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**Ref: 18/28700-2
August 2018**

**45 HILLFIELD PARK,
LONDON, N10 3QU**

BASEMENT IMPACT ASSESSMENT

Prepared for

Ahrberg Jackson Design

Working on behalf of

Mr Justin Keery



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1.0 INTRODUCTION

1.1 Project Objectives

The purpose of this assessment is to consider the effects of a proposed basement construction on the local slope stability, surface water and groundwater regime at the residential property at 45 Hillfield Park, London, N10 3QU.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the Client and other parties, including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

1.2 Planning Policy Context

With the absence of specific guidance on basements from Haringey Council this document follows current planning procedure for basements and lightwells adopted by other London Boroughs including Camden, Westminster, Kensington and Chelsea and Islington. Basement Guidance notes were drafted in June 2012, but were subsequently removed in July 2014.

These policies require proposed subterranean developments to mitigate against the effects of ground and surface water flooding and to include drainage systems that do not impact neighbouring property of the site or the water environment by way of changing the groundwater regime.

This report is intended to address the issues set out in the planning policies by the other London boroughs. It will review existing site investigation data and provide a preliminary assessment of the issues identified by the Site Analytical Services Limited screening process.

This report also provides an impact assessment of the geo-environmental impacts on adjacent structures and the surrounding area based on available site investigation data.

As part of this guidance a subterranean (groundwater) flow screening chart is provided.

1.3 Qualifications

The report has been prepared by Mr Thomas Murray, a Fellow of the Geological Society (FGS) and Mr Michael Harkness, a Fellow of the Geological Society (FGS).

2.0 SITE DETAILS

(National Grid Reference: TQ 228 839)

2.1 Site Location

45 Hillfield Park is a mid-terraced residential property, located on the south-eastern side of Hillfield Park, Muswell Hill at approximate postcode N10 3QU. The residential dwelling has two levels of accommodation; ground and first floor. The site covers an approximate area of 0.02 Hectares with the general area being under the authority of the London Borough of Haringey.

The site is located on the south-eastern side of Hillfield Park with residential properties to the north and south, a roadway to the west and a public footpath to the east.



Figure 1. Site Location Plan

2.2 Site Layout

The site was attended on 16th August 2018 for the purposes of conducting the site walkover.

The site is located on the south eastern side of Hillfield Park in, Haringey, North London.

The site comprises a terraced two storey residential property with a relatively flat rear garden. The rear of the property steps down from the decking onto the rear garden, which is predominately covered in grass.

The rear of the site is approximately 1-2m lower than the front of the site.

The front of the site is covered in paving slabs with various shrubbery around the boundary.

From the site walkover, there were no obvious potentially contaminating activities on the site.

From historical map evidence, it would appear that the site was first built on between 1896 and 1913. The surrounding area was at first agricultural and residential, but became predominately residential, although some industrial sites including railways and works have been present within the area.

2.3 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

The British Geological Survey maintains an archive of historical exploratory borehole logs throughout the UK. SAS Limited has searched the database and have found that there are no boreholes located within 150m of the site.

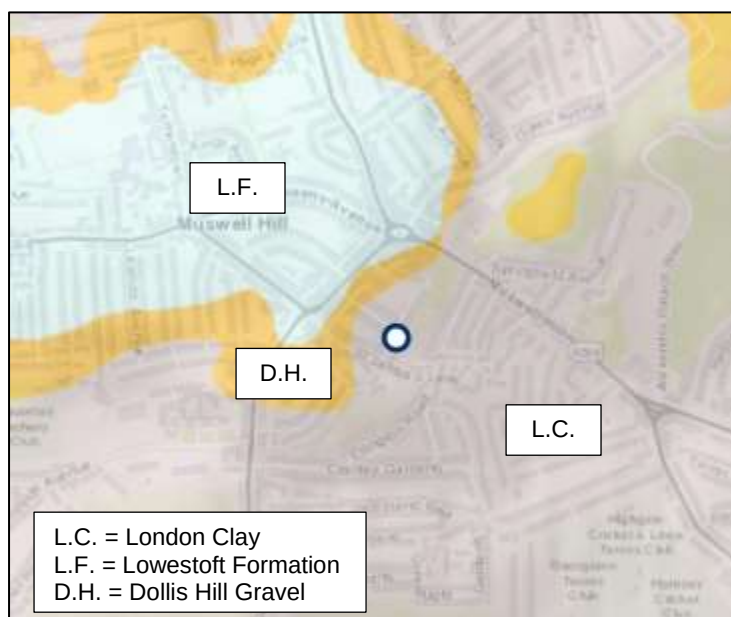


Figure 2. Geology of the Site (Ref. BGS Geoindex)

2.4 Hydrology and drainage

2.4.1 Rainfall and run-off

According to Mayes (1997) rainfall in the local area averages around 610mm/year and is significantly less than the national average of around 900mm/year.

Evapotranspiration is typically 450mm/year resulting in about 160mm/year as 'hydrologically effective' rainfall which is available to infiltrate into the ground or run-off as surface water flow.

With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) the site is not located within 100m of a former 'lost river'. The closest surface water feature is a drain located 165m south-west of the site.

The area located immediately around the site is highly developed with approximately 60% of the surface covered with hardstanding. Most of the rainfall in the area will run-off hard surface areas and be collected by the local sewer network.

2.4.2 Drainage

Surface drainage from the site is assumed to be directed to drains flowing to the south-west along Hillfield Road.

2.4.3 Flood Risk

River or Tidal flooding

The site is currently not located within 1 kilometre of an area at risk from extreme flooding from rivers or sea without defences (Zone 2) or an area at risk from rivers or sea without defences (Zone 3).

Surface water flooding

According to the Envirocheck Surface Water Flood maps of the area (obtained from data supplied by the Environment Agency) the site is at very low risk from surface water flooding, (Figure 3).

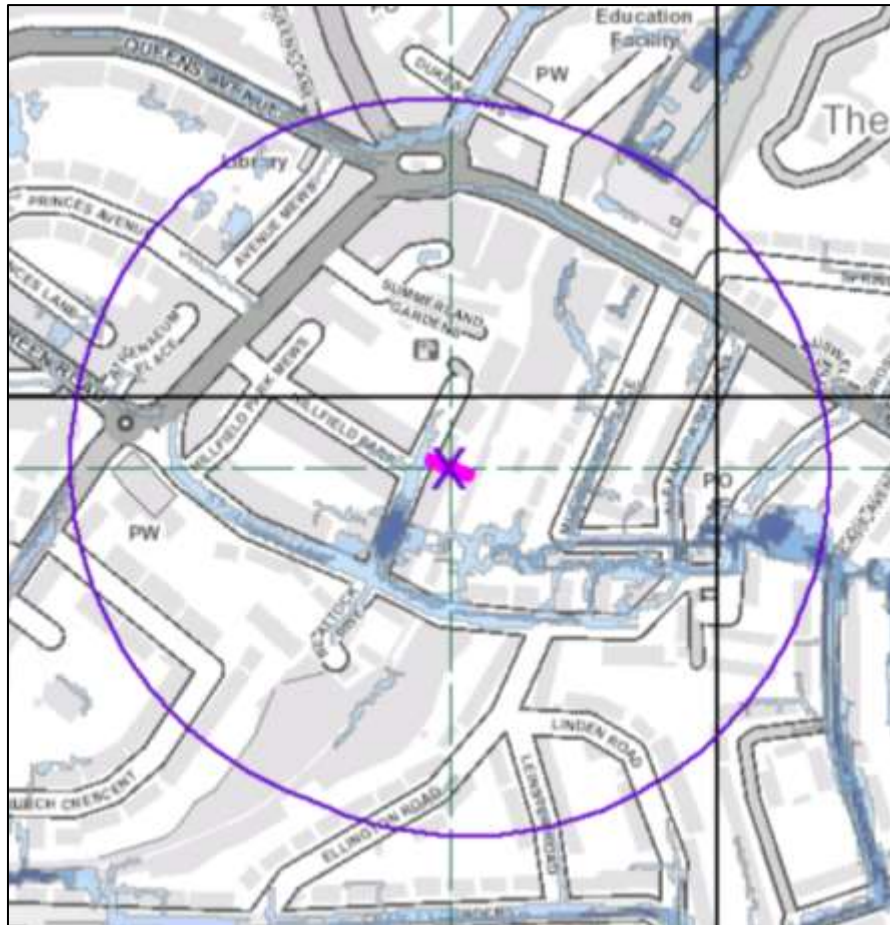


Figure 3. Extract from the Environment Agency's 'Risk of Flooding from Surface Water'. Ordnance Survey Crown copyright 2015. All rights reserved.

Sewer flooding

The London Regional Flood Risk Appraisal (2009) advises that foul sewer flooding is most likely to occur where properties are connected to the sewer system at a level below the hydraulic level of the sewage flow, which in general are often basement flats or premises in low lying areas. There is no record of sewer flooding having occurred at Hillfield Road and therefore the risk of sewer flooding is considered low.

2.5 Hydrogeology

The Environment Agency Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) and also their role in supporting surface water flows and wetland ecosystems.

The Bedrock geology underlying the site (London Clay) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Other hydrogeological data obtained from the Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 18/28700) for the site include:

- There are no Source Protections Zones evident within 1 kilometre of the site.
- There are no non-potable water abstraction licences within 1 kilometre of the site.
- There are no potable water abstraction licences within 1 kilometre of the site.

2.6 Previous Reports

The results from a Phase 1 Preliminary Risk Assessment and Factual Intrusive Investigation are presented under separate cover in Site Analytical Services Limited report (Project Nos. 18/28700 and 18/28700-1 respectively, both dated August 2018. The findings from the Factual Report are described in this basement impact assessment, whilst a copy of the report is included as Appendix A.

2.7 Proposed Development

It is proposed to construct a single storey rear extension with new decking, the extension of the existing basement and the creation of a lightwell in the front garden. Details of the structure and layout were provided; however, loadings were not available at the time of preparation of this report.

2.8 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site and the results are summarised in Table 1 below:

**Table 1: Summary of screening results**

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	1b. Will the proposed basement extend beneath the water table surface.	Unlikely – to be confirmed by Ground Investigation	Given the presence of a non-aquifer below the site it is unlikely that groundwater will be encountered during any excavations for the proposed basement, however this will be confirmed by the ground investigation.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	No	With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) the site is not located within 100m of a former 'lost river'. The closest surface water feature is a drain located 165m south-west of the site.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	No	The amount of hardstanding on-site is not expected to change.
	4. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS).	No	Existing drainage paths are to be utilised where possible. Whether soakaways/SUDS are used on the proposed development is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.
	5. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line.	No	With reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) the site is not located within 100m of a former 'lost river'. The closest surface water feature is a drain located 165m south-west of the site.
Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8).	No	A gentle slope towards the south-east was noted, however this is considerably less than 7 degrees.



Item	Description	Response	Comment
	2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8).	No	Re-profiling of landscaping at the site is not proposed.
	3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8).	No	The immediate surrounding area is gently (below 7 degrees) sloping towards the south-east.
	4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8).	No	There is a general slope across the surrounding area from north-east to south-west, but this is less than 1 in 8.
	5. Is the London Clay the shallowest strata at the site.	Yes	With reference to available BGS records, the London Clay Formation is expected to be encountered from ground level.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	No	It is understood that no trees are to be felled as part of this development
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	Yes	The site lies above the London Clay Formation, well known as having a high tendency to shrink and swell.
	8. Is the site within 100m of a watercourse or a potential spring line.	No	The closest surface water feature is a drain located 165m south-west of the site.
	9. Is the site within an area of previously worked ground.	No	According to the records held by the BGS the site is not underlain by any worked ground, Made Ground, infilled ground or landscaped ground.
	10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction.	Unknown – to be confirmed by Ground Investigation	The site has been classified as being situated above an unproductive (negligibly permeable) formation (London Clay) that is generally regarded as containing insignificant quantities of groundwater.
	11. Is the site within 5m of a highway or pedestrian right of way.	Yes	The site lies within 5m from Hillfield Road.



Item	Description	Response	Comment
	12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	Yes	The development will increase the depths of foundation at the site, although the foundation depths of adjacent properties are un.known.
	13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	Unknown / outside scope of report	A full statutory service search was outside the scope of this report and must be completed prior to any excavations.
Surface Water and Flooding	1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route.	No	The amount of hardstanding on-site is not changing therefore surface water will not be impacted by the development.
	2. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	No	The amount of hardstanding on-site is not expected to increase.
	3. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses.	No	All surface water for the site will be contained within the site boundaries and collected as described above; hence there will be no change from the development on the quantity or quality of surface water being received by adjoining sites. The basement will be beneath the footprint of the dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by Chapter 5 of the Arup report does not apply across these areas.
	4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	The surface water quality will not be affected by the development, as in the permanent condition collected surface water will be generally be from roofs, domestic hard landscaping or collected from beneath the landscaping layer over the basement.
	5. Is the site in an area known to be at risk from surface water flooding.	No	According to Environment Agency Surface Water Flood maps the site is not at risk from surface water flooding.

The Screening Exercise has identified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Will the proposed basement extend beneath the water table surface.

Slope Stability

- Is the London Clay the shallowest strata at the site.
- Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.
- Is the site within 5m of a highway or pedestrian right of way.
- Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.

3.0 SCOPING PHASE

This purpose of the scoping phase is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified impact factors and recommendations are stated.

A conceptual ground model is usually compiled at the scoping stage however, because the ground investigation has already been undertaken for this project, the conceptual ground model including the findings of the ground investigation is described under Chapter 4.

Subterranean (Groundwater Flow)

Potential Issue (Screening Question)		Potential impacts and actions
1b	Will the proposed basement extend beneath the water table surface?	Potential impact: Local restriction of groundwater flows (perched groundwater or below groundwater table). Action: Ground investigation required, then review.

Slope Stability

5	Is the London Clay the shallowest strata at the site?	Potential impact: The London Clay is prone to seasonal shrink-swell (subsidence and heave). Action: Ground investigation required, then review.
7	Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	Potential Impact: Ground movements will occur during and after the basement construction. Action: Ground investigation required, then review.
11	Is the site within 5m of a highway or a pedestrian right of way?	Potential impact: Excavation of basement causes loss of support to footway/highway and damage to the services beneath them. Action: Ensure adequate temporary and permanent support by use of best practice working methods.
12	Will the proposed basement substantially increase the differential depth of foundations relative to neighbouring properties?	Potential impact: Loss of support to the ground beneath the foundations to the surrounding properties if basement excavations are inadequately supported. Action: Ensure adequate temporary and permanent support by use of best practice methods.

These potential impacts have been further assessed through the ground investigation, as detailed in Section 4 below.

4.0 EXISTING SITE INVESTIGATION DATA

4.1 Records of site investigations

Ground conditions at the site were investigated by Site Analytical Services Limited in August 2018 (Report Reference 18/28700-1, dated August 2018). The ground conditions revealed by the investigation are summarised in the following table.

Strata	Depth to top of strata (mbgl)	Depth to base of strata (mbgl)	Description
Made Ground	0.00	2.30	Grass surface over clayey silty gravelly sand with brick and concrete fragments.
London Clay	2.30	10.00 (Base of BH1)	Firm becoming stiff silty sandy clay containing partings of silty fine sand and occasional gypsum crystals.

Table A: Summary of Ground Conditions in Exploratory Holes

Groundwater was not encountered within the borehole and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the borehole and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Groundwater was encountered at a depth of 2.48m in the monitoring standpipe after a period of approximately three to four weeks. However, this is believed to be surface water.

Groundwater is by its nature, hidden from view and unforeseen ground conditions can occur. It is therefore recommended that the water levels in the monitoring borehole be periodically measured immediately prior to, and during construction. Should groundwater levels rise to within the excavation volume, or should significant groundwater inflow be observed during excavation, professional advice should be sought.

5.0 FOUNDATION DESIGN

5.1 General

It is proposed to construct a single storey rear extension with new decking, the extension of the existing basement and the creation of a lightwell in the front garden.

5.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessment undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man made services are undertaken over the site prior to final design works.

5.3 Conventional Spread Foundations

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the borehole, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff silty sandy clay deposits which occur at depths of approximately 2.30m below ground level.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 130kN/m² at 2.50m depth in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from "Foundation Design and Construction", Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

5.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

5.5 Retaining Walls

5.5.1 General

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table B below to assist the design of these structures.

Stratum	Depth to top (m)	Bulk Density (Mg/m ³) (γ)	Effective Angle of Internal Friction (Φ)
London Clay Formation	2.30	2.00	21

Table B. Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients k_a and k_p . The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

5.5.2 Ground Movement

The upward movement of the base of an excavation occurs as a result of unloading and may be considered as consisting of two parts:

1. A short term movement called heave which occurs as a result of elastic rebound and may typically occur during the construction period
2. A long term movement called swell which occurs as a result of the absorption of water into the pores of the soils as the ground adjusts to new stress conditions.

The site lies above the London Clay Formation known to have a medium susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2 (2010).

Excavations will encounter the London Clay and the contractor should account for these upward ground movements such as providing heave protection measures to the floor slab.

The actual amount of movement will depend upon a number of factors including the construction timetable, ultimate loads and critically, the depth of the final excavation.

5.6 Chemical Attack on Buried Concrete

The results show the soil samples tested to have water soluble sulphate contents of up to 2.25g/litre associated with near neutral pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-3 conditions.

In addition, segregations of gypsum were noted within the London Clay Formation. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such concrete in accordance with full Class DS-3 conditions.

6.0 BASEMENT IMPACT ASSESSMENT

6.1 Summary

The screening identified a number of potential impacts. The table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

Potential Impact	Site Investigation conclusions	Impact sufficiently addressed without further justification?
The proposed basement extends beneath the water table surface.	Groundwater was encountered in the monitoring standpipe installed at a depth of 2.48m below the depth of the rear garden. However, as the stratum is a non-aquifer, this water is more likely to be surface water infiltrating into the borehole and getting trapped by the aquiclude.	Yes
The London Clay the shallowest strata at the site.	The London Clay has been proven to be the shallowest strata at the site.	Yes
There a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	The London Clay was proven below the site and was recorded as having a medium susceptibility to shrinkage and shrinkage. However, the base of proposed basement will extend well below the potential depth of root action.	Yes
The site is within 5m of a highway or pedestrian right of way.	The proposed basement is not to be extended below Hillfield Road and therefore it is suggested that the impact on these access roads is likely to be minimal. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.	Yes.
The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.	The development will result in the extension of the foundation depth of the basement relative to neighbouring properties.	No – see below for further details.

6.2 Outstanding Risks and Issues

The significant impacts which require further information have been described in detailed below in order to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

- a. The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works. This will require close collaboration with the appointed contractor's temporary works coordinator.

The Party Wall Act (1996) will apply to this development because neighbouring houses lie within a defined space around the proposed building works. The party wall process should be followed and adhered to during this development.

A monitoring plan should be set out at design stage and should include a monitoring strategy, instrumentation and monitoring plans and action plans. Trigger levels on movements will need to be defined. Precise levelling or reflective survey targets should be installed at the garden walls and neighbouring buildings. Monitoring should take place in advance of the proposed works as a base-line survey, during the works and for a period following the completion of the works, to understand the long term effects.

7.0 BIA CONCLUSIONS

1. It is proposed to construct a single storey rear extension with new decking, the extension of the existing basement and the creation of a lightwell in the front garden.
2. Conditions at the site were investigated by Site Analytical Services Limited in August 2017 (SAS Report Reference 18/28700-1). The borehole revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised up to 2.30m thickness of Made Ground, underlain by the London Clay Formation.
3. As proven from the site investigation, the Bedrock geology underlying the site (solid permeable formations) has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
4. Groundwater was encountered in the monitoring standpipe installed at a depth of 2.48mbelow the depth of the rear garden. However, as the stratum is a non-aquifer, this water is more likely surface water infiltrating into the borehole and getting trapped by the aquiclude.
5. A monitoring plan will be set out at design stage and will include a monitoring strategy, instrumentation and monitoring plans and action plans.
6. The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground if not properly managed. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures during the works.
7. The proposed development will not increase flood risk at the site or the surrounding area. Also, since the development is on already developed land covered in hardstanding, it will not adversely impact the Council's sustainability objectives.

8.0 REFERENCES

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9.0 APPENDIX A – FACTUAL GROUND INVESTIGATION REPORT



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**Ref: 18/28700-1
August 2018**

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FACTUAL REPORT ON A GROUND INVESTIGATION

Prepared for

Ahrberg Jackson Design

Working on behalf of

Mr Justin Keery



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Business Reg. No. 2255616





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1.0 INTRODUCTION

1.1 Outline and Limitations of Report

At the request of Ahrberg Jackson Design, working on behalf of Mr Justin Keery, a ground investigation was carried out in connection with a proposed residential development at the above site.

The information was required for the design and construction of foundations and infrastructure for the proposed development at the existing site which includes the construction of a single storey rear extension with new decking, the extension of the existing basement and the creation of a lightwell in the front garden.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory hole made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole location which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 SITE DETAILS

(National Grid Reference: TQ 228 839)

2.1 Site Location

45 Hillfield Park is a mid-terraced residential property located on the south-eastern side of Hillfield Park, Muswell Hill at approximate postcode N10 3QU. The residential dwelling has two levels of accommodation; ground and first floor. The site covers an approximate area of 0.02 Hectares with the general area being under the authority of the London Borough of Haringey.

The site is located on the south-eastern side of Hillfield Park with residential properties to the north and south, a roadway to the west and a public footpath to the east.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the London Clay Formation at depth.

3.0 SCOPE OF WORK

3.1 Site Works

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken :-

- The drilling of one continuous flight auger borehole to 10.00m maximum depth below ground level (Borehole 1).
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the borehole.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory hole.
- Factual reporting on the results of the investigation.

3.2 Ground Conditions

The location of the exploratory hole is shown on the site sketch plan, Figure 1.

The borehole revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.00m in thickness resting on deposits of the London Clay Formation.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the borehole, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Depth to base of strata (mbgl)	Description
Made Ground	0.00	2.30	Grass surface over clayey silty gravelly sand with brick and concrete fragments.
London Clay	2.30	10.00 (Base of BH1)	Firm becoming stiff silty sandy clay containing partings of silty fine sand and occasional gypsum crystals.

Table A: Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered in the borehole and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the borehole and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Groundwater was encountered at a depth of 2.48m in the monitoring standpipe after a period of approximately three to four weeks. However, this is believed to be surface water.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (July and August 2018) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 IN-SITU TESTING AND LABORATORY TESTS

4.1 Hand Vane Tests

In the essentially cohesive natural soils encountered at the site, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930 (2015).

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

4.2 Classification Tests

Atterberg Limit tests were conducted on a two soil samples taken from Borehole 1 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

The test results are given in Table 1, contained in Appendix B.

4.3 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on two soil samples selected to give a range of depth are presented on Table 2, contained in Appendix B.

5.0 WASTE ACCEPTANCE CRITERIA TESTING

5.1 Waste Acceptance Criteria Analysis

A sample was obtained from 1.00m depth below ground level in Borehole 1 made at the location indicated on the site sketch plan (Figure 1).

The sample selected for analysis was sub-contracted to DETS Limited (a UKAS and MCERTS accredited laboratory) and their report is contained in Appendix B.

The sample was analysed using the Catwastesoil assessment tool, which concluded that the sample was not hazardous in nature.

The sample was analysed for Waste Acceptance Criteria (WAC) testing in order to classify soils on site for disposal purposes.

For the purpose of waste disposal, the soil sample would be classified as:

BH1 @ 1.00m

Non-Hazardous Waste

The sample exceeded the upper acceptance limits for Inert Waste for Fluoride.

6.0 REFERENCES

1. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.
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6. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."
7. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107
8. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London
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10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.
11. Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.
12. Tomlinson, M J, 2001. "Foundation Design and Construction", Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).



Site Analytical Services Ltd.

REF: 18/28700-1

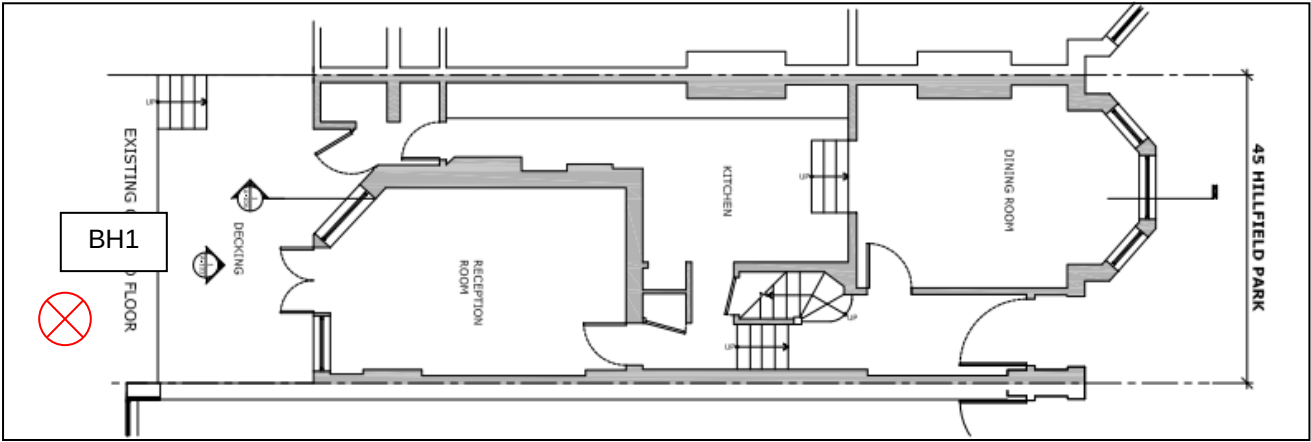
LOCATION: 45 Hillfield Park, London, N10 3QU

FIG: 1

TITLE: Site Sketch Plan

DATE: August 2018

SCALE: NTS





Site Analytical Services Ltd.

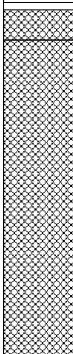
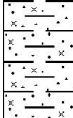
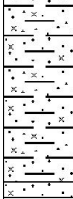
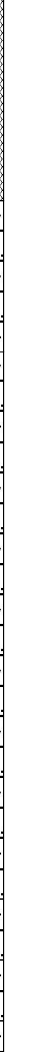
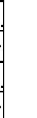
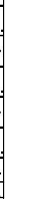
APPENDIX 'A'

Borehole Logs

Site Analytical Services Ltd.							Site 45 HILLFIELD PARK, LONDON, N10 3QU		Borehole Number BH1	
Boring Method CONTINUOUS FLIGHT AUGER		Casing Diameter 100mm cased to 0.00m			Ground Level (mOD)		Client MR. JUSTIN KEERY		Job Number 1828700	
		Location TQ227839			Dates 30/07/2018		Architect AHRBERG JACKSON DESIGN		Sheet 1/2	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.25	D1					(0.20) 0.20	MADE GROUND: Grass over black gravelly sandy clay with fragments of brick and concrete rubble			
0.50	D2						MADE GROUND: Loose becoming medium dense, brown gravelly clayey slightly silty fine to coarse grained sand with fragments of brick and concrete rubble			
0.75	D3									
1.00 1.00-1.30	D4 M1 92/300					(2.10)				
1.50 1.50-1.80	D5 M2 109/300									
2.00 2.00-2.30	D6 M3 124/300					2.30	Firm, dark brown grey silty sandy CLAY			
2.50 2.50	D7 V1 72					(1.00)				
3.00 3.00	D8 V2 72					3.30	Firm becoming stiff, brown silty sandy CLAY			
3.50 3.50	D9 V3 130+									
4.00 4.00	D10 V4 130+									
4.50 4.50	D11 V5 130+									
5.00 5.00	D12 V6 130+									
6.00 6.00	D13 V7 130+					(6.60)				
7.00 7.00	D14 V8 130+									
8.00 8.00	D15 V9 130+									
9.00 9.00	D16 V10 130+									
10.00 10.00	D17 V11 130+					9.90				
Remarks D= Disturbed Sample M= Makintosh Probe-Blows/Penetration (mm) V= Vane Test - Results in kPa Groundwater was not encountered during boring/excavation Excavating from 0.00m to 1.00m for 1 hour. Excavating from 0.00m to 1.00m for 1 hour.								Scale (approx)	Logged By	
								1:50	EW	
								Figure No. 1828700.BH1		

Site Analytical Services Ltd.							Site 45 HILLFIELD PARK, LONDON, N10 3QU		Borehole Number BH1	
Boring Method CONTINUOUS FLIGHT AUGER		Casing Diameter 100mm cased to 0.00m		Ground Level (mOD)		Client MR. JUSTIN KEERY		Job Number 1828700		
		Location TQ227839		Dates 30/07/2018		Architect AHRBERG JACKSON DESIGN		Sheet 2/2		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
						10.00	Stiff, dark grey blue silty sandy CLAY with occasional gypsum crystals Complete at 10.00m			
Remarks							Scale (approx)	Logged By		
							1:50	EW		
							Figure No. 1828700.BH1			

Site Analytical Services Ltd.			Site 45 HILLFIELD PARK, LONDON, N10 3QU	Borehole Number BH1
Installation Type Single Installation	Dimensions Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 100 mm		Client MR. JUSTIN KEERY	Job Number 1828700
	Location TQ227839	Ground Level (mOD)	Architect AHRBERG JACKSON DESIGN	Sheet 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling												
   	   	   		1.00	Bentonite Seal	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)			
											5 min	10 min	15 min	20 min				
						Groundwater Observations During Drilling												
						Date	Start of Shift					End of Shift						
							Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)		
						Instrument Groundwater Observations												
						Inst. [A] Type : Slotted Standpipe												
						Date	Instrument [A]			Remarks								
							Time	Depth (m)	Level (mOD)									
			8.00	Bentonite Seal														
			9.00															
			10.00	General Backfill														

Remarks	Lockable cover set in cement
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Site Analytical Services Ltd.

APPENDIX `B'

Laboratory Test & Groundwater Monitoring Data



Ref: 18/28700-1

**PLASTICITY INDEX &
MOISTURE CONTENT
DETERMINATIONS**

LOCATION 45 Hillfield Park, London, N10 3QU

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Modified Plasticity Index %	Class
BH1	3.00	30	63	24	39	100	39	CH
	4.00	28	57	24	33	100	33	CH

Table 1

**SULPHATE & pH
DETERMINATIONS****LOCATION** 45 Hillfield Park, London, N10 3QU

BH/TP No.	DEPTH BELOW GL m	SOIL SULPHATES AS SO ₄		WATER SULPHATES AS SO ₄		pH	CLASS	SOIL - 2mm %
		TOTAL %	WATER SOL g/l		g/l			
BH1	5.00		1.88			7.5	DS-3	100
	7.00		2.25			7.5	DS-3	100

Classification – Tables C1 and C2 : BRE Special Digest 1 : 2005



Ref: 18/28700-1

GROUNDWATER MONITORING

LOCATION 45 Hillfield Park, London, N10 3QU

GROUNDWATER MONITORING RECORD			
Date	Weather Conditions	Ground Conditions	Temperature (°C)
16/08/2018	Cloudy and raining	Wet	18.0
Monitoring Point Location	Depth to water (mBGL)		Depth to Base of well (mBGL)
BH1	2.60		8.00

Table 3



Ref: 18/28700-1

GROUNDWATER MONITORING

LOCATION 45 Hillfield Park, London, N10 3QU

GROUNDWATER MONITORING RECORD			
Date	Weather Conditions	Ground Conditions	Temperature (°C)
23/08/2018	Raining	Wet	18.0
Monitoring Point Location	Depth to water (mBGL)		Depth to Base of well (mBGL)
BH1	2.48		8.00

Table 3a



Aubrey Davidson
Site Analytical Services Ltd
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33 River Road
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Essex
IG11 0EA

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

DETS Report No: 18-80477

Site Reference: 45 Hillfield Park

Project / Job Ref: 18/28700

Order No: 2401

Sample Receipt Date: 09/08/2018

Sample Scheduled Date: 09/08/2018

Report Issue Number: 1

Reporting Date: 15/08/2018

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services



DETS Ltd
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Maidstone
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Soil Analysis Certificate						
DETS Report No: 18-80477	Date Sampled	None Supplied				
Site Analytical Services Ltd	Time Sampled	None Supplied				
Site Reference: 45 Hillfield Park	TP / BH No	BH1				
Project / Job Ref: 18/28700	Additional Refs	None Supplied				
Order No: 2401	Depth (m)	1.00				
Reporting Date: 15/08/2018	QTSE Sample No	353396				

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS	8.0			
Total Cyanide	mg/kg	< 2	NONE	< 2			
Complex Cyanide	mg/kg	< 2	NONE	< 2			
Free Cyanide	mg/kg	< 2	NONE	< 2			
Total Sulphate as SO ₄	mg/kg	< 200	NONE	315			
Total Sulphate as SO ₄	%	< 0.02	NONE	0.03			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	52			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.05			
Sulphide	mg/kg	< 5	NONE	< 5			
Organic Matter	%	< 0.1	MCERTS	1.1			
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	0.6			
Arsenic (As)	mg/kg	< 2	MCERTS	13			
W/S Boron	mg/kg	< 1	NONE	< 1			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	29			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	23			
Lead (Pb)	mg/kg	< 3	MCERTS	61			
Mercury (Hg)	mg/kg	< 1	NONE	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	29			
Selenium (Se)	mg/kg	< 3	NONE	< 3			
Zinc (Zn)	mg/kg	< 3	MCERTS	80			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 18-80477	Date Sampled	None Supplied				
Site Analytical Services Ltd	Time Sampled	None Supplied				
Site Reference: 45 Hillfield Park	TP / BH No	BH1				
Project / Job Ref: 18/28700	Additional Refs	None Supplied				
Order No: 2401	Depth (m)	1.00				
Reporting Date: 15/08/2018	QTSE Sample No	353396				

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	0.12			
Fluorene	mg/kg	< 0.1	MCERTS	0.23			
Phenanthrene	mg/kg	< 0.1	MCERTS	4.45			
Anthracene	mg/kg	< 0.1	MCERTS	1.22			
Fluoranthene	mg/kg	< 0.1	MCERTS	5.96			
Pyrene	mg/kg	< 0.1	MCERTS	4.90			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	2.14			
Chrysene	mg/kg	< 0.1	MCERTS	1.90			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	1.86			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.74			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	1.60			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.75			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.64			
Coronene	mg/kg	< 0.1	NONE	< 0.1			
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	9			
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	19.4			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	26.5			
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	26.5			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 18-80477	Date Sampled	None Supplied				
Site Analytical Services Ltd	Time Sampled	None Supplied				
Site Reference: 45 Hillfield Park	TP / BH No	BH1				
Project / Job Ref: 18/28700	Additional Refs	None Supplied				
Order No: 2401	Depth (m)	1.00				
Reporting Date: 15/08/2018	QTSE Sample No	353396				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	15			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	20			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	34			
Total >C5 - C35	mg/kg	< 42	NONE	< 42			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-80477	Date Sampled	None Supplied				
Site Analytical Services Ltd	Time Sampled	None Supplied				
Site Reference: 45 Hillfield Park	TP / BH No	BH1				
Project / Job Ref: 18/28700	Additional Refs	None Supplied				
Order No: 2401	Depth (m)	1.00				
Reporting Date: 15/08/2018	QTSE Sample No	353396				

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 2	MCERTS	< 2				
p & m-xylene	ug/kg	< 2	MCERTS	< 2				
o-xylene	ug/kg	< 2	MCERTS	< 2				
MTBE	ug/kg	< 5	MCERTS	< 5				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3									
DETS Report No: 18-80477		Date Sampled	None Supplied		Landfill Waste Acceptance Criteria Limits				
Site Analytical Services Ltd		Time Sampled	None Supplied						
Site Reference: 45 Hillfield Park		TP / BH No	BH1						
Project / Job Ref: 18/28700		Additional Refs	None Supplied						
Order No: 2401		Depth (m)	1.00						
Reporting Date: 15/08/2018		QTSE Sample No	353396						
Determinand	Unit	MDL							
TOC ^{MU}	%	< 0.1	0.6		Inert Waste Landfill				
Loss on Ignition	%	< 0.01	2.70		Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill				
BTEX ^{MU}	mg/kg	< 0.05	< 0.05		Hazardous Waste Landfill				
Sum of PCBs	mg/kg	< 0.1	< 0.1		3%				
Mineral Oil ^{MU}	mg/kg	< 10	< 10		5%				
Total PAH ^{MU}	mg/kg	< 1.7	26.5		6%				
pH ^{MU}	pH Units	N/a	8.0		10%				
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1		6				
					1				
					500				
					100				
					--				
					>6				
					To be evaluated				
					To be evaluated				
Eluate Analysis			2:1 mg/l	8:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic ^U		< 0.01	< 0.01		< 0.2	0.5	2	25	
Barium ^U		0.02	< 0.02		0.1	20	100	300	
Cadmium ^U		< 0.0005	< 0.0005		< 0.02	0.04	1	5	
Chromium ^U		< 0.005	< 0.005		< 0.20	0.5	10	70	
Copper ^U		< 0.01	< 0.01		< 0.5	2	50	100	
Mercury ^U		< 0.005	< 0.005		< 0.01	0.01	0.2	2	
Molybdenum ^U		0.024	0.019		0.2	0.5	10	30	
Nickel ^U		< 0.007	< 0.007		< 0.2	0.4	10	40	
Lead ^U		< 0.005	< 0.005		< 0.2	0.5	10	50	
Antimony ^U		< 0.005	< 0.005		< 0.06	0.06	0.7	5	
Selenium ^U		< 0.005	< 0.005		< 0.1	0.1	0.5	7	
Zinc ^U		< 0.005	< 0.005		< 0.2	4	50	200	
Chloride ^U		2	< 1		< 12	800	15000	25000	
Fluoride ^U		1.5	1.2		12.2	10	150	500	
Sulphate ^U		< 1	7		69	1000	20000	50000	
TDS		105	77		792	4000	60000	100000	
Phenol Index		< 0.01	< 0.01		< 0.5	1	-	-	
DOC		10.5	12.9		127	500	800	1000	
Leach Test Information									
Sample Mass (kg)			0.20						
Dry Matter (%)			85.4						
Moisture (%)			17						
Stage 1									
Volume Eluate L2 (litres)			0.32						
Filtered Eluate VE1 (litres)			0.14						
Results are expressed on a dry weight basis, after correction for moisture content where applicable									
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepancies with current legislation									
M Denotes MCERTS accredited test									
U Denotes ISO17025 accredited test									



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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 18-80477	
Site Analytical Services Ltd	
Site Reference: 45 Hillfield Park	
Project / Job Ref: 18/28700	
Order No: 2401	
Reporting Date: 15/08/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 353396	BH1	None Supplied	1.00	14.5	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/S}

Unsuitable Sample ^{U/S}

^ no sampling date provided; unable to confirm if samples are within acceptable holding times



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-80477

Site Analytical Services Ltd

Site Reference: 45 Hillfield Park

Project / Job Ref: 18/28700

Order No: 2401

Reporting Date: 15/08/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received