



**Site:** Barrhill Memorial Hall  
**SBA Ref:** J 2742  
**Re:** Site Investigation  
**Client:** Barrhill Memorial Hall Community Association  
**Prepared:** 13 August 2013

Scott Bennett Associates (Group 2) Limited were appointed by the Barrhill Memorial Hall Community Association (the Client), to provide a geotechnical report relative to a proposed extension to the existing hall.

The aim of this study was to provide an assessment of the ground conditions within the subject area and to evaluate the impact the identified conditions could potentially have on the development.

This report details the findings of the site investigation, identifies potential geotechnical and environmental constraints, potentially significant pollutant linkages and provides recommendations in relation to the proposed development in terms of compliance with Part IIA of the Environmental Protection Act 1990 and the appropriate Planning Advice Note (PAN33).

While every effort has been made to determine the conditions across the area of investigation, it should be noted that ground conditions can vary between sample locations and consequently, conditions may exist within certain areas, which may be at variance to those disclosed by this report.

This report and the conclusions contained herein have been written in the context of the purpose stated above and should not be utilised in any differing context without prior reference to us, to ensure continued pertinence of the recommendations advised.

We would advise that changes in accepted practices, legislation, regulation or guidance may necessitate review and possible revision of the report in part, or in whole, following its submission. In the event that appropriate regulatory approval and recommendations of the report have not been implemented following a period of 12 months from the report date, it should be referred to us for review and, if necessary, amendment.

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### **Desk Study**

Available historic mapping shows that the site was un-developed prior to the construction of the existing hall. No industrial or other contaminative land uses were recorded in the vicinity of the site.

The geology maps available on the BGS 1:50,000 scale mapping show the site to be underlain with sedimentary strata of the Kirkcolm Formation of Ordovician age, comprising greywacke. The mapping shows the drift to comprise glacial till but no indication of depth to rockhead is available.



A surface layer of made and disturbed ground associated with the existing development is likely to be present.

There are no minerals of economic value at shallow depth below the site. There are no mine entries or quarries recorded at or close to this site. The site is considered to be minerally stable.

### **Ground Investigation**

An appropriate scope of works was devised to accommodate the requirements of the initial brief, which was to attempt to determine any significant development constraints. The positioning of the sampling points was devised to provide reasonable coverage over the site area. Aitken Laboratories carried out a ground investigation on the site with trial pits and boreholes being sunk in July 2013, all under the direction of SBA.

The site investigations comprised 3 No. continuous percussive (Terrier) boreholes, and 3 No. hand dug trial pits, as shown on the attached plan. To minimise disruption to the existing surfaces and the risk to any buried services present the previously specified machine dug trial pits were replaced with the boreholes. The logs of these trial pits and boreholes are attached.

A limited range of geochemical testing was specified by SBA, and samples for chemical testing were submitted to the UKAS accredited laboratory of Derwentside Environmental Testing Services Ltd (DETS) in Consett.

The analysis suite selected included a range of common contaminants relevant to human health risk assessment including metals (mercury, arsenic, cadmium, chromium, copper, nickel, lead, selenium and zinc), boron, cyanide, sulphide, total sulphate, phenol (total), speciated total petroleum hydrocarbons (TPH), and speciated polyaromatic hydrocarbons (PAH). Soil organic matter (SOM) content and pH testing were also carried out, together with screening for the presence of asbestos. Two samples were subject to the full range of testing.

The results are presented in the DETS report 13-85194 dated 26 July 2013.

### **Fieldwork Results**

Three trial pits numbered HP101 to HP103 were sunk by hand on the western elevation of the existing building at the locations shown on the attached plan.

HP101 shows a 100mm thick footing with an outstand of 0.15m from the building wall, set at a formation 0.25m below the existing ground level. The footing sits on grey clayey gravel, with an obstruction at 0.60m depth.

HP102 shows a 100mm thick footing with an outstand of 0.25m from the building wall, set at a formation 0.60m below the existing ground level. The footing sits on gravel, with an obstruction at 0.80m depth.

HP103 shows a 200mm thick footing with an outstand of 0.10m from the building wall, set at a formation 0.60m below the existing ground level. The footing sits on gravel, which was proved to 0.70m depth.



Borehole BH101 was sunk close to the west of the hall, to provide information on the ground conditions for foundation design. This bore showed 0.1m of topsoil over made ground of sandy gravelly clay with ash extending to probable rock at a depth of 0.50m.

BH102 and BH103 were sunk in the field adjoining the west of the hall, where it is proposed to form a car park, and showed similar results. A layer of topsoil 0.1m thick was present at the surface and overlay a band of made ground comprising sandy gravelly clay with ash and cobbles extending to 0.35m – 0.40m depth. This in turn was underlain by a band of dark brown peat extending to depths of 0.80m - 0.90m, which overlies grey clayey, sandy gravel. Obstructions thought to be bedrock were present at depth of 1.40m and 1.30m.

In the fieldwork groundwater was encountered in all three boreholes, with the trial pits recorded as dry. Water was recorded at depths between 0.50m and 1.30m typically within the gravel above the rock.

### **Environmental Aspects**

To provide an initial assessment of the potential significance of contaminant concentrations detected in soil samples collected from the site, a generic risk assessment is presented below using soil assessment criteria that are derived to be protective of human health.

The soil assessment criteria are intended to provide a conservative means of initial assessment. Where contaminant concentrations are less than the appropriate assessment criteria, it is considered unlikely that the contaminant concentrations will pose a potentially unacceptable risk to human health. Where a contaminant concentration exceeds the assessment criteria, it does not automatically follow that an unacceptable risk exists, but that further assessment may be necessary to quantify the risk taking into account site-specific information.

For initial screening of the soil data the test results obtained have been assessed with respect to the most stringent “residential with home grown produce” end-use scenario. Soil Guideline Values (SGVs) from the Environment Agency have been used where available, and otherwise Generic Assessment Criteria (GAC) produced by LQM-CIEH (second edition, published in July 2009) were used. The SGVs and GACs represent intervention values which indicate that soil concentrations above these values could pose an unacceptable risk to the health of site users, and that further risk assessment/investigation or remedial action is required.

A summary of the range of concentrations relative to their respective reference concentrations is presented in the following tables, where exceedences are indicated in **bold type**.



**Results of Inorganic Chemical Testing on Soils**

Contaminant	Contaminant Range In All Samples (mg/kg)	Soil Reference Values Residential with Plant Uptake (mg/kg)	Soil Reference Values Phytotoxic pH >7.0 (mg/kg)
Arsenic	12 - 13	32	50
W S Boron	1.1 – 1.5	291	
Cadmium	1.0 – 1.1	10	3
Chromium III	53 – 57	627	400
Copper	33 – 36	2,330	135
Lead	47 - 130	450	300
Mercury	0.23 – 0.82	170	1
Nickel	46 - 49	130	75
Selenium	<0.5 – 1.0	350	3
Zinc	120 - 150	3,750	300
Total Cyanide	0.2 – 0.3	25	
Sulphide	<10 – 16	1000 (ICRCL)	
Sulphate (%)	0.11 – 0.18	0.24 (BRE)	
pH	<b>6.2 – 6.5</b>	<b>&lt;6.5 (BRE)</b>	

**Results of Organic Chemical Testing on Soils**

Contaminant	Contaminant Range In All Samples (mg/kg)	Soil Reference Values Residential with Plant Uptake (mg/kg)
Total Phenols	<0.3	420
GRO	<0.1	110
DRO	26 -29	346
MRO	180 – 190	770
TPH	209 – 216	1000 (Special Waste)
Naphthalene	<0.1 – <0.4	8.7
Acenaphthylene	<0.1 – <0.4	850
Acenaphthene	<0.1 – <0.4	1000
Fluorene	<0.1 – <0.4	780
Phenanthrene	<0.1 – <0.4	380
Anthracene	<0.1 – <0.4	9200
Fluoranthene	<0.1 – <0.4	670
Pyrene	<0.1 – <0.4	1600
Benzo(a)anthracene	<0.1 – <0.4	5.9
Chrysene	<0.1 – <0.4	9.3
Benzo(b)fluoranthene	<0.1 – <0.4	7
Benzo(k)fluoranthene	<0.1 – <0.4	10
Benzo(a)pyrene	<0.1 – <0.4	1
Indeno(123-cd)pyrene	<0.1 – <0.4	10
Dibenzo(ah)anthracene	<0.1 – <0.4	0.9
Benzo(ghi)perylene	<0.1 – <0.4	47



The Tier 1 soil contamination risk assessment indicated that no inorganic or organic contaminants were present in the samples of made ground tested at concentrations above the available reference values. There are also no phytotoxic conditions present in the samples of shallow soil.

In terms of durability of concrete in contact with the ground acidic conditions were present, which will require measures to protect concrete.

## **RECOMMENDATIONS**

- Foundations should be strip or pad footings set at similar levels to the existing building, and so either on or just above the rock. A safe bearing pressure in excess of 500kN/m<sup>2</sup> may be anticipated with negligible settlement.
- The consideration of the site history and current uses suggested that the risk of contamination being present was low or negligible. Analytical testing of selected samples has shown that all contaminants measures were at levels which do not pose a risk to human health.
- Concrete in contact with the ground should be designed to Design Sulphate class of DS1 and an Aggressive Chemical Environment for Concrete (ACEC) designation of AC-2z.