a)pyrene	TM074	ng/l	<10	<10	<10	<10	<10
Indeno(123cd)pyrene	TM074	ng/l	<10	<10	<10	<10	<10
Dibenzo(ah)anthracene	TM074	ng/l	<10	<10	<10	<10	<10
Benzo(ghi)perylene	TM074	ng/l	<10	<10	<10	<10	<10
PAH 16 Total	TM074	ng/l	<10	109	437	126	<10

☒

1

ISO 17025 accredited

M MCERTS accredited

* Subcontracted test

» Shown on prev. report

Matrix: LIQUID

Location: HARBOROUGH HILL

Client Contact: Simon Steel

[illegible]

Date 07.09.2006

☒

11

» Shown on prev. report

Client Contact: Simon Steel

Date 07.09.2006

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 06/12451/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Report Key :

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

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited	ISO 17025 Accredited	MCERTS Accredited	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)				NA	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection				NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.				NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓			NA	
TM099	BS 2690: Part 7:1968 / BS 6068: Part 2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser	✓			NA	
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter	✓			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy	✓			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓			NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS	✓			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	✓			NA	

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

ALcontrol Geochem Analytical Services Table Of Results - Appendix

Job Number: 06/12451/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Summary of Coolbox temperatures

[illegible]

ALcontrol Geochem - Table Of Results							
Job Number:	06/14307/02/01						
Client:	BWB Consulting						
Client Ref:	LDS126						
Matrix:	LIQUID						
		Sample Identity		BH01	BH02	BH03	BH04
		Depth					
		Sample Type		LIQUID	LIQUID	LIQUID	LIQUID
		Sample Received Date		22/08/2006	22/08/2006	22/08/2006	22/08/2006
		Sampled Date		21/08/2006	21/08/2006	21/08/2006	21/08/2006
		Batch		1	1	1	1
		Sample Number(s)		1	2-3	4-5	6-7
	Method	Units	Method Detection Limit				
Arsenic Dissolved (ICP-MS)	TM152	ug/l	<1				
Barium Dissolved (ICP-MS)	TM152	ug/l	<1				
Beryllium Dissolved (ICP-MS)	TM152	ug/l	<1				
Boron Dissolved (ICP-MS)	TM152	ug/l	<10				
Cadmium Dissolved (ICP-MS)	TM152	ug/l	<0.4				
Chromium Dissolved (ICP-MS)	TM152	ug/l	<1				
Copper Dissolved (ICP-MS)	TM152	ug/l	<1				
Lead Dissolved (ICP-MS)	TM152	ug/l	<1				
Nickel Dissolved (ICP-MS)	TM152	ug/l	<1				
Selenium Dissolved (ICP-MS)	TM152	ug/l	<1				
Vanadium Dissolved (ICP-MS)	TM152	ug/l	<1				
Zinc Dissolved (ICP-MS)	TM152	ug/l	<3				
Mercury Dissolved (CVAA)	TM127	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05
Conductivity (at 25 deg.C)	TM120	mS/cm	<0.014	0.322	1.070	1.594	1.213
Sulphate (soluble)	TM098	mg/l	<3	52	190	253	211
Ammoniacal Nitrogen as N	TM099	mg/l	<0.2	<0.2	0.2	<0.2	0.5
Phenols Monohydric	TM062	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Total Cyanide	TM153	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
pH Value	TM133	pH Units	<1.00	7.66	7.25	7.61	7.20
EPH (DRO) (C10-C40)	TM061	ug/l	<10				

PAH by GCMS							
Naphthalene	TM074	ng/l	<10				
Acenaphthylene	TM074	ng/l	<10				
Acenaphthene	TM074	ng/l	<10				
Fluorene	TM074	ng/l	<10				
Phenanthrene	TM074	ng/l	<10				
Anthracene	TM074	ng/l	<10				
Fluoranthene	TM074	ng/l	<10				
Pyrene	TM074	ng/l	<10				
Benz(a)anthracene	TM074	ng/l	<10				
Chrysene	TM074	ng/l	<10				
Benzo(b)fluoranthene	TM074	ng/l	<10				
Benzo(k)fluoranthene	TM074	ng/l	<10				
Benzo(a)pyrene	TM074	ng/l	<10				
Indeno(123cd)pyrene	TM074	ng/l	<10				
Dibenzo(ah)anthracene	TM074	ng/l	<10				
Benzo(ghi)perylene	TM074	ng/l	<10				
PAH 16 Total	TM074	ng/l	<10				

☒

1

» Shown on prev. report

Matrix: LIQUID
Location: BARNSELEY
Client Contact: Chris Evans

[illegible]

Date 07.09.2006

☒

11

» Shown on prev. report

Matrix: LIQUID
Location: BARNSELEY
Client Contact: Chris Evans

[illegible]

Date 07.09.2006

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 06/14307/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Report Key :

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

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
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TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection				NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.				NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓			NA	
TM099	BS 2690: Part 7:1968 / BS 6068: Part 2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser	✓			NA	
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter	✓			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy	✓			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓			NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS	✓			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	✓			NA	

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

ALcontrol Geochem Analytical Services Table Of Results - Appendix

Job Number: 06/14307/02/01
Client: BWB Consulting
Client Ref. No.: LDS126

Summary of Coolbox temperatures

[illegible]

APPENDIX 5

SOIL CLASSIFICATION TESTING

Serial number: LT949

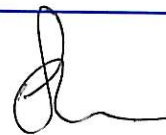
Date of issue: 08/08/2006

Page 1 of 19

1265

Issued by Norwest Holst Limited - Soil Engineering Division,
Parkside Lane,
Dewsbury Road,
Leeds
LS11 5SX.
Tel: 0113 2711111
Fax: 0113 2760472
Email: soils@norwest.co.uk

Authorised signatory



M. J. Baldwin	(Technical Manager)
R. J. Rogers	(Principal Engineer)
✓ S. Kirk	(Laboratory Manager)
S. K. Sharda	(Assistant Laboratory Manager)

Customer name BWB Consulting LTD
Address Prospect House
32 Sovereign Street
Leeds
LS1 4BJ

Contract name Harbourhill Road, Barnsley
Your reference ERL06259

Dates of receipt of samples 20/07/2006

Dates of testing 20/07/2006 to 08/08/2006

Testing was performed to the standard named on individual test results.

Sampling was not performed by the Laboratory of Norwest Holst Soil Engineering.

Testing was performed on 24 number of samples received in fair condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Some samples were of insufficient size to perform compaction tests. Bags were combined or tests cancelled as requested.

Quality Control Check performed by



K. A. Walker (Laboratory Quality Manager)

This test report shall not be reproduced except in full without the written permission of Norwest Holst Soil Engineering.

Key to Laboratory Summary Sheets

Common to all summaries

Sample Type	U	Undisturbed sample	D	Small disturbed sample
	P	Piston sample	B	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	C	Rock core
	AMAL	Amalgamated sample		
Test status	Any result in <i>italics</i> indicates a test that is not within the scope of the UKAS accreditation for this laboratory.			

Summary of Laboratory Soil Tests: Index / Classification Tests

Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	'	Following value in silt column denotes combined clay and silt fraction		
	p	Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer.		

Summary of Laboratory Soil Tests: Strength and Permeability Tests

Triaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
	CUM	Multi stage consolidated undrained	CU3	Set of 3 consolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
	CD3	Set of 3 consolidated drained		
	Note that single stage tests are reported assuming $f = 0$ for total stress and $c' = 0$ for effective stress			
Consol	Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m_v	coefficient of compressibility quoted for p_0 to $p_0 + 100\text{kPa}$, where determined		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
	p	Peak value	r	Residual value
	RS	Ring shear		

Summary of Laboratory Soil Re-Use Test

MCV	s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration
-----	---	--	-----	--

Summary of Laboratory Rock Strength Tests

Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Test performed parallel to planes of weakness		
	P	Test performed perpendicular to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		

Summary of Laboratory Rock Materials Tests

Ten% fines	w	Soaked test	d	Dry test
Point Load Index Result				
Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Parallel to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		
Dimensions	W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
	D	Distance between platens when just in contact with specimen		
	D'	Distance between platens at point of failure		
	De	Equivalent core diameter	Is	P/De^2
	Is(50)	$F \times Is$	F	$(De/50)^{0.45}$
	Is(50) point load strength index corrected for a diametral test of core diameter 50mm			
	For Axial/Lump tests $De^2 = (4/\pi) \times (W \times D')$		For Diametral tests $De^2 = D \times D'$	

Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

Project Name Harbourhill Road, Barnsley

Project No. LT949

Engineer Christopher Evans

Client BWB Consulting LTD

Classification Tests Summary

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	Bulk Density	Dry Density	Particle Density	Liquid Limit	Plastic Limit	Plastic Index	Passing 425µm	Linear Shrinkage	Particle size				
						%	Mg/m ³			%	%		%	%	%	%	%	%	%
															Clay	Silt	Sand	Gravel	Cobbles
BH01	1.10		B	1.10	01										27	29	22	22	0
BH01	1.10		D	1.10	01	46				66	48	18	72						
BH02	1.00		D	1.00	01	13				55	21	34	100						
BH02	2.00		B	2.00	01										42	26	15	17	0
BH02	2.00		D	2.00	01	14													
BH03	1.00		D	1.00	01	16				40	21	19	100						
BH03	2.00		D	2.00	01	7.8													
BH04	0.60	002	B	0.60	01										40	32	7	21	0
BH04	1.00		D	1.00	01	9.7				34	19	15	100						
BH05	2.50		D	2.50	01	33													
BH05	2.60		B	2.60	01										34	39	22	5	0
TP12	1.10		B	1.10	01										14	24	32	23	7
							End												

Approved by:

Stuart Kirk

Leeds Laboratory

Report No.: LT949

Page 3 of 19

Print date 08/08/2006

Revision No. 2.01

Issue Date 17/07/2006

**NORWEST
HOLST**

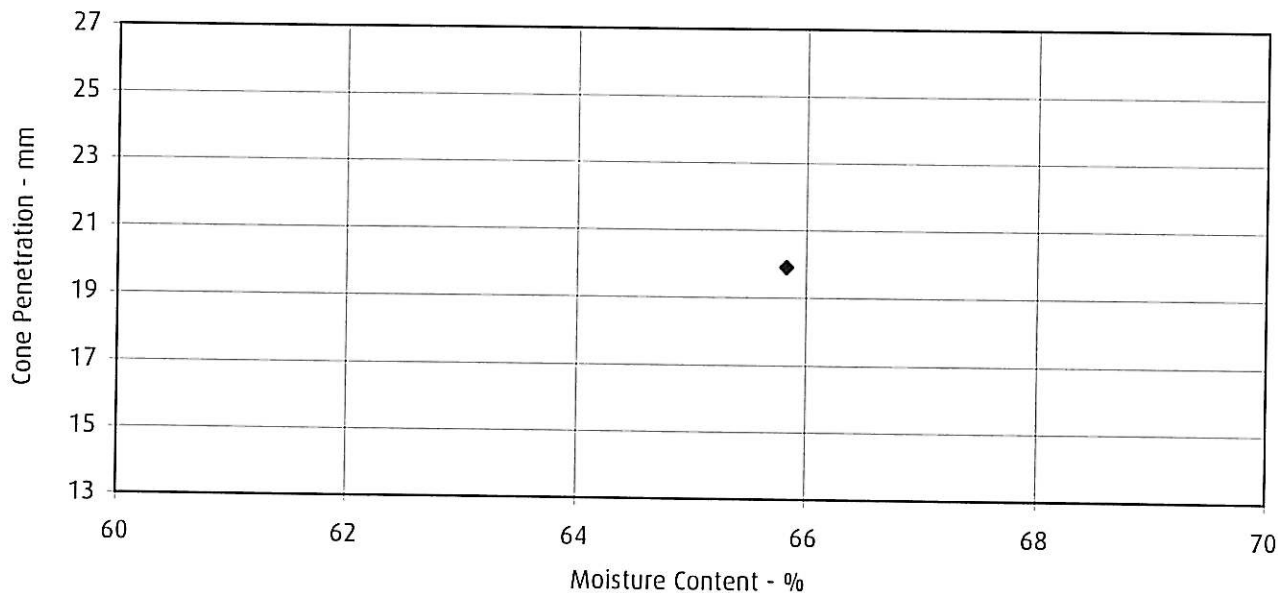
SOIL ENGINEERING

[illegible]

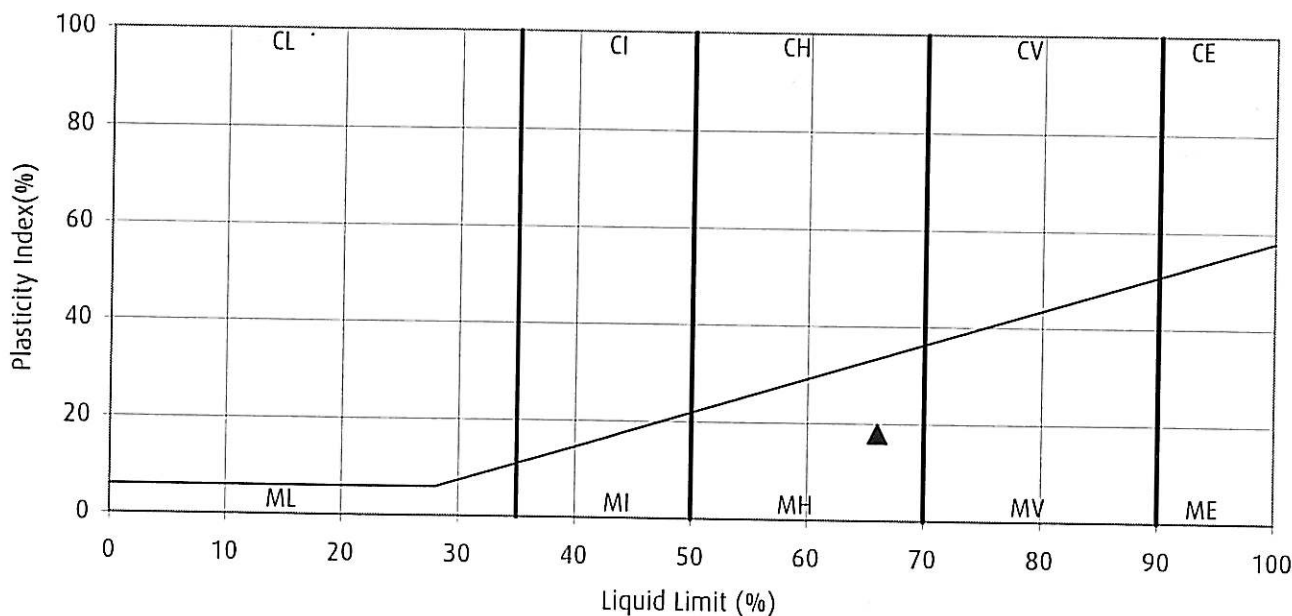
Client BWB Consulting LTD

[illegible]

Project Name Harbourhill Road, Barnsley		Liquid And Plastic Limit Test	Hole ID BH01
Project No. LT949			Sample Depth 1.10m
Engineer Christopher Evans			Sample Number
Client BWB Consulting LTD			Sample Type D
Description Dark brown slightly gravelly CLAY		Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5	Specimen Depth 1.10m
			Specimen Number 1



Natural moisture content:	46	Estimated percentage retained on 425µm sieve:	28.3
Liquid limit:	66	Preparation of sample: Wet sieve	
Plastic limit:	48	Remarks: Insufficient specimen to perform 4 point test.	
Plasticity index:	18		
Moisture content of soil passing 425µm	64		
Liquidity index:	0.89		



Project Name Harbourhill Road, Barnsley

Project No. LT949

Engineer Christopher Evans

Client BWB Consulting LTD

Liquid And Plastic Limit Test

Test Method: BS1377: Part 2: 1990:
Clause 4.4 and 5

Hole ID
BH02

Sample Depth
1.00m

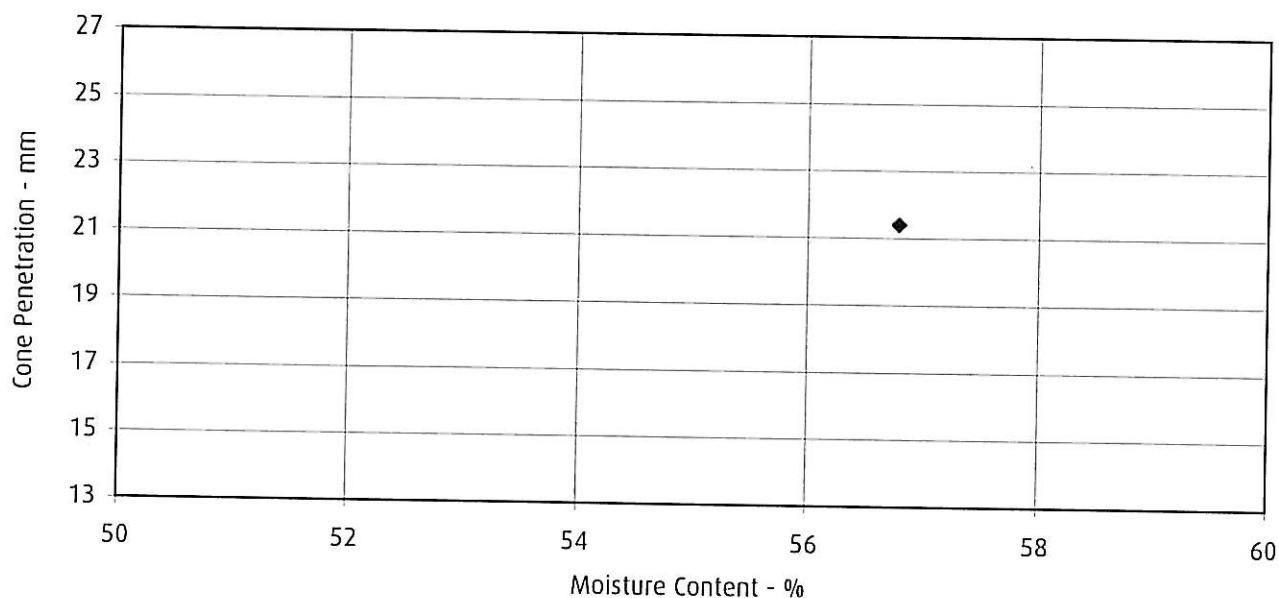
Sample Number

Sample Type
D

Description Grey CLAY.

Specimen Depth
1.00m

Specimen Number
1



Natural moisture content:

13

Liquid limit:

55

Plastic limit:

21

Plasticity index:

34

Moisture content of soil passing 425µm

13

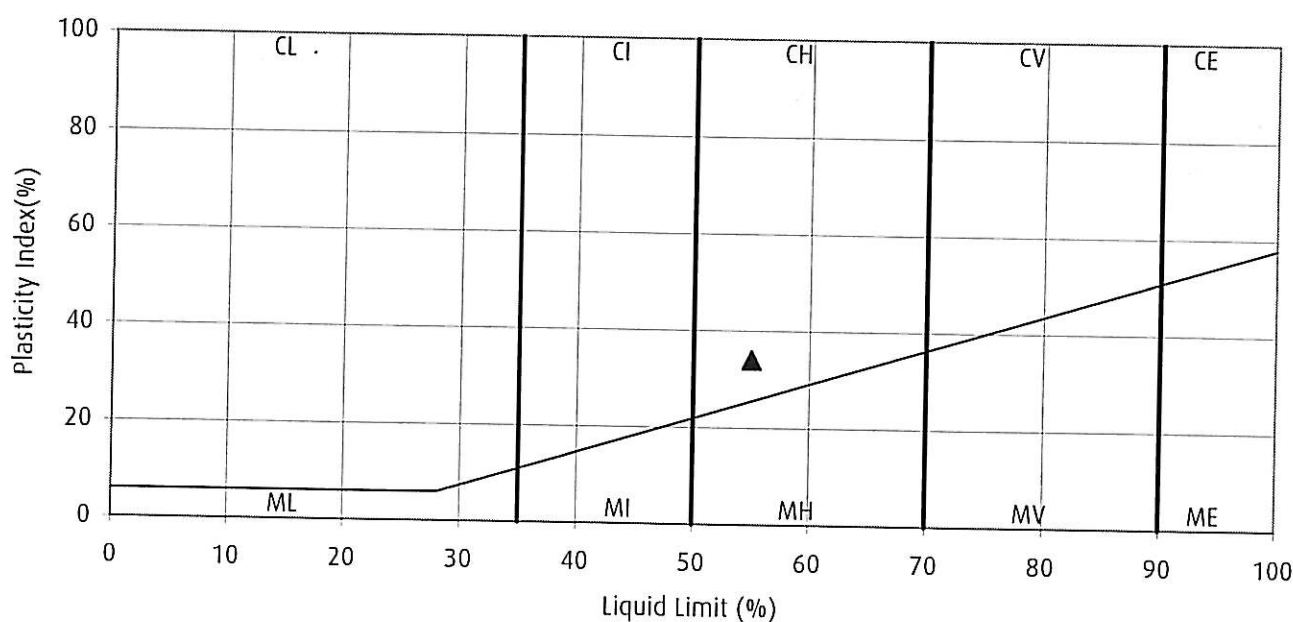
Liquidity index:

-0.24

Estimated percentage retained on 425µm sieve: 0.0

Preparation of sample: Natural

Remarks: Insufficient specimen to perform 4 point test.



Approved by:

Sushil Sharda

Leeds Laboratory

Report No.: LT949

Page 8 of 19

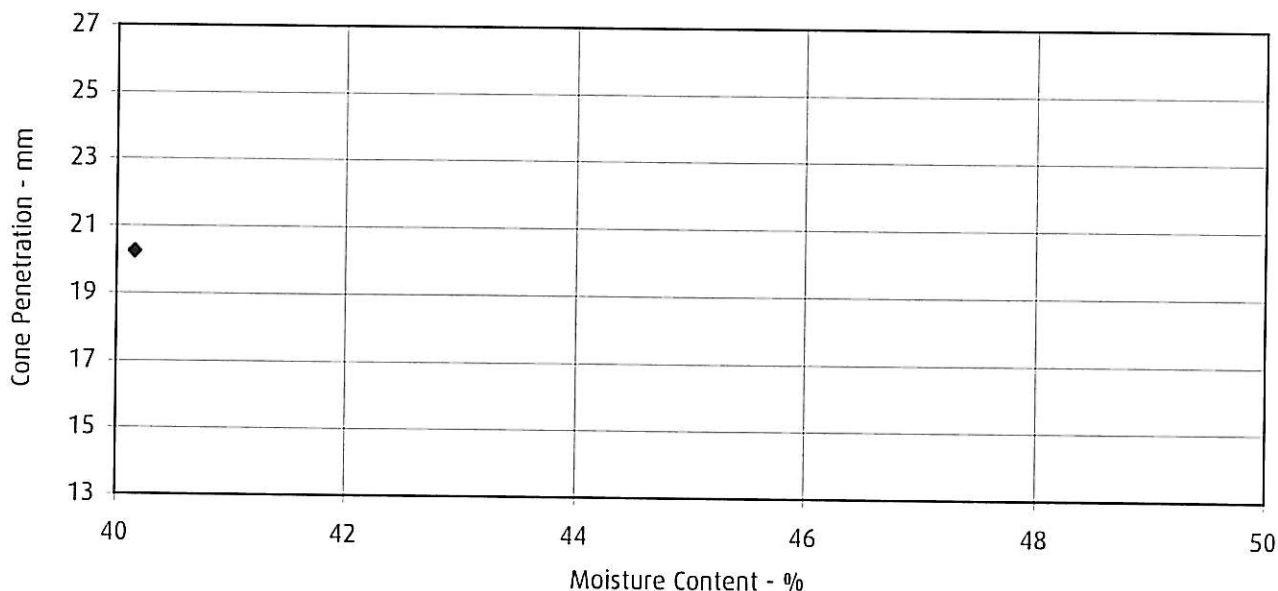
Print date 08/08/2006

Revision No. 2.01

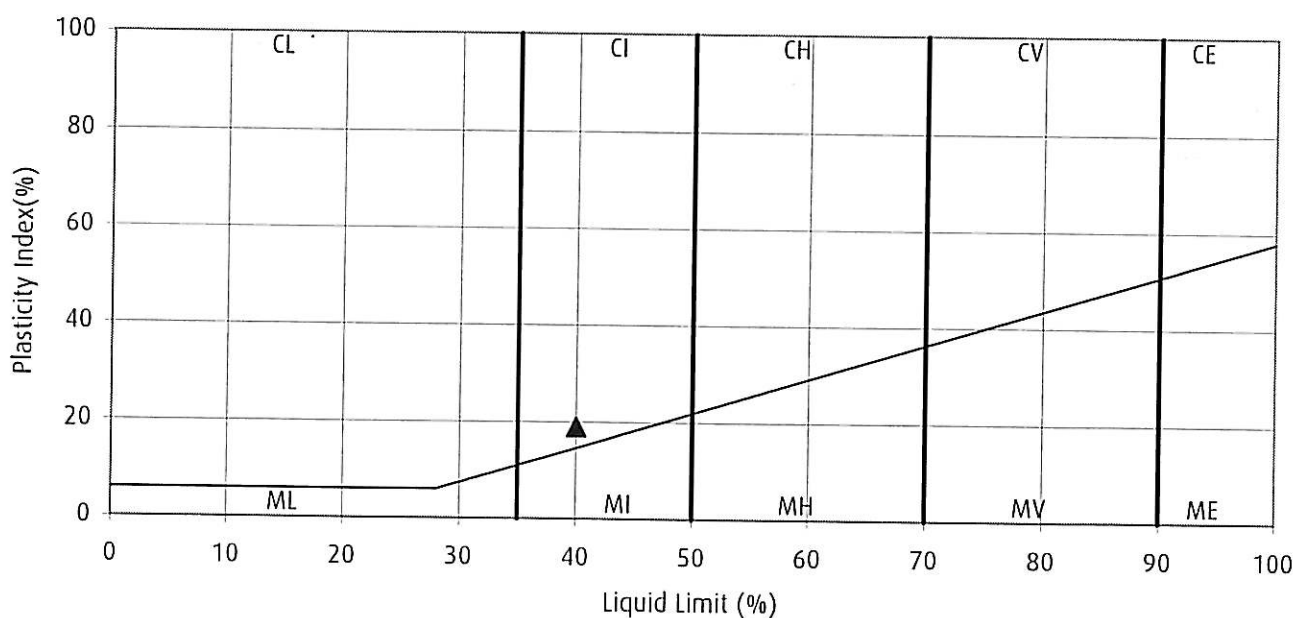
Issue Date 27/03/2006

**NORWEST
HOLST**
SOIL ENGINEERING

Project Name Harbourhill Road, Barnsley		Liquid And Plastic Limit Test	Hole ID BH03
Project No. LT949			Sample Depth 1.00m
Engineer Christopher Evans			Sample Number
Client BWB Consulting LTD			Sample Type D
Description Brown CLAY.		Test Method: BS1377: Part 2: 1990: Clause 4.4 and 5	Specimen Depth 1.00m
			Specimen Number 1



Natural moisture content:	16	Estimated percentage retained on 425µm sieve:	0.0
Liquid limit:	40	Preparation of sample: Natural	
Plastic limit:	21	Remarks: Insufficient specimen to perform 4 point test.	
Plasticity index:	19		
Moisture content of soil passing 425µm	16		
Liquidity index:	-0.26		



Project Name Harbourhill Road, Barnsley

Project No. LT949

Engineer Christopher Evans

Client BWB Consulting LTD

Liquid And Plastic Limit Test

Test Method: BS1377: Part 2: 1990:
Clause 4.4 and 5

Hole ID
BH04

Sample Depth
1.00m

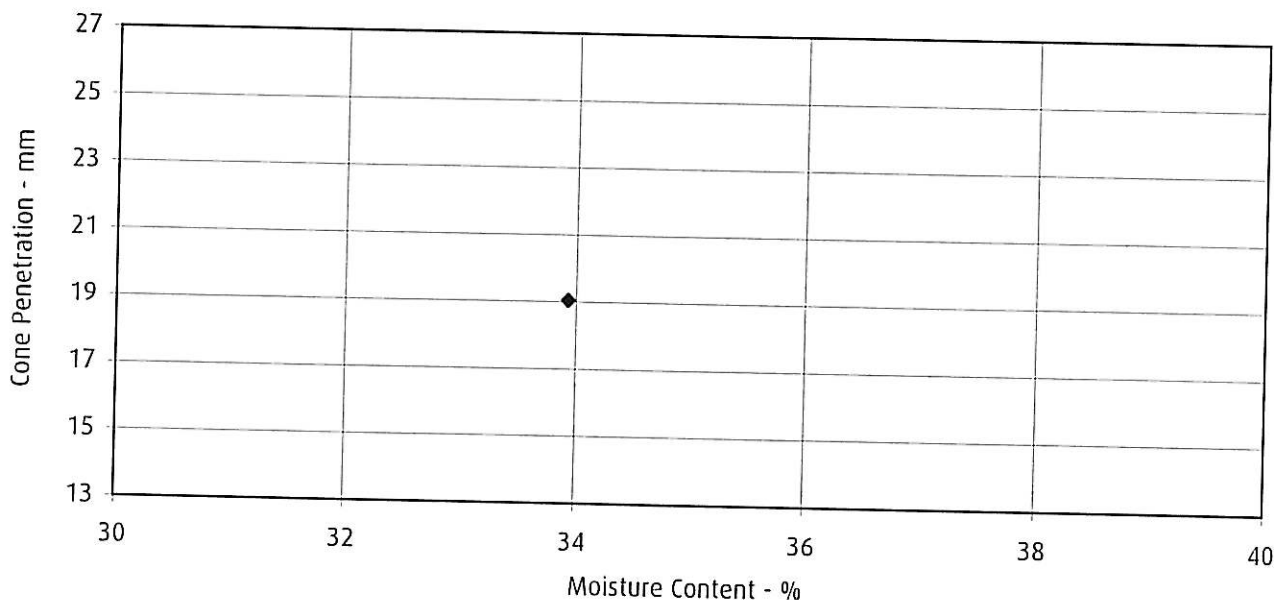
Sample Number

Sample Type
D

Specimen Depth
1.00m

Specimen Number
1

Description Brown CLAY.



Natural moisture content:

9.7

Estimated percentage retained on 425µm sieve:

0.0

Liquid limit:

34

Preparation of sample: Natural

Plastic limit:

19

Remarks: Insufficient specimen to perform 4 point test.

Plasticity index:

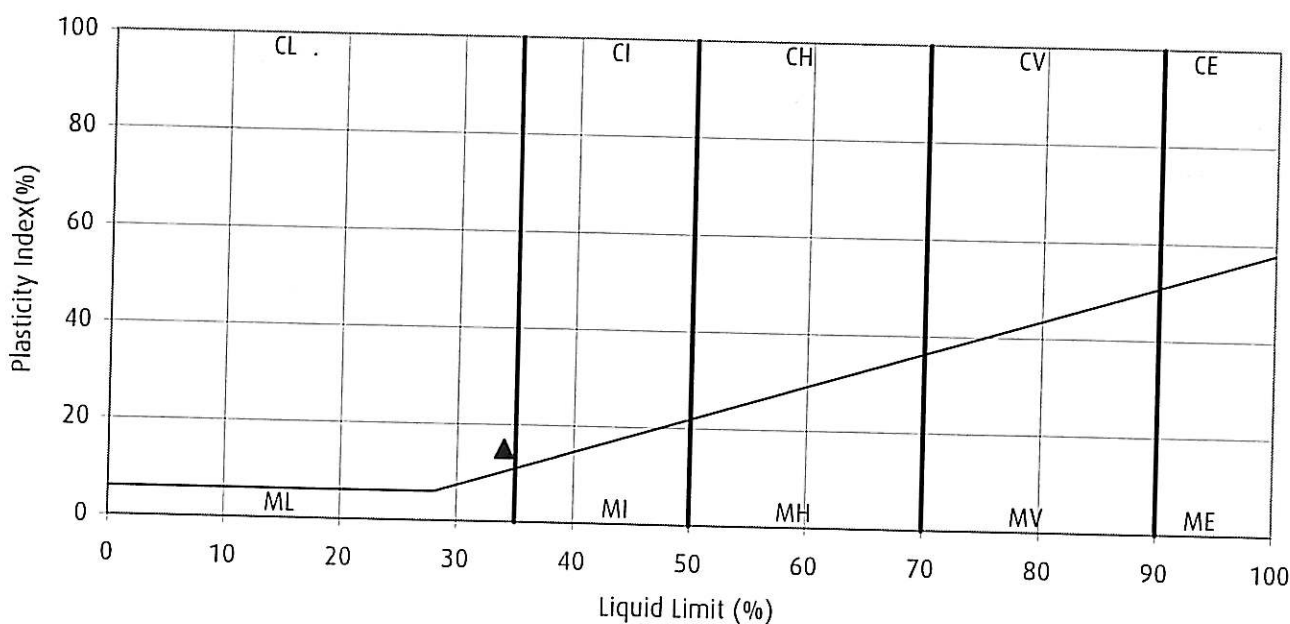
15

Moisture content of soil passing 425µm

9.7

Liquidity index:

-0.62



Approved by:

Sushil Sharda

Leeds Laboratory

Report No.: LT949

Page 10 of 19

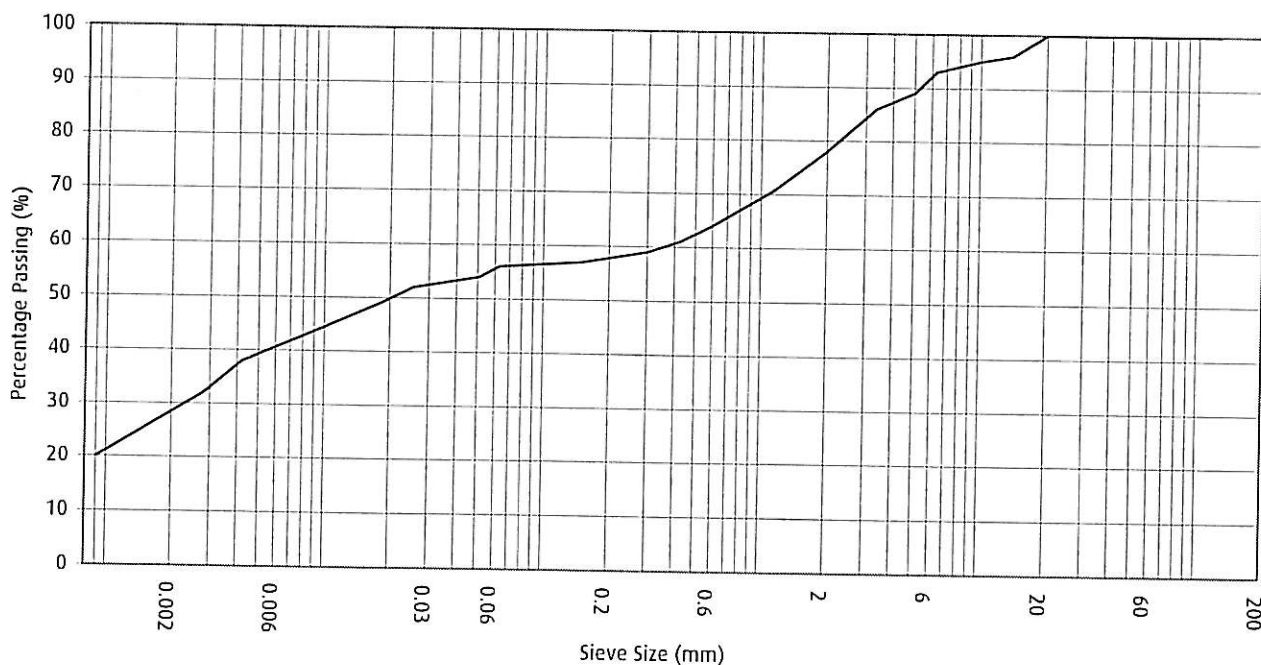
Print date 08/08/2006

Revision No. 2.01

Issue Date 27/03/2006

**NORWEST
HOLST**
SOIL ENGINEERING

Project Name	Harbourhill Road, Barnsley	Particle Size Distribution	Hole ID	BH01
Project No.	LT949		Sample Depth	1.10m
Engineer	Christopher Evans		Sample Number	
Client	BWB Consulting LTD		Sample type	B
Description			Dark brown slightly sandy gravelly CLAY.	
			Specimen Depth	1.10m
			Specimen No.	1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%
Clay:	27
Silt:	29
Sand:	22
Gravel:	22
Cobbles:	0

General remarks

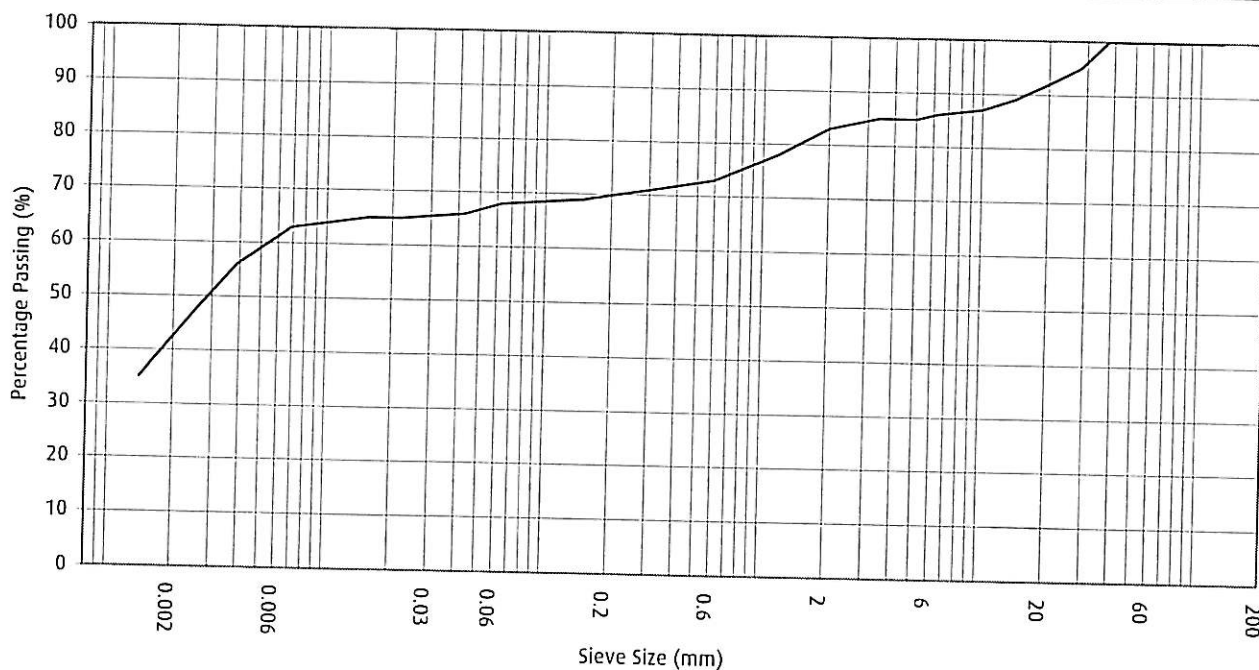
Particle density: 2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	96		
		10.0	95		
		6.3	93	0.0509	54
125.0	100	5.0	89	0.0256	52
100.0	100	3.35	86	0.0182	49
75.0	100	2.00	78	0.0083	43
63.0	100	1.18	71	0.0042	38
50.0	100	0.600	64	0.0028	32
37.5	100	0.425	61	0.0009	20
28.0	100	0.300	59		
20.0	100	0.212	58		
		0.150	57		
		0.063	56		

Approved by:	Leeds Laboratory	Report No.: LT949
Sushil Sharda		
	Page 11 of 19	Print date 08/08/2006
Revision No. 3.01	Issue Date 28/04/2006	



Project Name Harbourhill Road, Barnsley		Particle Size Distribution BS 1377: Part 2: 1990: 9.2, 9.5	Hole ID BH02
Project No.	LT949		Sample Depth 2.00m
Engineer	Christopher Evans		Sample Number
Client	BWB Consulting LTD		Sample type B
Description Grey sandy CLAY with mudstone gravel.			Specimen Depth 2.00m
			Specimen No. 1



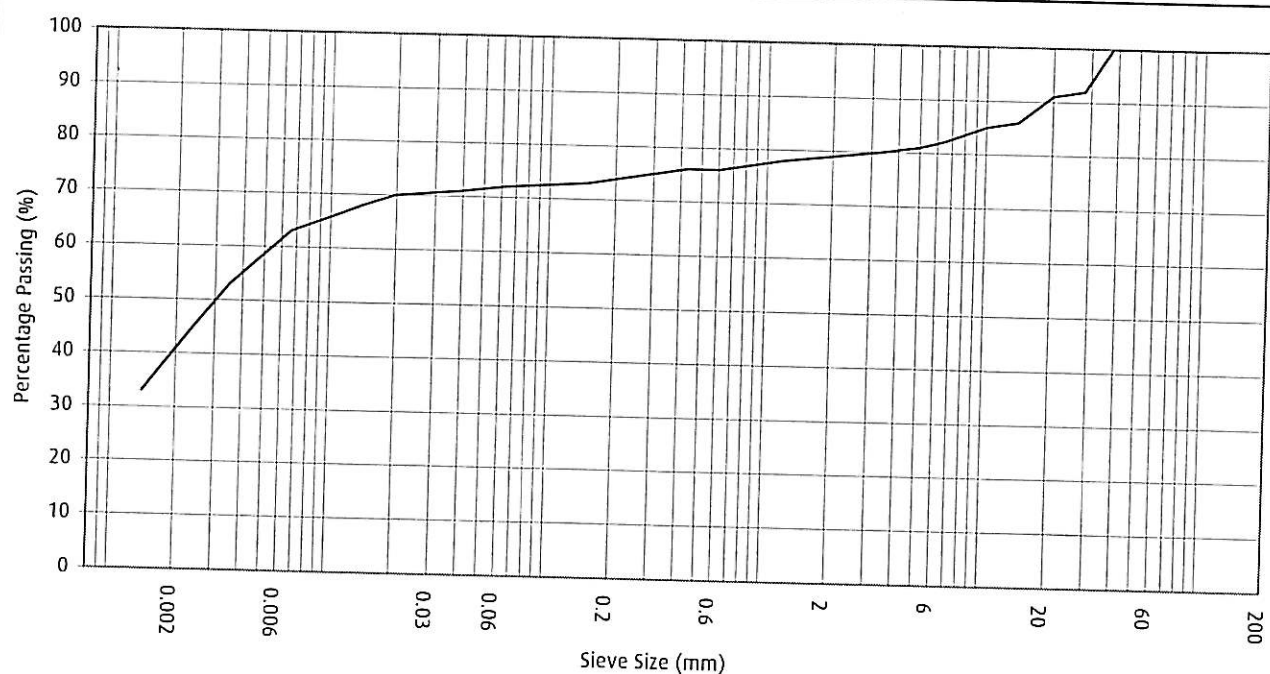
CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

PARTICLE SIZE	%	General remarks
Clay:	42	
Silt:	26	
Sand:	15	
Gravel:	17	
Cobbles:	0	
Particle density:		2.65Mg/m ³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	89		
		10.0	87		
		6.3	86	0.0428	66
125.0	100	5.0	85	0.0215	65
100.0	100	3.35	85	0.0153	65
75.0	100	2.00	83	0.0069	63
63.0	100	1.18	78	0.0039	56
50.0	100	0.600	73	0.0026	48
37.5	100	0.425	72	0.0014	35
28.0	95	0.300	71		
20.0	92	0.212	70		
		0.150	69		
		0.063	68		

Approved by:	Leeds Laboratory	Report No.: LT949	
Sushil Sharda		Page 12 of 19	
	Revision No. 3.01	Issue Date 28/04/2006	

Project Name	Harbourhill Road, Barnsley	Particle Size Distribution	Hole ID	BH04
Project No.	LT949		Sample Depth	0.60m
Engineer	Christopher Evans		Sample Number	002
Client	BWB Consulting LTD		Sample type	B
Description	Brown slightly sandy slightly gravelly CLAY.		Specimen Depth	0.60m
			Specimen No.	1

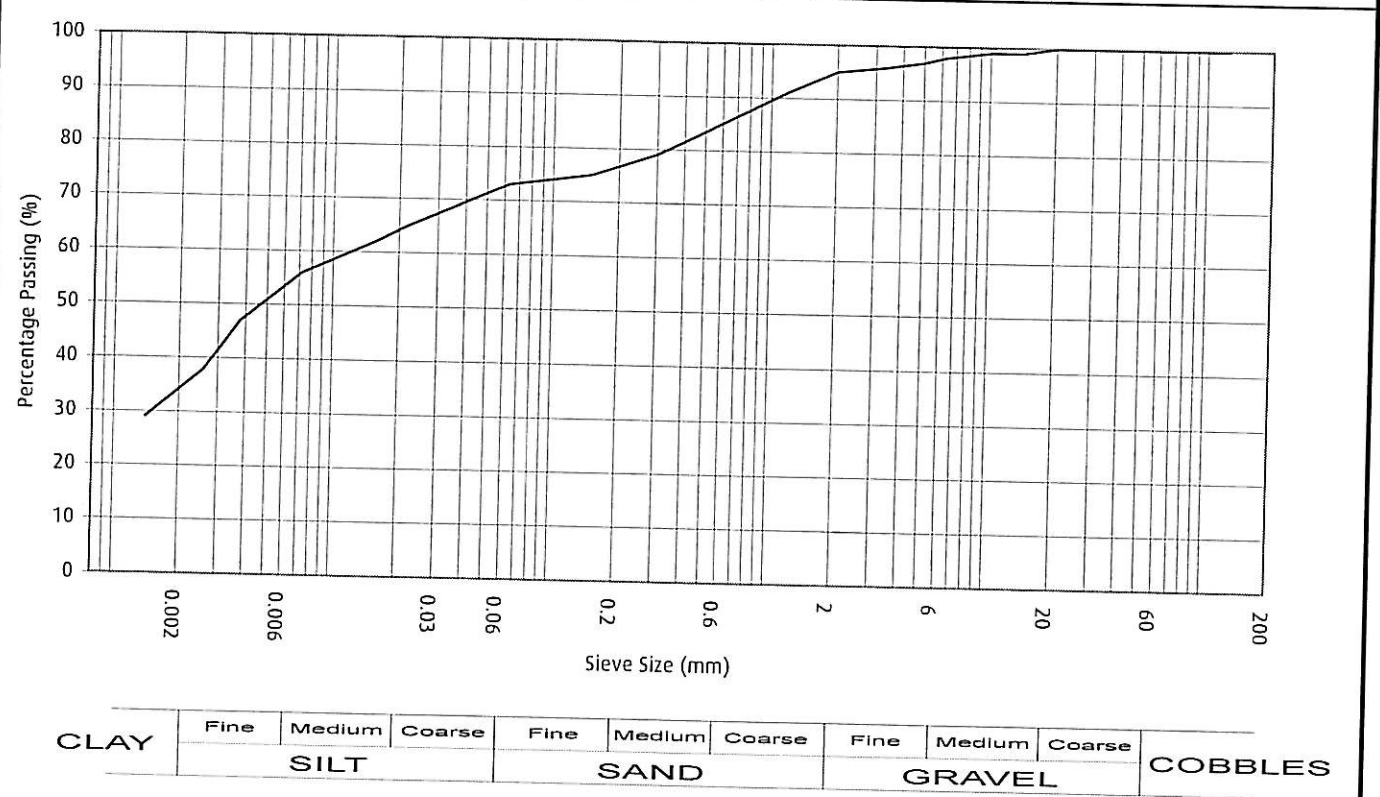


CLAY	Fine	Medium	Coarse	SILT	Fine	Medium	Coarse	SAND	Fine	Medium	Coarse	GRAVEL	COBBLES

PARTICLE SIZE	%	General remarks Sample size was insufficient to be representative of particle size
Clay:	40	
Silt:	32	
Sand:	7	
Gravel:	21	
Cobbles:	0	
Particle density:		2.65Mg/m³ Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	86		
		10.0	85		
		6.3	82	0.0392	71
125.0	100	5.0	81	0.0198	70
100.0	100	3.35	80	0.0141	68
75.0	100	2.00	79	0.0066	63
63.0	100	1.18	78	0.0035	53
50.0	100	0.600	76	0.0024	45
37.5	100	0.425	76	0.0014	33
28.0	92	0.300	75		
20.0	91	0.212	74		
		0.150	73		
		0.063	72		

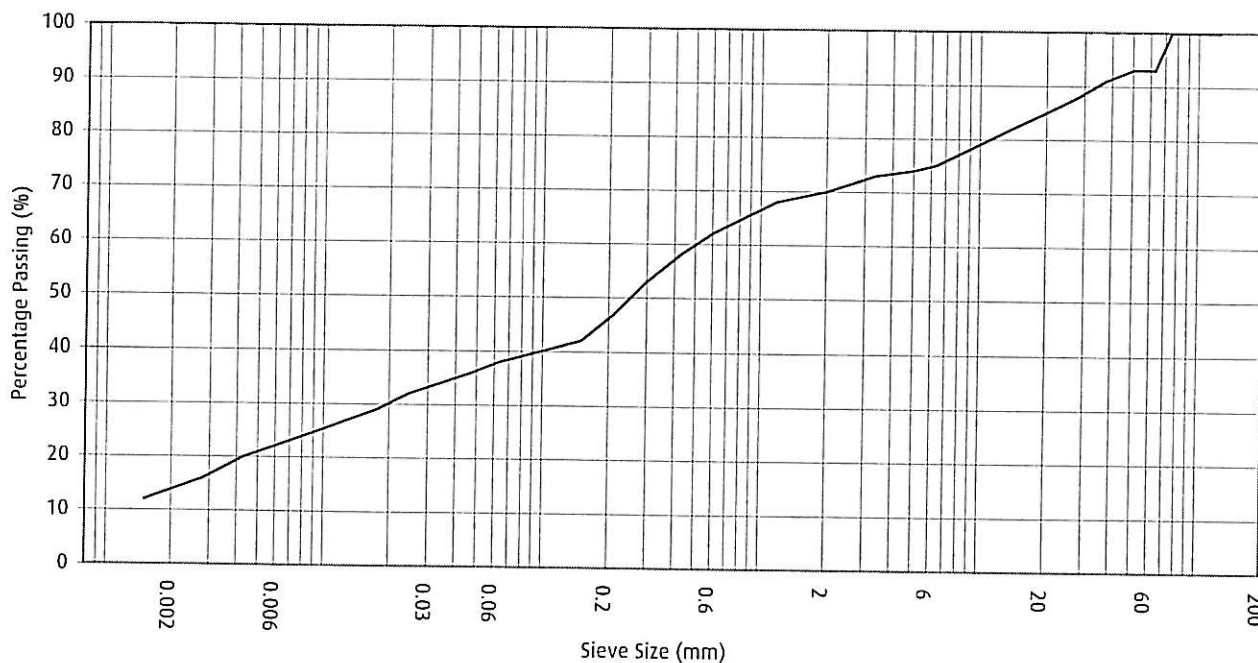
Project Name	Harbourhill Road, Barnsley	Particle Size Distribution	Hole ID	BH05
Project No.	LT949		Sample Depth	2.60m
Engineer	Christopher Evans		Sample Number	
Client	BWB Consulting LTD		Sample type	B
Description		Brown slightly sandy slightly gravelly CLAY.	Specimen Depth	2.60m
			Specimen No.	1



PARTICLE SIZE		General remarks
Clay:	34	
Silt:	39	
Sand:	22	
Gravel:	5	
Cobbles:	0	

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size	mm	Cumulative % passing	Sieve size	mm	Cumulative % passing
			14.0		99
			10.0		99
			6.3		98
125.0		100	5.0		97
100.0		100	3.35		96
75.0		100	2.00		95
63.0		100	1.18		91
50.0		100	0.600		85
37.5		100	0.425		82
28.0		100	0.300		79
20.0		100	0.212		77
			0.150		75
			0.063		73
				Equivalent particle diameter	
				0.0423	70
				0.0218	65
				0.0157	62
				0.0072	56
				0.0038	47
				0.0026	38
				0.0014	29

Project Name	Harbourhill Road, Barnsley	Particle Size Distribution	Hole ID	TP12
Project No.	LT949		Sample Depth	1.10m
Engineer	Christopher Evans		Sample Number	
Client	BWB Consulting LTD		Sample type	B
Description	MADE GROUND: Dark brown sandy gravelly clay with brick and glass fragments.	BS 1377: Part 2: 1990: 9.2, 9.5	Specimen Depth	1.10m
			Specimen No.	1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

PARTICLE SIZE

Clay: 14

Silt: 24

Sand: 32

Gravel: 23

Cobbles: 7

General remarks

Particle density: 2.65Mg/m³

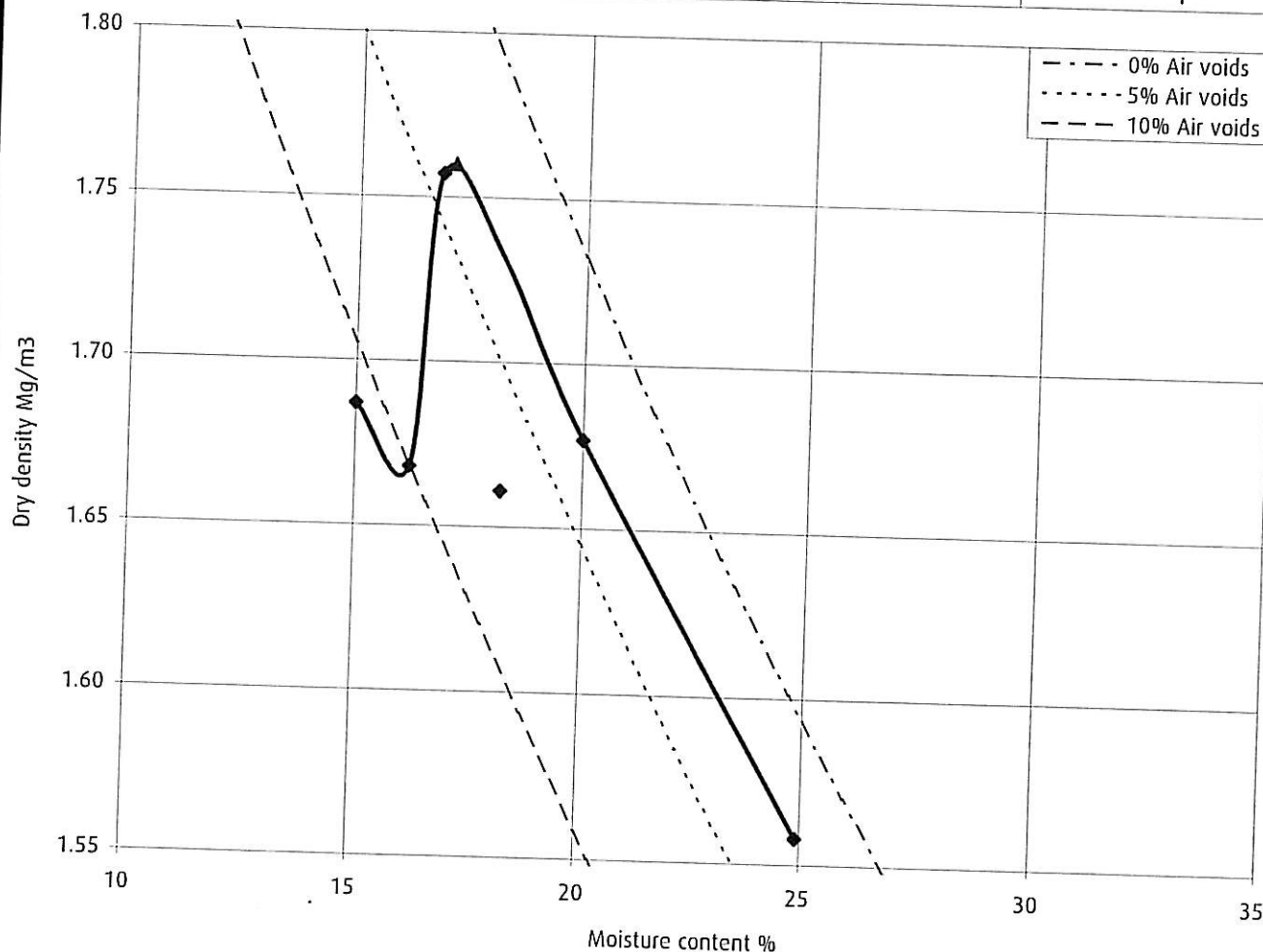
Assumed

WET SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter	Cumulative % passing
		14.0	82		
		10.0	79	0.0479	36
		6.3	75	0.0245	32
125.0	100	5.0	74	0.0176	29
100.0	100	3.35	73	0.0081	24
75.0	100	2.00	70	0.0043	20
63.0	93	1.18	68	0.0028	16
50.0	93	0.600	62	0.0015	12
37.5	91	0.425	58		
28.0	88	0.300	53		
20.0	85	0.212	47		
		0.150	42		
		0.063	38		

Approved by:	Leeds Laboratory	Report No.: LT949
Sushil Sharda		
	Page 15 of 19	Print date 08/08/2006
Revision No. 3.01	Issue Date 28/04/2006	



Project Name	Harbourhill Road, Barnsley	Dry Density / Moisture Content Relationship	Hole ID	TP02
Project No.	LT949		Sample Depth	0.70m
Engineer	Christopher Evans		Sample Number	002
Client	BWB Consulting LTD		Sample Type	AMAL
Description		Light and dark brown slightly gravelly sandy CLAY	Specimen Depth	0.70m
Amalgamation: TP02,002,B,0.70m + TP02,003,B,1.50m.			Specimen Number	1



Maximum dry density	1.76Mg/m³	Experimental points	Moisture content %	Dry Density Mg/m³
Optimum moisture content	17%			
Corrected maximum dry density for removal of gravel	1.77Mg/m³			
Method of compaction	2.5kg Rammer			
Batches tested	Separate batches tested.	Nat	15.0	1.69
Particle density	Assumed 2.65Mg/m³		16.2	1.67
Gravel retained on 20mm sieve	2%		16.8	1.76
Gravel retained on 37.5mm sieve	1%		18.2	1.66
			20.0	1.68
			24.9	1.56

General remarks: Test performed on specimen unsuitable due to gravel content.

Approved by:	Leeds Laboratory	Report No.: LT949	NORWEST HOLST SOIL ENGINEERING
Stuart Kirk		Page 16 of 19	
Revision No.	2.01	Issue Date 09/05/2006	

Project Name Harbourhill Road, Barnsley Project No. LT949 Engineer Christopher Evans Client BWB Consulting LTD		Dry Density / Moisture Content Relationship BS1377: Part 4: 1990: Clause 3		Hole ID TP10	Sample Depth 1.20m	Sample Number 003	Sample Type AMAL
Description Brown slightly gravelly CLAY. Amalgamation: TP10,003,B,1.20m + TP10,004,B,2.20m.						Specimen Depth 1.20m	Specimen Number 1

Dry density Mg/m³

Moisture content %

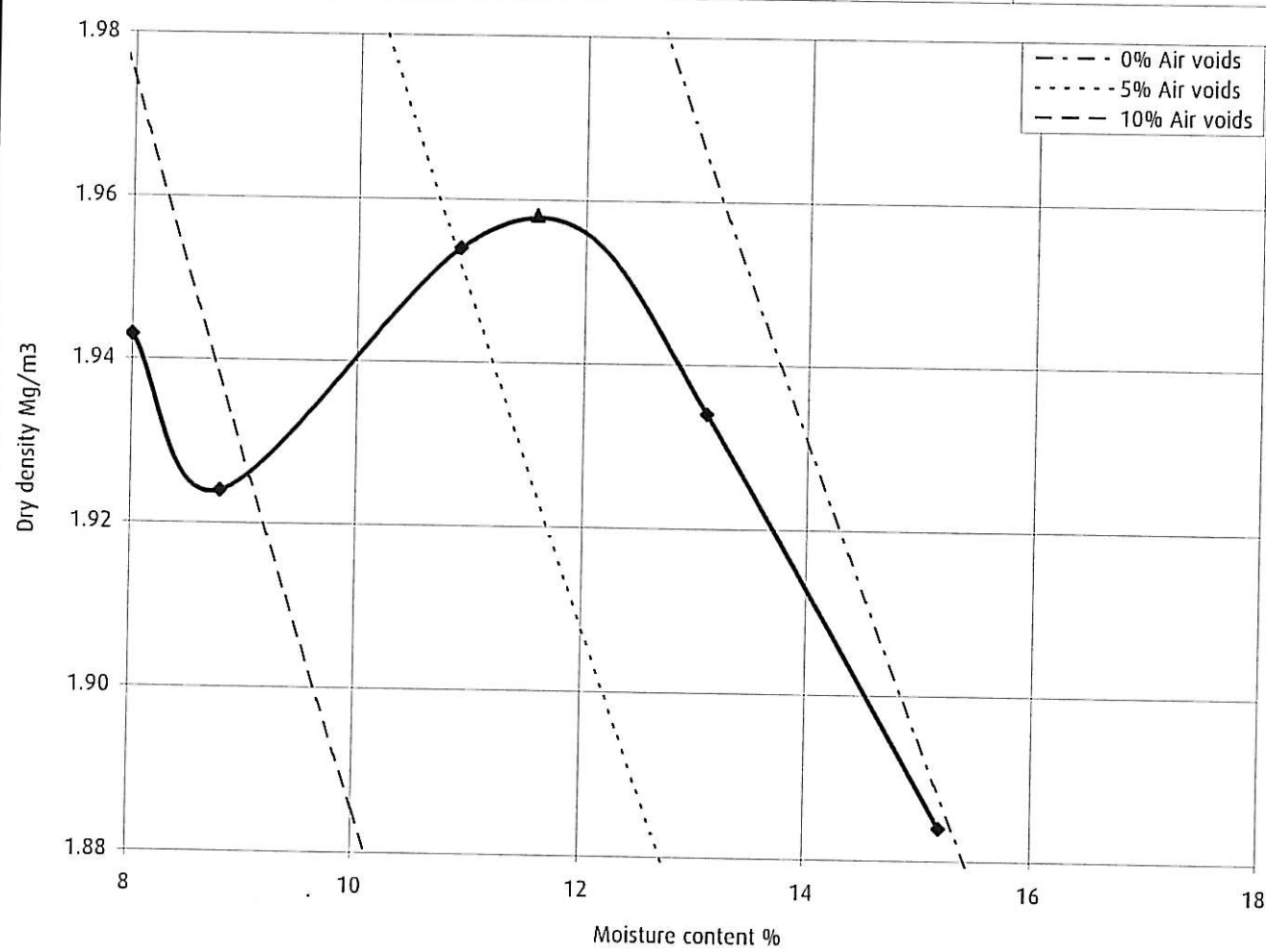
Legend:
 - - - 0% Air voids
 - - - 5% Air voids
 - - - 10% Air voids

Maximum dry density 1.78Mg/m ³ Optimum moisture content 15% Corrected maximum dry density for removal of gravel 1.79Mg/m ³	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Experimental points</th> </tr> <tr> <th>Moisture content %</th> <th>Dry Density Mg/m³</th> </tr> </thead> <tbody> <tr><td>12.8</td><td>1.77</td></tr> <tr><td>14.3</td><td>1.78</td></tr> <tr><td>16.4</td><td>1.77</td></tr> <tr><td>19.6</td><td>1.72</td></tr> <tr><td>21.2</td><td>1.69</td></tr> </tbody> </table>	Experimental points		Moisture content %	Dry Density Mg/m ³	12.8	1.77	14.3	1.78	16.4	1.77	19.6	1.72	21.2	1.69
Experimental points															
Moisture content %	Dry Density Mg/m ³														
12.8	1.77														
14.3	1.78														
16.4	1.77														
19.6	1.72														
21.2	1.69														
Method of compaction 2.5kg Rammer Batches tested Single specimen. Particle density Assumed 2.65Mg/m ³ Gravel retained on 20mm sieve 2% Gravel retained on 37.5mm sieve 1%	Nat														

General remarks Test performed on specimen unsuitable due to gravel content.

Approved by:	Leeds Laboratory	Report No.: LT949	NORWEST HOLST SOIL ENGINEERING
Sushil Sharda		Page 17 of 19	
	Revision No. 2.01	Issue Date 09/05/2006	
		Print date 08/08/2006	

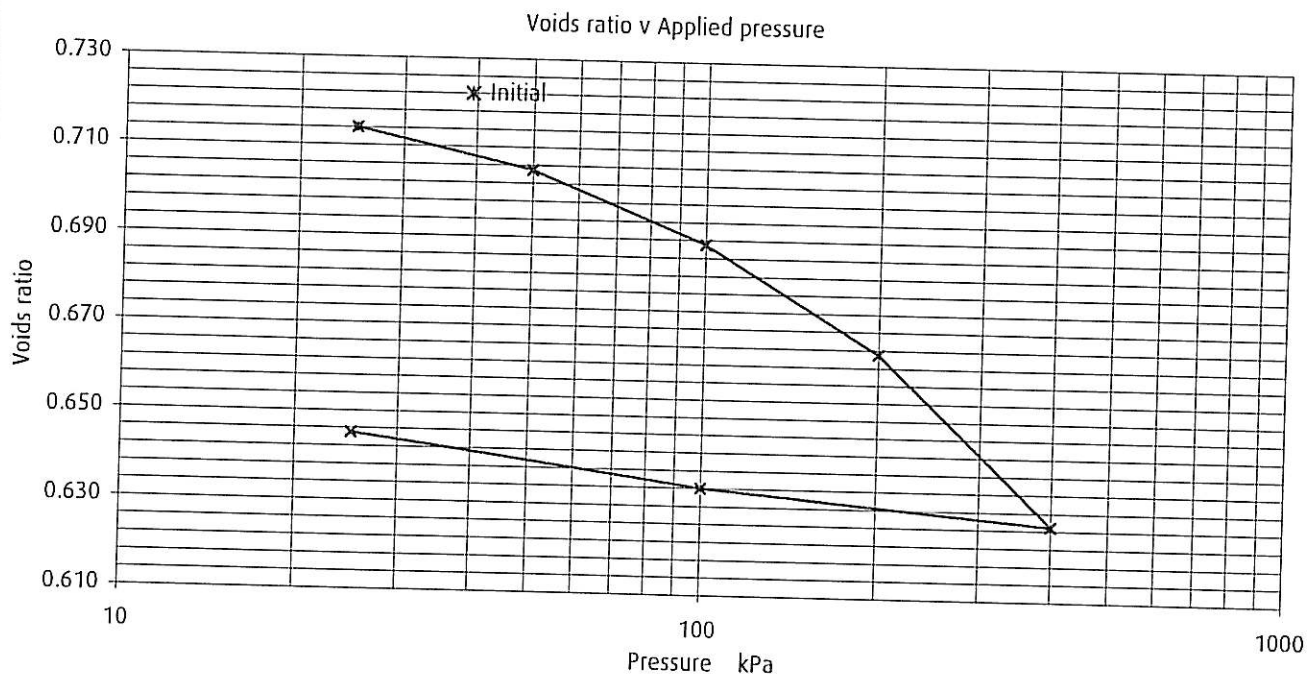
Project Name	Harbourhill Road, Barnsley	Dry Density / Moisture Content Relationship	Hole ID	TP13
Project No.	LT949		Sample Depth	1.00m
Engineer	Christopher Evans		Sample Number	002
Client	BWB Consulting LTD		Sample Type	AMAL
Description		Brown gravelly sandy CLAY with mudstone fragments.	Specimen Depth	1.00m
Amalgamation:		TP13,002,B,1.00m + TP13,003,B,2.00m + BH04,002,B,0.60m.	Specimen Number	1



Maximum dry density	1.96Mg/m³	Experimental points	
Optimum moisture content	12%		
Corrected maximum dry density for removal of gravel	1.99Mg/m³	Moisture content %	Dry Density Mg/m³
Method of compaction	2.5kg Rammer	8.0	1.94
Batches tested	Single specimen.	8.8	1.92
Particle density	Assumed 2.65Mg/m³	10.9	1.95
Gravel retained on 20mm sieve	6%	12.0	1.87
Gravel retained on 37.5mm sieve	2%	13.1	1.93
		15.2	1.88

General remarks Test performed on specimen unsuitable due to gravel content.

Project Name	Harbourhill Road, Barnsley	Oedometer Consolidation	Hole ID	BH05
Project No.	LT949		Sample Depth	2.00m
Engineer	Christopher Evans		Sample Number	
Client	BWB Consulting LTD		Sample Type	U
Description	Mottled brown slightly gravelly CLAY.	BS1377: Part 5: 1990: 3.0	Specimen Depth	2.04m
			Specimen Number	1



Specimen details

Trimmmings moisture content	25	%
Diameter	75.0	mm
Height	18.95	mm
Bulk density	1.96	Mg/m ³
Dry density	1.54	Mg/m ³
Initial moisture content	27	%
Initial voids ratio	0.722	
Saturation	100	%
Particle density	2.65	Mg/m ³
Specimen depth	2.04	m
Specimen ref.	01	
Final moisture content	26	%

Coefficient of volume compressibility
for a pressure increment of 100kPa
in excess of the present effective
overburden pressure

0.18 m²/MN

Laboratory coefficients

Pressure kPa	Compressibility m ² /MN	Consolidation c _v m ² /year		Voids ratio
	m _v	log time	root time	
25	0.19	6.9	8.4	0.714
50	0.22	2.8	2.7	0.705
100	0.19	3.9	3.1	0.689
200	0.14	5.4	8.6	0.665
400	0.11	6.5	4.9	0.627
100				0.634
25				0.645

Specimen prepared as per BS1377: Part 1: 1990: Clause 8.6 Test performed at an average temperature of 23°C (Results corrected for 20°C)
Specimen cut and tested with longest axis in an horizontal orientation.

Approved by:
Sushil Sharda

Leeds Laboratory

Report No.: LT949

Page 19 of 19

Print date 08/08/2006

Revision No. 2.01

Issue Date 07/07/2006

NORWEST
HOLEY
SOIL ENGINEERING

APPENDIX 6

GAS AND GROUNDWATER MONITORING

BWB GAS AND GROUNDWATER MONITORING

SITE	Harbourhill Road (Barnsley)
CLIENT	Kennett Properties
JOB No	LDS126
DATE	27/07/2006
START TIME/FINISH TIME	8.30-9.10
ENGINEER	C Evans
INSTALLATION DETAILS	50mm stand pipe
MONITORING EQUIPMENT	GA2000 Gas analyser, flow pod electronic dipmeter

WEATHER CONDITIONS	START	FINISH
Dry/raining etc	DRY	-
Cloud Cover	6/8	-
Wind strength and direction	Slight	-
Temperature (°C)		-
Barometric Pressure (mb)	1006	

Ref	Base of Response Zone (m)	Depth to water (m)	Methane		Carbon Dioxide (%v/v)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Oxygen (%v/v)	Temp (°C)	Flow (l/hr)	Notes
BH01	10.00	8.93	N.D	N.D	2.1	0.0	N.D	10.5	N.R	-0.2 to -0.7	
BH02	19.00	6.49	N.D	N.D	N.D	N.D	N.D	20.4	N.R	-0.1 to -0.3	
BH03	30.00	8.94	N.D	N.D	0.7	N.D	N.D	18.7	N.R	-0.6 to -0.2	
BH04	19.00	17.38	N.D	N.D	0.9	N.D	N.D	18.6	N.R	-2.7 to -2.8	Blocked on arrival
BH05	20.00	20.05	N.D	N.D	1.6	N.D	N.D	13.4	N.R	-1.8 to - 2.1	

LEL Lower Explosive limit (100% LEL = 5% Flammable gas)

N.D. Value below detection limit of equipment used

N.R. Not recorded

BWB GAS AND GROUNDWATER MONITORING

SITE	Harbourhill Road (Barnsley)
CLIENT	Kennett Properties
JOB No	LDS126
DATE	21/07/2006
START TIME/FINISH TIME	10.10 - 10.40
ENGINEER	S Steel
INSTALLATION DETAILS	50mm stand pipe
MONITORING EQUIPMENT	GA2000 Gas analyser, flow pod electronic dipmeter

WEATHER CONDITIONS	START	FINISH
Dry/raining etc	DRY	-
Cloud Cover	8/8	-
Wind strength and direction	Slight	-
Temperature (°C)	N.R	-
Barometric Pressure (mb)	1009	

Ref	Base of Response Zone (m)	Depth to water (m)	Methane		Carbon Dioxide (%v/v)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Oxygen (%v/v)	Temp (°C)	Flow (l/hr)	Notes
BH01	10.00	DRY	N.D	N.D	2.9	N.D	N.D	9.9	N.R	0.4 to 0.9	
BH02	19.00	5.79	N.D	N.D	N.D	N.D	N.D	20.4	N.R	0.2 to -0.1	
BH03	30.00	7.97	N.D	N.D	N.D	N.D	N.D	20.2	N.R	-0.2 to -0.5	
BH04	19.00	17.68	N.D	N.D	1.7	N.D	N.D	17.5	N.R	-1.6 to -1.7	
BH05	20.00	19.93	N.D	N.D	0.8	N.D	N.D	16.6	N.R	-2.9	

LEL Lower Explosive limit (100% LEL = 5% Flammable gas)

N.D. Value below detection limit of equipment used

N.R. Not recorded

BWB GAS AND GROUNDWATER MONITORING

SITE	Harbourhill Road (Barnsley)
CLIENT	Kennett Properties
JOB No	LDS126
DATE	14/07/2006
START TIME/FINNISH TIME	8.30-9.10
ENGINEER	S Steel
INSTALLATION DETAILS	50mm stand pipe
MONITORING EQUIPMENT	GA2000 Gas analyser, flow pod electronic dipmeter

WEATHER CONDITIONS	START	FINISH
Dry/raining etc	DRY	-
Cloud Cover	1/8	-
Wind strength and direction	Slight	-
Temperature (°C)	17*	-
Barometric Pressure (mb)	1024	

Ref	Base of Response Zone (m)	Depth to water (m)	Methane		Carbon Dioxide (%v/v)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Oxygen (%v/v)	Temp (°C)	Flow (l/hr)	Notes
			(%v/v)	(%LEL)							
BH01	10.00	DRY	N.D	N.D	2.8	25.0	N.D	11.8	N.R	0.2 to -0.5	
BH02	19.00	5.67	N.D	N.D	N.D	N.D	N.D	20.2	N.R	0.1 to -0.2	
BH03	30.00	8.00	N.D	N.D	N.D	N.D	N.D	20.1	N.R	-0.9 to -1.2	
BH04	19.00	17.52	N.D	N.D	0.2	N.D	N.D	19.7	N.R	-1.9	
BH05	20.00	19.78	N.D	N.D	1.8	N.D	N.D	13.1	N.R	-2.2 to - 2.3	Full of slurry at base

LEL Lower Explosive limit (100% LEL = 5% Flammable gas)

N.D. Value below detection limit of equipment used

N.R. Not recorded

BWB GAS AND GROUNDWATER MONITORING

SITE	Harbourhill Road (Barnsley)		
CLIENT	Kennett Properties		
JOB No	LDS126		
DATE	21/08/2006		
START TIME/FINNISH TIME	10.10 - 10.40		
ENGINEER	C Evans		
INSTALLATION DETAILS			50mm stand pipe
MONITORING EQUIPMENT			GA2000 Gas analyser, flow electronic dipmeter

WEATHER CONDITIONS	START
Dry/raining etc	DRY
Cloud Cover	1/8
Wind strength and direction	Very windy
Temperature (°C)	N.R
Barometric Pressure (mb)	1003

Ref	Base of Response Zone (m)	Depth to water (m)	Methane		Carbon Dioxide	Carbon Monoxide	Hydrogen Sulphide	Oxygen	Temp	Flow
			(%v/v)	(%LEL)	(%v/v)	(ppm)	(ppm)	(%v/v)	(°C)	(l/hr)
Background	N.R	N.R	N.D	N.D	N.D	N.D	N.D	20.4	N.R	N.R
BH01	10.00	6.51	N.D	N.D	0.6	N.D	N.D	17.2	N.R	0.0 to 0.3
BH02	19.00	6.10	N.D	N.D	N.D	N.D	N.D	20.5	N.R	0.4 to -0.4
BH03	30.00	8.80	N.D	N.D	0.2	N.D	N.D	19.0	N.R	-0.1 to 0.1
BH04	19.00	17.44	N.D	N.D	4.1	N.D	N.D	19.6	N.R	-2.4 to -0.8
BH05	20.75	20.09	N.D	N.D	0.7	N.D	N.D	16.7	N.R	-1.2 to -0.4

LEL
N.D.
N.R.

Lower Explosive limit (100% LEL = 5% Flammable gas)
Value below detection limit of equipment used
Not recorded

Notes

Borehole BH01 Instalation below level of run off water
on arrival required to remove bung before monitoring

Borehole BH04 Instalation below level of run off water
on arrival required to remove bung before monitoring

BWB GAS AND GROUNDWATER MONITORING

SITE	Harbourhill Road (Barnsley)
CLIENT	Kennett Properties
JOB No	LDS126
DATE	14/08/2006
START TIME/FINISH TIME	10.10 - 10.40
ENGINEER	C Evans
INSTALLATION DETAILS	50mm stand pipe
MONITORING EQUIPMENT	GA2000 Gas analyser, flow pod electronic dipmeter

WEATHER CONDITIONS	START	FINISH
Dry/raining etc	DRY	-
Cloud Cover	1/8	-
Wind strength and direction	Very windy	-
Temperature (°C)	N.R	-
Barometric Pressure (mb)	1003	

Ref	Base of Response Zone (m)	Depth to water (m)	Methane		Carbon Dioxide (%v/v)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Oxygen (%v/v)	Temp (°C)	Flow (l/hr)	Notes
			(%v/v)	(%LEL)							
Background	N.R	N.R	N.D	N.D	N.D	N.D	N.D	20.4	N.R	N.R	
BH01	10.00	8.94	N.D	N.D	3.4	N.D	N.D	3.8	N.R	0.0 to 1.7	
BH02	19.00	6.59	N.D	N.D	N.D	N.D	N.D	19.8	N.R	0.4 to -0.4	
BH03	30.00	8.91	N.D	N.D	0.8	N.D	N.D	17.9	N.R	-0.1 to 0.1	
BH04	19.00	17.44	N.D	N.D	4.1	N.D	N.D	13.2	N.R	-0.4 to -2.7	
BH05	20.00	20.01	N.D	N.D	1.6	N.D	N.D	12.9	N.R	2.7 to 0.5	

LEL Lower Explosive limit (100% LEL = 5% Flammable gas)

N.D. Value below detection limit of equipment used

N.R. Not recorded