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Report No. 7028/1
Date: July 2005


* 20 JAN 2006 *
GEOENVIRONMENTAL APPRAISAL
of land at
RADCLIFFE RIVERSIDE HIGH SCHOOL
(WEST CAMPUS)

45 673

Prepared for
BURY METROPOLITAN BOROUGH COUNCIL



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RADCLIFFE RIVERSIDE HIGH SCHOOL (WEST CAMPUS)

SUMMARY OF GEOENVIRONMENTAL ISSUES

The site is located off School Street, approximately 300m west of Radcliffe town centre at NGR SD779071 and occupies an area of approximately 4 hectares.

The site is generally flat lying, with ground levels sloping down very gently from north west to south east. Hard surfaced yard areas on the east side of the site step down approximately 0.5m adjacent to the main school building.

Historically the site was in agricultural use before being utilised as a cricket pitch in the late 19th century and smallholdings in the early 20th century. The site was first developed as a school in the 1930's, with a number of additional school buildings added during the late 19th century.

Encia Consulting Limited were commissioned by Bury Metropolitan Borough Council Education Committee to provide a geo-environmental appraisal of the site. It is understood that the site is to be eventually redeveloped as part of a land transfer deal with P & F Properties, following the construction of a replacement school nearby. A proposed development layout is not currently available. Encia's investigation included a Phase I Desk Based Study and Phase II Site Investigation.

A summary of salient geo-environmental issues is provided in the table below.

Issue	Remarks
Made Ground	Gravelly clay topsoil with fragments of brick, porcelain, glass and ash, overlying fine to coarse gravel of clinker, coke and brick identified in the majority of the exploratory holes to depths ranging from 0.35m to 2.5m.
Natural Ground	Encountered beneath the site in all exploratory hole positions and generally comprised soft brown sandy clay overlying saturated loose to medium dense sand with gravels and bands of clay. Stiff to very stiff cohesive Glacial Till was encountered at depths ranging from 3.2m WS3 to 7.50m in BH1. Peat was identified in BHS and RBH5 at depths between 1.50m and 2.80m.
Contamination	Contamination exists in the Made Ground and natural drift strata beneath the site. The identified contaminants include elevated concentrations of arsenic, cadmium, lead, phytotoxins (copper, zinc and total sulphate), PAH and benzo(a)pyrene. In addition, slightly elevated levels of leachable copper and PAH along with two elevated PAH concentrations in groundwater.
Hazardous Gas	Elevated concentrations of carbon dioxide have been recorded in two monitoring wells. The maximum concentration recorded was 5.1%. No positive gas flow rates have been recorded in any of the monitoring wells. Due to insufficient monitoring data the site is initially classified as 'Characteristic Situation 2'.
Mining & Quarrying	The site is indicated to be underlain by two coal seams, with the 'Stonedelph' seam subcropping the south east corner of the site and the 'Top Five Quarters' seam present at shallow depth underlying the north west portion of the site. Both seams dipping to the south east. The Coal Authority report identified 6 worked seams at 60-430m depth underlying the site last worked in 1900 and the risk that the site could be underlain by shallow workings. Two coal pits and three collieries were identified in close proximity to the site from historical maps. No evidence of quarrying on site has been identified.
Preparatory Works	Type 3 Pre Demolition Asbestos Survey. Removal of any identified asbestos containing materials. Demolition of existing buildings, removal and crushing of all hard surfaces, relic foundations and sub-surface obstructions. General site clearance. Provision of a 600mm thick surface cover of "clean" soil comprising 450mm subsoil and 150mm topsoil be provided in all proposed 'soft' end use areas. Validation by chemical analysis of any imported soil/material for use in garden and/or landscaped areas. Supervision of the works by a suitably qualified consultant to include detailed records, testing requirements, etc

This brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

Issue	Remarks
Foundations	Piled foundation solution would be required for the site with piles taken down to the underlying stiff to very stiff cohesive Glacial Till deposits. Alternatively vibro ground improvement may also be suitable for the site.
Groundwater & Excavations	Some groundwater flow is anticipated in shallow excavations. Therefore, any excavations are likely to require shoring, most notably in granular soils and Made Ground deposits.
Flooding & Drainage	Soakaways within areas of granular infill and natural sands/gravels may be a viable drainage option for parts of the site. Soakaway testing and in-situ permeability testing would need to be undertaken to fully assess the suitability. The site is not indicated to be at risk of flooding or extreme flooding events according to information from the Environment Agency database.
Highways	For access road and pavement areas, Made Ground deposits are considered to have equilibrium CBR of <1%. Road and pavements placed upon the natural deposits are considered to have an equilibrium CBR of 2%.

Significant developer abnormalities relating to geoenvironmental issues at the site are:

- Type 3 Pre Demolition Asbestos Survey
- Removal of any identified asbestos containing materials
- Demolition of existing buildings/foundations and grubbing up of hardstand.
- Provision of capping layer in proposed landscaped and garden areas.
- Provision of gas protective measures.
- Possible piled foundations/vibro ground improvement.

This brief summary should not be assumed to represent a complete account of all the potential geoenvironmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

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- 01 Environmental Setting
- 02 Ground Investigation Fieldwork
- 03 Geotechnical Laboratory Tests
- 04 Contamination Laboratory Analysis & Interpretation
- 05 Hazardous Gas

Appendix B - Drawings

- 7028/1 Site Location Plan
- 7028/2 Existing Site Layout Plan
- 7028/3 Conceptual Site Model
- 7028/4 Borehole Location Plan
- 7028/5 Detailed Topographical Survey

Appendix C - Photographic Survey

Appendix D - Search Responses & Other Correspondence

From	To	Date	Content
Encia Consulting Ltd	The Coal Authority	25 May 2005	Coal Authority Report
Encia Consulting Ltd	Landmark Information Group Ltd	23 May 2005	Envirocheck Report
Encia Consulting Ltd	Environment Agency	25 May 2005	Environment Agency Site Report
Encia Consulting Ltd	Bury Metropolitan Borough Council	26 May 2005	Environmental Information Report

Appendix E - Exploratory Hole Logs

Appendix F - Chemical Analysis Results

Appendix G - Geotechnical Test Results

Appendix H - Gas/Groundwater Monitoring Results

Appendix I - Commission

FOREWORD (Geo-environmental Investigation Report)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Encia Consulting Limited (Encia); such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

The report presents observations and factual data obtained during our site investigation, and provides an assessment of geo-environmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Encia prior to significant revision of the development proposals.

The report should be read in its entirety, including all associated drawings and appendices. Encia cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third party reports) are based on information obtained from a variety of sources as detailed within this report, and which Encia believes are reliable. All reasonable care and skill has been applied in examining the information obtained. Nevertheless, Encia cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced geo-environmental consultants. Encia does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by Encia, whilst fully appropriate, may not have encountered all significant subsurface conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy.

It should be borne in mind that the timescale over which the investigation was undertaken may not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present and that houses will be of two storey construction. If this is not to be the case, then some modification to this report may be required.

It should be noted that the banning of the co-disposal of hazardous and non-hazardous waste was introduced in July 2004, as a result of the implementation within the UK of the Landfill Directive. This will considerably affect the current practices and procedures for the handling and disposal of wastes, in particular hazardous wastes. In addition, it will be a requirement for all wastes to be pre-treated and to comply with certain waste acceptance procedures prior to sending wastes to landfill. The full potential effects of these important changes are not known at this stage, but it is perceived that disposal costs will rise, particularly for hazardous wastes, and waste pre-treatment may, in some cases, become an 'additional' redevelopment cost with regard to the remediation of contaminated sites.

Should this report recommend that materials could be excavated and removed off site for landfill disposal, then it should be noted that the costs, timescales and implications of the pending changes to waste management legislation cannot be predicted at this stage. Encia Consulting Limited will not be responsible for changing practices, etc that may affect the viability of necessary remedial actions or of the implications of potential alternative treatment techniques.

Encia reserve the right to amend their conclusions and recommendations in the light of further information that may become available.

**GEO-ENVIRONMENTAL APPRAISAL
OF LAND AT
RADCLIFFE RIVERSIDE HIGH SCHOOL (WEST CAMPUS)**

1 INTRODUCTION

1.1 The Commission and Brief

1.1.1 Encia Consulting Limited (Encia), were commissioned by Bury Metropolitan Borough Council (Bury MBC) to carry out a geo-environmental appraisal of land at Radcliffe Riverside High School (West Campus).

1.1.2 Correspondence regarding Encia's appointment, including the brief for this investigation, is included in Appendix I. The agreed scope of works included:

- A site walkover and inspection.
- An assessment of the land use history.
- Conduct a detailed topographical survey.
- Determination of the site's environmental setting.
- An intrusive ground investigation comprising two days window sampling, six cable percussion and six rotary boreholes.
- Assessment of the geotechnical properties of the near surface deposits to enable provision of foundation and highway recommendations.
- A qualitative assessment of contamination risks, with respect to potential receptors.
- The provision of recommendations with respect to site preparatory and remedial works.

1.2 The Proposed Development

1.2.1 The site is planned to be exchanged, together with the nearby Riverside East Campus (formerly Coney Green High School) site as part of a land transfer deal with P & F Properties, which would see both the eastern and western school sites relocated to the nearby East Lancashire Papermill site.

1.2.2 It is assumed that the proposed redevelopment of the site will comprise residential dwellings, associated gardens, POS and adoptable roads and sewers. No site layout has been provided at this stage.

1.3 Report Format and Limitations

1.3.1 All standard definitions, procedures and guidance are contained within Appendix A, which includes background, generic information on:

- Assessment of the site's environmental setting.
- Ground investigation fieldwork (including techniques, in-situ testing and sampling).
- Geotechnical Testing.
- Contamination Testing (including current guidance and notes about organics analyses).
- Hazardous Gas (including potential sources and notes about current guidance).

1.3.2 General notes and limitations relevant to all Encia geo-environmental investigations are described in the Foreword and should be read in conjunction

with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

- 1.3.3 The primary aims of this exploratory phase of investigation were to identify salient geo-environmental issues affecting the site to enable the Client to obtain budget costs for the necessary future site preparatory and remedial works. Supplementary investigations in order to satisfy the Local Planning Authority, develop a Remedial Strategy and enable refinement of budget abnormalities may well be required dependant on the findings of this investigation.

2 SITE DESCRIPTION

2.1 General

- 2.1.1 The site location is shown on Drawing Number 7028/1 presented in Appendix B to this report. Site details are summarised in the Table below.

Table 2.1: Summary of Site Details

Detail	Remarks
Location	Immediately south of School Street on the western edge of Radcliffe town centre
NGR	SD 799071
Area	Approximately four hectares
Known services	A water main is known to run from the main school building out onto Abden Street to the east. A gas main running east from the south east of the site onto Chard Street. High voltage cables are present, located along the north eastern and northern site boundaries.

2.2 Site Features

- 2.2.1 An Encia Engineer completed a walkover survey of the site on 10th May 2005. A photographic record of the site at the time of the site investigation is presented in Appendix C to this report.
- 2.2.2 Existing salient features are summarised in the Table below and shown on Drawing Number 7028/2 presented in Appendix B to this report.

Table 2.2: Summary of Site Features

Feature	Remarks
Current Access	The site can be accessed from School Street to the south, Abden Street to the north east and Lord Street to the north.
Topography	The site is generally level, with ground levels sloping down very gently from north west to south east. Hard surfaced yard areas on the east side of the site step down approximately 0.5m adjacent to the main school building. The Manchester, Bury & Bolton Canal adjacent to the north western boundary of the site is located in a shallow cutting approximately 1.5-2.0m below existing site levels. A topographical survey is included as Drawing No. 7028/5 in Appendix B.
Approximate areas	0.75 ha buildings. 0.75 ha tarmac and concrete hardstand. 2.5 ha grass (gardens and recreational grounds).
Nature of boundaries	West and north - 1.5-2.0m steel palisade fencing with intermittent hedge/trees South and east - Iron railings (1.5m high) and brick/stone pillars.
Surrounding land uses	East - Terraced residential dwellings, with nursing home to south east South - Residential bungalows to south east, bowling green and field to south and small industrial estate to south west. West - Manchester, Bolton and Bury Canal with agricultural land and industrial/residential areas beyond. North - Undeveloped grassland, canal to north with industrial premises beyond. Industrial premises, residential dwellings and nursery to north east.

- 2.2.3 The site can effectively be split into two, with the main school building located in the eastern portion of the site along a several smaller buildings and car parking areas. To the south of the school building is a tarmac covered playground with a small grassed area located in the south eastern part of the site. The entire western portion of the site is occupied by the school playing fields and recreational area, which is covered by turf.

2.3 Site Operations

- 2.3.1 The site is still currently used as a school, although it is not known to possess any environmental licences or consents.

2.4 Japanese Knotweed

- 2.4.1 During the site walkover, we did not notice the presence of any Japanese Knotweed. However, it should be noted that we are not qualified ecologists and as such cannot be guarantee the absence of Knotweed or other invasive vegetation.

3 SITE HISTORY

- 3.1.1 In order to investigate the development history and previous land uses at the site and immediate surrounding land, site centred extracts from Ordnance Survey (OS) plans dating back to 1850 were examined. These plans are presented in Appendix D to this report.
- 3.1.2 The Table below provides a summary of the salient points relating to the history of the site with respect to the proposed end use. It is not the intention of this report to describe in detail all the changes that have occurred on or adjacent to the site. Significant former uses/operations are highlighted in bold text for ease of reference.

Table 3.1: Summary of Site History

Date(s)	Site	Surrounding Land
1850	The site is indicated to have been undeveloped and in agricultural use as part of five fields.	Immediately adjacent land use is shown to have been primarily agricultural to the north, east and south with the Bolton and Bury Canal indicated to the west. A railway line is shown 200m to the south east. The River Irwell is indicated to be present 200m to the south, with two dye works present to the north of the River. Coal pits are shown to have been present 50m to the east and 100m west of the site, with Green Lane Colliery 75m to the west/south west and Black Cat Colliery 300m west.
1893-1894	The majority of the site is indicated to have remained undeveloped, although the south western area is shown to be in use as a cricket ground, with a small pavilion.	To the east of the site the coal pit is no longer shown and development of terraced residential dwellings, a small school and mill are shown. To the south of the site terraced residential dwellings, a bowling green, reservoir , railway sidings and a new colliery (Allen's Green Colliery) . Green Lane Colliery to the south west has been expanded. To the west of the site the Black Cat Colliery is no longer shown, whilst Mills are indicated to have been developed on the far side of the canal to the north west of the site. Further industrial and residential development is indicated on the north side of the canal 100-300m north of the site.

1909-1910	No significant change.	To the east, further infill residential development is indicated, with small areas of allotments. South of the site Allen's Green Colliery is no longer indicated with Green Lane Colliery shown as disused.
1929-1930	The site has been split into a number of smallholdings, some indicated to possess small outbuildings or sheds .	Fill is indicated to have been deposited on land immediately to the north of the site, possibly encroaching slightly across the site boundary. Redevelopment of the industrial premises to the north west is indicated. Land to the south of the site is also shown to have been split into smallholdings, with a small foundry also shown 50m to the south west.
1937	The site is shown to have been redeveloped as a school , with a square school building occupying the central eastern portion of the site and playing fields to the west.	Ground to the north of the site appears to have been levelled. Fewer smallholdings are indicated to the north east and south of the site. To the south of the site, School Lane is shown, whilst the foundry and some buildings associated with Green Lane Colliery are no longer indicated.
1956-1965	Eight small buildings (possibly air raid shelters) are shown close to the northern edge of the site, with a further small building on the east boundary of the site.	Land immediately to the north is shown to have been redeveloped as the Corporation Highway Depot , with residential development and a day nursery to the north west.
1970-1972	Buildings are shown in the north, north west and eastern site areas.	Extensive redevelopment is indicated to the south of the site, with two engineering works indicated.
1980-1987	Further buildings are shown to the south west and north east of the main school building.	New residential development is shown 200m to the north west and north east of the site.
1987-Present	One building to the north west of the main school building is no longer indicated.	A new industrial building is indicated to the north of the site on the 1989 plan. Extensive new residential development and a new school are shown 300m to the west of the site on the 1999 plan.

4 ENVIRONMENTAL SETTING

4.1 General

- 4.1.1 Notes describing how the site's environmental setting has been assessed are included in Appendix A to this report. The responses received from the Coal Authority, Bury MBC, Environment Agency and Landmark Information Group are presented in Appendix D.

Table 4.1: Site Environmental Setting

Issue	Data reviewed	Summary
Geology	1:50,000 BGS map (Sheet 85, Manchester, Solid) 1:63,360 BGS map (Sheet 85 Manchester, Drift)	Drift Strata - Cohesive Glacial Till. Solid Strata - Mudstone, sandstones and coal seams from the Westphalian 'B' formation of Carboniferous age. These strata are indicated to dip at a shallow angle towards the south east. Faults - A north west to south east trending fault is indicated to underlie the central portion of the site. Shallowest Coal Seam - The 'Stonedeilph Mine' is indicated to subcrop the south east corner of the site, whilst a further seam, the 'Top Five Quarters Mine' is indicated to subcrop immediately to the north west of the site, dipping to the south east.
Mining	Coal Authority Report BGS maps	A coal Authority report states that the site is within the likely zone of influence of six seams of coal at 60-430m depth, last worked in 1900 although the Coal Authority suggest the surface movement should now have ceased. The Coal Authority noted that the property is in an area where coal is believed to exist close to the surface, which may have been worked in the past. No shafts or adits are known to be located on the site according to Coal Authority records. The site is not recorded as having been affected by mining induced subsidence. As noted in section 3.1.2 above historical maps show coal pits indicated to have been present 50m east and 100m west of the site, with collieries 75m west and south west and 100m south.
Quarrying	Historical OS Plans	Quarrying is not indicated to have taken place on, or in the immediate vicinity of the site.
Radon	BRE Report BR211	The site is not indicated to be located within a Radon Affected Area or require a geological assessment for radon.
Hydrogeology	Environment Agency Groundwater Vulnerability map (Sheet 10, Central Lancs)	Solid Strata - Minor aquifer with soils of high leaching potential. Drift Strata - Non-aquifer. The site is not indicated to be located within a groundwater source protection zone. No licenced groundwater abstractions have been identified within 1km of the site.
Hydrology	Environment Agency Landmark Report	Nearest Surface Watercourse - the disused Manchester Bolton and Bury Canal immediately to the west. A small pond and three small reservoirs are also located 75m west and 150m south of the site. The River Irwell is located 200m to the south of the site. Water Quality Data - The River Irwell is classified as Grade E (Poor) according to the GQA water quality scheme. Pollution Incidents - Twenty-eight pollution incidents and three substantiated pollution incident register events to controlled watercourses were recorded by the Environment Agency within 1km of the site between 1994 and 2001. None were indicated to relate to the site. Discharge Consents - Sixteen active licensed discharge consents have been identified within 1km of the site. None relate to discharges from the site.
Flood Risk	Environment Agency	The site is not indicated to be at risk of flooding or extreme flooding events according to information from the Environment Agency database.
Land Use Designations	Landmark Report	The site is not indicated to possess any sensitive land use designations. Land immediately to the south west of the site is designated as an area of 'Adopted Green Belt'.

4.2 Landfills

- 4.2.1 Known or suspected areas of licensed waste management facilities in the vicinity of the proposed development site are summarised below:

Table 4.2: Summary of Waste Management Facilities

Location	NGR (proximity to site)	Remarks	Source of data
Cemetery Road, Radcliffe	3780 4079 (630m north)	The DANO Plant is a medium sized waste treatment (pulverisation) facility (licence ref 01012) operated by Greater Manchester Waste Limited. The site also functions as a civic amenity and waste transfer site. The plant appears to have been present since the 1970's, with an adjacent railway cutting infilled since around this date.	Landmark Report
Sion St, Bradbury St, Radcliffe	3781 4068 (220m south east)	Inert site filled with ash and clay from adjacent railway embankments to north of River Irwell. Licence (ref 635/90) issued in March 1991 and surrendered in June 1991 by Bury MBC.	Landmark Report, Bury Metropolitan Borough Council
Freightman Hillock Farm, Radcliffe	3777 4060 (830m south)	Very small inert/non hazardous waste site. Licence (ref 25/76/M2) surrendered in 1978. Deposition of fill commenced from 1950's, until late 1970's. Current land use is woodland/agriculture/public open space.	Landmark Report

- 4.2.2 One other licensed waste management facility has been identified located 500m south of the site. This facility (Nursery Works, Sion Street) is licensed to process end of life vehicles.
- 4.2.3 Historical maps do not indicate infilling on the site. The deposition of a thin layer of fill materials is however indicated on ground immediately to the north of the site in the 1920's and 1930's. The deposition of fill materials is also indicated in the vicinity of the two collieries, 75m to the south west and west of the site in the late 19th and early 20th century, and also in the vicinity of the colliery and associated railway sidings 100m south and south east of the site around the same dates.
- 4.2.4 A further unlicensed landfill site is indicated from historical maps 275m to the south of the site. Deposition of fill on this site commenced from the 1930's until approximately the 1970's. Current land use on this site is public open space.

4.3 Other Issues

- 4.3.1 No sites with authorisations for storage of hazardous substances have been identified within 1km of the site.
- 4.3.2 Two sites with active Local Authority Air Pollution Control (LAPC) authorisations have been identified within 1km of the site. One comprises a petrol filling station 270m to the south east, whilst the other relates to a waste oil burner at a site 30m to the north west, operated by FAM Engineering Ltd.

4.4 Consultations

- 4.4.1 Consultations have been held with The Environmental Services Division of Bury MBC and the Environment Agency.

- 4.4.2 Bury MBC were able to provide information in relation to known landfill sites and authorised processes. This information has been presented in Sections 4.2 and 4.3 above.
- 4.4.3 Bury MBC also confirmed that there are no entries in their records in respect of sites designated as 'contaminated land' on or within 250m of the site. In addition, they also noted that they had no records of nuisance issues or pollution incidents relating to the site on their database for the previous 12 months. The full response from Bury MBC is presented in Appendix D.
- 4.4.4 The full response from the Environment Agency is provided in their 'Complete Property Search Report'. A 'dangerous substances inventory' site is indicated to be located approximately 250m south of the site according to the Environment Agency Report. The exact nature of the dangerous substances is not indicated in the Environment Agency report. Accordingly, further consultation is recommended.

5 GROUND INVESTIGATION DESIGN

5.1 Preliminary Conceptual Site Model

- 5.1.1 The historical plans show that the site was originally in use for agricultural purposes, prior to being utilised for recreational uses and smallholdings. The site was initially developed as a school in the 1930's, with several buildings added in subsequent years. It is thought that some Made Ground may have been deposited on the northern boundary of the site during the 1950's, although the site is not considered likely to be significantly contaminated as a result of previous or existing land uses.
- 5.1.2 Given the proposed residential end use of the site, the following contamination sources, pathways and receptors can be identified as shown in the table below.

Table 5.1: Potential Sources, Pathways & Receptors

Source	Pathway	Receptor
Possible contamination hotspots in soils underlying former and existing school buildings and outbuildings, hardcore surfaced areas and northern edge of site	Ingestion Dermal Contact Ingestion of Home Grown Produce	Construction Workers Future Residents
Possible contamination hotspots (as above).	Leaching Infiltration Surface or subsurface migration	Controlled Waters
Fill underlying adjacent sites immediately to north and 50-100m to south	Gas migration Surface or subsurface migration	Future Residents
Former Coal Workings	Gas migration	Future Residents

- 5.1.3 Potential pollutant linkages are shown on a preliminary conceptual site model, presented as Drawing No 7028/3 in Appendix B to this report.

5.2 Investigation Strategy

- 5.2.1 The preliminary conceptual site model was used as a basis for design of an appropriate ground investigation, the scope of which is summarised below. Careful consideration was given to the preliminary conceptual site model and historical features.

Table 5.2: Initial Ground Investigation Strategy

Exploratory holes	Purpose
WS1-WS12	To determine the general nature of soils underlying the site, including the: Nature, distribution and thickness of any made ground. Nature, degree and extent of any contamination.
BH1-BH6B	To allow in-situ testing of the Made Ground and natural soils present beneath the site and the recovery of soil and groundwater samples for chemical and geotechnical laboratory analysis.
BH1, BH2, BH5, BH6b, WS1, WS4, WS7 and WS12	To install gas/groundwater monitoring wells to establish groundwater levels and hazardous gas concentrations beneath the site.
RBH1-RBH3	To attempt to determine the presence, location and depth of the 'Stonedelph' coal seam (unworked coal, broken ground or voids) indicated to be present sub-cropping the south east corner of the site and also to check for the presence of any other unrecorded coal seams or mine workings.
RBH4-RBH6	To attempt to determine the presence, location and depth of the 'Top Five Quarters Mine' coal seam (unworked coal, broken ground or voids) indicated to be underlying the north west edge of the site at shallow to moderate depths and also to check for the presence of any other unrecorded coal seams or mine workings.

5.2.2 As the site has never been developed for industrial purposes, an assessment of potential contaminants (with reference to CLR8) could not be undertaken for the site. As such, soil samples recovered from the ground investigation were scheduled for a general suite of determinands as described in Section 8 of this report.

6 FIELDWORK

6.1 Scope of Works

6.1.1 Fieldwork was supervised by Encia between 31st May 2005 and 16th June 2005 and comprised the exploratory holes listed below.

Table 6.1 Scope of Ground Investigation Works

Technique	Exploratory holes	Final depth(s)	Remarks
Window Sample boreholes	WS1 to WS12	3.5m to 4m	To recover soil samples for chemical analysis and assess ground conditions. Monitoring wells installed in WS1, WS4, WS7 & WS12.
Cable percussive boreholes	BH1 to BH6	0.7m to 17.0m	SPTs typically at 1.0 m centres. Monitoring wells installed in BH1, BH2, BH5 & BH6b. BH6 and BH6a terminated at 0.7m due to obstructions.
Rotary open-hole probeholes	RBH1 to RBH6	30m to 40m	To investigate the presence/absence of shallow mine workings beneath the site.

6.1.2 Notes describing ground investigation techniques, in-situ testing and sampling are included in Appendix A to this report.

6.1.3 The locations of all exploratory holes drilled at the site are presented on Drawing No. 7028/4 in Appendix B.

6.1.4 Exploratory hole logs are presented in Appendix E to this Report. These logs include details of the following:

- Samples taken.
- Descriptions of the solid strata, and any groundwater encountered.
- Results of the in-situ testing.
- The monitoring wells installed.

6.1.5 A total of eight exploratory holes (BH1, BH2, BH5, BH6b, WS1, WS4 WS7 and WS12) were installed with combined gas/groundwater monitoring standpipes. An initial programme of six weekly monitoring visits is planned for the site. Results from the monitoring carried out to date are presented in Appendix H.

7 GROUND CONDITIONS

7.1 General

7.1.1 A complete record of the strata encountered beneath the proposed development site is given on the various exploratory hole records, presented in Appendix E. However, a summary of the ground conditions is provided below.

7.2 Topsoil

7.2.1 Natural topsoil deposits were encountered in five exploratory holes (WS2, BH1, BH3, BH4 and BH5) to depths ranging from 0.25m (BH1) to 0.7m (BH3). The natural topsoil typically comprised slightly gravelly clay with vegetation rootlets.

7.3 Hardstanding

7.3.1 Approximately 0.05m of tarmac hardstanding was encountered in three exploratory holes (WS1, WS3 and WS4). The tarmac was located across car parking and playground areas surrounding the school buildings in the eastern area of the site.

7.4 Made Ground

7.4.1 Made Ground deposits were identified in the majority of the exploratory holes to depths ranging from 0.35m in WS11 to 2.5m in WS8. In general however, the Made Ground was found to be less than 1.0m deep across the majority of the central and eastern parts of the site, with pockets of deeper fill encountered in the western and south eastern areas.

7.4.2 The Made Ground deposits beneath the playground and car parking areas generally comprised a fine to coarse gravel of ash, sandstone, brick and glass with occasional pockets of sandy clay. In landscaped areas around the school and the playing field in the western portion of the site, the Made Ground consisted of gravelly clay topsoil with fragments of brick, porcelain, glass and ash, overlying fine to coarse gravel of clinker, coke, and brick.

7.4.3 It should be noted that BH6 and BH6a were terminated at approximately 0.7m depth due to an obstruction.

7.5 Natural Ground

7.5.1 Natural ground was encountered beneath the site in all exploratory hole positions (except for BH6 and BH6a). The natural drift strata generally comprised soft brown sandy clay (interpreted as cohesive alluvium) overlying saturated loose to medium dense sand with gravels and bands of clay (granular alluvium). Stiff to very stiff cohesive Glacial Till was encountered at depths ranging from 3.2m (WS3) to 7.50m (BH1), underlying the granular drift deposits.

- 7.5.2 Peat was identified in BH5 and RBH5 at depths between 1.50m and 2.80m.
- 7.5.3 Solid strata were encountered in six rotary boreholes (RBH1 to RBH6) at depths ranging from 10.8m (RBH1) to 19.0m (RBH2) and comprised grey mudstone (Coal Measures) with bands of hard siltstone. Coal was identified in three rotary boreholes at depths of 24.0m (RBH3 and RBH4) and 31.70m (RBH2).
- 7.5.4 The in-situ relative density of the cohesive and granular deposits underlying site was established by carrying out 'Standard Penetration Tests' (SPTs) during the drilling of the cable percussive boreholes. The SPT results are shown on the exploratory hole logs presented in Appendix E.
- 7.5.5 SPTs carried out within the shallow natural cohesive deposits present in BH2, BH3 and BH5 at depths ranging from approximately 1.0m to 4.0m recorded N-values ranging from 2 in BH5 at 3.80m to 8 in BH2 at 1.20m indicating these soils to be in a soft condition.
- 7.5.6 SPTs carried out within the cohesive Glacial Till, encountered at greater depths (3.2m to 7.5m) recorded N-values ranging from 26 in BH2 at 7.5m to 80 in BH3 at 10.0m indicating these soils to be in a stiff to very stiff condition.
- 7.5.7 SPTs carried out in the natural granular deposits beneath the site recorded N-values ranging from 4 in BH1 and BH4 at 2.0m to 21 at 6.0m in BH1 indicating these deposits to be in loose to medium dense condition.

7.6 Visual & Olfactory Evidence of Organic Contamination

- 7.6.1 No visual or olfactory evidence of organic contamination was noted during the site investigation.

7.7 Groundwater

- 7.7.1 Groundwater was encountered in eight window sample holes and five cable percussive boreholes during drilling at depths ranging from 1.0m (WS9) to 8.10m (BH6b). Deeper groundwater strikes were recorded in four of the rotary boreholes at depths between 17.0m (RBH4) and 29.0m (RBH2).
- 7.7.2 Groundwater levels recorded in the installations during the subsequent groundwater-monitoring programme are summarised below:

**Table 7.1: Summary of Recorded Groundwater Levels
(8th June 2005 to 29th June 2005)**

Exploratory Location	Approximate Borehole Elevation (AOD)	Response Zone (depth range)	Typical standing water level (m bgl)	Maximum Elevation of Groundwater (AOD)
BH1	79.00	1.0m to 10.0m	1.81 to 1.89	77.19
BH2	77.80	1.0m to 10.0m	2.43 to 2.60	75.37
BH5	78.50	1.0m to 10.0m	2.58 to 2.81	75.92
BH6b	78.20	1.0m to 10.0m	0.53 to 1.49	77.67
WS1	77.90	0.5m to 3.5m	1.35	76.55
WS4	77.50	0.5m to 3.0m	1.33 to 1.47	76.17
WS7	78.05	0.5m to 3.0m	0.90 to 1.35	77.15
WS12	78.10	1.0m to 3.0m	0.88 to 1.09	77.20

- 7.7.3 An Encia engineer visited the site on 8th June 2005 to obtain water samples from the groundwater monitoring wells.

- 7.7.4 In order to obtain a representative groundwater sample, it is generally considered necessary to purge each well by removing three times the volume of water standing within the HDPE well. Purging was undertaken wherever recharge rate allowed. Where recharge was slow the wells were emptied and sampled at the end of the day.
- 7.7.5 Purging of monitoring wells was carried out using a 39mm or 19mm disposable bailer.
- 7.7.6 The water samples obtained were labelled and placed in cool boxes and despatched to a UKAS/MCerts accredited laboratory.

7.8 Mining Investigation

- 7.8.1 Six rotary boreholes (RBH1 to RBH6) were drilled to depths ranging from 30m (RBH1 and RBH3) to 40m (RBH2) to determine whether the site is underlain by unrecorded shallow mine workings. The strata encountered are summarised below:

Table 7.2: Summary of Strata Encountered by Rotary Drilling

Borehole No.	Depth to Rockhead (m)	Depth to Coal (m)	Thickness of Coal (mm)	Remarks
RBH1	10.8	Not encountered	-	Full flush recovery - No Voids
RBH2	19.0	20.00 30.70	600 600	Full flush recovery - No Voids
RBH3	15.0	24.00	2000	Full flush recovery - No Voids
RBH4	15.5	24.00 25.00	500 1100	Full flush recovery - No Voids
RBH5	15.7	Not encountered	-	Full flush recovery - No Voids
RBH6	17.5	Not encountered	-	Full flush recovery - No Voids

- 7.8.2 The published geology of the site indicates that mudstone, sandstones and coal seams from the Westphalian 'B' formation of Carboniferous age underlie the site (Sheet 85, Manchester, 1:50,000). The 'Stonedelph Mine' is indicated to subcrop the south east corner of the site, whilst the 'Top Five Quarters Mine' is indicated to subcrop immediately to the north west of the site, dipping towards the south east.
- 7.8.3 Six rotary boreholes were drilled to a maximum depth of 40m and encountered solid strata comprising grey mudstone (Coal Measures) with bands of hard siltstone. Coal was encountered in RBH2, RBH3 and RBH4 between 20.00m and 30.70m, although no loss of air flush was recorded in any of the rotary borehole positions, suggesting the absence of any voids or broken ground that could be interpreted as abandoned coal workings. Based on these findings we consider the risk from abandoned shallow coal mine workings to be low.

8 CONTAMINATION ANALYSIS

8.1 General

- 8.1.1 Notes outlining current guidance with respect to the interpretation of analytical data are included in Appendix A to this report.

Soils Analysis

- 8.1.2 Testing was undertaken on a total of twenty soil samples from varying depths within the Made Ground and natural deposits.
- 8.1.3 Fifteen samples of Made Ground and three samples of natural ground were analysed at a UKAS/MCerts accredited laboratory for a "standard" suite comprising:

pH, water soluble boron, and total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc)

- 8.1.4 Additional chemical analysis was also carried out on a number of samples for the following determinands:

Phenols, sulphide, sulphur, cyanide, water-soluble sulphate, chloride, nitrate, magnesium, speciated polycyclic-aromatic hydrocarbons (PAH), and asbestos screening.

- 8.1.5 Leachability testing (in accordance with NRA leachate test protocols) was carried out on eight soil samples to determine the mobility of contaminants present. The samples were tested for:

pH, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, boron, chloride, sulphate, sulphide, phenols and PAH.

- 8.1.6 As no evidence of organic contamination was noted during the ground investigation, no targeted hydrocarbon analysis was undertaken.

Waters Analysis

- 8.1.7 In addition to the chemical analysis carried out on soils, outlined above, seven groundwater samples, recovered on the first monitoring visit (8th June 2005) from BH1, BH2, BH5, BH6, WS4, WS7 and WS12 were submitted for following analysis:

pH, metals, chloride, sulphate, cyanide, phenols, PAH and speciated TPH along with ammoniacal nitrogen, biological oxygen demand and chemical oxygen demand.

8.2 Soil/Fill Contamination Results

- 8.2.1 A summary of the soil/fill contamination test results are summarised in Table 8.3 on page 16 of this report with the analytical certificates as received from the laboratory presented in Appendix F to this report.

Inorganic Contaminants

- 8.2.2 Statistical analysis of the Made Ground strata chemical test results has been carried out in accordance with the methods outlined in DEFRA/Environment Agency R&D publication CLR7 (2002). The results are summarised in Table 8.1 below with all Soil Guidance Value (SGV) working spreadsheets presented in Appendix F.

Table: 8.1 Summary of Soil Contamination based on CLEA SGV's for Residential Dwellings with Plant Uptake – Made Ground

Determinand	SGV Trigger Level (mg/kg)	Minimum Recorded (mg/kg)	Maximum Recorded (mg/kg)	US ₉₅ Value (mg/kg)	No. Samples Tested	US ₉₅ Value Exceeds SGV? (Y/N)
Arsenic	20	1	62	23.10	15	Y
Cadmium	1	1	5	1.40	15	Y
Chromium	130	14	78	41.26	15	N
Lead	450	19	1403	138* ¹	15	N
Mercury	8	1	1	1	15	N
Selenium	35	3	3	3	15	N
Nickel	50	6	70	42.62	15	N

*¹ Calculated as an arithmetic mean only

- 8.2.3 Five elevated concentrations of arsenic were identified in the Made Ground deposits in WS6 to WS10 at depths ranging from 0.1m (WS10) to 1.6m (WS8). The maximum concentration recorded was 62mg/kg, although this was found to lie within the normal distribution of sample results. However, the upper 95th percentile concentration (US₉₅) was found to be 23.10mg/kg compared to the CLEA SGV of 20mg/kg.
- 8.2.4 Two other soil samples recovered from the natural clay topsoil in BH5 and WS2 at depths of 0.6m and 0.1m respectively, also recorded individual concentrations of arsenic above the CLEA SGV of 20mg/kg. The concentrations recorded were found to be 28mg/kg in BH5 and 99mg/kg in WS2. Additionally, one elevated concentration of chromium was also recorded in the natural topsoil deposits in WS2 at 0.1m. The concentration recorded was 172mg/kg compared to the SGV of 130mg/kg.
- 8.2.5 As only three soil samples recovered from the natural strata were analysed, no statistical analysis has been undertaken on these samples. As such, the contaminated natural deposits identified in BH5 and WS2 will be treated as contamination 'hotspots'.
- 8.2.6 One highly elevated lead concentration was recorded in WS8 at 1.6m. The concentration recorded was 1403mg/kg. The arithmetic mean of lead concentrations in the Made Ground was however found to be below the Tier 1 SGV of 450mg/kg indicating that, lead contamination is not widespread. The elevated sample result encountered in WS8 was found to be a statistical outlier and should be regarded as a contamination 'hotspot'.
- 8.2.7 Two slightly elevated concentrations of cadmium were identified in the shallow Made Ground deposits of WS10 and WS12 at 0.1m depth. The concentrations recorded were found to be 5mg/kg and 3mg/kg respectively. The elevated sample result recorded in WS10 was found to be a statistical outlier.
- 8.2.8 The upper 95th percentile concentration (US₉₅) for cadmium was found to be 1.40mg/kg compared to the SGV of 1mg/kg indicating that slight cadmium contamination exists within the Made Ground soils across the site.
- 8.2.9 Although individual concentrations of nickel have been detected in excess of the Tier 1 threshold concentration of 50mg/kg, statistical analysis indicates that these concentrations are not statistical outliers, and are therefore representative of the normal distribution of results. The US₉₅ concentration for nickel of 42.62mg/kg is below the Tier 1 threshold concentration.

- 8.2.10 No other determinands for which CLEA SGV's have been published were found to exceed their respective target guidance values.
- 8.2.11 The table below presents a summary of the chemical test results for soils (organic and inorganic) where DEFRA/Environment Agency has not published Soil Guidance Values (SGV's).

Table 8.2: Summary of Soil Contamination for Inorganic and Organic Determinands

Determinand	Tier 1 Threshold Criteria (mg/kg)	Minimum Recorded (mg/kg)	Maximum Recorded (mg/kg)	No. of Samples Tested	No. of samples exceeding Tier 1 Threshold Criteria
Copper	135 ^{*1}	1	1194	18	3
Zinc	300 ^{*1}	45	2227	18	4
Total Sulphate	2,400 ^{*2}	533	3366	18	1
PAH (Total)	40 ^{*3}	0.97	131	14	3
Benzo(a)pyrene	0.38 ^{*4}	0.05	9.70	14	9

^{*1} MAFF Code of Good Agricultural Practice for the Protection of Soil 1993 (Appendix II)

^{*2} BRE Special Digest 1.

^{*3} Dutch Intervention Value (Dutch Ministry of Housing, Spatial Planning and Environment, 1994)

^{*4} Encia Risk based screening level derived through BP Risk software model amended to CLEA 2002.

- 8.2.12 Phytotoxic chemicals (copper and zinc) have been measured against a concentration considered to present a risk to plant growth based on the MAFF Code of Good Agricultural Practice for the Protection of Soil, 1993 (Appendix II) with total sulphate measured against concentrations given in BRE Special Digest 1.
- 8.2.13 Three elevated concentrations of copper have been recorded in WS7, WS8 and WS9 at depths ranging from 0.15m (WS9) to 1.6m (WS8). The maximum concentration recorded was 1194mg/kg in WS8, compared to the threshold trigger concentration of 135mg/kg.
- 8.2.14 Four elevated zinc concentrations have been identified in the shallow natural and Made Ground soils in WS2, WS10 and WS12 at depths ranging from 0.1m to 0.8m. The maximum concentration recorded was 2227mg/kg in WS2 at 0.1m compared against the threshold trigger concentration of 300mg/kg.
- 8.2.15 Two elevated concentration of total sulphate have been recorded in the shallow Made Ground deposits of WS3 at 0.3m and WS10 at 0.8m. The maximum concentration was found to be 3366mg/kg (WS3) compared to the target threshold concentration of 2400mg/kg.
- 8.2.16 It should be noted that copper, zinc and total sulphate are 'phytotoxic' elements (those which impair plant growth) and are not considered a risk to human health in the concentrations recorded.
- Organic Contaminants**
- 8.2.17 Organic contaminants have been assessed against available international guidance, notably the risk based Dutch Intervention Values (DIV), and/or concentrations considered to present significant contamination based on our professional judgement.
- 8.2.18 Two soil samples recovered from the natural topsoil deposits in WS2 and the shallow Made Ground soils in WS7 at 0.1m respectively, returned elevated concentrations of total polycyclic aromatic hydrocarbons (PAH). The maximum concentrations varied from 52mg/kg in WS7 to 131mg/kg in WS2 compared to

the threshold trigger concentration of 40mg/kg.

- 8.2.19 A total of nine soil samples, of fourteen tested, exhibited elevated concentrations of the PAH compound benzo(a)pyrene. The concentrations ranged from 0.41mg/kg to 9.70mg/kg compared to Encia's risk based target threshold value of 0.38mg/kg.

Leachability Testing

- 8.2.20 A summary of leachable contamination is presented in Table 8.4 on page 17 of this report.
- 8.2.21 Due to the close proximity of the disused Manchester Bolton and Bury Canal and numerous small pond and reservoirs, concentrations of leachable determinands have been assessed, where possible, against the Environmental Quality Standards (EQS) for freshwater. For determinands where no EQS trigger concentrations are published, reference has been made to the Water Supply (Water Quality) Regulations 1989 as amended.
- 8.2.22 Two slightly elevated concentrations of leachable copper have been identified in WS1 and WS3 at 0.1m to 0.4m depth. The maximum concentration recorded was found to be 64ug/l compared to the threshold value of 28ug/l.
- 8.2.23 Three slightly elevated leachable PAH concentrations were recorded in WS1, WS4 and WS7 at depths ranging from 0.1m to 1.2m. The concentrations recorded varied from 0.59ug/l to 5.1ug/l compared to the threshold concentration of 0.1ug/l.

Groundwater Contamination

- 8.2.24 Ground water contamination results are summarised in Table 8.5 on page 18 of this report.
- 8.2.25 Seven groundwater samples submitted for chemical analysis from BH1, BH2, BH5, BH6, WS4, WS7 and WS12 showed little contamination of the groundwater beneath the site.
- 8.2.26 Chemical Oxygen Demand (COD) was found to be slightly elevated in all groundwater samples, with concentrations ranging from 256mg/l to 14200mg/l. It is considered that these concentrations could potentially be attributed to the presence of oxidising inorganic compounds derived from the underlying Coal Measures strata.
- 8.2.27 When compared against the Water Supply (Water Quality) Regulations, four groundwater samples returned slightly elevated concentrations of ammoniacal nitrogen. It is considered that this is representative of the general background concentrations for an urban area such as this.
- 8.2.28 Two slightly elevated concentrations of PAH were recorded in groundwater samples recovered from WS4 and WS7. The concentrations were 3.3ug/l in WS4 and 1.6ug/l in WS7 compared to the threshold concentration of 0.1ug/l.
- 8.2.29 No other elevated concentrations of inorganic or organic contaminants were identified in the groundwater chemical analysis.

Table 8.3: Summary of Ground Contamination at Radcliffe High (West Campus)

Contaminant Concentrations in mg/kg unless otherwise stated.																
Trigger Level Concentrations are Shown In Brackets and assume a residential end use with gardens.																
Sample Location & Depth (m)	Material	pH*	As (20)*	Cd (1)*	Cr (130)*	Pb (450)*	Hg (8)*	Se (35)*	B (3)*	Cu *x	Ni (50)*	Zn *x	CN (20)*	Total SO ₄ (2,400) ₀	Total PAH (40) ₀	Benzo(a)pyrene (0.38) +
BH5/0.6	Clay Topsoil	4.70	28	-	-	-	-	-	-	-	-	-	-	-	-	-
WS1/0.1	Made Ground	11.47	-	-	-	-	-	-	-	-	-	-	-	-	-	0.41
WS1/0.8	Sandy Clay	7.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS2/0.1	Clay Topsoil	5.14	99	-	172	-	-	-	-	-	78	2227	-	-	131	9.70
WS3/0.3	Made Ground	11.82	-	-	-	-	-	-	-	-	-	-	-	3366	-	1.46
WS4/0.6	Made Ground	7.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS5/0.2	Made Ground	5.23	-	-	-	-	-	-	-	-	-	-	-	-	-	2.17
WS5/0.7	Made Ground	5.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS6/0.2	Made Ground	4.85	22	-	-	-	-	-	-	-	-	-	-	-	-	1.18
WS7/0.1	Made Ground	6.11	-	-	-	-	-	-	-	-	-	-	-	-	52	4.07
WS7/0.8	Made Ground	6.55	62	-	-	-	-	-	-	609	70	-	-	-	-	-
WS8/0.7	Made Ground	5.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS8/1.6	Made Ground	5.94	27	-	-	1403	-	-	-	1194	62	-	-	-	-	2.73
WS9/0.15	Made Ground	5.25	25	-	-	-	-	-	-	151	-	-	-	-	-	-
WS10/0.1	Made Ground	6.34	-	5	-	-	-	-	-	-	55	1598	-	-	-	2.18
WS10/0.8	Made Ground	6.52	-	-	-	-	-	-	-	-	-	355	-	2443	-	-
WS11/0.4	Clay Topsoil	6.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS12/0.1	Made Ground	7.54	-	3	-	-	-	-	-	-	56	1218	-	-	-	2.12

Key		Source of Guidance Trigger Level
-	Parameter tested for but not found to be in excess of threshold concentration	* ICRCL Guidance Note 59/83, Second Edition (1987) - (Boron Phytotoxic only)
	Parameter not tested for	\$ DEFRA and the EA Contaminated Land Exposure Assessment (CLEA) - March '02
#	All pH results listed to confirm which soil guideline values are to be used in CLEA assessment	° Dutch Intervention Levels
♦	Tier 1 Value is pH dependent	◇ BRE Special Digest 1, Concrete in Aggressive Ground (2001)
+	Concentration derived through Endia risk assessment	x MAFF - The Soil Code (Rev. 1998)
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		Endia Consulting Limited

Table 3.4: Summary of the Leachability Testing on samples from Radcliffe High (West Campus)

Sample Location & Depth (m)	Material	Contaminant Concentration in µg/litre Unless Otherwise Shown											
		pH	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Se	B	Total PAH
			(50)*	(5)*	(250)*	(28)*	(250)*	(1)*	(200)*	(500)*	(10)+	(2000)*	0.1+
BH5/0.6	Clay Topsoil	6.53	-	-	-	-	-	-	-	-	-	-	-
WS1/0.1	Made Ground	11.10	-	-	-	52	-	-	-	-	-	0.59	-
WS3/0.3	Made Ground	11.04	-	-	-	64	-	-	-	-	-	-	-
WS4/0.6	Made Ground	7.94	-	-	-	-	-	-	-	-	-	5.1	-
WS7/0.8	Made Ground	7.10	-	-	-	-	-	-	-	-	-	2.0	-
WS8/0.7	Made Ground	6.83	-	-	-	-	-	-	-	-	-	-	-
WS10/0.8	Made Ground	7.62	-	-	-	-	-	-	-	-	-	-	-
WS12/0.1	Made Ground	8.27	-	-	-	-	-	-	-	-	-	-	-

Key

	Source of Guidance Trigger Level
	Environmental Quality Standards (EQS)
-	Parameter tested for but found not to be in excess of relevant trigger level concentration
	Parameter not tested for
	Water Supply (Water Quality) Regulations 1989, as amended in 2000

8.5: Summary of Groundwater Contamination at Radcliffe High (West Campus)

Sample Location	Inorganic Contaminant Concentrations in µg/l unless otherwise stated. Trigger Level Concentrations are Shown in Brackets										
	pH	As	B	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Se
		(50)*	(2000)*	(5)*	(250)*	(28)*	(250)*	(1)*	(200)*	(500)*	(10)+
BH1	6.72	-	-	-	-	-	-	-	-	-	-
BH2	7.26	-	-	-	-	-	-	-	-	-	-
BH5	6.88	-	-	-	-	-	-	-	-	-	-
BH6	7.63	-	-	-	-	-	-	-	-	-	-
WS4	7.35	-	-	-	-	-	-	-	-	-	-
WS7	8.43	-	-	-	-	-	-	-	-	-	-
WS12	6.46	-	-	-	-	-	-	-	-	-	-

Sample Location	Contaminant Concentrations in µg/l unless otherwise stated. Trigger Level Concentrations are Shown in Brackets								
	Benzene	Toluene	Ethyl Benzene	Xylenes	Phenols	PAH	TPH - C ₆ to C ₄₀		
	(1) *	(1,000) #	(150) #	(70) #	(0.5) +	(0.1) +	GRO C ₆ to C ₁₀ (1) ϕ +	DRO C ₁₀ to C ₂₀ (600) #	LRO C ₂₀ to C ₄₀ (600) #
BH1	6.72				-	-			
BH2	7.26	-	-	-	-	-	-	-	-
BH5	6.88				-	-			
BH6	7.63	-	-	-	-	-	-	-	-
WS4	7.35				-	3.34			
WS7	8.43				-	1.68			
WS12	6.46				-	-			

Key		Source of Guidance Trigger Level	
-	Parameter tested for but found not to be in excess of relevant trigger level concentration	*	Environmental Quality Standards (EQS)
	Parameter not tested for	#	Dutch E-3.c Intervention Level for Soil Remediation (1994)
< LoD	Parameter concentration is below limit of detection (which is greater than trigger concentration)	##	Dutch E-3.c Intervention Level for mineral oil (1994)
+	Water Supply (Water Quality) Regulations 1989, as amended in 2000	◇	Conservative value - assumes all C ₆ to C ₁₀ is benzene

9 CONTAMINATION (QUALITATIVE RISK ASSESSMENT & REMEDIATION)

9.1 Environmental Setting & End Use

- 9.1.1 The laboratory analytical results indicate that contamination exists in the Made Ground and natural drift strata beneath the site. The identified contaminants include elevated concentrations of arsenic, cadmium, lead, phytotoxins (copper, zinc and total sulphate), PAH and benzo(a)pyrene. In addition, slightly elevated levels of leachable copper and PAH were also recorded.
- 9.1.2 In order to assess the significance of this contamination, consideration must be given to the site's environmental setting and the proposed end use.
- 9.1.3 The underlying solid strata (Coal Measures) are classified as a minor aquifer. The nearest surface watercourse is the disused Manchester Bolton and Bury Canal located immediately to the west of the site. A number of small ponds and reservoirs are also situated approximately 75m to the east and 150m south of the site, with the River Irwell located 300m to the south. Therefore, in terms of groundwater risk, the site's environmental setting is considered to be of low to moderate sensitivity.
- 9.1.4 With respect to human health, the proposed residential end use is considered sensitive. Transient risks to construction workers can be addressed by the adoption of appropriate health and safety measures.
- 9.1.5 A conceptual ground model showing contamination sources and potential pollutant linkages to receptors is summarised on Drawing No 7028/3 in Appendix B.

9.2 Pollutant Linkages

- 9.2.1 In terms of the proposed redevelopment of the site, plausible pollutant linkages can be summarised as follows:

Sources

- 9.2.2 Made Ground of varying depths (0.35m to 2.5m) underlies the majority of the site and has been proven through chemical analysis to contain elevated concentrations of inorganic and organic determinands which would generally be considered unsuitable as a near-surface material in landscaped and/or garden areas.
- 9.2.3 Leachability analysis identified two slightly elevated concentrations of copper concentrations and three elevated PAH concentrations.
- 9.2.4 Groundwater testing also revealed two slightly elevated concentrations of PAH.
- 9.2.5 Visual and olfactory evidence of hydrocarbon contamination was not identified in any of the exploratory holes.

Pathways

- 9.2.6 Potential contaminant pathways include:
- ingestion
 - dermal contact
 - inhalation of contaminated particulates
 - surface water run-off, including existing drainage infrastructure
 - downward infiltration of leachable/mobile contaminants to groundwater

- lateral migration of contamination in groundwater off site towards nearby watercourses or other receptors.

Receptors

9.2.7 Potential contaminant receptors include:

- the environment – minor aquifer and/or nearby surface watercourses
- site workers and end users of the site (residents)

9.2.8 Consequently, it can be concluded that there are plausible pathways between actual contaminant sources and potential receptors. Consequently, some remedial action will be required, either treatment/removal of the source, or elimination of the pathway.

9.3 Potential Remedial Options

General

9.3.1 The Made Ground and natural deposits present beneath the site have been proven through chemical analyses to contain elevated concentrations of both organic and inorganic contamination. The contaminants identified are summarised below:

- Elevated arsenic and cadmium US₉₅ concentrations above their respective SGV in Made Ground deposits.
- Arsenic and chromium 'hotspots' in natural topsoil deposits of WS2 and BH6.
- One lead 'hotspot' in the Made Ground deposits of WS8 at 1.6m.
- Elevated phytotoxic contaminants in shallow natural and Made Ground deposits.
- Elevated PAH and benzo(a)pyrene contamination.
- Elevated leachable copper and PAH.
- Slightly elevated PAH in two groundwater samples.

9.3.2 Recommendations provided in the following sections should be approved with the appropriate regulatory authorities prior to commencement of site redevelopment.

Inorganic and Organic Contamination

9.3.3 Due to the presence of widespread elevated inorganic and organic contamination within the Made Ground soils across the site and localised contamination within the shallow topsoil deposits of WS2 and BH6, it is recommended that a 600mm thick surface cover of "clean" soil comprising 450mm subsoil and 150mm topsoil be provided in all proposed 'soft' end use areas (i.e. gardens and landscaped areas). This cover will break potential pollutant linkages between the underlying contaminated fill and future end-users.

9.3.4 This cover thickness is in line with current UK guidance provided in the recent publication *Cover Systems for Land Regeneration*. This document, published by the Building Research Establishment (BRE) in 2004, concluded: "any disturbance or intermixing of soils is unlikely to exceed 600mm depth".

9.3.5 As an alternative to the above and depending on final site levels, the Made Ground types are considered suitable for redistribution beneath concrete oversite or areas of hardstanding, where they would be satisfactorily isolated from end users.

- 9.3.6 It is considered that the topsoil currently present in the western and northern portions of the site is not suitable for re-use within garden or landscaped areas of the proposed residential development.

Waste Classification

- 9.3.7 Disposal of the Made Ground off site is not considered appropriate, economically viable, nor in line with current Government philosophy regarding sustainable development. However, some excess arisings may be generated by excavations for foundations, sewers etc.
- 9.3.8 In the context of waste soils generated by remediation and/or groundworks activities on brownfield sites, the following definitions (from the Landfill Regulations 2002) apply:
- Inert (e.g. uncontaminated 'natural' soil, bricks, concrete, tiles & ceramics).
 - Non-Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances, but at concentrations below prescribed thresholds).
 - Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances at concentrations above prescribed thresholds).
- 9.3.9 Dangerous substances include compounds containing a variety of determinants commonly found in contaminated soils on brownfield sites, for example arsenic, lead, chromium, benzene etc.
- 9.3.10 Soil arisings generated by excavations at this site are likely to be classified as non-hazardous.

Leachable Contamination

- 9.3.11 It is considered that the elevated leachable copper and PAH contamination identified in Made Ground deposits of WS1, WS3, WS4 and WS7 is unlikely to impact on the underlying minor aquifer or nearby surface watercourses due to the presence of low permeability clay (cohesive Glacial Till) deposits underlying the site. These deposits will naturally attenuate any downward migration of mobile contaminants. Additionally, due to the nature of the proposed development, positive drainage will greatly reduce surface water infiltration, further reducing downward migration of the mobile contaminants identified.

Groundwater/Surface Water

- 9.3.12 Two slightly elevated concentrations of PAH contamination were recorded in water samples taken from WS4 and WS7. In view of the site's environmental setting the identified groundwater contamination is not considered significant. There are no licensed abstraction points within a 1km radius, and the site is located above a minor aquifer.

9.4 Summary of Potential Pollutant Linkages & Mitigation

9.4.1 In terms of the proposed redevelopment plausible pollutant linkages, and feasible remediation options, are summarised in the Table below:

Table 9.1: Summary of Pollutant Linkages & Remediation Options

Receptors	Pathways	Contaminants	Remediation Options
Human Health (Future residents) ◊	Consumption of contaminated vegetables	Inorganic and organic contamination in the Made Ground and natural topsoil deposits	600mm clean cover for garden areas.
	Ingestion		
	Inhalation (dust and/or vapours)		
	Dermal contact		
	Infiltration of water supply pipes	Halogenated aliphatics & aromatics, Sulphate in the Made Ground	Liason with Water Supply company and possible use of resistant supply pipes.
	Contact with "aggressive" soil and/or groundwater	Sulphate in the Made Ground	Use of sulphate resistant concrete and building materials.
Plants	Uptake of phytotoxic elements	Elevated copper, zinc and total sulphate in the Made Ground	600mm clean cover for garden areas
Groundwater	Migration of leachable components	Inorganic and organic contamination in the Made Ground and natural topsoil deposits	Presence of low permeability clay deposits beneath site. Nature of development reducing rainwater infiltration. Low environmental sensitivity
	Surface water runoff		

◊ Transient risks to construction workers will be addressed by the adoption of appropriate health and safety measures in accordance with the Health and Safety at Work Act 1974 and regulations made under the Act including for example the COSHH Regulations.

10 HAZARDOUS GAS

10.1 General

10.1.1 A number of potential sources of ground gas have been identified at the site including the following:

- Widespread Made Ground deposits across the site.
- Localised peat deposits in the area of BH5 and RBH5 (north western site area).
- Potential mines gas issues relating to nearby shallow coal workings.

10.1.2 A total of eight gas-monitoring wells have been installed in the boreholes and window sample holes across the site. Details of the installations are given on the exploratory hole logs presented in Appendix E to this report.

10.2 Scope Of Works

10.2.1 To date, the wells have been monitored on four occasions for groundwater levels and soils-gases. A further two visits are proposed over the next two weeks, the results of which will be presented as an addendum to this report, issued at a later date.

10.2.2 A standard gas monitoring procedure has been followed, details of which are provided in Appendix A.

10.3 Monitoring Results & Site Characterisation

- 10.3.1 Generic Notes outlining how monitoring results are interpreted in order to characterise the soil-gas regime at the site are presented in Appendix A. These notes outline the derivation of 6 Characteristic Situations by CIRIA, and subsequent revisions proposed by Wilson & Card (1999) as shown in the Table below.

Table 10.1: Site Classification (Wilson & Card, 1999)

Characteristic Situation (Wilson & Card, 1999)	Limiting borehole gas volume flow of CH ₄ or CO ₂ (l/hr)	Additional limiting factors
1	<0.07	Methane not to exceed 1% v/v and carbon dioxide not to exceed 5% v/v
2	<0.7	Borehole air flow rate not to exceed 70 litre/hr otherwise increase to Characteristic Situation 3
3	<3.5	
4	<15	
5	<70	Quantitative Risk Assessment required to evaluate scope of protection measures. *
6	>70	

Notes:

Borehole flow rate = volume of gas (regardless of composition) which is escaping from well.

Borehole gas volume flow (litre/hour) = gas concentration (%) / 100 × borehole flow rate (l/hr)

To facilitate design implementation, the limiting values for both methane and carbon dioxide are identical.

- 10.3.2 It should be noted that, to date, only four of the proposed six gas monitoring visits have been conducted to date, and therefore the conclusions and recommendations provided in the following sections may be subject to change.
- 10.3.3 In order to facilitate design and in accordance with the DETR approach, a default value of 0.1 litres/hour has been used in the absence of any recorded flows i.e. the limit of detection of the flow rate equipment.
- 10.3.4 The results of the monitoring completed to date are presented in Appendix H and are summarised below.

Table 10.2: Summary of Gas Monitoring Results

Well	Range of Methane Concentrations (Steady) (% v/v)	Range of Carbon Dioxide Concentrations (Steady) (%)	Range of Positive Flow Rates (litre/hour)	Maximum borehole gas volume flow of CH ₄ or CO ₂ (l/hr)	Characteristic Situation (Wilson and Card)
BH1	N/D	0.0 to 0.2	N/D	0.1	1
BH2	N/D	0.1 to 0.2	N/D	0.1	1
BH5	N/D	0.1 to 0.5	N/D	0.1	1
BH6b	N/D	0.0 to 0.4	N/D	0.1	1
WS1	N/D	0.7	N/D	0.1	1
WS4	N/D	2.0 to 5.1	N/D	0.1	1
WS7	N/D	3.1 to 4.7	N/D	0.1	1
WS12	N/D	0.0 to 0.9	N/D	0.1	1

* N/D = None Detected.

* N/R = Not Recorded.

- 10.3.5 The monitoring results available to date do not show any elevated concentrations of methane in the eight gas monitoring installations.

- 10.3.6 Elevated concentrations of carbon dioxide (i.e. above 1.5% by volume) have been recorded in two monitoring wells (WS4 and WS7). The maximum concentration recorded was 5.1% in WS4.
- 10.3.7 No positive gas flow rates have been recorded in any of the monitoring wells to date.
- 10.3.8 Based on the information available to date and by reference to Table 10.1 above (Wilson and Card, 1999) the gas conditions at the site are consistent with "Characteristic Situation 2".

10.4 Recommended Gas Protection

- 10.4.1 An initial appraisal of the hazardous gas situation at the site indicates that the data obtained to date, is consistent with Characteristic Situation 2 (Wilson and Card 1999). As such, Encia would recommend that the client adopt the following gas exclusion measures;
- Ventilation of confined spaces within the building.
 - Well-constructed and ventilated and suspended floor slab.
 - Low permeability gas membrane.
 - Minimum penetration of the gas membrane by services.
- 10.4.2 Should this assessment be supported by an extended monitoring programme, the recommendations provided above could be subject to change.

11 GEOTECHNICAL TESTING

11.1 General

- 11.1.1 Nine samples of natural soil were submitted to a suitably accredited laboratory with a schedule of geotechnical testing drawn up by Encia.
- 11.1.2 The geotechnical laboratory test results are presented in Appendix G to this report.

11.2 Atterberg Limits

- 11.2.1 Three natural soil samples recovered from BH2 and BH3 at depths ranging from 1.00m to 3.65m were submitted for moisture content and plasticity indices testing by use of the cone penetrometer method and rolling thread test. The results have been compared against guidance given in the NHBC Standards, Chapter 4.2.
- 11.2.2 The plasticity indices were found to range from 10% to 17% indicating the shallow cohesive deposits underlying the site to be of low shrinkability (volume change potential).
- 11.2.3 Natural moisture content of the three samples tested ranged from 22% to 35%.

11.3 Soluble Sulphate and pH

- 11.3.1 In accordance with BRE Special Digest 1 (2001), this site has been classified as brownfield with a mobile groundwater regime.
- 11.3.2 Any foundations are anticipated to extend to depths in excess of 1.0m, through

Made Ground and natural strata. As such, soil samples recovered from varying depths beneath the site have been submitted for pH and water-soluble sulphate (2:1 soil/water extract).

- 11.3.3 The concentrations of sulphate in the aqueous soil extracts of nine samples were determined using the gravimetric method. In addition, samples of Made Ground were tested using ion chromatography as part of the contamination suite. The pH value of each sample was determined by the electrometric method.
- 11.3.4 The highest water-soluble sulphate concentration and the lowest pH value for each soil type analysed are shown in the Table below. Chloride concentrations are all below 0.015g/l and nitrate concentrations are all below 0.020g/l, consequently both are insignificant.

Table 11.1: Summary of Sulphate and pH results

Soil type	Lowest pH values	Highest Soluble Sulphate Concentration (g/l)
Made Ground	5.23	0.085
Natural Granular	4.70	0.015
Natural Cohesive	7.32	0.027

- 11.3.5 In accordance with the BRE Special Digest 1, where a data set contains five to nine results, the mean of the highest two water-soluble sulphate results should be taken, along with the mean of the lowest 20% of pH values.
- 11.3.6 As such, the representative water-soluble sulphate concentration for the site is 0.056g/l with a pH value of 4.98. Therefore, in accordance with Table 2 of SD1, sub-surface concrete should be classified as Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-3z.
- 11.4 Particle Size Distribution Tests (PSD)**
- 11.4.1 Five soil samples taken from the natural granular deposits underlying the site at depths ranging from 1.0m to 5.0m were submitted for PSD testing, method 9.2 'wet sieve' (BS1377:1990). The results indicate the granular soils present beneath the site comprise a mixture of well-sorted sand with horizons of poorly sorted silty sand and gravel.

12 GEOTECHNICAL ISSUES

12.1 Mining & Quarrying

- 12.1.1 It was identified during the desk study that the site is in an area where coal is believed to exist close to the surface, which may have been worked in the past. Furthermore, historical maps show a number of coal pits and collieries to have been present within close proximity to the western and southern site areas.
- 12.1.2 As such, six rotary boreholes were drilled to a maximum depth of 40m and encountered solid strata comprising grey mudstone (Coal Measures) with bands of hard siltstone. Coal was encountered in three rotary boreholes between 20.00m and 30.70m, although no loss of air flush i.e. potential workings was recorded in any of the rotary borehole positions. Based on these findings we consider the risk from abandoned shallow coal mine workings to be low.

- 12.1.3 Quarrying is not indicated to have taken place on, or in the immediate vicinity of the site.

12.2 Foundation Recommendations

General

- 12.2.1 No proposed development or site layout plans have been provided to Encia at this stage, and as such, for the purpose of this report we have assumed that the site is to be redeveloped for standard two-storey residential dwellings and that line loads will not exceed 80kN/m run.
- 12.2.2 The site investigation has identified variable depths of mixed cohesive and granular Made Ground deposits across the site, ranging from 0.35m in WS11 to 2.5m in WS8. In general however, the Made Ground was found to be less than 1.0m deep across the majority of the central and eastern parts of the site, with pockets of deeper fill encountered in the western and south eastern areas.
- 12.2.3 Made Ground material is considered unsuitable as a founding stratum since, due to its generally weak and heterogeneous nature, it would likely result in unacceptable total and differential settlements. Consequently, foundations should be taken through any Made Ground to found within the underlying competent natural soils.
- 12.2.4 The underlying natural drift strata generally comprised soft brown sandy clay overlying saturated loose to medium dense sand with occasional gravels and bands of clay. Stiff to very stiff cohesive Glacial Till was encountered at depths ranging from 3.2m (WS3) to 7.50m (BH1).

Recommendations

- 12.2.5 Based on the information available to date, it is our opinion that a piled foundation solution would be required for the site with piles taken down to the underlying stiff to very stiff cohesive Glacial Till deposits. Advice on pile types, length and design will need to be sought from specialist piling contractors.
- 12.2.6 Alternatively, due to the presence of deep granular deposits beneath much of the site, vibro ground improvement may also be suitable for the site. Vibro ground improvement would allow shallow conventional or semi-raft foundations to be founded on vibro treated ground. However, advice will need to be sought from a specialist vibro contractor to confirm the suitability of the site for vibro ground improvement.
- 12.2.7 Should the site require re-profiling works prior to development, the information contained in this report should be re-assessed once final levels are known in order to design an appropriate foundation solution.

12.3 Excavations

- 12.3.1 Based on the results of the investigation it is likely that some groundwater flow will be encountered in shallow excavations. Therefore, any excavation are likely to require shoring, most notably in granular soils and Made Ground deposits

12.4 Drainage

- 12.4.1 Soakaways within areas of granular infill and natural sands/gravels may be a viable drainage option for parts of the site. However, soakaway testing and in-situ permeability testing would need to be undertaken to fully assess the suitability.

- 12.4.2 It is recommended that the developer contact the local water company (United Utilities Water Services) with respect to capacity in existing foul sewers in the vicinity of the site or to determine whether on-site balancing will be required.

12.5 Highways

- 12.5.1 Made Ground is present across much of the site and it is strongly recommended that consultation regarding the specification of the highways should be made with the adopting authority.
- 12.5.2 For access road and pavement areas, Made Ground deposits are considered to have equilibrium CBR of <1%. Road and pavements placed upon the natural deposits are considered to have an equilibrium CBR of 2%.
- 12.5.3 Where Made Ground is **less than 2m thick** the following options are considered suitable.
- Excavation of the full thickness of made ground and replacement with suitable aggregate in accordance with Series 600 (Earthworks) of The Highways Agency (HA) "Specification for Highway Works" 1998.
 - Excavation of the full thickness of Made Ground, screening, selection and replacement of suitable Made Ground materials in engineered layers in accordance with Series 600. Unsuitable materials which should not be used include any soft or wet materials, biodegradables including topsoil, wood, peat or lignite, scrap metal and material which, by virtue of its particle size or shape, cannot be properly and effectively compacted (e.g. oversize material or gravels which are tabular).
- 12.5.4 Where Made Ground is **in excess of 2m thick**, it is considered that the **upper 2m** of Made Ground should be removed and replaced in accordance with the above recommendations. However, the residual Made Ground materials in the base of the excavation should be inspected and (where necessary) any soft spots removed and replaced with suitable engineered fill.
- 12.5.5 Where the Made Ground is re-engineered it is considered that a CBR value of 5% should be achievable, however, this should be verified by plate load testing on site and confirmed with the adopting authority.
- 12.5.6 Crushing of demolition\hardstand\foundation arisings will generate aggregate, which (subject to confirmatory testing) should be suitable for use as unbound pavement materials within the highways.

13 REDEVELOPMENT ISSUES

13.1 General

- 13.1.1 This report has presented options with respect to foundation solutions, treatment of contamination etc that are considered technically feasible and in line with current good practice. Consequently, we would expect to obtain regulatory approval for whichever option is adopted, although this cannot be guaranteed. Copies of this report should be forwarded to the relevant regulatory authorities (NHBC & Local Authority) for their comment/approval.

13.2 Remedial Strategy

- 13.2.1 Redevelopment of this site will almost certainly be subject to planning conditions relating to remediation and validation. Once a specific, preferred

development strategy has been decided, Encia could liaise with the local Planning Authority and NHBC and prepare a detailed Remediation Strategy report for approval.

13.2.2 The Remediation Strategy document would include:

- General background information, including site location, site description and a summary of ground investigation data.
- An overview of existing constraints on the proposed development and the aims of the proposed remedial works.
- Specific details of the anticipated site remedial/preparatory works.
- Details of site supervision and validation.
- A summary of implications for redevelopment.

13.2.3 The anticipated remediation works are summarised below:

- Type 3 Pre Demolition Asbestos Survey.
- Removal of any identified asbestos containing materials.
- Demolition of existing buildings, removal and crushing of all hard surfaces, relic foundations and underground obstructions.
- General site clearance.
- Provision of a 600mm thick surface cover of "clean" soil comprising 450mm subsoil and 150mm topsoil be provided in all proposed 'soft' end use areas.
- Validation by chemical analysis of any imported soil/material for use in garden and/or landscaped areas.
- Supervision of the works by a suitably qualified consultant to include detailed records, testing requirements, etc

13.2.4 It is strongly recommended that the demolition contractor should chase-out all significant buried structures, and survey-in the resultant excavations before making them safe by backfilling. At the very least, relevant features should be surveyed-in before "hiding" them beneath a veneer of rubble. Similarly, it would be prudent to complete a drainage survey prior to blading rubble across the site to leave it safe and secure.

13.3 Health & Safety Issues

13.3.1 During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with protective clothing, footwear and gloves. Personnel should be instructed in why and how they are to be used.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor should satisfy the Health & Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

- 13.3.2 Before site operations are started, the necessary COSHH statements and Health & Safety Plan should be drafted in accordance with the CDM regulations.

13.4 New Utilities

- 13.4.1 Post demolition and subject to regrade proposals, the bulk of the existing Made Ground will remain on site. This Made Ground contains contaminants at concentrations above the guidance threshold values for an end use that includes domestic gardens and utility workers are likely to come into direct contact with the Made Ground.
- 13.4.2 Although utility workers will only be exposed to the contaminated soil/fill for a relatively short time, the contaminants represent a risk and simple precautionary measures are required, i.e. good personal hygiene and basic personnel protective equipment.
- 13.4.3 In addition to the above, the atmosphere in shored trenches in excess of 1.2m should be monitored for oxygen and hazardous gas (methane & carbon dioxide), prior to personnel entering such excavations. Monitoring should continue whilst personnel are working in deep excavations.
- 13.4.4 Utility trench excavations are likely to yield contaminated arisings. Poor handling and control of such arisings could give rise to contamination of the clean capping material and/or areas of the site previously devoid of any contamination. It is therefore recommended that any arisings from beneath the capping layer be stockpiled in designated areas from which the clean capping material has been stripped.
- 13.4.5 It is recommended that trenches for services including site drainage and water supply be cut over size in order to isolate pipe materials from potential contaminants and to enable maintenance to be conducted in "clean" material.
- 13.4.6 It is strongly recommended that all statutory service bodies are consulted at an early stage with respect to the ground conditions within which they will lay services in order to enable them to assess at an early stage any potential abnormal costs.
- 13.4.7 It is likely that the local water company will request the use of ductile iron mains, with plastic coated copper house connections, given that residual organic contaminants will still be present post-remediation, albeit at trace concentrations.

14 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

14.1 General

- 14.1.1 The recommendations provided below have been based on the ground conditions identified across the site in the exploratory holes. If any significant variations to the ground conditions identified herein are encountered, advice should be sought from Encia Consulting Limited.

14.2 Hazardous Gas

- 14.2.1 Gas monitoring undertaken to date has shown no elevated concentrations of methane in any of the gas monitoring installations. Elevated carbon dioxide has however been identified in two monitoring wells (WS4 and WS7). The maximum concentration recorded was 5.1% in WS4. No positive gas flow rates

have been recorded.

- 14.2.2 The information available to date indicates that the site is consistent with Characteristic Situation 2. However, in accordance with current guidance (Wilson and Card 1999), as only limited data is available at this time, we would recommend that the proposed development be modified to 'Characteristic Situation 4'.

14.3 Mining

- 14.3.1 Six rotary boreholes have been drilled to a maximum depth of 40m and encountered solid strata comprising grey mudstone (Coal Measures) with bands of hard siltstone. Coal was encountered in RBH2, RBH3 and RBH4 between 24.00m and 30.70m, although no loss of air flush i.e. potential workings was recorded in any of the rotary borehole positions. Based on these findings we consider the risk from abandoned shallow coal mine workings to be low.

14.4 Contamination & Remediation

- 14.4.1 The laboratory analytical results indicate that contamination exists in the Made Ground and natural drift strata beneath the site. The identified contaminants include elevated concentrations of arsenic, cadmium, lead, phytotoxins (copper, zinc and total sulphate), PAH and benzo(a)pyrene. In addition, slightly elevated levels of leachable copper and PAH along with two elevated PAH concentrations in groundwater.
- 14.4.2 It is recommended that a 600mm thick surface cover of "clean" soil comprising 450mm subsoil and 150mm topsoil be provided in all proposed 'soft' end use areas (i.e. gardens and landscaped areas). This cover will break potential pollutant linkages between the underlying contaminated fill and future site end-users.
- 14.4.3 It is considered that the elevated leachable copper and PAH contamination identified in Made Ground deposits of WS1, WS3, WS4 and WS7 is unlikely to impact on the underlying minor aquifer or nearby surface watercourses due to the presence of low permeability clay (cohesive glacial till) deposits underlying the site. These cohesive soils will effectively attenuate any downward migration of mobile contaminants. Additionally, due to the nature of the proposed development, positive drainage will greatly reduce surface water infiltration, further reducing downward migration of the mobile contaminants identified.
- 14.4.4 Two slightly elevated concentrations of PAH contamination were recorded in water samples taken from WS4 and WS7. In view of the site's environmental setting (low to moderate sensitivity) the identified groundwater contamination is not considered significant.

14.5 Foundations

- 14.5.1 Based on the information available to date, it is our opinion that a piled foundation solution would be required for the site with piles taken down to the underlying stiff to very cohesive glacial till deposits. Advice on pile types, length and design will need to be sought from specialist piling contractors.
- 14.5.2 Alternatively, due to the presence of deep granular deposits beneath much of the site, vibro ground improvement may also be suitable for the site. Vibro ground improvement would allow shallow conventional or semi-raft foundations to be founded on vibro treated ground. However, advice will need to be sought from a specialist vibro contractor to confirm the suitability of the site for vibro ground improvement.

14.6 Flooding

- 14.6.1 The Environment Agency indicate that the site is not located within an indicative floodplain.

14.7 Drainage & Highways

- 14.7.1 Soakaways within areas of granular infill and natural sands/gravels may be a viable drainage option for parts of the site. Soakaway testing and in-situ permeability testing would need to be undertaken to fully assess the suitability.
- 14.7.2 We would recommended that the developer contact the local water company (United Utilities Water Services) with respect to capacity in existing foul sewers in the vicinity of the site or to determine whether on-site balancing will be required.
- 14.7.3 For access road and pavement areas, Made Ground deposits are considered to have an equilibrium CBR of <1%. Road and pavements placed upon natural clay deposits are considered to have a CBR in the region of 2%. The formation should be thoroughly proof rolled and any areas of soft/loose material will need to be excavated and replaced with compacted granular fill. Geo-grid reinforcement may also be required in deeper areas of Made Ground.
- 14.7.4 If bearing capacities of the soils at service placement level or at road formation level are found to be insufficient then the formation may need to be overdug and reinstated with compacted DoT 6F2 type material in order to achieve a suitable bearing surface.

Appendix A
General Notes

Generic Notes – Encia Geoenvironmental Investigations

1. Environmental Setting

General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the Correspondence Appendix of this Geoenvironmental Report.

Geology, Mining & Quarrying

In order to establish the geological setting of a site, Encia refer to BGS maps for the area, and the relevant geological memoir.

A coal mining report is obtained from the Coal Authority. Further information is sourced from the Local Authority and by reference to current and historical OS plans.

Landfills

Encia obtain data from the Landmark Information Group, the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site. Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite), and can move through fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Encia refer to BRE Report BR211, 1999: *"Radon: guidance on protective measures for new dwellings"*.

BR211 provides a preliminary indication of the measures required for a particular site, but it is also often necessary to request a Stage 2 Protective Measures Site Report from the BGS.

The level of protection needed is site-specific and is determined by reference to the radon potential map for the area followed by a geological assessment of the site. This information is contained in the Annexes of BR211.

Annex A – derived from statistical analysis of radon measurements in existing houses carried out by the NRPB and grouped on a 5km grid.

Annex B – based on an assessment of the same radon measurements grouped by geological units. The maps show the 5km grid squares underlain completely or in part, by geological units which potentially exceed the action levels for radon protective measures. The grid squares are coded according to the highest potential within the square. In many cases the actual geological radon potential varies considerably within a grid square.

Encia adopt the following procedure when assessing risk associated with radon.

Firstly, Annex A maps are reviewed to see whether the site requires full, basic or no measures. If the site is in a dark brown square, full radon protection measures are required. If the site is in a light brown square, reference should be made to Annex B.

Secondly, Annex B maps are reviewed to see whether a further geological assessment is required which may result in upgrading the result from Annex A. If a site lies within a shaded square, it may require radon protection, and Encia request a Stage 2 Protective Measures Site Report from the BGS.

If the site is in a square that is not coloured or shaded in either set of maps then no radon protection is needed and therefore a BGS Report is not normally necessary.

The BGS geological assessment involves checking whether the site is on or close to a geological unit that has statistically been found to have elevated radon potential. The geological assessment is based on either 1:50,000 or the 1:250,000 scale data. The search area specified as part of the request is increased by 50m in areas where 1:50,000 data is available and by 500m in areas with 1:250,000 scale data to allow for potential inaccuracies in the position of boundaries. The BGS report indicates the highest level of protection required within the search area and its buffer zone.

When requesting a BGS report, Encia select the search radius carefully, since too large a search radius may result in the inclusion of areas underlain by geological units of a higher radon potential, thereby giving rise to recommending too high a level of protection.

The report also includes (where available), a list of the geological units included in the assessment. Encia check that these actually underlie the site, rather than the buffer zone only.

On the basis of radon measurements in dwellings and on their geological interpretation, the BGS report stipulates the level of protective measures required for the proposed development site, and this could be:

1. no measures,
2. basic measures, or
3. full measures.

Details of these measures are provided in the Hazardous Gas section of this Geoenvironmental Report.

Hydrogeology

Encia obtain information from the Environment Agency (EA) and the Landmark Information Group with respect to:

- groundwater quality
- recorded pollution incidents
- licensed groundwater abstractions

Reference is also made to the EA document *"Policy and Practice for the Protection of Groundwater"* (1998) and the relevant Groundwater Vulnerability Map.

Bedrock and any overlying granular Drift deposits are classified by the EA:-

- **Major aquifers:** *"Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public water supply and other purposes".*
- **Minor aquifers:** *"Fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Although these aquifers will seldom produce large quantities of water for abstractions, they are important both for local supplies and in supplying base flow to rivers".*
- **Non-aquifers:** *"Formations which are generally regarded as containing insignificant quantities of groundwater. However groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants. Some non-aquifers can yield water in sufficient quantities for domestic use".*

Groundwater vulnerability is determined by 4 variables:

1. The presence and nature of overlying soil (the weathered zone affected by living organisms; soil in the UK can extend up to 2m in depth). Physical properties of the soil affect the downward passage of water and its ability to attenuate pollutants. The EA make reference to a three-fold classification of soil types:-
 - Soils of **low** leaching potential are defined as *"soils in which the pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants".*
 - Soils of **intermediate** leaching potential are defined as *"soils which have a moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-adsorbed diffuse source pollutants and liquid discharges could penetrate the soil layer".*
 - Soils of **high** leaching potential are defined as *"soils with little ability to attenuate diffuse source pollutants and in which non-adsorbed diffuse source pollutants and liquid discharges have the potential to move rapidly to underlying strata or to shallow groundwater".*

In urban areas and restored mineral workings the soil information is based on fewer observations than elsewhere. A worst-case vulnerability (H) is therefore assumed for these areas and for current mineral workings by the EA. All are given a designation of **HU** unless proved otherwise.
2. The presence and nature of Drift, which often overlies bedrock. Where Drift is of substantial thickness and low permeability, it can provide an effective barrier to surface pollutant migration. Permeable Drift is classified as a Minor Aquifer except where it is in probable hydraulic continuity with a Major Aquifer, where it is regarded as part of the Major Aquifer unless proven otherwise by site investigation.
3. The nature of the geological strata (bedrock). Rocks that contain groundwater in exploitable quantities are called aquifers.
4. The depth of the unsaturated zone; ie that part of the aquifer which lies above the water table

The EA have also designated Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone is a function of the aquifer, volume of groundwater abstracted and the effective rainfall, and may vary from tens to several thousand hectares.

Hydrology

Encia obtain information from the Environment Agency and the Landmark Information Group with respect to:

- surface water quality
- recorded pollution incidents
- licensed abstractions (groundwater & surface waters)
- licensed discharge consents
- site susceptibility to flooding

The EA have set water quality targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality classification scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are six GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to flooding is assessed by reference to the Environment Agency's Indicative Floodplain Maps which provide a general overview of areas of land in natural floodplains and therefore potentially at risk of flooding from rivers or the sea. The maps use the best information currently available, based on historical flood records and geographical models. They indicate where flooding from rivers, streams, watercourses or the sea is possible. However the maps do not show flood defences which offer vital protection in many areas.

For flooding from rivers the maps indicate the extent of flooding for a one in one hundred (or a one per cent) chance of flooding each year, for flooding from the sea and tidal estuaries, the maps show a one in two hundred (or 0.5 per cent) chance of flooding each year.

It should also be noted that as the floodplain shown is the 1 in 100 year (or 1 in 200 year as appropriate), areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley, the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within the indicative floodplain, it is recommended that a flood survey be undertaken by a specialist consultant who can advise on appropriate mitigating measures; ie raising slab levels, provision of storage etc.

COMAH & Explosive Sites

Encia obtain information from the Landmark Information Group with respect to COMAH or explosive sites within 1km of the proposed development site. Encia's report refers to any that are present, and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH

site may object to a proposed development (although it is the Local Authority who have final say, and they are likely to place more weight on advice from the HSE).

Preliminary Conceptual Ground Model

The site's environmental setting (and proposed end use) is used by Encia to assess the significance of any contamination encountered during the subsequent ground investigation

Assessment of contaminated land is based on an evaluation of pollutant linkages (source-pathway-receptor). Contaminants within the near surface strata represent a potential source of pollution. The environment (most notably groundwater), site workers and end users are potential targets.

Potential pollutant linkages are shown on a preliminary conceptual site model, presented as a Drawing in an Appendix to this Geoenvironmental Report. The preliminary model is revised in light of data arising from the subsequent ground investigation.

Generic Notes – Encia Geoenvironmental Investigations

2. Ground Investigation Fieldwork

General

Encia Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930: 1999 *"Code of practice for site investigation"*
- BS10175: 2001 *"Code of practice for the identification of potentially contaminated sites"*.
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 *"Sampling strategies for contaminated land"*
- *"Guidance on the protection of housing on contaminated land"* – NHBC & EA R&D Publication 66 (2000)
- *"Development of appropriate soil sampling strategies for land contamination"* – EA R&D Technical Report P5-066/TR (2001)
- AGS: 1996 *"Guide to the selection of Geotechnical Soil Laboratory Testing"*

Exploratory hole logs are presented in Appendices to this Geoenvironmental Report. These logs include details of the:

- Investigation technique adopted
- Samples taken
- Descriptions of the solid strata, and any groundwater encountered.
- Results of any in-situ testing
- Any gas/groundwater monitoring well installed

Exploratory Hole Locations

Exploratory hole locations are selected by Encia, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

Investigation Techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 1999 and BS1377: 1990. Techniques most commonly used by Encia include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket.
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing.
- Window or Windowless Sampling boreholes. Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in

areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).

- Rotary percussive open-hole probeholes are typically drilled using a tricone rock roller bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse.

Where installed, gas\groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10 mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete.

Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

In-situ Testing

Where relative densities of granular materials given on the trial pit and window sample logs are based on visual inspection only, they do not relate to any specific bearing capacities. However, wherever possible Encia employ a Mackintosh probe to assess relative density. Mackintosh probe results can be related to approximate allowable bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as $N^* = x$.

The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

Sampling

Representative soil/fill samples are taken at regular intervals from the exploratory holes to assist in description of the ground and to allow selected laboratory testing to be performed. The type of sample taken is dependent on the nature of the stratum and the purpose of the analysis.

Where the soils encountered contain a significant proportion of coarse grained material, truly representative samples are not typically obtained - only the finer fraction is placed in sample containers. However, a visual estimate of the amount of coarse material is made on site.

NB: Coarse constituents not sampled are defined as: coarse gravel, cobble and boulder. (i.e. any 'particles' with an average diameter greater than 20mm).

Occasionally, unrepresentative 'spot' samples are also taken from some exploratory locations for contaminant analysis, typically where unusual, localised pockets of materials are encountered.

Samples of soil for chemical testing are placed into 1 litre plastic tubs prior to delivery to the selected laboratory. Samples of water are taken in one litre, brown glass bottles and stored in

cool boxes, at a temperature of approximately 4°C, until delivery to the selected laboratory. Soil/fill samples for organic analysis are also stored in cool boxes.

Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

Long-term monitoring of standpipes or piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

Description of Strata

The soils encountered during an Encia ground investigation are described (logged) in general accordance with BS 5930. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text.

The materials encountered in the trial pits are logged, samples taken, and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

Key to Exploratory Hole Logs

Keys to logs are presented in the Appendix(ces) containing the logs. There are two Keys - Symbols & Legends and Terms & Definitions.

Generic Notes – Encia Geoenvironmental Investigations

3. Geotechnical Laboratory Tests

General

Soil samples are delivered to the laboratory for testing along with a schedule of testing drawn up by Encia. All tests are carried out in accordance with BS 1377:1990.

The test results are presented as received in an Appendix to this Geoenvironmental Report.

The following laboratory testing are routinely carried out on a selection of samples:

- Atterberg limits & moisture contents
- Soluble sulphate & pH

The additional tests are typically only scheduled where significant earthworks regrade is anticipated:

- Grading.
- Compaction tests.
- Particle density.

Atterberg Limits & Moisture Content

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each "type" of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth. Encia typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%.

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised April 2003), which advocates the use of modified Plasticity Index (I'_p), defined as:

$$I'_p = I_p * (\% < 425\mu\text{m} / 100)$$

ie if PI is 30%, but the soil contains 80% < 425µm, then: $I'_p = 30 * 80/100 = 24\%$.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs.

Encia apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to:

- the average values for each particular soil type (ie differentiate between residual soil and alluvium),
- the number of results in each class and
- the actual values.

Unless the judgment strongly indicates otherwise, Encia typically adopt a conservative approach and recommend assumption of the higher classification.

Soluble Sulphate and pH

Sulphates in soil and groundwater are the chemical agents most likely to attack sub-surface concrete, resulting in expansion and softening of the concrete to a mush. Another common cause of concrete deterioration is groundwater acidity.

The rate of chemical attack depends on the concentration of aggressive ions and their replenishment at the reaction surface. The rate of replenishment is related to the presence and mobility of groundwater.

Encia refer to BRE Special Digest 1 (SD1) "Concrete in aggressive ground. Part 1: Assessing the aggressive chemical environment" (2001). SD 1 provides definitions of:

- the nature of the site (greenfield, brownfield or pyritic)
- the groundwater regime (static, mobile or highly mobile)
- the Design Sulphate Class (DC Class) and
- the Aggressive Chemical Environment for Concrete (ACEC Class)

Encia reports clearly state each of the above for the site being considered.

The concentrations of sulphate in aqueous soil/fill extracts are determined in the laboratory using the gravimetric method. The results are expressed in terms of SO_4 for direct comparison with BS 5328:1997. The pH value of each sample was determined by the electrometric method.

SD1 also discusses determination of "representative" sulphate concentration from a number of tests. Essentially if <10 samples of a given soil-type have been tested, the highest measured sulphate concentration should be taken. If >10 samples have been tested, the mean of the highest 20% of the sulphate test results can be taken. With respect to groundwater, the highest sulphate concentration should always be taken.

With respect to pH (soil & groundwater) the value used is the lowest value if <10 samples have been tested and the mean of the lowest 20% if >10 samples have been tested.

Generic Notes – Encia Geoenvironmental Investigations

4. Contamination Laboratory Analysis & Interpretation

General

An assessment of potential contaminants associated with the former usages of the site is undertaken with reference to CLR 8 *"Potential contaminants for the assessment of land"* and the relevant DETR Industry Profile(s).

Common Inorganic Contaminants

These include:

- metals, most notably cadmium, copper, chromium, mercury, lead, nickel, and zinc.
- semi-metals, most notably arsenic, selenium, and (water soluble) boron
- non-metals, most notably sulphur
- inorganic anions, most notably cyanides (free & complex), sulphates, sulphides, and nitrates.

With respect to the terminology used by most analytical laboratories:

Total cyanide = Free cyanide + Complex cyanide

Total cyanide (CN) is determined by acid extraction; whereas free cyanide is the water soluble fraction.

Complex cyanide is "bound" in compounds and is hard to breakdown. Laboratory determination of complex CN involves subjecting the sample to uv digestion for determination of both free and total CN.

Thiocyanate (SCN) is a different species combined with sulphur.

Elemental sulphur (S) and free sulphur are the same. Total sulphur is all forms, including that present in sulphates (SO₄), sulphides etc

There are 2 forms of chromium (Cr), chromium VI and chromium III. chromium VI is the more toxic of these. In soils, total chromium is determined by a strong aqua regia acid digestion. Chromium VI is an empirical method based on a water extract test.

Common Organic Contaminants

Petroleum hydrocarbons are a mixture of hydrocarbons produced from the distillation of crude oil. They include aliphatics (alkanes, alkenes and cycloalkanes), aromatics (single or multi benzene ringed compounds) and hydrocarbon-like compounds containing minor amounts of oxygen, sulphur or nitrogen.

Petroleum hydrocarbons can be grouped based on the carbon number range:-

GRO – Gasoline Range Organics (typically C₆ to C₁₀). Also referred to as PRO – Petroleum Range Organics

DRO – Diesel Range Organics (typically C₁₀ to C₂₈)

LRO – Lubricating Oil Range Organics (typically C₂₈ to C₄₀)

MRO – Mineral Oil Range Organics (typically C₁₈ to C₄₄)

However, it should be borne in mind that the terms "GRO" and "DRO" analysis are purely descriptive terms, the exact definition of which varies.

Total Petroleum Hydrocarbons (TPH) is also a poorly defined term; some testing laboratories regard TPH as hydrocarbons ranging from C₅-C₄₀, whereas others define TPH as C₁₀-C₃₀.

The composition of a TPH plume migrating through the ground can vary significantly; this is primarily dictated by the nature of the source (eg petrol, diesel, engine oil etc). Furthermore, different hydrocarbons are affected differently by weathering processes, and this can result in further variation in the chemical composition of the TPH.

Gasoline contains light aliphatic hydrocarbons rapidly (especially within the C₄ to C₅ range) that will evaporate. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene and xylenes, referred to as BTEX. Small amounts of polyaromatic hydrocarbons (PAHs) such as benzo(a)pyrene may also be present.

Diesel and light fuel oils have higher molecular weights than gasoline. Consequently, they are less volatile and less water soluble. About 25 to 35% is composed of aromatic hydrocarbons. BTEX concentrations are generally low.

Heavy Fuel Oils are typically dark in colour and considerably more viscous than water. They contain 15 to 40% aromatic hydrocarbons. Polar NSO compounds are also present.

Lubricating Oils are relatively viscous and insoluble in groundwater. They may contain 10 to 30% aromatics, including the heavier PAHs. NSO compounds are also common.

Polycyclic Aromatic Hydrocarbons (PAHs) have more than two fused benzene rings as a structural characteristic. PAH compounds are present in both petrol and diesel, although in significantly lower concentrations than in coal tars. Certain PAH compounds are carcinogenic (Benzo(a)pyrene) and/or mobile in the environment (naphthalene).

Polychlorinated Biphenyls (PCBs)

Volatile Organic Compounds (VOCs)

Semi-Volatile Organic Compounds (SVOCs)

Phenols

Solvents, pesticides, herbicides

Dioxins & furans

Methods of Analysis (Organic Compounds)

Toluene Extractable Matter (TEM) results provide a screening test for organic contamination. The sample is air dried at 30°C and ground prior to addition of the solvent (toluene). The solvent extraction is aggressive and most organic compounds (fuels, oils, tars, humic material, animal fats and vegetable oil) are dissolved, as are some other inorganic contaminants such as sulphur. However, the volatiles (lighter fuel fraction etc) are lost during evaporation of the solvent.

Total Petroleum Hydrocarbon (TPH) by IR (also known as mineral oil by some testing laboratories) is undertaken on "as received" samples. Tetrachloroethylene is the solvent, and fluoroscil is used to remove humic material, animal fats and vegetable oil. Consequently this

analysis detects a wide range of "mineral" organics from volatiles (BTEX and gasoline), through diesel and oils to tars (including the very heavy, stable tars such as asphalt and bitumen).

TPH by GC-FID is a more refined analytical technique which only detects hydrocarbons (aliphatic and aromatic) in the range C₁₀ to C₄₀ (volatiles, heavy tars, humic material and sulphur are not detected). The laboratory can provide a breakdown of the TPH results into diesel range organics (**DRO**) and heavier lubricating oil range organics (**LRO**).

GRO (PRO) by GC-FID analysis detects the more volatile C₆-C₉ hydrocarbons (aliphatic and aromatic), including those organic compounds present in petrol.

Speciated VOC (by GC-MS) analysis quantifies the concentrations of 30 USA-EPA priority compounds. These include chlorinated alkanes and alkenes (in the molecular weight range chloroethane to tetrachloroethane); trimethylbenzenes; dichlorobenzenes; and the 4 BTEX compounds (benzene, ethyl-benzene, toluene & xylene).

Speciated sVOC by (GC-MS) analysis quantifies the concentrations of a variety of organic compounds, including the 16 USA-EPA priority PAHs, phenols, 7 USA EPA priority PCB congeners, herbicides & pesticides.

Note: PAHs are hydrocarbons and consequently (where present) will be picked-up when scheduling TPH. by GC-FID. Naphthalene (the lightest PAH) is also one of the 58 US EPA VOCs.

Speciated TPH by GC-FID provides a "banded" TPH, initially split into aromatic and aliphatic fractions and then further divided into fraction specific carbon bandings based upon behavioural characteristics.

Note: Risk assessment models require physiochemical properties (solubilities, toxicities etc) of compounds in order to model their behaviour in the environment. These physiochemical properties cannot be derived from a single "TPH", "GRO" or "DRO" value. However, the carbon banded fractions can be used in risk assessment models.

If the relative proportion of each carbon banding within the "TPH" impact at a site is known, the risks posed by each individual fraction can be assessed and a simple back calculation applied to calculate an overall "TPH" screening value based upon the percentage weight fraction of each banding present in the "TPH". Specialised analytical techniques and data interpretation skills are required to identify each carbon banding.

Current Guidance

The UK approach to the consideration of contaminated land is based upon the principles of risk assessment. This in turn is founded upon the use of so called source⇒pathway⇒target principles in order to establish the presence, or potential presence, of a pollutant linkage.

Encia Consulting Ltd adopts a tiered approach to risk assessment, consistent with UK guidance and best practice. The initial step of such a risk assessment (or Tier 1) is the comparison of site data with appropriate guidance levels, intervention levels or remedial targets.

In March 2002 DEFRA and the Environment Agency published a series of technical research papers (R & D Publications CLR 7, 8, 9 and 10) introducing the UK approach to the assessment of risk to **human health** from land contamination. This methodology and approach represents current scientific knowledge and thinking. The overall methodology also included the Contaminated Land Exposure Model (CLEA) and some Soil Guideline Values (SGV's).

At the time of writing this report, these guidelines only address seven contaminants and the development of both the CLEA model and additional SGV's is ongoing. Where published, SGV's have been utilised as intervention values for the purpose of an initial Tier 1 assessment.

Where SGV's were not published at the time of writing this report, appropriate Tier 1 human health related assessments have been based upon information that was best available at the time of the study.

With respect to the assessment of potential **phytotoxic effects** of contaminants, Encia refer to "The Soil Code" (MAFF, 1998) for copper and zinc. The CLEA SGV is adopted for nickel.

The potential risk to **building materials** is considered through reference to relevant BRE Digests, with particular emphasis on BRE Special Digest 1, 'Sulphate and Acid Resistance of Concrete in the Ground', 2001.

With respect to the interpretation of the **calorific values**, at present there are no accepted methods to assess whether a sample is combustible and under what circumstances it might smoulder. Some guidance is given in ICRCL Note 61/84 "Notes on the fire hazards of contaminated land" which states that:

"In general.....It seems likely that materials whose CV's exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn".

Tier 1 **groundwater** risk assessments are undertaken by comparing leachate concentrations with the appropriate water quality standard. Depending upon the specific characteristics and environmental setting of the site the appropriate standard is likely to be one of the following:

- Water Supply (Water Quality) Regulations 1989
- Environmental Quality Standards (for Freshwater)
- The Surface Waters (Abstraction for Drinking Water) Regulations

The tier 1 risk assessment of **landfill gas** is undertaken through reference to the following documents:

- Approved Document C, Building Regulations 1991
- CIRIA Report 149, "Protecting Development from Methane", 1995

Should any Tier 1 criteria be exceeded, then three potential courses of action are available. (The first is only applicable in terms of human health, but the second and third could also be applied to groundwater or landfill gas).

- Undertake further statistical analysis following the approach set out in Appendix A of CLR 7 in order to determine whether contaminant concentrations of inorganic contaminants within soil/fill actually present a risk (only applicable to assessing the risk to human health).
- Based on a qualitative risk assessment, advocate an appropriate level of remediation to "break" the pollutant linkage - for example the removal of the contaminated materials or the provision of a clean cover.
- Carry out a more detailed quantitative risk assessment in order to determine whether contamination risks actually exist.

Generic Notes – Encia Geoenvironmental Investigations

5. Hazardous Gas

General

Hazardous gas is considered to be any mixture of potentially explosive, toxic or asphyxiating gases, most notably methane, carbon dioxide and oxygen (deficiency).

In addition, radon, a naturally occurring radioactive gas is also considered. Further information about radon is included in Notes 1. – Environmental Setting.

Assessment of potential risks associated with hazardous gas are based on a review of data obtained from the Landmark Information Group, the Environment Agency and the Local Authority and the British Geological Survey.

Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Where landfilling has occurred within 250m of the site boundary, the Local Planning Authority may request a landfill gas investigation in accordance with the Town and Country Planning General Development Order, 1988.

Sources

Potential sources of hazardous gas are:

- Landfill sites
- Made ground, especially where significant depths are present
- Shallow mineworkings associated with coal extraction
- Geological strata, including peat, organic silts, coal-bearing strata and limestone (reaction with acidic waters), granite (radon)
- Groundwater can sometimes act as a "carrier" for hazardous gas.
- Leakages from pipelines or storage tanks
- Sewers, septic tanks and cess pits

Generation

Wherever biodegradable material is deposited, landfill gas (principally a mixture of methane and carbon dioxide) is likely to be generated by microbial activity. Carbon dioxide is an asphyxiant and toxic; methane is flammable and a mixture containing between 5% and 15% methane by volume in air is explosive. Landfill gas in the ground is unlikely in itself to pose a significant risk, though it may damage vegetation. However, infiltration of landfill gas into confined spaces (e.g. cellars, services, etc) may give rise to considerable risk.

There is no typical figure for the length of time that landfill gas will be evolved, but at many sites significant gas generation continues for at least 15 years after the last deposit of waste.

Migration

Gas migration from a landfill site may occur in several ways. It may migrate through adjacent strata; the distance of migration being dependent on the pressure gradients, volume of gas and

permeability of the strata. Where there are faults, cavities and fissures within the strata, gas may move considerable distances. Other migration pathways for gas include man-made features such as mine shafts, roadways and underground services.

Gas migration is influenced by a number of climatic factors, such as atmospheric pressure variations, water table level variations and the influence of a covering of snow or ice over the surface of the site and surrounding area.

Current Guidance

Guidance on landfill gas monitoring control at landfill sites is given in two technical memoranda, Waste Management Paper Nos. 26 and 27, published by the Department of the Environment.

Waste Management Paper 27, 1991 recommends that no dwellings should be constructed within 50m of any landfill that has the capacity to produce large volumes of landfill gas. No garden should extend to within 10m of the landfilled waste. However, development closer to landfill has been permitted where a comprehensive gas risk assessment has been completed (typically based on a minimum of 6 to 12 month monitoring programme) and appropriate gas exclusion measures designed.

The current advice with regard to monitoring for landfill gas is that if the trigger value of 1% volume (20% LEL) for methane and 1.5% volume for carbon dioxide is exceeded then remedial/control measures will be required.

It should be noted that the guideline limit for carbon dioxide of 1.5% volume recommended in Waste Management paper No. 27 is the short term (10 minute) occupational exposure limit for carbon dioxide quoted by the Health and Safety Executive in their publication, EH40. The long-term (8 hour) occupational exposure limit for carbon dioxide is 0.5% volume.

Approved Document C to the Department of the Environment's Building Regulations 1992, requires that where there may be gaseous contamination of the ground but the level of methane is unlikely to exceed 1% by volume, the ground floor of any house or similar small building shall be constructed of suspended concrete and ventilated as described in BRE Digest Report "Construction of New Buildings on Gas Contaminated Land". The document also requires specific design measures to be taken if a level of 5% volume carbon dioxide exists or is exceeded within the ground.

Although the above guidance is still relevant it has been more recently updated with the following documents published by the Construction Industry Research and Information Association (CIRIA).

CIRIA Report 149	'Protecting Development from Methane' (1995)
CIRIA Report 150	'Methane Investigation Strategies' (1995)
CIRIA Report 151	'Interpreting Measurement of Gas in the Ground' (1995)
CIRIA Report 152	'Risk Assessment for Methane and other gases from the ground (1995)

The above documents are intended to provide advice on how to investigate and deal with gas contaminated ground with respect to development.

CIRIA report 149 characterised sites based on the recorded methane / carbon dioxide concentration and emission rates recorded during a suitable gas investigation. Characteristic situation 1 is deemed to be the lowest risk scenario with the risk rating increasing up to 6. The characteristic situations are classified as follows:

Gas Monitoring Procedure

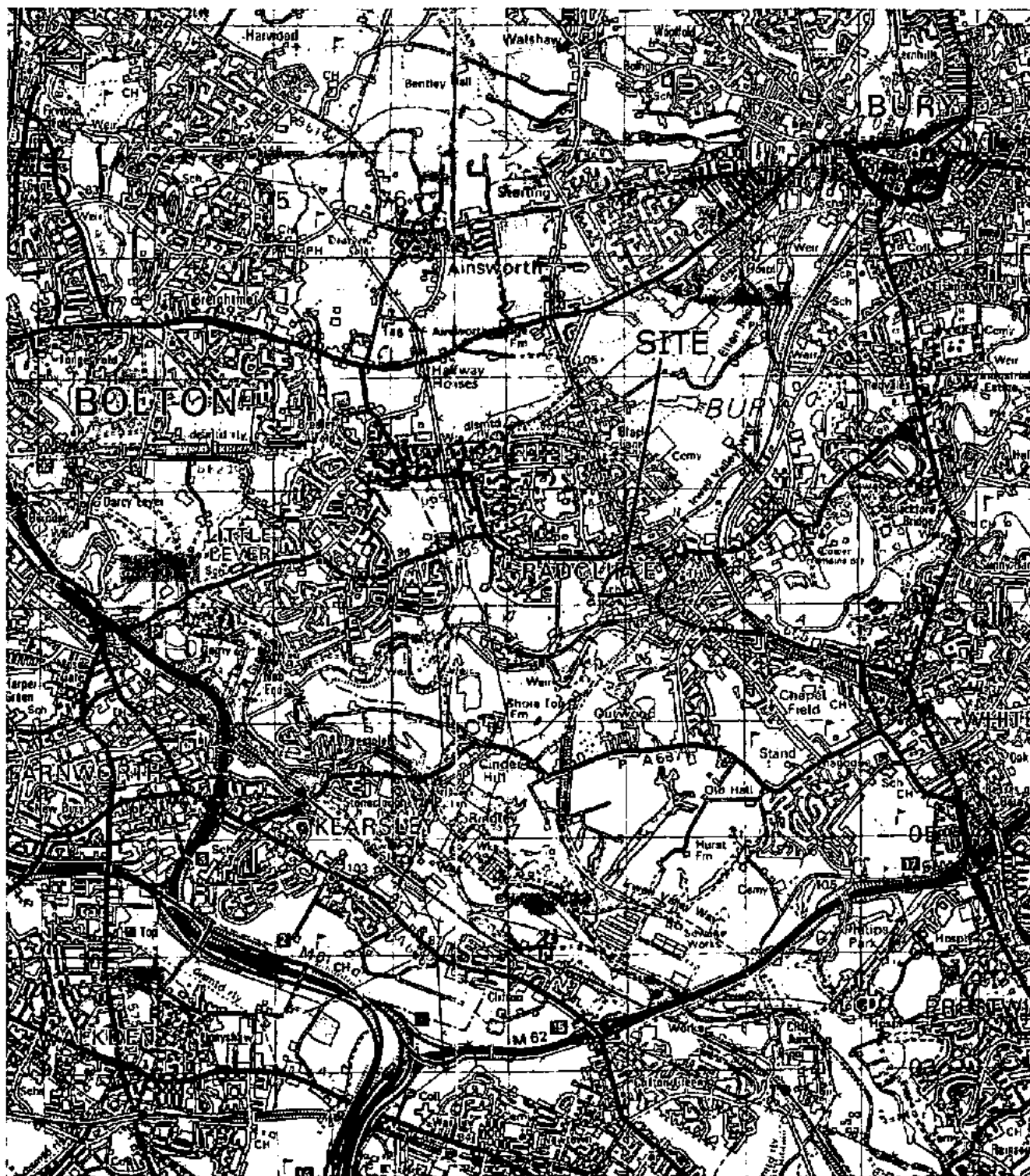
Encia adopt a standard gas monitoring procedure, in accordance with CIRIA guidance. This procedure involves the measurement, in the following order of:

- Atmospheric temperature, pressure and ambient oxygen concentration on site immediately prior to and on completion of monitoring.
- Gas emission rate.
- Methane, oxygen and carbon dioxide concentrations using an infra-red gas analyser.
- Standing water level using a dipmeter.

In addition, ground conditions at each sampling location are recorded together with prevailing weather conditions and any other observations such as any vandalism.

Where samples of gas are required for laboratory analysis, Gresham Tubes are used. Gas concentrations in the well are typically recorded immediately before and after retrieval of a sample.

Appendix B
Drawings



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ENCIA
CONSULTING LIMITED

STONE CROSS PLACE
STONE CROSS LANE NORTH
LONDON
WARRINGTON
WA3 2SH

TEL: 01942 824406
FAX: 01942 824030

CLIENT

BURY M.B.C.

JOB TITLE

RADCLIFFE HIGH SCHOOL

DRAWING TITLE

SITE LOCATION PLAN

DRAWN BY

NCW

SIGNATURE

DATE

13-07-05

STATUS

FINAL

APPROVED

NR

SIGNATURE

DATE

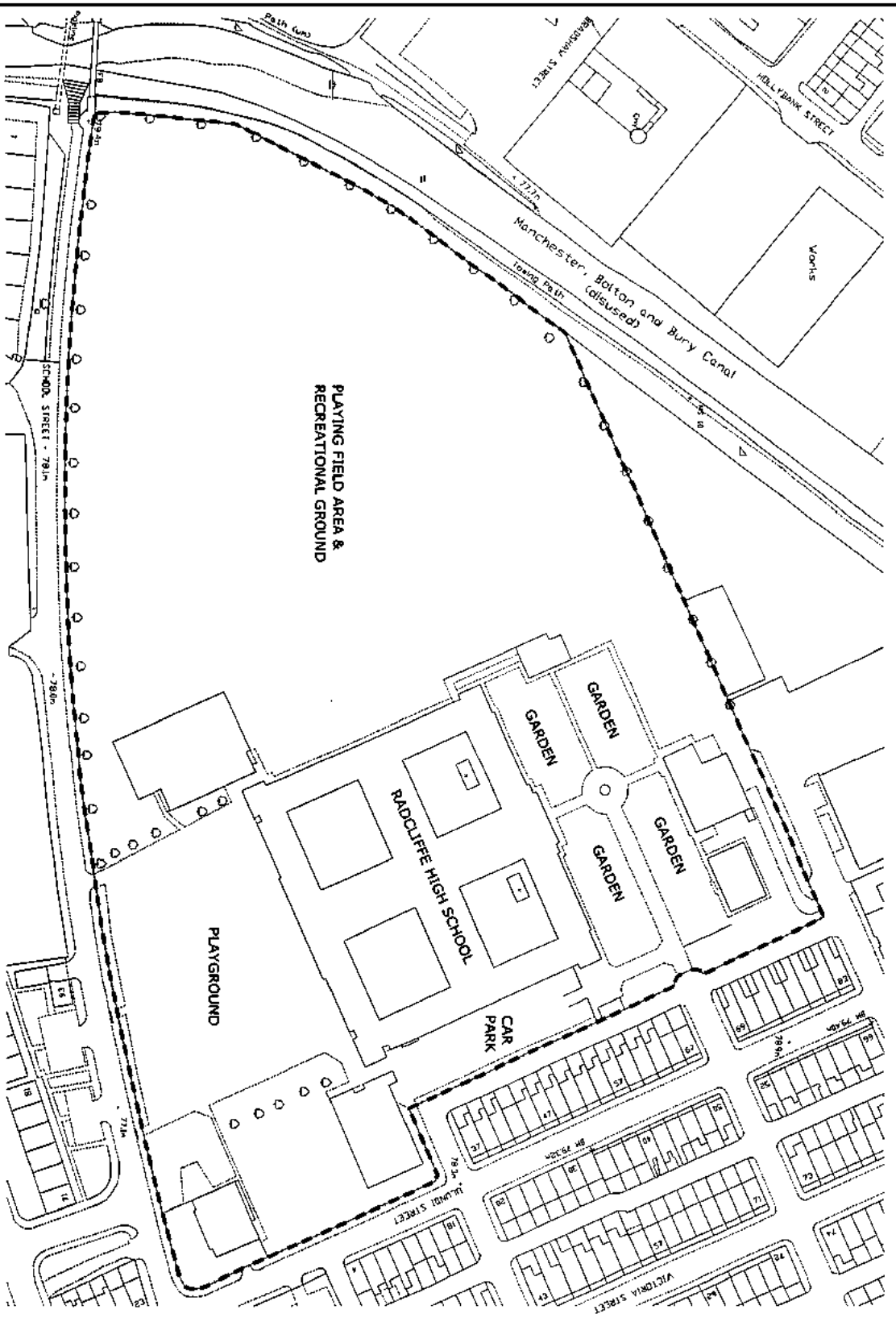
13-07-05

SCALE

1/50,000

DRG No.

7028/1



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STONE CROSS LANE NORTH
LONDON
WALTON ROAD
WALTON
WALTON 281
TEL: 01942 844000
FAX: 01942 844000

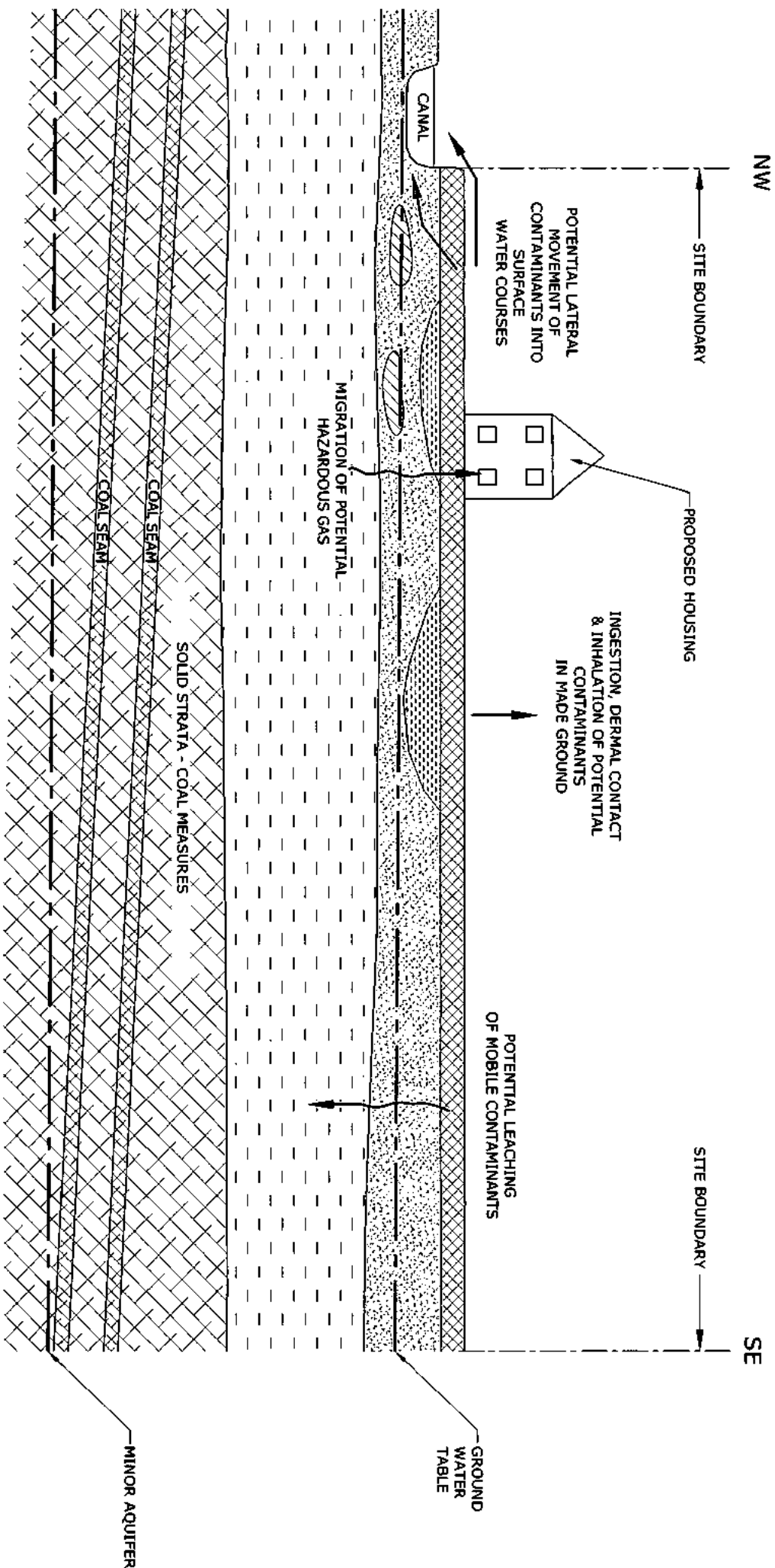
BURY M.B.C.

RADCLIFFE HIGH SCHOOL

EXISTING SITE LAYOUT PLAN

STATUS
FINAL

DESIGNED BY	NCW	DATE	13-07-05
APPROVED	NR	DATE	13-07-05
SCALE	1/1250	DATE	7028/2



KEY

- MADE GROUND
- SAND & GRAVEL WITH CLAY INCLUSIONS (GRANULAR ALLUVIUM)
- SOFT COHESIVE ALLUVIUM
- STIFF GLACIAL TILL (BOULDER CLAY)
- SHALLOW LOCALISED PEAT DEPOSITS

ENCLIA
CONSULTING LIMITED

STONE CROSS PLACE
STONE CROSS LANE NORTH
LOWTON
LEICESTERSHIRE
LE14 2ST

TEL: 01454 824406
FAX: 01454 824428

CLIENT

BURY M.B.C.

JOB TITLE

RADCLIFFE HIGH SCHOOL

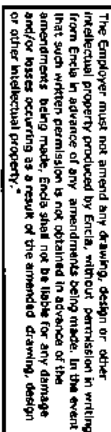
DRAWING TITLE

CONCEPTUAL SITE MODEL

STATUS

FINAL

DESIGNED BY	NRW	SIGNATURE	DATE
APPROVED	NR	SIGNATURE	DATE
SCALE	N.T.S.	DWG No.	7028/3



KEY
 WIS WINDOW SAMPLE - ENCLIA MAY 2005
 BH BOREHOLE - ENCLIA MAY 2005
 CBH ROTARY BOREHOLE - ENCLIA MAY 2005
 SITE BOUNDARY

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STONE CROSS LAKE NORTH
LOWTON
WARWINGTON
WAS 25M

TEL: 01942 824106
FAX: 01942 824030

BURY M.B.C.

RADCLIFFE HIGH SCHOOL

EXPLORATORY HOLE LOCATION PLAN

FINAL

NCW	DATE
13-07-05	

NR	NR	13-07-05
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1/1250	7028/4
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Appendix C
Photographic Survey



Photo 3: View of playground and main school area from southern portion of the site



Photo 4: View of car parking area located in eastern part of the site

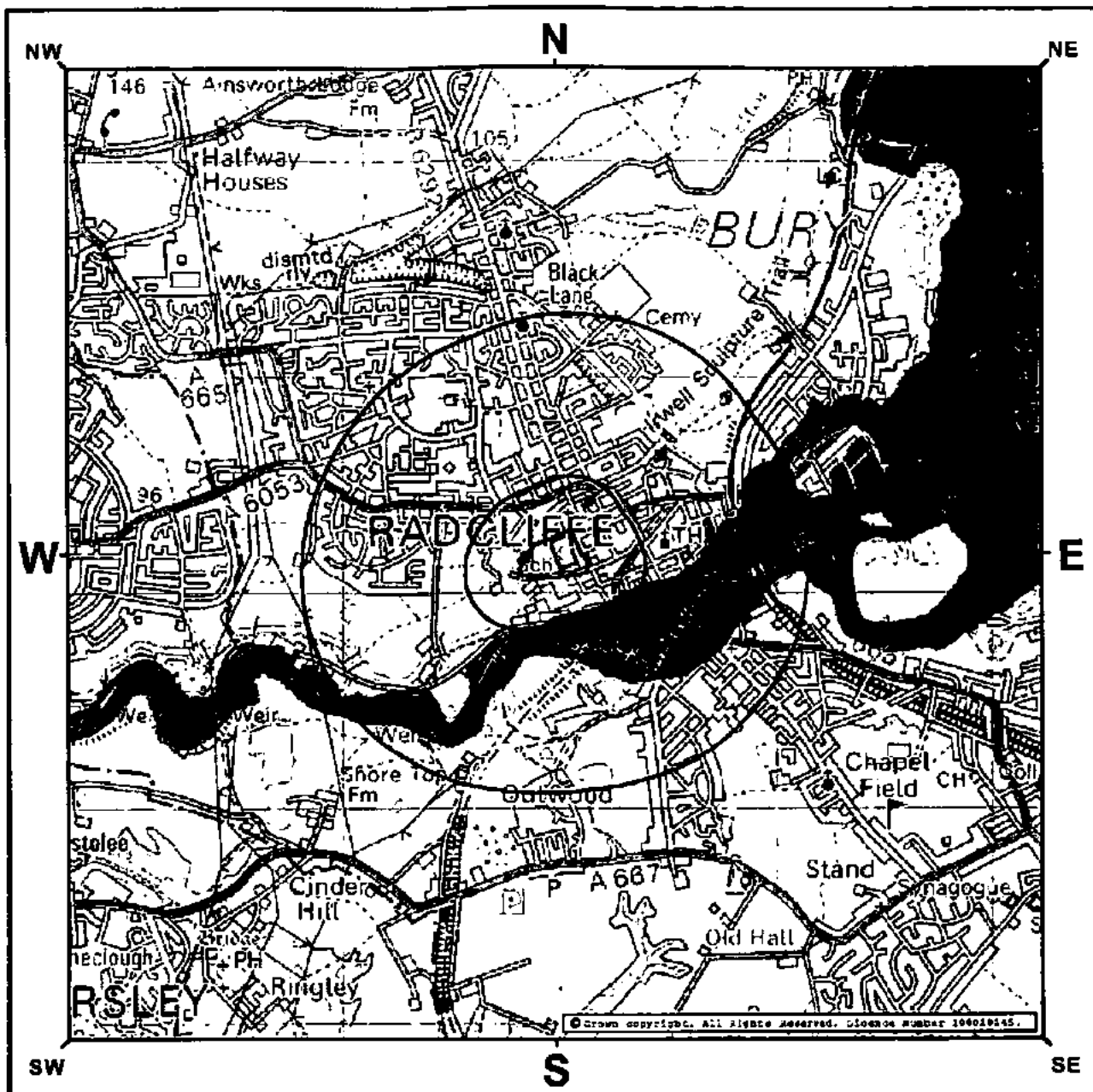


Photo 5: Frontage of main school building with garden areas in foreground



Photo 6: View of northern boundary of the site adjacent to garden areas

Appendix D
Search Responses & Other Correspondence



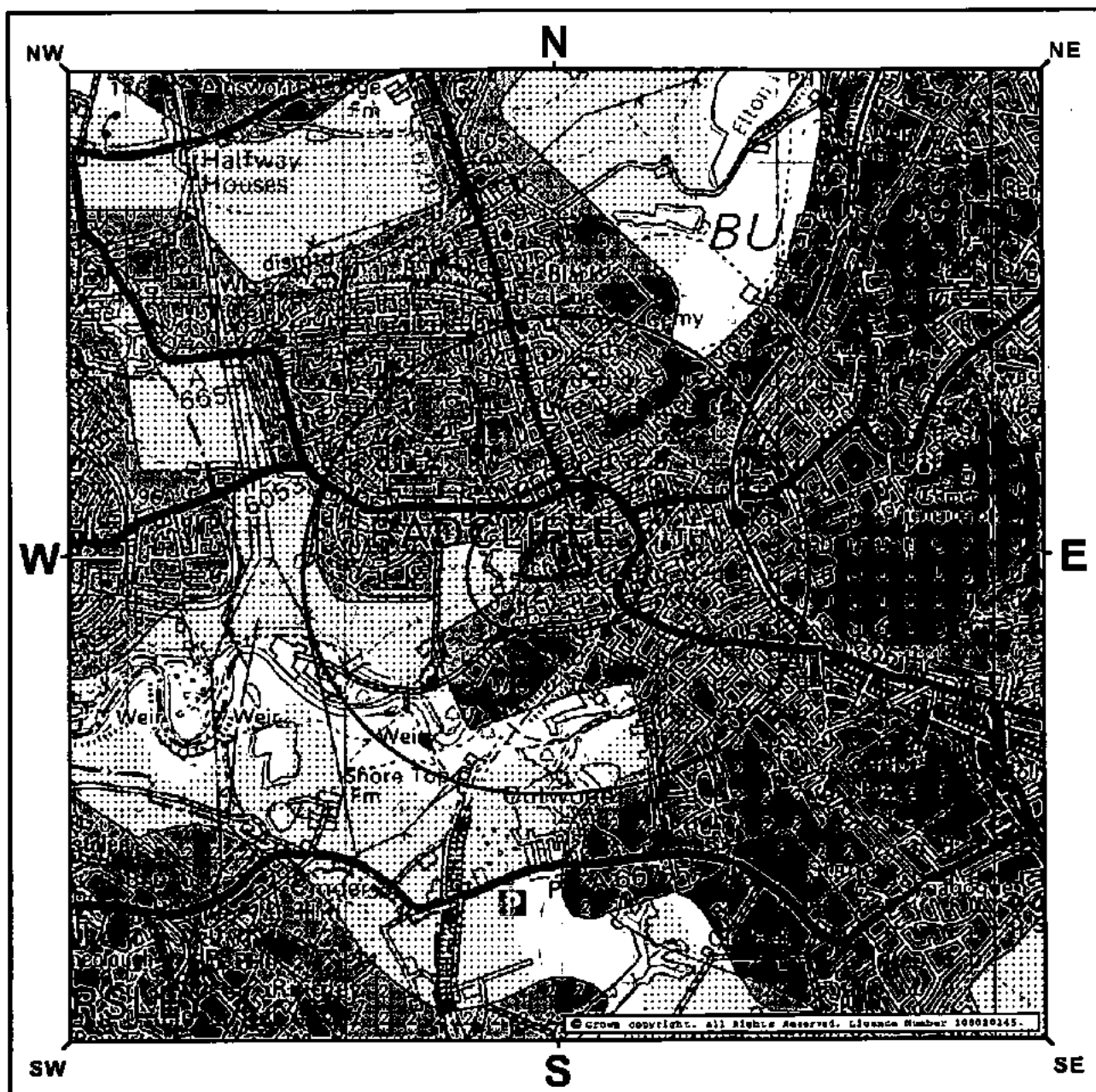
KEY

General

- Specified Site
- ✕ Bearing Reference Point
- Buffer

Agency & Hydrological Environment Agency

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defences
- Flood Water Storage Areas
- Flood Defences



KEY

General

- Specified Site
- ✕ Bearing Reference Point
- Buffer

Groundwater Vulnerability

Geological Classes

Major Aquifer
(High Permeable)

Minor Aquifer
(Variable Permeable)

Non Aquifer
(Negligibly Permeable)

Soil Classes

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

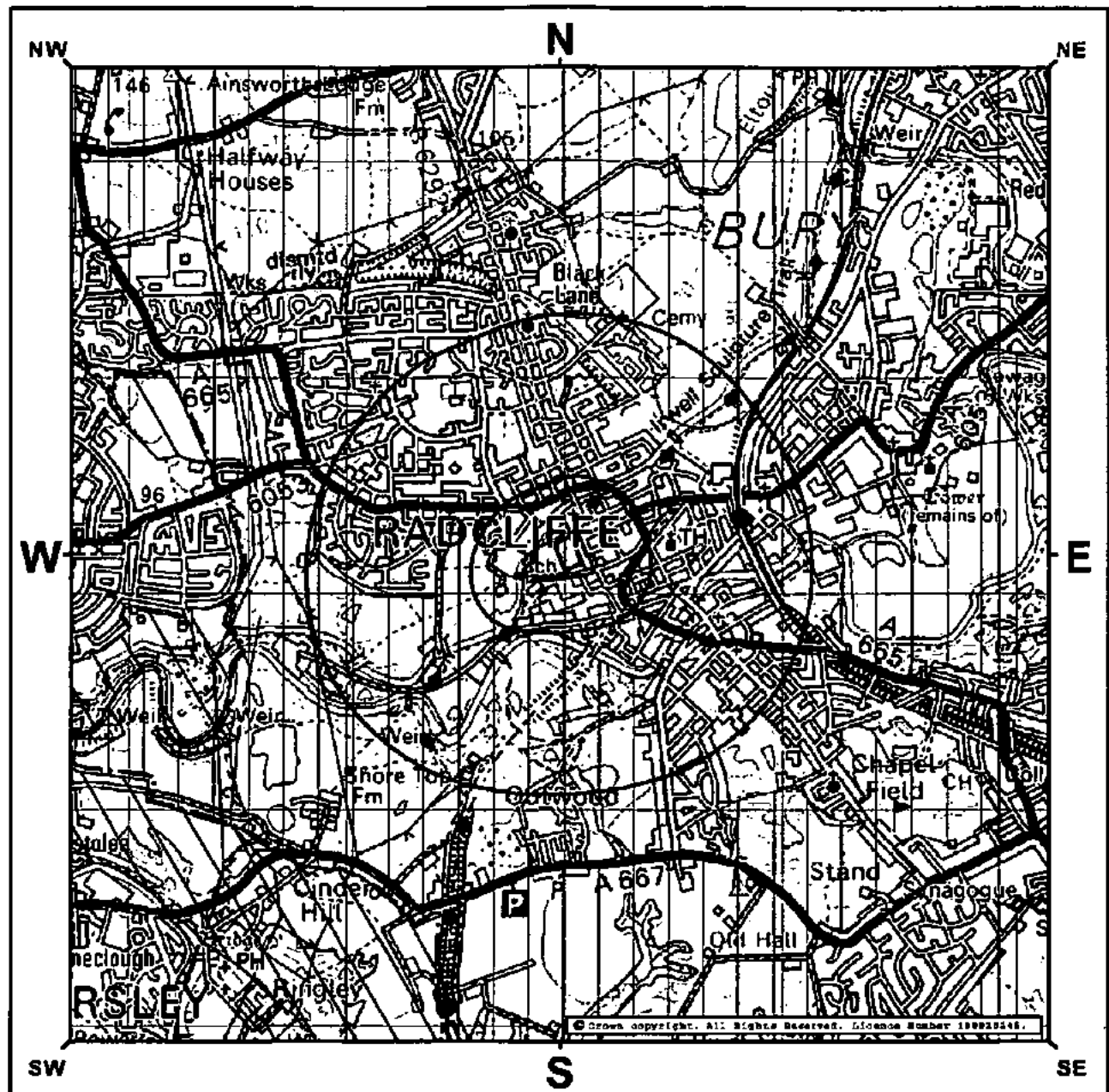
Low

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

Low

Drift Deposit



KEY

General

- Specified Site
- × Bearing Reference Point
- Buffer

Sensitive Land Uses

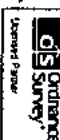
- ▨ Area of Adopted Green Belt
- ▨ Area of Unadopted Green Belt
- ▨ Area of Outstanding Natural Beauty

- Environmentally Sensitive Area
- ▨ Forest Park
- Local Nature Reserve
- ▨ Marine Nature Reserve
- National Nature Reserve
- ▨ National Park
- ▨ National Scenic Area

- ▨ Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- ▨ Ramsar Site
- ▨ Site of Special Scientific Interest
- ▨ Special Area of Conservation
- ▨ Special Protection Area



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Envirocheck Order No. EC11189471_1_1

9520

Abstract

Grid Reference **377980** **407180**



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0670 Fax: 0038 639 6671

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Customer Ref: 1001 (Refined) 0011
 Envirocheck Limited
 1001 Cross Pine Stone Cross Lane
 Walsby
 Walsby

SITE DETAILS GtF Reference 377960 407180

Ref: 1001 (Refined) 0011
 Envirocheck Limited
 1001 Cross Pine Stone Cross Lane
 Walsby
 Walsby

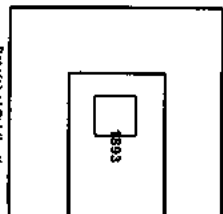
Historical Map Legend

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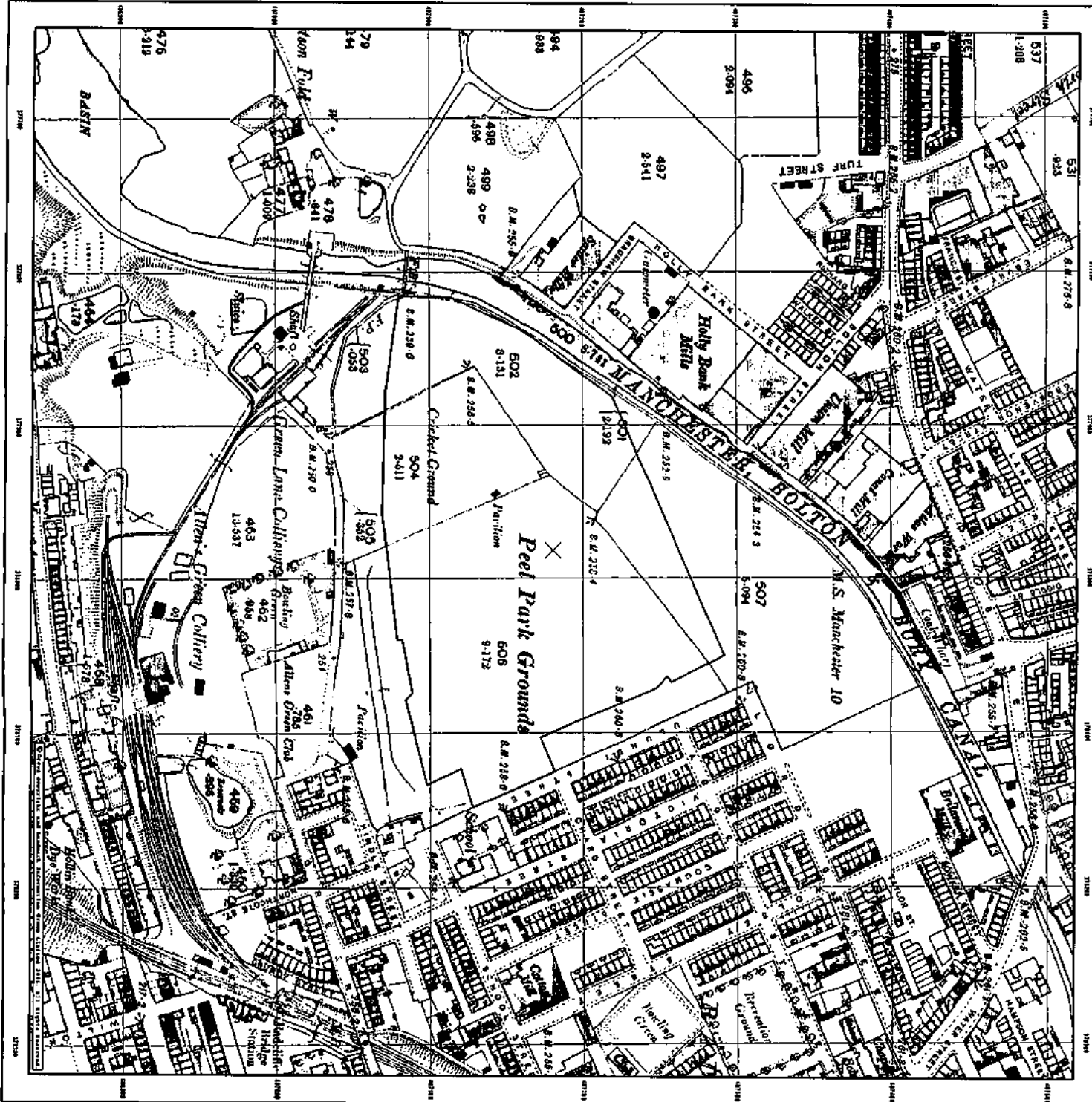
Ordnance Survey County Series

This historical map shows some information from the 1893 Ordnance Survey map. It is not a true representation of the land at that time, but a composite of information from various sources. It is not a true representation of the land at that time, but a composite of information from various sources. It is not a true representation of the land at that time, but a composite of information from various sources.

LANCASHIRE AND FURNESSE
 Published 1893
 Source map 6426 - 112,200



Details of Publication







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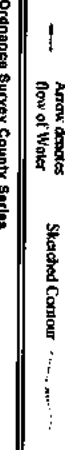
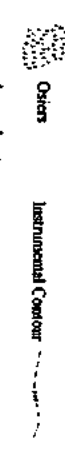
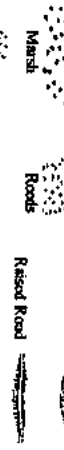
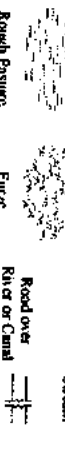
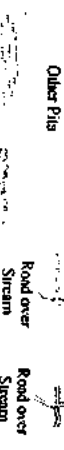
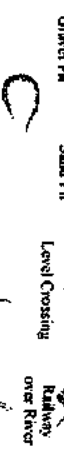
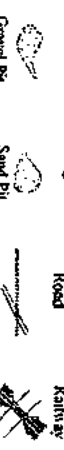
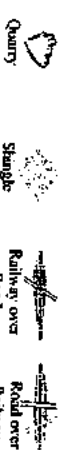
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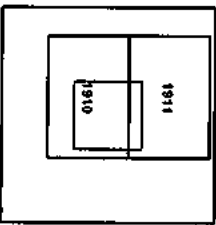


Ordnance Survey County Series

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LANCASHIRE AND FURNESS

Source map scale - 1:10,000



Date(s) of Publication: 1991



1. Introduction

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**WIA**
Information



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ECO-8467-9988 14 (81)

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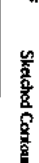
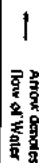
Ericks Consulting Limited

Watering

Grid Reference	377880	407180
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Родительский клуб

Historical Mind Legend

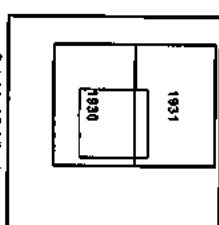


Ordinance Survey County Series

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LANCASHIRE AND FURNESS

Source map scale - 1:10,500



Date(s) of Publication: 19-01-2019



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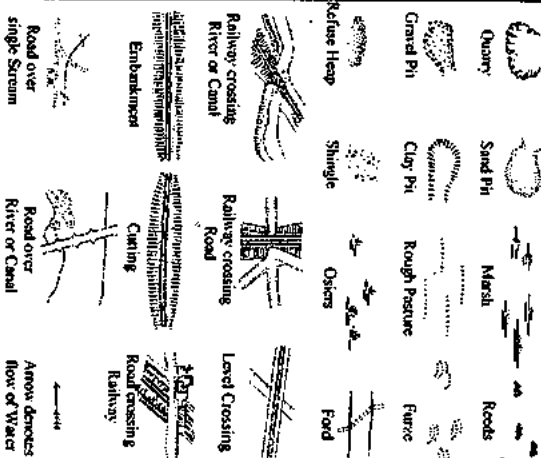


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LINE NORTH

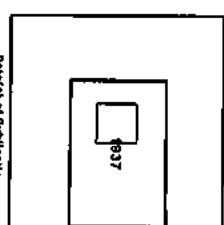
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Ordinance Survey County Series

The identified towns shown were represented from other publications, based on the scale indicated for England. Most of the data in the table is from the 1:25,000 scale, but additional mapping notes were used to fill in certain details. The scale of the map is 1:25,000. The data was collected from the Ordnance Survey maps, which are the most accurate source of data for this purpose. The data was collected from the Ordnance Survey maps, which are the most accurate source of data for this purpose. The data was collected from the Ordnance Survey maps, which are the most accurate source of data for this purpose.

LANCASHIRE AND FURNESS
Published 1937
Source map scale - 1:2,500



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CLIENT DETAILS Envirocheck Order No. EC111947_1.1

Customer Ref: 104100000000
Rode Consulting Limited
Rode Cross Road Stone Lane North
Warrington
WA1 3SL

SITE DETAILS Grid Reference 377980 407180

Location: Map Sheet
Rode Cross
Rode Cross

Historical Map Legend

Clunk Pit, Clay Pit, or Quarry Non-contiguous Trees Bracken

Gravel Pit Coniferous Trees Heath

Sand Pit Scrub Rough Grassland

Disused Pit or Quarry Lym Reeds

Refuse or Slag Heap Pole Transmission Line Siltings

Direction of Flow of Water Shingle Marsh

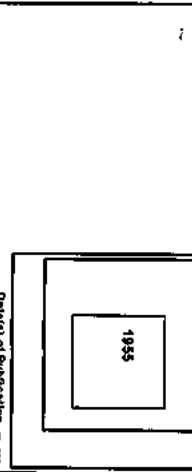
Quilting Sand Embankment

Road / Over Level Crossing Standard Gauge Multiple Track

Sliding, Trenching or Mineral Line Narrow Gauge

ORDNANCE SURVEY PLAN

Published 1955
Source map scale: 1:10,000



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Information Group
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 (Rev. 10/01/00)

Customer Ref: 1011189471_1.1
 Envirocheck Order No. EC11189471_1.1
 (Rev. 10/01/00)

SITE DETAILS

Grid Reference 377980 407100
 (Rev. 10/01/00)

Historical Map Legend

Active Quarry, Chalk
 Pile or Clay Pit
 Culvert

Slope
 Direction of
 Cope, Oiler

Pylon
 Transmission Line
 Water flow

Marsh
 Saltings
 Orchard Tree
 Reeds

Rough Grassland
 Scrub
 Heath
 Broken

Coniferous Tree
 Non-coniferous Tree
 (Not Surveyed)

Ordnance Survey Plan
 (Not Surveyed)

Ordnance Survey Plan
 (Not Surveyed)

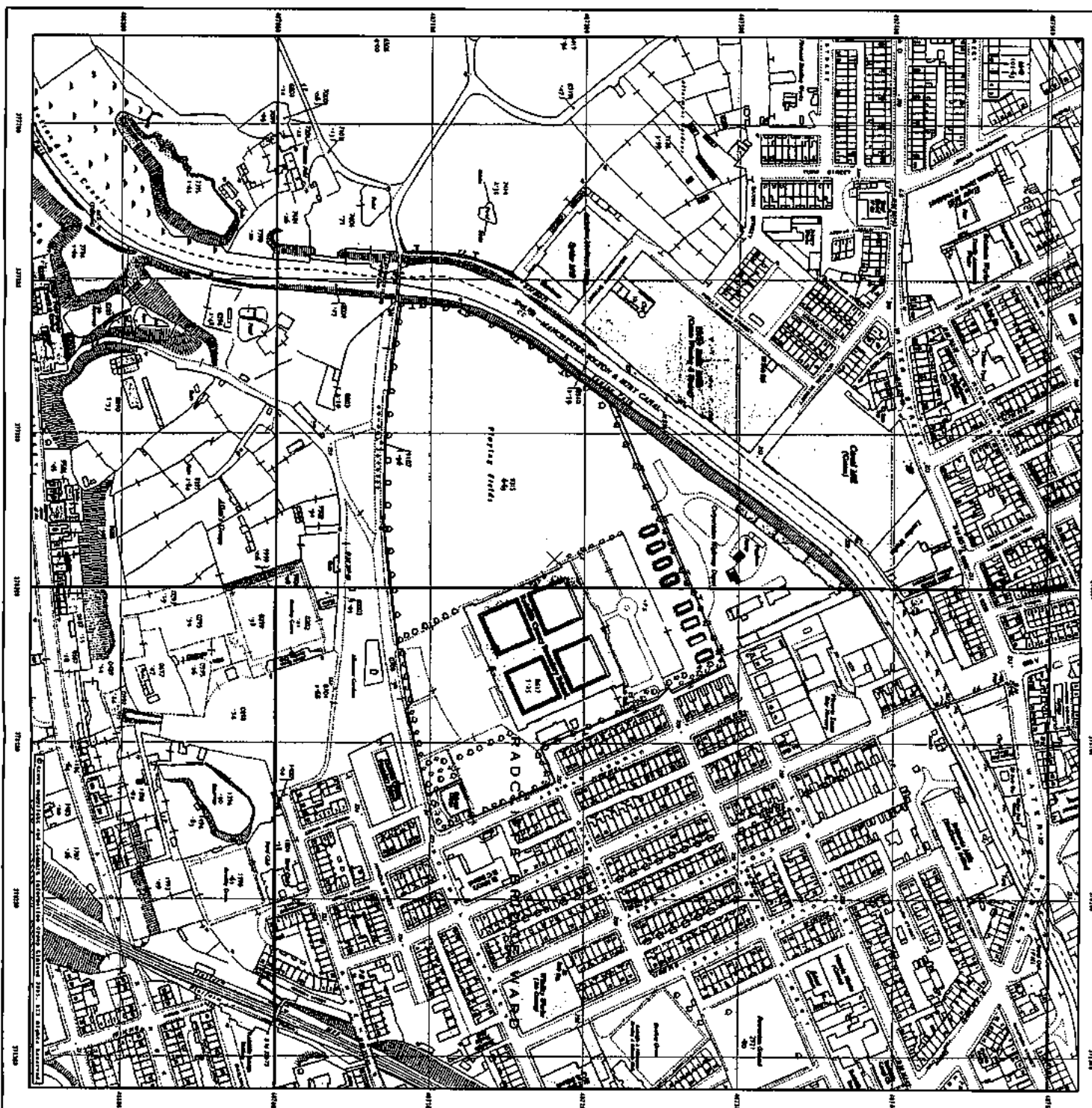
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 (Not Surveyed)



Customer Referrals: 1 million 437K

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24000 10th Avenue, Suite 100
West Vancouver, BC V8V 2E1
Tel: 604-261-1111

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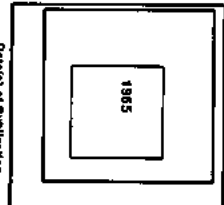
COORDINANCE SURVEY PLAN

Published 1955

Service map scale : 1:10,800

Published 1965

Борща нап scale : 1:10,560



Declaration of Preparation



106 CH 270-284



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Environmental Order No. EC11189471 1

Customer Referrals: 100%

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Wetherham**

WAS 18M

241
0114
660

SITE DETAILS

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Practice Problem 1 (Hibbeler, 2008)

CLIENT DETAILS

Envirocheck Order No. EC11189471_1.1

Customer Ref: 1000000000

Bechtel Consulting Limited

Stone Cross Place Stone Cross Lane Walsingham

NAS 38H

SITE DETAILS

Grid Reference 377980 407100

Sheets: 1000000000

School Street

Details:

Historical Map Legend

Chalk Pit, Clay Pit, or Quarry

Non-continuous

Trees

Bracken

Gravel Pit

Contaminants

Heath

Sand Pit

Scrub

Rough

Grassland

Disused Pit or Quarry

Lake Loch or Pond

Reeds

Refuse or Slag Heap

Electricity

Saltings

Direction of Flow of Water

Shingle

Marsh

Culvert

Embankment

Standard Gauge

Multiple Track

Road

Level

Foot

Standard Gauge

Single Track

Under

Diver

Crossing

Bridge

Single Track

or Mineral Line

Narrow Gauge

Ordnance Survey Plan

3

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Ordnance Survey Plan

1:10,000

Ordnance Survey Plan

1:10,000

1970

Details of Publication



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Enviroscheck Order No. EC11189471_1_1

金工部 10.04.2008

2.0000 L. 2.7700 M. 1.0000 N.

Grid Reference	377880	407180
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Historical Map Legend

Non-coniferous	Coniferous
 	 
Trees	Trees
TT	TT
Bracken	Bracken

Coniferous
Leath

1000

Scrub	Rough
Lake, Loef	Ginsal

our Planet
Pylon
Records

Electricity	— 1.5 —	Savings
Transmission	— 1.5 —	
Pole	— 1.5 —	

W of Water ———— Marsh

Shingle

Sand

Mud

Embarkment
Standard Charge

[illegible]

Over	Crossing	Bridges
Siding, Transverse		
or Mineral Lines		

NATON CLAUDE

conductor in his posthumous work built on the skills acquired in England. Writing to his father and brother in 1843, he expressed his longing to work with them and to work on the great theories of physics that they had developed.

When virus production, which yielded the 118,544 samples from a number of European and African countries, was completed, the researchers began testing for the presence of the virus. The researchers found that the virus was present in 10 of the 118,544 samples. The researchers found that the virus was present in 10 of the 118,544 samples.

On 1978, (the first 1:1) app maps were produced using the Transverse Mercator projected map system, with new editions appearing every 10 years or so.

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1980

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Date(s) of Publication to which

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Information Group

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1, 8028

Waterlogging

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
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Grid Reference 377980 407180

Grid Reference 377980 407180

Inactive Quarry: Chalk Pit or Clay Pit	Active Quarry: Chalk Pit or Clay Pit	Culvert

[illegible]

Slope

Slope

Pykna	Electricity	Direction of Capital
Transmission Line		

11

Marsh	Salttings	Orchard Tree	Ree

Rough Grassland

$\frac{B}{S} = \frac{R}{G}$

$S = \frac{BR}{G}$

$T = \frac{B^2 R}{G^2}$

FICAM

上	木	草	草
Coniferous Tree	Coniferous Tree	Non-coniferous	Non-coniferous

	Tree (Survived)	Tree (Not Survived)
(Survived)		
(Not Survived)		

Additional Stats
The 2001 study (University of Maryland) on factors, other studies of same size conducted and published, found that the odds of an accident were 1.5 times greater if the driver was not wearing a seat belt.

with a double-blind, randomized, controlled trial. The results of the trial are expected to be published in the near future.

ORDNANCE SURVEY PLAN
Published 1958 to 1982
Source map scale - 1:1,250

1956	1978
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	1981	1982
1. Total	100	100
2. Government	100	100
3. Private	100	100
4. Total	100	100
5. Government	100	100
6. Private	100	100
7. Total	100	100
8. Government	100	100
9. Private	100	100
10. Total	100	100
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13. Total	100	100
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96. Private	100	100
97. Total	100	100
98. Government	100	100
99. Private	100	100
100. Total	100	100

[illegible]

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Date(s) of Publication

OS Ordnance
Survey

LANDMAP

Information

Leads to Leads

Produced by Leadmark Information Group Limited, Tel: 01793 434 4975 Fax: 01793 434 4976





Envirocheck Order No. EC11189471_1_1
 673-661-1000 (Toll Free)

1

Grid Reference	377980	407100
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Inert Quarry: Chalk Pit or Clay Pit	Active Quarry: Chalk Pit or Clay Pit	Culvert



Skype

Pyram	Electricity Transmission Line	Direction of Water Flow	Coppe. Ore
Pyram	Electricity Transmission Line	Direction of Water Flow	Coppe. Ore

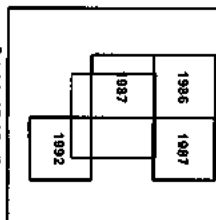
Marsh	Saltines	Orchard Tree	Road
1	1	1	1
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Rough Grassland	Scrub	Heath	Bracken
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100	100	100	100

+	+	+	+
Coniferous Tree	Coniferous Tree	Non-coniferous Tree	Non-coniferous Tree
(Surveyed)	(Not Surveyed)	(Surveyed)	(Not Surveyed)

19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853,

Source map scale - 1:1,250



Date(s) of Publication were



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Envirotech Order No. EC11189471_1_1
 415-669-2668 in 816

Grid Reference	377980	407180
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Culvert



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Bracken

Non-confidential

Free (Not Survive)

大正十一年九月一日

Produced in South Africa

103

1987

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OMARK

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Envirocheck Order No. EC11189471_1_1

1,0021

Lama North

Grid Reference	37795D	407180
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Inactive Quarry; Chalk Pit or Clay Pit	Active Quarry; Chalk Pit or Clay Pit	Culvert



Slope

Slope

Pyran	Electricity	Transmission Line	Direction of Water Flow	Copying, Orientation
Pyran	Electricity	Transmission Line	Direction of Water Flow	Copying, Orientation

Math	✓	✓	✓
Sabbies	✓	✓	✓
Norfolk Tern	✓	✓	✓
Reeds	✓	✓	✓

Graph Cross and	θ	μ	Practition
Scrub	$\theta = 1$	$\mu = 1$	$\theta = 1$

	Tree	Tree
Conscious and Omission Not	Non-conscious	Non-conscious
(Survived)	(Not Survived)	(Not Survived)

The 10 different species were stored separately in 200-ml plastic bags, individually labeled in the field, wrapped in plastic, and placed in a cooler. The 10 species were subjected for sampling within 24 hr and by 1980 it emerged that 6 of the 10 species were considered to be the ecologically purest of Great Britain. The published first paper on the effect in which some British birds have the mycoplasma-like, *Mycoplasma* sp. (OI) were two birds of the Eurasian Parakeet, *Myiopsitta monachus* (a single colony) and a group of scientific, young birds of significant importance in ecology and

LAN

1972	1989
1909	1989

Origin(s) of Publication



Produced by Cambridge Information Group, Limited. Tel: 01703 650 6470 Fax: 0476 650 6471



Customer Ref: MFG 3 MARCH 2002

Customer Ref: Mape 1 Mathew, 0025
Ensis Consulting Limited
Stone Cross Plaza Stone Cross Lane North
Warrington
WA5 2SH

Grid Reference	377980	407180
----------------	--------	--------

KNOXVILLE, Tenn.
 Dec. 10, 1904
 Dear Sir:

Slope

104-72840-1

Bench Mark

**Direction of
Water Flow**

 Python

Electricity Transmission Line

Administrative Boundaries

Civil parish/community boundary

District boundary

County boundary

Boundary post/stone
Boundary meeting symbol (note: these
always appear in opposed pairs or groups
of three)

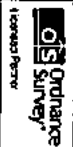
Large-Scale National Grid Data

Large-Scale National Grid Data

ORDNANCE SURVEY PLAN
Published 1897

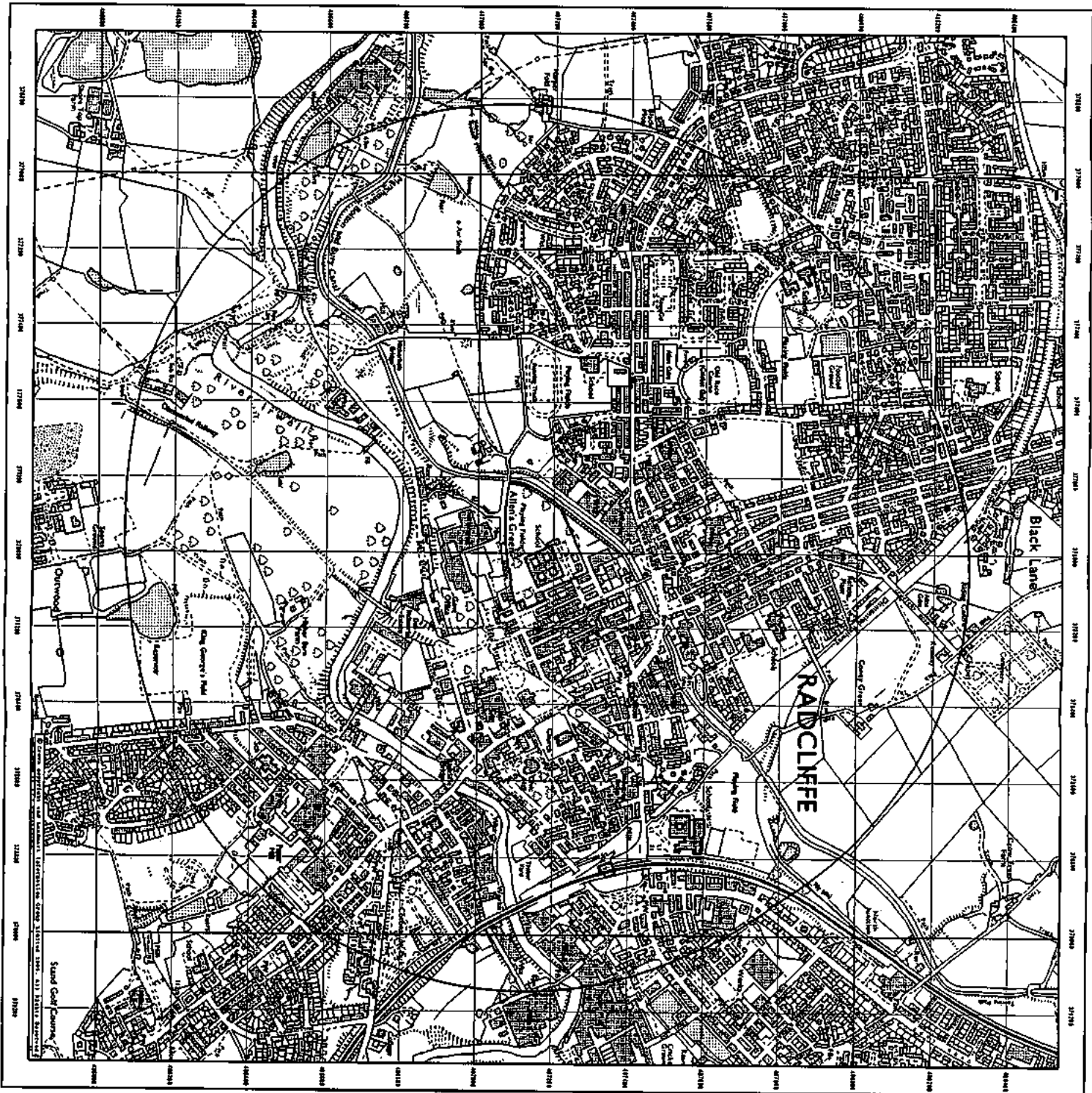
Source map scale - 1:1,250

1992	1992
1992	1992
1992	1992



LANDMARK
Information Group

Produced by Landmark Information Group Limited, Tel: 0870 830 8670 Fax: 0870 050 867



CLIENT DETAILS

Envirocheck Order No. EC11189471.1.1
 Customer Ref: M11189471.1.1
 Project Name: Radcliffe
 Client: The City of Manchester
 Address: 100 Piccadilly, Manchester, M1 2BB

SITE DETAILS

Grid Reference: 377980 407180
 Site Name: Radcliffe
 Site Address: 100 Piccadilly, Manchester, M1 2BB

Historical Map Legend

- Chalk Pit, Clay Pit, or Quarry
- Non-continuous Trees
- Bracken
- Gravel Pit
- Coniferous Trees
- Heath
- Sand Pit
- Scrub
- Rough Grassland
- Lake, Loch or Pond
- Disused Pit or Quarry
- Hydro
- Roads
- Refuse or Slag Heap
- Pole
- Electricity Transmission Line
- Settlements
- Direction of Flow of Water
- Shingle
- Sand
- Marsh
- Coasting
- Embankment
- Standard Gauge Multiple Track
- Road
- Level
- Foot
- Standard Gauge Single Track
- Under
- Over
- Crossing Bridge
- Sliding Tannery or Mineral Line
- Narrow Gauge

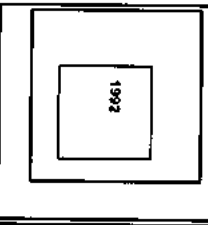
Ordnance Survey Plan

The Ordnance Survey Plan is a map of the United Kingdom, showing the coastline, rivers, and other geographical features. It is published by the Ordnance Survey, a government department responsible for the production and distribution of maps of the United Kingdom. The plan is available in a variety of formats, including paper, digital, and on-line. It is a valuable resource for anyone interested in the geography of the United Kingdom.

ORDNANCE SURVEY PLAN

Published 1992

Source map scale: 1:10,000



Detail of Publication 1992



Envirocheck Order No. EC11189471_1_1

Estadística 2016-17

1554247

Grid Reference 377980 407180

Historical Map Legend

Welby Building

Category	Item	Value
Electricity	Electricity	100
	Transmission Line	100
Python	Python	100
	Python	100

derivative

Civil parish/community boundary

District boundary

County boundary

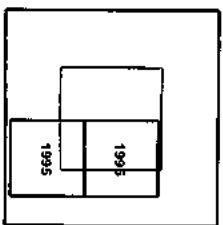
Boundary post/stone
Boundary marking symbol (note: these
always appear in opposed pairs or groups
of three)

ried O

Large-scale research (1990) reported that 60% of business buyers' buying decisions are based on the past, and confirmed in the predicted and 1995. These data may be the first step towards official mapping and so provide detailed information on buying behaviour, not used to date but appropriate, delivery such as the previous. These data were produced in 1990, 1995 and 1997, the section.

LAN

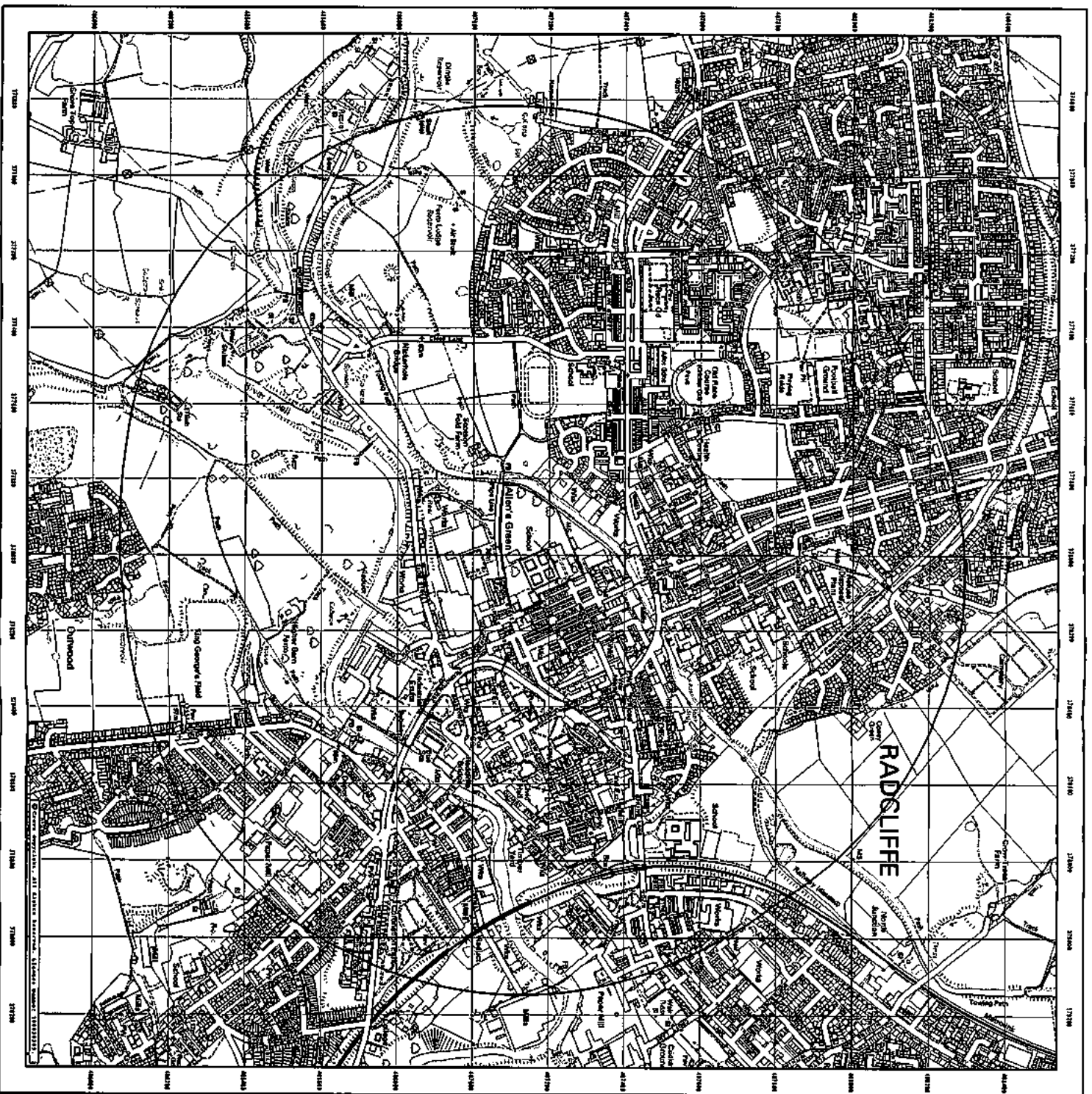
1



Date(s) of Publication 44415

**Information Group**

Produced by Coinman Information Group Limited. Tel: 0870 650 6070 Fax: 0870 450 4674



A Landmark product

CLIENT DETAILS

Envirocheck Order No. EC118471_1.1
 Customer: Radcliffe (Haworth) Ltd
 Site: Containing Limited
 Stone Cross Road Stone Cross Lane North
 Warrington
 WA1 2JH

SITE DETAILS

Grid Reference: 37780 40710
 Radcliffe High School
 School Street
 Radcliffe

Historical Map Legend

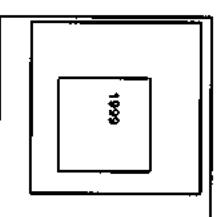
Non-coniferous Trees	Pylon
Coniferous Trees (where shown)	Telephone Line (where shown)
Orchard	Electricity Transmission Line (with poles)
Rough Grassland	Gravel Pit
Heath	Shingle
Scrub	Refuse Tip or Slag Heap
Marsh Salt Marsh or Reeds	Sand
County Boundary (England only)	Sand Pit
Civil Parish or Community Boundary	Slopes
Concurrence Boundary	District Unitary, Metropolitan, London Borough Boundaries

10K Raster Mapping

The National Mapping Agency (NMA) has produced a 1:10,000 scale vector dataset. These maps are available for purchase from the Ordnance Survey. The maps are available in a digital format (DXF) and can be used for a variety of purposes. The maps are available for purchase from the Ordnance Survey. The maps are available in a digital format (DXF) and can be used for a variety of purposes.

ORDNANCE SURVEY PLAN

Published 1998
 Source map scale: 1:15,000



Details of Publication 1999



Produced by Landmark Information Group Limited. TEL: 01273 825 478 FAX: 01273 825 481

Philip D Allen CPFA

Executive Director of Environment & Development Services

Our Ref

SDOCS/ENV/CC/sr56196.4

Your Ref

Date

9 June 2005

Please ask for

Mr C Crompton

Direct Line 0161-253

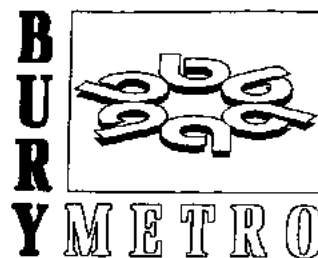
5581

Direct Fax 0161-253

5563

E-Mail

C.J.Crompton@bury.gov.uk

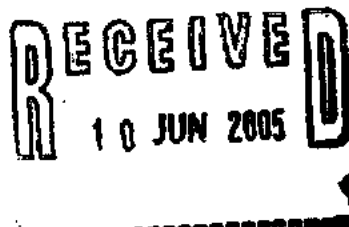


**ENVIRONMENTAL
SERVICES DIVISION**

*Textile Hall
Manchester Road
Bury BL9 0DG
Tel: 0161-253-5566*

**Alan Freer
Borough Environmental
Services Officer**

Anne Willoughby
ENCIA Consulting Ltd
Stone Cross Place
Stone Cross Lane North
Lowton
Warrington
WA2 2HS



Dear Anne

**INFORMATION REQUEST
RIVERSIDE WEST CAMPUS (RADCLIFFE HIGH)**

With regards to your fax dated 26 May 2005 concerning the above site we offer the following comments:

Landfill Sites

*** We are aware of one notified landfill site within 250m of the search site, the location of which is indicated on the enclosed plan. Details of this landfill is given below:

Landfill Name: SW of Sion Street
File reference: C092 **Grid Ref.:** 378196 406835 (centre)

This site is was infilled under Licence 635/90, issued March 1991 and surrendered June 1991. The site was infilled with ash and natural clays from adjacent railway embankments to raise levels and aid run off to the adjacent river. There is no further information on file.

Contaminated Land

There are no entries relating to the site or surrounding land in the register maintained under s78R(1) of the Environmental Protection Act 1990. It is not known at this time whether the site or any of the surrounding land will be identified as contaminated or subject to an inspection.

Cont/d.....

Bury Prestwich Radcliffe Ramsbottom Tottington Whitefield

BURY METROPOLITAN BOROUGH

www.bury.gov.uk

*Community
Legal Service*



**Trading Standards
Certificate Number
Q51206**



**Certificate Number 1549/S8
Environmental Services**



INVESTOR IN PEOPLE



Authorised Processes

*** We are aware of one Part B process within 250m of the search site, the location of which is indicated on the enclosed plan. Details of this process are given below:

Process Reference	Operator	Distance from site	Grid Ref.	Pollutants (process)
LAPPC0308	FAM Engineering Bolton Street, Radcliffe	~ 30m to north west	377816 407233	Particulates (Waste Oil Burner)

We are not aware of any Part A2 or Part A authorised processes within 250m of the site, however the Environment Agency may hold further details.

Nuisance & Reported Incidents

We have searched the Environmental Services FLARE database for nuisance and pollution incidents.

No nuisance incidents have been logged against the address supplied within the last 12 months.

No pollution incidents have been logged against the address supplied within the last 12 months.

No Statutory Notices for nuisance have been served against the address supplied or the immediate area within the last 12 months. The only complaint on file in the last 12 months is from a local resident complaining about the burning of waste to the rear of a shop on Abden Street.

Environment Information Regulations 2004

The new Environmental Information Regulations came into force on 1st January 2005. These regulations enable individuals and organisations to request environmental information held by public bodies. In the majority of cases, we will endeavour to respond to your request within 20 working days; extended to a maximum of 40 working days should the request be complex or voluminous. Public Bodies are allowed to make a reasonable charge for supplying the information requested, and we will contact you if a charge is applicable.

Cont/d.....

You are welcome to have access to any public registers or to examine the information free of charge. If you wish to do so, please contact the Authority to arrange viewing.

If you are dissatisfied with your response, you have the right to complain to the Local Authority, who will conduct an internal review to try and resolve any issues or problems. Please complete a 'Report a Problem' complaint form available from our website: www.bury.gov.uk or by contacting customer services on 0161 253 5353. Should you still not be satisfied with your response, you may then appeal to the Information Commissioner. Details can be found on the following website: www.informationcommissioner.gov.uk or by contacting 01625 545 700.

Customer Satisfaction Survey

Environmental Services, as part of its commitment to Customer Care, is looking at ways to improve its service. Our commitment is to listen to our customers and offer courteous, helpful advice and assistance.

*** With regards to your information request I should be grateful if you could complete the enclosed questionnaire to help us assess if we are meeting your needs.

Information collected in the survey will be strictly confidential and will enable us to provide a quality service.

*** A pre-paid envelope is enclosed to return the completed questionnaire. Thank you for your co-operation.

*** Please find enclosed a receipt for your cheque of £63.00. Should you have any further queries please call.

Yours sincerely



COLIN CROMPTON
ENVIRONMENTAL PROTECTION OFFICER

Enc

The above details are based upon records currently held by the Environmental Services Division and are believed to be accurate at the time of printing. However, this Division can accept no responsibility for their accuracy or completeness.

Part B ref 0308

Landfill C092

250m Buffer

KEY:

- | | | | |
|--|----------------------|---|---------------|
|  | Search Site Boundary |  | Landfill Site |
|  | Authorised Process | | |

TITLE:

Raddliffe Riverside West Campus
Landfill Site and Authorised Process Proximity

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Bury MBC 100023063/2005

NGR: 378658 407620
SCALE (approx): 1:5000 Date: June 2005





**ENVIRONMENT
AGENCY**

Report Reference: 590005_994_1344455_9
Distributor Reference
Your Reference: 133814
Report Delivery Method: Email - pdf
Report Date: June 7, 2005

**Address: RADCLIFFE RIVERSIDE WEST CAMPUS, ABDEN
STREET, RADCLIFFE, MANCHESTER,**

Dear Sir/Madam,

Thank you for placing your order with Environment Agency Property Search. Your **Complete Property Search Report** is enclosed.

The Environment Agency and GroundSure Limited, a leading environmental consultancy, have prepared this composite report using the particular information, skills and expertise of each organisation. The Environment Agency has reviewed its own data to make the Flooding assessment below and to answer questions E1 to E14 in the 'Environment Agency Questions' section of this report. GroundSure has reviewed all of the data in this report, including subsidence, radon and coal mining, and has assessed the risk of the site being designated as 'Contaminated Land' as defined by Part IIA of the Environmental Protection Act 1990. After making their respective assessments, the Environment Agency and GroundSure consider that the risks associated with the following environmental conditions are as follows:

Risk	Assessment of Risk
Flooding	√
Subsidence	Very Low
Radon	Less than 1%
Coal Mining	Further Action may be needed
Contaminated Land as defined by the Environmental Protection Act 1990	Passed

For further information about the assessment of the Risk factors above or other findings in this report, please refer to the 'Overview and Guidance' section of this report.

The Environment Agency and GroundSure are responsible for their respective assessments (see the 'Professional Assessment Methodology' section). The limit of liability for this report is set at £1m. The Environment Agency is self insured and GroundSure has total PI cover of £5 million.

If you or your client have any query relating to this composite report, or if you wish to see the detailed data reports that support it, please contact the Environment Agency's National Customer Contact Centre on 08708 506506, or contact your original report supplier.

Yours faithfully,

Property Search
Environment Agency

The composite report is comprised of a summary of the Environment Agency data report and GroundSure's Homebuyers Review. The two source documents are available on request for no extra charge. Your attention is drawn to the terms and conditions regulating this report and its use which are set out at the end of this report.

Environment Agency Property Search

For Further Information contact NCCC on 08708 506 506



**ENVIRONMENT
AGENCY**

area. If these relate to the property being purchased (please check the plan and if relevant the details of consent or licence holder identified in the search) you should make further enquiries of the vendor and if necessary check the details with us. If not within the boundaries of the property being purchased there would not normally be a risk for a residential house although it may be of interest to some purchasers.

Whilst falling outside the scope of this assessment you may wish to consider the following factors which could affect the property.

The study site is located in an area which may be affected by surface or sub-surface coal mining. A Coal Mining Search is recommended. This can be ordered through the Coal Authority or your preferred search provider.

The property is located in an area which is regarded by the British Geological Survey (BGS) as having a moderate risk of shallow mining related subsidence. It would be prudent to ask an RICS accredited surveyor to comment on this matter (www.ricsfirms.co.uk) and ask the local Building Regulations Officer at the local authority to confirm whether they hold any records of significant subsidence problems in the area. You may also wish to consider having a site-specific geological assessment of the property. This is available through a BGS Natural Ground Stability Report at a cost of £50 excluding VAT. Contact details are provided below.



and the South East, although many factors may contribute to subsidence. Whilst surveyors are normally aware of local problem areas, the BGS data may highlight high risk areas which may require particular consideration. The data is provided by the British Geological Survey and comes with an assessment of risk described as follows: Negligible, Very Low, Low, Moderate, High, Very High.

Radon: Radon is a colourless and odourless radioactive gas, which occurs naturally and is present in all areas of England & Wales. Usually the amount poses only a negligible risk to the inhabitants of a building. In some areas where the level of Radon is significant, there may be a risk to health. The data used in this assessment is supplied by the National Radiological Protection Board ('NRPB'). The data does not specify exact Radon levels, but identifies the percentage of properties that are estimated to be above the "action level". The NRPB advises that further steps should be taken to measure Radon levels in a building in an area where more than 1% of properties are estimated to be above the "action level." The NRPB risk classification is as follows: Less than 1%; 1-3%; 3-10%; 10-30%; more than 30%.

Coal Mining: The assessment is based on information from the Coal Authority identifying areas of current and former coal mining activity. Information concerning coal mining works affecting particular properties is only available from the Coal Authority. The Assessment describes the risk as follows: Passed: The site is not in a designated coal mining area. Further Action may be needed: The site is in a designated coal mining area.

Contaminated Land: As part of this report GroundSure considers key environmental information and provides a professional assessment of the risk that the property will be designated as 'Contaminated Land' as defined under Part IIA of the Environmental Protection Act 1990. This assessment is based on the following data (as set out in the Homebuyers Review report¹):

- Historical land use (derived from 1:10,000 scale Ordnance Survey maps)
- Infilled land (derived from 1:10,000 scale Ordnance Survey maps)
- Landfill and waste transfer/treatment or disposal sites (including scrap yards)
- Current industrial uses
- Integrated Pollution Prevention and Control (IPPC), and Local Authority Air Pollution Control (LAAPC)
- Control of Major Accident Hazards Sites (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS)
- Dangerous Substances Inventory Releases (DSI)
- Radioactive Substance Authorisations (RAS)
- Discharge and Red List Discharge Consents
- Sites Determined as Contaminated Land under Part IIA EPA 1990
- Environment Agency Recorded Pollution Incidents

In assessing specific site risk, GroundSure follows principles used extensively throughout the environmental consultancy sector. GroundSure's "source-pathway-receptor" analysis considers the potential for specific industries to have generated residual contamination and for this contamination to have remained at a site, or to have migrated to neighbouring sites. The system also considers groundwater vulnerability, soil leaching potential and geology.

After making its risk assessment, GroundSure will categorise the property as either "Passed" or "Failed". This assessment depends upon whether GroundSure considers that there is a "Substantial Risk" that the site will be designated as "Contaminated Land" as defined by Part IIA of the Environmental Protection Act 1990. "Substantial Risk" is defined as that level of risk which would result in the worst 1% of all sites being "Failed."

If the site is Failed it does not necessarily mean that the site is unsuitable for purchase, but only that further assessment of the risk is required. When a site is Failed the practitioner may discuss the case with one of GroundSure's consultants. Where a site is Failed environmental insurance may be available to underwrite the risk.

Limitations of Assessment re Contaminated Land

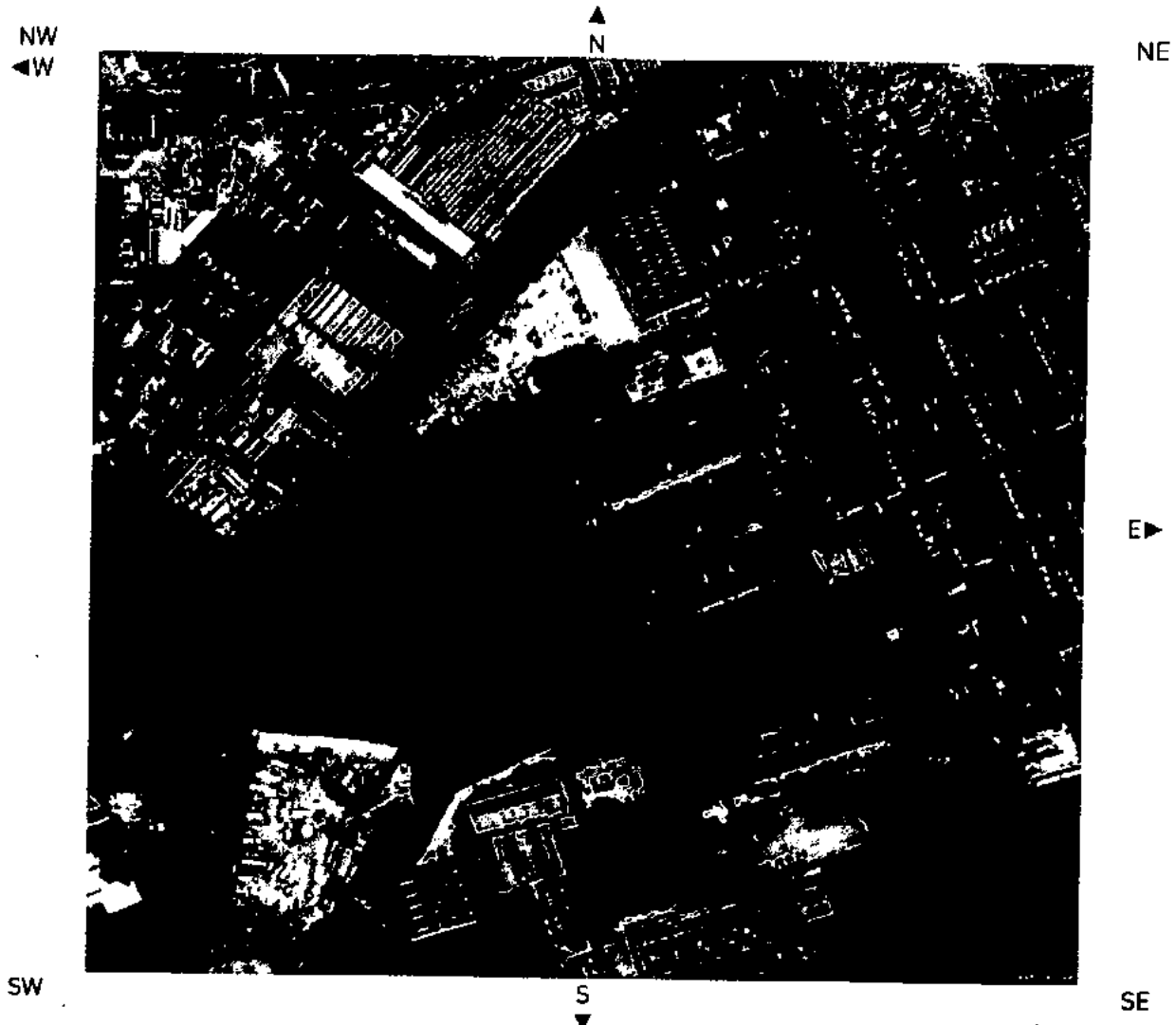
The risk assessment reviews a range of historical and current databases. However, the historical land use data reviewed for this assessment does not include data derived from 1:2,500 scale maps (except in the

¹The data in the Homebuyers Review report is provided by various companies including: AEA Technology, British Geological Survey, Catalist, Coal Authority, Environment Agency, Landmark Information Group, individual Local Authorities, NRPB, Ordnance Survey, and PointX.
Environment Agency Property Search



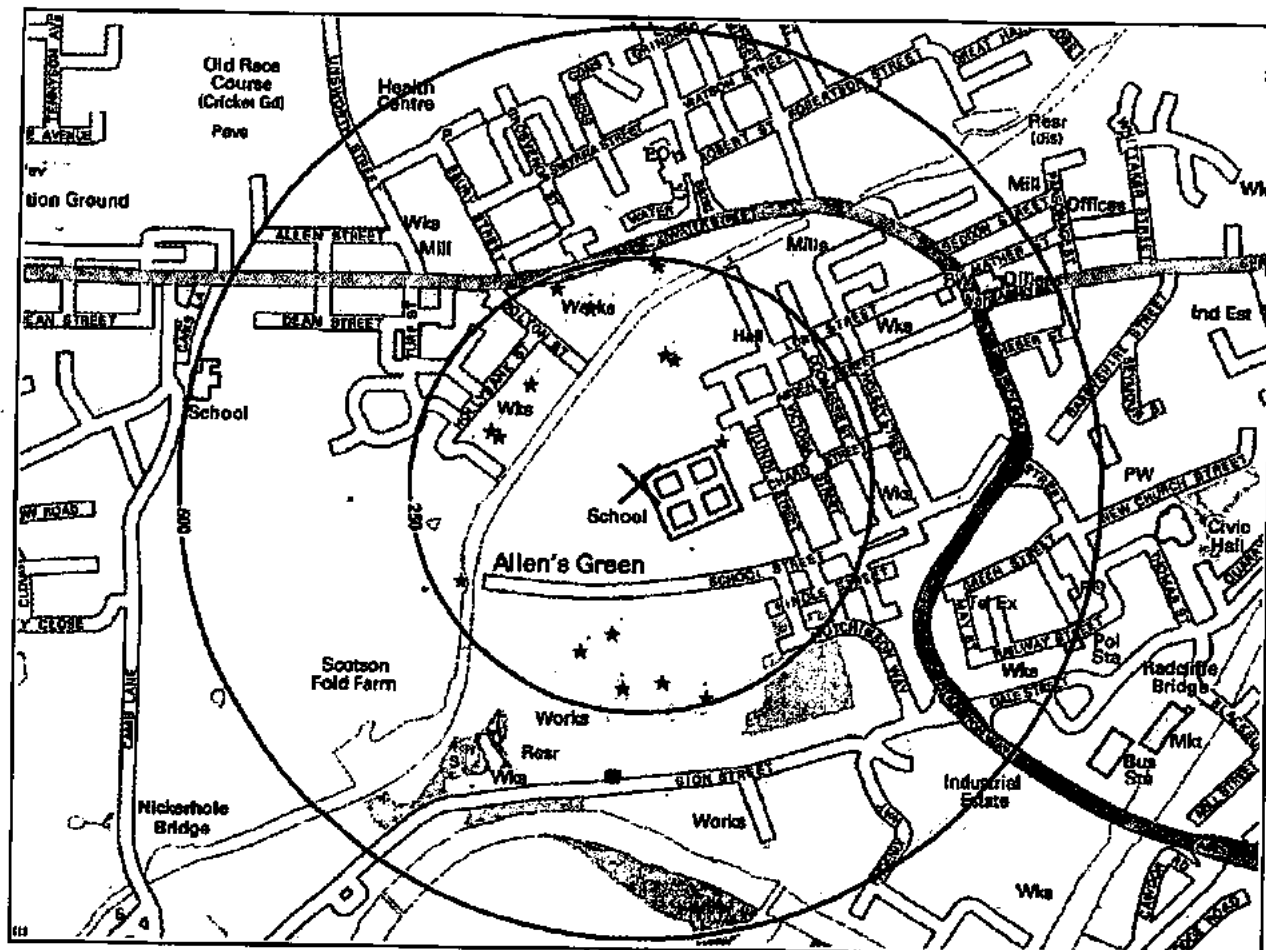
ENVIRONMENT
AGENCY

Aerial Photo



Aerial photography supplied by Getmapping PLC.
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GroundSure Data Map



GroundSure Data Map Legend



Crown Copyright. All Rights Reserved
Licence Number: 1000151162

- ★ Potentially Contaminative Industrial Sites ● Petrol & Fuel Sites ■ Dangerous Substance Sites (List 1)
✱ Sites Determined as Contaminated Land ★ LAAPC Consents □ Dangerous Substance Sites (List 2)
⊙ BGS / DoE Survey Landfill --- COMAH / NHHS Sites
GroundSure Local Authority Landfill Data (Region Data) + GroundSure Local Authority Landfill Data (Point Data)



groundsure

5.3 The Purchaser agrees that the Purchaser and any person who is provided with a copy of the Product (pursuant to Clause 3.2 or otherwise) shall not: (a) remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to the Supplier or a Data Provider from the Product; (b) create any product which is derived directly or indirectly from the Product; (c) combine the Product with or incorporate the Product into any other information, data or service; (d) reformat or otherwise change (whether by modification, addition or enhancement) the Product; (e) provide data derived from a Product to third parties without the express written permission of the Supplier or the Data Provider (as the case may be); (f) use (directly or indirectly) any data derived from a Product on any public medium (including a website).

5.4 Notwithstanding Clause 4.3, and for the avoidance of doubt, the Purchaser acting in a professional capacity may make reasonable use of the Product to advise his client.

5.5 The Purchaser will inform Supplier promptly of any problems or issues relating to the Product of which the Purchaser is, or reasonably should have been, aware.

6. USE OF SUPPLIER DATA

6.1 The Purchaser may use the Product solely for his own personal use in connection with the acquisition, disposal or charging of the Site for private residential use or to advise his Client in relation to such a transaction.

6.1.1 The Product must not be used for commercial re-use or for the purpose of evaluating the Site for any commercial, industrial or other change of use.

7. DATA PROVIDERS AND THIRD PARTY RIGHTS

7.1 Subject to Clause 7.2 below and in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999, Ordnance Survey (the Secretary of State for Transport and the Office of the Deputy Prime Minister (acting through Ordnance Survey or its successor)), GroundSure Limited and Landmark Information Group Limited may enforce a breach of these Terms and Conditions against the Purchaser, provided that such breach specifically relates to the infringement of intellectual property rights of such Data Providers.

7.2 The Supplier and the Purchaser agree not to rescind or vary these Terms and Conditions to the detriment of Ordnance Survey, GroundSure Limited or Landmark Information Group Limited without first obtaining the prior written consent of Ordnance Survey, GroundSure Limited or Landmark Information Group Limited.

7.3 Other than the parties referred to in Clause 7.1, no person other than the Purchaser and the Supplier shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of these Terms and Conditions.

8. ADDITIONAL RESEARCH

In the event that Additional Research is required, this will be provided to the Purchaser as additional work on terms to be agreed to in writing.

9. VERSION DETAILS

These terms were prepared on 18th January 2005.

The

**COAL
AUTHORITY**

EMMA HAYES,
ENCIA CONSULTING LIMITED,
ENCIA HOUSE EQUINOX 2,
AUDBY LANE,
WETHERBY,
WEST YORKSHIRE,
LS22 4RD

This matter is being dealt with by Jan Cassidy

Our Ref: **10187821-05**

Your Ref: **33672/7028/BRB**

Electronic Ref: **EME_00002839060002_005**

RRUID: **005.00002839060002**

Date: **25 May 2005**

Dear Sir,

Coal Mining Report
RADCLIFFE HIGH SCHOOL, ABDEN STREET, RADCLIFFE, MANCHESTER,
LANCASHIRE, M26 3AT

I refer to the enquiry dated 23rd May 2005, received 23rd May 2005, in connection with the above.

This report is based on and limited to the records in the possession of The Coal Authority at the time the search is answered.

Past Underground Mining

The property is within the likely zone of influence on the surface from workings in 6 seams of coal at 60m to 430m depth, the last date of working being 1900.

Ground movement from the above mentioned past coal workings should by now have ceased.

In addition you may wish to know that the property is in an area where coal is believed to exist at or close to the surface that may have been worked at some time in the past.

Present Underground Mining

The property is not within the zone of likely physical influence on the surface from any present underground coal workings.

Future Underground Mining

The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination by the Coal Authority.

The property is not within a geographical area for which a licence to extract coal by underground methods has been granted.

The property is not within the zone of likely physical influence at the surface from plans of future workings in our possession.

However reserves of coal exist in the locality which could be worked at some time in the future subject to feasibility, licences, and planning consents.

We have no record of any notice of the risk of the land being affected by subsidence being given under S.46 of the Coal Mining Subsidence Act 1991.

Shafts and Adits

We have no knowledge of any mine entries within, or within 20 metres of, the boundary of the property.

The records held by the Coal Authority may be incomplete. Consequently, there may exist in this locality mine entries of which we have no knowledge.

Surface Geology

Records in our possession do not disclose any fault or other line of weakness at the surface as having affected the stability of the property.

Past Opencast Mining

The property is not located within the geographical boundary of an opencast site from which coal has been extracted by opencast methods.

Present Opencast Mining

The property does not lie within 200 metres of the geographical boundary of an opencast site within which coal is being extracted by opencast methods.

Future Opencast Mining

The property is not within 800 metres of the geographical boundary of an opencast site for which a licence to extract coal by opencast methods is awaiting determination.

The property is not within 800 metres of the geographical site boundary of an opencast site for which a licence to extract coal by opencast methods has been granted.

Subsidence

The records in our possession do not disclose any damage notice or claim having been given, made or pursued in respect of the property since 1 January 1984.

The records in our possession do not disclose any current "Stop Notice" affecting the property.

The records in our possession do not show any request having been made to execute preventative works under S.33 of the Coal Mining Subsidence Act 1991.

Withdrawal of Support

The property does not lie within a geographical area in respect of which a notice of entitlement to withdraw support has been published.

The property does not lie within a geographical area in respect of which a notice has been given under S.41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working Facilities Orders

The property is not within a geographical area that is the subject of an Order made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to Owners of Former Copyhold Land

The property is not within an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Additional Remarks

In view of the mining circumstances a prudent developer would seek appropriate technical advice before works are undertaken on site. All proposals should have regard to good engineering practice in mining areas as identified in authoritative publications on mining stability problems. In any event, no activities should be undertaken that intersect, disturb, or interfere with any coal or mines of coal without permission of the Coal Authority.

These replies are prepared in accordance with the 2003 editions of the Coal Authority's Terms and Conditions, User Guide and the Law Society's Guidance Notes.

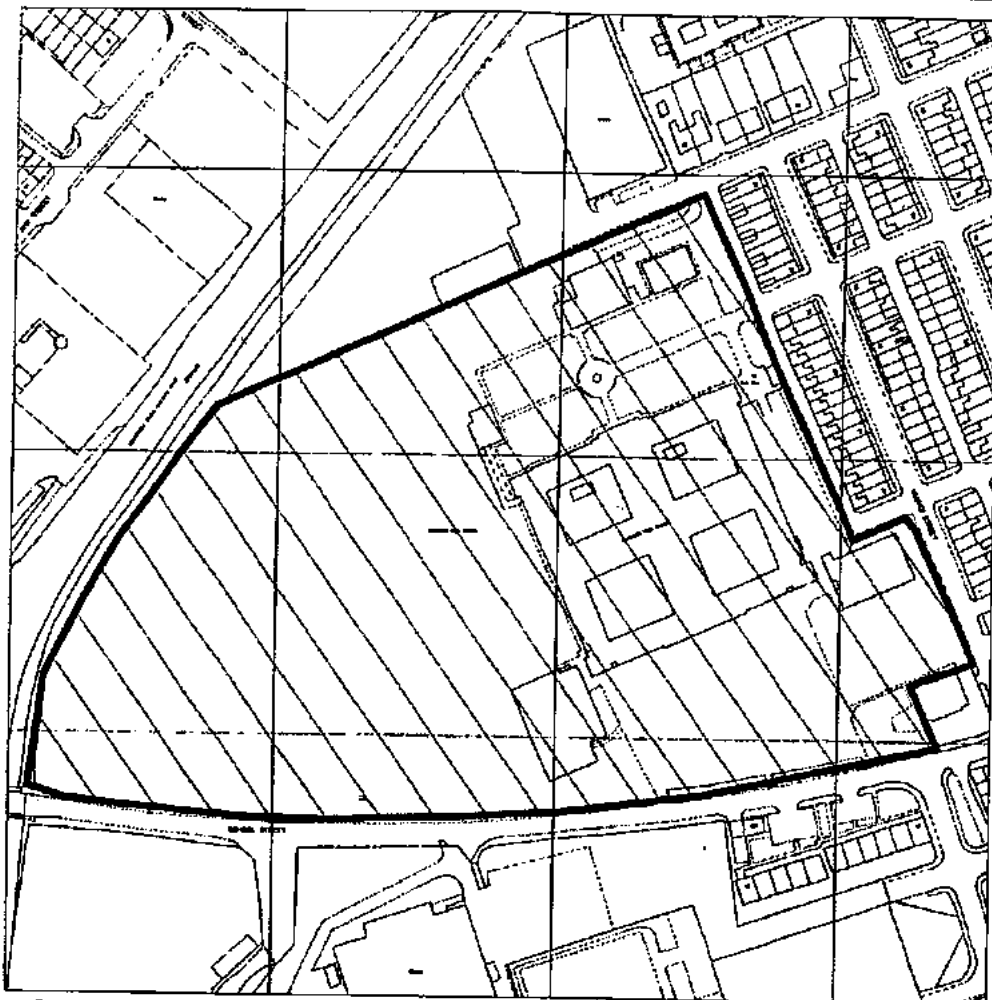
Copyright in coal mining reports and certificates belongs to the Coal Authority. Information used to compile this report is protected by the Coal Authority's database right. All rights are reserved and unauthorised use is prohibited. Copyright and other intellectual property is not transferred to external parties by possession of a mining report or certificate, however those for whom the report is supplied have the right to use it.

Yours faithfully



Stephen Pennell

Director of Mining Information and Services



Crown Copyright.

PLAN NOT TO SCALE

This map is reproduced from the Ordnance Survey material by The Coal Authority [or division thereof] with the permission of the Controller of Her Majesty's Stationery Office, Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: ALS106GA001.

This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



Appendix E
Exploratory Hole Logs

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS1

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				MADE GROUND: Tarmac. (HARDSTAND)	0.05			
2D	0.80		N=4		MADE GROUND: Black and grey fine to coarse gravel of ash and red brick. (GRANULAR MADE GROUND)	0.40			
					Damp soft orange and grey sandy CLAY with fragments of shale and coal. (COHESIVE ALLUVIUM)	1.50			
3D	2.00				Damp loose to medium dense grey silt. (GRANULAR ALLUVIUM)	2.50			
					Stiff to very stiff dark grey sandy gravelly CLAY with occasional sandstone cobbles. (TILL)	3.50			
					End of borehole at 3.50 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Window sample was installed. Monitoring installation comprised plain pipe from 0.0m to 0.5m, slotted response zone from 0.5m to 3.5m.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS2

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				Grass onto dark brown slightly gravelly clay TOPSOIL with rootlets.				
2D	0.60				Firm dark brown organic gravelly CLAY. (COHESIVE ALLUVIUM)	0.40			
						0.80			
3D	1.50				Loose orange and gray slightly clayey fine to medium SAND. Becoming wet at 1.2m (GRANULAR ALLUVIUM)				
						2.50			
					Saturated loose brown and orange gravelly fine to medium SAND with occasional fines of coal and cobbles of sandstone. (GRANULAR ALLUVIUM)				
						4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 2.5m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS3

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.30				MADE GROUND: Tarmac. (HARDSTAND)	0.05			
2D	0.70				MADE GROUND: Grey and red fine to coarse gravel of brick and sandstone with occasional cobbles of brick. (GRANULAR MADE GROUND)	0.60			
3D	1.40				MADE GROUND: Soft to firm brown sandy clay with fragments of red brick. (COHESIVE MADE GROUND)	0.90			
					Soft becoming firm brown and grey sandy CLAY with occasional fragments of coal and shale. (COHESIVE ALLUVIUM)	2.00			
					Loose grey and brown fine to coarse slightly gravelly SAND. (COHESIVE ALLUVIUM)	3.20			
					Stiff brown gravelly CLAY with bands of saturated gravelly SAND. (TILL)	4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS4

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
					MADE GROUND: Tarmac. (HARDSTAND)	0.05			
1D	0.60				MADE GROUND: Grey fine to coarse gravel of mudstone and sandstone with fragments of tarmac. (GRANULAR MADE GROUND)	0.45			
2J	1.20				MADE GROUND: Loose black fine to coarse gravel of ash, clinker and brick with occasional fragments of glass. Slight organic odour between 1.2m and 1.4m. (GRANULAR MADE GROUND)				
					Soft brown and grey slightly sandy gravelly CLAY. (COHESIVE ALLUVIUM)	1.90			
3D	2.20				Wet dense to very dense grey fine to coarse SAND and GRAVEL. (GRANULAR ALLUVIUM)	2.60			
					End of borehole at 4.00 m	4.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Window sample was installed. Monitoring Installation comprised of plain pipe from 0.0m to 0.5m, slotted response zone from 0.5m to 3.0m (hole collapsed from 3.0m to 4.0m).
3. Groundwater encountered at 2.6m during drilling.

Equipment/Methods

Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.

Logged by

NR

JOB

7028

FIGURE

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS5

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Wall / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.20				MADE GROUND: Grass onto dark brown slightly gravelly clay topsoil with rootlets and rare fragments of coke and clinker. (COHESIVE MADE GROUND)	0.60			
2D	0.70				MADE GROUND: Dark brown slightly humic gravelly clay with rare fragments of red brick and glass. (COHESIVE MADE GROUND)	0.80			
					Soft brown and grey slightly sandy gravelly CLAY. (COHESIVE ALLUVIUM)	1.50			
3D	1.60				Loose brown and grey gravelly SAND with fragments of shale and coal. (GRANULAR ALLUVIUM)	2.40			
					Wet dense grey fine to coarse SAND and GRAVEL. (GRANULAR ALLUVIUM)	3.70			
4D	3.80				Stiff to very stiff gravelly CLAY with fines of coal. (TILL)	4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 2.4m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 02/06/2005

Co-ords

End date 02/06/2005

Ground Level

WS6

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.20				MADE GROUND: Grass onto dark brown slightly gravelly topsoil with rootlets and rare fragments of coke and clinker. (GRANULAR MADE GROUND)	0.60			
2D	0.70				Soft to firm orange and light brown very sandy slightly gravelly CLAY. (COHESIVE ALLUVIUM)	0.90			
3D	1.20				Damp loose orange and grey fine to medium SAND with occasional fines of coal. Saturated from 1.5m. (GRANULAR ALLUVIUM)				
					Stiff to very stiff brown gravelly CLAY with cobbles of sandstone. (TILL)	3.70			
					End of borehole at 4.00 m	4.00			
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 1.5m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Raddcliffe High School, Raddcliffe

Start date 03/06/2005

Co-ords

End date 03/06/2005

Ground Level

WS7

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rare fragments of red brick and glass. (COHESIVE MADE GROUND)	0.35			
2D	0.80				MADE GROUND: Soft to firm brown gravelly clay. Gravel is fine to coarse of ash, clinker and brick. (COHESIVE MADE GROUND)				
3D	2.80				Saturated loose grey fine to medium SAND with occasional fines of coal and bands of soft clay. (GRANULAR ALLUVIUM)	2.00			
					End of borehole at 4.00 m	4.00			
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Window sample was installed. Monitoring installation comprised of plain pipe from 0.0m to 0.5m, slotted response zone from 0.5m to 3.5m (hole collapsed from 3.5m to 4.0m). 3. Groundwater encountered at 2.0m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/06/2005

Ground Level

WS8

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.20				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rootlets. (COHESIVE MADE GROUND)	0.50			
2D	0.70				MADE GROUND: Black and brown fine to coarse gravel of clinker, porcelain, brick and slate. (GRANULAR MADE GROUND)	1.20			
3D	1.60				MADE GROUND: Wet very soft dark brown and black gravelly clay with pockets of ash and clinker. (GRANULAR MADE GROUND)	2.50			
					Saturated loose grey and brown fine to medium SAND. (GRANULAR ALLUVIUM)	4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 2.8m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/06/2005

Ground Level

WS9

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.15				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rootlets and rare fragments of glass and clinker. (COHESIVE MADE GROUND)	0.45			
					Firm light brown gravelly CLAY. (COHESIVE ALLUVIUM)	0.65			
2D	1.20				Damp loose orange fine to medium SAND. (GRANULAR ALLUVIUM)	1.00			
					Wet becoming saturated medium dense brown and grey fine to medium SAND with fines of coal. (GRANULAR ALLUVIUM)	2.20			
					Medium dense to dense orange and grey fine to coarse SAND and GRAVEL. (GRANULAR ALLUVIUM)	3.50			
					Stiff to very stiff grey gravelly CLAY with fines of coal. (TILL)	4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered at 1.0m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/08/2005

Ground Level

WS10

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.05				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rootlets. (COHESIVE MADE GROUND)	0.15			
2D	0.60				MADE GROUND: Brown and orange fine to coarse gravel of ash, clinker, brick, coal and porcelain. (GRANULAR MADE GROUND)				
3D	1.80				Soft grey and orange mottled slightly gravelly CLAY. (COHESIVE ALLUVIUM)	1.50			
					Damp medium dense grey slightly sandy SILT. (GRANULAR ALLUVIUM)	2.10			
					End of borehole at 4.00 m	4.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater not encountered during drilling.

Equipment/Methods

Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.

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FIGURE

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/08/2005

Ground Level

WS11

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				MADE GROUND: Grass onto dark brown gravelly clay topsoil with fragments of clinker and porcelain. (GRANULAR MADE GROUND)	0.35			
2D	0.40				Brown slightly clayey SAND with occasional rootlets. (GRANULAR ALLUVIUM)	0.70			
3D	1.00				Damp loose to medium dense orange and grey slightly clayey gravelly SAND with fines of coal. (GRANULAR ALLUVIUM)				
4D	2.60								
					End of borehole at 4.00 m	4.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater not encountered during drilling.

Equipment/Methods

Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.

Logged by

NR

JOB

7028

FIGURE

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/06/2005

Ground Level

WS12

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rare fragments of red brick and glass. (COHESIVE MADE GROUND)	0.40			
2D	0.70				Damp firm grey sandy slightly gravelly CLAY. (COHESIVE ALLUVIUM)	1.10			
					Soft to firm orange and grey clayey slightly gravelly fine to medium SAND. (GRANULAR ALLUVIUM)	2.00			
3D	2.20				Saturated grey slightly clayey fine to coarse SAND and GRAVEL with fines of coal. (GRANULAR ALLUVIUM)	2.80			
					Stiff to very stiff dark grey sandy gravelly CLAY. (TILL)	4.00			
					End of borehole at 4.00 m				
Remarks 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Window sample was installed. Monitoring installation comprised of plain pipe from 0.0m to 0.5m, slotted response zone from 0.5m to 4.0m. 3. Groundwater encountered at 2.0m during drilling.									
Equipment/Methods Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.						Logged by NR	JOB 7028	FIGURE	

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-1

Start date 31/05/2005

Co-ords

Sheet 1 of 2

End date 02/08/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				TOPSOIL: Firm dark brown mottles slightly gravelly clayey sand with much organic matter and fine rootlets (TOPSOIL)	0.25			
2B	0.50					0.50			
3B	1.00		N=6		Loose dark brown orange mottled slightly clayey sand with some organic matter (TOPSOIL)	1.00			
4D	1.50								
5B	2.00		N=4		Medium dense damp orange brown very clayey fine SAND with some fine gravelly clay (GRANULAR ALLUVIUM)				
6D	2.50								
7B	3.00		N=4		Loose damp orange brown slightly gravelly clayey fine SAND. Gravel is sub angular with fines of coal (GRANULAR ALLUVIUM)				
8D	3.50								
9B	3.70					3.70			
10B	4.00		N=15		Medium dense brown fine to coarse SAND and GRAVEL with cobbles of sandstone with bands of firm to stiff gravelly sandy clay (GRANULAR ALLUVIUM)	4.50			
11D	4.50								
12B	5.00		N=28		Stiff brown very sandy very gravelly CLAY with cobbles of mudstone and sandstone. (COHESIVE GLACIAL DEPOSITS)	5.00			
					Medium dense brown very sandy GRAVEL with cobbles of mudstone and sandstone. (GRANULAR GLACIAL DEPOSITS)				
13B	6.00		N=21			6.60			
					Medium dense brown very sandy GRAVEL with cobbles of sandstone and mudstone and bands of firm to stiff gravelly sandy clay. (GRANULAR GLACIAL DEPOSITS)				
14B	7.50		N=27			7.50			
					Very stiff sandy gravelly CLAY with cobbles of mudstone and sandstone. (TILL)				
15B	8.50								
16U	9.00								

Continued on next sheet

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

AJB

JOB

7028

FIGURE

WINDOW SAMPLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Start date 03/06/2005

Co-ords

End date 03/06/2005

Ground Level

WS12

Sheet 1 of 1

Scale 1:50

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N values	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.10				MADE GROUND: Grass onto dark brown gravelly clay topsoil with rare fragments of red brick and glass. (COHESIVE MADE GROUND)	0.40			
2D	0.70				Damp firm grey sandy slightly gravelly CLAY. (COHESIVE ALLUVIUM)	1.10			
					Soft to firm orange and grey clayey slightly gravelly fine to medium SAND. (GRANULAR ALLUVIUM)	2.00			
3D	2.20				Saturated grey slightly clayey fine to coarse SAND and GRAVEL with fines of coal. (GRANULAR ALLUVIUM)	2.80			
					Stiff to very stiff dark grey sandy gravelly CLAY. (TILL)	4.00			
					End of borehole at 4.00 m				

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Window sample was installed. Monitoring installation comprised of plain pipe from 0.0m to 0.5m, slotted response zone from 0.5m to 4.0m.
3. Groundwater encountered at 2.0m during drilling.

Equipment/Methods

Window sample hole advanced by percussive methods using 120mm and 90mm sampling rods.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-1

Start date 31/05/2005

Co-ords

Sheet 1 of 2

End date 02/08/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				TOPSOIL: Firm dark brown mottles slightly gravelly clayey sand with much organic matter and fine rootlets (TOPSOIL)	0.25			
2B	0.50					0.50			
3B	1.00		N=6		Loose dark brown orange mottled slightly clayey sand with some organic matter (TOPSOIL)	1.00			
4D	1.50								
5B	2.00		N=4		Medium dense damp orange brown very clayey fine SAND with some fine gravelly clay (GRANULAR ALLUVIUM)				
6D	2.50								
7B	3.00		N=4		Loose damp orange brown slightly gravelly clayey fine SAND. Gravel is sub angular with fines of coal (GRANULAR ALLUVIUM)				
8D	3.50								
9B	3.70					3.70			
10B	4.00		N=15		Medium dense brown fine to coarse SAND and GRAVEL with cobbles of sandstone with bands of firm to stiff gravelly sandy clay (GRANULAR ALLUVIUM)	4.50			
11D	4.50								
12B	5.00		N=28		Stiff brown very sandy very gravelly CLAY with cobbles of mudstone and sandstone. (COHESIVE GLACIAL DEPOSITS)	5.00			
13B	6.00		N=21		Medium dense brown very sandy GRAVEL with cobbles of mudstone and sandstone. (GRANULAR GLACIAL DEPOSITS)	6.60			
14B	7.50		N=27		Medium dense brown very sandy GRAVEL with cobbles of sandstone and mudstone and bands of firm to stiff gravelly sandy clay. (GRANULAR GLACIAL DEPOSITS)	7.50			
15B	8.50				Very stiff sandy gravelly CLAY with cobbles of mudstone and sandstone. (TILL)				
16U	9.00								

Continued on next sheet

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

AJB

JOB

7028

FIGURE

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BH-1

Sheet 2 of 2

Scale 1:63

Remarks			
Equipment/Methods Cable percussion boring rig equipped with 150mm diameter tools and casing.	Logged by AJB	JOB 7028	FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-2

Start date 03/06/2005

Co-ords

Sheet 1 of 1

End date 03/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				MADE GROUND: Brown gravelly clay fill with fragments of red brick and occasional ash fragments (ASH & CLINKER)				
2B	0.50								
3D	1.20		N=9		Wet soft brown very sandy CLAY (COHESIVE GLACIAL DEPOSITS)	1.20			
4D	1.80				Medium dense wet brown fine to medium very clayey SAND (GRANULAR GLACIAL DEPOSITS)	1.60			
5D	2.00		N=10						
6B	3.00		N=12						
7D									
			N=13						
8B	5.00		N=16						
9D									
10B	6.00		N=27		Very stiff brown gravelly CLAY (TILL) (Glacial Till)	5.90			
11B	7.50		N=26						
12D									
13B	9.00		N=44						
14D									

Remarks

End of borehole at 10.00 m

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-3

Start date 02/06/2005

Co-ords

Sheet 1 of 1

End date 02/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				TOPSOIL: Grass onto dark brown slightly sandy gravelly clay with occasional cobbles of sandstone and fines of coal (TOPSOIL)	0.70			
2B	0.50								
3B	1.00		N=5		Soft grey sandy CLAY with bands of fine to medium orange sand (COHESIVE GLACIAL DEPOSITS)				
4U	2.00								
5D	2.50								
6B	3.00		N=4						
7B	4.00		N=12		Firm becoming stiff brown slightly sandy gravelly CLAY with cobbles of sandstone (TILL)	3.70			
8B	5.00		N=42						
9B	6.00		N=34		Very stiff brown gravelly CLAY with occasional cobbles of sandstone and fines of coal (TILL)	5.70		▽	
10B	7.50		N=47						
11B	9.00		N=69						

Remarks

End of borehole at 10.00 m

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-4

Start date 02/06/2005

Co-ords

Sheet 1 of 1

End date 02/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				TOPSOIL: Grass onto dark brown gravelly CLAY (TOPSOIL)				
2B	0.50					0.60			
3B	1.00		N=6		Loose grey and brown fine to medium SAND (GRANULAR GLACIAL DEPOSITS)				
4B	2.00		N=4						
5B	3.00		N=10*		Medium dense grey and brown fine to medium SAND (GRANULAR GLACIAL DEPOSITS)	3.00			
6B	4.00		N=10		Medium dense brown fine to medium SAND with bands of clay (GRANULAR GLACIAL DEPOSITS)	3.70			
7B	6.00		N=54		Stiff to very stiff brown gravelly CLAY with sandstone cobbles (TILL)	5.80			
8B	7.50		N=76						
9B	8.50								
					End of borehole at 9.50 m	9.50			

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-5

Start date 03/06/2005

Co-ords

Sheet 1 of 1

End date 03/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1D	0.60				TOPSOIL: Grass onto dark brown gravelly CLAY (TOPSOIL)	0.60			
2B	1.00		N=7		Loose light brown slightly gravelly SAND (GRANULAR GLACIAL DEPOSITS)				
3B	1.60		N=6		Damp brown fibrous organic clayey PEAT (COHESIVE GLACIAL DEPOSITS)	1.60			
4B 5D 6U	2.60				Very soft to soft grey very sandy gravelly CLAY with fines of coal (COHESIVE GLACIAL DEPOSITS)	2.80			
7D	3.30		N=2						
8B	4.60		N=4		Loose saturated slightly clayey SAND with fines of coal (GRANULAR GLACIAL DEPOSITS)	4.40			
9D	5.20								
10B	5.80		N=6						
11B	6.50								
12B	7.00		N=38		Stiff to very stiff brown gravelly CLAY with sandstone cobbles (TILL)	6.90			
13U	8.10		N=38						

Remarks

End of borehole at 10.00 m

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-6

Start date 02/06/2005

Co-ords

Sheet 1 of 1

End date 02/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				MADE GROUND: Black fine to medium gravel of ash and clinker. (ASH & CLINKER)				
					End of borehole at 0.70 m	0.70			

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-6A

Start date 02/06/2005

Co-ords

Sheet 1 of 1

End date 02/06/2005

Ground Level

Scale 1:83

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.00				MADE GROUND: Black fine to medium gravel of ash and clinker. (ASH & CLINKER)	0.70			
					End of borehole at 0.70 m				

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

JOB

FIGURE

7028

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-6B

Start date 02/06/2005

Co-ords

Sheet 1 of 2

End date 02/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
1B	0.20				MADE GROUND: Grass onto black fine to coarse clayey gravel with occasional fragments of porcelain (GRANULAR MADE GROUND)				
2B	1.20		N=4						
3D	1.80								
4B	2.10		N=7		Loose grey and orange slightly clayey SAND with occasional fine to coarse gravel (GRANULAR GLACIAL DEPOSITS)	2.10			
5B	3.10		N=5		saturated from 3m				
6D	4.00								
7B	4.30		N=10		Loose to medium dense saturated gray fine to coarse gravelly SAND with cobbles of sandstone and fines of coal (GRANULAR GLACIAL DEPOSITS)	4.30			
8B	5.20		N=14						
9B	6.00		70/150mm		Stiff to very stiff brown gravelly clay with cobbles of sandstone (TILL)	5.70			
10B	7.40		N=32						
11B	9.00		N=32						

Continued on next sheet

Remarks

Equipment/Methods

Cable percussion boring rig equipped with 150mm diameter tools and casing.

Logged by

NR

JOB

7028

FIGURE

BOREHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

BH-6B

Start date 02/06/2005

Co-ords

Sheet 2 of 2

End date 02/06/2005

Ground Level

Scale 1:63

Sample no & type	Sample depth (m)	Casing depth (m)	U100 SPT & N value	Well / backfill details	Description	Depth (m)	Reduced level (m)	Ground-water	Legend
12B	10.40		N=38		Stiff to very stiff brown gravelly clay with cobbles of sandstone (TILL)				
13B	11.60		N=42						
14B	13.00		N=47 ⁺						
					End of borehole at 13.50 m	13.50			
Remarks									
Equipment/Methods Cable percussion boring rig equipped with 150mm diameter tools and casing.						Logged by NR	JOB 7028	FIGURE	

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords -

DATE 02/06/2005

Ground Level -

RBH1

Sheet 1 of 2

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				MADE GROUND: Gravel with ash				
				Saturated brown sandy GRAVEL	1.00			
				Stiff brown gravelly CLAY (Glacial Till)	6.00			
				Grey SILTSTONE	10.00			
				Continued on next sheet				

Remarks

No voids or loss of flush

Equipment/Methods

Logged by

JOB

FIGURE

Sintec

7028

ENCIA
GROUP LIMITED

Scale 1:100

[illegible]

PROBEHOLE LOG



CLIENT Bury MBC

SITE Raddiffe High School, Radcliffe

Co-ords -

DATE 02/06/2005

Ground Level -

RBH2

Sheet 1 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				MADE GROUND: Gravel with brick fragments and ash				
				MADE GROUND: Sandy ashey CLAY	1.00			
				Saturated SAND and GRAVEL	3.00			
				Stiff brown gravelly CLAY (Glacial Till)	5.00			
Continued on next sheet								
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords -

DATE 02/06/2005

Ground Level -

RBH2

Sheet 2 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Stiff brown gravelly CLAY				
				Grey MUDSTONE	19.00			
				COAL	20.00			
				Dark grey MUDSTONE	20.60			
				Light grey MUDSTONE	22.50			
				COAL	30.70			
				Grey MUDSTONE <i>Continued on next sheet</i>	31.30			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords

DATE 02/06/2005

Ground Level

RBH2

Sheet 3 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Grey MUDSTONE				
				Grey SILTSTONE with occasional bands of grey mudstone	33.00			
				End of probeshole at 40.00 m	40.00			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

DATE 03/06/2005

Co-ords -

Ground Level -

RBH3

Sheet 1 of 2

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				MADE GROUND: Ash and fragments of brick				
				Saturated SAND and GRAVEL	2.00			
				Stiff brown gravelly CLAY (Glacial Till)	4.50			
				Light grey MUDSTONE	15.00			
Continued on next sheet								

Remarks

No voids or loss of fluid

Equipment/Methods

Logged by

Sintec

JOB

7028

FIGURE

ENCIA
GROUP LIMITED

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Light grey MUDSTONE				
				COAL with shale	24.00			
				Light grey MUDSTONE	26.00			
				End of probehole at 30.00 m	30.00			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by Sintec	JOB 7028	FIGURE	

PROBEHOLE LOG



CLIENT Bury MBC

SITE Raddcliffe High School, Raddcliffe

Co-ords

DATE 03/08/2005

Ground Level

RBH4

Sheet 1 of 2

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				MADE GROUND: Ashy clay fill	0.50			
				Saturated SAND and GRAVEL				
				Stiff brown gravelly CLAY (Glacial Till)	4.30			
				Continued on next sheet	15.50			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

ENCIA
GROUP LIMITED

Scale 1:100

[illegible]

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords -

DATE 15/06/2005

Ground Level -

RBH5

Sheet 1 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Brown sandy CLAY				
				Brown fibrous clayey PEAT	1.50			
				Grey CLAY	2.00			
				SILTSTONE	4.50			
				Saturated SAND and GRAVEL	5.00			
				Stiff brown gravelly CLAY (Glacial Till)	6.00			
				Brown/ grey SANDSTONE	13.50			
				Continued on next sheet	15.70			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG

ENCIA

GROUP REMOVED

CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords -

DATE 15/06/2005

Ground Level -

RBH5

Sheet 2 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Grey MUDSTONE				
				Black MUDSTONE with traces of coal	29.30			
				Light grey MUDSTONE	29.70			
				Dark grey mudstone with traces of coal	30.80			
				Continued on next sheet				
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

DATE 15/08/2005

Co-ords

Ground Level

RBH5

Sheet 3 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Dark grey mudstone with traces of coal	32.20			
				Dark grey mudstone	33.00			
				End of probehole at 33.00 m				
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG

ENCIA
GROUP N141136

CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords

DATE 16/06/2005

Ground Level

RBH6

Sheet 1 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	wall/ backfill	description	depth (m)	level (m)	ground water	legend
				Saturated brown SAND and GRAVEL				
				Stiff brown gravelly CLAY (Glacial Till)	4.50			
Continued on next sheet								
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Raddiffe High School, Raddiffe

Co-ords -

DATE 16/06/2005

Ground Level -

RBH6

Sheet 2 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Stiff brown gravelly CLAY				
				Brown weathered MUDSTONE with occasional bands of sandstone	17.50			
				Gray MUDSTONE with bands of siltstone	22.80			
Continued on next sheet								
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

PROBEHOLE LOG



CLIENT Bury MBC

SITE Radcliffe High School, Radcliffe

Co-ords -

DATE 16/06/2005

Ground Level -

RBH6

Sheet 3 of 3

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Grey MUDSTONE with bands of siltstone				
				End of probehole at 35.50 m	35.50			
Remarks No voids or loss of flush								
Equipment/Methods					Logged by	JOB	FIGURE	
					Sintec	7028		

Appendix F
Chemical Analysis Results

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

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

Job Number: 05/08263/02/01
Client: Encia Consulting
Client Ref. No.: 7028

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

Sample Identity	BH5	WS1	WS1	WS2	WS2	WS3	WS4	WS5	WS5	Method Code	LoD/Units
Depth (m)	0.6	0.1-0.3	0.8-1.0	0.1-0.3	0.6-0.7	0.3-0.4	0.6-0.8	0.2-0.4	0.7-0.8		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05		
Sample Received Date	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	1	2	3	5	6	8	11	13	14		
Total Sulphate	1040	1474	541	1553	-	3366	1489	1531	1168	TM148	<50 mg/kg
Boron Water Soluble	7	<1	<1	1	-	<1	<1	<1	<1	TM129 ^M	<1 mg/kg
Arsenic	28	4	6	99	-	<1	14	5	12	TM129 ^M	<1 mg/kg
Cadmium	<1	<1	<1	<1	-	<1	<1	<1	<1	TM129 ^M	<1 mg/kg
Chromium	15	18	26	172	-	78	40	14	17	TM129 ^M	<1 mg/kg
Copper	72	4	6	<1	-	<1	22	35	57	TM129 ^M	<1 mg/kg
Mercury	<1	<1	<1	<1	-	<1	<1	<1	<1	TM129 ^M	<1 mg/kg
Nickel	25	24	30	78	-	6	33	9	25	TM129 ^M	<1 mg/kg
Lead	306	19	27	301	-	61	43	137	192	TM129 ^M	<1 mg/kg
Selenium	<3	<3	<3	<3	-	<3	<3	<3	<3	TM129 ^M	<3 mg/kg
Zinc	163	49	73	2227	-	58	109	45	189	TM129 ^M	<1 mg/kg
Acid Soluble Sulphide	<50	<50	-	<50	-	<50	<50	<50	<50	TM105 ^M	<50 mg/kg
Phenols Total Monohydric	<0.01	0.04	-	<0.01	-	0.02	0.05	<0.01	<0.01	TM062 ^M	<0.01 mg/kg
Total Cyanide	<1	<1	-	<1	-	<1	17	<1	<1	TM153 ^M	<1 mg/kg
Asbestos Presence Screen	-	-	-	-	-	-	-	-	-	TM001	NONE
Chloride 2:1 soil/water extract	0.010	-	0.012	-	0.010	-	-	0.011	-	TM097 ^M	<0.001 g/l
Magnesium 2:1 soil/water extract	<0.001	-	0.001	-	<0.001	-	-	0.004	-	TM129 ^M	<0.001 g/l
Nitrate 2:1 soil/water extract	0.0020	-	0.0006	-	0.0017	-	-	0.0033	-	TM102 ^M	<0.0003 g/l
pH Value	4.70	11.47	7.32	5.14	5.65	11.82	7.14	5.23	5.74	TM133 ^M	<1.00 pH Units
Soluble Sulphate 2:1 Extract as SO4	0.027	-	0.015	-	0.011	-	-	0.085	-	TM098 ^M	<0.003 g/l
Total Sulphur	0.02	0.13	-	0.08	-	0.16	0.21	0.21	0.10	TM068 ^M	<0.01 %
PAH by GC-FID											
Naphthalene	0.53	0.76	-	2.20	-	0.77	0.10	1.25	0.25	TM061 ^M	<0.05 mg/kg
Acenaphthylene	0.05	0.05	-	0.43	-	0.11	<0.05	0.09	<0.05	TM061 ^M	<0.05 mg/kg
Acenaphthene	0.10	0.21	-	2.53	-	0.34	0.09	0.52	0.09	TM061 ^M	<0.05 mg/kg
Fluorene	<0.05	0.11	-	1.61	-	0.29	0.06	0.29	<0.05	TM061 ^M	<0.05 mg/kg
Phenanthrene	0.16	0.63	-	17.08	-	2.08	0.35	2.81	0.29	TM061 ^M	<0.05 mg/kg
Anthracene	<0.05	0.15	-	3.65	-	0.50	0.07	0.56	0.06	TM061 ^M	<0.05 mg/kg
Fluoranthene	0.07	0.70	-	25.23	-	2.51	0.48	4.44	0.41	TM061 ^M	<0.05 mg/kg
Pyrene	0.06	0.68	-	21.88	-	2.63	0.45	4.29	0.43	TM061 ^M	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 16.06.2005

☒

11

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

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

All results expressed on a dry weight basis.

Date 16.06.2005

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

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

Job Number: 05/08263/02/01
Client: Encia Consulting
Client Ref. No.: 7028

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

Sample Identity	WS6	WS6	WS7	WS7	WS8	WS8	WS9	WS10	WS10	Method Code	LoD/Units
Depth (m)	0.2-0.4	1.2-1.5	0.1-0.2	0.8-1.2	0.7-0.9	1.6-1.9	0.15-0.3	0.05-0.1	0.8-1.0		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05	03.06.05		
Sample Received Date	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05	07.06.05		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	17	19	20	21	24	25	26	29	30		
Total Sulphate	880	-	1581	1312	2020	1702	1488	2109	2443	TM148	<50 mg/kg
Boron Water Soluble	<1	-	<1	<1	2	2	<1	1	<1	TM129 ^M	<1 mg/kg
Arsenic	22	-	15	62	9	27	25	20	9	TM129 ^M	<1 mg/kg
Cadmium	<1	-	<1	<1	<1	<1	<1	5	<1	TM129 ^M	<1 mg/kg
Chromium	33	-	28	20	40	33	74	22	24	TM129 ^M	<1 mg/kg
Copper	129	-	83	609	39	1194	151	31	15	TM129 ^M	<1 mg/kg
Mercury	<1	-	<1	<1	<1	<1	<1	1	2	TM129 ^M	<1 mg/kg
Nickel	30	-	23	70	44	62	19	55	33	TM129 ^M	<1 mg/kg
Lead	141	-	114	256	55	1403	159	407	66	TM129 ^M	<1 mg/kg
Selenium	<3	-	<3	<3	<3	<3	<3	<3	<3	TM129 ^M	<3 mg/kg
Zinc	145	-	124	160	86	223	65	1598	355	TM129 ^M	<1 mg/kg
Acid Soluble Sulphide	<50	-	<50	-	<50	182	<50	<50	-	TM105 ^M	<50 mg/kg
Phenols Total Monohydric	<0.01	-	0.09	-	<0.01	0.02	<0.01	0.02	-	TM062 ^M	<0.01 mg/kg
Total Cyanide	<1	-	<1	-	<1	<1	<1	<1	-	TM153 ^M	<1 mg/kg
Asbestos Presence Screen	-	-	-	NFD	-	NFD	-	-	NFD	TM001	NONE
Chloride 2:1 soil/water extract	-	0.007	-	0.012	0.010	-	-	-	0.017	TM097 ^M	<0.001 g/l
Magnesium 2:1 soil/water extract	-	0.002	-	0.002	0.003	-	-	-	0.021	TM129 ^M	<0.001 g/l
Nitrate 2:1 soil/water extract	-	0.0008	-	0.0045	0.0070	-	-	-	0.0191	TM102 ^M	<0.0003 g/l
pH Value	4.85	6.21	6.11	6.55	5.74	5.94	5.25	6.34	6.52	TM133 ^M	<1.00 pH Units
Soluble Sulphate 2:1 Extract as SO4	-	0.007	-	0.062	0.068	-	-	-	0.117	TM098 ^M	<0.003 g/l
Total Sulphur	0.12	-	0.15	-	0.47	0.71	0.14	0.16	-	TM068 ^M	<0.01 %
PAH by GC-FID											
Naphthalene	0.46	-	2.91	-	2.27	1.88	<0.05	2.80	-	TM061 ^M	<0.05 mg/kg
Acenaphthylene	0.18	-	0.38	-	0.15	0.42	<0.05	0.36	-	TM061 ^M	<0.05 mg/kg
Acenaphthene	0.33	-	1.08	-	0.26	0.89	<0.05	0.67	-	TM061 ^M	<0.05 mg/kg
Fluorene	0.16	-	0.54	-	0.06	0.62	<0.05	0.58	-	TM061 ^M	<0.05 mg/kg
Phenanthrene	1.77	-	6.77	-	0.46	4.85	0.21	2.58	-	TM061 ^M	<0.05 mg/kg
Anthracene	0.36	-	1.26	-	0.06	1.08	<0.05	0.90	-	TM061 ^M	<0.05 mg/kg
Fluoranthene	2.79	-	9.23	-	0.65	6.57	0.40	3.56	-	TM061 ^M	<0.05 mg/kg
Pyrene	2.71	-	8.15	-	0.60	5.98	0.38	4.65	-	TM061 ^M	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 16.06.2005

Job Number: 05/08263/02/01
Client: Encia Consulting
Client Ref. No.: 7028

» Shown on prev.
Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

[illegible]

All results expressed on a dry weight basis.

Date 16.06.2005

Job Number: 05/08263/02/01
Client: Encia Consulting
Client Ref. No.: 7028

» Shown on prev.

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

Sample Identity	WS11	WS12	WS12								Method Code	LoD/Units
Depth (m)	0.4-0.6	0.1-0.2	2.2-2.4									
Sample Type	SOIL	SOIL	SOIL									
Sampled Date	03.06.05	03.06.05	03.06.05									
Sample Received Date	07.06.05	07.06.05	07.06.05									
Batch	1	1	1									
Sample Number(s)	33	36	38									
Total Sulphate	533	1639	-									
Boron Water Soluble	<1	<1	-								TM129 ^g _M	<1 mg/kg
Arsenic	9	12	-								TM129 ^g _M	<1 mg/kg
Cadmium	<1	3	-								TM129 ^g	<1 mg/kg
Chromium	22	24	-								TM129 ^g _M	<1 mg/kg
Copper	<1	34	-								TM129 ^g	<1 mg/kg
Mercury	<1	<1	-								TM129 ^g	<1 mg/kg
Nickel	17	56	-								TM129 ^g _M	<1 mg/kg
Lead	31	264	-								TM129 ^g	<1 mg/kg
Selenium	<3	<3	-								TM129 ^g	<3 mg/kg
Zinc	67	1218	-								TM129 ^g _M	<1 mg/kg
Acid Soluble Sulphide	-	<50	-								TM105 ^g	<50 mg/kg
Phenols Total Monohydric	-	<0.01	-								TM062 ^g _M	<0.01 mg/kg
Total Cyanide	-	<1	-								TM153 ^g _M	<1 mg/kg
Asbestos Presence Screen	-	-	-								TM001	NONE
Chloride 2:1soil/water extract	0.011	-	0.006								TM097 ^g	<0.001 g/l
Magnesium 2:1soil/water extract	<0.001	-	<0.001								TM129 ^g	<0.001 g/l
Nitrate 2:1 soil/water extract	0.0007	-	0.0005								TM102 ^g	<0.0003 g/l
pH Value	6.46	7.54	5.43								TM133 ^g	<1.00 pH Units
Soluble Sulphate 2:1 Extract as SO4	0.023	-	0.005								TM098 ^g	<0.003 g/l
Total Sulphur	-	0.13	-								TM068 ^g	<0.01 %
PAH by GC-FID												
Naphthalene	-	1.41	-								TM061 ^g	<0.05 mg/kg
Acenaphthylene	-	0.23	-								TM061 ^g	<0.05 mg/kg
Acenaphthene	-	0.49	-								TM061 ^g	<0.05 mg/kg
Fluorene	-	0.50	-								TM061 ^g	<0.05 mg/kg
Phenanthrene	-	2.98	-								TM061 ^g	<0.05 mg/kg
Anthracene	-	0.84	-								TM061 ^g	<0.05 mg/kg
Fluoranthene	-	4.31	-								TM061 ^g	<0.05 mg/kg
Pyrene	-	5.70	-								TM061 ^g	<0.05 mg/kg

All results expressed on a dry weight basis.

Date 16.06.2005

☒

11

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

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

[illegible]

Date 16.06.2005

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

Matrix: SOLID
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Brandon Rice-Birchall

[illegible]

All results expressed on a dry weight basis.

Date 09.06.2005

ALcontrol Geochem Analytical Services

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

Job Number: 05/08263/02/01
Client: Encia Consulting
Client Ref. No.: 7028

» Shown on prev.
Matrix: LEACHATE
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

[illegible]

Date 16.06.2005

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

» Shown on prev.
Matrix: LEACHATE
Location: RADCLIFFE HIGH SCHOOL
Client Contact: Andrew Bain

Date 16.06.2005

Job Name: Radcliffe High West Campus

Job No: 7028

Made Ground

Analytical Data

Material Type	Data (mg/kg)	Log Data
---------------	--------------	----------

MG	4	0.6021
MG	1	0.0000
MG	14	1.1461
MG	544	0.6990
MG	1273	1.0792
MG	22	1.3424
MG	15	1.1761
MG	62	1.7924
MG	27	0.9542
MG	227	1.4314
MG	25	1.3979
MG	20	1.3010
MG	19	0.9542
MG	12	0.9542
MG	12	1.0792

Mean Value Test

n	t	t value
---	---	---------

2	6.3140	
3	2.9200	
4	2.3530	
5	2.1320	
6	2.0150	
7	1.9430	
8	1.8950	
9	1.8600	
10	1.8330	
11	1.8120	
12	1.7960	
13	1.7820	
14	1.7710	
15	1.7610	1.761
16	1.7530	
17	1.7460	
18	1.7400	
19	1.7340	
20	1.7290	
21	1.7250	
22	1.7210	
23	1.7170	
24	1.7140	
25	1.7110	
26	1.7080	
27	1.7060	
28	1.7030	
29	1.7010	
30	1.6990	
31	1.6970	
32	1.6955	
33	1.6940	
34	1.6925	
35	1.6910	
36	1.6895	
37	1.6880	
38	1.6870	
39	1.6860	
40	1.6850	

Outlier Test

T _{crit} 10%	T _{crit} V
-----------------------	---------------------

	1.420	
	1.600	
	1.730	
	1.830	
	1.910	
	1.980	
	2.040	
	2.085	
	2.130	
	2.170	
	2.210	
	2.245	2.245
	2.280	
	2.305	
	2.330	
	2.355	
	2.380	

Determinand: Arsenic

No. of samples: 15

SGV: 20.00

t value:
mean (x):
st.dev (s):
95% ile:

1.761
16.40
14.74
28.10

Is the Mean Value Test Higher or Lower than the SGV?
Higher or Lower Higher

Y max:
Y mean:
Y st.dev.:
T value
Comparator

1.792
1.061
0.0413
1.753
2.245

Maximum Value Test Result:
Outlier Test?

Maximum Value Test Result: 1.792
Outlier Test? 1.792

Job Name: Radcliffe High West Campus

Job No: 7028

Made Ground

Analytical Data

Mean Value Test

Outlier Test

Material Type	Data (mg/kg)	Log Data
---------------	--------------	----------

n	t	t value
-----	-----	-----------

$T_{crit} 10\%$ $T_{crit} V$

MG	1	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.6990
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.0000
MG	1.0000	0.4771

2	6.3140	
3	2.9200	
4	2.3530	
5	2.1320	
6	2.0150	
7	1.9430	
8	1.8950	
9	1.8600	
10	1.8330	
11	1.8120	
12	1.7960	
13	1.7820	
14	1.7710	1.771
15	1.7610	
16	1.7530	
17	1.7460	
18	1.7400	
19	1.7340	
20	1.7290	
21	1.7250	
22	1.7210	
23	1.7170	
24	1.7140	
25	1.7110	
26	1.7080	
27	1.7060	
28	1.7030	
29	1.7010	
30	1.6990	
31	1.6970	
32	1.6955	
33	1.6940	
34	1.6925	
35	1.6910	
36	1.6895	
37	1.6880	
38	1.6870	
39	1.6860	
40	1.6850	

1,420	
1,600	
1,730	
1,830	
1,910	
1,980	
2,040	
2,085	
2,130	
2,170	
2,210	2,210
2,245	
2,280	
2,305	
2,330	
2,355	
2,380	

Bestimmend: **Cadmium**

No. of samples:	14
SGV:	1.00

```
t value: 1.7701
mean (x): 10.14
st.dev (s): 0.53
95% ile: 1.40
```

Is the Mean Value Test Higher or Lower than the SGV?
Higher or Lower

Y max:	0.4377
Y mean:	0.0278
Y st.dev:	0.2401
T value	1.889
Comparator	2.210

Maximum Value Test Result:	Maximum Value Test Result:
Outlier Test?	Maximum Value Test Result:

Outlier Data (mg/kg)

5 WS10 at 0.1m

Job No: 7028

Made Ground

Analytical Data

Material Type	Data (mg/kg)	Log Data
Control	0	0
Low Dose	10	1
High Dose	100	2

Mean Value Test

n	t	t value
---	---	---------

Outlier Test

T_{crit} 10% **T_{crit} v**

MG	19	1.2788
MG	61	1.7853
MG	143	1.6335
MG	137	2.1367
MG	192	2.2833
MG	141	2.1492
MG	114	2.0569
MG	256	2.4082
MG	55	1.7404
MG		3.1471
MG	159	2.2014
MG	140	2.6096
MG	66	1.8195
MG	31	1.4914
MG	264	2.4216

2	6.3140	
3	2.9200	
4	2.3530	
5	2.1120	
6	2.0150	
7	1.9430	
8	1.8950	
9	1.8600	
10	1.8330	
11	1.8120	
12	1.7960	
13	1.7820	1.771
14	1.7710	
15	1.7610	
16	1.7530	
17	1.7460	
18	1.7400	
19	1.7340	
20	1.7290	
21	1.7250	
22	1.7210	
23	1.7170	
24	1.7140	
25	1.7110	
26	1.7080	
27	1.7060	
28	1.7030	
29	1.7010	
30	1.6990	
31	1.6970	
32	1.6955	
33	1.6940	
34	1.6925	
35	1.6910	
36	1.6895	
37	1.6880	
38	1.6870	
39	1.6860	
40	1.6850	

1,420		
1,600		
1,730		
1,830		
1,910		
1,980		
2,040		
2,085		
2,130		
2,170		
2,210	2,210	
2,245		
2,280		
2,305		
2,330		
2,355		
2,380		

Determinand: _____ **Lead**

No. of samples:	14
SGV:	450.0

```
t value: 15.777
mean (x): 16819
st.dev (s): 11075
95% ile: 19152
```

Is the Mean Value Test Higher or Lower than the SGV? Lower

Y max:	2.610
Y mean:	2.008
Y st.dev.:	0.446
T value	10.819
Comparator	2.240

Maximum Value Test Result: Maximum Value within a Normal Distribution:

Outlier Test?

Outlier Data (mg/kg)

1403 WS8 at 1.6m

Job No: 7028

Made Ground

Analytical Data

Material Type	Data (mg/kg)	Log Data
1	10	1.0
2	20	1.3
3	30	1.5
4	40	1.6
5	50	1.7
6	60	1.8
7	70	1.85
8	80	1.9
9	90	1.95
10	100	2.0

Mean Value Test

n	t	t value
---	---	---------

Outlier Test

$T_{crit} 10\%$ $T_{crit} V$

[illegible]

2	6.3140	
3	2.9200	
4	2.3530	
5	2.1320	
6	2.0150	
7	1.9430	
8	1.8950	
9	1.8600	
10	1.8330	
11	1.8120	
12	1.7960	
13	1.7820	
14	1.7710	
15	1.7610	1.761
16	1.7530	
17	1.7460	
18	1.7400	
19	1.7340	
20	1.7290	
21	1.7250	
22	1.7210	
23	1.7170	
24	1.7140	
25	1.7110	
26	1.7080	
27	1.7060	
28	1.7030	
29	1.7010	
30	1.6990	
31	1.6970	
32	1.6955	
33	1.6940	
34	1.6925	
35	1.6910	
36	1.6895	
37	1.6880	
38	1.6870	
39	1.6860	
40	1.6850	

1,420	
1,600	
1,730	
1,830	
1,910	
1,980	
2,040	
2,085	
2,130	
2,170	
2,210	
2,245	2,245
2,280	
2,305	
2,330	
2,355	
2,380	

Determinand:	Mercury
No. of samples:	15
SGV:	8.00

t value:	10.261
mean (x):	100
st.dev (s):	1000
95% ile:	100

Is the Mean Value Test Higher or Lower than the SGV? Lower

Y max:	0.000	0.000
Y mean:	0.000	0.000
Y st.dev.:	0.000	0.000
T value	40.0W/0	40.0W/0
Comparator	2.225	2.225

Maximum Value Test Result:

Outlier Test?

Test Result: GDIV/01

Job Name: Radcliffe High West Campus

Job No: 7028

Made Ground

Analytical Data

Material Type	Data (mg/kg)	Log Data
---------------	--------------	----------

MG	24	1.3802
MG	6	0.7782
MG	33	1.5185
MG	47	0.9542
MG	25	1.3979
MG	30	1.4771
MG	23	1.3617
MG	70	1.8451
MG	44	1.6435
MG	62	1.7924
MG	41	1.2788
MG	55	1.7404
MG	33	1.5185
MG	17	1.2304
MG	56	1.7482

Mean Value Test

n	t	t value
---	---	---------

2	6.3140	
3	2.9200	
4	2.3530	
5	2.1320	
6	2.0150	
7	1.9430	
8	1.8950	
9	1.8600	
10	1.8330	
11	1.8120	
12	1.7960	
13	1.7820	
14	1.7710	
15	1.7610	1.761
16	1.7530	
17	1.7460	
18	1.7400	
19	1.7340	
20	1.7290	
21	1.7250	
22	1.7210	
23	1.7170	
24	1.7140	
25	1.7110	
26	1.7080	
27	1.7060	
28	1.7030	
29	1.7010	
30	1.6990	
31	1.6970	
32	1.6955	
33	1.6940	
34	1.6925	
35	1.6910	
36	1.6895	
37	1.6880	
38	1.6870	
39	1.6860	
40	1.6850	

Outlier Test

T _{crit} 10%	T _{crit} V
-----------------------	---------------------

	1.420	
	1.600	
	1.730	
	1.830	
	1.910	
	1.980	
	2.040	
	2.085	
	2.130	
	2.170	
	2.210	
	2.245	2.245
	2.280	
	2.305	
	2.330	
	2.355	
	2.380	

Determinand: Nickel

No. of samples: 15

SGV: 50.00

t value: 1.761
mean (x): 38.73
st.dev (s): 10.64
95% ile: 42.62

1.761
38.73
10.64
42.62

Is the Mean Value Test Higher or Lower than the SGV?
Higher or Lower LOWER

Y max: 1.845
Y mean: 1.444
Y st.dev.: 0.808
T value: 1.896
Comparator 2.245

1.845
1.444
0.808
1.896
2.245

Maximum Value Test Result: Maximum Value Within Normal Distribution

Maximum Value Within Normal Distribution
--

Appendix G
Geotechnical Test Results

Test Report



Report No 92/060 / 12449

Date 24 June 2005

To Client ENCIA Consulting Ltd
Client's Representative Mr N Riding
cc

The report presents test certificate(s) which identify test measurements and results on samples received in our laboratory on 09/06/05 in connection with your contract/project at Radcliffe High, Riverside

The certificate(s) also presents information relating to the origin, source or location, material or type description or other identification supplied for reference.

Test methods or adopted procedures are identified on each certificate. Where a test specification has been advised against which the sample is to be assessed, a statement is included regarding whether or not the sample complies.

Where applicable, relevant support documents are appended.

The report content is contained as appendix sheets, as below:-

<u>Description</u>	<u>Quantity</u>	<u>Test Date</u>	<u>Appendix Sheet No(s)</u>
Moisture Content	3	14-15/06/05	IP1
Plasticity Index	3	20-23/06/05	IP1
Gradation	5	15-16/06/05	PSD1-PSD5
Triaxial U100	1	20/06/05	TXL1

RECEIVED
27 JUN 2005

Signed for AMEC Group Limited

P. Thomas

P Thomas
Laboratory Manager

AMEC Group Limited
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This report shall not be reproduced except in full, without written approval of the laboratory. The results presented in this report relate only to the items tested.

Form No TEST/R/0898

Sample Disposal Notice



Report No **92/060 / 12449**
Date **24 June 2005**
Project **Radcliffe High, Riverside**
Client **ENCIA Consulting Ltd**
Client's Representative **Mr N Riding**

Samples received in the Permanent Laboratory on **09/06/05** in connection with the
above project: -

- ☒ were used during test
☐ are disposed immediately following test
☐ will be disposed of by **24/07/05**
*(If you wish to make alternative arrangements, please contact the undersigned at least five
working days prior to this date, confirming your requirements in writing)*

Signed for AMEC Group Limited

P. Thomas

P Thomas
Laboratory Manager

AMEC Group Limited
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Church Street Adlington Chorley
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Index Properties

BS 1377: Part 2: 1990

Method 4.3, 4.4, 5.3 + 5.4



Client: ENCIA Consulting Ltd

Contract: Radcliffe High, Riverside

Borehole Trial Pit No.	Depth (m)	Sample Type	Sample No	Site Ref	Description of Material Tested	% Passing 425µm Sieve	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index
BH2	1.80	BULK	100599	N/A	Brown CLAY	99	31	35	21	14
BH3	1.00-1.45	BULK	100597	N/A	Brown very sandy CLAY	97	22	25	15	10
BH3	3.00-3.65	BULK	100598	N/A	Brown slightly sandy CLAY	98	22	36	19	17

Sample Preparation

- ☐ Natural State (Part 2, Method 4.2.3)
☐ Wet Sieving (Part 2, Method 4.2.4)
☒ Air Drying (Part 1, Methods, 7.3.4 + 7.3.5)

NOTES: Moisture content tested in accordance with BS 1377: Part 2: Method 3.2

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Report No: 92/060 / 12449

Appendix Sheet No: IP1

Form No IP/R/0494

Determination of the Undrained Shear Strength in Triaxial Compression

BS 1377: 1990 : Part 7, Method 8/9



Client: ENCIA Consulting Ltd

Contract: Radcliffe High, Riverside

Borehole Trial Pit No.	Depth (m)	Sample No	Sample Type	Description of Material Tested	Moisture Content %	Bulk Density Mg/m ³	Sample Height mm	Sample Diameter mm	Dry Density Mg/m ³	Triaxial Compression Test			Strain at Failure %	Type of Failure	Type of Test
										confining stress kN/m ² Q3	compressive strength kN/m ² F (Q1 - Q3)	apparent cohesion kN/m ² Cu			
BH3	3.00- 3.45	016756	U100	Firm/stiff dark brown sandy CLAY	14	1.76	**	**	1.56	**	**	**	**	**	**

Types of Failure:
P Plastic
B Brittle

C Compound

Type of Test:
U Undrained
M Multistage

S Single Stage
R Remoulded

Membrane
Correction
Clause
8.5.1.4

Nominal Specimen Size
○ 38mm x 76mm
● 100mm x 200mm

Rate of Strain (% min)
**

NOTES: **Unsuitable for test due to insufficient sample and poor recovery.
Pocket Pentrometer Results (kgf/cm²) = 3.5

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Report No: 92/060 / 12449
Appendix Sheet No: TXL1

Form No TXL/R/0505

Particle Size Distribution

BS 1377: 1990: Part 2

Method: 9.2 Wet Sieve

9.3 Dry Sieve

9.4 Sedimentation

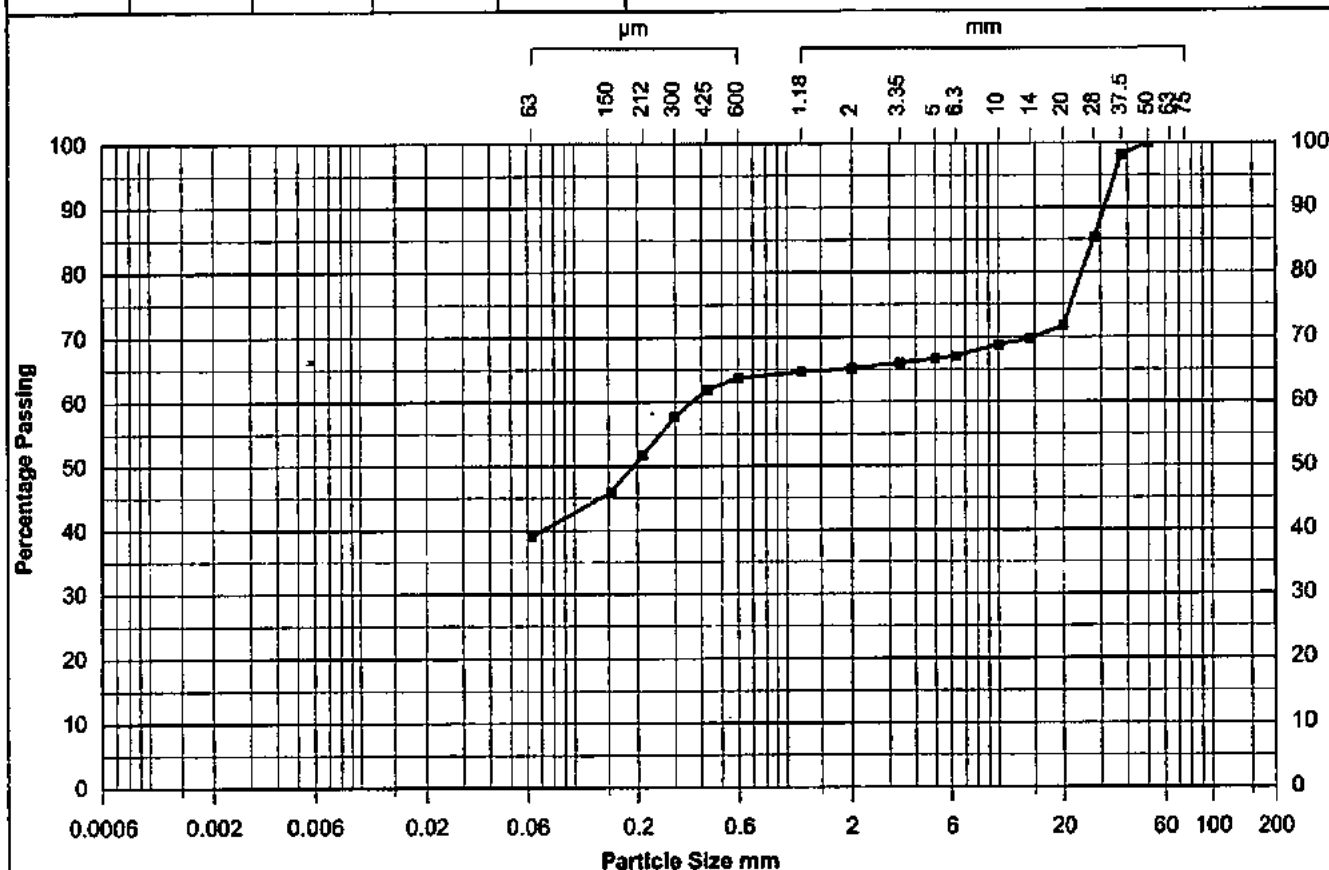
Other: see below



Client: ENCIA Consulting Ltd

Contract: Radcliffe High, Riverside

Borehole/ Trial Pit No	Depth (m)	Sample Type	Sample No	Site Ref	Description of Material
BH1	5.00	BULK	100593	N/A	Brown silty SAND with fine/coarse sized gravel



Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles
	Silt			Sand			Gravel			

Weight of original sample: 7.7kg

Method of fine analysis: N/A

Weight of sample tested: 7.1kg Method 9.2

Soil pre-treated with:

Sodium Hexametaphosphate*

Sodium Carbonate/Sodium Hexametaphosphate*

Hydrogen Peroxide*

NOTES:

* Delete as appropriate

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Report No 92/060/12449
Appendix Sheet No PSD2

www.amec.com

Form No PSD/R/0494

Particle Size Distribution



BS 1377: 1990: Part 2

Method: 9.2 Wet Sieve

9.3 Dry-Sieve

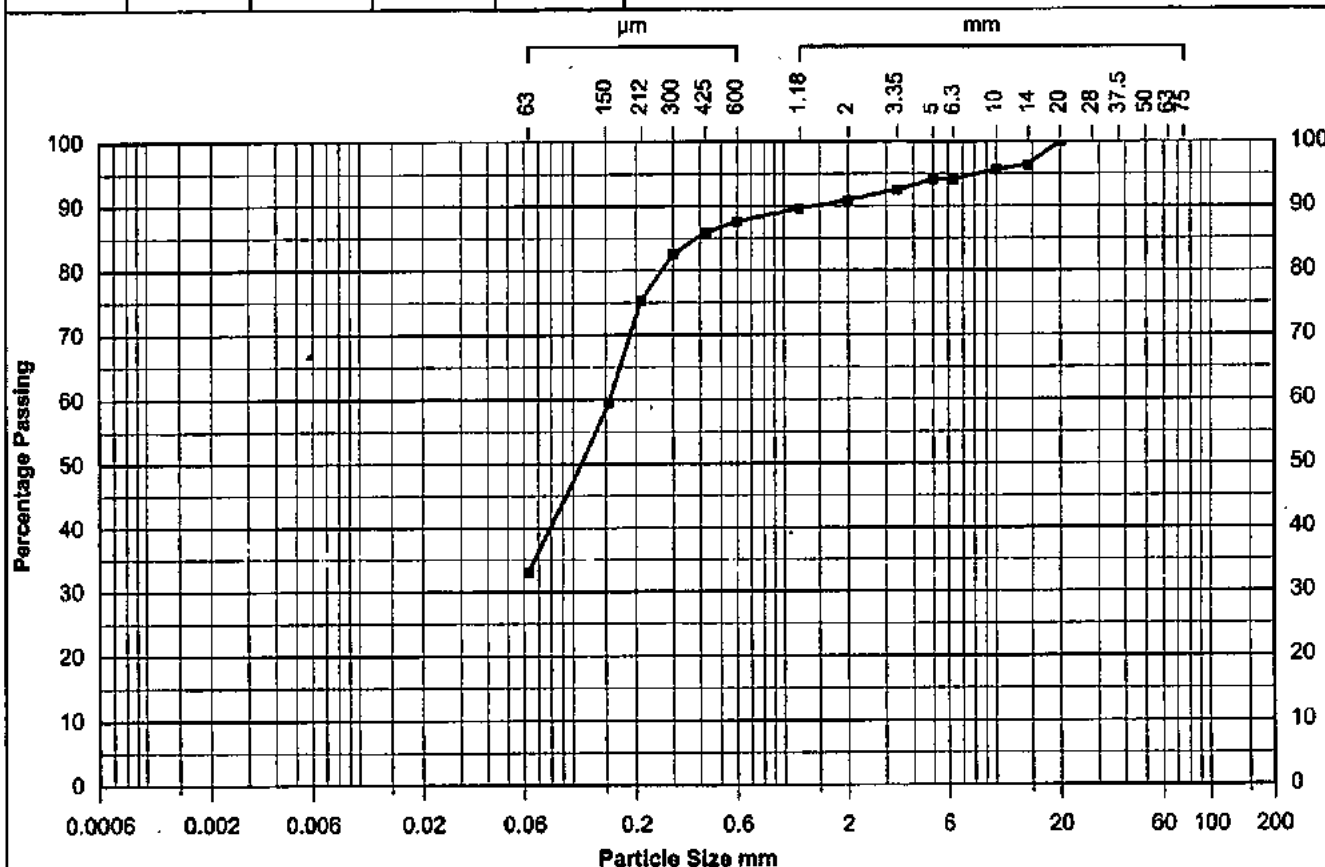
9.4 Sedimentation

Other: see below

Client: ENCIA Consutling Ltd

Contract: Radcliffe High, Riverside

Borehole/ Trial Pit No	Depth (m)	Sample Type	Sample No	Site Ref	Description of Material
BH2	3.00	BULK	100599	N/A	Brown silty SAND with occasional fine/medium sized gravel



Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles
	Silt			Sand			Gravel			

Weight of original sample: 10.4kg

Method of fine analysis: N/A

Weight of sample tested: 1.4kg Method 9.2

Soil pre-treated with:

Sodium Hexametaphosphate*

Sodium Carbonate/Sodium Hexametaphosphate*

Hydrogen Peroxide*

NOTES:

* Delete as appropriate

AMEC Group Limited
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Report No 92/060/12449

Appendix Sheet No PSD3

www.amec.com

Form No PSD/R/0494

Particle Size Distribution



BS 1377: 1990: Part 2

Method: 9.2 Wet Sieve

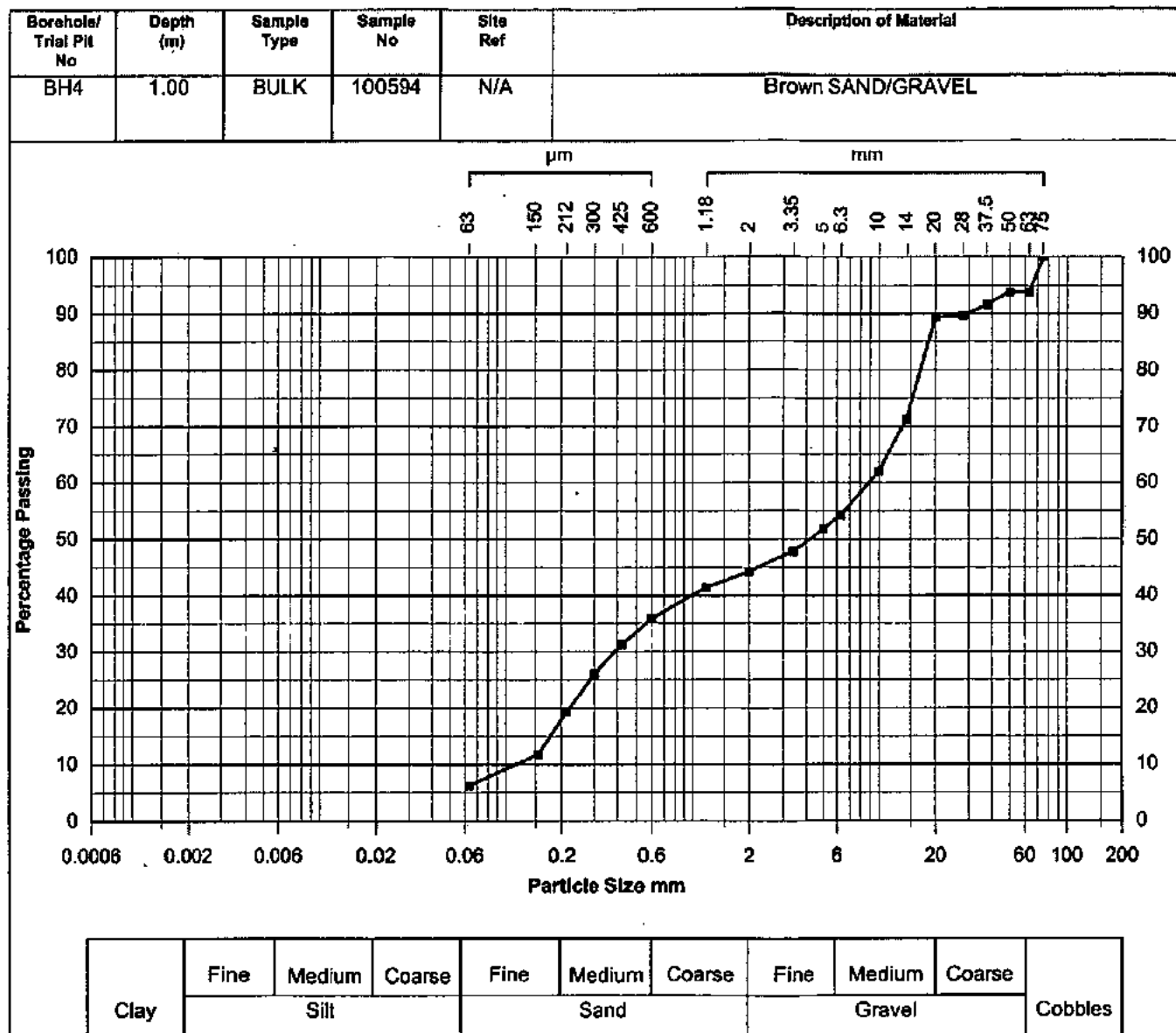
9.3 Dry Sieve

9.4 Sedimentation

Other: see below

Client: ENCIA Consutling Ltd

Contract: Radcliffe High, Riverside



Weight of original sample: 7.8kg

Method of fine analysis: N/A

Weight of sample tested: 6.2kg Method 9.2

Soil pre-treated with:
Sodium Hexametaphosphate*
Sodium Carbonate/Sodium Hexametaphosphate*
Hydrogen Peroxide*

NOTES:

* Delete as appropriate

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Report No 92/060/12449
Appendix Sheet No PSD4

www.amec.com

Form No PSD/R/0494

Particle Size Distribution



BS 1377: 1990: Part 2

Method: 9.2 Wet Sieve

9.3 Dry Sieve

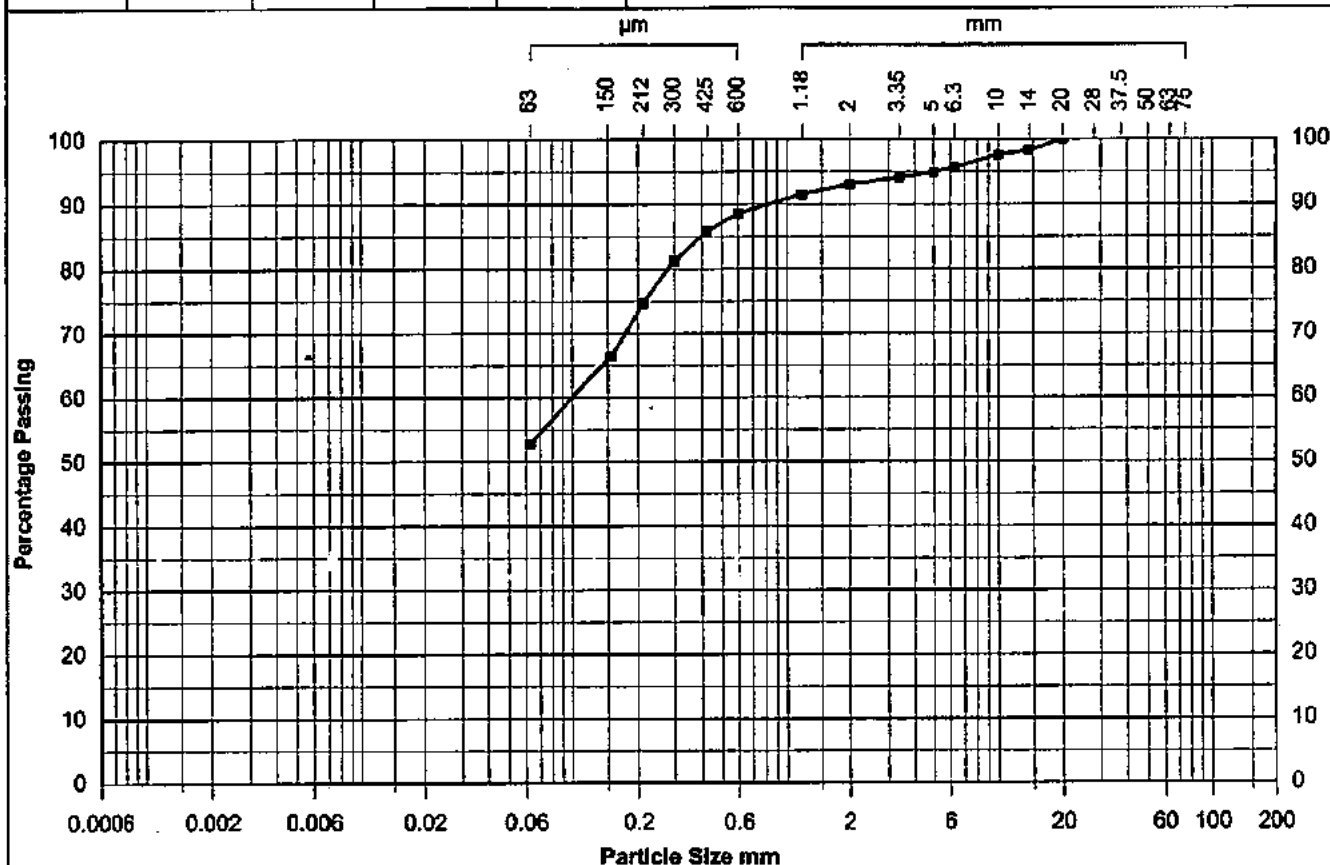
9.4 Sedimentation

Other: see below

Client: ENCIA Consutling Ltd

Contract: Radcliffe High, Riverside

Borehole/ Trial Pit No	Depth (m)	Sample Type	Sample No	Site Ref	Description of Material
BH4	4.00	BULK	100595	N/A	Brown sandy CLAY with occasional fine/medium sized gravel



Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles
	Silt			Sand			Gravel			

Weight of original sample: 11.5kg

Method of fine analysis: N/A

Weight of sample tested: 797g Method 9.2

Soil pre-treated with:
Sodium Hexametaphosphate*
Sodium Carbonate/Sodium Hexametaphosphate*
Hydrogen Peroxide*

NOTES:

* Delete as appropriate

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Report No 92/060/12449
Appendix Sheet No PSD5

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Form No PSD/R/0494

Particle Size Distribution

BS 1377: 1990: Part 2

Method: 9.2 Wet Sieve

9.3 Dry Sieve

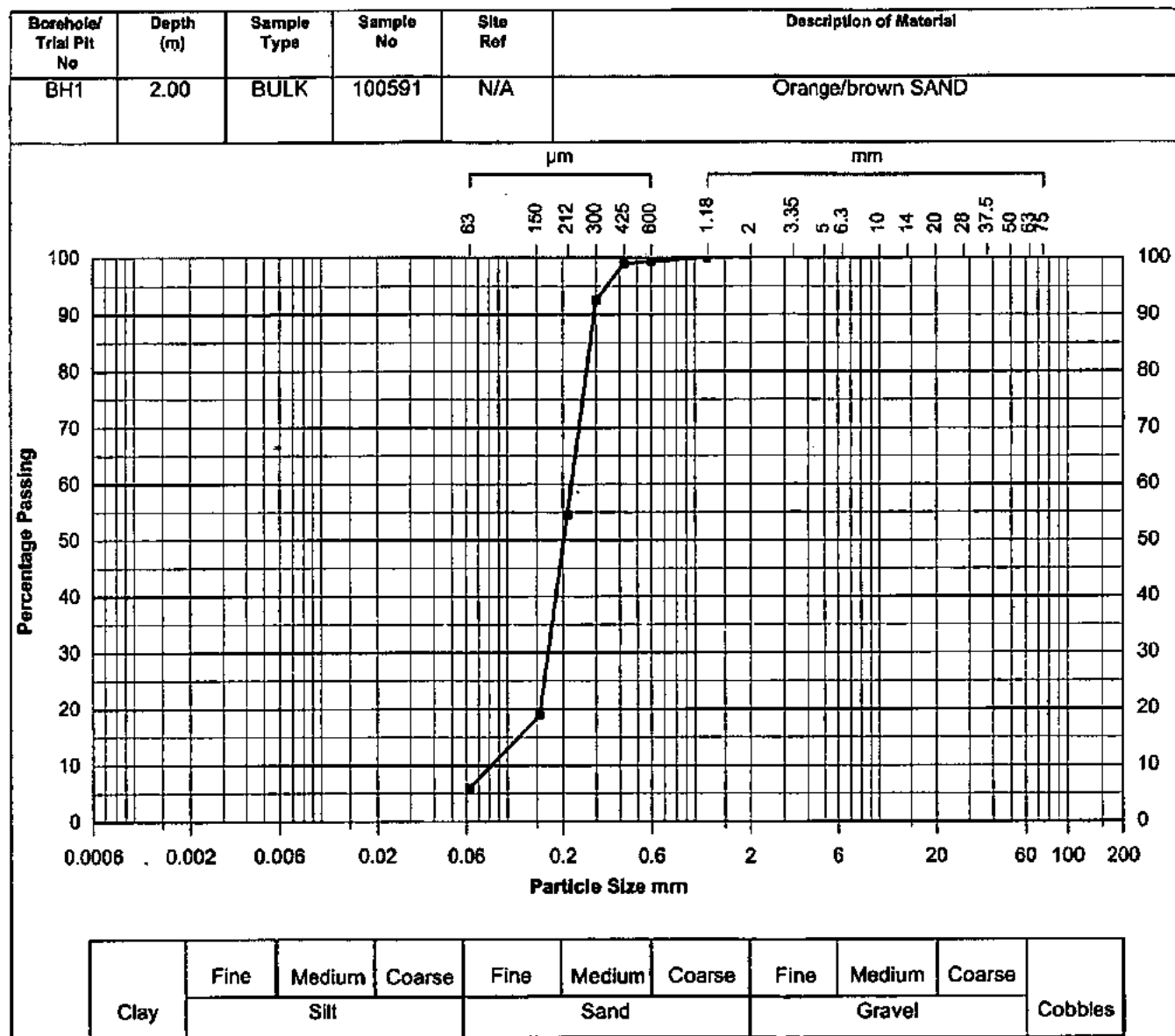
9.4 Sedimentation

Other: see below



Client: ENCIA Consutling Ltd

Contract: Radcliffe High, Riverside



Weight of original sample: 12.2kg

Method of fine analysis: N/A

Weight of sample tested: 921g Method 9.2

Soil pre-treated with:
Sodium Hexametaphosphate*
Sodium Carbonate/Sodium Hexametaphosphate*
Hydrogen Peroxide*

NOTES:

* Delete as appropriate

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Report No 92/060/12449
Appendix Sheet No PSD1

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Form No PSD/R/0494

Appendix H
Gas/Groundwater Monitoring Results

[illegible]

Notes			
Equipment Used:		Calibration	Key
Gas Data LMSX Infra red analyser Geotechnical Instruments Dismeter		Last date 27.04.03	POS - Positive Flow NEG - Negative Flow ND - None Detected NR - Not Recorded
Barometric Pressure Trend:		998mb steady	
Start of Visit:	End of Visit:	Intermediate Readings:	
Weather Conditions:	Sunny		
Surface Ground Conditions:	Dry		Temp:
Remarks:			
Checked:	Approved:		

**Appendix I
Commission**

5996/BRB

13th May 2005

Mr Jonathan Flax
P and F Properties Limited
Top Floor
1 Ashley Road
Altrincham
Cheshire
WA14 2DT

By: Fax and Post

Dear Mr Flax

**Proposed Development at Radcliffe High School, Radcliffe,
Proposal For Geo-Environmental Investigations**

With reference to our discussions at the meeting on the 6th May 2005 convened by Adrian Simmons (EC Harris) held at the offices of Bury Local Education Authority, we are pleased to present our costed proposals and outline scope of works for site investigations at the above site.

Encia understand that the Radcliffe High School Site may be acquired by P and F Properties as part of a land transfer with Bury MBC which will involve the development of the new Radcliffe Riverside School on the former East Lancashire Paper Mill site.

The proposal outlines those investigations that Encia Consulting consider necessary to enable the site to be developed. We understand however, that given the timescale presented and the difficulties involved in conducting a full-scale site investigation in an operational school, that P and F Properties may require the investigation to be phased with a preliminary investigation (aimed primarily at contamination related issues) being undertaken in the first instance.

Background and Site Description

We understand that, in accordance with the Radcliffe Three Sites Masterplan, the site is to be redeveloped for residential purposes, with approximately 200 units comprising terraces and two storey apartment blocks, POS (approximately 1ha), adoptable roadways and sewers. No detailed development proposals or site plans have been provided at this stage.

The site is located to the west of Radcliffe, at approximate grid reference SD779071. The site is of approximately 4.9ha, is roughly square in shape. The site is bounded to the south by School Street and to the east by residential properties off Ulundi Street. The western boundary is the disused Manchester, Bolton and Bury Canal.

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Examination of partial historical maps held by Encia indicates that the site was formerly open fields, a park and cricket ground and the present School dates from the 1930's.

To the south of the site is the Strebor Engineering Site (die casting engineering works) which was formerly the Green Lane Colliery. Other coal mining related sites are noted on historical plans immediately to the northeast, west and northwest of the site. Industrial premises are located immediately to the west of the canal, and along the northern boundary of the site.

Examination of geological maps help by Encia indicates that the bedrock comprises Carboniferous Middle Coal Measures strata. The Geological Map indicates that coal seams outcrop to the northwest of the site and these dip shallowly to the southeast. A further coal seam outcrops on the southeast part of the site. A fault is also depicted trending northwest-southeast across the site. Drift deposits overly the bedrock and comprise Glacial Till (Boulder Clay).

Significant thicknesses of Made Ground are not anticipated however given the adjacent site uses the ground may be contaminated.

We set out below, a scope of works that we consider will allow us to assess most reasonably foreseeable abnormal development issues that may affect the site. However Encia reserve the right to vary our intrusive investigation proposals following a walkover survey of the site and in the light of information obtained during the desk study.

Desk Top Study

The investigation will be commenced with a thorough Desk Top Study, which will address the entire site. This Desk Top Study (DTS) will include a walkover survey of the site, to examine the area for any issues that may give rise to ground contamination or structural issues, or present access difficulties to proposed investigation techniques.

In addition to the walkover, we will procure a Landmark 'Envirocheck' report for the site which will provide information on the historical development of the site and surrounding areas, and other geo-environmental information which is held by the Landmark Information group (who draw from databases held by the Environment Agency), and will allow us to establish the environmental setting of the site.

To supplement the Envirocheck report, we would also normally make informal enquiries with the following organisations:

- The Local Authority Building Control Department
- The Local Authority Environmental Health Department
- The Local Authority Planning Department (including enquiries relating to public rights of way across the site)
- The Environment Agency (enquiries relating to local contaminative industries that may affect any proposed development and to surface water and groundwater issues)
- Other authorities that may be seen as relevant as the DTS progresses
- Our preliminary investigations have indicated that the site geology consists of natural soils (which include a sequence of glacial sands and gravels, and glacial till) overlying coal bearing strata (Westphalian B Coal Measures). As a result allowance has been made to procure a Coal Authority Coal Mining Report.

The Desk Top Study will not be reported as a stand-alone document but will be incorporated into the overall geo-environmental report for the site in the form of a 'Conceptual Site Model' (CSM). The regulatory authorities will require a CSM in order to

satisfy themselves that the overall investigation works have considered all possible contamination sources and assessed potential pollution pathways in the context of contamination related issues.

Ground Investigation Sampling and Chemical Testing Proposals

As a result of the current occupancy of the site by Radcliffe High School, it is anticipated that fieldwork will be phased to minimise disruption and disturbance. Elements of the investigation should, for health and safety reasons, take place outside school hours and will need to be supervised full time by an Encia Engineer. We have allowed a provisional sum for health and safety management (signage and fencing etc.) for the duration of the field investigations.

Window Sample Boreholes

We have allowed for two days of window sampling at the site to assess ground conditions in area of hardstanding and areas where access is restricted. Each borehole will be drilled to nominal depths of 4 to 6m. Selected window sample boreholes will be installed with dual purpose gas and groundwater monitoring standpipes (complete with gas valve and protective cover), to allow for the subsequent monitoring of hazardous gas and the collection of groundwater samples. We have also allowed for a six-week monitoring programme to be undertaken.

Due to the presence of hardstanding in some areas of the site, we have also allowed for the provision of a concrete corer.

Cable Percussion Boreholes

We have allowed for six cable percussion boreholes to be drilled to 15m to enable in-situ density tests and to collect undisturbed samples for geotechnical analysis. Additional disturbed samples for chemical testing can also be recovered. Selected boreholes will be installed with a dual purpose gas and groundwater monitoring standpipes (complete with gas valve and protective cover), to allow for the subsequent monitoring of hazardous gas and the collection of groundwater samples.

Rotary Probeholes

We have provisionally allowed for six rotary boreholes to be drilled to a depth of 30mbgl in order to further assess the presence/absence of shallow mine workings beneath the site. All rotary boreholes will be backfilled with arisings and a cement/bentonite grout. This item may not be required or could be reduced in scope depending on the findings of the desk study.

Supervision, Reinstatement and Access

We have allowed for five days on site for supervision of the ground investigation by an experienced geo-environmental engineer from Encia Consulting Limited. The engineer will log the exploratory holes in general accordance with the requirements of BS 5930 and co-ordinate the recovery of soil and groundwater samples as necessary.

We have assumed in preparing this proposal that all existing landowners/users will be contacted by others to arrange suitable access and clearance. **We have also assumed that information regarding buried services will be provided to us although we can obtain the information at an additional cost.**

Chemical & Geotechnical Analysis

Samples would be recovered for the purpose of both contamination and geotechnical testing. Samples would be generally representative of the ground and groundwater conditions encountered. Additional spot samples may be required to be tested if localised material is encountered.

Chemical analyses allow for a general suite of testing for metal and other inorganic determinands and additionally a number of targeted organics tests to include speciated VOC, SVOC, TPH (EPH, DRO etc) and asbestos screen tests on soils (as outlined in DEFRA/CLR Report 8 'Potential Contaminants for the Assessment of Land'). We have allowed for selected samples to be tested for pesticides given the historical use of the site. Leachability tests will also be performed on soils and groundwater samples would be scheduled for a full range of inorganic and organic (speciated) determinands. Subject to the findings of the desk study a revision to our assumed testing suite may be required. We have assumed a standard ten-day turnaround in the laboratory for analysis.

We have allowed a sum for geotechnical testing which will allow a brief classification of the soils. A period of three weeks following the fieldwork should be allowed for the results of the geotechnical analysis.

Topographic Survey

An allowance has been included for a full topographic survey of the site.

Reporting

On completion of the intrusive site investigation works, Encia Consulting Ltd will prepare a geoenvironmental investigation report for the site. The report will include a Desk Top Study, factual record of the site operations, details of the ground conditions, a copy of the exploratory records and the laboratory data. The report will also include a detailed qualitative assessment of the contamination and ground gas risks drawing upon information to assess identified pollutant linkages utilising established source-pathway-target models based upon current UK guidance criteria.

We will also interpret ground conditions from a geotechnical viewpoint and include recommendations for foundations, pavement design etc.

We have not at this stage allowed for the carrying out of any quantitative risk assessments for gas, soil or groundwater contamination. We will advise you as to whether such additional works would be necessary once the findings of the investigation are known.

Costs and Timescales

Our costs for the investigation works outlined above would be ***** (including the provisional costs for rotary probe boreholes and topographic survey) of which we estimate approximately ***** might be eligible for Contaminated Land Tax Relief. A breakdown of our costings is attached to this letter.

The price does not, at this stage, include for the preparation of a detailed remediation strategy report, which the Local Authority may require. However, the above fixed price does include for submitting 2 copies of the report to yourselves as well as to the NHBC and Local Authority and for submitting a single piece of correspondence to the regulators to address any questions they may have on the report. Any further meetings,

correspondence or additional works not noted above would be charged at the rates given in the table below.

Item	Rate
Regional Manager	***
Principal Engineer	***
Senior Engineer	***
Engineer	***
Technician	***
Service inspection pits for explorer holes	***
Obtain buried services information	***
Additional copies of report(s)	***

We understand however, that given the timescale presented and the difficulties involved in conducting a full-scale site investigation in an operational school, that P and F Properties may require the investigation to be phased with a preliminary investigation (aimed primarily at early identification of contamination related issues) being undertaken in the first instance. It is anticipated that the preliminary investigation could take place in the forthcoming school half term break (27th May-6th June).

We have therefore included an additional cost breakdown based upon a preliminary investigation to include the following;

- Desk top study as outlined above
- Allowance for two days window sampling as outline above
- Allowance for a reduced amount of soil and groundwater analysis
- Three gas/groundwater monitoring visits
- Production of a preliminary interpretative report

Our costs for the preliminary investigation works outlined above would be *****of which we estimate approximately ***** might be eligible for Contaminated Land Tax Relief.

With regard to the programme for the preliminary works, we would commence the investigation immediately upon instruction subject to the availability of sub-contractors and the provision/obtaining of buried services information. It is likely that the fieldwork will take approximately three days to complete. We propose that the completed report would be submitted four weeks after completion of the fieldwork to enable the laboratory testing and gas-monitoring programme to be completed, although interim information can be provided once received. If an accelerated programme is required, we will need to address the scope of works undertaken and assess any additional costs charged by the laboratory for shorter turn around times.

Any formal involvement of Encia to this scheme would be based on our Standard Terms and Conditions of Appointment, a copy of which can be provided on request.

We will submit our first invoice on completion of the desk study and fieldwork, and our second invoice will be submitted on submission of our report which will include the cost of the laboratory testing, monitoring and reporting. Our invoices are strictly payable within 28 days of the date of each invoice.

We trust that you will find this proposal to be acceptable but should you require any additional information or clarification on any matter at this stage please do not hesitate to contact us.

Yours sincerely

Brandon Rice-Birchall
For and on behalf of
ENCIA CONSULTING LIMITED

Enc Cost Estimate Full Investigation
 Cost Estimate Preliminary Investigation

