

NOTES

LEGEND

- WINDOW SAMPLE BOREHOLE
- CABLE PERCUSSION BOREHOLE
- INFERRED BOUNDARY OF LANDFILL

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FIGURE 3
SITE PLAN SHOWING INFERRED BOUNDARY OF FORMER LANDFILL

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Appendix A GEA Report

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a ground investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Cundall Johnston and Partners, on behalf of Balfour Beatty Construction Limited, with respect to the redevelopment of this site by the construction of a new four storey school. The purpose of the investigation has been to assess the ground conditions, investigate the presence of contamination and to provide information for the design of piled foundations. A desk study has previously been carried out by Manchester City Council and a copy of the report has been provided.

DESK STUDY FINDINGS

The desk study indicated that the site had not been developed prior to the construction of the existing school between 1956 and 1963. At that time however landfilled refuse tips are shown to the west and north of the site. Previous ground investigations by Northern Foundations and by Strata Surveys Limited indicated made ground over glacial deposits of sandy clay and clayey fine sand. These previous investigation reports indicated significant depths of landfill immediately beyond the northern and western boundaries. Significant concentrations of both methane and carbon dioxide were measured within the borehole standpipes.

GROUND CONDITIONS

Boreholes in the north and west of the site have revealed made ground to depths of up to 7.5 m, comprising ashy sand with much refuse which was underlain by sandy clay. Within the central area of the site the made ground was generally less than 1.0 m in thickness and was underlain by Glacial Till comprising firm sandy clay and then medium dense clayey sand. The sand was underlain at depths of around 17 m by very stiff sandy slightly gravelly clay which extended to the full depth of the investigation. In the southern and southeastern part of the site the made ground extended to generally less than 0.5 m and was found to be underlain by firm becoming stiff brown sandy clay with layers of medium dense brown fine sand. Groundwater was encountered within some of the granular layers although subsequent monitoring has revealed the depths to groundwater to vary between 0.49 m (85.21 m OD) and 7.01 m (81.19 m OD).

RECOMMENDATIONS

Spread foundations would not be appropriate for the ground conditions encountered and column loads proposed; therefore recourse to a piled solution should be sought. Driven piles would avoid the need for the disposal of potentially contaminated arisings and would be appropriate for the sand layers. As an alternative, continuous flight augered bored piles bearing within the very stiff clay of the glacial till or the medium dense sand could also prove suitable although consideration would need to be given to the disposal of potentially contaminated pile arisings and likely increased concrete overbreak and loss within the variable and loose made ground. A preliminary pile design suggests that an approximately 13 m long 370 mm driven cast in situ pile may provide a working load of 500 kN whilst a 450 mm diameter CFA pile, founding at a depth of 15 m, could provide a working load of around 460 kN and a factor of safety of 3, although not taking account of negative skin friction effects. On the basis of the buildings being piled and over the former landfill, a fully suspended ground floor slab construction should be anticipated together with the installation of full gas protection measures.

Metallic contamination and asbestos have been found within the landfill such that further site specific risk assessment will be required for playing field areas. When beneath the proposed building or hardstanding potential pathways to that material are likely to be broken. Elsewhere on the site a single elevated concentration of arsenic has been measured but is not considered to pose a significant risk to health.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Balfour Beatty Construction and in consultation with Cundall Johnston and Partners LLP, to carry out a ground investigation at Plant Hill High School, Plant Hill Road in Higher Blackley, Manchester. A desk study was undertaken by Manchester City Council and the report was supplied to GEA with the enquiry documents.

1.1 Proposed Development

It is proposed to redevelop this site through the construction of a new four storey structure along with the provision of car parking and soft landscaping; the latter including a 'natural habitat'.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows.

- to establish whether a landfill that is known from previous work to be adjacent to the site, also encroaches onto this site;
- to determine the ground conditions and their engineering properties;
- to provide information to assist in the design of piled foundations and retaining walls;
- to provide site specific information in respect of ground gas;
- provide information for use in the design of pavements; and
- to investigate the presence of contamination.

1.3 Scope of Work

In order to meet the above objectives, a ground investigation was carried out and comprised, in summary, the following activities:

- three cable percussion boreholes advanced to a maximum depth of 20.5 m;
- a series of 20 small diameter open-drive boreholes advanced to a maximum depth of 9.0 m;
- installation and subsequent monitoring of eight gas and groundwater standpipes;
- testing of selected soil samples for geotechnical and contamination purposes; and

- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 THE SITE

2.1 Site Description

The site, which is in use as a high school with an annexed adult learning facility, is located within the suburb of Higher Blackley and lies some 6 km north of Manchester city centre. The site is bounded to the southeast and east by Plant Hill Road and to the north partially by the residential properties of Longton Road. Beyond the remainder of the northern, the western and southwestern boundaries lies open grassland. The site may additionally be located by National Grid Reference 385380 403690.

The site is irregular in shape and is of approximate maximum dimensions 375 m north to south by 200 m east to west.

The northernmost third of the site area is currently in use as playing fields, predominantly set to grass but with an approximately 90 m by 60 m tarmac surfaced area in the northeast. This part of the site slopes gently down to the west from a level of about 89.2 m OD to 85.7 m OD over approximately 200 m. The perimeter of this area is interspersed with small trees and rough shrubs. In addition a raised grassed mound, approximately 30 m by 10 m in area and 2.5 m in height lies along the western boundary.

The central part of the site is occupied by the existing school buildings. These comprise a range of single, two and three storey concrete and masonry structures with external areas surfaced in tarmac, paving slabs and concrete. These buildings lie at levels of between about 89.9 m OD and 87.5 m OD with a series of retaining walls and steps accounting for the level differences. The rough tarmac surfaced main school car park lies south of the school buildings. A number of mature deciduous trees are present between the school buildings and Plant Hill Road.

The remaining southern part of the site is occupied by the caretaker's house and a masonry adult education building and surrounded by soft landscaping at levels of between roughly 92.6 m OD around the caretaker's house and 87.7 m OD in front of the school.

2.2 Previous Site Investigation Reports

A desk study report, by Manchester City Council Structural Engineer's Group but with no reference, was supplied along with historical maps and environmental data obtained in 2004 from the Landmark Information Group. The desk study was specific to a new school development under the BSF framework and is therefore considered relevant to this report. This information was provided as part of the enquiry documentation along with three previous site investigation reports, two of which, by Strata Surveys Limited (ref 10022, dated December 1999) and Northern Foundations (Investigations) Limited (ref SI 7693, dated June 2000) relate to the site. The third, relating to the land immediately beyond the northern and western boundaries was prepared by Geotechnics (ref PN050930, dated October 2005).

The desk study report indicates that the site had, from at least the mid-1800s, been undeveloped farmland. The surrounding area is noted to have been subject to residential development from 1932. The maps dated from 1893 to 1956 show a watercourse flowing in the southwest of the site with two ponds being identified in the northeast. Plant Hill School is shown to have been built between 1956 and 1963 with the whole of the open land to the northwest of the site being identified as having been a refuse tip on the 1963 map. Subsequent maps show little change to the site to the present day, with the exception of the construction of the sports hall north of the main buildings since 1999.

The superficial geology beneath the site is indicated by the previous investigations to be Glacial Till, predominantly comprising sandy clay to a depth of around 5 m, overlying bodies of sand of up to 5 m in thickness. The solid geology is indicated to comprise Sherwood Sandstone, a major aquifer of high (urban) leaching potential which is expected to be present at a depth of around 40 m. A search of Coal Authority records reportedly indicated that the site is not within the zone of influence of past underground coal workings.

Passing reference to is made previous landfill sites and the Envirocheck search indicates the presence of two such sites, between 500 m and 1000 m from the site. An additional drawing provided with the desk study is thought to be Manchester City Council's record of landfill sites. This plan is appended and indicates that almost all of the area of Plant Hill School's playing field is a landfill site and that the entire school to be within a 250 m zone of influence.

The previous site investigation reports record largely similar ground conditions on the site, with firm and stiff sandy clay found to overlie sand which was proved to the relatively limited depths investigated.

The Geotechnics report on the land beyond the northern and western boundaries indicates a thin clay cover beneath which lies made ground comprising domestic refuse to a depth of some 3.9 m.

2.3 Other Information

Discussion with members of staff at the school has indicated that significant problems with settlement of the school playing fields have occurred in the past such that pitches have had to be relaid, to the extent that part of the area was hard covered with tarmac.

2.4 Preliminary Risk Assessment

The desk study report concludes that there is a low risk to receptors from the proposed development although notes that the two landfill sites in the vicinity are likely to impact the proposed development.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, three cable percussion boreholes, Borehole Nos 1, 3 and 4, were advanced through the fill materials and into the natural soils to depths of up to 20.5 m. The extremely soft condition of the playing fields did not allow access to the location of Borehole No 2 and following consultation with the consulting engineer this borehole was, for the present time, deleted.

In addition, a series of 20 shallow boreholes, Borehole Nos WS1 to WS20, were advanced using a tracked open-drive sampling rig.

Standard Penetration Tests (SPTs) were carried out at regular intervals within the cable tool boreholes and some of the open-drive boreholes.

Eight combined soil-gas and groundwater monitoring standpipes were installed to depths of between 3.0 m and 7.0 m at locations specified by the consulting engineer.

Disturbed and undisturbed samples were recovered from the boreholes at regular intervals for subsequent geotechnical and contamination analyses. A programme of gas and groundwater monitoring is currently underway and the results obtained thus far are appended; those for subsequent visits will be reported as an addendum to this report.

The borehole records and the results of the laboratory analyses are appended, together with a site plan indicating the borehole locations. The nomenclature and locations of the boreholes were specified by the consulting engineer. Borehole levels have been interpolated from spot heights and contours on an electronic drawing (ref: Plant Hill Topo survey.dwg) which was supplied by the client.

3.1 Sampling Strategy

It is understood that the borehole locations were selected to give an indication of the ground conditions in the area of the proposed building and elsewhere to address particular items of concern in relation to the possible encroachment of the landfill sites onto the proposed development. The recovered soil samples were selected for geotechnical purposes and to provide a general view of the soluble sulphate concentrations.

Additionally 14 samples of the made ground were recovered at selected depths to investigate the degree of contamination within the made ground and to investigate if those contaminants were widespread throughout the site and a single sample was also screened for asbestos. These selected samples have been subjected to chemical analyses to determine concentrations of a range of typical soil contamination indicative parameters. For this investigation the analytical suite included a range of metals, speciated total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide, and monohydric phenols. The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. Details of the accreditation and test methods are summarised in the Appendix together with the analytical results; full MCERTS details are available upon request.

4.0 GROUND CONDITIONS

The exploratory holes have indicated that the western and northern parts of the site are underlain by made ground up to 7.5 m in thickness whilst the central, southern and southeastern parts are apparently generally underlain by glacial deposits, encountered as stiff sandy clay with layers of sand, which were proved to the maximum depth of investigation of 20.5 m.

4.1 Made Ground

Beneath the surfacing of grass or tarmac, made ground was encountered at each location and was found to extend to depths of between 0.2 m and 7.5 m. The depths and composition of the made ground were found to vary across the site, but some consistency was observed within three areas.

The western and northern area of the site encompasses Borehole Nos WS1, WS3, WS7, WS9, WS13, WS14 and Borehole Nos 1 and 3 and is considered to represent the part of the site onto which the landfill encroaches. Within this broadly crescent-shaped area towards the boundaries of the site, made ground was found to extend to depths of between approximately 4 m and 7.5 m and was found to comprise black and dark grey sandy ash with clinker, wood, rubber, plastic, concrete, wire, glass and paper. Pockets of the material were extremely malodorous with anoxic hydrocarbon odours noted. In addition a sample of cement sheet suspected to contain asbestos was identified within Borehole No WS9. SPTs within the material were highly variable with N-values varying between 2 and 20.

The central area of the site encompasses Borehole Nos WS2 in the north, through WS4, WS5, WS6, WS8, WS10 to WS13, and WS20 and is considered to represent the area peripheral to the landfill. Within this area the depth of made ground was generally less than 1.0 m and was found to reduce in thickness approaching the current buildings. The made ground was found to comprise generally dark brown humic sandy clay with traces of brick, ash, clinker and coal although refuse as above was found within Borehole No WS 8.

The third area comprises the eastern and southeastern part of the site, including Borehole Nos WS17 to 19 and Borehole No 4 and is predominantly occupied by the current buildings and car parking areas. In this area, made ground comprising sandy clay with fragments of coal, ash and clinker was encountered and found to be typically less than 0.5 m in thickness.

Coal, ash and clinker were observed to be generally present within the made ground across all of the site. These materials and the malodourous materials within the refuse, are considered to suggest the presence of possible contamination; with ash and clinker being commonly rich in metallic elements whilst the associated ash and unburnt coal are typically high in PAH. The sample of cement sheeting from Borehole No WS9 has been screened for and found to contain 'white' crysotile asbestos.

A total of 14 samples of the made ground have been tested for the presence of contamination and the results are discussed in Section 4.4.

4.2 Glacial Deposits

Within the central, northern and western parts of the site, generally firm brown and brownish grey sandy clay was found to extend to depths of between 0.3 m and 9.0 m. This material was found to contain layers of medium dense pale brown clayey silty fine to medium sand of between 0.2 m and 1.2 m in thickness. A more substantial layer of similar sand was encountered within the clay between depths of 5.0 m and 10.8 m within Borehole No 1 and from 7.0 m to 9.1 m and 11.3 m to 16.6 m within Borehole No 3. Beneath the sand layers stiff becoming very stiff sandy clay with

occasional fine to medium gravel, thought to represent glacial till, was encountered at depths of around 17.0 m and extended to the maximum depth investigated at 20.5 m.

In the southern and southeastern part of the site the made ground extended to generally less than 0.5 m and was found to be underlain by firm becoming stiff brown sandy clay with layers of medium dense brown fine sand. Within Borehole No 4 this sandy clay was underlain by medium dense brown clayey silty fine to medium sand, which extended to the maximum depth investigated of 20.5 m. The soils revealed within Borehole No WS16 are considered to reflect the view that the localised area may have contained a backfilled pond as soft humic clay was found to extend to a depth of 3.2 m.

With the exception of a single sample of the soft silty clay within Borehole No WS16 which was identified as having medium volume change potential, the laboratory tests have shown the sandy clay to be of low shrinkability.

Generally no visual or olfactory evidence of contamination was identified in the natural soils, However black silt partings were noted within Borehole No WS1 within the clay encountered beneath the made ground; the staining extending from 7.5 m to 8.6 m depth.

4.3 Groundwater

Groundwater was encountered as a slow inflow close to the base of the made ground at a depth of 4.0 m within Borehole Nos 1 and 3 rising to 3.9 m and 3.7 m respectively in 20 minutes. Further ingress was recorded within the fine to medium sand layers at depths of 12.5 m and 16.5 m within Borehole Nos 1 and 3 respectively, again only rising by 0.5 m within 20 minutes. Within Borehole No 4, it was necessary to add water to assist boring of the sand at depths of 14 m and 17 m. This would appear to suggest that groundwater is generally to be found within sand lenses within the overall soil profile.

During subsequent gas monitoring the depths to groundwater were measured to vary between the shallowest at 0.49 m (85.21 m OD) within Borehole No WS13 and the deepest at 7.01 m (81.19 m OD) within Borehole No WS1. Where encountered at relatively shallow depth the groundwater is considered to represent perched conditions with groundwater existing within lenses of sand separated by layers of clay.

4.4 Soil Contamination

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

The use of a risk-based approach, which is presented in Part 2 of this report, means that it is not appropriate to determine the significance of contamination test results by simply comparing individual contaminant concentrations to a single "trigger" or "target" concentration.

The significance of the results is therefore considered in more detail in Part 2, whilst the tables below set out the values measured within the samples; the first table for samples taken from the landfill and the second for samples recovered remote from the landfill area.

Samples taken from the landfill area:

Determinant	Maximum Concentration Recorded (mg/kg)	Minimum Concentration Recorded (mg/kg)	Number of samples below detection limit	Normalised upper bound US_{95}
Arsenic	180	32	None	138
Cadmium	10	<1.0	1	5
Chromium	120	26	None	85
Copper	1500	180	None	931
Lead	2200	170	None	1504
Mercury	41	<1	5	14
Nickel	110	36	None	98
Selenium	<2	<2	All	<2
Zinc	2600	510	None	1815
Total Cyanide	7	<1	5	5
Total Phenols	<1	<1	All	<1
Sulphide	200	<10	3	89
Sulphate Total	6.6 %	0.3 %	None	3.8 %
Soluble Chloride	<50 mg/l	<50 mg/l	All	<50 mg/l
PAH	21	1.8	None	14
TPH (C8-C10)	<10	<1	All	7
TPH (C10-C12)	38	<1	4	18
TPH (C12-C16)	150	2	4	62
TPH (C16-C21)	840	9	None	337
TPH (C21-C35)	840	71	None	2960
Total Organic Carbon	33 %	4 %	None	23 %
pH	7.9	6.4	-	-

Note: The use of the normalised upper bound for 95th percentile confidence aims to remove some of the uncertainty associated with calculation of an arithmetic sample mean of a relatively small number of samples. The US95 value is the upper bound of the range within which it can be stated with 95% confidence that the true mean concentration of the data set will fall.

Samples taken outside the landfill area:

Determinant	Maximum Concentration Recorded (mg/kg)	Minimum Concentration Recorded (mg/kg)	Number of samples below detection limit	Normalised upper bound US_{95}
Arsenic	24	6	None	22
Cadmium	<1.0	<1.0	9	<1.0
Chromium	22	8	None	20
Copper	88	21	None	79
Lead	140	10	None	126
Mercury	<1	<1	All	<1
Nickel	33	9	None	28
Selenium	<2	<2	All	<2
Zinc	170	33	None	154
Total Cyanide	<1	<1	All	<1
Total Phenols	<1	<1	All	<1
Sulphide	21	<10	All	17
Sulphate Total	0.29 %	0.02 %	None	0.25 %
Soluble Chloride	<50 mg/l	<50 mg/l	All	<50 mg/l
PAH	9	0.03	None	7
TPH (C8-C10)	<1	<1	All	<1
TPH (C10-C12)	<1	<1	All	<1
TPH (C12-C16)	3	<1	All	3
TPH (C16-C21)	15	<1	2	12
TPH (C21-C35)	56	<1	2	43
Total Organic Carbon	16 %	0.2 %	None	12 %
pH	8.3	6.4	-	-

Note: The use of the normalised upper bound for 95th percentile confidence aims to remove some of the uncertainty associated with calculation of an arithmetic sample mean of a relatively small number of samples. The US95 value is the upper bound of the range within which it can be stated with 95% confidence that the true mean concentration of the data set will fall.

4.5 Soil Gas

Measurements of soil gas concentrations of up to 5.7 % vol methane and up to 20.0 % vol carbon dioxide were reported by Geotechnics, although no measurable flow appears to have been recorded.

Within the current investigation, two visits to monitor methane, carbon dioxide and oxygen have been undertaken as part of a regime of six visits. The results are presented within the appendix. Thus far, measurable concentrations of methane have only been recorded within Borehole No WS1, in which the made ground was found to extend to a depth of 7.5 m. In this borehole, methane concentrations of 18.4 % vol and 21.1 % vol have been measured in conjunction with flows of 0.8 l / hr and 0.2 l/hr respectively. Carbon dioxide has been measured at concentrations of generally between 'less than 0.1' % vol and 4.6 % vol. Higher concentrations of carbon dioxide were recorded within Borehole Nos WS1 and WS13, at 14.2 % vol and 12.1 % vol respectively; both of these boreholes contained significant depths of made ground deriving from the adjacent landfill. The implications of these results are discussed in Part 2 of this report.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations for foundations and other aspects of the development.

5.0 INTRODUCTION

Consideration is being given to the redevelopment of this site through the construction of a new school building. The layout and structures have not yet been finalised but for the purposes of this investigation, a four storey concrete framed structure has been proposed on the existing school fields as shown on the appended site plan. Areas of car parking and soft landscaping are also proposed, the soft landscaping to include a natural habitat area. Loadings have been indicated by the Engineer to be generally in the in the range of 3000 kN to 5000 kN for columns, 100 kN/m to 250 kN/m for load-bearing walls and 15 kN/m^2 for ground floor slabs.

6.0 GROUND MODEL

The previous desk study has shown the site to have had an uncontaminative history. On the basis of the investigation, the ground conditions at this site can be characterised as follows.

- Areas of made ground extending to depths of up to7.5 m are present in the northern and eastern parts of the site associated with a landfill dating from the 1960s;
- in the remaining areas of the site the made ground was found to extend to depths of generally less than 1.0 m;
- beneath the made ground, glacial deposits comprising generally firm and stiff sandy slightly gravelly clay was found to extend to a depth of 20.5 m;
- the clay contains lenses and substantial layers of clayey silty fine and medium sand; and
- groundwater was encountered at most locations on the site and has subsequently been measured in standpipes at depths of between 0.5 m and 7.0 m (85.2 m OD and 81.2 m OD).

6.1 Contaminants of Concern

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end the tables below indicate those contaminants of concern that have US95 values in excess of a generic human health risk based guideline value which is either that of the CLEA[1] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Beta Version 1.0 software assuming a residential end use without plant uptake, as the proposed landscaping is understood not to be used for produce. Where contaminant concentrations are measured in excess of these values it is considered that there is a potential for there to be some risk to human health

1 CLR 7 (2002) *Assessment of risks to human health from land contamination: an overview of the development of soil guideline values and related research;* CLR8 (2002) *Priority contaminants for the assessment of land;* CLR 9 (2002) *Contaminants in soil: collation of toxicological data and intake values;* CLR10 (2002) *The contaminated land exposure model (CLEA): technical basis and algorithms,* and reports CLR TOX1-25 and CLR SGV1-10,15 and 16; all DEFRA and Environment Agency.

and hence site specific risk assessment, soil remediation or risk management may be required. Values measured at concentrations below these values are not deemed to require further consideration with regard to human health.

The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

The table below details the contaminants of concern within samples of the landfill.

Contaminant of Concern	Maximum concentration recorded (mg/kg)	Minimum concentration recorded (mg/kg)	Normalised upper bound US_{95}	Generic Risk-Based Screening Value
Arsenic	180	32	138	20
Lead	2200	170	1504	450
Mercury	41	<1	14	15
Nickel	110	36	98	75
Total Organic Carbon	33 %	4 %	23 %	6 %

The concentrations of these metallic contaminants, together with the asbestos which was contained within cement sheeting, are considered to be indicative of the general contamination within the landfill material beneath part of this site. The source of the materials is likely to have derived from general industrial and domestic refuse and according to the historical maps was placed during the 1960s.

The table below details the contaminants of concern within the made ground which does not include the landfill.

Contaminant of Concern	Maximum concentration recorded (mg/kg)	Minimum concentration recorded (mg/kg)	Normalised upper bound US_{95}	Generic Risk-Based Screening Value
Arsenic	24	6	22	20

The US95 values calculated indicate that the single concentration of arsenic that is in excess of the risk based screening value is from the made ground. This concentration is considered to derive from the ash and clinker recorded within the borehole.

The implications of the contaminants of concern are assessed in detail in the developed conceptual site model in Section 7.6.

7.0 ADVICE AND RECOMMENDATIONS

The current Development Option 2 locates the proposed building largely in the central area of the site but with its extremities entering the deeper areas of made ground near Borehole Nos 1 and 3. Considering the relatively high column loads associated with a four-storey concrete framed building, located in part over the area of deep made ground, spread foundations are not considered to be appropriate for such ground conditions and therefore recourse to a piled solution should be sought. For possible smaller structures in the south and east of the site, shallow spread foundations may be considered.

7.1 Piled Foundations

Piles bearing within the stiff or very stiff clay or the medium dense sand of the Glacial Till are considered to provide a suitable foundation solution. Although both bored and driven piles could be suitable, the ground conditions and the presence of the landfill appear to favour a driven pile scheme.

Driven piles would avoid the need for the disposal of potentially contaminated arisings and are considered appropriate for the relatively thick layers of sand encountered. It is considered that a working load in the order of 500 kN could be achieved by a 370 mm diameter driven cast-in-situ pile in such ground conditions. The depth of such a pile would vary, dependent on the thickness and relative density of the sand layers but could be anticipated to generally be in the range from 11 m to 15 m.

Further investigation is recommended to provide a more complete view of the sand layer within the proposed building layout and therefore to provide an indication of whether the sand layer thins out such that the possibility of piles overstressing the Glacial Till beneath becomes a problem. In this regard further cable tool boreholes and dynamic cone penetrometer plots could prove useful.

Pre-cast concrete driven piles could also be considered; however the possibility may remain of creating a pathway for contaminants to penetrate the natural soils beneath the made ground. Since a driven cast-in-situ pile is formed by wet concrete filling any space on withdrawal of the piling tube, such a pile would prevent such a pathway from being formed and is therefore likely to be the most suitable type.

A cased rotary open bored pile is unlikely to prove economical due to water bearing granular soils at depth. It is therefore considered that bored piles constructed using a continuous flight auger could prove suitable with the positive rotation of the auger flighting any potentially contaminated soils to the surface, reducing the potential downward movement of contamination.

Consideration will need to be given to the disposal of potentially contaminated soils, which would by nature of the CFA process be mixed with the natural soils during the concreting phase of pile construction possibly rendering all of the pile spoil as possibly contaminated. Further, increased concrete over-break and loss within the variable and potentially very loose made ground should be anticipated and therefore be considered when costing the piling options.

As a further alternative, some form of rotary displacement pile could be considered with the associated saving of spoil disposal costs whilst taking maximum advantage of the bearing capacity of the granular deposits. Piling specialists should be consulted in respect of their proprietary methods and design methodology for such a technique.

The following parameters, based upon the ground conditions revealed in the boreholes are considered suitable for the preliminary design of straight-shafted bored piles.

Ultimate Skin Friction		***kN/m²***
Made Ground	GL to 4.0 m	Ignore
Glacial Till	4 m to 7 m	50
Glacial Sand	below 7 m	70
Ultimate End Bearing		***kN/m²***

Glacial Sand	below 12 m	3000

It is standard practice to apply a factor of safety of between 1.5 and 3.0 to the above parameters in the computation of working loads of individual piles. If piles are to penetrate areas of landfill it is likely that negative skin friction loading will be induced into the pile by the settlement of the landfill as it degrades and this will need to be taken into account in the final design.

A preliminary pile design suggests that a 450 mm diameter CFA pile, founding at a depth of 15 m, could provide a working load of around 460 kN and a factor of safety of 3, although not taking account of negative skin friction effects. For the larger column loads a 600 mm diameter pile providing a working load in the order of 685 kN could be anticipated.

The examples given above are for guidance and preliminary design only. The advice of a specialist piling contractor should be sought in respect of the particular type of pile which should be considered in the ground conditions encountered and with the site constraints that will apply.

Attention is drawn to the soft and variable surface conditions on the school field. These conditions, albeit in winter, should be considered in relation to the layout of the proposed buildings and the anticipated need for a relatively thick piling mat.

7.2 Spread Foundations

It is not currently proposed to construct new buildings in the area of the existing school in the east and south of the site. However in these areas, where firm clay was encountered at relatively shallow depth, spread foundations bearing at a minimum depth of 0.75 m, could be designed to apply a net allowable bearing pressure of 125 kN/m^2.

7.3 Excavations

It is difficult to assess the potential stability of excavations from boreholes. However, on the basis of the observations of the materials on site it is anticipated that excavations in the made ground and glacial till are unlikely to remain dry and stable in the short to medium term. Where excavations penetrate sand layers and the made ground, water ingress may be anticipated. Such inflows should generally be adequately controllable with conventional sump pumping techniques although groundwater from within the landfill is unlikely to be suitable for direction into the main drainage system.

Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides provided in order to comply with normal safety requirements.

In view of the elevated gas measurements it is recommended that all excavations be monitored for soil gas concentrations and particularly if man-entry is required. At this stage consideration should be given to forced ventilation and the provision of gas monitors and alarms for relevant personnel.

7.4 Ground Floor Slabs

On the basis of the main building being piled and partially over the former landfill; a fully suspended ground floor slab construction should be adopted. The results of the gas monitoring results to date indicate that gas protection measures are likely to be required. Further monitoring

is currently underway and the results, together with recommendations will be issued as an addendum.

7.5 Effect of Sulphates

Chemical analyses of selected soil samples have revealed moderate to elevated concentrations of total and soluble sulphate corresponding to concrete class DS-3 of Table C2 of BRE Special Digest 1: SD1 Third Edition (2005). The elevated values are generally attributable to the made ground, with which pile and foundation concrete may come into contact. The measured pH conditions are such that with mobile groundwater conditions assumed for concrete, an ACEC classification of AC-4 may be adopted.

The guidelines contained in the above digest should be followed in the design of foundation concrete.

7.6 Retaining Walls

It is understood that there may be a requirement to retain soils within the southern and eastern parts of the site during reprofiling and following demolition. Such retaining walls are likely to be formed as gravity structures bearing onto the glacial till and for the design of such the following parameters are considered appropriate.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion (c' – kN/m^2)	Effective Friction Angle (Φ' – degrees)
Made Ground (non-landfill)	1800	Zero	25
Stiff sandy clay	2000	Zero	28
Medium dense sand	1900	Zero	32

7.7 Pavement Design

The proposed areas of car parking are understood to be in the west of the site and almost totally over the deep and variable made ground. A substantial construction thickness would be required beneath the asphalt surfacing to minimise significant differential settlement. It is understood that a 450mm layer of a capping material (6F2) incorporating a geo-grid (Tensar) is to be allowed for beneath the nominal 150mm sub-base of MOT type 1. Even with such a construction, further settlement may occur and it would be prudent to set a strategy in place for periodic repair and / or replacement over the proposed lifetime of the surfaces.

Alternatively relocating the car park to the site of the current buildings is likely to reduce the thickness of material required although CBR testing will be required when the levels and layouts of pavements and car parks have been established.

7.8 Contamination Conceptual Model

The results of the contamination tests have generally confirmed the presence of arsenic contamination across the site within the made ground which is considered to probably be a result of the inclusions of ash and clinker. In addition the PAH and TPH are likely to derive from coal, clinker and probably lubricating mineral oil within the colliery waste.

The following tables summarises the Conceptual Model for the site and provides indication where pollution linkages may occur for which remedial action may be required.

SOURCE	RECEPTOR	PATHWAY	COMMENTS
Arsenic contamination within near surface soils; material NOT deriving from landfill	groundwater	percolation	percolation is not considered to pose a risk due to the depths of essentially impermeable glacial till which protect the underlying Coal Measures aquifer.
		groundwater	the metallic contaminants appear to be largely present within the made ground which is above and therefore isolated from the current groundwater where it exists within perched sand layers.
	end users	direct contact	end users will be effectively isolated from contaminants by new buildings and hardstanding areas. On the school fields there is a risk of ingestion and skin contact through games lessons and sports activities.
		ingestion of contaminated soil or dust	on the school fields during dry spells there is a risk of inhalation of wind blown dust and skin contact through games lessons and sports activities.
	site workers during construction	ingestion of contaminated soil or dust, skin contact, inhalation	appropriate protective equipment and working practices will be required during groundworks; however once the hard coverage of the site is in place dusting of the contaminated soils will not occur
	vegetation	uptake via soil, groundwater or vapour	landscaped areas are proposed along the eastern boundary. Appropriate thickness of clean imported topsoil to be laid to break any pathway.
Metallic contamination and asbestos within made ground comprising Landfill	groundwater	percolation	the cover thickness to be assessed across the landfill area. Percolation is not considered to pose a risk in areas of hardstanding or beneath the new buildings
		groundwater	the metallic contaminants are to be present within the made ground which is above and therefore isolated from the current groundwater where it exists within sand layers.
	end users	direct contact	end users will be effectively isolated from contaminants by new buildings and hardstanding areas. On the school fields there is a risk of ingestion and skin contact through games lessons and sports activities. A site specific risk assessment is proposed in these areas.
		ingestion of contaminated soil or dust	on the school fields during dry spells there is a risk of inhalation of wind blown dust and skin contact through games lessons and sports activities. Site specific risk assessment is proposed.
	site workers during construction	ingestion of contaminated soil or dust, skin contact, inhalation	appropriate protective equipment and working practices will be required during groundworks if the landfill materials are uncovered. However once the hard coverage of the site, or further capping material is in place dusting of the contaminated soils will not occur.
	vegetation	uptake via soil, groundwater or vapour	landscaped areas are still to be defined and will require further consideration and appropriate thickness of clean imported topsoil to be laid to break any pathway.

Each of the potential pollution linkages is considered in more detail below.

7.8.1 Groundwater

The groundwater is apparently present within layers of sand within the Glacial Deposits, and is therefore thought likely to be perched within the largely impermeable clay, with the main aquifer within the Sherwood Sandstone reportedly at a considerable depth beneath the surface. The till may generally be considered to protect the groundwater from the vertical migration of contaminants from the made ground above. This protection will be enhanced by the hard covering of the site in the areas of car parking and playground as well as the area covered by the proposed buildings.

7.8.2 End Users

7.8.2.1 Direct Contact

End users will be effectively isolated from direct contact with the identified contaminants by the extent of buildings and areas of external hardstanding. Areas of soft landscaping have yet to be defined and will require further consideration in due course. An appropriate depth of clean topsoil will be required prior to planting in areas of former landfill.

On the playing fields there is a limited risk that children could come into contact with the arsenic. The arsenic is, however contained within the made ground which contained ash and clinker. The risk is perceived to be in skin contact and in dusting during summer periods. In the field area over the landfill the cover appears to be of between 0.25 m and 0.35 m in thickness. Further site specific risk assessment should be undertaken in respect of the measured contaminants and the depth of cover together with the likely exposure times for each age group. Such a quantitative assessment would indicate whether or not clean material would be required to cover the playing fields following construction of the school.

7.8.2.2 Vapours

Concentrations of PAH are unlikely to pose a risk of vapours within the proposed buildings, however the measures proposed for the soil gas will more than adequately deal with moderate vapour concentrations should they arise.

7.8.3 Site Workers

Concentrations of metals and asbestos have been measured in the soils within this investigation. Site workers should be made aware of the contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE[2] and CIRIA[3] and the requirements of the Local Authority Environmental Health Officer. Further if workers were to complain of skin or eye irritation or nausea then work should be suspended pending further investigation.

2 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO

3 CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association

7.9 Soil Gas

On the basis of previous investigations, the current readings and the nature of the made ground, significant concentrations of methane and carbon dioxide can be expected within the soil gas. At this stage, the requirement for full gas protection measures including a positively vented layer should be anticipated. Although the detail would require further development it may be possible to incorporate such a layer within the piling mat construction and therefore gain some economical benefit.

If the proposed buildings were to be moved away from the former landfill area and closer to the south-eastern corner of the site it is considered possible that the gas protection measures required could be reduced, or, for example, a vertical gas protection barrier installed between the landfill and the new structures.

It would be prudent to investigate ground gas mitigation within the existing sports hall building. This should include a review of the current protection measures and assessment of whether a retro-fit method of protection is required. Further monitoring is currently underway and the results will be drawn together in an addendum to this report in due course. The above recommendations will therefore be reviewed at that stage.

7.10 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are classified as accepting inert, non-hazardous or hazardous wastes in accordance with the EU waste Directive. The classification of soils discarded during the development of this site as Inert or Hazardous waste which are to be disposed of at landfill may need to be established by comparison with the Waste Acceptance Criteria (WAC) based upon the results of CEN method bulk leaching tests or percolation tests. Such tests should be carried out upon representative samples from the waste stream once the extent of the materials to be discarded has been established.

Based upon the results of the analyses carried out and the technical guidance provided by the Environment Agency[4] it is considered likely that the made ground deriving from the landfill would be classified as Hazardous and natural soils from this site would be generally classified as Non-hazardous. Further more, the asbestos discovered within Borehole No WS09 is likely to put material from that area into the Hazardous waste category. This classification should be confirmed by the receiving landfill once the soils to be discarded have been defined. In order to finalise this classification it may be necessary to carry out further analyses including WAC CEN method bulk leaching tests should an inert waste classification be sought.

8.0 FURTHER WORK

It is understood that this investigation is to be followed in due course by a targeted ground investigation when the layout and extent of peripheral works have been defined.

The next phase of investigation would be expected to include further boreholes to refine the pile design and to establish the extent of the landfill with greater confidence. Such investigation is recommended to provide a more complete view of the sand layer within the proposed building layout. In this regard further cable tool boreholes and dynamic cone penetrometer plots could

[4] Environment Agency 2003. *Hazardous Waste: Interpretation of the definition and classification of hazardous waste.* Technical Guidance WM2

prove most useful.

The depth of cover to the landfill which exists beneath the school playing fields should be established and a detailed quantitative risk assessment undertaken to provide recommendations over the depth of cover to the made ground in the light of the contaminant concentrations beneath.

When the levels and layout of landscaping has been finalised CBR testing could be undertaken to establish design parameters for pavements and other car parking.

APPENDIX

Borehole Records

SPT Summary

Laboratory Test Results
: Summary of Geotechnical Results
Particle Size Distribution Test Results

Chemical Test Results

Generic Guideline Values

Gas Monitoring Results

Historical Maps

Site Plan

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH01**
Boring Method Cable Percussion	**Casing Diameter** 150mm cased to 17.00m	**Ground Level (mOD)** 87.50	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 06/12/2006- 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.40)	Made Ground (Brown humic sandy clay)		
0.40-0.50	D1				87.10	0.40	Made Ground (Dark grey and black sand, ash, timber, steel wire, paper, pottery and plastic)		
1.00-1.45 1.00-1.45	SPT N=9 S2			1,1/1,1,1,6		(1.60)			
1.50-1.60	D3								
2.00-2.45 2.00-2.45	SPT N=7 S4	1.80 1.80		1,1/1,1,3,2	85.50	2.00	No recovery, loose drilling		
3.00-3.45	SPT N=7	3.00		1,1/2,1,2,2		(2.20)			
3.50-3.60	D5	3.00							
4.00-4.45	d6	4.00	3.90	Water strike(1) at 4.00m, rose to 3.90m in 20 mins, sealed at 4.50m.	83.30	4.20	Soft yellow brown silty CLAY with layers of fine to medium sand		▼1 ▽1
4.00-4.45 4.50-4.60	SPT N=3 D7	4.00	3.90	0,0/0,1,1,1		(1.40)			
5.00-5.45 5.00-5.45	SPT N=5 S8	4.80 4.80		0,1/1,1,1,2					
5.50-5.60	D9				81.90	5.60	Medium dense pale brown silty fine to medium SAND with thin layers of clay		
6.50-6.95 6.50-6.95	SPT N=21 S10	6.00 6.00		3,3/4,5,6,6		(2.40)			
7.00-7.50	B11								
8.00-8.45 8.00-8.45	SPT N=19 S12	7.80 7.80		2,3/3,4,6,6	79.50	8.00	Firm brown silty CLAY becoming pale brown silty fine sand		
8.50-9.00	B13								
9.40-9.50	D14					(2.80)			
9.50-9.95 9.50-9.95	SPT N=17 S15	9.00 9.00		3,3/4,4,4,5					

Remarks
Borehole backfilled with arisings from 20.5 m to 10.0 m and with bentonite from 10.0 m to ground level.

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.BH01

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH01**	
Boring Method Cable Percussion	**Casing Diameter** 150mm cased to 17.00m	**Ground Level (mOD)** 87.50	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 06/12/2006- 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00-10.10	D16					(2.80)			
10.80-10.90	D17				76.70	10.80			
11.00-11.45	SPT N=16	10.50		3,4/4,4,4,4			Stiff brown laminated CLAY with thin laminations of pale brown fine sand		
11.00-11.45	S18	10.50							
11.90-12.00	D19								▼2
12.50-12.95	S20	12.30	12.00	Water strike(2) at 12.50m, rose to 12.00m in 20 mins.					▽2
12.50-12.95	SPT N=14	12.30	12.00	2,2/3,3,4,4					
12.90-13.00	D21					(4.50)			
13.90-14.00	D22								
14.00-14.45	SPT N=14	13.50	13.00	1,2/3,3,4,4					
14.00-14.45	S23	13.50	13.00						
14.90-15.00	D24								
15.30-15.40	D25				72.20	15.30			
15.50-15.95	SPT N=28	15.30	14.70	3,5/6,7,7,8			Stiff to very stiff dark greyish brown sandy CLAY with occasional gravel and cobbles		
15.50-15.95	S26	15.30	14.70						
16.40-16.50	D27								
17.00-17.45	SPT N=31	16.80	16.50	5,6/7,7,8,9					
17.00-17.45	S28	16.80	16.50						
17.40-17.50	D29					(5.20)			
18.40-18.50	D30								
18.50-18.95	SPT N=33	17.00		5,6/7,8,8,10					
18.50-18.95	S31	17.00							
19.50-19.60	D32								
20.05-20.50	SPT N=39	17.00		6,7/8,9,10,12					

Remarks
Chiselling from 18.10m to 18.30m for 1/2 hour.

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.BH01

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH01**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 17.00m	87.50	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 06/12/2006- 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.05-20.50	S33	17.00				(5.20)			
					67.00	20.50	Complete at 20.50m		

Remarks	**Scale (approx)**	**Logged By**
	1:50	MC
	Figure No.	
	J06365.BH01	

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH03**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 17.00m	85.90	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 08/12/2006- 13/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							Made Ground (Greyish brown very sandy clay)		
0.20-0.30	D1					(0.60)			
					85.30	0.60			
0.60-0.70	D2						Made Ground (Sandy ash, brick, stone, timber, glass, rubber with pockets of soft to firm grey to brown sand and clay)		
1.20-1.65	SPT N=7			1,2/2,2,2,1					
1.20-1.65	S3								
1.70-1.80	D4								
2.00-2.45	SPT N=9	1.80		1,0/1,2,2,4					
2.00-2.45	S								
2.50-2.60	D5					(3.90)			
3.00-3.45	SPT N=6	2.80		1,1/1,2,1,2					
3.00-3.45	S6								
3.50-3.60	D7								▼1
4.00-4.45	S			1(1) at 4.00m, rose to 3.70m in 20 mins.					▽1
4.00-4.45	SPT N=8	3.80		1,0/1,2,2,3					
4.40-4.50	D8				81.40	4.50			
4.50-4.60	D9						Firm dark brown and brown sandy CLAY		
5.00-5.45	SPT N=15	4.80		1,2/2,3,4,6					
5.00-5.45	S10								
5.50-5.60	D11					(2.50)			
6.40-6.50	D12								
6.50-6.95	U13			42 blows					
6.95-7.00	D14				78.90	7.00			
							Medium dense brownish grey very clayey medium SAND		
7.50-7.60	D15								
8.00-8.45	SPT N=16	7.50		2,3/3,4,4,5		(2.10)			
8.00-8.45	S16								
8.40-8.50	D17								
8.50-9.00	B18								
9.10-9.20	D19				76.80	9.10			
							Stiff brownish grey very sandy CLAY		
9.50-9.95	U20			68 blows					

Remarks
50 mm combined gas and groundwater monitoring standpipe installed to a depth of 5.0 m with a response zone from 1.0 m to 5.0 m

Scale (approx)	**Logged By**
1:50	MC

Figure No.
J06365.BH03

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Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH03**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 17.00m	85.90	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 08/12/2006- 13/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
9.95-10.00	D21								
10.50-10.60	D22					(2.40)			
11.00-11.45 11.00-11.45	SPT N=47 S23			4,5/5,9,13,20					
11.50-11.60 11.60-12.10	D24 B25				74.40	11.50	Dense greyish brown silty fine SAND		
						(0.80)			
12.30-12.40	D26				73.60	12.30			
12.50-12.95 12.50-12.95	SPT N=31 S27	12.00		4,5/7,7,8,9			Stiff dark greyish brown sandy CLAY with occasional mudstone gravel		
13.50-13.60	D28								
14.00-14.45 14.00-14.45	SPT N=31 S29	13.50		3,4/6,7,8,10					
14.50-14.60	D30					(4.30)			
15.40-15.50	D31								
15.50-15.95 15.50-15.95	SPT N=29 S32	15.00		3,5/6,6,8,9					▼2
				Water strike(2) at 16.50m, rose to 16.00m in 20 mins, sealed at 17.00m.					▽2
16.60-16.70	D33				69.30	16.60	Stiff dark greyish brown laminated sandy CLAY with occasional mudstone gravel and laminations of fine brown sand		
17.00-17.45 17.00-17.45	SPT N=27 S34	17.00	16.50	4,5/6,6,7,8					
17.50-17.60	D35								
						(2.80)			
18.40-18.50 18.50-18.95 18.50-18.95	D36 SPT N=34 S37	17.00		3,5/7,8,9,10					
19.40-19.50	D38				66.50	19.40			
20.05-20.50	SPT N=40			5,7/8,9,11,12					

Remarks

Scale (approx)	**Logged By**
1:50	MC

Figure No.
J06365.BH03

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH03**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 17.00m	85.90	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 08/12/2006- 13/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.05-20.50	S39						Complete at 20.50m		

Remarks	**Scale (approx)**	**Logged By**
	1:50	MC
	Figure No.	
	J06365.BH03	

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH04**
Boring Method Cable Percussion	**Casing Diameter** 150mm cased to 12.00m	**Ground Level (mOD)** 89.90	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 14/12/2006-15/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					89.85	(0.05)	Made Ground (Tarmac)		
0.10-0.20	D1					0.05			
0.30-0.40	D2					(0.55)	Made Ground (Firm brown and grey mottled very sandy clay with traces of brick, coal, roots, charcoal and wood)		
					89.30	0.60			
0.60-0.70	D3						Soft pale orange brown and pale grey mottled very silty very sandy CLAY		
1.00-1.45	U4			32 blows					
						(1.40)			
1.45-1.50	D5								
					87.90	2.00			
2.00-2.45	SPT N=16	1.80	1.70	1,2/3,4,4,5			Firm greyish brown sandy CLAY with occasional fine mudstone gravel		
2.00-2.45	S6	1.80	1.70						
2.50-2.60	D7								
						(1.40)			
3.00-3.45	SPT N=12	2.80		1,2/3,3,3,3					
3.00-3.45	S8	2.80							
					86.50	3.40			
3.50-3.60	D9						Medium dense greyish brown fine SAND		
4.00-4.45	U10	4.00		28 blows					
						(1.80)			
4.45-4.50	D11								
5.00-5.45	SPT N=32	4.70		3,5/7,7,8,10					
5.00-5.45	S12	4.70			84.70	5.20			
5.20-5.30	D13						Firm greyish brown sandy CLAY with occasional fine mudstone gravel and thin sand layers		
5.80-5.90	D14								
						(1.90)			
6.30-6.40	D151								
6.50-6.83	SPT 50/180			5,9/15,22,13					
6.50-6.95	S6								
6.50-7.00	D17								
7.00-7.10	D18				82.80	7.10			
							Stiff greyish brown sandy CLAY with layers of fine silty sand		
7.60-7.70	D19								
						(1.75)			
8.00-8.45	SPT N=12	7.80		2,3/3,3,3,3					
8.00-8.45	S20	7.80							
8.50-8.60	D21								
					81.05	8.85			
					80.90	(0.15) 9.00	Medium dense brown fine to medium SAND with occasional gravel		
							Medium dense and locally dense greyish brown very silty fine to medium SAND		
9.40-9.50	D22								
9.50-9.95	SPT N=18	9.00		2,3/4,4,5,5					
9.50-9.95	S23	9.00							

Remarks
Chiselling from 6.70m to 7.00m for .75 hours.

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.BH04

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH04**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 12.00m	89.90	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 14/12/2006- 15/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00-10.50	B24								
10.50-10.60	D25								
11.00-11.45	SPT N=22	10.80		3,4/4,5,6,7					
11.00-11.45	S26	10.80							
11.50-11.60	D27								
12.40-12.50	D28								
12.50-12.95	SPT N=23			3,4/5,5,6,7					
12.50-12.95	S29								
13.50-13.60	D30								
14.00-14.45	SPT N=26	14.00	13.50	4,5/6,6,7,7					
14.00-14.45	S31	14.00	13.50						
14.50-14.60	D32								
						(11.50)			
15.40-15.50	D33								
15.50-15.95	SPT N=34	15.40	14.50	4,5/7,8,9,10					
15.50-15.95	S34	15.40	14.50						
16.40-16.50	D35								
17.00-17.45	SPT N=28	16.80	16.00	4,5/6,7,7,8					
17.00-17.45	S36	16.80	16.00						
17.50-17.60	D37								
18.40-18.50	D38								
18.50-18.95	SPT N=23	18.50		3,4/4,5,6,8					
18.50-18.95	S39	18.50							
19.50-19.60	D40								
20.05-20.50	SPT N=26	20.00		3,4/5,6,7,8					

Remarks
Water added from 13.50m to 13.60m.

Scale (approx)	**Logged By**
1:50	MC

Figure No.
J06365.BH04

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Borehole Number** **BH04**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 12.00m	89.90	Balfour Beatty Construction Limited	J06365
	Location	**Dates** 14/12/2006- 15/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.05-20.50	S41	20.00				(11.50)			
					69.40	20.50	Complete at 20.50m		

Remarks	**Scale (approx)**	**Logged By**
	1:50	MC
	Figure No.	
	J06365.BH04	

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS01**	
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 88.20	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 06/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				88.00	(0.20) 0.20	Made Ground (Dark brown humic sandy clay)		
					(0.60)	Made Ground (Dark brown and black slightly clayey humic sand with fragments of brick, concrete, gravel and rootlets)		
0.60	D1			87.40	0.80			
1.00-1.45	CPT N=9		1,2/0,0,1,8	87.20	(0.20) 1.00	Made Ground (Broken concrete and brick)		
1.60	62					Made Ground (Black fragments of ash, brick, glass, pottery, wood, metal and plastic)		
2.00-2.45	CPT N=1		1,0/0,0,1,0					
2.60	D3							
3.00-3.45	CPT N=14		2,4/6,4,3,1					
3.60	D4							
4.00-4.45	CPT N=0		1,1/0,0,0,0		(6.50)			
4.60	D5							
5.00-5.45	CPT N=6		1,1/2,1,1,2					
5.60	D6							
6.00-6.45	CPT N=2		2,3/1,1,0,0					
6.60	D7							
7.00-7.45	CPT N=4		1,1/1,1,1,1					
				80.70	7.50	Soft dark grey and dark brown mottled sandy silty CLAY with black silt partings		
8.30	D8				(1.10)			
				79.60	8.60	Firm pale orange-brown and pale grey mottled sandy CLAY		
8.80	D9				(0.40)			
				79.20	9.00	Complete at 9.00m		

Remarks
50 mm combined gas and groundwater monitoring standpipe installed to a depth of 8.0 m with a response zone from 1.0 m to 8.0 m
Cased to 5.0 m
Groundwater not encountered

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS01

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS02**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 88.30	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 05/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				88.20	(0.10)	Made Ground (Dark brown humic silty sandy clay)		
					0.10			
0.20	D1				(0.40)	Made Ground (Reddish-brown clayey sand and gravel with fragments of wood and rootlets)		
				87.80	0.50			
						Pale orange-brown medium SAND with occasional fine to medium gravel, becoming darker with depth		
0.90	D2							
1.00-1.45	SPT N=13		1,2/2,3,4,4					
					(2.00)			
1.50	D3							
2.00-2.45	SPT N=23		4,4/5,5,6,7					
				85.80	2.50			
						Medium dense orange-brown slightly clayey medium SAND with occasional fine to medium gravel, becoming paler with depth		
3.00-3.45	CPT N=11		3,4/3,3,3,2		(1.20)			
				84.60	3.70			
3.90	D4					Firm brown slightly sandy CLAY		▽1
			Water strike(1) at 4.00m.		(0.75)			
4.00-4.45	CPT N=10		1,1/2,2,3,3					
				83.85	4.45			
						Complete at 4.45m		

Remarks
Groundwater standing at a depth of 4.0 m on withdrawal of casing on completion of the borehole

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS02

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS03**	
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.70	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 04/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				87.45	(0.25) 0.25	Made Ground (Dark brown humic clayey sand with roots and fragments of glass)		
0.20	D1							
0.50	D2				(0.60)	Made Ground (Brown sandy clay with fragments of coarse sand sized ash and occasional medium gravel)		
				86.85 86.80	0.85 (0.05)	Made Ground (Black shredded rubber)		
					0.90			
1.20	D3					Made Ground (Fragments of wood, brick, concrete, pottery, plastic, textile and glass with occasional fragments of ash)		
					(6.10)			
6.90	D4			80.70	7.00			
						Complete at 7.00m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS03

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS04**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 89.20	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 04/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Made Ground (Dark brown humic sandy clay with gravel sized fragments of concrete, brick, clinker and fragments of ash and coal)		
0.20	J1			88.95	0.25			
0.50	D2				(0.45)	Made Ground (Yellowish-brown and pale grey mottled sandy clay, sandy layers and fragments of yellowish-brown sandstone)		
0.90	D3			88.50	0.70			
1.00-1.45	CPT N=15		1,3/3,4,4,4		(0.50)	Medium dense pale greyish-brown and orange-brown mottled very clayey slightly gravelly SAND		
1.50	D4			88.00	1.20	Firm pale brown and pale grey mottled very sandy CLAY with laminations of very dark fine silty sand		
2.00-2.45	SPT N=9		2,3/2,2,2,3		(1.90)			
2.50	D5							
3.00-3.45	SPT N=13		1,2/2,2,4,5	86.10	3.10	Firm greyish-brown silty CLAY with occasional fragments of mudstone and siltstone		
3.70	D6				(1.20)			
4.00-4.45	SPT N=23		5,6/6,6,5,6					
				84.90	4.30	Medium dense pale brown fine to medium SAND with occasional gravel		
4.80-5.00	D7				(0.70)			
5.00-5.45	CPT N=4		1,1/1,1,1,1	84.20	5.00	Complete at 5.45m		

Remarks
Groundwater not encountered
50 mm combined gas and groundwater monitoring standpipe installed to a depth of 4.0 m with a response zone from 1.0 m to 4.0 m

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS04

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS05**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Balfour Beatty Construction Limited **Job Number** J06365
	Location	**Dates** 05/12/2006	**Engineer** Cundall Johnston and Partners LLP **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Made Ground (Dark brown silty clayey sand with occasional gravel and fragments of brick, rootlets and plastic)		
0.30	D1				0.20 (0.20)	Made Ground (Gravel in a dark brown sandy clay matrix)		
					0.40	Firm reddish-brown sandy CLAY with occasional gravel and fine gravel sized coal fragments		
0.90	D2		Water strike(1) at 0.90m.					▽1
1.00-1.45	SPT N=11		2,2/2,3,3,3		(2.00)			
2.00-2.45	SPT N=16		2,3/3,3,5,5					
					2.40 (0.10)	Orange-brown medium sized SAND		
					2.50 (0.20)	Soft to firm orange-brown very sandy CLAY		
3.00-3.45	CPT N=5		1,1/1,2,1,1		2.70	Loose orange-brown SAND with occasional black partings of coal fragments		
3.20	D3				(1.30)			
4.00-4.45	CPT N=12		1,1/1,2,2,7		4.00	Complete at 4.00m		

Remarks
Groundwater standing at a depth of 0.9 m on withdrawal of casing on completion of the borehole

Scale (approx)	**Logged By**
1:50	EMA

Figure No.
J06365.WS05

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS06**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.80	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 05/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				87.70	(0.10)	Made Ground (Dark brown and black humic silty clay)		
				87.60	0.10			
0.30	D1				(0.10)	Made Ground (Sandy gravel sub-base)		
				87.30	0.20			
					(0.30)	Made Ground (Dark brown silty sandy clay with a gravel of dark glassy fragments at 0.3 m)		
					0.50			
0.90	D2					Medium dense and locally loose orange-brown fine and medium SAND with occasional pale yellowish-brown, grey and black mottling becoming slightly clayey with depth		▽1
1.00-1.45	SPT N=12		Water strike(1) at 1.00m. 3,4/2,3,3,4					
1.90	D3							
2.00-2.45	SPT N=13		1,2/3,3,4,3					
					(3.95)			
3.00-3.45	CPT N=9		1,2/2,2,2,3					
4.00-4.45	CPT N=21		2,4/4,4,6,7					
				83.35	4.45			
						Complete at 4.45m		

Remarks
Groundwater standing at a depth of 1.0 m on withdrawal of casing on completion of the borehole

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS06

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS07**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.20	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Made Ground (Dark brown humic clayey sand with rootlets and occasional brick fragments)		
0.20	D1			86.90	0.30			
0.60	D2				(0.70)	Made Ground (Pale brown, pale grey and pale orange mottled slightly sandy clay)		
				86.20	1.00			
					(2.25)	Made Ground (Black fragments of glass, plastic, wood, brick, gravel, metal and ash)		
2.80	D3							
				83.95	3.25			
3.40	D4				(0.75)	Firm becoming stiff reddish-brown slightly sandy CLAY with occasional fine gravel of coal		
				83.20	4.00			
						Complete at 4.00m		

Remarks
Groundwater not encountered
50 mm combined gas and groundwater monitoring standpipe installed to a depth of 4.0 m with a response zone from 1.0 m to 4.0 m

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS07

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS08**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.60	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 11/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				87.35	(0.25) 0.25	Made Ground (Dark brown very sandy humic clay with rootlets and traces of brick)		
				87.15	(0.20) 0.45	Made Ground (Firm pale yellowish-brown silty very sandy clay)		
0.70	J1		Water strike(1) at 0.80m.		(0.55)	Made Ground (Dark brown, greyish brown and black silty gravelly sand with fragments of coal, ash, clinker, soot and brick)		▽1
				86.60	1.00			
1.20	D2				(0.35)			
1.30	D5			86.25	1.35	Pale grey and very pale brown very silty very sandy CLAY with dark grey speckling		
1.60	D3					Firm becoming stiff pale reddish-brown and pale grey mottled sandy CLAY		
2.30	D4				(1.65)			
				84.60	3.00			
						Complete at 3.00m		

Remarks
Groundwater standing at a depth of 0.8 m on withdrawal of casing on completion of the borehole

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS08

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS09**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.00	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 11/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				86.80	(0.20) 0.20	Made Ground (Dark brown very sandy humic clay with rootlets and traces of brick)		
				86.60	(0.20) 0.40	Made Ground (Pale yellowish-brown silty very sandy clay)		
					(1.10)	Made Ground (Dark brown, greyish brown and black silty gravelly sand with fragments of coal, ash, clinker and brick)		
				85.50	1.50			
					(0.60)	Firm pale grey and very pale brown very silty very sandy CLAY with dark grey speckling		
2.00-2.45	SPT N=10		0,1/1,2,3,4	84.90	2.10			
3.00-3.45	SPT N=10		2,2/2,2,3,3		(1.90)	Firm becoming stiff pale reddish-brown and pale grey mottled sandy CLAY with thin layers of pale brown fine sand		
4.00-4.45	SPT N=13		2,1/3,3,3,4	83.00	4.00			
					(0.45)	Medium dense pale brown fine to medium SAND		
				82.55	4.45			
						Complete at 4.45m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS09

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS10**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.20	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 11/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Made Ground (Dark brown humic sandy clay with fragments of clinker, coal, rootlets and tin can)		
0.20	J1			86.90	0.30	Firm pale brown very sandy CLAY		
0.80	D2				(1.20)			
1.00-1.45	SPT N=15		1,3/3,3,4,5					
1.30	D3			85.70	1.50	Stiff greyish brown sandy CLAY with occasional fine gravel and layers of pale brown fine to medium sand		
2.00-2.45	SPT N=16		1,1/2,4,4,6					
2.20	D4				(2.95)			
3.00-3.45	SPT N=15		2,2/3,3,4,5					
3.20	D5							
4.00-4.45	SPT N=22		1,3/4,4,7,7					
4.20	D6			82.75	4.45	Complete at 4.45m		

Remarks
50 mm combined gas and groundwater monitoring standpipe installed to a depth of 5.0 m with a response zone from 1.0 m to 5.0 m
Layers of sand were observed to be wet from 1.5 m

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS10

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester		**Number** **WS11**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.50	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 05/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				87.40	(0.10) 0.10	Made Ground (Dark brown sandy clay)		
0.50	D1				(0.70)	Made Ground (Fragments of gravel, brick, concrete, geotextile, clinker and ash)		
				86.70	0.80			
				86.50	(0.20) 1.00	Made Ground (Yellowish-brown sandy clay)		
1.00-1.45	SPT N=10		1,1/2,3,2,3			Firm orange-brown sandy CLAY with occasional pale grey mottling and black partings		
1.60	D2				(1.00)			
2.00-2.45	SPT N=5		0,0/0,0,2,3	85.50	2.00	Soft pale grey and pale brown mottled silty CLAY becoming dark grey with depth and rare coal fragments		
2.90	D3				(1.00)			
3.00-3.45	SPT N=11		0,2/1,2,3,5	84.50 84.45	3.00 (0.05)	Very soft dark grey and brown humic CLAY		
					3.05	Soft dark grey slightly silty CLAY becoming dark grey with depth and rare coal fragments		
3.50	D4				(0.75)			
				83.70	3.80			
3.90	D5			83.50	(0.20) 4.00	Medium dense orange-brown SAND with coal fragments		
4.00-4.45	SPT N=17		4,5/3,5,3,6					
						Complete at 4.45m		

Remarks Groundwater not encountered	**Scale (approx)** 1:50	**Logged By** EMA
	Figure No. J06365.WS11	

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS12**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 88.80	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 12/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				88.75	(0.05) 0.05	Made Ground (Tarmac)		
0.50	J1				(0.85)	Made Ground (Grey slightly clayey very fine to coarse sandy silty gravel)		
1.00-1.45	SPT N=16		1,3/4,4,4,4	87.90	0.90			
1.50	D2				(0.90)	Stiff reddish-brown very sandy CLAY with occasional sand layers		
2.00-2.45	SPT N=19		3,3/4,5,6,4	87.00	1.80			
2.45-2.55	D3				(1.25)	Medium dense reddish-brown medium SAND		
3.00-3.45	SPT N=16		2,4/3,4,5,4	85.75	3.05			
3.50	D4				(1.15)	Stiff greyish brown sandy CLAY with occasional fine gravel		
4.00-4.45	SPT N=14		1,2/2,3,4,5	84.60	4.20			
						Complete at 4.45m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS12

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS13**	
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 85.70	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				85.45	(0.25) 0.25	Made Ground (Brown sandy clay with fragments of ash, rootlets and occasional gravel)		
0.35	D2			85.30	(0.15) 0.40	Made Ground (Dark brown sandy clay with rootlets)		
0.80	D3					Made Ground (Dark reddish-brown fragments of ash, clinker, pottery, glass, bricks and wood, becoming darker below 1.8 m)		
					(4.30)			
3.00	J1							
				81.00	4.70			
4.80	D4				(0.30)	Pale brown fine to medium SAND		
				80.70	5.00			
						Complete at 5.00m		

Remarks
50 mm combined gas and groundwater standpipe installed to a depth of 3.5 m with a response zone from 0.5 m to 3.5 m
Groundwater not encountered
Borehole backfilled with bentonite

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS13

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester		**Number** **WS14**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 88.30	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 07/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				88.20	(0.10)	Made Ground (Dark brown clay with fragments of brick, glass and coal)		
0.20	D1				0.10			
				87.80	(0.40)	Made Ground (Pale orange-brown and pale grey mottled sandy clay with rootlets and coal fragments)		
0.80	D2				0.50	Made Ground (Black gravel of brick, ash and coal with pockets of orange-brown sandy clay)		
				86.90	(0.90)			
					1.40	Made Ground (Reddish-brown and black sandy clay with occasional brick fragments)		
1.60	D3			86.60	(0.30)			
				86.50	1.70	Made Ground (concrete)		
1.90	D4			86.30	(0.10)			
					1.80	Made Ground (Firm grey and dark brown mottled clay)		
					(0.20)			
					2.00	Terminated at 2.00m		

Remarks
Borehole backfilled with bentonite
Groundwater not encountered
Sampler refused at 2.0 m

Scale (approx)	Logged By
1:50	EMA

Figure No.
J06365.WS14

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS15**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 88.40	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 12/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Made Ground (Dark brown humic sandy clay with rootlets and occasional gravel)		
0.30	J1			88.10	0.30	Firm brown and pale grey mottled silty sandy CLAY		
0.60	D2							
1.00-1.45	SPT N=9		0,1/1,2,3,3		(1.30)			
				86.80	1.60			
1.60	D3			86.60	(0.20)	Stiff pale brownish-grey silty sandy CLAY		
					1.80	Stiff pale yellowish-brown sandy silty CLAY		
2.00-2.45	SPT N=17		0,2/5,5,4,3		(0.60)			
2.40	D4			86.00	2.40			
				85.80	(0.20)	Medium dense pale brown finr to medium SAND		
2.90	D5				2.60	Stiff greyish brown sandy CLAY with occasional fine to medium gravel		
3.00-3.45	SPT N=19		2,3/3,5,5,6					
					(1.85)			
4.00-4.45	SPT N=28		2,3/6,8,7,7					
4.20	D6			83.95	4.45			
						Complete at 4.45m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS15

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester		**Number** **WS16**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 89.50	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 12/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				89.45	(0.05) 0.05	Made Ground (Tarmac)		
				89.10	(0.35) 0.40	Made Ground (Tarmac fragments with black ash, clinker and sand)		
				88.80	(0.30) 0.70	Made Ground (Yellowish-brown sandy silty gravel)		
0.80	J1				(0.30)			
1.00-1.45	SPT N=3		0,0/0,0,1,2	88.50	1.00	Made Ground (Broken brick and brick fragments with sandy clay and dark grey ashy sand)		
1.40	D2				(0.90)	Made Ground (Pale brown mottled pale grey sandy clay)		
				87.60	1.90			
2.00-2.45	SPT N=0		0,0/0,0,0,0			Soft humic very silty very sandy CLAY with occasional roots		
2.60	D3				(1.00)			
2.90	D4			86.60	2.90			
3.00-3.45	SPT N=6		1,1/1,1,2,2		(0.30)	Loose pale brown silty fine SAND		
3.10	D5			86.30	3.20			
3.60	D6				(1.25)	Stiff greyish brown sandy CLAY with occasional fine to medium gravel		
4.00-4.45	SPT N=12		1,1/2,3,3,4					
4.30	D7			85.05	4.45	Complete at 4.45m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS16

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GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester		**Number** **WS17**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.30	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 13/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				87.10	(0.20) 0.20	Made Ground (Dark brown humic sandy clay with roots and rootlets)		
0.40	D1			86.80	(0.30) 0.50	Stiff pale orange-brown and pale grey mottled silty sandy CLAY		
0.80	D2			86.70	(0.10) 0.60	Pale brown medium SAND		
1.00-1.45	SPT N=14		1,1/2,3,4,5	86.35	(0.35) 0.95	Dark orange brown and grey mottled silty sandy CLAY		
1.10	D3			86.15	(0.20) 1.15	Medium dense orange-brown medium SAND		
1.80	D4					Firm becoming stiff greyish brown sandy CLAY with occasional fine and medium gravel of dark grey mudstone		
2.00-2.45	SPT N=14		2,2/3,3,4,4					
2.60	D5							
3.00-3.45	SPT N=13		1,2/3,3,3,4					
3.60	D6				(5.30)			
4.00-4.45	SPT N=15		2,2/3,4,4,4					
4.60	D7							
5.00-5.45	SPT N=18		1,2/3,5,4,6					
5.60	D8							
6.00-6.45	SPT N=25		2,3/5,6,6,8					
6.20	D9			80.85	6.45	Complete at 6.45m		

Remarks
Groundwater not encountered

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS17

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GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site
Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester

Number
WS18

Excavation Method
Open drive lined percussive sampler

Dimensions

Ground Level (mOD)
89.90

Client
Balfour Beatty Construction Limited

Job Number
J06365

Location

Dates
13/12/2006

Engineer
Cundall Johnston and Partners LLP

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Made Ground (Tarmac and tarmac fragments, gravel, ash, clinker, brick fragments and hydrocarbon odour)		
0.25	J1			89.60	0.30	Soft dark orange brown very sandy CLAY with occasional gravel and roots		
0.60	D2				(0.80)			
1.00-1.45	SPT N=15		2,2/3,4,3,5	88.80	1.10	Stiff greyish brown sandy CLAY with occasional fine and medium mudstone gravel		
1.40	D3				(0.60)			
1.80	D4			88.20	1.70	Greyish brown firm silty SAND		
2.00-2.45	SPT N=22		2,3/5,6,5,6		(1.00)	very clayey to 2.6m		▽1
			Water strike(1) at 2.40m.					
2.80	D5			87.20	2.70	Stiff greyish brown sandy CLAY with occasional fine and medium mudstone gravel		
3.00-3.45	SPT N=25		1,2/4,7,6,8		(0.80)			
				86.40	3.50	Greyish brown firm silty SAND		
				86.10	(0.30) 3.80			
3.90	D6			85.90	(0.20) 4.00	Stiff greyish brown sandy CLAY with occasional fine and medium mudstone gravel		
4.00-4.45	SPT N=16		1,2/2,4,4,6	85.80	(0.10) 4.10	Greyish brown firm silty SAND		
				85.45	(0.35) 4.45	Stiff greyish brown sandy CLAY with occasional fine and medium mudstone gravel		
						Complete at 4.45m		

Remarks
Groundwater standing at a depth of 2.4 m on withdrawal of casing on completion of the borehole

Scale (approx)
1:50

Logged By
MC

Figure No.
J06365.WS18

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS19**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 92.60	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 12/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35)	Made Ground (Dark brown humic sandy clay with brick fragments at 0.3 m)		
0.30	J1			92.25	0.35			
0.50	D2				(0.30)	Soft pale brown and pale grey mottled very silty sandy CLAY		
				91.95	0.65			
					(0.65)	Medium dense pale brown and pale grey mottled silty clayey fine to medium SAND		
1.00-1.45	SPT N=10		1,1/1,3,3,3					
1.20	D3			91.30	1.30			
					(0.50)	Stiff reddish-brown and pale grey mottled silty very sandy CLAY with black speckling and occasional fine to medium gravel		
1.60	D4			90.80	1.80			
2.00-2.45	SPT N=29		2,4/5,6,8,10			Stiff greyish brown sandy CLAY with occasional fine and medium mudstone gravel		
2.20	D5				(0.70)			
				90.10	2.50			▽1
			Water strike(1) at 2.60m.			Pale brown fine to medium clayey SAND		
					(0.70)			
3.00-3.45	SPT N=14		1,2/3,3,3,5					
3.20	D6			89.40	3.20			
						Stiff greyish brown very sandy CLAY with occasional fine and medium mudstone gravel		
3.80	D7				(1.25)			
4.00-4.45	SPT N=9		2,1/2,2,2,3					
				88.15	4.45			
						Complete at 4.45m		

Remarks
Groundwater standing at a depth of 2.6 m on withdrawal of casing on completion of the borehole

Scale (approx)	Logged By
1:50	MC

Figure No.
J06365.WS19

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GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site** Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Number** **WS20**
Excavation Method Open drive lined percussive sampler	**Dimensions**	**Ground Level (mOD)** 87.60	**Client** Balfour Beatty Construction Limited	**Job Number** J06365
	Location	**Dates** 11/12/2006	**Engineer** Cundall Johnston and Partners LLP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	J1			87.30	(0.30) 0.30	Made Ground (Dark brown humic very sandy clay with rootlets)		
0.40	D2		Water strike(1) at 0.40m.	87.10	(0.20) 0.50	Pale greyish-brown and orange-brown mottled very sandy CLAY		▽1
0.50	J3				(0.30)			
0.50-0.70	D4			86.80	0.80	Pale reddish-brown medium SAND		
1.00-1.45	SPT N=17		1,4/4,5,4,4		(0.30)			
1.10	D5			86.50	1.10	Stiff reddish-brown with black speckling very sandy CLAY with occasional coarse gravel and fragments of charcoal		
1.60	D6					Medium dense greyish brown fine SAND		
2.00-2.45	SPT N=12		1,1/2,2,3,5					
2.60	D7				(2.65)			
3.00-3.45	SPT N=13		1,1/2,3,4,4					
3.50	D8			83.85	3.75	Stiff greyish-brown sandy CLAY with occasional fine gravel of dark grey mudstone		
4.00-4.45	SPT N=20		2,2/3,4,5,8		(0.70)			
4.20	D9			83.15	4.45	Complete at 4.45m		

Remarks
Groundwater standing at a depth of 0.4 m on withdrawal of casing on completion of the borehole

Scale (approx)	**Logged By**
1:50	MC

Figure No.
J06365.WS20

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GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Standard Penetration Test Results

Site : Plant Hill High School, Manchester

Client : Balfour Beatty Construction Limited

Engineer : Cundall

Job Number J06365

Sheet 1 / 3

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH01	1.00	1.15	1.45	SPT	1	1	1	1	1	6	N=9	
BH01	2.00	2.15	2.45	SPT	1	1	1	1	3	2	N=7	
BH01	3.00	3.15	3.45	SPT	1	1	2	1	2	2	N=7	
BH01	4.00	4.15	4.45	SPT	0	0	0	1	1	1	N=3	
BH01	5.00	5.15	5.45	SPT	0	1	1	1	1	2	N=5	
BH01	6.50	6.65	6.95	SPT	3	3	4	5	6	6	N=21	
BH01	8.00	8.15	8.45	SPT	2	3	3	4	6	6	N=19	
BH01	9.50	9.65	9.95	SPT	3	3	4	4	4	5	N=17	
BH01	11.00	11.15	11.45	SPT	3	4	4	4	4	4	N=16	
BH01	12.50	12.65	12.95	SPT	2	2	3	3	4	4	N=14	
BH01	14.00	14.15	14.45	SPT	1	2	3	3	4	4	N=14	
BH01	15.50	15.65	15.95	SPT	3	5	6	7	7	8	N=28	
BH01	17.00	17.15	17.45	SPT	5	6	7	7	8	9	N=31	
BH01	18.50	18.65	18.95	SPT	5	6	7	8	8	10	N=33	
BH01	20.05	20.20	20.50	SPT	6	7	8	9	10	12	N=39	
BH03	1.20	1.35	1.65	SPT	1	2	2	2	2	1	N=7	
BH03	2.00	2.15	2.45	SPT	1	0	1	2	2	4	N=9	
BH03	3.00	3.15	3.45	SPT	1	1	1	2	1	2	N=6	
BH03	4.00	4.15	4.45	SPT	1	0	1	2	2	3	N=8	
BH03	5.00	5.15	5.45	SPT	1	2	2	3	4	6	N=15	
BH03	8.00	8.15	8.45	SPT	2	3	3	4	4	5	N=16	
BH03	11.00	11.15	11.45	SPT	4	5	5	9	13	20	N=47	
BH03	12.50	12.65	12.95	SPT	4	5	7	7	8	9	N=31	
BH03	14.00	14.15	14.45	SPT	3	4	6	7	8	10	N=31	
BH03	15.50	15.65	15.95	SPT	3	5	6	6	8	9	N=29	
BH03	17.00	17.15	17.45	SPT	4	5	6	6	7	8	N=27	
BH03	18.50	18.65	18.95	SPT	3	5	7	8	9	10	N=34	
BH03	20.05	20.20	20.50	SPT	5	7	8	9	11	12	N=40	
BH04	2.00	2.15	2.45	SPT	1	2	3	4	4	5	N=16	
BH04	3.00	3.15	3.45	SPT	1	2	3	3	3	3	N=12	
BH04	5.00	5.15	5.45	SPT	3	5	7	7	8	10	N=32	
BH04	6.50	6.65	6.83	SPT	5	9	15	22	13		50/180mm	
BH04	8.00	8.15	8.45	SPT	2	3	3	3	3	3	N=12	
BH04	9.50	9.65	9.95	SPT	2	3	4	4	5	5	N=18	
BH04	11.00	11.15	11.45	SPT	3	4	4	5	6	7	N=22	
BH04	12.50	12.65	12.95	SPT	3	4	5	5	6	7	N=23	
BH04	14.00	14.15	14.45	SPT	4	5	6	6	7	7	N=26	
BH04	15.50	15.65	15.95	SPT	4	5	7	8	9	10	N=34	
BH04	17.00	17.15	17.45	SPT	4	5	6	7	7	8	N=28	
BH04	18.50	18.65	18.95	SPT	3	4	4	5	6	8	N=23	
BH04	20.05	20.20	20.50	SPT	3	4	5	6	7	8	N=26	
WS01	1.00	1.15	1.45	CPT	1	2	0	0	1	8	N=9	
WS01	2.00	2.15	2.45	CPT	1	0	0	0	1	0	N=1	

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Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Standard Penetration Test Results

Site : Plant Hill High School, Manchester

Client : Balfour Beatty Construction Limited

Engineer : Cundall

Job Number J06365

Sheet 2 / 3

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
WS01	3.00	3.15	3.45	CPT	2	4	6	4	3	1	N=14	
WS01	4.00	4.15	4.45	CPT	1	1	0	0	0	0	N=0	
WS01	5.00	5.15	5.45	CPT	1	1	2	1	1	2	N=6	
WS01	6.00	6.15	6.45	CPT	2	3	1	1	0	0	N=2	
WS01	7.00	7.15	7.45	CPT	1	1	1	1	1	1	N=4	
WS02	1.00	1.15	1.45	SPT	1	2	2	3	4	4	N=13	
WS02	2.00	2.15	2.45	SPT	4	4	5	5	6	7	N=23	
WS02	3.00	3.15	3.45	CPT	3	4	3	3	3	2	N=11	
WS02	4.00	4.15	4.45	CPT	1	1	2	2	3	3	N=10	
WS04	1.00	1.15	1.45	CPT	1	3	3	4	4	4	N=15	
WS04	2.00	2.15	2.45	SPT	2	3	2	2	2	3	N=9	
WS04	3.00	3.15	3.45	SPT	1	2	2	2	4	5	N=13	
WS04	4.00	4.15	4.45	SPT	5	6	6	6	5	6	N=23	
WS04	5.00	5.15	5.45	CPT	1	1	1	1	1	1	N=4	
WS05	1.00	1.15	1.45	SPT	2	2	2	3	3	3	N=11	
WS05	2.00	2.15	2.45	SPT	2	3	3	3	5	5	N=16	
WS05	3.00	3.15	3.45	CPT	1	1	1	2	1	1	N=5	
WS05	4.00	4.15	4.45	CPT	1	1	1	2	2	7	N=12	
WS06	1.00	1.15	1.45	SPT	3	4	2	3	3	4	N=12	
WS06	2.00	2.15	2.45	SPT	1	2	3	3	4	3	N=13	
WS06	3.00	3.15	3.45	CPT	1	2	2	2	2	3	N=9	
WS06	4.00	4.15	4.45	CPT	2	4	4	4	6	7	N=21	
WS06	5.00	5.15	5.45	CPT	4	3	4	2	3	3	N=12	
WS09	2.00	2.15	2.45	SPT	0	1	1	2	3	4	N=10	
WS09	3.00	3.15	3.45	SPT	2	2	2	2	3	3	N=10	
WS09	4.00	4.15	4.45	SPT	2	1	3	3	3	4	N=13	
WS10	1.00	1.15	1.45	SPT	1	3	3	3	4	5	N=15	
WS10	2.00	2.15	2.45	SPT	1	1	2	4	4	6	N=16	
WS10	3.00	3.15	3.45	SPT	2	2	3	3	4	5	N=15	
WS10	4.00	4.15	4.45	SPT	1	3	4	4	7	7	N=22	
WS11	1.00	1.15	1.45	SPT	1	1	2	3	2	3	N=10	
WS11	2.00	2.15	2.45	SPT	0	0	0	0	2	3	N=5	
WS11	3.00	3.15	3.45	SPT	0	2	1	2	3	5	N=11	
WS11	4.00	4.15	4.45	SPT	4	5	3	5	3	6	N=17	
WS12	1.00	1.15	1.45	SPT	1	3	4	4	4	4	N=16	
WS12	2.00	2.15	2.45	SPT	3	3	4	5	6	4	N=19	
WS12	3.00	3.15	3.45	SPT	2	4	3	4	5	4	N=16	
WS12	4.00	4.15	4.45	SPT	1	2	2	3	4	5	N=14	
WS15	1.00	1.15	1.45	SPT	0	1	1	2	3	3	N=9	
WS15	2.00	2.15	2.45	SPT	0	2	5	5	4	3	N=17	

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Tyttenhanger House
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Standard Penetration Test Results

Site : Plant Hill High School, Manchester

Client : Balfour Beatty Construction Limited

Engineer : Cundall

Job Number J06365

Sheet 3 / 3

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
WS15	3.00	3.15	3.45	SPT	2	3	3	5	5	6	N=19	
WS15	4.00	4.15	4.45	SPT	2	3	6	8	7	7	N=28	
WS16	1.00	1.15	1.45	SPT	0	0	0	0	1	2	N=3	
WS16	2.00	2.15	2.45	SPT	0	0	0	0	0	0	N=0	
WS16	3.00	3.15	3.45	SPT	1	1	1	1	2	2	N=6	
WS16	4.00	4.15	4.45	SPT	1	1	2	3	3	4	N=12	
WS17	1.00	1.15	1.45	SPT	1	1	2	3	4	5	N=14	
WS17	2.00	2.15	2.45	SPT	2	2	3	3	4	4	N=14	
WS17	3.00	3.15	3.45	SPT	1	2	3	3	3	4	N=13	
WS17	4.00	4.15	4.45	SPT	2	2	3	4	4	4	N=15	
WS17	5.00	5.15	5.45	SPT	1	2	3	5	4	6	N=18	
WS17	6.00	6.15	6.45	SPT	2	3	5	6	6	8	N=25	
WS18	1.00	1.15	1.45	SPT	2	2	3	4	3	5	N=15	
WS18	2.00	2.15	2.45	SPT	2	3	5	6	5	6	N=22	
WS18	3.00	3.15	3.45	SPT	1	2	4	7	6	8	N=25	
WS18	4.00	4.15	4.45	SPT	1	2	2	4	4	6	N=16	
WS19	1.00	1.15	1.45	SPT	1	1	1	3	3	3	N=10	
WS19	2.00	2.15	2.45	SPT	2	4	5	6	8	10	N=29	
WS19	3.00	3.15	3.45	SPT	1	2	3	3	3	5	N=14	
WS19	4.00	4.15	4.45	SPT	2	1	2	2	2	3	N=9	
WS20	1.00	1.15	1.45	SPT	1	4	4	5	4	4	N=17	
WS20	2.00	2.15	2.45	SPT	1	1	2	2	3	5	N=12	
WS20	3.00	3.15	3.45	SPT	1	1	2	3	4	4	N=13	
WS20	4.00	4.15	4.45	SPT	2	2	3	4	5	8	N=20	

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PROJECT NAME PLANT HILL HIGH SCHOOL, MANCHESTER

PROJECT NO: GEO/10981

Date	31/01/2007
Approved	JSturges
Page	3 of 4

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression Tests			Chemical Tests			
BH/WS No.	Depth (m)	No.	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 mic (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Stress (kPa)	pH	2:1 W/S SO4 (g/l)	Organic Content (%)	Other tests and comments
BH04	19.50	D4	D	Brown clayey silty fine SAND														Particle Size Distribution Test
WS06	0.90	D2	D	Brown slightly clayey fine to coarse SAND with occasional fine to medium gravel	18	NP	NP	NP	92									Sample is Non-plastic
WS08	1.20	D2	D												6.3	0.07		
WS08	1.60	D3	D	Mottled brown sandy silty CLAY with traces of fine gravel	22	33	17	16	98									
WS09	1.80	D2	D	Mottled brown and black sandy slightly organic silty CLAY with traces of fine gravel	23	34	17	17	98									
WS10	0.80	D2	D	Mottled brown and grey sandy silty CLAY with traces of fine to medium gravel	22	27	15	12	98									
WS12	1.50	D2	D	Brown very silty sandy CLAY														Particle Size Distribution Test
WS13	4.80	D4	D												7.5	0.07		
WS15	2.40	D4	D	Brown slightly sandy silty CLAY with traces of fine to medium gravel	26	32	20	12	97									
WS16	1.40	D2	D	Mottled brown silty CLAY with traces of brick fragments	31	45	23	22	99								1.9	
WS16	3.60	D6	D	Brown silty CLAY with traces of fine gravel	20	34	18	16	99									
WS17	0.40	D1	D	Mottled brown and grey sandy silty CLAY with traces of fine gravel and rootlets	16	31	17	14	98									

SUMMARY OF GEOTECHNICAL TESTING

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Authorised Signatories: • J R Masters (Qual Mgr) • C F Wallace (Tech Mgr) • G J Corio (Tech Mgr) [X] J Sturges (Tech Mgr) • S Burke (Snr Tech) © GEOLABS LIMITED
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PROJECT NAME	**PLANT HILL HIGH SCHOOL, MANCHESTER**
PROJECT NO:	**GEO/10981**

Date	31/01/2007
Approved	*JSturges*
Page	2 of 4

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression Tests			Chemical Tests			
BH/WS No.	Depth (m)	No.	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 mic (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Stress (kPa)	pH	2:1 W/S SO4 (g/l)	Organic Content (%)	Other tests and comments
BH03	11.60	B25	B	Brown CLAY / SILT and fine SAND														
BH03	15.50	S32	S												8.8	0.05		
BH03	17.50	D35	D	Brown very silty CLAY	21	37	21	16	100									
BH04	1.00	U4	U	Soft mottled brown and grey sandy silty CLAY	22					2.14	1.75	20	168	84				
BH04	1.45	D5	D	Mottled brown sandy silty CLAY	18	29	19	10	100									
BH04	3.00	S8	S	Brown grey CLAY / SILT with abundant fine sand														Particle Size Distribution Test
BH04	4.00	U10	U	Soft fissured slightly sandy silty CLAY with traces of fine to medium gravel	18					2.26	1.91	75	113	57	8.7	0.06		
BH04	6.50	D17	D	Brown fine to coarse SAND with occasional fine gravel	4.5	NP	NP	NP	43									Sample is Non-plastic
BH04	8.50	D21	D	Brown clayey silty fine to coarse SAND with occasional fine to coarse gravel														Particle Size Distribution Test
BH04	11.50	D27	D												8.3	0.31		
BH04	12.40	D28	D	Brown clayey silty fine SAND														Particle Size Distribution Test
BH04	16.40	S34	S	Brown clayey silty fine SAND														Particle Size Distribution Test

SUMMARY OF GEOTECHNICAL TESTING

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PROJECT NAME	**PLANT HILL HIGH SCHOOL, MANCHESTER**
PROJECT NO:	**GEO/10981**

Date	31/01/2007
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Page	1 of 4

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression Tests			Chemical Tests			
BH/WS No.	Depth (m)	No.	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 mic (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Stress (kPa)	pH	2:1 W/S SO4 (g/l)	Organic Content (%)	Other tests and comments
BH01	1.50	D3	D												8.4	1.41		
BH01	4.50	D7	D	Mottled brown slightly sandy silty CLAY with traces of fine gravel and rootlets	21	32	19	13	99									
BH01	7.00	B11	B	Brown clayey silty fine to coarse SAND														Particle Size Distribution Test
BH01	8.50	B13	B	Brown clayey silty fine to medium SAND														Particle Size Distribution Test
BH01	11.90	D19	D	Brown very sandy silty CLAY	21	NP	NP	NP	100									
BH01	14.00	S23	S												7.9	<0.05		
BH01	19.50	D32	D	Brown sandy silty CLAY	14	25	14	11	100									
BH03	0.60	D2	D												7.8	1.47		
BH03	6.40	D12	D												8.0	<0.05		
BH03	6.50	U13	U	Firm dark brown CLAY with traces of fine to medium gravel	17					2.21	1.89	125	327	163				
BH03	8.50	B18	B	Brown clayey silty fine to coarse SAND with occasional fine to coarse gravel														Particle Size Distribution Test
BH03	9.50	U20	U	Stiff dark brown fine sandy silty CLAY with occasional fine to medium sandstone fragments	11					2.28	2.05	130	708	354				

SUMMARY OF GEOTECHNICAL TESTING

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PROJECT NAME PLANT HILL HIGH SCHOOL, MANCHESTER

PROJECT NO: GEO/10981

Date	31/01/2007
Approved	JSturges
Page	4 of 4

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression Tests			Chemical Tests			
BH/WS No.	Depth (m)	No.	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 mic (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Stress (kPa)	pH	2:1 W/S SO4 (g/l)	Organic Content (%)	Other tests and comments
WS17	1.10	D3	D												7.0	<0.05		
WS17	1.80	D4	D	Brown slightly sandy silty CLAY with occasional fine to medium gravel	14	30	20	10	88									
WS18	0.60	D2	B	Brown sandy silty CLAY with traces of fine gravel and brick fragments	15	30	16	14	99									
WS18	1.40	D3	B	Brown sandy silty CLAY with traces of fine to medium gravel	14	27	14	13	99									
WS19	0.50	D2	D	Mottled brown sandy very silty CLAY with traces of fine to medium gravel	22	38	23	15	100									
WS19	1.20	D3	S	Brown very sandy very silty CLAY	26	NP	NP	NP	100									Sample is Non-plastic
WS20	0.70	D4	D	Brown clayey silty fine to medium SAND														Particle Size Distribution Test

SUMMARY OF GEOTECHNICAL TESTING

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BS1377 : Part 2 : Clause 9 : 1990

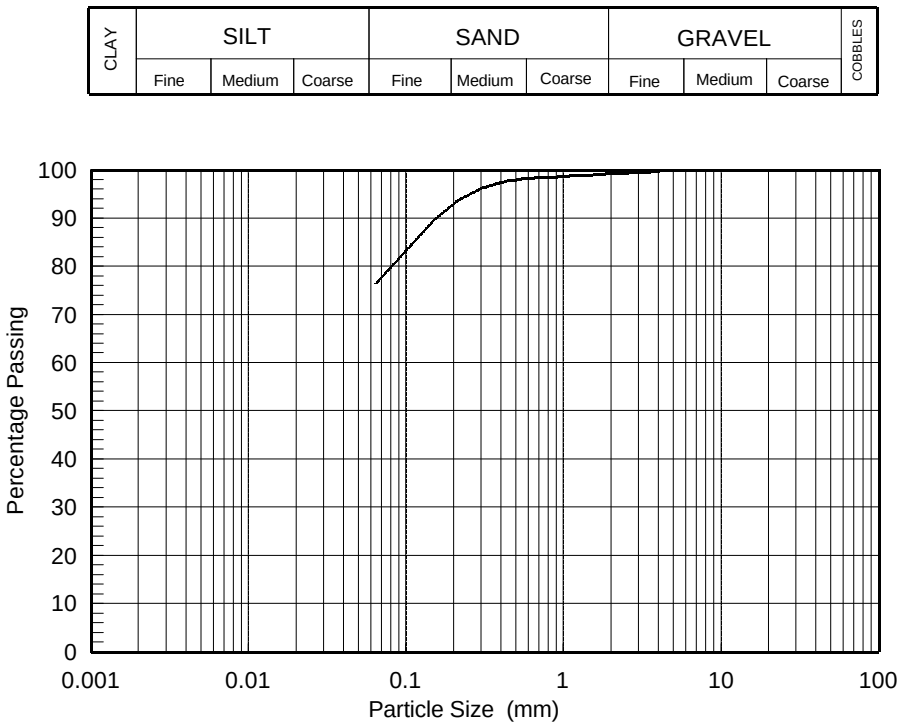
Determination of Particle Size Distribution

Window Sample:	WS12
Sample Number:	D2
Depth (m):	1.50

Description:
Brown very silty sandy CLAY

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	99
1.18 mm	99
600 µm	98
425 µm	98
300 µm	96
212 µm	94
150 µm	90
63 µm	76



Particle Proportions		
Cobbles	0.0	%
Gravel	0.7	%
Sand	23.0	%
Silt & Clay	76.3	%

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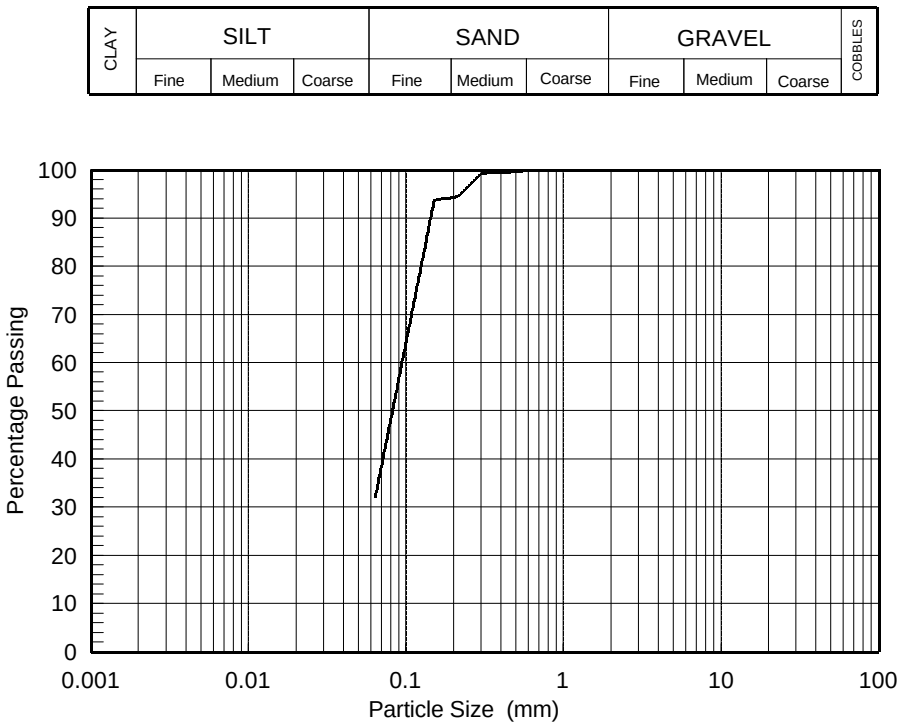
BS1377 : Part 2 : Clause 9 : 1990

Determination of Particle Size Distribution

Borehole Number: BH4 Sample Number: D40 Depth (m): 19.50	Description: Brown clayey silty fine SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	99
212 µm	94
150 µm	94
63 µm	32



Particle Proportions		
Cobbles	0.0	%
Gravel	0.0	%
Sand	68.1	%
Silt & Clay	31.9	%

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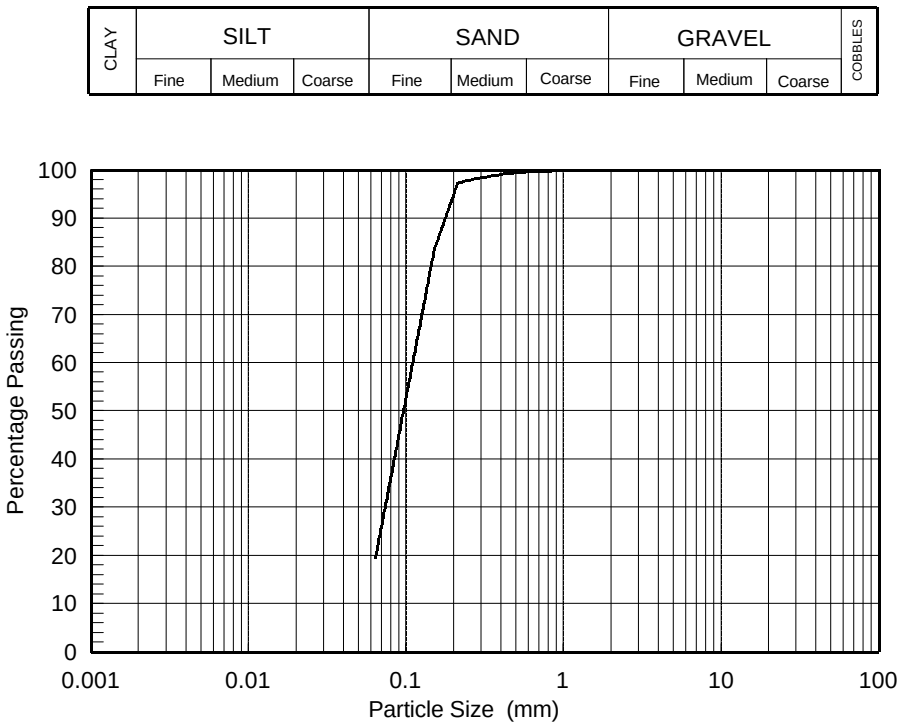
BS1377 : Part 2 : Clause 9 : 1990

Determination of Particle Size Distribution

Borehole Number: BH4	Description:
Sample Number: D35	Brown clayey silty fine SAND
Depth (m): 16.40	

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	98
212 µm	97
150 µm	83
63 µm	19



Particle Proportions		
Cobbles	0.0	%
Gravel	0.0	%
Sand	80.8	%
Silt & Clay	19.2	%

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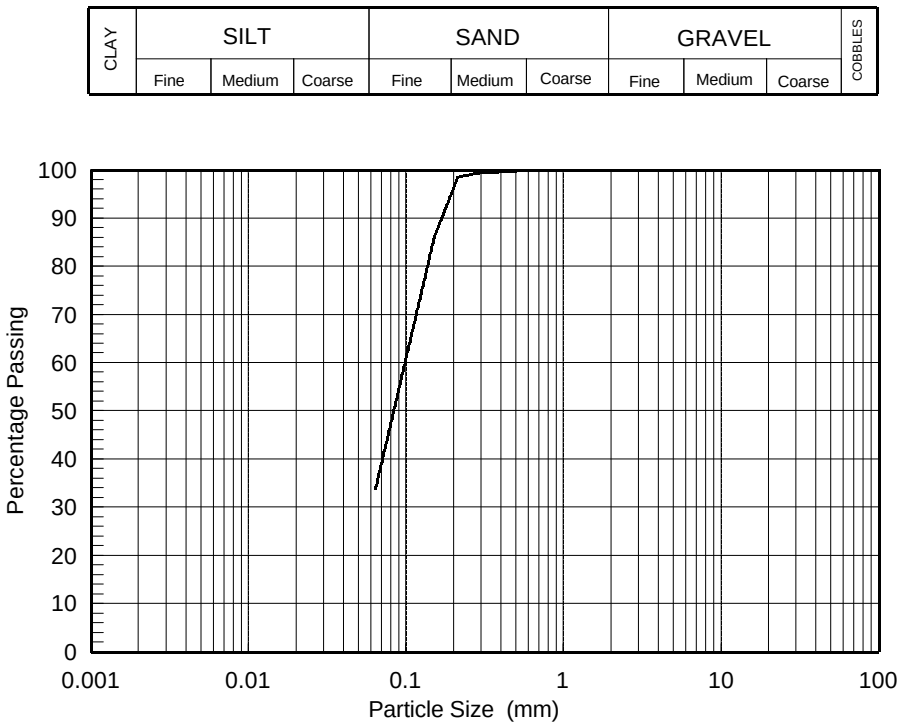
BS1377 : Part 2 : Clause 9 : 1990

Determination of Particle Size Distribution

Borehole Number: BH4	Description:
Sample Number: D28	Brown clayey silty fine SAND
Depth (m): 12.40	

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	99
212 µm	99
150 µm	86
63 µm	34



Particle Proportions		
Cobbles	0.0	%
Gravel	0.0	%
Sand	66.4	%
Silt & Clay	33.6	%

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BS1377 : Part 2 : Clause 9 : 1990

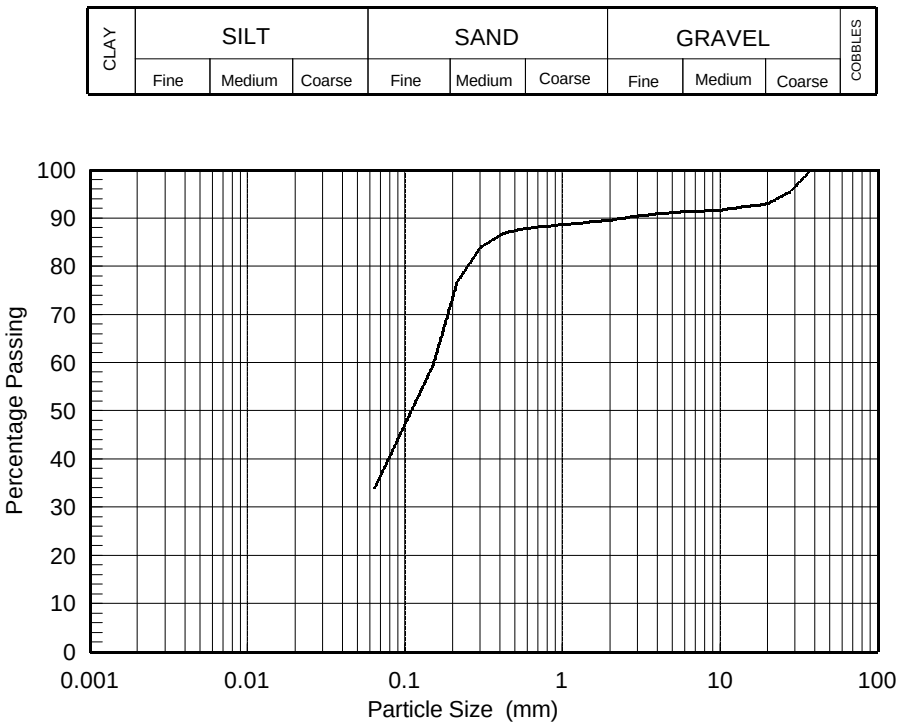
Determination of Particle Size Distribution

Borehole Number:	BH4
Sample Number:	D21
Depth (m):	8.50

Description:
Brown clayey silty fine to coarse SAND
with occasional fine to coarse gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	96
20 mm	93
14 mm	92
10 mm	92
6.3 mm	91
5 mm	91
3.35 mm	91
2 mm	90
1.18 mm	89
600 µm	88
425 µm	87
300 µm	84
212 µm	77
150 µm	60
63 µm	34



Particle Proportions		
Cobbles	0.0	%
Gravel	10.4	%
Sand	55.9	%
Silt & Clay	33.7	%

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Date: 31/01/2007

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Project Name:
PLANT HILL HIGH SCHOOL, MANCHESTER

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BS1377 : Part 2 : Clause 9 : 1990

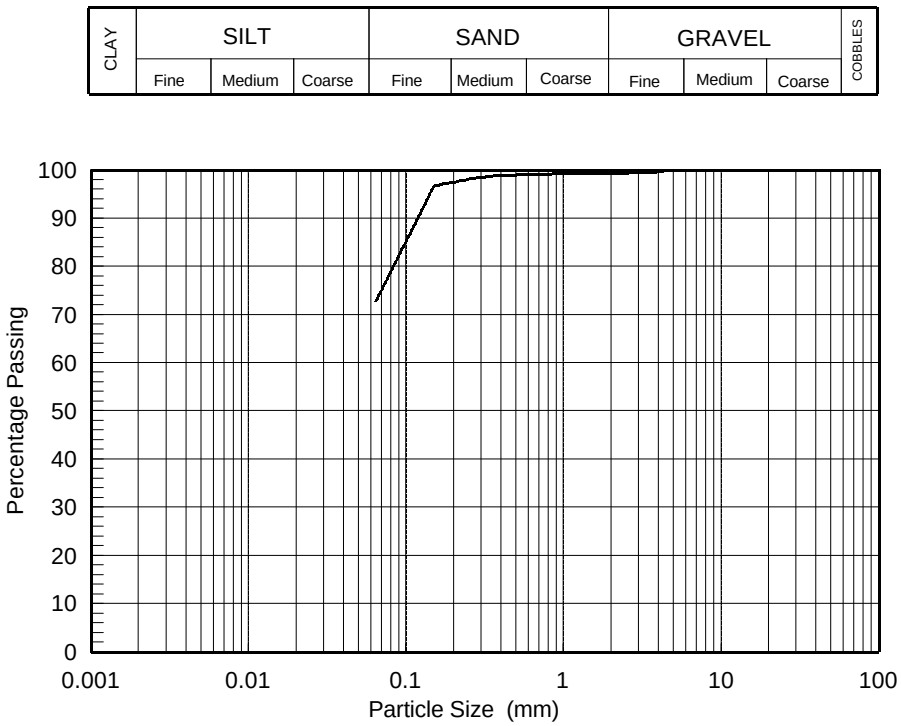
Determination of Particle Size Distribution

Borehole Number:	BH4
Sample Number:	S8
Depth (m):	3.00

Description:
Brown grey CLAY / SILT with abundant fine sand

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	99
2 mm	99
1.18 mm	99
600 µm	99
425 µm	99
300 µm	99
212 µm	98
150 µm	97
63 µm	73



Particle Proportions		
Cobbles	0.0	%
Gravel	0.6	%
Sand	26.8	%
Silt & Clay	72.5	%

Checked and Approved
Initials: JS
Date: 31/01/2007

Project Number:
GEO / 10981
Project Name:
PLANT HILL HIGH SCHOOL, MANCHESTER

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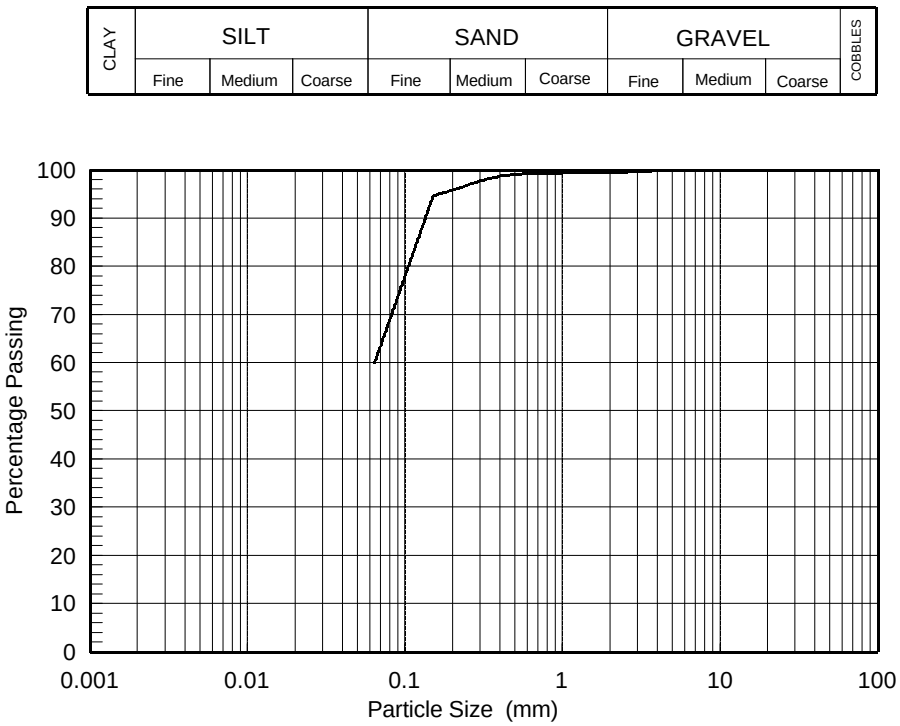
BS1377 : Part 2 : Clause 9 : 1990

Determination of Particle Size Distribution

Borehole Number: BH3	Description:
Sample Number: B25	Brown CLAY / SILT and fine SAND
Depth (m): 11.60	

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	99
425 µm	99
300 µm	98
212 µm	96
150 µm	95
63 µm	60



Particle Proportions		
Cobbles	0.0	%
Gravel	0.4	%
Sand	39.9	%
Silt & Clay	59.8	%

Checked and Approved Initials: JS Date: 31/01/2007	Project Number: **GEO / 10981** Project Name: **PLANT HILL HIGH SCHOOL, MANCHESTER**	GEOLABS

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BS1377 : Part 2 : Clause 9 : 1990

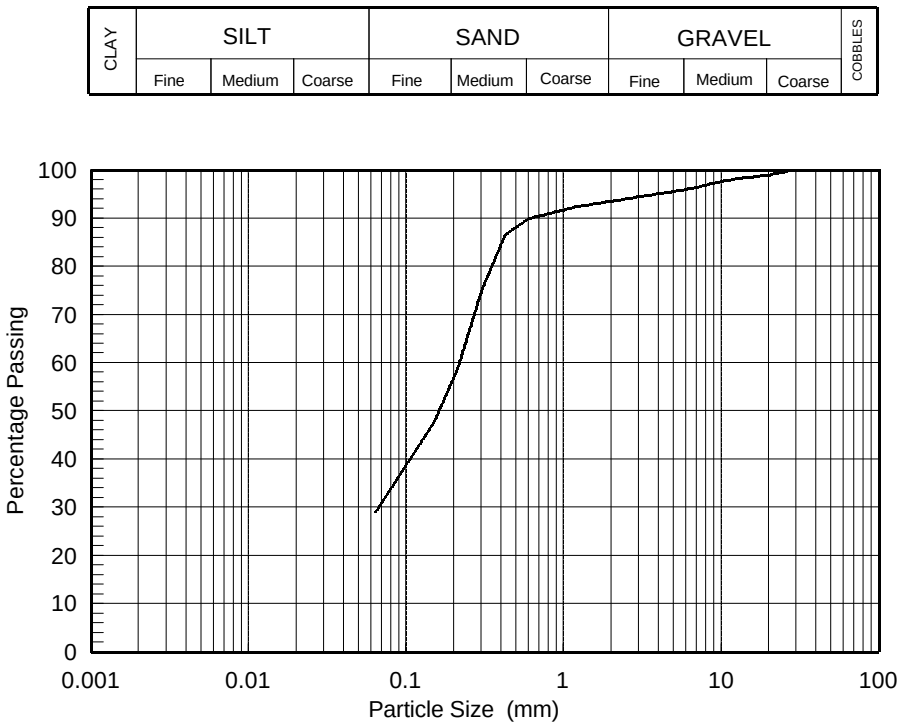
Determination of Particle Size Distribution

Borehole Number:	BH3
Sample Number:	B18
Depth (m):	8.50

Description:
Brown clayey silty fine to coarse SAND
with occasional fine to coarse gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	99
14 mm	99
10 mm	98
6.3 mm	96
5 mm	96
3.35 mm	95
2 mm	94
1.18 mm	92
600 µm	90
425 µm	87
300 µm	75
212 µm	59
150 µm	48
63 µm	29



Particle Proportions		
Cobbles	0.0	%
Gravel	6.5	%
Sand	64.6	%
Silt & Clay	28.9	%

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BS1377 : Part 2 : Clause 9 : 1990

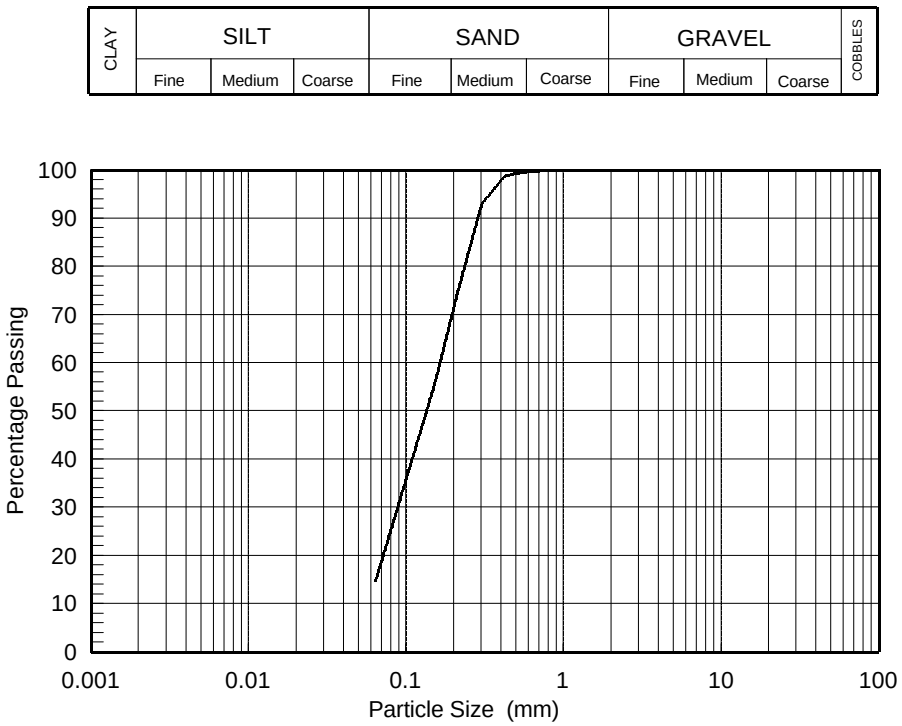
Determination of Particle Size Distribution

Borehole Number:	BH1
Sample Number:	B13
Depth (m):	8.50

Description:
Brown clayey silty fine to medium SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	93
212 µm	75
150 µm	55
63 µm	14



Particle Proportions		
Cobbles	0.0	%
Gravel	0.0	%
Sand	85.5	%
Silt & Clay	14.5	%

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Date: 31/01/2007

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BS1377 : Part 2 : Clause 9 : 1990

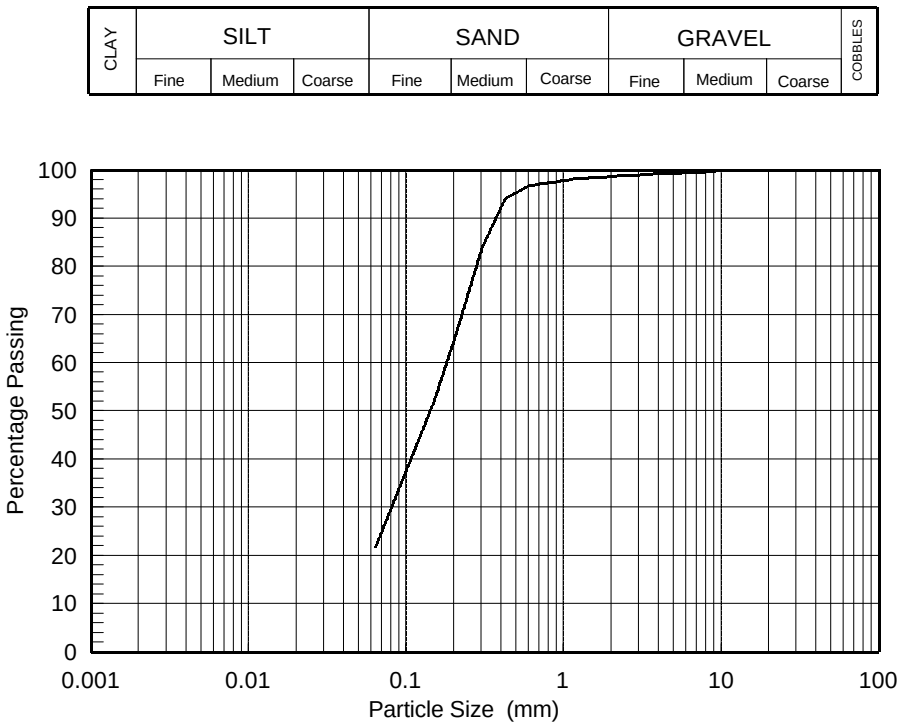
Determination of Particle Size Distribution

Borehole Number:	BH1
Sample Number:	B11
Depth (m):	7.00

Description:
Brown clayey silty fine to coarse SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	99
3.35 mm	99
2 mm	99
1.18 mm	98
600 µm	97
425 µm	94
300 µm	84
212 µm	67
150 µm	52
63 µm	21



Particle Proportions		
Cobbles	0.0	%
Gravel	1.3	%
Sand	77.2	%
Silt & Clay	21.5	%

Checked and Approved
Initials: JS
Date: 31/01/2007

Project Number:
GEO / 10981
Project Name:
PLANT HILL HIGH SCHOOL, MANCHESTER

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BS1377 : Part 2 : Clause 9 : 1990

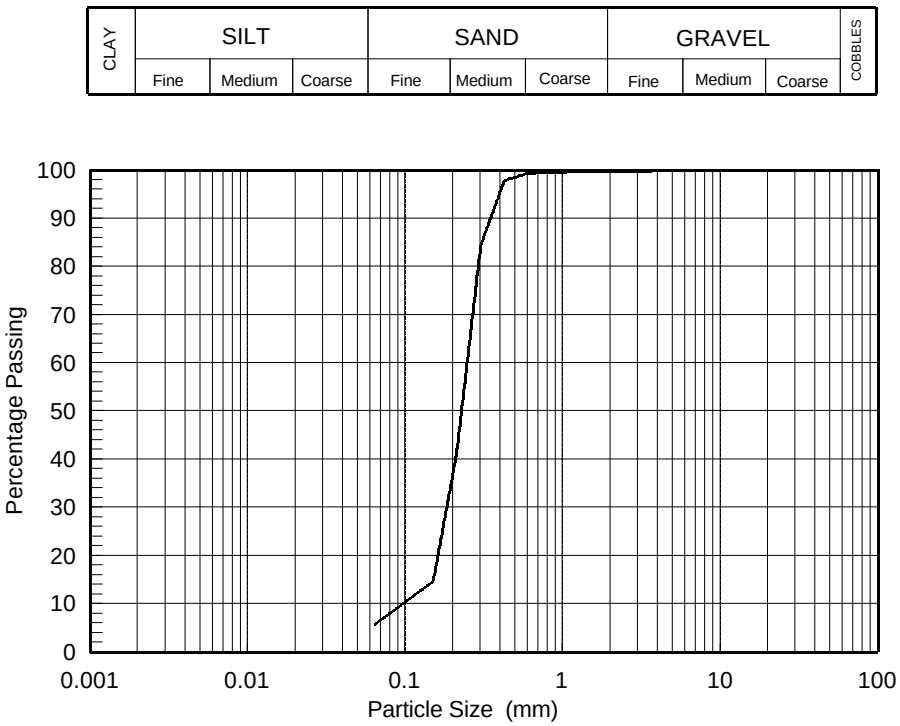
Determination of Particle Size Distribution

Window Sample:	WS20
Sample Number:	D4
Depth (m):	0.70

Description:
Brown clayey silty fine to medium SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

SIEVE	
Sieve	% pass
200 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	99
425 µm	98
300 µm	84
212 µm	42
150 µm	15
63 µm	6



Particle Proportions		
Cobbles	0.0	%
Gravel	0.2	%
Sand	94.2	%
Silt & Clay	5.6	%

Checked and Approved
Initials: JS
Date: 31/01/2007

Project Number:
GEO / 10981
Project Name:
PLANT HILL HIGH SCHOOL, MANCHESTER

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Client: Geotechnical & Environmental Associates Limited, Unit 1, Church Farm, Gotham Road, Kingston-on-Soar, Nottinghamshire NG11 0DE

Scientific Analysis Laboratories

Report Number:	92684 compiled
Date of Report:	30/01/07
Client:	Geotechnical and Environmental Associates Unit 1 Church Farm Gotham Road Kingston on Soar Notts NG11 0DE
Client Contact:	Martin Cooper
Client Job Reference:	Plant Hill
Date Job Received at SAL:	08/01/07
Date Analysis Started:	16/01/07
Date Analysis Completed:	30/01/07

The results reported relate to samples received at the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS or MCERTS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs

Key to symbols used on this report:

W: Analysis was performed at another SAL laboratory
S: Analysis was subcontracted
N: Analysis is not UKAS accredited
U: Analysis is UKAS accredited
M: Analysis is MCERTS accredited

Report written by:

Helen Ashpool
Senior Project Manager

Report checked and authorised by:

Ross Walker
Project Manager

UKAS TESTING 1549 Group

mCERTS 1549

Report Number: 92684 compiled
Client Job Reference: Plant Hill

SAL Ref:	92684 001	92684 002	92684 003	92684 004	92684 005	92684 007
Client Ref:	WS1 D3 2.6	WS1 D5 4.6	WS1 D7 6.6	WS3 D3 1.2	WS6 D1 0.3	WS8 J1 0.7
Depth m	2.6	4.6	6.6	1.2	0.3	0.7
Date Sampled	-	-	-	-	-	-
Type	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil
Matrix	Soil	Soil	Soil	Soil	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol						
Cyanide (Total)	Colorimetry	mg/kg	1	AR	U	5	<1	5	5	<1	7
Phenols (Total-Mono)	Colorimetry	mg/kg	1	AR	U	<1	<1	<1	<1	<1	<1
Sulphide	Colorimetry	mg/kg	10	AR	N	28	40	200	95	21	19
Total Petroleum Hydrocarbons (C8-C10)	GC/FID	mg/kg	1	AR	U	3	2	<10 *	<10 *	<1	<1
Total Petroleum Hydrocarbons (C10 - C12)	GC/FID	mg/kg	1	AR	U	17	16	38	<10 *	<1	<1
Total Petroleum Hydrocarbons (C12-C16)	GC/FID	mg/kg	1	AR	U	21	19	150	59	2	3
Total Petroleum Hydrocarbons (C16-C21)	GC/FID	mg/kg	1	AR	U	280	33	840	170	8	17
Total Petroleum Hydrocarbons (C21-C35)	GC/FID	mg/kg	1	AR	U	1600	440	6500	4100	23	87
Total Petroleum Hydrocarbons (C8-C10 aliphatic)	GC/FID	mg/kg	1	AR	N	2	-	<10 *	<10 *	-	-
Total Petroleum Hydrocarbons (C8-C10 aromatic)	GC/FID	mg/kg	1	AR	N	<1	-	<10 *	<10 *	-	-
Total Petroleum Hydrocarbons (C10-C12 aliphatic)	GC/FID	mg/kg	1	AR	N	8	-	11	<10 *	-	-
Total Petroleum Hydrocarbons (C10-C12 aromatic)	GC/FID	mg/kg	1	AR	N	<1	-	<10 *	<10 *	-	-
Total Petroleum Hydrocarbons (C12-C16 aliphatic)	GC/FID	mg/kg	1	AR	N	5	-	61	36	-	-
Total Petroleum Hydrocarbons (C12-C16 aromatic)	GC/FID	mg/kg	1	AR	N	<1	-	<10 *	<10 *	-	-
Total Petroleum Hydrocarbons (C16-C21 aliphatic)	GC/FID	mg/kg	1	AR	N	150	-	400	110	-	-
Total Petroleum Hydrocarbons (C16-C21 aromatic)	GC/FID	mg/kg	1	AR	N	10	-	80	16	-	-
Total Petroleum Hydrocarbons (C21-C35 aliphatic)	GC/FID	mg/kg	1	AR	N	910	-	2500	3000	-	-
Total Petroleum Hydrocarbons (C21-C35 aromatic)	GC/FID	mg/kg	1	AR	N	41	-	790	170	-	-
Polyaromatic Hydrocarbons (Total)	GC/MS (SIR)	mg/kg	0.01	AR	U	6.9	17	12	11	3.5	7.3
Moisture	Grav (1 Dec) (105 C)	%	0.1	AR	N	21	26	34	32	24	36
Moisture	Grav (1 Dec) (40 C)	%	0.1	AR	N	25	24	30	43	22	33
Arsenic	ICP/OES	mg/kg	2	A40	M	140	150	97	100	24	95
Cadmium	ICP/OES	mg/kg	1	A40	M	2	3	3	10	<1	2
Chromium	ICP/OES	mg/kg	1	A40	M	37	49	51	94	18	59
Copper	ICP/OES	mg/kg	1	A40	M	420	790	330	1000	88	420
Lead	ICP/OES	mg/kg	1	A40	M	1200	1200	1600	1200	140	1000
Mercury	ICP/OES	mg/kg	1	A40	M	1	<1	41	5	<1	<1

Report Number: 92684 compiled
Client Job Reference: Plant Hill

SAL Ref:	92684 001	92684 002	92684 003	92684 004	92684 005	92684 007
Client Ref:	WS1 D3 2.6	WS1 D5 4.6	WS1 D7 6.6	WS3 D3 1.2	WS6 D1 0.3	WS8 J1 0.7
Depth m	2.6	4.6	6.6	1.2	0.3	0.7
Date Sampled	-	-	-	-	-	-
Type	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil
Matrix	Soil	Soil	Soil	Soil	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol						
Nickel	ICP/OES	mg/kg	1	A40	M	88	93	70	110	18	81
Selenium	ICP/OES	mg/kg	2	A40	M	<2	<2	<2	<2	<2	<2
Sulphate (Total)	ICP/OES	%	0.01	A40	N	2.4	2.2	4.6	3.7	0.29	0.79
Sulphate(2:1)	ICP/OES	g/l	0.1	AR	N	1.5	-	2.2	1.3	-	-
Zinc	ICP/OES	mg/kg	1	A40	M	930	2000	1500	2600	170	1200
Total Organic Carbon	OX/IR	%	0.1	A40	N	16	17	33	16	5	22
pH	Probe			AR	M	7.1	7.5	7.3	7	7.7	6.9
Chloride (2:1)	Titration	mg/l	50	AR	N	<50	<50	<50	<50	<50	<50

*** LOD raised due to dilution of sample**

AR- Analysis carried out on sample As received

A40- Analysis carried out on Dried and Ground sample (40°C)

Report Number: 92684 compiled
Client Job Reference: Plant Hill

SAL Ref:	92684 008	92684 010	92684 011	92684 012	92684 013
Client Ref:	WS9 J1 0.9	WS13 D3 0.8	WS13 J1 3.0	WS14 D3 1.6	WS15 J1 0.3
Depth m	0.9	0.8	3.0	1.6	0.3
Date Sampled	-	-	-	-	-
Type	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil
Matrix	Soil	Soil	Soil	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol					
Cyanide (Total)	Colorimetry	mg/kg	1	AR	U	<1	<1	<1	<1	<1
Phenols (Total-Mono)	Colorimetry	mg/kg	1	AR	U	<1	<1	<1	<1	<1
Sulphide	Colorimetry	mg/kg	10	AR	N	<10	<10	46	<10	<10
Total Petroleum Hydrocarbons (C8-C10)	GC/FID	mg/kg	1	AR	U	<10 *	<1	<1	<1	<1
Total Petroleum Hydrocarbons (C10 - C12)	GC/FID	mg/kg	1	AR	U	<10 *	<1	<1	<1	<1
Total Petroleum Hydrocarbons (C12-C16)	GC/FID	mg/kg	1	AR	U	27	7	4	2	<1
Total Petroleum Hydrocarbons (C16-C21)	GC/FID	mg/kg	1	AR	U	130	49	17	9	<1
Total Petroleum Hydrocarbons (C21-C35)	GC/FID	mg/kg	1	AR	U	990	130	71	81	<1
Total Petroleum Hydrocarbons (C8-C10 aliphatic)	GC/FID	mg/kg	1	AR	N	<10 *	-	-	-	-
Total Petroleum Hydrocarbons (C8-C10 aromatic)	GC/FID	mg/kg	1	AR	N	<10 *	-	-	-	-
Total Petroleum Hydrocarbons (C10-C12 aliphatic)	GC/FID	mg/kg	1	AR	N	<10 *	-	-	-	-
Total Petroleum Hydrocarbons (C10-C12 aromatic)	GC/FID	mg/kg	1	AR	N	<10 *	-	-	-	-
Total Petroleum Hydrocarbons (C12-C16 aliphatic)	GC/FID	mg/kg	1	AR	N	17	-	-	-	-
Total Petroleum Hydrocarbons (C12-C16 aromatic)	GC/FID	mg/kg	1	AR	N	<10 *	-	-	-	-
Total Petroleum Hydrocarbons (C16-C21 aliphatic)	GC/FID	mg/kg	1	AR	N	75	-	-	-	-
Total Petroleum Hydrocarbons (C16-C21 aromatic)	GC/FID	mg/kg	1	AR	N	34	-	-	-	-
Total Petroleum Hydrocarbons (C21-C35 aliphatic)	GC/FID	mg/kg	1	AR	N	550	-	-	-	-
Total Petroleum Hydrocarbons (C21-C35 aromatic)	GC/FID	mg/kg	1	AR	N	140	-	-	-	-
Polyaromatic Hydrocarbons (Total)	GC/MS (SIR)	mg/kg	0.01	AR	U	4.3	21	8.7	1.8	0.53
Moisture	Grav (1 Dec) (105 C)	%	0.1	AR	N	22	22	30	15	19
Moisture	Grav (1 Dec) (40 C)	%	0.1	AR	N	21	21	40	16	18
Arsenic	ICP/OES	mg/kg	2	A40	M	42	130	180	32	14
Cadmium	ICP/OES	mg/kg	1	A40	M	2	2	3	<1	<1
Chromium	ICP/OES	mg/kg	1	A40	M	120	58	69	26	22
Copper	ICP/OES	mg/kg	1	A40	M	270	1000	1500	180	46
Lead	ICP/OES	mg/kg	1	A40	M	540	2200	1200	170	60
Mercury	ICP/OES	mg/kg	1	A40	M	<1	<1	1	<1	<1

Report Number: 92684 compiled

Client Job Reference: Plant Hill

SAL Ref:	92684 008	92684 010	92684 011	92684 012	92684 013
Client Ref:	WS9 J1 0.9	WS13 D3 0.8	WS13 J1 3.0	WS14 D3 1.6	WS15 J1 0.3
Depth m	0.9	0.8	3.0	1.6	0.3
Date Sampled	-	-	-	-	-
Type	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil
Matrix	Soil	Soil	Soil	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol					
Nickel	ICP/OES	mg/kg	1	A40	M	40	99	110	36	22
Selenium	ICP/OES	mg/kg	2	A40	M	<2	<2	<2	<2	<2
Sulphate (Total)	ICP/OES	%	0.01	A40	N	0.3	0.33	6.6	0.82	0.11
Sulphate(2:1)	ICP/OES	g/l	0.1	AR	N	-	-	1.3	-	-
Zinc	ICP/OES	mg/kg	1	A40	M	960	1100	1900	510	110
Total Organic Carbon	OX/IR	%	0.1	A40	N	5.3	16	25	3.9	2.2
pH	Probe			AR	M	7.9	7.3	6.4	7.1	7.7
Chloride (2:1)	Titration	mg/l	50	AR	N	<50	<50	<50	<50	<50

*** LOD raised due to dilution of sample**

AR- Analysis carried out on sample As received

A40- Analysis carried out on Dried and Ground sample (40°C)

Report Number: 92684 compiled
Client Job Reference: Plant Hill

SAL Ref:	92684 014	92684 017
Client Ref:	WS16 J1 0.8	WS20 J3 0.5
Depth m	0.8	0.5
Date Sampled	-	-
Type	Topsoil	Topsoil
Matrix	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol		
Cyanide (Total)	Colorimetry	mg/kg	1	AR	U	<1	<1
Phenols (Total-Mono)	Colorimetry	mg/kg	1	AR	U	<1	<1
Sulphide	Colorimetry	mg/kg	10	AR	N	<10	<10
Total Petroleum Hydrocarbons (C8-C10)	GC/FID	mg/kg	1	AR	U	<1	<1
Total Petroleum Hydrocarbons (C10 - C12)	GC/FID	mg/kg	1	AR	U	<1	<1
Total Petroleum Hydrocarbons (C12-C16)	GC/FID	mg/kg	1	AR	U	3	<1
Total Petroleum Hydrocarbons (C16-C21)	GC/FID	mg/kg	1	AR	U	15	<1
Total Petroleum Hydrocarbons (C21-C35)	GC/FID	mg/kg	1	AR	U	56	<1
Total Petroleum Hydrocarbons (C8-C10 aliphatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C8-C10 aromatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C10-C12 aliphatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C10-C12 aromatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C12-C16 aliphatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C12-C16 aromatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C16-C21 aliphatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C16-C21 aromatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C21-C35 aliphatic)	GC/FID	mg/kg	1	AR	N	-	-
Total Petroleum Hydrocarbons (C21-C35 aromatic)	GC/FID	mg/kg	1	AR	N	-	-
Polyaromatic Hydrocarbons (Total)	GC/MS (SIR)	mg/kg	0.01	AR	U	5.4	0.03
Moisture	Grav (1 Dec) (105 C)	%	0.1	AR	N	21	14
Moisture	Grav (1 Dec) (40 C)	%	0.1	AR	N	12	13
Arsenic	ICP/OES	mg/kg	2	A40	M	17	6
Cadmium	ICP/OES	mg/kg	1	A40	M	<1	<1
Chromium	ICP/OES	mg/kg	1	A40	M	14	8
Copper	ICP/OES	mg/kg	1	A40	M	68	21
Lead	ICP/OES	mg/kg	1	A40	M	40	10
Mercury	ICP/OES	mg/kg	1	A40	M	<1	<1

Report Number: 92684 compiled

Client Job Reference: Plant Hill

SAL Ref:	92684 014	92684 017
Client Ref:	WS16 J1 0.8	WS20 J3 0.5
Depth m	0.8	0.5
Date Sampled	-	-
Type	Topsoil	Topsoil
Matrix	Soil	Soil

Determinand	Method	Units	LOD	Analysis	Symbol		
Nickel	ICP/OES	mg/kg	1	A40	M	33	9
Selenium	ICP/OES	mg/kg	2	A40	M	<2	<2
Sulphate (Total)	ICP/OES	%	0.01	A40	N	0.19	0.02
Sulphate(2:1)	ICP/OES	g/l	0.1	AR	N	-	-
Zinc	ICP/OES	mg/kg	1	A40	M	150	33

Total Organic Carbon	OX/IR	%	0.1	A40	N	16	0.2
pH	Probe			AR	M	8.3	6.4
Chloride (2:1)	Titration	mg/l	50	AR	N	<50	<50

*** LOD raised due to dilution of sample**

AR- Analysis carried out on sample As received

A40- Analysis carried out on Dried and Ground sample (40°C)

Report Number: 92684 compiled
Client Job Reference: Plant Hill

SAL Ref:	92684 006
Client Ref:	WS7 D1 0.2
Depth m	0.2
Date Sampled	-
Type	Fill #
Matrix	Soil

Determinand	Method	Units	LOD	Analysis	Symbol	
Cyanide (Total)	Colorimetry	mg/kg	1	AR	U	<1
Phenols (Total-Mono)	Colorimetry	mg/kg	1	AR	U	<1
Sulphide	Colorimetry	mg/kg	10	AR	N	<10
Total Petroleum Hydrocarbons (C8-C10)	GC/FID	mg/kg	1	AR	U	<1
Total Petroleum Hydrocarbons (C10 - C12)	GC/FID	mg/kg	1	AR	U	<1
Total Petroleum Hydrocarbons (C12-C16)	GC/FID	mg/kg	1	AR	U	2
Total Petroleum Hydrocarbons (C16-C21)	GC/FID	mg/kg	1	AR	U	6
Total Petroleum Hydrocarbons (C21-C35)	GC/FID	mg/kg	1	AR	U	25
Polyaromatic Hydrocarbons (Total)	GC/MS (SIR)	mg/kg	0.01	AR	U	8.9
Moisture	Grav (1 Dec) (105 C)	%	0.1	AR	N	8.3
Moisture	Grav (1 Dec) (40 C)	%	0.1	AR	N	26
Arsenic	ICP/OES	mg/kg	2	A40	U	17
Cadmium	ICP/OES	mg/kg	1	A40	U	<1
Chromium	ICP/OES	mg/kg	1	A40	U	14
Copper	ICP/OES	mg/kg	1	A40	U	52
Lead	ICP/OES	mg/kg	1	A40	U	120
Mercury	ICP/OES	mg/kg	1	A40	U	<1
Nickel	ICP/OES	mg/kg	1	A40	U	16
Selenium	ICP/OES	mg/kg	2	A40	U	<2
Sulphate (Total)	ICP/OES	%	0.01	A40	N	0.15
Zinc	ICP/OES	mg/kg	1	A40	U	96
Total Organic Carbon	OX/IR	%	0.1	A40	N	5.1
pH	Probe			AR	U	7.5
Chloride (2:1)	Titration	mg/l	50	AR	N	<50

AR- Analysis carried out on sample As received
A40- Analysis carried out on Dried and Ground sample (40°C)
 # Sample is outside the scope of MCERTS accreditation. Results are UKAS only

Report Number: **92684 compiled**
Client Job Reference: **Plant Hill**

SAL Ref.	**92684 018**
Client Ref.	**WS9 0.9 ASBESTOS**
Type	**Cement Sheet**

Determinand	**Method**	**Units**	**Symbol**	
Element	PLM	-	WN	Cement Sheet
Asbestos Type	PLM	-	WU	Chrysotile
Asbestos Level	PLM	%	WN	Typically 10-25
Comments	PLM	-	WN	-

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Generic Risk-Based Soil Guideline Values

INORGANICS

	Residential Usage with plant uptake			Commercial	Structures / Services	Comment
	pH 6	pH7	pH 8			
pH		-		-	<5.0 to >8.0	WRAS
Arsenic		20		500	(10)	SGV1 (WRAS)
Cadmium	1	2	8	1,400	(3)	SGV3 (WRAS)
Chromium		130		5,000	(600)	SGV4 (WRAS)
Copper	100	135	200	Limited toxicity		SLG
Lead		450		750	(500)	SGV10 (WRAS)
Mercury		8		480	(1)	SGV5 (WRAS)
Nickel		50		5,000		SGV7
Selenium		35		8,000	(3)	SGV9 (WRAS)
Zinc	250	300	450	Limited toxicity		SLG
Soluble Sulphate (2:1) mg/l	Limited toxicity			Limited toxicity	0	BRE/WRAS
Sulphide	Limited toxicity			Limited toxicity	250	WRAS
Chloride	Limited Toxicity			Limited toxicity	370	BRE

Notes:

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these values indicate a potential risk, and thus require further, site specific risk assessment.

SGV Soil Guide Line Value - Derived from the CLEA model and published by DEFRA

SLG Sludge (Use in Agriculture) Regulations 1989, as amended: Maximum permissible concentrations of potentially toxic elements (PTEs) in soil (0-25 cm)1 after application of sewage sludge waste and maximum annual rates of addition

BRE Building Research Establishment Special Publication 1:2005 - Concrete in Aggressive Ground

WRAS Water Regulations Advisory Scheme - The selection of materials for water supply pipes to be laid in contaminated land No 9-04-03 Oct 2002

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Generic Risk-Based Soil Guideline Values

ORGANICS

	Residential Usage with plant uptake			Commercial	Structures / Services	Comment
	SOM 1%	SOM 2.5%	SOM 5%			
Total Organic Carbon		6		10		Potential for Methanogenesis
Total Cyanide		140		12,000	(250)	GGV (WRAS)
Total Mono Phenols	78	150	280	21,900	(5)	SGV8 (WRAS)
Benzene	0.024	0.056	0.109	1.7 - 7.3		SGV12
Toluene	3	7	14	150		SGV15
Ethyl Benzene	9	21	41	48,000		SGV16
Xylene	6	15	30	340		SGV18
Total Petroleum Hydrocarbons	500			500		Trigger for speciated testing
PRO (C5-C10)	129	300	590	530,000	(50)	GGV Speciation Dependent (WRAS)
DRO (C12-C28)	20,000			580,000	(50)	GGV Speciation Dependent (WRAS)
Lube Oil (C28- 40)	140,000			Limited Toxicity	(50)	GGV Speciation Dependent (WRAS)
Aliphatic C5-C6	12	22	39	537		GGV
Aliphatic C6-C8	30	67	130	156,000		GGV
Aliphatic C8-C10	8	18	40	156,000		GGV
Aliphatic C10-C12	45	110	219	156,000		GGV
Aliphatic C12-C16	5,900	7,140	6,110	156,000		GGV
Aliphatic C16-C35	130,000			Limited Toxicity		GGV
Aromatic C6-C7	2.5	5.4	10	124		GGV
Aromatic C7-C8	6.4	15	30	339		GGV
Aromatic C8-C10	8.4	21	41	522		GGV
Aromatic C10-C12	17	41	83	62,200		GGV
Aromatic C12-C16	23	55	112	62,300		GGV
Aromatic C16-C21	14	34	69	46,700		GGV
Aromatic C21-C35	1,230	1,280	1,140	46,700		GGV

Notes: Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these values indicate a potential risk, and thus require further, site specific risk assessment.

SGV Soil Guide Line Value - Derived from the CLEA model and published by DEFRA

GGV Generic Guideline Value - Calculated using the CLEA UK Software Beta Version 1.0 (2005) using the data from the appropriate TOX report published by DEFRA where available

SLG Sludge (Use in Agriculture) Regulations 1989, as amended: Maximum permissible concentrations of potentially toxic elements (PTEs) in soil (0-25 cm)1 after application of sewage sludge waste and maximum annual rates of addition

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Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Generic Risk-Based Soil Guideline Values

POLY AROMATIC HYDROCARBONS

	Residential Usage with plant uptake			Commercial	Structures / Services	Comment
	SOM 1%	SOM 2.5%	SOM 5%			
Total PAH	35			1,120	(50)	GGV[1] / (WRAS)
Naphthalene	7	17	34	290-1400		SGV 19
Acenaphthylene	32	84	239	87,900		GGV
Acenaphthene	48	124	239	87,900		GGV
Fluorene	37	96	185	58,600		GGV
Phenanthrene	1,140	9,610	Limited Toxicity	440,000		GGV
Anthracene	44,200	Limited Toxicity	Limited Toxicity	440,000		GGV
Fluoranthene	60	Limited Toxicity	Limited Toxicity	58,600		GGV
Pyrene	45	Limited Toxicity	Limited Toxicity	43,900		GGV
Benzo(a) Anthracene	10			280		TEF GGV
Chrysene	100			2,800		TEF GGV
Benzo(b) Fluoranthene	10			280		TEF GGV
Benzo(k) Fluoranthene	10			280		TEF GGV
Benzo(a) pyrene	1.00			30		GGV[2]
Indeno(1 2 3 cd) Pyrene	10			280		TEF GGV
Dibenzo(a h) Anthracene	2.5			71		TEF GGV
Benzo (g h i) Perylene	3970	Limited Toxicity	Limited Toxicity	44,000		GGV

Notes:

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these values indicate a potential risk, and thus require further, site specific risk assessment.

SGV Soil Guide Line Value - Derived from the CLEA model and published by DEFRA

GGV Generic Guideline Value - Calculated using the CLEA UK Software Beta Version 1.0 (2005) using the data from the appropriate TOX report published by DEFRA where available or from the USEPA IRIS database where UK TOX data unavailable

GGV[1] Generic Guideline Value - Based on typical ratio of total PAH to individual species in our experience and used as a trigger for PAH speciation; individual species GGVs derived using the CLEA UK Software Beta Version 1.0 (2005) using the data from the appropriate TOX reports

GGV[2] Generic Guideline Value for oral exposure to Benzo (a) Pyrene - Calculated using the CLEA UK Software Beta Version 1.0 (2005) using the data from the TOX 2 report published by DEFRA

TEF GGV Toxic Equivalent Factored Generic Guideline Value - Calculated using toxic equivalent values for Benzo (a) pyrene calculated using the CLEA UK Software Beta Version 1.0 (2005) and the TOX report published by DEFRA

WRAS Water Regulations Advisory Scheme - The selection of materials for water supply pipes to be laid in contaminated land No 9-04-03 Oct 2002

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Gas Monitoring**

Site	Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Job Number** J06365
Client	Balfour Beatty Construction Limited	**Sheet** 1 of 8
Engineer	Cundall Johnston and Partners LLP	

Date	17/01/2007	29/01/2007						
Air Temperature °C								
Barometric Pressure mB	998	1015						
Visit No	1	2	3	4	5	6		
Borehole No	BH3							
Condition of Standpipe	Good	Good						
Combustible gas (CH4) % LEL	Nil	Nil						
Combustible gas (CH4) % vol	<0.1	<0.1						
Combustible gas (CH4) ppm	<1000	<1000						
Carbon Dioxide % vol	4.6	1.9						
Oxygen % vol	15.2	18.1						
Flow Rate (max) l/hr	<0.1	0.3						
Relative Downhole Pressure mb	N/R	N/R						
Downhole Temperature °C								
Water Level m	4.44	0.85						
Remarks								

Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Gas Monitoring**

Site	Plant Hill High School, Plant Hill Road, Higher Blackley, Manchester	**Job Number** J06365
Client	Balfour Beatty Construction Limited	**Sheet** 2 of 8
Engineer	Cundall Johnston and Partners LLP	

Date	17/01/2007	29/01/2007						
Air Temperature °C								
Barometric Pressure mB	998	1015						
Visit No	1	2	3	4	5	6		
Borehole No	WS1							
Condition of Standpipe	Good	Good						
Combustible gas (CH4) % LEL	Nil	Nil						
Combustible gas (CH4) % vol	18.4	21.1						
Combustible gas (CH4) ppm	18400	21100						
Carbon Dioxide % vol	14.2	13.4						
Oxygen % vol	12.1	2.8						
Flow Rate (max) l/hr	0.8	0.2						
Relative Downhole Pressure mb	N/R	N/R						
Downhole Temperature °C								
Water Level m	6.96	7.01						
Remarks								